Exchange Rate Regimes in Central America: 1970 – 2008

by

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APPROVAL OF THE DISSERTATION COMMITTEE

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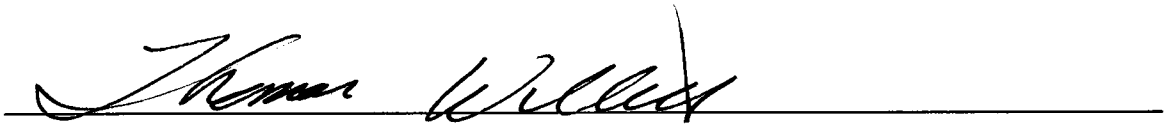

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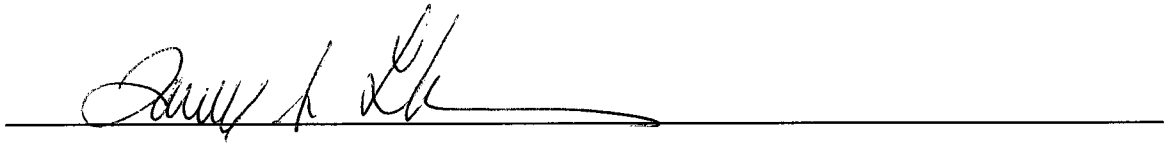

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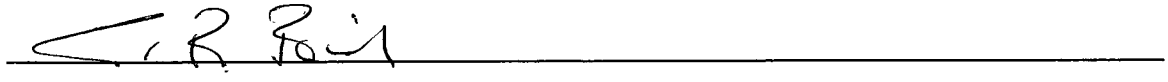

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Abstract

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During the last few years there has been considerable interest in the classification of exchange rates in order to investigate a wide range of hypotheses including the relationships of alternative exchange rate regimes with inflation and growth. In this sense, the main objective of this dissertation is to analyze the evolution of the exchange rate regimes for six countries located in Central America during the last four decades. In order to evaluate these developments, I review recent efforts and advances that have been made in the construction of behavioral measures to classify exchange rate regimes and their relationship with economic performance. As it has become widely recognized that official classifications of exchange rate regimes can often be quite misleading particularly for small economies like the ones located in this region, in the first chapter, I review a methodology that argues that at least two parameters are needed to adequately classify exchange rate regimes: trend rate of change and behavior with respect to deviations from trend. Finally, in the second chapter, I analyze the relationship between the exchange rate regimes and the economic performance in Central America.

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1. INTRODUCTION

One of the challenges facing those who want to understand the characteristics and consequences of exchange rate regimes is the identification and implementation of a classification scheme. This scheme must define the categories that constitute an exchange rate regime and provide a set of criteria that classifies a country's experience in a particular time period into one of those categories. These are far from trivial tasks.

Exchange rate regime classification schemes vary along several dimensions. A central dichotomy is between regimes declared by the government (a de jure classification) and those based on actual data (a de facto classification). These data will include exchange rates, but may also include other variables, such as interest rates or central bank reserves. Another distinction is the number of categories. Classification schemes may include only two broad categories (e.g., "pegged" and "nonpegged"), or a larger set of more narrowly defined ones (e.g., "managed floating" and limited flexibility") (Klein and Shambaugh, 2010).

In this context, in the first chapter of this dissertation I discuss a recent area of research which has been devoted to behavioral classifications based explicitly or implicitly on the idea of considering to what degree governments respond to exchange market pressure with official intervention versus allowing the exchange rate to adjust. In particular, I analyze a methodology proposed by Willett, Kim and Nitithanprapas (2007) (henceforth WKN) and its application to Central America in the period 1970 -2008. This methodology is similar in spirit but points out that the previous efforts have not given sufficient attention to the micro analytic foundations of the measures and that this has led to problems.

I examine the issue of trends and argue that at least two parameters – coefficients for trend and for deviations around trend – are necessary for the general classification of exchange rate regimes. I compare the classification using this methodology with the one by Reinhart and Rogoff (2004) (henceforth RR) and the one by the IMF. In general, it is concluded that for Central America the RR and IMF classifications are misleading in many of the years of analysis, and therefore, the author's results gives a more accurate classification of the exchange rate regimes within the region.

Moving forward, once I have analyzed the classifications of exchange rate regimes in Central America, it is the objective of the second chapter to study the relationship between the exchange rate regimes and economic performance.

In this sense, the economic debate on the relative merits of fixed and flexible exchange rate regimes has come to be known by some economists as the ''two corners'' debate (Fischer, 2001). Supporters of hard pegs have argued that this type of regime provides credibility and results in lower inflation, a more stable economic environment and faster economic growth. Supporters of flexibility, on the other hand, have argued that under floating exchange rates the economy has a greater ability to adjust to external shocks. According to this view, which goes back at least to Meade (1951), countries with a flexible exchange rate system will be able to buffer real shocks stemming from abroad.

In order to test formally whether a set of economic performance variables, including GDP and inflation, have behaved differently across the Central American countries and exchange rate regimes, I conducted a series of tests for the equality of means and medians. I also computed a non parametric Kruskal-Wallis test on the equality of distributions. In addition, in order to examine whether hard pegged countries perform

differently than other regimes, after controlling for the fundamental determinants of growth, I estimate a panel econometric model using a small number of data points for the Central American economies. The results obtained from this model confirmed the other statistical tests.

In summary, the analysis reported in this chapter suggests that, when compared to other countries, the hard pegged countries have: (a) grown at a significantly lower rate; (b) have had a similar fiscal record when compared with managed floats; (c) In terms of current account balances, hard pegs regimes' behavior has been no different than that of conventional or crawling peg / crawling band regimes; (d) have had significantly lower inflation and; (e) during the period of analysis, banking and balance of payments crises tended to occur more frequently under managed regimes, but the incidence of sudden stops in Central America is highest under conventional peg regimes.

2. CLASSIFICATION OF EXCHANGE RATE REGIMES

In recent years, there has been great interest in developing classifications of exchange rate regimes that go beyond the official designations of regimes reported by national governments to the IMF. The recent research in this area has been devoted to behavioral classifications based explicitly or implicitly on the idea of considering to what degree governments respond to exchange market pressure with official intervention versus allowing the exchange rate to adjust.

The approach used in this chapter is based on Willett, Kim and Nitithanprapas (2007) (henceforth WKN). This methodology is similar in spirit but points out that the previous efforts have not given sufficient attention to the micro analytic foundations of the measures and that this has led to problems. WKN particularly highlight two types of problems. One is the inappropriateness of using standard deviations or variances when there are trends in the data such as would occur under crawling pegs or discrete breaks such as occur with adjustable pegs[1]. In such circumstances it is necessary more than one parameter to describe regimes. The second is that the concept of the propensity to intervene, in the face of exchange market pressure, is clearly defined only in the case of intervention that leans against the wind (with fixed rates being complete leaning). Quite a number of observations of reserve and exchange rate changes have the wrong signs, however. Variance ratios, for example, pay no attention to this problem. Ways of dealing with wrong sign observations are discussed but these do not appear to be any one best method.

[1] This problem is also addressed in Calvo and Reinhart (2002) (henceforth CR).

2.1. Literature Review

Initially, considerable use was made by researchers of the official IMF classifications of exchange rate regimes, but the IMF's original coding was soon recognized to be subject to serious problems of two kinds. First, these classifications did not distinguish among all of the major different categories of exchange rate regimes that are relevant for research. A second problem was that the IMF's coding was based on national government statements of their exchange rate policies and these official descriptions often differ greatly from the actual policies that governments pursued. For example, a number of countries that officially classified themselves as having floating rates in fact managed their exchange rates in ways identical to managed floating regimes (e.g. Guatemala and the Dominican Republic in recent years).

Increasing recognition of this measurement problem has led to two types of responses. One alternative to the original IMF coding is a new set of more detailed classifications published in 1999 by the IMF. These are far superior to the old IMF system, both in the delineation of categories of regimes in a more analytically useful manner and in categorization based on the best judgments of the IMF's country experts of what governments are actually doing, not just their stated polices[2]. The other alternative, developed primarily by academic researchers, has been to develop behavioral measures of exchange rate regimes based on the actual behavior of exchange rates and/or official intervention (typically proxied by changes in international reserves).

One of the best known of the new measures is the massive effort by Reinhart and Rogoff (2004) (henceforth RR)'s herculean "Natural" classification that puts emphasis on the behavior of black market or parallel rates, and a number of classifications based on

[2] See Table 1 in Appendix A.

the statistical behavior of exchange rates, international reserves[3]. One of their major innovations is their focus on market determined exchange rates. They use histories to separate whether or not countries have dual or multiple rates or parallel markets. If they do, they are classified exchange rate regimes using market determined exchange rate data (from Pick's currency yearbook, Pick's Black MK year books, and Pick's World Currency Report). When the exchange rate is unified, the IMF's monthly data is used to classify the exchange rate regime. Then they use the statistical measures of volatility to classify the regimes. If the absolute monthly percent change in the exchange rate is equal to zero for 4 consecutive months or more, that episode is classified as a de facto peg if the exchange rate is unified. To distinguish among pegs and bands, they calculate the probability that the monthly absolute percent exchange rate change remains within a one percent band over a rolling period. If the probability is 80 percent or higher, then it is classified as a peg regime. If the exchange rate has no drift, it is classified as a fixed parity; if there is a drift, it is labeled as a crawling peg; and if the exchange rate goes through period of both appreciation and depreciation, it is termed a moving peg.

They also distinguish between exchange rate arrangement that has high exchange rate volatility under low inflation floating regimes and other regimes that have high volatility due to high inflation. If inflation is above 40 percent, they classify it under a "freely falling" category (with the exceptional cases when the market rate follows a confirmed pre-announced regime: since a country that has inflation above 40 percent often adopted a crawling peg as a nominal anchor). They also classify an exchange rate as

[3] An updated version of this paper's data is available online in "Exchange Rate Arrangements Entering the 21st Century: Which Anchor Will Hold? (with Ethan O. Ilzetzki, 2008)". http://terpconnect.umd.edu/~creinhar/Papers.html

"free falling" for the cases where a crisis generates a sudden transition from a fixed regime to managed or independent float regime accompanied by a large depreciation.

For countries that are not classified as peg/band and that are not included in the free falling category, RR proxy the composite degree of exchange rate flexibility to distinguish between managed float and free float. However, this is based only on the actual behavior of the exchange rate, rather than the propensity to intervene in exchange markets. For example, Guatemala's reserves increase has been in such a huge scale that there is no question that there have been heavy interventions. The central bank has used massive amounts to hold down the appreciations for its currency. Even though, it is early to classify its exchange rate regime during this period, it is appropriate to say that to label it as free versus fixed is clearly wrong. The key positive issue of this chapter is to attempt to determine how heavy or light the management has been and this is in turn, an important component of normative analysis of how appropriate or inappropriate its policies have been.

Several recent studies have taken the behaviors of reserves as well as exchange rates into account in classifying exchange rate regimes. A prominent example of this approach is the work of CR who consider the variability of nominal exchange rates, international reserves, and interest rates in order to evaluate whether or not official classifications are useful in practice. They find evidence that the variability of reserves and interest rates is high relative to the fluctuations in the exchange rate. Their conclusion that in many cases central banks are trying to stabilize the exchange rate is undoubtedly correct, but in classifying currency regimes the behavior of nominal exchange rates and foreign reserves should be related to the concept of exchange market pressure. Where

exchange market pressure is high, both exchange rate and reserves may show considerable volatility. In contrast, where pressure is low, both may show little variability. In this category, there is also an important paper by Levy Yeyati and Sturzenegger (2005) (henceforth LYS).

The analysis and comparisons with the classifications of other studies suggests that in many cases it is difficult to judge the correctness of particular classifications. There are frequently substantial gray areas. This turns out to be particularly important for interpretations of the role of exchange rate regimes in Central America. As can be seen later in more detail, the exchange rate history of Central America is somewhat different from that of the rest of Latin America. Unlike most Latin American countries, the small economies of Central America were able to keep a fixed exchange rate parity vis-à-vis the U.S. dollar for a very long period. (Esquivel and Larrain, 1999).

A more appropriate measure of the flexibility of the exchange rate regimes is the ratio of currency market pressure taken on changes in reserves versus changes in the exchange rate; what WKN call the propensity to intervene. A number of studies have made use of this basic idea to construct behavioral indices of the degree of exchange rate flexibility using relative volatility ratios. These studies vary in a number of technical details such as the use of average absolute changes versus standard deviations and variances, the normalization for reserve changes, and the exchange rate measures used. Probably more importantly, however, almost all of the measures used share two major problems – they fail to deal adequately with the problem of trends and they do not relate their statistical measures directly to the concept of exchange market pressure (Weymark, 1997 is an important exception).

A conceptually more appropriate measure of the exchange rate policy practiced by a country is based on the concept of exchange market pressure (EMP) and was the basis for an earlier classification effort by Weymark (1995). In this approach the degree of exchange rate flexibility is measured by the proportion of exchange market pressure that is reflected in movements in the exchange rate relative to the proportion that is met through official intervention. The greater the former, the more flexible is the regime. This basic idea also underlies most other recent efforts at classification of exchange rate regimes (WKN, 2005).

WKN argue that a ratio of variances approach also runs into problems when there are trends in reserves or exchange rates. They argue that in fact at least two parameters are necessary to classify exchange rate regimes. This is because we have no clear theoretical basis for comparing the relative degree of flexibility of a more rapidly trending regime with a narrow band for allowable short term fluctuations with a more slowly trending regime with a wide band. Thus, it is important to distinguish trend behavior from behavior with respect to deviations from trend. Indeed, one of the goals of this dissertation is to discuss operational issues involved in applying this approach along with uses concerning proxies for intervention to the countries in Central America.

2.2. An Exchange Market Pressure Methodology for Classifying ER Regimes

The concept of exchange market pressure introduced by Girton and Roper (1977) is a measure of the gap between quantities demanded and supplied in the foreign exchange market at a particular exchange rate. It provides a way of comparing pressures under alternative exchange rate regimes by adding changes in reserves (i.e. as a measure of

official intervention) and exchange rate changes. The concept of exchange market pressure assumes that intervention is used to limit exchange rate fluctuations.

The propensity to intervene is the degree to which authorities allow pressures in the currency market to move the exchange rate versus intervening to dampen its movement. Thus under a fixed rate if there is downward pressure on a currency, the authorities would buy domestic currency in the foreign exchange market, i.e. sell international reserves, in order to keep the value of the currency constant (i.e. propensity to intervene of one) or under a completely free float let the currency depreciate with no intervention (propensity of zero). Some combination of the two implies a coefficient between zero and one. The same holds in reverse for upward pressures on a currency, i.e. the authority would do nothing or sell domestic currency thereby gaining international reserves.

With a managed float or some form of movable peg, the authorities could choose a mix of response by intervening to take some but not all of the pressure off of the exchange rate by channeling it onto changes in reserves. Such leaning against the wind could be light or heavy and steady or sporadic. According to WKN, by looking at the ratio of percentage changes in the exchange rate to the sum of percentage changes in the exchange rate and reserves, we have a continuous index of the propensity to intervene in the foreign exchange market that varies between zero and one. One minus the index of the propensity to intervene gives the degree of exchange rate flexibility, i.e. the degree of exchange rate flexibility is the absolute percentage change in exchange rate divided by the absolute percentage change in reserves plus the absolute percentage change in the exchange rate. This approach is superior to looking at the behavior of the exchange rate

alone since it allows us to distinguish (at least conceptually) whether a low level of exchange rate volatility is due to a low level of shocks or to a high propensity of the authorities to intervene. Likewise, where changes in exchange market pressure are substantial there may be considerable exchange rate changes even in the face of heavy intervention[4].

The EMP approach is clearly defined only for intervention that leans against the wind, i.e. slows down exchange rate movements. However, as WKN have pointed out, it is not uncommon for monthly changes in reserves and exchange rates to violate the leaning against the wind assumption. Thus this issue of "wrong signs" is not trivial. (Weymark, 1995).

Where government policies lean with rather than against the wind, i.e. where reserve declines occur during a period of currency appreciation or reserve increases during a period of depreciation, the concept of the propensity to intervene is not well defined in the EMP framework. A look at the data for countries in Central America shows that these combinations occur fairly frequently. One method of dealing with wrong signs has been provided by Weymark (1995, 1997, and 1998), who was the first to explicitly relate measure of the degree of exchange market intervention to the concept of exchange market pressure.

In general, it will be hard to distinguish between wrong sign observations due to imperfect proxies and those due to leaning with the wind. Thus, at least initially, this methodology propose comparing calculations with wrong signs included and excluded to see whether this makes a great difference in the particular case. It will likely prove useful

[4] The Central American case will be considered in a following section.

to undertake some careful case studies for episodes where there are a number of wrong signs to see if some clues about the reasons can be discovered.

2.2.1. Changes in Trends, Regimes and Reserves

It is well known that in the presence of trends the standard deviation of a series and the average absolute changes can give very misleading pictures of the variability of the series. Levels of exchange rate often have substantial trends, i.e. are non-stationary and ignoring them can create substantial problems. Fortunately most of the studies on exchange rate classifications have used the log of the exchange rate and many exchange rate series are stationary in first difference or percentage changes. This is not always the case, however. For example, when the rate of crawl is accelerated or decelerated over time, the standard deviation of detrended exchange rate changes will not equal to the standard deviation of exchange rate changes (WKN, 2005).

In the other hand, while it is widely assumed that there has been a substantial increase in exchange rate flexibility, there has also been considerable accumulation of reserves. This has led some economists to argue that there has really been little change in exchange rate policies (McKinnon and Schnabl, 2004). The methodology presented here helps clarify this debate by distinguishing (conceptually at least) between intervention designed to accumulate reserves such as may be highly desirable after a period of reserve losses, intervention to hold down the average level of the exchange rate for competitive advantage, and intervention to smooth out short-run fluctuations in the exchange rate.

The first two motives will be observationally equivalent in terms of the statistical data during the early stages of recouping reserve losses. In the later stages of reserve

accumulation distinctions would have to be based on judgments about whether reserve accumulations were becoming "excessive". The appropriate level of reserves for a country can of course be a matter of considerable dispute. The third type of intervention – to limit short-term fluctuations in the exchange rate - is more easily identified. Indeed that is what the suggested methodology is designed to capture, once changes in reserves are detrended as well as changes in the exchange rate.

2.2.2. Two Parameter Indices

Following WKN, the use of one parameter to capture the trend rate of crawl and a second one to describe the policy toward fluctuations around the crawling parity are easily interpreted in terms of the institutional characteristics of exchange rate regimes. The coefficient of the country-specific time trend on the log of the bilateral exchange rate is a proxy for the rate of crawl. The minimum and the maximum of deviations from the trend is a proxy for a band width. The traditional narrow band peg of the Bretton Woods system would have a zero rate of crawl and a narrow band width. A horizontal band would also have a zero rate of crawl but a substantial width. A narrow band crawling peg could have a substantial rate of crawl but a low value for band width, while a crawling band would have substantial parameters for both. It is clear that the first (narrow band) and fourth (crawling band) of these categories are more fixed and more flexible respectively than the middle two, but the appropriate ranking of the middle two on institutional grounds is ambiguous.

Note, however, that band widths defined either as announced limits or the maximum actual fluctuations around parity or trend are not fully adequate to describe a

countries' propensity to intervene. What is needed is the propensity to intervene in the face of exchange market pressure that deviates from trend. Thus in the two-parameter characterization, we keep the trend rate of change of the exchange rate but replace the band width with the propensity to smooth fluctuations around trend.

Propensities to intervene may change quite substantially over time depending on such factors as the interpretations of the causes of exchange market pressures, the state of the domestic economy, the nearness of elections, and the world view of the relevant policy officials. This raises the obvious problems of the appropriate time periods for calculations. Data limitations make monthly changes the shortest feasible unit for analysis for most countries, but the length of the time period over which observations should be averaged is far from clear. It will likely vary with the purpose at hand. For example, we may want to distinguish between broad categories of exchange rate regimes and the specific operating strategies followed within these broader categories.

2.2.3. Trend Coefficients

The first step, in order to calculate the two parameter indices, is to break down the two main variables (the exchange rate and policy instrument) into trend and deviations from trend components:

$$e_t = T_{e_t} + u_{e_t} \qquad (1)$$

$$r_t = T_{r_t} + u_{r_t} \qquad (2)$$

where e and r are exchange rate and policy instrument in logarithm, T and u are trend component and deviation from the trend component, and t denotes periods.

There are various ways to estimate trends. In this chapter, I use a linear time trend as the main method since sub-periods are short in most cases and there is no significant benefit of using more complicated methods such as a Hodrick-Prescott filter. The trend coefficient of the exchange rate reflects the average rate of the appreciation or depreciation over time. Under a crawling peg or band or a managed float operated as a de facto crawl, it would reflect the rate of crawling. Under a free floating rate it would just reflect the average rate of appreciation or depreciation. The trend coefficient of reserves gives the average rate of accumulation or loss in reserves.

2.2.4. Propensities to Intervene

Propensities to intervene measure the degree of intervention in our framework. They are based on the exchange market pressure equation,

$$EMP_t = \Delta e_t + \varepsilon_t \cdot \Delta r_t \qquad (3)$$

where EMP implies the exchange market pressure and ε is a conversion coefficient that relates intervention to changes in the exchange rate, i.e., it is the slope of the excess demand function in the foreign exchange market. In the monetary model used by Girton and Roper (1977), this coefficient is one. Through the first order difference of equations (1) and (2), we have equations (4) and (5), which are decompositions of the terms on the right side of equation (3). Substitution of equation (4) and (5) into equation (3) leads to equations (6), (7), and (8). They indicate that exchange market pressure (EMP_t^C) is composed of two sub-pressures: trend pressure (EMP_t^T) and detrended pressure (EMP_t^{DT}) .

$$\Delta e_t = \Delta T_{e_t} + \Delta u_{e_t} \tag{4}$$

$$\Delta r_t = \Delta T_{r_t} + \Delta u_{r_t} \tag{5}$$

$$EMP_t^C = \Delta e_t + \varepsilon_t \cdot \Delta r_t = (\Delta T_{e_t} + \varepsilon_t \cdot \Delta T_{r_t}) + (\Delta u_{e_t} + \varepsilon_t \cdot \Delta u_{r_t}) \tag{6}$$

$$EMP_t^T = \Delta T_{e_t} + \varepsilon_t \cdot \Delta T_{r_t} \tag{7}$$

$$EMP_t^{DT} = \Delta u_{e_t} + \varepsilon_t \cdot \Delta u_{r_t} \tag{8}$$

It is not uncommon for governments who say that they are only intervening to smooth out temporary fluctuations in the exchange rate to have sustained increases or decreases in reserves. If continued over long periods, this is a clear indication that the authorities are doing more than just smoothing. A run of reserve changes in the same direction may be quite consistent with purely smoothing interventions since in the short term it can be hard to distinguish changes in trends from movements around the trends. However, if authorities don't want there to be an appreciating trend for their currency, say for competitive reasons, they are likely to be slow to recognize a market-driven trend and continue for some time to smooth it away. Likewise, we could see asymmetric smoothing where governments are more concerned with movements in one direction than the other. Looking at monthly ratios and breaking them into trend and cyclical components allows us to investigate such issues in a way that cannot be captured by ratios of variances. Of course, as it will be discussed later, even ex post there can be disagreement about what to consider as shifts in trends versus movements around them so application won't always be free from ambiguity.

Following the methodology, I estimate trend propensities to intervene (TPI), and smoothing propensities to intervene around trend (SPI). Under the common assumption

of a unitary elasticity of the exchange rate with respect to intervention[5], these indices are given by

$$TPI_t = \frac{\left|\Delta T_{r_t}\right|}{\left|\Delta T_{e_t}\right| + \left|\Delta T_{r_t}\right|} \tag{9}$$

$$SPI_t = \frac{\left|\Delta u_{r_t}\right|}{\left|\Delta u_{e_t}\right| + \left|\Delta u_{r_t}\right|} \tag{10}$$

For most applications, these are averages over the time periods of interest.

As it is discussed later, observations undefined within the EMP framework yield ambiguous information on the extent to which governments intervene to influence exchange rates. Some may be due to the imperfect proxy of official interventions, strong interventions, or super flexibility of exchange rates.

The propensity to intervene based only on observations with the right sign is therefore the main index for characterizing foreign exchange policy. However, as a robustness check, propensities based on all the observations are also calculated. Since equations (9) - (10) can produce abnormal levels of indices for observations with the wrong sign, this study uses the absolute percentage changes for observations with the wrong sign.

2.2.5. Intervention Proxies

One of the most difficult problems in applying the EMP approach is that few countries make data on their exchange market intervention publicly available. Most empirical studies use changes in reserves as a proxy but acknowledge that this is far from perfect.

[5] An exception is Weymark (1995, 1997, and 1998) who estimates the elasticity.

Reserves can change due to interest earnings, changes in valuation due to currency movements, and official borrowings as well as intervention. And interventions can include actions in forward, not just spot markets. These problems have led some researchers to give up using reserve measures altogether (Gosh, Gulde, Ostry and Wolf, 1997).

WKN say that one adjustment that can be made fairly easily is to subtract an estimate of interest earnings from the reserve figures. In their study, they adjusted reserve changes for Japan for estimates of interest earnings, but just find that this makes little difference for our estimates. Both series fairly closely tracked the data on Japan's actual interventions over the period 1991 to 2005. Of course, this proxy may not work as well for other countries, but their results for Japan suggest that this approach is worth using in the absence of better information, while remembering that it is only a proxy.

A final problem is that a constant amount of intervention per period in the same direction would give rise to varying percentage changes as reserve levels rose or fell. Likewise, initial reserve levels can make a substantial difference. Studies such as CR, and Hernández and Montiel (2003) characterize Japan as having a low volatility in foreign reserves. Although Japan intervened heavily in absolute terms in the foreign exchange market in the early 2000s, the percentage changes in reserves were fairly small due to the high initial levels of reserves.

There are several ways to deal with this problem. The most popular method has been to use scaling variables for intervention proxies. Holden *et al.* (1979), Weymark (1997), Bayoumi and Eichengreen (1998), and LYS use the lagged money base, lagged narrow money, and the sum of export and import for 12 months as scaling variables. This

problem is lessened in WKN's framework because detrending the intervention proxies moderates it.

2.3. The Case of Central America

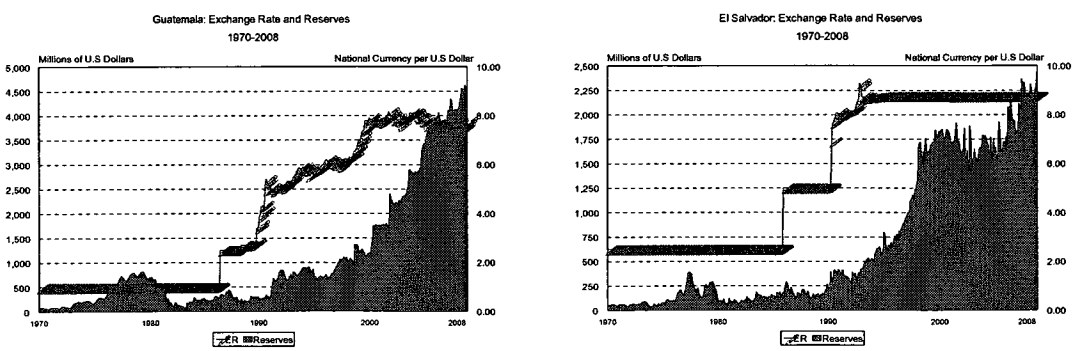
The exchange rate regimes of all the Central American countries were dollar pegs before diverging in the 1980s, when most of the pegs had to be abandoned for different reasons, including external shocks, civil conflict, and inconsistent domestic policies. The notable exception is Panama, which has been fully dollarized since 1904. All the countries, with the exception of El Salvador and Panama, then had "freely falling" exchange rate regimes according to RR. In Central America the pegged exchange rate played a disciplinary role until the early 1970s. At that time every country in Central America started to violate the fiscal and domestic credit restrictions imposed by a pegged exchange rate. Not surprisingly, by the late 1980s early 1990s every one of these countries had abandoned the fixed parity and had experienced an inflationary outburst (Edwards, 1995). According to RR's classification, Costa Rica abandoned the peg in 1981, El Salvador in 1983, Guatemala in 1984, Honduras in 1990, and Nicaragua in 1979. The Dominican Republic had a very narrow de facto crawling band until 1982.

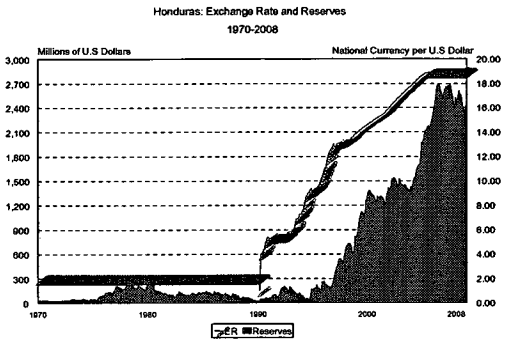
Figure 1 shows the evolution of the nominal exchange rate for the Central American countries between 1970 and 2008. The exchange rate is in local currency units per U.S. dollar and the reserves are in millions of U.S. dollars. I use the bilateral nominal exchange rate because is the only one publicly available for the six the countries in question and it makes comparisons possible.

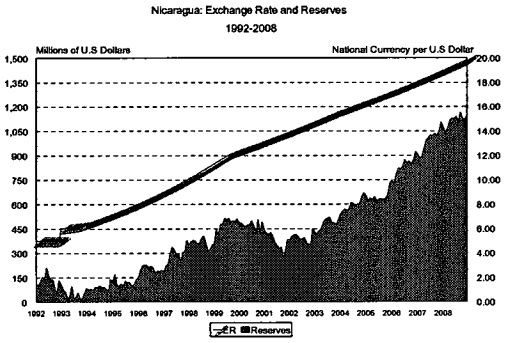
As can be seen in this figure, the exchange rate history of Central America is somewhat different from that of the rest of Latin America. Unlike most Latin American countries, the small economies of Central America were able to keep a fixed exchange rate parity vis-à-vis the U.S. dollar for a very long period.

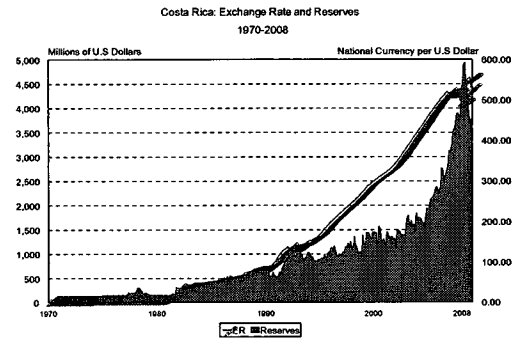
The fixed parity of the Honduran currency was the longest in Central America and it survived intact until 1990, when the government was forced to devalue. El Salvador and Guatemala were able to sustain a fixed parity only until the mid-eighties, when their currencies collapsed in the midst of internal civil conflicts and when the debt crisis in Latin America was at its worst. Nicaragua, on the other hand, devalued its currency in early 1979 at a time of tremendous civil unrest that culminated with the fall of the Somoza regime and the Sandinista takeover. In the region, Costa Rica had the least stable parity against the dollar in the pre-debt crisis period. In fact, Costa Rica had to adjust the value of its currency as early as 1961 and then again in 1974 and 1981. Some of the countries then went through several different regimes, at times involving multiple currency practices, before converging to their current arrangements.

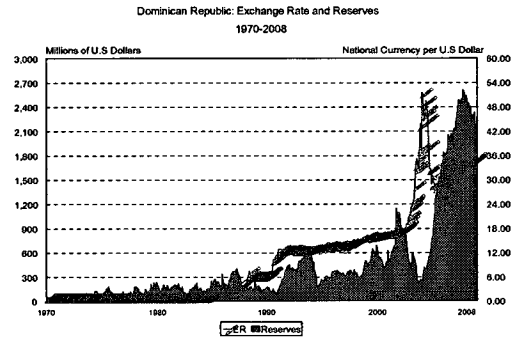
Figure 1. Central America: Exchange Rate and Reserves, 1970 – 2008











2.3.1. Guatemala

The classification of Central American countries' exchange rate arrangements is sensitive to the measure used. According to the natural classification, Guatemala oscillated between freely falling and managed floats in the years following the abandonment of the crawling band in 1984. Then in 1991, the system converged to a de facto crawling peg, which is still the present regime according to RR. In the IMF classification, however, Guatemala has had a managed float and a freely float during the 1990s and 2000s.

Table 1. Guatemala: Exchange Rate Regime Classification
(IMF's Annual Report on Exchange Rate Arrangements and Restrictions, various issues)

Date	Coarse Classification
1970 - 1988	No separate legal tender
1989 - 1998	Freely Floating
1999 – 2002	Managed Floating
2003 – 2004	Freely Floating
2005 - 2008	Managed Floating

Table 2. Guatemala: Exchange Rate Regime Classification
(Ilzetki, Reinhart and Rogoff, 2008)

Date	Classification: Primary/Secondary/Tertiary	Comments
May 25, 1963 – November 16, 1984	Peg to US dollar	Black market all but disappeared.
November 16, 1984 – March, 1985	Multiple exchange rates	There are three rates. There is no data on the parallel rate for this period.
March, 1985 – June 1986	Freely falling/ Managed floating/ Parallel Market/ Multiple exchange rates	
July 1986 – June 23, 1988	Managed floating, Multiple rates	Parallel market premium hits 400%.
June 23, 1988 – May 1989	De facto crawling peg to US dollar / Multiple rates	
June 1989 – May 1991	Freely falling / De facto crawling band	+/- 2%
June 1991 – December 2007	De facto crawling peg to US dollar	Parallel market premia is in single digits during this period.

2.3.2. El Salvador

After abandoning the peg in 1983, El Salvador had a managed floating regime until 1990, when it moved to a de facto peg (RR, 2004). However, in the early 1990s after the cessation of civil conflict, the exchange rate came under appreciating pressures which were resisted using sterilized intervention. Dollarization was adopted in 2001.

Table 3. El Salvador: Exchange Rate Regime Classification
(IMF's Annual Report on Exchange Rate Arrangements and Restrictions, various issues)

Date	Coarse Classification
1970 - 1984	No separate legal tender
1985 - 1989	Managed Floating
1990 - 1994	Freely Floating
1995 – 2000	Conventional Peg
2001 – 2008	No separate legal tender (Dollarization)

Table 4. El Salvador: Exchange Rate Regime Classification
(Ilzetki, Reinhart and Rogoff, 2008)

Date	Classification: Primary/Secondary/Tertiary	Comments
May 1961 – August 9, 1982	De facto crawling band around US dollar / Parallel Market	+/- 2% band. Official rate is pegged to the US dollar.
August 9, 1982 – June 1, 1990	Managed floating / Dual Market	Third illegal market exists. Premium peaks at 472 percent frior to the January 1986 devaluation.
March 19, 1990 – June 1, 1990	De facto crawling band around US dollar / Multiple rates	+/- 2% band.
June 1, 1990 – January 1, 2001	De facto peg to US dollar	Parallel market premium is in the 10 – 20 percent range through most of this period.
January 1, 2001 – December 2007	Exchange rate arrangement with no separate legal tender	US dollar. The printing of new colones, the domestic currency, is prohibited, but the existing stock of colones will continue to circulate along with the U.S dollar as legal tender until all colon notes wear out physically.

2.3.3. *Honduras*

After a brief spell in the freely falling category, Honduras had a de facto crawling band from 1991 to 1998 before converging to a de facto crawling peg according to the natural classification. In the IMF classification, however, Honduras adopted a float in 1992–94. It then moved to a crawling peg and finally a crawling band in 1996. The rate of crawl is determined by the projected inflation differential with its main trading partners and the exchange rate of its main trading partners vis-à-vis the U.S. dollar. The band was widened from 1 to 7 percent in 1998, but movement within the band has been limited.

Table 5. Honduras: Exchange Rate Regime Classification
(IMF's Annual Report on Exchange Rate Arrangements and Restrictions, various issues)

Date	Coarse Classification
1970 - 1989	No separate legal tender
1990 - 1991	Conventional fix peg
1992 - 1993	Crawling peg
1994 - 2008	Crawling band

Table 6. Honduras: Exchange Rate Regime Classification
(Ilzetki, Reinhart and Rogoff, 2008)

Date	Classification: Primary/Secondary/Tertiary	Comments
June 30, 1950 – March 19, 1985	Peg to US dollar	Controls were lifted.
March 19, 1985 – March 13, 1990	De facto crawling band around US dollar / Parallel Market / Multiple rates	+/- 5% band. Parallel market premium peaks at 143% just before the devaluation.
March 13, 1990 - September 3, 1990	Freely falling / De facto crawling band around US dollar	In September 3, 1990 a dual market was introduced +/- 5% band.
September 3, 1990 – March 1991	Freely falling / De facto crawling band around US dollar / Dual Market	+/- 5% band.
April 1991 – June 18, 1992	De facto crawling band around US dollar / Dual Market	+/- 5% band.
June 18, 1992 – January 1996	De facto crawling band around US dollar	+/- 5%.
January 1996 - December 1998	De facto crawling band around the US / Dual Market	+ / - 5% band. Parallel market premia has been in single digits since 1993. The official rate is a de facto crawling peg.
January 1999 – December 2007	De facto crawling peg to US dollar.	There is an official +/- 7% band.

2.3.4. *Nicaragua*[6]

Nicaragua spent a long period with a freely falling regime owing to hyperinflation. In 1979 the recently installed Sandinista government of Nicaragua chose to keep its

[6] The monthly data for Nicaragua starts in 1992.

exchange rate fixed against the dollar. The parity was sustained until 1985, when the accumulated domestic inflation and the external conditions made inevitable the adjustment of the exchange rate. In 1991 the exchange rate was pegged and since 1993 it has been a crawling peg.

The rate of depreciation is now pre announced by the central bank. Since 1992, Nicaragua has implemented a crawling peg with pre-announced daily changes of the exchange rate.

Table 7. Nicaragua: Exchange Rate Regime Classification
(IMF's Annual Report on Exchange Rate Arrangements and Restrictions, various issues)

Date	Coarse Classification
1970 - 1989	No separate legal tender
1990 - 1991	Crawling band
1992 - 2008	Crawling peg

Table 8. Nicaragua: Exchange Rate Regime Classification
(Ilzetki, Reinhart and Rogoff, 2008)

Date	Classification: Primary/Secondary/Tertiary	Comments
January 1970 – November 16, 1974	De facto band around US dollar / Parallel market	+/- 2% band.
November 16, 1974 – September 8, 1978	Peg to US dollar	
September 8, 1978 – April 6, 1979	De facto band around US dollar / Dual Market	+/- 2% band.
April 6, 1979 – August 1982	Freely floating / Dual Market	There are multiple rates. The parallel market premium oscillates between 20-300%.
September 1982 – April 30, 1991	Freely falling / Freely floating /Dual Markets	There are multiple rates. The period from June 1986-July1987 registers as a "hyperfloat". On November 1987 the parallel premium hit its historic high of 11,329%. On February 15, 1988 the new Cordoba replaced the old Cordoba. Inflation peaks at 63,776%.
April 30, 1991 – February 1992	Peg to US dollar / Freely falling	In the early stages of the peg inflation was a high as 24,293%.
March 1992 – December 1992	Peg to US dollar	
January 1993 – December 2007	Crawling peg to US dollar	Since 1995, the parallel market premia has all but disappeared. Inflation data is not available for parts of the period.

2.3.5. Costa Rica

After the freely falling exchange rate period, Costa Rica steadily moved towards more flexible exchange rate arrangements. After repeated unsuccessful attempts to stabilize its

currency (none of which lasted more than a few months), began to target its real exchange rate in mid 1985 with relative success.

Costa Rica followed a real exchange rate rule based on the inflation differential with the United States. The rule was modified to take into account targeted rather than actual inflation in 1996. Then, the rate of crawl of the colon was adjusted on the basis of the inflation differential between Costa Rica and its main trading partners. In 2006, the central bank decided to change the regime to a managed float as a part of moving forward to an inflation targeting regime framework.

Table 9. Costa Rica: Exchange Rate Regime Classification
(IMF's Annual Report on Exchange Rate Arrangements and Restrictions, various issues)

Date	Coarse Classification
1970 - 1980	No separate legal tender
1981 - 1991	Crawling band
1992 - 2005	Crawling peg
2006-2008	Managed Floating

Table 10. Costa Rica: Exchange Rate Regime Classification
(Ilzetki, Reinhart and Rogoff ,2008).

Date	Classification: Primary/Secondary/Tertiary	Comments
December 24, 1969 – June 19, 1971	Peg to US dollar	
June 19, 1971 – April 25, 1974	De facto crawling band around US dollar / Dual Market	+/- 5% band. Official Peg to the US dollar. Parallel market premium consistently above 50%.
April 25, 1974 – September 26, 1980	Peg to US dollar	
September 26, 1980 – December 1980	Managed floating	
January 1981 – March, 1981	Freely falling / Managed floating	
March 9, 1981 – November 11, 1983	Freely falling / Managed floating /Multiple rates	Periodic attempts to fix the official rate are interspersed with frequent devaluations.
November 11, 1983 – December 1990	De facto crawling band around US dollar / Dual Market	De facto +/- 5% band, much narrower band if official rate is used.
January 1991 – December 2001	De facto crawling band around US dollar	De facto +/- 2% band. Parallel market premia is in low single digits. De facto crawling peg to US dollar since 1995 if official rate is used.
January 2002 – December 2007	De facto crawling peg to US dollar	De facto +/- 2% band. Parallel market premia is in low single digits. De facto crawling peg to US dollar since 1995 if official rate is used.

2.3.6. Dominican Republic

The Dominican Republic adopted a managed floating exchange rate regime in 1992, after a period with a freely falling exchange rate, but then moved to a de facto crawling band,

which lasted until 2003. At that time, a severe currency crisis brought the country back to a freely falling regime according to the natural classification, which would still apply today given the high inflation rate. According to the IMF classification, the Dominican Republic had a managed floating regime from 1991 to 1993 before moving to an independently floating arrangement in January 1994. It has been switching between these two regimes during the last decade. Today, the IMF considers the regime a managed float.

Table 11. Dominican Republic: Exchange Rate Regime Classification
(IMF's Annual Report on Exchange Rate Arrangements and Restrictions, various issues)

Date	Coarse Classification
1970 - 1984	No separate legal tender
1985 - 1987	Freely Floating
1988	Managed Floating
1989 – 1990	No separate legal tender
1991 - 1993	Freely Floating
1994 – 1999	Managed Floating
2000 - 2001	Freely Floating
2002 - 2008	Managed Floating

Table 12. Dominican Republic: Exchange Rate Regime Classification
(Ilzetki, Reinhart and Rogoff, 2008)

Date	Classification: Primary/Secondary/Tertiary	Comments
Octuber 1966 – September 1978	De facto crawling band around US dollar / Parallel Market	+/- 2% band Official rate is pegged to US dollar.
October 1978 – August 24, 1982	De facto crawling band around US dollar / Parallel Market	Official rate is pegged to US dollar.
August 24, 1982 – January 23, 1985	Managed floating / Dual Market	+/- 5% band. Official rate is pegged to US dollar. Parallel market premium oscillates in the 20-90% range. Parallel market premium climbs to 213% prior to the devaluation on January 1985.
January 23, 1985 – November 1985	Freely falling / Managed floating	
December 1985 – September 4, 1986	De facto crawling band around US dollar	+/- 5% band.
September 4, 1986 – June 1987	De facto crawling band around US dollar / Dual Market	+/- 5% band.
July 1987 – November 12, 1987	Freely falling / De facto crawling band around US dollar / Dual Market	
November 12, 1987 – February 11, 1988	Freely falling / Managed floating	
February 11, 1988 – August, 1991	Freely falling / Managed floating / Dual Market	There was a temporary unification in 1991.
September, 1991 – October 1992	Managed floating / Dual Market	Parallel market premium oscillates and is declining.
November 1992 – December 2001	De facto peg to US dollar / Dual Market	Parallel market data ends December 1998 – cannot verify 1999 onwards. Premium is in single digits during this period.
January 2002 – October 2003	De facto crawling band around US dollars	+/- 2% band.
November 2003 – December 2004	Freely Falling	
January 2005 – December 2007	Managed Float	

2.4. *Central America's Exchange Rate Policy "After the Peg"*

There have been considerable disputes about what Central America's exchange rate policy should be and what it has been. It has been argued that a serious application of the theory of optimum currency areas suggests that the broad outlines of Central America's current exchange rate policies are quite appropriate and that, although these countries should be very interested in regional (and global) monetary cooperation, this interest should not take the form of either unilateral or joint fixing or pegging of the exchange rate. Within this context, this section focuses on what policy has been.

Analytically, the degree of flexibility of an exchange rate regime depends on the degree of exchange market pressure that it takes in the form of intervention (proxied by changes in reserves) versus changes in exchange rates. In a pure float, all change comes in the exchange rate; and in a pure fix, all of it is taken as a change in reserves. (Other policies such as monetary policy and controls can also be varied to deal with exchange market pressure, and, as will be discussed below, this needs to be taken into account in the full description of a country's monetary policy-cum-exchange rate regime). Where exchange market pressure is strong, there can be both a lot of exchange rate movement and a lot of intervention.

Furthermore, the concept of exchange market pressure is only well defined when intervention is used to prevent or reduce exchange rate movements. For many monthly observations, however, reserve changes are found to reinforce rather than reduce exchange rate movements. Because there are different possible interpretations of these observations with "wrong signs" I report the results for correctly signed observations separately from those for the total observations. Rather than basing calculations on

arbitrary time periods, I look for changes in relationships and thus identify a number of sub periods. I contrast the statistical analysis based on these sub periods with a characterization for the full sample.

The two types of interventions are motivated by different goals. SPI is related with smoothing operation around the trend while TPI is related with managing trend. When market pressure is resolved entirely through the change of exchange rate without any intervention, the indices are 0. When market pressure is resolved only through intervention, the indices are 1. Thus, the higher the value of the intervention indices, the greater the propensity to intervene.

The indices are composed of trend coefficients as well as intervention indices. Because the natural logarithm of exchange rate and reserves is used to calculate intervention indices, the trend coefficients are interpreted as monthly rates of change. These are transformed into annual rates of change in the tables for ease of interpretation.

This approach also gives us a crude method of attempting to distinguish between reserve buildup and exchange rate smoothing motivations for intervention. With a clear delineation between the two objectives, the reserve accumulation objective should be revealed in the trend term and the smoothing objective in the smoothing propensity to intervene. In practice, however, these motives are often combined through patterns of asymmetric intervention via leaning against the wind more strongly during periods of appreciation than during depreciation. A country can be doing both, however; and the estimates suggest that this has been the case for most countries within the region.

2.4.1. Guatemala

There is no question that Guatemala's post 1970s exchange rate regime is based on a flexible or floating exchange rate. Within this broad category there exist many varieties of regimes, however; and where in this range Guatemalan policy should be placed has been the subject of some controversy.

The 1970s were characterized by a recurrent crisis in the foreign exchange market, caused by the breakdown of Bretton Woods, the impact of oil prices, the deterioration of the terms trade and a combination of inappropriate fiscal and current account adjustments. In addition, the political instability reduced private investment and this coupled with the rise of international interest rates caused major leaks of capital. The delay in abandoning the peg was one of the reasons for which the country lost a large amount of foreign reserves which pressured the depreciation of the currency. Between 1980 and 1985, Guatemala put in place multiple exchange rates that offered preferential treatment to a small list of essential goods. In 1986, the new democratic government introduced a plan whose main objective was to remove all these different rates. Three exchange rate markets were established: a) an exchange rate market for the payment of debt and official import transactions; b) one market for exports and imports of goods and services; and (c) a banking market, in which the exchange rate was determined by market forces. The existence of these markets caused problems in the allocation of foreign exchange and the control of the money supply. In 1988, the banking market was removed and 1989 the monetary authorities unified the exchange markets and approved the flotation of the quetzal. During 1990s and 2000s, the exchange policy has taken various forms, according to different classifications, including free and managed floating.

Currently, the Central Bank intervene in the exchange market in order avoid sharp fluctuations of the exchange rate.

Within this context, Guatemala officially maintains that it is practicing a "free float" but notes that official intervention is sometimes used. This terminology is not consistent with the standard textbook definition of freely floating. Jeffrey Frankel (2003), in his recent classification of exchange rate regimes, stated, "With a free float, the central bank does not intervene in the foreign exchange market." Ito and Park (2003) refer to this "nonexistence of official intervention" as the "fundamentalist" definition of free floating.

Seldom is such a pure free float followed in practice. As RR argue, "In reality, 'pure' floating exchange rates are an artifact of economics textbooks". Even in countries where the exchange rate is not an explicit target of policy, there are typically occasional (relatively rare) instances where there is unilateral or coordinated intervention in the foreign exchange market." The United States, Canada, and, in recent periods, Mexico would be examples of only occasional foreign exchange market intervention. For years New Zealand has been an exception and has practiced a completely free float although the central bank reserves the right to intervene if foreign exchange markets should become disorderly.

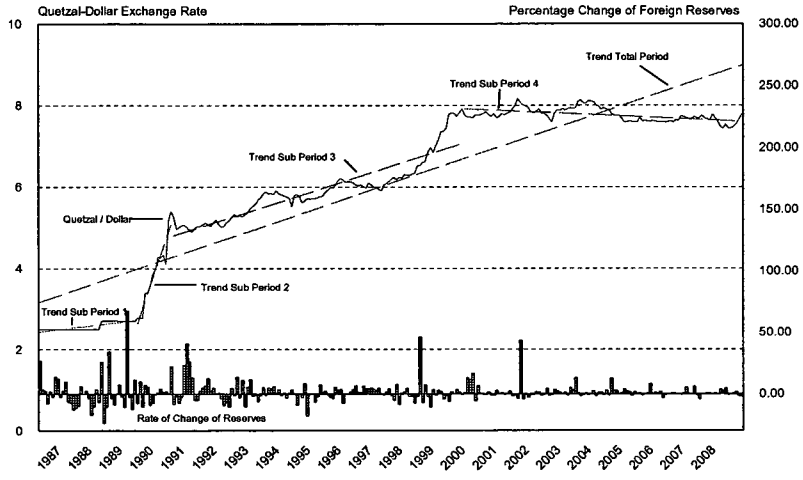
It is a significant characteristic of Guatemala's foreign exchange policy that in three out of the four sub periods, there was a consistent and a very large positive trend coefficient in the intervention proxy regardless of the movement in exchange rates. The estimates for TPI therefore have correct signs, when exchange rates appreciated, in only one out of four sub periods. This suggests that foreign reserve accumulation was the

primary objective, not managing the trend in exchange rates even though there has been a strong long-term depreciation trend in the quetzal since its abandoning of the peg.

The estimates for SPI for the whole period coincide fairly closely with the averages of those calculated for the sub periods three and four. SPIs for these sub periods, which are the longest of the sub periods, are quite close to those for the whole period, running around 0.70-0.75. I find much stronger smoothing intervention in the first period all running at 0.90 while most of the estimates for period two are considerably lower, with around 0.40 being an average estimate. Guatemala does display evidence of fear of completely free floating, but such fear appears to be much less strong than would be implied by a return to a de facto dollar standard.

It is interesting that most of the movements in the quetzal occurred during brief periods of substantial appreciation or depreciation, with the trend rates of change within periods being rather small. The results suggest a tendency toward asymmetrical intervention. In period two, when the quetzal was weak, the estimated coefficient of intervention around trend is substantially lower than in all other periods.

Figure 2. Guatemala: Bilateral Nominal Exchange Rate and Foreign Reserves
1986-2008



Sources: International Financial Statistics (IFS) and Author's calculations.

Table 13. Trend Coefficients and Intervention Indices for Bilateral Nominal Exchange Rate of Guatemalan Quetzal against the U.S. Dollar, 1986 – 2008.

Period	Trend Coefficient [a]		Type of Data [b]	Propensity to Intervene	
	Exchange Rate	Foreign Reserves		TPI (Average)	SPI (Average)
Total Period 1986:06–2008:12	5.20	14.74	A B (144/271)	0.80 0.80	0.72 0.76
Sub Period 1 1986:06–1989:07	3.51	-17.25	A B (20/38)	0.86 0.85	0.93 0.92
Sub Period 2 1989:08–1990:09	78.0	1.65	A B (4/14)	0.81 0.81	0.47 0.62
Sub Period 3 1990:10–2000:01	4.10	9.32	A B (66/112)	0.79 0.79	0.74 0.75
Sub Period 4 2000:02–2008:12	-0.45	13.96	A B (53/107)	0.80 0.79	0.71 0.75

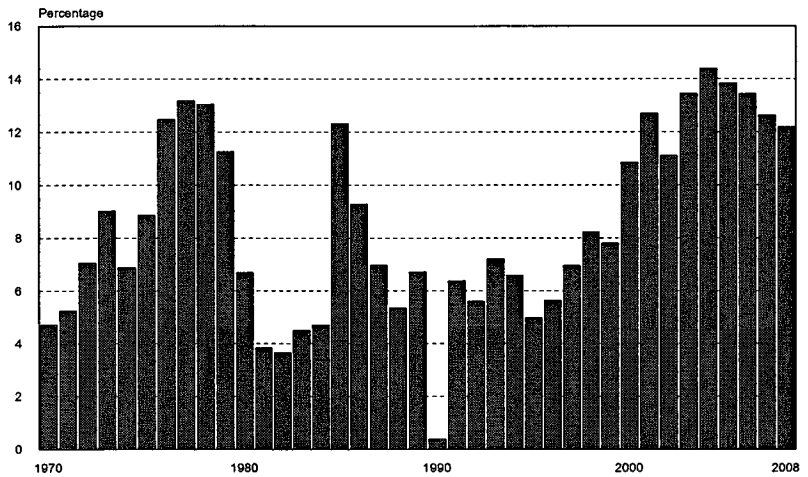
Source: Author's calculations.
a/ The trend coefficients are percentage change annual rates. A positive number for exchange rate means depreciation, and a positive number for reserve denotes increasing reserves.
b/ A: All signs, B: Right Signs, the numerator in parenthesis in this column is the number of observations of leaning against the wind: the denominator is the total number of observations.

The results do not provide strong evidence of a reserve target being met at some point with the tendency to accumulate reserves falling after. While both the trend and intervention coefficients in period four are lower than in period one, they are substantially higher than in period three. However, reserve accumulation does not necessarily imply that reserve holding has become excessive. It is important to have an idea of what level

of reserves would be optimal in order to judge whether current levels exceed that level. The theory behind the concept of optimum reserves is fairly well established and it points out that reserves confer benefits in terms of allowing countries to adopt slower speeds of adjustment when confronted with balance of payments crises. They may also contribute to the perceived creditworthiness of countries and therefore make crises less likely. Higher reserves therefore mean that future output losses may be avoided since future current account deficits can be better financed and the effects of capital outflows can be neutralized by running down reserves (Bird and Mandilaras, 2005, 2010).

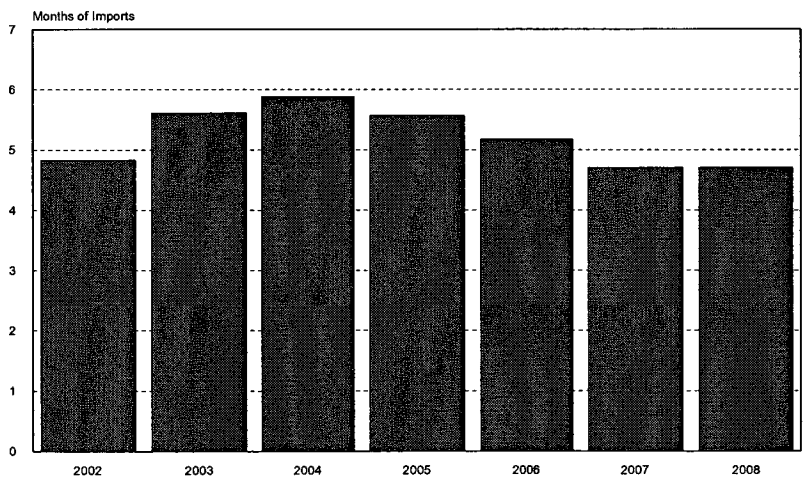
Nevertheless, attempts to operationalize the theory and estimate optimum reserves in Guatemala all seem to suggest that, according to conventional ideas, Guatemala reserve holding became excessive at the end of the 1990s and the beginning of the 2000s In the following graphs, it is possible to observe the positive trend in the reserves after 1990 (sub period 3). In addition, the only available indicator (proxy) in the region, that measures the adequacy of reserves, is the months of imports covered by reserves. During the last decade, this indicator has been above 3.5 months, which is the benchmark suggested by the IMF to the Central Banks in the region.

Figure 3. Guatemala: Reserves / GDP
1970 - 2008



Source: Executive Secretariat of the Central American Monetary Council (SECMCA).

Figure 4. Guatemala: Reserves
2002 - 2008



Source: Executive Secretariat of the Central American Monetary Council (SECMCA).

In 2004, the press began to report that the Bank of Guatemala has started to worry that reserves have reached excessive levels. A behavioral change toward reducing reserves show up in the last years of the sample period, which runs through the end of the year 2008. The standard public choice or bureaucratic theories of exchange rate policy

suggest that typical governments are often interested in keeping exchange rates undervalued in order to promote short-run growth and employment; central bank officials tend to have a longer time horizon and give more weight to avoiding inflation and future crisis.

Guatemala's "after the peg" exchange rate regime has been neither a free float nor a reversion to the heavy degree of management of the 1970s. It has been a managed float characterized by both considerable exchange rate flexibility and considerable management.

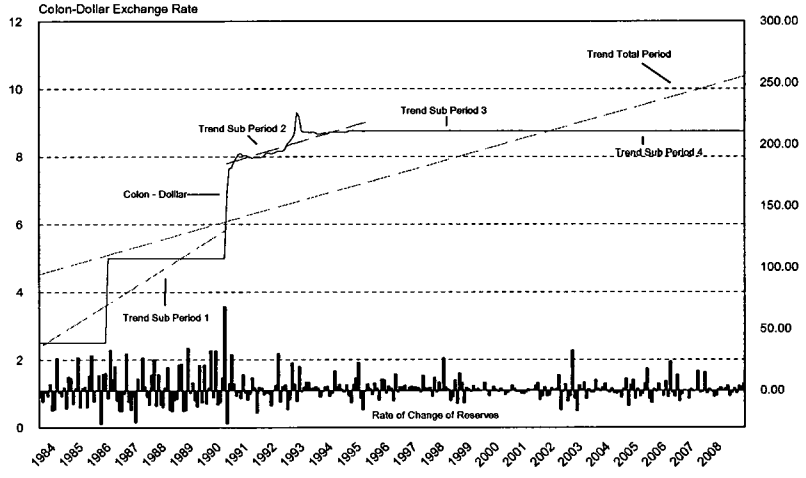
2.4.2. El Salvador

In 2000, Ecuador's full dollarization occurred in the midst of an economic and banking crisis. In contrast, in 2001 El Salvador's full dollarization was expected to enhance the set of previous structural reforms put in place to support economic stability and thus attract foreign investors. After reaching a peace agreement in the early 1990s resolving a civil war, El Salvador implemented comprehensive structural reforms in the mid-1990s in an attempt to rebuild and stabilize the economy. These reforms included the simplification of the tax structure, privatization of the financial system, and financial and trade liberalization. In addition, in 1991, the central bank adopted a fixed exchange rate policy with respect to the U.S. dollar to minimize exchange rate risk and to foster price stability.

Beginning in January 1, 2001, the Salvadoran government implemented the Monetary Integration Law, which established a fixed exchange rate of 8.75 colones per U.S. dollar and made the dollar legal tender and the only unit of account in the financial system. The colon is still considered legal tender and continues to circulate alongside the

dollar, but dollars have gradually replaced colones, which are no longer printed. All financial operations are denominated in dollars, and currently the use of the colon is generally limited to some rural areas. Unlike Ecuador, which adopted the dollar as a policy alternative to bring economic stability, El Salvador had enjoyed economic stability and low inflation rates before official dollarization.

Figure 5. El Salvador: Bilateral Nominal Exchange Rate and Foreign Reserves
1984-2008



Sources: International Financial Statistics (IFS) and Author's calculations.

Table 14. Trend Coefficients and Intervention Indices for Bilateral Nominal Exchange Rate of Salvadorean Colon against the U.S. Dollar, 1983 – 2008.

Period	Trend Coefficient [/a]		Type of Data [/b]	Propensity to Intervene	
	Exchange Rate	Foreign Reserves		TPI (Average)	SPI (Average)
Total Period 1983:08–2008:12	4.14	13.82	A B (228/304)	0.77 0.77	0.86 0.86
Sub Period 1 1983:08–1990:04	15.12	3.92	A B (39/81)	0.79 0.79	0.84 0.84
Sub Period 2 1990:05–1995:04	3.04	16.31	A B (26/60)	0.77 0.77	0.85 0.88
Sub Period 3 1995:05–2000:12	0.00	23.58	A B	1.00 1.00	1.00 1.00
Sub Period 4 2001:01–2008:12	0.00	4.37	A B	1.00 1.00	1.00 1.00

Source: Author's calculations.
a/ The trend coefficients are percentage change annual rates. A positive number for exchange rate means depreciation, and a positive number for reserve denotes increasing reserves.
b/ A: All signs, B: Right signs, the numerator in parenthesis in this column is the number of observations of leaning against the wind: the denominator is the total number of observations.

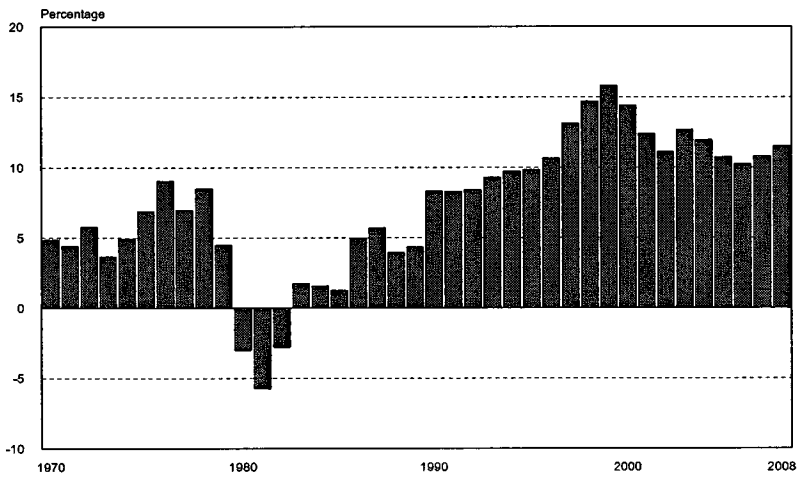
Through the entire period of the analysis (1983:08–2008:12), in El Salvador's foreign exchange policy there is a very large positive trend coefficient in the intervention proxy regardless of movement in exchange rates. It is important to take into account that in the case of this country, only the first and second periods were classified by the IMF and RR as a managed floating and/or de facto crawling band, respectively. The third and fourth sub periods, were classified as de facto peg to US dollar and no separate legal tender (dollarization), respectively. Therefore, when market pressure is resolved entirely through intervention, the estimates for TPI in these sub periods were one. The results of this methodology point out that the first and second sub periods were indeed conventional peg and managed floating, respectively. The third was again a conventional peg and the fourth sub period was, in line with the others authors, a dollarization regime sub period.

The estimates for SPI for the whole period coincide fairly closely with the averages of those calculated for the sub periods one and two. SPIs for these sub periods are quite high close to those for the whole period, running a little between 0.77-0.88. This could suggest that foreign reserve accumulation was the primary objective during period one and two and that for period three and four it was a priority to manage pressures in exchange rates.

Of course, as it has been mentioned, changes in reserves are far from a perfect proxy for official intervention, but with reserve accumulations so large during periods one to three, this seems like a safe conclusion. Time could have exerted a significant positive impact on reserve accumulation, however. It is not the objective of this chapter to explain this formally, but perhaps monetary authorities perceived the period covered by the study as one of increasing financial turbulence and potential vulnerability,

irrespective of whether some crises actually occurred. They may also have experienced a change in their preferences over time towards income stability as opposed to income level.

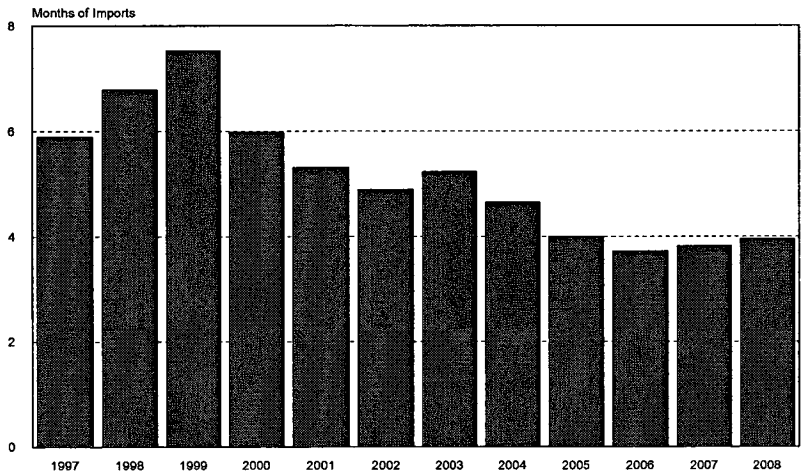
Figure 6. El Salvador: Reserves / GDP
1970 - 2008



Source: Executive Secretariat of the Central American Monetary Council (SECMCA).

There is no exact scientific way to judge reserve adequacy in today's world of substantial capital mobility, but a review of a number of benchmarks suggests that these accumulations exceeded prudent levels during the late 1990s and have decreased to the standard benchmark for the region in the 2000s.

Figure 7. El Salvador: Reserves (Months of Imports)
1997 - 2008



Source: Executive Secretariat of the Central American Monetary Council (SECMCA).

2.4.3. Honduras

The two parameter EMP framework finds that Honduras has had a substantially increased intervention during the period 1990:03–2008:12. TPIs are wrongly signed during sub periods with depreciation trend in the exchange rate. SPIs for all sub periods are similar to the one observed during the entire period. They are 0.80 and 0.88 for the first and second sub periods, respectively.

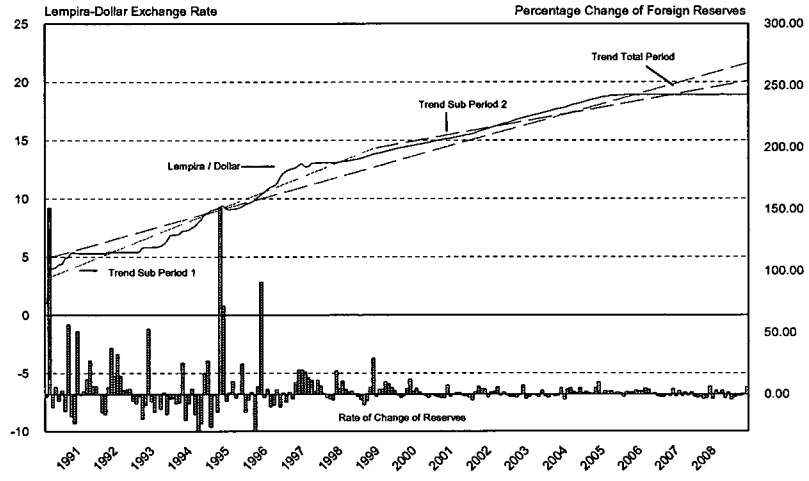
The trend coefficient points out that the foreign reserves accumulated per year on average by 32.08 percent and 10.98 percent for the first and second sub periods, respectively. This suggests that foreign reserve accumulation was the primary objective, not managing the trend in exchange rates. The results are consistent with the strategy publicly announced by the Central Bank of accumulating reserves. This could have been motivated by the depletion of reserves during the 1980s due to have waited longer to abandon the peg relative to the other countries.

The lempira has indeed been more flexible than it was before. As Guatemala, Honduras does display evidence of fear of completely free floating, but such fear appears to be much less strong than would be implied by a return to a conventional peg. Honduras's post peg exchange rate regime has been neither a free float nor a reversion to fix exchange rate regime. Indeed, it has been a crawling band characterized by both low exchange rate flexibility and considerable management. According to the indicators, there is evidence of a heavy degree of intervention consistent with the crawling peg and crawling band used during the period of analysis. Furthermore, the domestic economy has been week during the last years. It is possible that if the authorities had abstained from market intervention, the nominal exchange rate might have depreciated much more than otherwise, possibly choking off the recovery.

There was also a need for Honduras to continue rebuilding its level of international reserves, which were seriously depleted during the 1980s and 1990s due in part by the late abandoned of the exchange rate peg and losses caused by the natural disasters that hit the country. Indeed given Honduras's substantial involvement with international capital flows, a much higher level of reserves was a sound national investment in future crisis prevention.

The Central Bank explicitly says that it will use the exchange rate policy more actively to accumulate an adequate level of reserves. This will allow the Central Bank to adequately manage the impact on the exchange rate of the growing risks of foreign shocks, especially those related to the increase in fuel and food prices.

Figure 8. Honduras: Bilateral Nominal Exchange Rate and Foreign Reserves
1991-2008



Sources: International Financial Statistics (IFS) and Author's calculations.

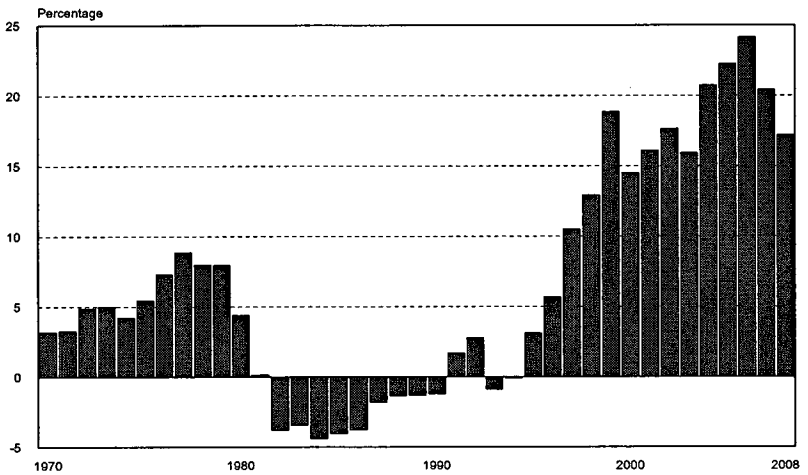
Table 15. Trend Coefficients and Intervention Indices for Bilateral Nominal Exchange Rate of Honduran Lempira against the U.S. Dollar, 1990 – 2008.

Period	Trend Coefficient [/a]		Type of Data [/b]	Propensity to Intervene	
	Exchange Rate	Foreign Reserves		TPI (Average)	SPI (Average)
Total Period 1990:03–2008:12	8.48	25.76	A B (111/226)	0.72 0.72	0.80 0.88
Sub Period 1 1990:03–1998:12	17.11	32.08	A B (49/106)	0.71 0.71	0.80 0.86
Sub Period 2 1999:01–2008:12	3.51	10.98	A B (60/120)	0.72 0.72	0.88 0.90

Source: Author's calculations.
a/ The trend coefficients are percentage change annual rates. A positive number for exchange rate means depreciation, and a positive number for reserve denotes increasing reserves.
b/ A: All signs, B: Right Signs, the numerator in parenthesis in this column is the number of observations of leaning against the wind: the denominator is the total number of observations.

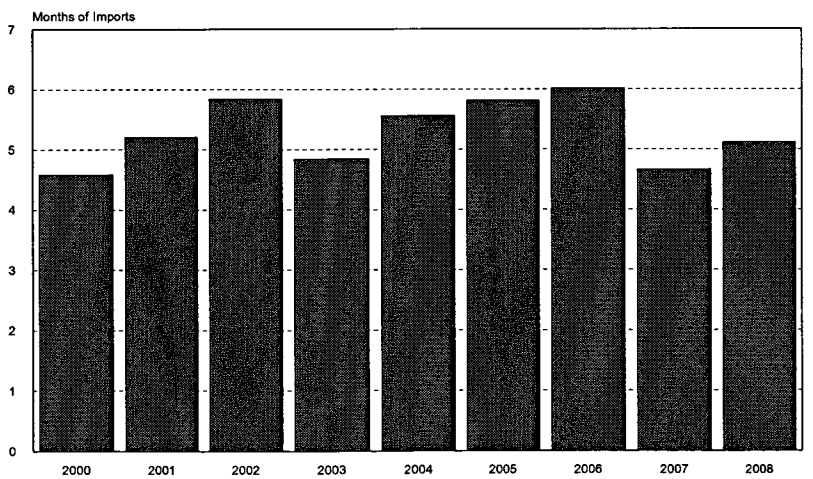
Indeed, the Central Bank has adopted as a goal, within the framework of the 2008-2009 Monetary Program, to increase reserves to at least US$250.0 millions to reach US$2,726.0 millions, compared to the December 2007 balance. This increase on reserves will allow the imports coverage level to be similar to last year's, at 4.0 months of imports.

Figure 9. Honduras: Reserves / GDP
1970 - 2008



Source: Executive Secretariat of the Central American Monetary Council (SECMCA).

Figure 10. Honduras: Reserves (Months of Imports)
2000 - 2008



Source: Executive Secretariat of the Central American Monetary Council (SECMCA).

2.4.4. Nicaragua

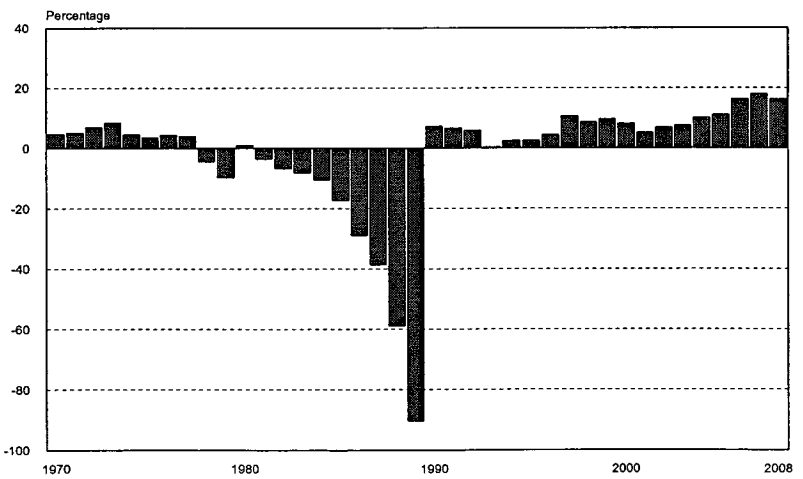
Following a decade of civil war, public sector overexpansion and hyperinflation, Nicaragua changed its course drastically during the 1990s as peace was reestablished and substantial progress in policy implementation was made to reduce macroeconomic imbalances and to transform to a market based economy. Macroeconomic policies were strengthened, most price controls eliminated, and the foreign exchange and trade systems liberalized. A program of public asset divestment was implemented, and public employment and military outlays declined substantially. Private banks were allowed to operate again and the Superintendency of Banks was created as an independent unit.

Since January 1993, the Nicaraguan government has followed a crawling peg devaluation schedule. Initially an annual rate of 5 percent was set in place; however, fragile credibility scheme given the high fiscal deficit resulted in increasing the rate to 12 percent in the same year. During the years 1994-1996, despite the effectiveness of exchange rate policy in reducing inflation, macroeconomic stability was weakened due to the deterioration of the public finances and the uncertainty resulting from the electoral process, so this higher rate remained unchanged. In addition, the government eliminated all significant restrictions on the foreign exchange system in 1996. After the new government took over in 1997, economic policy focused again in fiscal adjustments and growth. In 1999, with the successful implementation of the economic program of the government and in the process of the eligibility of Nicaragua to the HIPC initiative, the economic outlook was favorable for the coming years. Economic growth reached 7 percent, driven by the reconstruction program after the Hurricane Mitch. Thus, in July of the same year, the Central Bank of Nicaragua decided to initiate a process of gradual

reduction of the crawling peg rate by moving it from 12 percent to 9 percent, and in November of that same year was reduced to 6 percent.

This policy was well received by the economic agents and was seen as a sign of commitment to the economic program. However, in subsequent years, the intention of continuing with the reduction rate was postponed. In the period 2000-2001, the Nicaraguan economy was affected by three different disturbances: First, the emergence of the banking crisis; second, the strong deterioration of the public finances as part of the electoral cycle and third, the presence of an unfavorable international environment, which included the deterioration of the terms of trade and reserves and the uncertainty generated by terrorist activities and armed conflicts. In this context, the conditions necessary to continue with this policy were not given because, as postulated in the literature of balance of payments crises, a fixed exchange rate is not consistent with expansive economic policies which could damage the foundations of an economy.

Figure 12. Nicaragua: Reserves / GDP
1970 - 2008

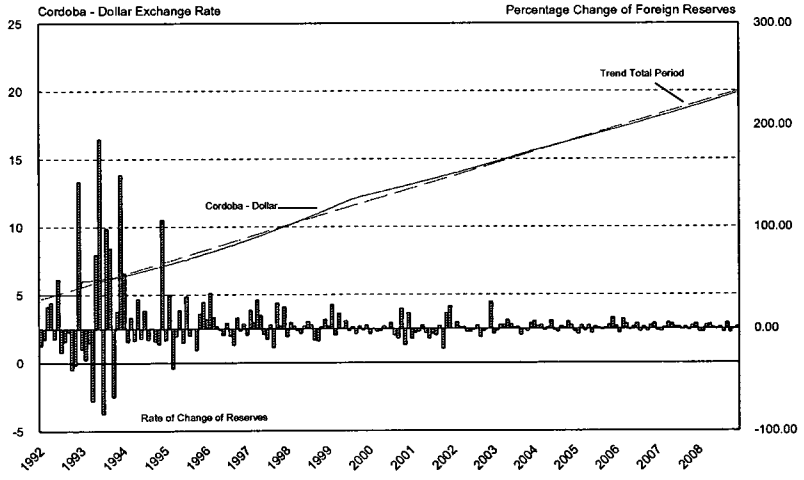


Source: Executive Secretariat of the Central American Monetary Council (SECMCA).

In 2001, in order to reduce the rate of inflation, consolidate the credibility the economic program and at the same time, reduce the financial impact of maintaining the value of the cordoba, a new program was designed. This program incorporated a reduction in the crawling peg rate by 1 percent. The current annual crawling peg rate is 5 percent. The cordoba to dollar rate is adjusted daily.

The EMP framework finds that Nicaragua has had a substantially increased intervention during the period 1992:01–2008:12. TPI and SPI are wrongly signed during the entire period with a depreciation trend in the exchange rate that is consistent with the average crawling rate used by the Central Bank. The flexibility of the exchange rate is very low, according to the calculations, they are 0.10 and 0.30, respectively. These results support the classification of the exchange rate regime in the crawling band/ crawling peg category after abandoning the peg.

Figure 13. Nicaragua: Bilateral Nominal Exchange Rate and Foreign Reserves 1992-2008



Sources: International Financial Statistics (IFS) and Author's calculations.

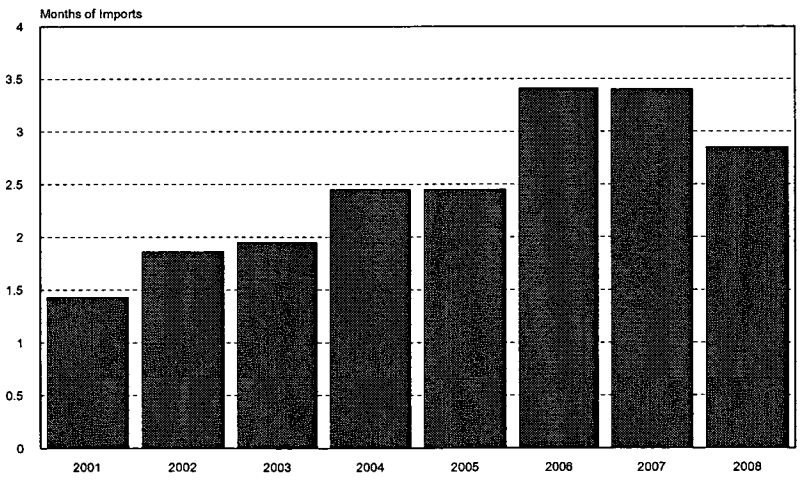
Table 16. Trend Coefficients and Intervention Indices for Bilateral Nominal Exchange Rate of Nicaraguan Cordoba against the U.S. Dollar, 1992 – 2008.

Period	Trend Coefficient [/a]		Type of Data [/b]	Propensity to Intervene	
	Exchange Rate	Foreign Reserves		TPI (Average)	SPI (Average)
Total Period 1992:01–2008:12	8.38	17.95	A B (87/204)	0.70 0.70	0.90 0.95

Source: Author's calculations.
a/ The trend coefficients are percentage change annual rates. A positive number for exchange rate means depreciation, and a positive number for reserve denotes increasing reserves.
b/ A: All signs, B: Right Signs, the numerator in parenthesis in this column is the number of observations of leaning against the wind: the denominator is the total number of observations.

The trend coefficient shows that the foreign reserves accumulated per year on average by 17.95 percent. It is possible that, during the early 1990s, the foreign reserve accumulation was the primary objective, not managing the trend in exchange rate. This could have been motivated by the depletion of reserves that took place during the civil conflict and also, when the nation was hit by natural disasters. The indicator of months of imports covered by reserves is the smallest in the region, with a range between 1.5 – 2.5.

Figure 14. Nicaragua: Reserves (Months of Imports)
2001 - 2008



Source: Executive Secretariat of the Central American Monetary Council (SECMCA).

2.4.5. Costa Rica

Until the late 1970s the Costa Rican exchange rate remained fixed, with occasional devaluations. At the beginning of the 1980s, the economy faced an external debt crisis which generated the emergence of a multiple exchange rates regime system.

A crawling band regime was applied in November 1983, initially based on fixation and centralization of currencies in the Central Bank of Costa (BCCR). Starting in March of 1992 the BCCR allowed greater participation of private actors in a context of a more open balance of payments account. However, in June of that same year the Monetary Authority took control of the exchange market while maintaining free capital mobility. Thus, the BCCR continued to influence directly and indirectly the value of the currency in order to preserve the external competitiveness of the domestic sectors and to prevent deterioration of the external sector. As part of the recent transition towards an inflation targeting framework, in October of 2006 the crawling peg regime was changed to a managed floating.

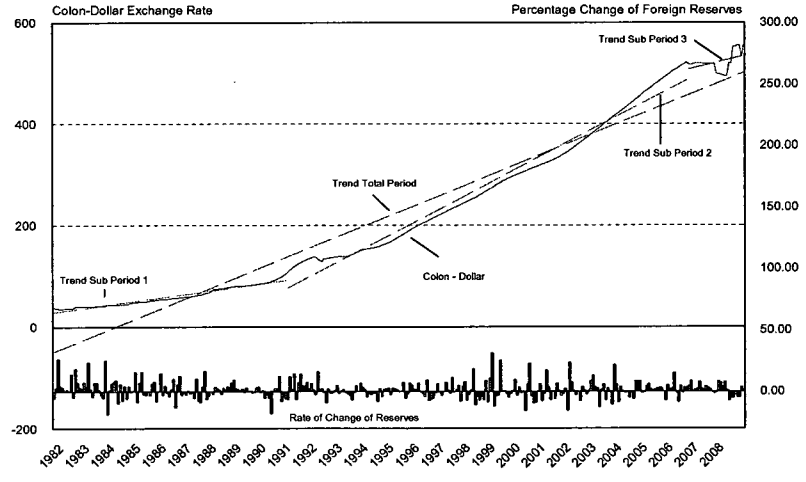
The substantial appreciation of the colon in 2007 and early 2008 has further highlighted the potential conflict in objectives. While some official statements have indicated a belief that this recent appreciation has been caused primarily by destabilizing speculation, many commentators have suggested that it largely reflects market fundamentals.

In summary, the recent adoption of a managed float seems to have served Costa Rica well. No fundamental change in Costa Rica's exchange rate regime is called for. There remain, however, a number of important issues from both Costa Rica and Central American perspectives concerning the best strategies for managing the colon's float.

Although it is concluded that the evidence is overwhelming that the most appropriate classification for Costa Rica's after the peg exchange rate regime is as a crawling peg / crawling band for sub period 1 and a managed float for sub period 2, how best to manage this float under an ever changing array of circumstances is not an easy task.

During the entire period of analysis (1981:10–2008:12), the colon had a strong depreciation trend and small volatility around the trend. This low volatility, according to this methodology, resulted from a heavy intervention policy. TPI had the wrong sign and SPI was quite high, 0.78-0.89. This suggests that foreign reserve accumulation was the primary objective, not managing the trend in exchange rates even though there has been a strong long-term depreciation trend in the colon since its abandoning of the peg.

Figure 15. Costa Rica: Bilateral Nominal Exchange Rate and Foreign Reserves 1982-2008



Sources: International Financial Statistics (IFS) and Author's calculations.

Table 17. Trend Coefficients and Intervention Indices for Bilateral Nominal Exchange Rate of Costa Rican Colon against the U.S. Dollar, 1981 – 2008.

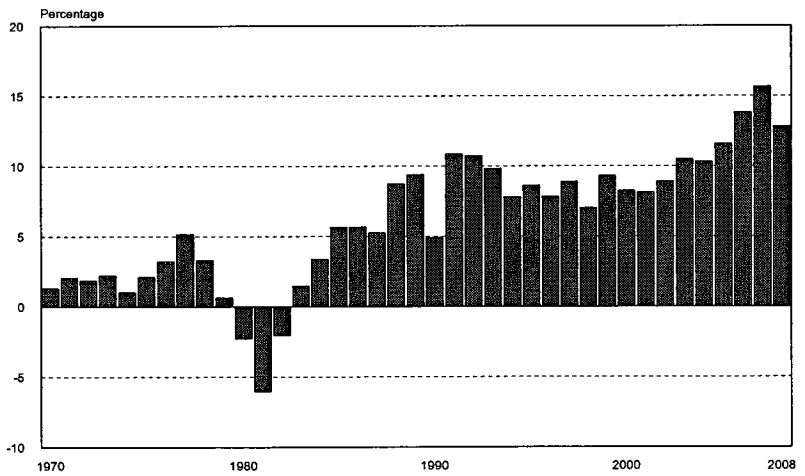
Period	Trend Coefficient [/a]		Type of Data [/b]	Propensity to Intervene	
	Exchange Rate	Foreign Reserves		TPI (Average)	SPI (Average)
Total Period 1981:10–2008:12	11.50	9.65	A B (128/327)	0.58 0.58	0.82 0.85
Sub Period 1 1981:10–1990:12	12.04	16.58	A B (42/111)	0.60 0.60	0.79 0.85
Sub Period 2 1991:01–2006:09	10.31	6.96	A B (87/189)	0.56 0.56	0.87 0.89
Sub Period 3 2006:10–2008:12	2.27	14.44	A B (10/27)	0.57 0.57	0.78 0.83

Source: Author's calculations.

a/ The trend coefficients are percentage change annual rates. A positive number for exchange rate means depreciation, and a positive number for reserve denotes increasing reserves.

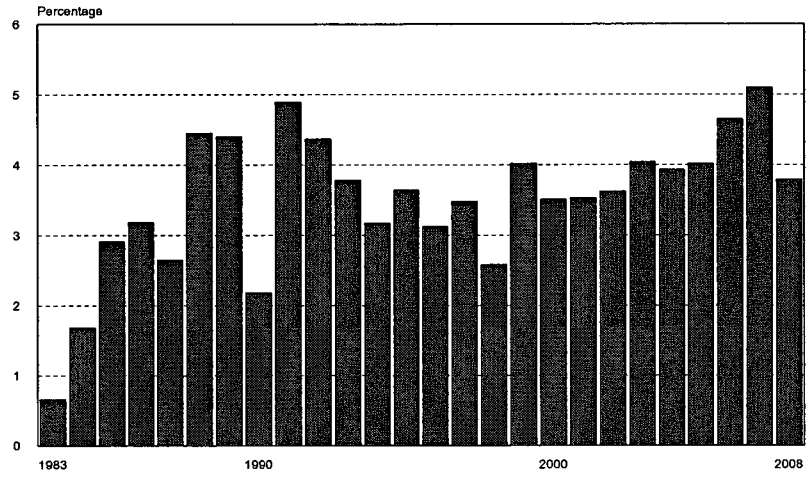
b/ A: All signs, B: Right Signs, the numerator in parenthesis in this column is the number of observations of leaning against the wind: the denominator is the total number of observations.

Figure 16. Costa Rica: Reserves / GDP
1970 - 2008



Source: Executive Secretariat of the Central American Monetary Council (SECMCA).

Figure 17. Costa Rica: Reserves (Months of Imports)
1983 - 2008



Source: Executive Secretariat of the Central American Monetary Council (SECMCA).

2.4.6. Dominican Republic

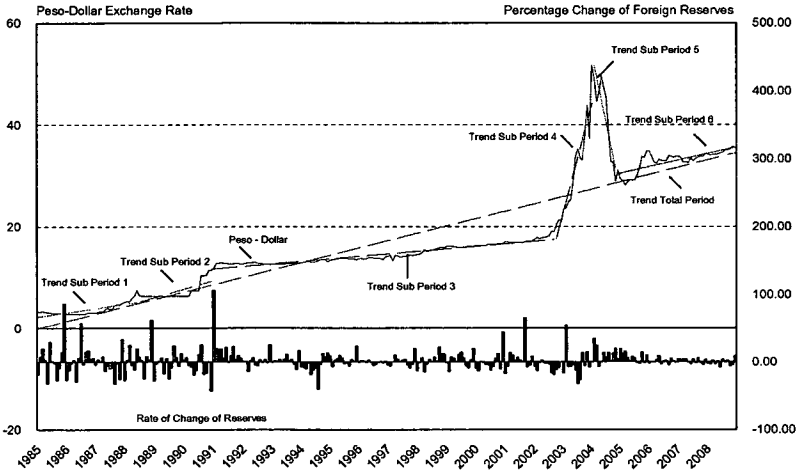
For most of the 1990s, the Dominican Republic experienced robust economic growth, declining unemployment rates, low inflation, and a generally manageable external position. In the second half of the decade, the Dominican Republic ranked among the world's fastest growing economies, with standout performances in construction, telecommunications, tourism, and free-trade exports. The ratio of public external debt to GDP fell markedly, from over 70 percent at the beginning of the decade to about 20 percent by the end of the decade.

This picture contrasts dramatically with the country's poor economic performance during the 1980s owing to a combination of severe monetary and fiscal imbalances, pervasive price controls, financial sector rigidities, multiple currency practices, and an extremely restrictive trade regime. As a result of a series of wide-ranging stabilization and structural reforms, macroeconomic stability was restored and sustained throughout most of the 1990s. This period was characterized by single digit inflation despite a

prolonged period of sustained rapid growth and the buffeting of the economy by a series of external shocks—an oil price shock in 2000, the September 11 terrorist attacks, and the global economic slowdown in 2001. Toward the end of 2002, a banking crisis emerged and became full blown in 2003, resulting in macroeconomic instability, which was characterized by a large rundown in government deposits, a significant fall in net international reserves, and a substantial depreciation in the value of the peso.

In the Dominican Republic, since 1947 until 1983 the exchange rate was fixed to the dollar. Then the Central Bank installed a system of flexible exchange rate with heavy interventions. Since 1983 the Central Bank began to adjust to changes in the market and a devaluation process started until it reached DR$12.87 per US$ 1.00, in 1995. After a decade of relative stability, in August 2002, the exchange rate moved up from DR$18.00 in 2004 to around DR$42.00 per dollar in the same year. According to economic authorities, this gradual Dominican currency devaluation was due to rumors and news about a local commercial bank, BANINTER, and his subsequent bankruptcy of fraudulently, which led to the intervention of the Central Bank of the Dominican Republic in April 2003. At the end of 2004, and thanks to the trust placed by economic agents to the new authorities, the exchange rate went through a period of adjustment that ended in an appreciation of the Dominican peso to the dollar which remains stable today around of DR$35.00 per dollar to December 2008.

Figure 18. Dominican Republic: Bilateral Nominal Exchange Rate and Foreign Reserves 1985-2008



Sources: International Financial Statistics (IFS) and Author's calculations.

Table 18. Trend Coefficients and Intervention Indices for Bilateral Nominal Exchange Rate of Dominican Peso against the U.S. Dollar, 1985 – 2008.

Period	Trend Coefficient [a]		Type of Data [b]	Propensity to Intervene	
	Exchange Rate	Foreign Reserves		TPI (Average)	SPI (Average)
Total Period 1985:01–2008:12	10.47	10.19	A B (153/288)	0.71 0.70	0.74 0.74
Sub Period 1 1985:01–1988:06	21.66	-5.70	A B (23/42)	0.81 0.81	0.73 0.67
Sub Period 2 1988:07–1990:12	22.30	-20.47	A B (15/30)	0.72 0.72	0.77 0.77
Sub Period 3 1991:01–2002:09	3.38	7.03	A B (68/141)	0.69 0.69	0.82 0.83
Sub Period 4 2002:10–2004:01	94.09	-0.53	A B (10/16)	0.64 0.64	0.53 0.53
Sub Period 5 2004:02–2004:11	-50.76	146.00	A B (7/10)	0.63 0.63	0.54 0.58
Sub Period 6 2004:12–2008:1	4.12	20.50	A B (26/49)	0.68 0.68	0.71 0.71

Source: Author's calculations.
a/ The trend coefficients are percentage change annual rates. A positive number for exchange rate means depreciation, and a positive number for reserve denotes increasing reserves.
b/ A: All signs, B: Right Signs, the numerator in parenthesis in this column is the number of observations of leaning against the wind: the denominator is the total number of observations.

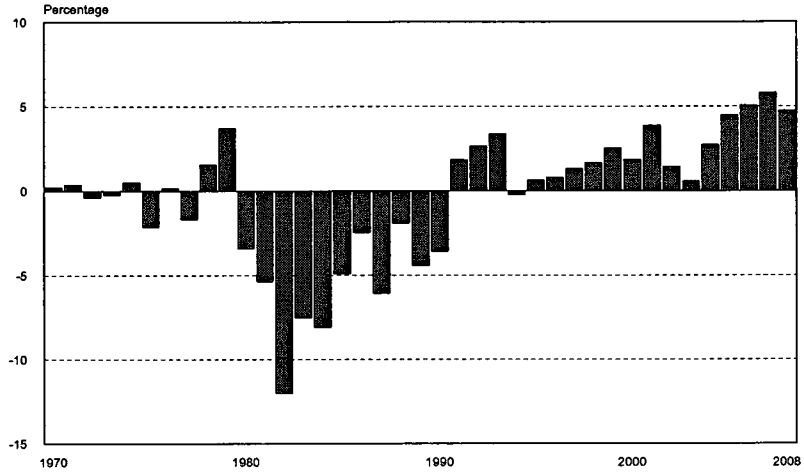
During the post peg period the peso depreciated against the dollar. While the peso has an overall appreciation trend over the entire period, it is far from steady. It is possible to observe a number of rather sharp breaks in each rate behavior. Based on inspection, I divided the post peg period into six sub-periods: (i) 1985:01–1988:06, (ii) 1988:07–

1990:12, (iii) 1991:01–2002:09, (iv) 2002:10–2004:01, (v) 2004:02–2004:11 and (vi) 2004:12–2008:1. According to this methodology, the Dominican Republic's foreign exchange policy has been consistent and shows a positive trend coefficient in the intervention proxy in three out of six sub periods. Therefore, the estimates for TPI have correct signs in four out of six sub periods. This suggests that foreign reserve accumulation was not a primary objective but consistently managing the trend in the exchange rate.

The estimates for SPI for the whole period coincide fairly closely with the averages of those calculated for the sub periods one, two and six. SPIs for these sub periods are quite close to those for the whole period running a little between 0.74-0.77. We find much stronger smoothing intervention in the third period at 0.83 while most of the estimates for period four and five are considerably lower, with around 0.53-058.

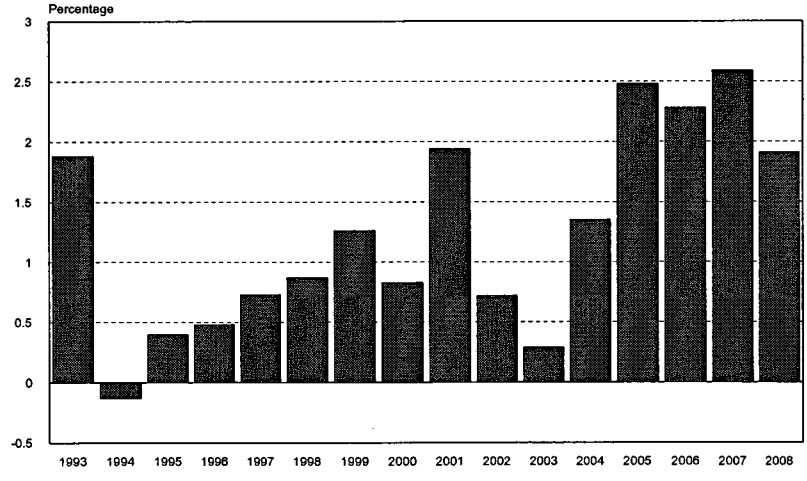
The calculations suggests that while the category of a managed floating rate is an appropriate label for the Dominican Republic's exchange rate regime over this whole period, there have been substantial changes in intervention behavior. For some issues such as the effect of exchange rate regime on economic growth, these changes in behavior are likely not of great importance. For the characterization of intervention reaction functions they seem quite important, however.

Figure 19. Dominican Republic: Reserves / GDP
1970 - 2008



Source: Executive Secretariat of the Central American Monetary Council (SECMCA).

Figure 20. Dominican Republic: Reserves (Months of Imports)
1993 - 2008



Source: Executive Secretariat of the Central American Monetary Council (SECMCA).

2.5. *Concluding Remarks*

This section develops a methodology for classifying exchange rate regimes in Central America based on a more precise application of the concept of exchange market pressure than has been used in other studies[7].

I discuss the issue of trends and argue that at least two parameters – coefficients for trend and for deviations around trend – are necessary for the general classification of exchange rate regimes. Because of shifting trends, issues of changes in regimes and the appropriate time periods for analysis become important. There is likely to be no single best answer to such issues and the best answer is often likely to vary depending on the question at hand.

The lack of full correspondence between changes in reserves and actual exchange market intervention is a major problem. I emphasize the frequency with which the data on changes in exchange rates does not fit within the leaning against the wind framework implied by the concept of exchange market pressure. How to classify such wrong signs observations is especially problematic. I believe one path to progress in the analysis of Central America is careful country studies which investigate these wrong sign observations and attempt to gain insight into the extent to which these results from actual intervention behavior versus weaknesses in changes in reserves as a proxy for intervention. The inclusion of sterilization measures and/or interest rate behavior in such broader classifications is an important area for further research.

[7] See Table 2 in Appendix A for the author's classification by country.

3. EXCHANGE RATE REGIMES AND ECONOMIC PERFORMANCE

As was mentioned previously, during the last few years economists' views on exchange rate regimes have evolved significantly. Fixed-but-adjustable regimes have lost support, while hard pegs and floating rates have gained in popularity. The discussion on the relative merits of these two contrasting exchange rate systems has come to be known as the "two corners" debate (Fischer, 2001). Supporters of hard pegs have argued that this type of regime provides credibility and results in lower inflation, a more stable economic environment and faster economic growth. Supporters of flexibility, on the other hand, have argued that under floating exchange rates the economy has a greater ability to adjust to external shocks. According to this view, which goes back at least to Meade (1951), countries with a flexible exchange rate system will be able to buffer real shocks stemming from abroad. This, in turn, will allow countries with floating rates to avoid costly and protracted adjustment processes. Thus, it is the objective of this chapter to investigate the relationship between exchange rate regimes and economic performance, in particular for Central America.

3.1. Literature Review

According to Tavlas, Dellas and Stockman (2008), the earlier (i.e., pre-late 1990s) empirical literature on the performance of alternative exchange-rate systems focused mainly on comparing unconditional variances of nominal and real exchange rates under the Bretton-Woods system and the successor (beginning in 1973) system of managed floating exchange rates. Stockman (1983) and Mussa (1986), for example, found that the post-1973 period was characterized by increases in the volatility of real exchange rates

compared with that of the Bretton-Woods era. These findings were corroborated in studies by Baxter and Stockman (1989) and Flood and Rose (1995). The latter two studies also examined the volatilities of other macroeconomic variables under the respective regimes. Apart from the greater variability of real exchange rates under the managed floating regime, Baxter and Stockman (1989) found little evidence of systematic differences in the behavior of macroeconomic aggregates (consumption and industrial production) under the two regimes. A similar result was obtained by Flood and Rose (1995), who found that the unconditional volatilities of such macroeconomic variables as industrial production, money, consumer prices, and interest rates did not change very much across the two regimes. The finding emerging from the earlier empirical literature that the volatility of many key macroeconomic variables is invariant to the exchange rate system while that of the key relative price - the real exchange rate- is not, creates a major conundrum. Recall that the neoclassical model with flexible prices implies the absence of an effect on any real variable. Therefore, it is consistent with the finding that the volatility of most macroeconomic variables is independent of the exchange rate regime in place, but inconsistent with the finding that the volatility of the real exchange rate is not. Models with nominal rigidities, on the other hand, can account for the latter result, but is inconsistent with the former finding. These inconsistencies between the empirical evidence and the implications of the main theories of exchange rates strongly suggest that the classification of exchange rate regimes used in this literature is problematic.

Several key differences distinguish the empirical methodology followed by authors of the recent literature from the general approach adopted in the pre late 1990s

literature. First, whereas the earlier literature was based solely on the de jure coding, the recent literature investigates the possible relationship between macroeconomic aggregates and exchange rate regimes using the de facto codings described above, sometimes in conjunction with results based on the de jure coding. Second, earlier studies mainly compared differences in time-series properties between the Bretton-Woods pegged but adjustable exchange rate system and the subsequent managed floating exchange rate system while recent studies assess performance of the variety of systems that have sprung up in the post-Bretton Woods era. Third, whereas authors of earlier studies focused exclusively on comparisons of unconditional moments of macroeconomic variables to assess differences in behavior, authors of subsequent studies have also reported conditional first and second moments of per-capita growth and inflation derived from panel-data regression analysis (Tavlas, Dellas, and Stockman, 2008).

In addition, these authors argue that there does not appear to be a consensus theoretical framework on growth to guide empirical work in the area. As a result, a diverse and sometimes unwieldy empirical growth literature has been produced, in which over fifty variables have been found to be correlated with growth in at least one regression but also in which few studies control for the variables analyzed by other researchers (Levine, and Renelt, 1992). This situation has carried over to the exchange-rate regime literature, making it difficult to isolate the effect of the regime on growth from the effects of other factors, such as omitted-variable bias when a control variable included in one study has been omitted from another.

Also, following the work of Kormandi and Maguire (1985), a common feature of most cross-country growth regressions, including those used in the exchange rate regime

literature, is that the explanatory variables are entered linearly and independently, and are assumed to have coefficients that are invariant both over time and cross sectionally. These assumptions can be overly restrictive, biasing the results obtained. Third, in an evaluation of the empirical growth literature, Levine and Renelt (1992) found that the empirical linkages between long run growth rates and a broad array of economic policy, political, and institutional variables used in cross country regressions are not robustly correlated with growth; small alterations on the conditioning set overturn previous results. The authors interpreted their findings as suggesting that the results of cross country studies are sensitive to the conditioning information set. Studies on inflation generally use the same set of variables.

3.2. Exchange Rate Regimes and Inflation

Recent episodes of financial distress have refocused the discussion by introducing the question of which exchange rate regime is better suited to deal with increasingly global and unstable world capital markets (Edwards, and Levy Yeyati, 2005). In particular, given the increasing importance of international capital flows and the importance of external as well as domestic monetary shocks, some analyses have narrowed the traditional trade off to a price stability growth dilemma, also possibly variability of growth, according to which fixes are expected to enhance the credibility of non inflationary monetary policies, reducing inflation and the volatility of nominal variables, while floats are seen as allowing the necessary price adjustments in the face of external (real and financial) shocks, reducing output fluctuations and improving growth performance. As mentioned, the exchange rate regime may affect growth rate and

inflation indirectly through its disciplinary effect on money growth, as well as directly through lower inflation expectations.

According to Bird (2002), perhaps the principal appeal of a hard pegged exchange rate regime is its potentially counter inflationary property. This feature will be particularly attractive to countries that, while having a poor record with respect to inflation and little scope for fighting inflation via the domestic control of monetary aggregates or via inflation targeting, at the same time, face high inflationary expectations. However, in countries with historically high inflation, any counter inflationary policy may carry only limited credibility. If firm exchange rate pegging fails to alter inflationary expectations, it will either result in rising unemployment automatically as the money supply falls, or as governments are forced to pursue contractionary fiscal policies to defend the peg, or the abandonment of the peg in an attempt to neutralize the effect of inertial inflation on the real exchange rate and the balance of payments. However, once abandoned, future attempts to peg may carry even less credibility than they did before. While building some flexibility into the peg by means of crawling may allow inflation to be reduced more gradually and may permit a lower rate of appreciation in the real exchange rate as a consequence of inflation, it may also bring into question the resolve of the government to lower inflation. This may in turn limit the impact in reducing inflationary expectations, with the end result that the crawling peg is actually associated with further real appreciation. In order to make counter inflationary policy credible, governments may therefore need to contemplate regimes that effectively rule out future devaluations completely. This is the central attraction of currency boards, and, even more so, dollarization and currency union. Ironically, the problem with any escape route in this

context is that it may be used; and this creates a moral hazard problem. Regimes that are less flexible and more difficult to exit from have the advantage of suggesting a stronger commitment by the government to fighting inflation but have the disadvantage of being more likely to be associated with balance of payments disequilibria. However, Willett (2006) has pointed out that some crawling pegs have worked fairly well.

It is clear from the discussion above that no exchange rate regime is a substitute for well designed macroeconomic policy (Bird, 2002). A government that persistently runs large fiscal deficits is likely to encounter exchange rate problems, irrespective of its regime choice. Similarly a country that avoids long term fiscal deficits and monetary excesses and is unaffected by economic shocks is likely to encounter few exchange rate problems, whether it opts for a flexible or a fixed exchange rate regime or something in between the two. Moreover, unless there is sterilization in the short run, a country experiencing a sudden inflow of capital will find that its real exchange rate appreciates whether its exchange rate is flexible or pegged. In the former case the nominal value of the currency will rise, whereas in the latter the domestic money supply will increase, leading to inflation. It is certainly possible to make too much of choosing the right exchange rate regime.

A finding that emerges from much of the literature, applying to both unconditional and conditional results, is that pegged exchange rate systems tend to be associated with lower inflation rates. The study by Ghosh, Gulde and Wolf (2002) is representative of the results reported in the literature. Using the de jure coding over the period 1970-99 for a group of one hundred fifty (advanced and developing) economies, they found that inflation averaged 13.3 percent under pegs, 22.0 percent under

intermediate regimes, and 24.3 percent under floats. Using their coding, the differences were more pronounced: 9.4 percent under pegs, 30.2 percent under intermediate systems, and 58.8 percent under floating regimes. Moreover, within the group of pegged currencies, the literature points to the following results: (i) regimes that underwent "frequent" adjustments in central parity and, for basket pegs, in the composition and/or the weights of the basket, generated higher inflation than did "infrequent" adjusters (Ghosh, Gulde, Ostry, and Wolf, 1997; Levy Yeyati, and Sturzenegger, 2001), (ii) single-currency pegs, which tend to be easier to verify than other pegs, had lower inflation rates than other pegged arrangements (Bleaney and Fielding, 2002), and (iii) the harder the peg, the lower the inflation rate (Edwards, 2001; Ghosh, Gulde and Wolf, 2000; Hanke, 2002; Edwards and Magendzo, 2003; Bleaney and Mongelli, 2005; Alfero, 2005; Willett 2003; Willett, Chiu, Dechsakulthorn and Kim, 2007; Angkinand, Chiu and Willett 2009).

Willett *et al.* (2009) have added to the analysis of exchange rate regimes and inflation some theoretical considerations concerning transparency and the robustness of external versus domestic approaches to imposing discipline. First, they question the frequently made assumption that fixing exchange rates are necessarily superior to central bank independence and inflation targeting in terms of transparency and offering early warning signs of excessively expanding policies. Second, they stress the danger of adopting policy rules which are too brittle. If economies face only one type of shock then optimal policy rules and efficient constraint systems can be identical. But under realistic conditions economies face many types of disturbances and efficient constraint systems need to provide some scope for flexibility in short-run policy responses. On this score they argue that central bank independence and flexible inflation targeting have a

considerable advantage over exchange rate based systems. Thus they suggest that exchange rate-based systems of long-run discipline are well suited only for small open economies that closely approximate the optimum currency area criteria for fixed exchange rates.

According to the authors, it is often emphasized in the literature that an institution will be more credible, the greater is the cost of abandoning it. Thus, since the political and economic cost of devaluing a hard fix should be much higher than devaluing an adjustable peg, the credibility of the former should be much greater. What is sometimes overlooked, however, is that the relevant consideration is not just the cost of abandonment, but also the cost of maintaining the policy or institution.

As a result of these conflicting considerations, the net effect of pegged versus flexible exchange rates on monetary discipline could go either way. The balance would depend on the magnitudes of short run benefits and longer run costs and the discount rate at which they are evaluated, and thus could vary both across countries and time. Such considerations strongly suggest, however, that as time horizons shorten with the approach of an election, adjustable pegs are unlikely to provide strong inducements to avoid political business cycles.

The analysis in Willett *et al.* (2009) suggests that in general fixed exchange rates are unlikely to provide adequate sources of macroeconomic discipline. It is important to clearly distinguish between hard and soft fixes, with only the former providing strong discipline over monetary expansion and inflation. Hard fixes make sense, however, only for countries that can sufficiently closely meet the conditions delineated in the literature on optimum currency areas. While there is clearly more scope for meeting these

conditions ex post rather than ex ante, and it is the ex post situation that is relevant, there is little evidence to support the view that endogenous responses will be so strong that ex ante conditions are irrelevant. In addition, fixed rates may reduce rather than increase short run discipline over fiscal policy by making deficits initially easier to finance. Argentina's currency board offers a prime example. Thus, proposals for most countries to adopt hard fixes to establish monetary discipline must be considered suspect.

3.3. Exchange Rate Regimes and Growth

As it was pointed out before, the literature has not yet agreed on how exchange rate regimes affect growth performance. This is probably due to the fact that we tend to associate only nominal effects to the choice of nominal variables. However, several arguments have been advanced to suggest a link between the two.

On the one hand, by reducing relative price volatility, a peg is expected to foster growth through its positive effect on investment and trade. Moreover, lower price uncertainty should lead to lower real interest rates, contributing to the same effect. On the other hand, the lack of exchange rate adjustments under a peg, coupled with some degree of short run price rigidity, may result in price distortions and high unemployment in the face of external shocks. More important, the need to defend a peg in the event of negative external shocks entails a significant cost in terms of real interest rates, as well as increased uncertainty as to the sustainability of the regime. Calvo (1999) has suggested that the external shocks faced by a country are not independent of the exchange rate regime.

At an empirical level this relationship has been studied in a series of recent papers. Mundell (1995), for example, examines the growth performance of industrial countries before and after the demise of Bretton Woods, finding that the earlier period, characterized by the prevalence of fixed exchange rates, was associated with faster average growth. Ghosh *et al.* (1997), using all IMF reporting countries for the period 1960–90, fail to find systematic evidence of an impact of the type of regime on growth. However, these results are challenged by Rolnick and Weber (1997), who find, using long-term historical data, that output growth was higher under fiat standards compared with commodity (e.g., gold) standards.

A similar conclusion is reached by Levi-Yeyati and Sturzenegger (2000) who explore the relationship between exchange rate regimes and growth using annual data covering the period 1974–99. In summary, their main findings are the following: First, fixed exchange rate regimes are associated with a lower per capita output growth rate. The previous result is driven by non industrial economies. For industrial economies the exchange rate regime is not related to growth performance. Similarly, fixed exchange rate regimes are associated with higher output volatility only in the case of non industrial countries; they have no significant impact on volatility within the group of developed economies.

Consequently the literature does not provide clear-cut support for the hypothesis that any particular regime enhances growth. Unconditionally, Ghosh, Gulde and Wolf (2002), Dubas, Lee and Mark (2005), and Reinhart and Rogoff (2004) found that intermediate regimes grow faster than other regimes. However, Bailliu, Lafrance and Perraut (2003) and Levy-Yeyati and Sturzenegger (2003), using their respective codings,

found that floating regimes registered the highest growth rates, while De Grauwe and Schnabl (2008) found that pegs grew faster than flexible regimes. A similar, mixed picture applies to the results of growth regressions. For example, Ghosh, Gulde, Ostry and Wolf (1997), De Grauwe and Schnabl (2008), and Rogoff *et al.* (2003) found that differences among regimes were mainly small. In contrast, Levy-Yeyati and Sturzenegger (2003) and Eichengreen and Leblang (2003) found that floating regimes had the highest growth rates, whereas Ghosh, Gulde and Wolf (2002) found that intermediate regimes were associated with higher growth; Bailliu, Lafrance and Perrault (2003), Dubas, Lee and Mark (2005) and De Grauwe and Schnabl (2008) found that hard pegged regimes had the highest growth rates.

Despite the wide disparity of results, several common threads among the regression studies can be discerned. First, in studying the connection between the exchange-rate system and growth, it appears that the level of country aggregation matters. Studies that disaggregated countries into subgroups of advanced and developing economies often found that, for the former group, the exchange rate system either made little difference or that floats registered higher growth rates than other regimes, whereas, for the latter group, pegs were associated with higher growth (Ghosh, Gulde and Wolf, 2002; Rogoff *et al.*, 2003; De Grauwe and Schnabl, 2008; Dubas, Lee and Mark, 2005). Levy-Yeyati and Sturzenegger (2003), however, found that, while growth rates were significantly higher under floats than pegs for all countries in their sample, the negative impact of pegs on growth was entirely accounted for by their group of non-industrial economies; for industrial economies, the exchange-rate regime was found to be largely irrelevant.

Second, the presence of a strong monetary policy framework, rather than the exchange-rate system per se, appears to be an important determinant of growth. Bailliu, Lafrance and Perrault (2003) provided direct evidence in support of this view. They regrouped regimes into three categories of (1) pegged, (2) more flexible (including both intermediate and flexible regimes) with a nominal anchor, and (3) more flexible without a nominal anchor. Their results indicated that the "more flexible with-an-anchor regime" and the pegged regime -which, as the authors noted, contains a built-in anchor (the peg)- were associated positively with growth, compared with the "more flexible without-a nominal- anchor regime". This view is also consistent with Rogoff *et al.*'s (2003) interpretation of their result regarding the statistical association between pegged regimes and growth; the authors inferred that developing economies, which sometimes lack sound institutions and a strong anti-inflation track record, may have gained credibility and enhanced policy discipline (thereby, lowering interest rates) by adopting pegged rates.

Third, the evidence indicates that country-specific factors matter. Analyzing an array of regressions, Ghosh, Gulde and Wolf (2002) concluded that their finding of higher growth for economies with intermediate and pegged regimes was attributable not so much to that regime per se, but to variables such as size, openness, and terms-of-trade growth, and the existence of simultaneity bias. Correspondingly, Edwards and Magendzo (2003) argued that the superior growth performance they detected in the group of common currency economies was driven mainly by the inclusion of very small and highly open economies within that group. This argument, in turn, is consistent with the above interpretation that a strong monetary framework, rather than any particular exchange-rate system, is related to growth; small, highly open economies are typically

the primary beneficiaries of the monetary anchor provided by pegged rates. Fourth, the sample period seems to matter. Most studies use sample periods beginning around 1970 (Tavlas, Dellas, and Stockman, 2008).

3.4. Exchange Rate Regimes and Banking and Currency Crises

The currency and banking crises of the past decade or so have generated considerable interest in the possible relationships between exchange rate regimes and crises. This literature has not found consistent results, however. Empirical studies such as Demaç and Peria (2003) and Husain *et al.* (2005) have found fixed rates to be more prone to banking crises than flexible rates, while Eichengreen and Rose (2000) did not find significant differences across regimes.

Perhaps the most frequently heard argument relating exchange rate regimes to banking crises concerns the potential for pegged exchange rates to lead the private sector to underestimate the risk of unhedged foreign currency borrowing. The resulting overborrowing due to moral hazard generated by perceptions of government guarantees against major exchange rate changes is frequently pointed to as one of the major causes of the Asian financial crises. Since much of the borrowing tends to be short term and unhedged, this creates a worsened liquidity situation both for the private sector and for the country as a whole (Chiu and Willett, 2009).

The relationship between the choice of exchange rate regimes and domestic lending booms, therefore, can be analyzed by applying the arguments from the overborrowing channel. The availability of "cheap" funds from abroad can lead to incentives for excessive domestic credit creation by the domestic banking sector, likely

leading to an increase in the proportion of loans that turn bad. Under pegged or other heavily managed exchange rate regimes large capital inflows are often associated with the balance of payment surpluses. With passive central bank policies the resulting increase in international reserves will increase the monetary base and lead to money and credit expansion. A positive effect of capital inflows on lending booms is not automatic, however, as domestic policies such as sterilization can be an important intervening variable to limit money and credit expansion and there is evidence of considerable sterilization by many emerging market countries (Sachs *et al.*, 1996 and Ouyang, Rajan and Willett, 2008).

In addition, there has been considerable interest in the interrelationships among twin (banking and currency) crises (e.g. Kaminsky and Reinhart, 1999 and Glick and Hutchison, 2001). In countries with a pegged exchange rate where banks borrow abroad in foreign denominated currency and lend in local currency, this currency mismatch can cause an expected depreciation of the domestic currency to lead to bank runs. There is a considerable reason to believe that soft pegs make currency crises more likely, especially for countries that face substantial international capital mobility. This is the unstable middle hypothesis.

Political considerations tend to induce governments to delay adjusting such pegs until after the market has begun to see them as having become substantially over or undervalued (Willett, 2007). In such situations while market participants will not know whether there will be an adjustment or the peg in the next period, they know in which direction the rate will go if there is a change. This creates the famous "one way speculative option" that creates incentives for both hedgers and speculators to move

money out of countries with overvalued pegs. There is considerable debate, however, about how far away from the dead center of adjustably pegged exchange rate regimes one has to go to substantially reduce the probability of currency crises. The two corners or bipolar hypothesis, which holds that one needs to go all the way to one or the other of the extremes of hard fixes or floating rates, is not strongly supported by the data, but the high crisis propensity of soft pegs is confirmed (Angkinand, Chiu and Willett, 2009).

Finally, another important channel for possible relationships between exchange rate regimes and financial crises involves issues of bailouts and the lender of last resort function. One argument is that bank runs will be more likely under hard fixes because there will be less (and perhaps even no) scope for national lender of last resort activities. The counter argument is that for this very reason, greater market discipline and improved bank risk management practices would be imposed on the banking sector. As a result, excessive risk taking incentives and financial instability would be lessened under hard fixes. In addition, there is the debate over the possible macroeconomic discipline effects of (hard) fixed exchange rates. Sounder macro policies should reduce the frequency of banking crises.

Angkinand and Willett (2010) conclude that the effects of exchange rate regimes operating through their influence on net foreign borrowing and the frequency of currency crises explain an important part of the total effects while effects through the credit boom channel are less important. They find that intermediate regimes are associated with a higher likelihood of banking crises. These results also suggest that it is not necessary to move all the way from the middle to the flexible corner to substantially reduce the probabilities of banking crises.

3.5. *The Case of Central America*

Analyzing performance in small countries traditionally represented a challenge for economists. Data are usually not available, and when they are, they are of poor quality and cover selected variables only. In our case the problem is that until recently, harmonized data for the region was not available. I believe that the only effort to put together the region's most important statistical historical series has been done by the Executive Secretariat of the Central American Monetary Council (SECMCA). In that sense, I rely on this source as the main statistical provider. In collecting the data I first turned to the SECMCA data files. If the SECMCA had no information, I turned to the IMF and then to the Central Banks. I focus on the 1970 - 2008 period.

Regarding the exchange rate regime classification, I used the IMF and RR data sets. In addition, I used my own classification based on the findings of the previous chapter. The IMF fourteen categories of exchange rate regimes are: (1) No separate legal tender, (2) Pre announced peg or currency board arrangement, (3) Pre announced horizontal band that is narrower than or equal to +/- 2 percent, (4) De facto peg, (5) Pre announced crawling peg, (6) Pre announced crawling band that is narrower than or equal to +/- 2 percent, (7) De facto crawling peg, (8) De facto crawling band that is narrower than or equal to +/- 2 percent, (9) Pre announced crawling band that is wide than or equal to +/- 2 percent, (10) De facto crawling band that is narrower than or equal to +/- 5 percent, (11) Moving band that is narrower than or equal to +/- 2 percent (i.e., allows for both appreciation and depreciation over time), (12) Managed floating, (13) Freely floating, and (14) Freely falling.

Following other studies, in this analysis I group these fourteen categories into six regimes: hard pegs (1-2), conventional peg (3-4), crawling peg / crawling band (5-11), managed floats (12), freely floats (13) and freely falling (14).

Table 19. Distribution of Exchange Rate Regimes: 1970 – 2008

Classification	Regime 1	Regime 2	Regime 3	Regime 4	Regime 5	Regime 6	Total
RR: Observations	8	61	123	16	4	22	234
Percentage	3.42	26.07	52.56	6.84	1.71	9.40	100.00
IMF: Observations	11	112	55	25	31	0	234
Percentage	4.70	47.86	23.50	10.68	13.25	0.00	100.00
Author: Observations	8	112	59	55	0	0	234
Percentage	3.42	47.86	25.21	23.50	0.00	0.00	100.00

The following is included in each regime:

Regime 1: Hard peg.

Regime 2: Conventional Peg.

Regime 3: Crawling Peg / Crawling Band.

Regime 4: Managed Floating.

Regime 5: Free Floating.

Regime 6: Free Falling.

Before moving to the statistical analysis, it is important to explain some of these differences. While some of the distinction made in these new IMF and RR classifications can be questioned, especially among different forms of managed floating, the IMF's classification is particularly good on distinguishing hard fixes from soft adjustable pegs, but only when the "fine" classification is used. As I mentioned before, and in order to make comparisons among the three classifications, I use their fine classification and grouped the regimes as hard pegs, conventional peg, crawling pegs, managed floats, free

floats and free falling regimes, respectively, since these are the regimes that are most relevant for the current discussion.

In addition, around 47.86 percent of the total regimes within the IMF's classification are under the regime 1 (conventional peg) while regime 3 (crawling peg / crawling band) is the most frequent one found by RR's classification with almost 53 percent. This could reflect the difficulty in distinguishing between the fixed or hard pegs and other soft pegs (conventional peg, crawling peg and crawling band). Indeed, according to the author's analysis the only regime under the hard peg category that has been used by the region during the period in question is the dollarization regime used recently by El Salvador. Also, the IMF's classification puts together under regime 5 (free floating) 25 observations that the RR's divide between regime 5 and 6 (free falling) which account for 4 and 22 observations, respectively. In this case, the problem is to assume that for some periods of time the exchange rate has been moving freely. As has been explained in the previous chapter, the degree of intervention for most of the countries has been very high, what make the author believe that at the best, when the countries have tried to implement a free floating exchange rate regime what really has been taking place is a managed floating. Moreover, regarding the RR's classification, the authors include under regime 6 most of the transitional periods. These periods are mostly outliers and many times are just short lived periods which do not necessarily reflect the regime that was implemented by the country for a reasonable time. As a result, some indicators could have some bias toward an extreme performance under this regime, in particular, inflation and the fiscal and current account deficits.

Finally, the author's classification takes into consideration these differences and tries to minimize it by using only four categories that reflect what has been taking place in the region. These categories include the conventional peg that was used by all countries during the 1970s and part of the 1980s; a crawling peg / crawling band category that include the episodes that Honduras, Nicaragua and Costa Rica have used after abandoning the peg; a managed floating regime which has been the one used by Guatemala and the Dominican Republic for half of the period and; the only fixed or hard peg used in the region which is the dollarization regime used by El Salvador during the last decade.

The following tables contain summary data on (a) GDP growth; (b) inflation; (c) fiscal deficit / GDP; and (d) current account deficit / GDP under each regime. For each variable I present information on the mean, the median, and the standard deviation.

Table 20. Performance Indicators in Central America: IMF Classification [1/]

Average

	Regime 1	Regime 2	Regime 3	Regime 4	Regime 5
GDP	2.90	3.10	3.63	4.80	5.07
Inflation	3.55	11.93	15.92	12.71	13.64
Current Account / GDP	-3.63	-6.80	-10.80	-1.68	-1.79
Fiscal Deficit / GDP	-1.74	-8.44	-4.38	-0.78	-1.76

Median

	Regime 1	Regime 2	Regime 3	Regime 4	Regime 5
GDP	2.55	4.34	3.85	5.26	4.36
Inflation	4.26	9.01	11.20	8.57	10.05
Current Account / GDP	-3.57	-5.04	-6.49	-1.98	-4.11
Fiscal Deficit / GDP	-1.96	-3.78	-4.14	-0.57	-1.22

Standard Deviation

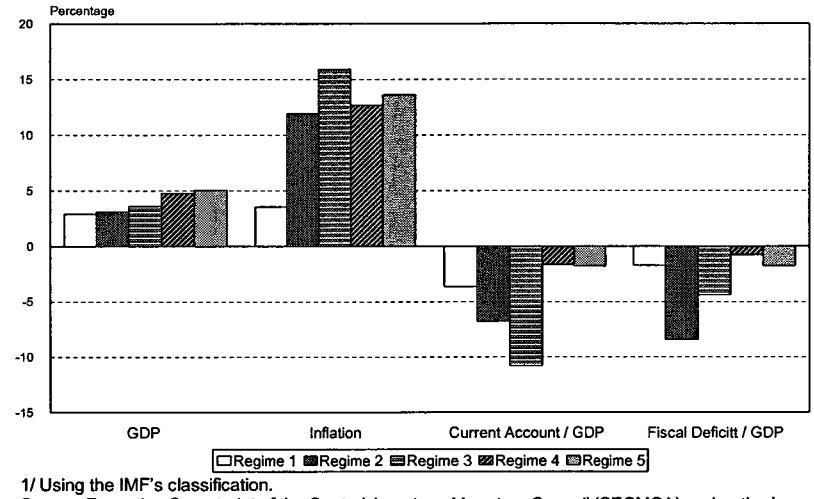
	Regime 1	Regime 2	Regime 3	Regime 4	Regime 5
GDP	1.00	5.47	2.88	2.85	4.15
Inflation	1.98	10.76	13.25	13.07	10.94
Current Account / GDP	2.03	11.78	9.56	6.15	7.11
Fiscal Deficit / GDP	1.14	29.38	1.85	1.09	2.46

Source: Executive Secretariat of the Central American Monetary Council (SECMCA) and author's calculations.

[1/] Regime 1: Hard peg.
Regime 2: Conventional Peg.
Regime 3: Crawling Peg / Crawling Band.
Regime 4: Managed Floating.
Regime 5: Free Floating.
Regime 6: Free Falling.

Figure 21. Performance Indicators in Central America [1/]

Average: 1970 - 2008



1/ Using the IMF's classification.
Source: Executive Secretariat of the Central American Monetary Council (SECMCA) and author's calculations.

Table 21. Performance Indicators in Central America: RR Classification [1/]

Average

	Regime 1	Regime 2	Regime 3	Regime 4	Regime 5	Regime 6
GDP	2.82	4.26	4.39	4.16	-4.33	-0.72
Inflation	3.95	8.88	11.43	15.36	N.A	40.07
Current Account / GDP	-4.25	-6.86	-6.70	0.14	-11.51	-7.89
Fiscal Deficit / GDP	-1.60	-3.89	-3.24	-1.02	-10.25	-23.78

Median

	Regime 1	Regime 2	Regime 3	Regime 4	Regime 5	Regime 6
GDP	2.44	4.35	4.53	3.03	1.90	-0.32
Inflation	4.56	7.81	10.05	11.10	N.A	32.72
Current Account / GDP	-4.13	-4.58	-4.88	-0.19	-18.23	-7.77
Fiscal Deficit / GDP	-1.08	-3.29	-3.18	-1.29	-8.99	-2.85

Standard Deviation

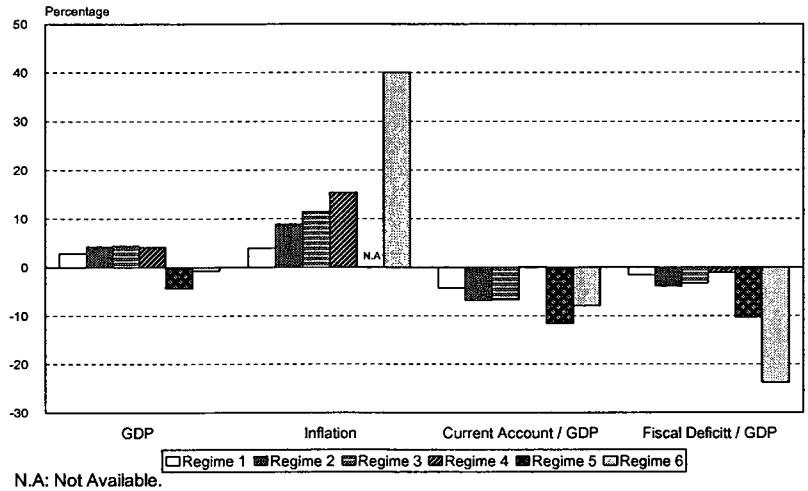
	Regime 1	Regime 2	Regime 3	Regime 4	Regime 5	Regime 6
GDP	1.09	4.45	3.43	3.64	15.02	4.03
Inflation	1.51	5.71	6.43	10.73	N.A	24.29
Current Account / GDP	1.96	10.00	7.85	6.37	16.95	21.01
Fiscal Deficit / GDP	1.32	2.61	2.75	1.69	2.29	61.30

N.A.= Not Available.
Source: Executive Secretariat of the Central American Monetary Council (SECMCA) and author's calculations.

[1/] Regime 1: Hard peg.
Regime 2: Conventional Peg.
Regime 3: Crawling Peg / Crawling Band.
Regime 4: Managed Floating.
Regime 5: Free Floating.
Regime 6: Free Falling.

Figure 22. Performance Indicators in Central America [1/]

Average: 1970 - 2008



N.A: Not Available.
1/ Using the RR's coarse classification.
Source: Executive Secretariat of the Central American Monetary Council (SECMCA) and author's calculations.

Table 22. Performance Indicators in Central America: Author Classification [1/]

Average

	Regime 1	Regime 2	Regime 3	Regime 4
GDP	2.82	3.35	3.93	4.10
Inflation	3.95	9.69	15.66	15.91
Current Account / GDP	-4.25	-7.37	-10.63	-0.14
Fiscal Deficit / GDP	-1.60	-8.45	-4.65	-0.84

Median

	Regime 1	Regime 2	Regime 3	Regime 4
GDP	2..44	4.30	3.97	3.93
Inflation	4.56	8.36	11.20	9.40
Current Account / GDP	-4.13	-4.74	-7.06	-3.23
Fiscal Deficit / GDP	-1.08	-3.56	-4.36	-0.57

Standard Deviation

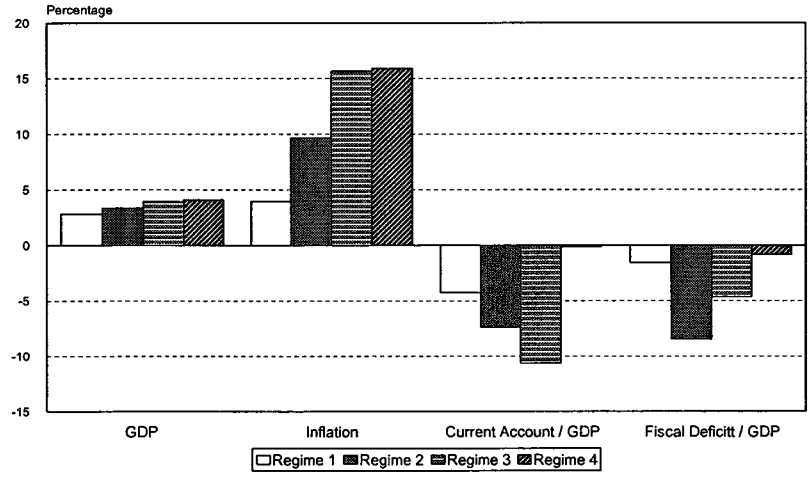
	Regime 1	Regime 2	Regime 3	Regime 4
GDP	1.09	5.68	2.85	3.13
Inflation	1.51	5.92	12.92	15.45
Current Account / GDP	1.96	10.62	9.32	8.87
Fiscal Deficit / GDP	1.32	29.38	1.80	1.32

N.A.= Not Available.
Source: Executive Secretariat of the Central American Monetary Council (SECMCA) and author's calculations.

[1/] Regime 1: Hard peg.
Regime 2: Conventional Peg.
Regime 3: Crawling Peg / Crawling Band.
Regime 4: Managed Floating.
Regime 5: Free Floating.
Regime 6: Free Falling.

Figure 23. Performance Indicators in Central America [1/]

Average: 1970 - 2008



1/ Using the Author's classification.
Source: Executive Secretariat of the Central American Monetary Council (SECMCA) and author's calculations.

Simple inspection of the data suggests that, when compared with other regimes, Central American countries with hard peg exchange rate regimes have had: (a) lower GDP growth when the IMF's and the author's classifications are used, but higher growth when compared to the free floating and free falling categories used by the RR's classification; (b) lower inflation; (c) relatively lower fiscal deficits when compared to soft pegs, but similar deficits when compared to managed floating regimes; and (d) lower current account deficits when compared to soft pegs, but higher current account deficits when compared to managed floating.

In order to test formally whether these four variables have behaved differently across countries, I conducted a series of tests for the equality of means and medians. I also computed a non parametric Kruskal-Wallis test on the equality of distributions. The Kruskal-Wallis χ^2 test is computed as:

$$K = \{[12/n(n+1)]\Sigma(R_j^2/n_j)\} - 3(n+1) \qquad (1)$$

where n_j is the sample size for the j group (j=1,...m), n is the sum of the n_js, R_j is the sum of the ranks j group, and the sum $\sum$ runs from j=1 to j=m.

The results obtained from these tests are reported in Appendix B. They show formally that: (1) GDP growth has been significantly lower under hard pegs exchange rate regime countries than in the other ones. The only exception is when the RR's classification is used. Under this classification, the free floating and free falling categories perform even lower than the hard peg regime. (2) Inflation has been statistically lower under hard pegs. (3) Current account deficits under hard peg are relatively low and similar to that of the conventional peg regime. Current account balances across countries are higher under crawling peg / crawling band and the lowest deficits are reported under managed floating. (4) There are no statistical differences in the behavior of fiscal deficits under the hard peg regime. These deficits are low and similar when compared with managed floating. Conventional and crawling peg / crawling band regimes show the highest fiscal deficits among countries.

An interesting question is whether hard pegged countries perform differently than other regimes, after controlling for the fundamental determinants of growth. Results obtained from a panel regression using a small number of data points for the Central American economies, confirmed the results from the other statistical tests. The control variables behave largely as expected: GDP growth is positively correlated with investment and negatively correlated with government consumption and population growth. The link is also positive in the case of openness. Finally, the sign for the initial GDP is positive, indicating the presence of divergence rather than convergence. These results suggest that, on average, the rate of growth of GDP is lower for hard pegs than

other regimes within the Central American nations. (see Appendix A). In these regressions the dummies' coefficients of the other exchange rate regimes are positive in most cases. When the RR classification is used a lower GDP is associated with floating and freely falling regimes.

Previous studies have pointed out some difficulties when working with independent floats as this category is sometimes associated with high average levels of money growth and inflation. (Bubula and Ötker Robe, 2002). Countries with high inflation usually of necessity adopt some form of floating rates. RR deal with this issue by putting such countries into a separate category of free falling rates. Of course when this is done the remaining category of non-free falling floating rates is associated with much better macroeconomic performance.[8] There is no ideal way to deal with this reverse causation issue. Here I deal with the issue by emphasizing the comparison of hard pegs with soft pegs and managed floats .This allows us to retain all of the observations while allowing us to put more focus on the regimes used by Central America between 1970 - 2008 and to put less focus on most of the very high inflation observations.[9]

Furthermore, high inflation countries have little choice but to adopt some form of flexible regime unless they are attempting exchange rate-based stabilization policies. The theoretical treatment used in this section focused on the effects of alternative exchange rate regimes for countries with low or moderate inflation rates. Thus I have limited the empirical analysis to such cases. Of course there is no precise way to draw the dividing line between low, moderate, and high rates of inflation, so I conduct the same econometric and statistical tests including and excluding the free falling regime used by

[8] See Hussain *et al.* (2005) and Rogoff *et al.* (2003).
[9] Most managed floats are less likely to subject to this particular type of endogeneity than are floating rates (Willett *et al.*, 2009).

RR. As most of these episodes are concentrated mostly in one country (Nicaragua) and only for a brief period of time, in the case of Central America, the main conclusions remained the same in all cases.

The results reported in these statistical and econometric exercises, then, can be summarized as follows: (1) There is evidence that countries with hard peg exchange rate regimes in Central America have grown at a statistically significantly lower rate than other regimes. Unfortunately, when the RR's classification is used the relation is far from clear. The difference, as noted previously, is due to the "free falling" category used by RR because the IMF classify most of these cases as "free floating". With respect to the author's classification, most of these "floaters" did not actually float and so were classify under different soft pegs regimes. As a consequence, using the RR classification leads to an overstatement of most of the performance indicators, in particular, inflation and fiscal and current account deficits under floating and free falling regimes. (2) It is clear that, a significantly lower rate of inflation has been observed under the hard peg regime. (3) In terms of current account balances, hard pegs regimes' behavior has been no different than that of conventional or crawling peg / crawling band regimes. The lowest fiscal deficits are reported under the managed floating regime. And (4), There is no evidence that countries with hard pegs regimes have run more prudent fiscal policies compared with the others. In fact, the formal tests show that, statistically speaking, it is not possible to make a distinction especially when compared with managed floating. In the other hand, their performances have been relatively better than the ones reported of the conventional and crawling peg / crawling band regimes. Given the small number of observations for

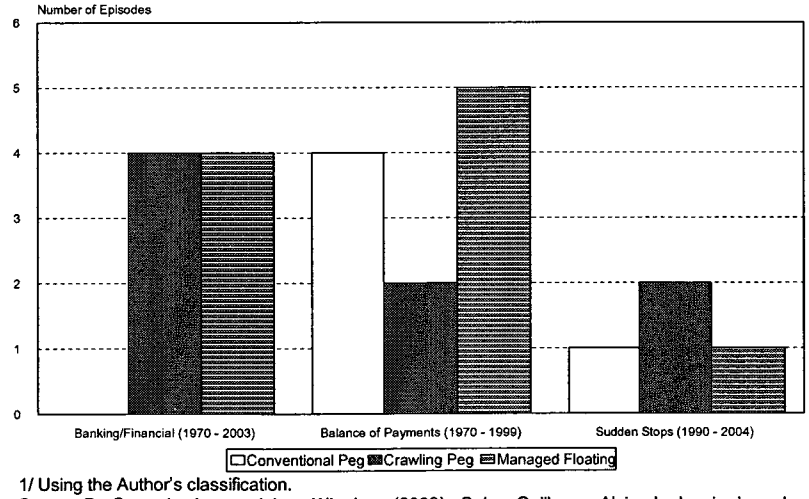
the region, and the low quality of the data, these results are subject to stronger caveats and should be interpreted with care.

3.5.1. Exchange Rate Regimes and Crises in Central America

From the currency and the financial crises perspective it is possible to divide the data available in Central America into three categories and explore the relation with the corresponding exchange rate regimes that were in place when the crises hit.

According to the data available, there have been approximately 8 episodes of financial and banking distress, 11 episodes of balance of payment crises and 4 episodes of sudden stops. Using the author's classification, the majority of these episodes took place under the exchange rate regimes of conventional peg, crawling peg / crawling band and managed floating.

Figure 24. Central America: Exchange Rate Regimes and Crises [1/]
1970 - 2008



1/ Using the Author's classification.
Source: De Gregorio, Jose and Jong-Wha Lee. (2003); Calvo, Guillermo, Alejandro Izquierdo and Luis Fernando Mejia. (2008); Finance and Development, September 2004; Caprio, Gerard and Daniela Klingebiel. (2003) and author's calculations.

Table 23. Frequency of Crises during Specific Regimes Using the Author Regime Classification

Type of Crisis	Conventional Peg	Crawling Peg / Band	Managed Floating
Banking/Financial (1970 – 2003)	-	8.51	9.52
Balance of Payments (1970 – 1999)	3.60	5.71	14.70
Sudden Stops (1990 – 2004)	10.00	4.16	3.57

Note: Frequencies are calculated by dividing the number of occurrences of a crisis under a particular regime by the total number of regime years. Each crisis is counted only once and hence, if it persists over multiple years, the subsequent years are not taken into account for this calculation.

Consider, first, the frequency of banking and financial crises. Managed regimes had a higher likelihood of banking crises. For the six countries, for the period from 1970-2003, the probability of a banking crisis in a given year varied between about 8.51 and 9.52 percent depending on the type of regime. Similar to the banking crises, balance of payments crises over the years 1970 to 1999 tended to occur more frequently under managed regimes with a probability of approximately 14.71 percent. Finally, the incidence of sudden stops in Central America during 1990 - 2004 is highest under pegged regimes and falls as flexibility in regime increases, that is, it varies from 10 to 3.57 percent from conventional peg to managed floating, respectively.

Exchange rates may be related to financial instability when pegs generate a moral hazard problem given the lack of incentives for private agents indebted in dollars to hedge their foreign exposure when the government has a commitment to maintain the exchange rate (Eichengreen and Hausmann 1999). Moreover, the association between rigidity and probability of banking crises in emerging markets and developing countries became stronger in the 1990s (Roggoff *et al.*, 2003). Currency crises over the years 1970 to 2008 in Central America tended to occur more frequently in intermediate regimes.

In order to analyze Central America in perspective to Latin America, we can compare these results to others from previous studies. For example, Roggoff *et al.*

(2003), examined the links between crises and exchange rate regimes. (See Appendix B). For emerging and developing countries (the Central American countries are included in both categories), for the period from 1980-1997 the probability of a banking crisis in a given year varied between about 11.4 and 0 percent with a clear variation across exchange rate regimes. According to these authors, in emerging countries, the probability of a banking crisis is 11.4, 7.5, 7.0 and 0.0 under peg, limited flexibility, managed floating and free floating regimes, respectively. In turn, the probabilities for developing countries are 2.8, 7.0 and 3.6 under peg, limited flexibility and managed floating regimes, respectively. The highest probabilities of a banking crisis occurred in the emerging market economies, where the evidence also suggests that the probability of a crisis increased with the rigidity of the exchange rate regime. Therefore, the probabilities calculated by the author, for the period of analysis, seem to be in line with the ones of these other studies with the highest probability of a banking crisis under a managed floating regime.

Another study that analyzes the link between the exchange rate regimes and balance of payments crises, in particular for Latin America is by Gregorio and Lee (2003). They defined a balance of payments crisis as an event when an index of exchange market pressure exceeds a certain threshold. They point out that severe speculative pressure does not always lead to large depreciations when the authorities successfully defend the currency by intervening in the foreign exchange market.

Their indicator of currency crises combines two approaches. First, they identify a country as having a balance of payments crisis if it experienced a nominal currency depreciation of at least 25 percent in any quarter of a specific year and the depreciation

rate exceeded that in the previous quarter by a margin of at least 10 percent. Second, they count those episodes in which the indicator of currency pressure for any month of that year exceeded three standard deviations above the mean of the indicator, provided that either the monthly nominal depreciation rate or percentage change of reserve loss exceeds 10 percent. Finally, they apply the window of three years to isolate independent crises. That is, a balance-of payments crisis occurring in that year or three years following the initial crisis is counted as a continuation of the same crisis rather than a new episode of crisis. A list of countries and events, including those from Central America, can be found in Appendix C.

A detailed analysis of the crises in Central America is beyond the scope of this dissertation. Nevertheless, several lines of further research seem especially important. For example, one is to investigate alternative measures for credit booms to test the link between exchange rate regimes and credit growth. A second area is to investigate whether some types of capital inflows increase the probability of financial crises more than others as may be suggested by recent findings that some types of capital flows are more susceptible to sudden stops and reversal than others. It is also important to investigate how much strong international reserve positions can reduce the probabilities of financial as well as currency crises. A final line of research is to investigate the roles of various political and institutional variables. For example, Angkinand and Willett (2010) find that while proxies of political weakness increase the probabilities of currency crises under any type of exchange rate regime, these effects are especially strong for soft pegs. This suggests both a direct linkage with financial crises through the currency crisis channel and also the possibility of such interaction effects with other institutional variables such

as capital controls, various types of domestic financial liberalization, and the quality of financial regulation and supervision.

3.6. Concluding Remarks

The purpose of this section has been to analyze the exchange rate regimes and the economic record in Central America. In doing this, I have made an effort to give an unbiased treatment of all exchange rate regimes and countries during the period of 1970 – 2008.

In a nutshell, the analysis reported in this section suggests that, when compared to other countries, the hard pegged countries have: (a) grown at a significantly lower rate; (b) have had a similar fiscal record when compared with managed floats; (c) In terms of current account balances, hard pegs regimes' behavior has been no different than that of conventional or crawling peg / crawling band regimes; (d) have had significantly lower inflation and; (e) during the period of analysis, banking and balance of payments crises tended to occur more frequently under managed regimes, but the incidence of sudden stops in Central America is highest under conventional peg regimes.

It is important to clearly distinguish among exchange rate regimes when we are testing for economic performance, in particular, among hard pegs, soft pegs and managed floats. In the case of Central America this is critical, as most of the available studies have drawn conclusions based on classifications that might be not reflecting the actual regimes that have taken place within the region. Thus, proposals for most countries to adopt a particular exchange rate regime in order to achieve better economic performance must be considered carefully.

Choosing the best exchange rate regime is a complex issue. It depends on many things about which governments bill be uncertain and where signals may be conflicting. But perhaps the most important issue to remember is that no exchange rate regime is a substitute for well designed macroeconomic policy (Bird, 2002).There are advantages and disadvantages associated with any choice, although these may be perceived in different ways by different countries or by the same country at different times.

This dissertation is only a first step in analyzing exchange rate regimes in Central America and their relationship with other variables. Future lines of research could be built upon this, and therefore, contribute to this important topic now that a broader overview of the region has been analyzed.

4. CONCLUSIONS

Exchange rate classification is neither a simple nor a trivial task. Cataloging behavior that runs across a broad spectrum into discrete categories requires some sort of rule and will invariably occasionally divide countries that behave somewhat similarly into different bins. Different techniques provide different insight into the exchange rate regime behavior of countries, and their disagreements should not simply be viewed as one being right or wrong.

For the case of Central America, I compare the author's classifications with the ones by RR and the IMF. An advantage of the author's methodology, as opposed to the other ones, is that is based on a more precise application of the concept of exchange market pressure[10]. In general, it is concluded that the RR and IMF classifications are misleading in many of the years of analysis, and therefore, the author's results gives a more accurate classification of the exchange rate regimes within the region.

Around 47.86 percent of the total regimes within the IMF's classification are under the regime 1 (conventional peg) while regime 3 (crawling peg / crawling band) is the most frequent one found by RR's classification with almost 53 percent. This could reflect the difficulty in distinguishing between the fixed or hard pegs and other soft pegs (conventional peg, crawling peg and crawling band). Indeed, according to the author's analysis the only regime under the hard peg category that has been used by the region during the period in question is the dollarization regime used recently by El Salvador. Also, the IMF's classification puts together under regime 5 (free floating) 25 observations that the RR's divide between regime 5 and 6 (free falling) which account for

[10] See Table 2 in Appendix A for the author's classification by country.

4 and 22 observations, respectively. In this case, the problem is to assume that for some periods of time the exchange rate has been moving freely. The degree of intervention for most of the countries has been very high, what make the author believe that at the best, when the countries have tried to implement a free floating exchange rate regime what really has been taking place is a managed floating.

Moreover, regarding the RR's classification, the authors include under regime 6 most of the transitional periods. These periods are mostly outliers and many times are just short lived periods which do not necessarily reflect the regime that was implemented by the country for a reasonable time. As a result, some indicators could have some bias toward an extreme performance under this regime, in particular, inflation and the fiscal and current account deficits.

The author's classification takes into consideration these differences and tries to minimize it by using only four categories that reflect what has been taking place in the region. These categories include the conventional peg that was used by all countries during the 1970s and part of the 1980s; a crawling peg / crawling band category that include the episodes that Honduras, Nicaragua and Costa Rica have used after abandoning the peg; a managed floating regime which has been the one used by Guatemala and the Dominican Republic for half of the period and; the only fixed or hard peg used in the region which is the dollarization regime used by El Salvador during the last decade.

At the same time, any tests that compare outcomes across regimes will inherently depend on categorizing the observations properly. (Klein and Shambaugh, 2010). In the case of Central America this is critical, as most of the available studies have drawn conclusions based on classifications that might be not reflecting the actual regimes that have taken place within the region. Therefore, the purpose of the second chapter was to analyze the exchange rate regimes and the economic performance in Central America using the three classifications.

In a nutshell, the analysis reported in this chapter suggests that, when compared to other countries, the hard pegged countries have: (a) grown at a significantly lower rate; (b) have had a similar fiscal record when compared with managed floats; (c) In terms of current account balances, hard pegs regimes' behavior has been no different than that of conventional or crawling peg / crawling band regimes; (d) have had significantly lower inflation and; (e) during the period of analysis, banking and balance of payments crises tended to occur more frequently under managed regimes, but the incidence of sudden stops in Central America is highest under conventional peg regimes.

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APPENDIX A

Table 1. Summary of Exchange Rate Regime Classifications Methodologies

Study	Methodology	Classification	Comment
Old IMF Classification (June 1982 – Before Revised)	Based on the publicly stated commitment of the central bank.	Peg: single currency, composite currency. Flexibility limited: vis-à-vis single currency, cooperative arrangements. More Flexible: adjusted to indicator, managed float, independent float.	Does not distinguish between hard peg and standard peg that is relevant for "hollowing out" research. Actual regimes are sometimes different from official regimes.
Revised IMF Classification (1999)	Based on IMF staff judgment of the regimes. Also classify exchange rate regimes against alternative monetary policy frameworks.	Exchange rate arrangement with no legal tender. Currency Board. Other conventional Fixed (ER fluctuates within a narrow margin at most +/- 1% around a central rate). Horizontal bands (margins are wider than +/- 1%) Crawling pegs Crawling bands Managed Float (the monetary authority influences the movement of ER through active intervention without specifying pre announced path of exchange rate. Independent Float (the ER is market determined, with any intervention aimed at moderating the rate of change rather than establishing level). Exchange rate as nominal anchor. Monetary aggregate anchor. Inflation target framework. Other the country has no explicitly stated nominal anchor but rather anchor but rather monitors various indicators in implementing monetary policy.	Besides classifying regimes more accurately, it offers more analytical categories, which vary by questions. For example, while it is useful, especially for "verifiability" research, to distinguish peg to single currency from peg to baskets, it is useful to distinguish hard pegs from other pegs in order to test the "hollowing out hypothesis". It is also important to distinguish whether or not regimes can be used as a nominal anchor for currency crises / inflation research.
Calvo and Reinhart (2002)	Behavioral Classification	Float: ones having a high probability that the monthly percent change in reserves falls within a +/- or 2.25 percent band. Fix: ones having a low probability that the monthly percent change in exchange rate falls within a +/- or 2.25 percent band.	Considering the volatility of nominal exchange rates or that of foreign reserves alone could be misleading.
Bofinger and Wollmershauser (2001)	Index of floating is calculated as the ratio of the sum of effective changes in foreign reserves to the sum of absolute changes in foreign reserves	A value closer to zero indicates as independent float regimes (intervention were carried out in order to smooth short run fluctuation around	Same as Calvo and Reinhart.

Study	Methodology	Classification	Comment
	using 2 methods of normalization: normalized changes in reserves as a ratio of external sizes (measured by a 12 month moving average of the arithmetic mean of import and export), and normalized changes in reserves as a percentage of the level of reserves at the beginning of underlying period.	determined trend). A value closer to one or minus one indicates as managed float regimes (a central bank tried to influence the trend of exchange rate). Independent float: prob (-0.33 < Index float < 0.33) > = 0.5 Managed float: prob (-0.33 < Index float < 0.33) < 0.5	
Hausmann *et al.* (2001)	Characterize the difference in exchange rate management on 3 variables using factor analysis. Stock of reserves relative to M2. The standard deviation of exchange rate depreciation relative to the standard deviation of stock of reserves, normalized by the average of dollar M2. The ratio of exchange rate volatility to interest rate volatility.	Provide a continuous index of exchange rate flexibility.	Does not exclude non leaning against the wind observation. Does not consider time trend. The relative volatility measure using standard deviation / variance can misclassify adjustable peg regimes.
Hernandez and Montiel (2003)	The degree of fixity can be inferred from: Exchange rate volatility measured by standard deviation / range of monthly percentage exchange rate changes Foreign reserve volatility measured by mean absolute / standard deviation monthly percentage change in reserves. Interest Rate volatility measured by mean absolute / standard deviation monthly changes in nominal interest rates. Severity of shock: Volatility ratios of exchange rate changes relative to interest rate changes. Volatility ratios of exchange rate changes relative to reserve changes.	Countries that have relatively more volatile exchange rates, and volatile reserves and interest rates can be judged as more flexible than others. Given countries such as US as a benchmark of 'pure floaters', the degree to which other countries deviate from such regimes can be evaluated by comparing the volatility of these variables relative to those of benchmark.	Same as Haussmann et al.
Holden *et al.* (1979)	Measure the index of flexibility by the ratio of the sum of absolute value of monthly percentage changes in the trade-weighted exchange rate to the sum of the absolute changes in reserves divides by the sum of imports and exports.	The index has a range of 0 and infinity. The higher the value of the index, the higher is the degree of exchange rate flexibility	

Study	Methodology	Classification	Comments
Porison (2000)	The degree of exchange rate flexibility is the ratio of the average absolute value of the monthly nominal exchange rate depreciation to the average absolute value of the monthly change in reserves normalized by the monetary base in the previous month.		Same as Holden et al.
Al-Marhubi (1994)	Uses the ratio of exchange rate volatility to pressures as measures of exchange rate flexibility. They used the variance of exchange rate as exchange rate volatility and used the sum of the variance of exchange rate and the variance of reserves as measures of speculative pressure.	Provide a continuous index, ranging from 0 to 1. The higher the value, the higher is the degree of exchange rate flexibility.	
Glick *et al.* (1995)	The degree of exchange rate flexibility is the variance of unanticipated changes in the nominal exchange rate over the sum of the variance of unperceived changes in reserves, measured as a fraction of monetary base, and the variance of unanticipated changes in exchange rates.	The exchange rate is perfectly flexible as the degree equals one. The exchange rate is perfectly as the degree equals zero. The value between 0 and 1 denotes the intermediate degree of exchange rate flexibility.	
Bayoumi and Eichengreen (1998)	A measure of intervention equals one minus the ratio of standard deviation of exchange rate changes to the standard deviation of speculative pressure. The speculative pressure between countries i and j, equal changes in exchange rate plus country i's change in reserves normalized by the lag of narrow money minus country j's change in reserves normalized by the lag of narrow money.	Heavy intervention defined as intervention index over 0.85. Medium levels intervention defined as an intervention indexes between 0.70 and 0.85.	
Popper and Lowell (1994)	The degree of intervention equals the ratio of normalized intervention to currency appreciation. The normalized intervention is defined as the net foreign assets as a fraction of lag of monetary base. Appreciation is measured as the annualized rate of change in the exchange rate over its level at the end of period.	Positive values of the ratio represent leaning against the wind. Negative values imply the intervention and exchange rate were push in the same direction. Values close to zero indicate small reserve movements and / or large exchange rate changes.	
Weymark (1997)	The degree of intervention is the proportion of exchange market pressure absorbed by intervention. It equals the ratio of changes in reserves to the sum of change in exchange rate, divided by the elasticity of excess demands in foreign exchange market and change in reserves.	Weymark's index has a range from $-\infty$ to $+\infty$. When the sign of changes in exchange rate and reserves is correct (Exchange rates depreciate and reserves decline), Waymark's index has a range from 0 to 1, with values closer to 1 indicating higher degree of fixity.	

Study	Methodology	Classification	Comments
	The elasticity can be derived using the structural model of small open economy model with rational expectation. She estimates the bilateral intervention statistics for Canada over the period 1975-1990 using 2SLS for estimates of the elasticity.	When the exchange rate changes are the same sign but have a greater absolute magnitude than the changes that would have occurred in the case of no intervention, Waymark's index is negative. When the exchange rate appreciates (depreciates) with excess supply (demand) of domestic currency, Waymark's index is greater than one.	
LYS (2005)	Based on the behavioral of exchange rate volatility (σ_e), the volatility of its rate of change ($\sigma_{\Delta e}$), and the volatility of reserves (σ_r). σ_e = average of the absolute monthly percentage changes in nominal exchanger rate. $\sigma_{\Delta e}$ = standard deviation of the monthly percentage changes in nominal exchange rate. σ_r = average of absolute monthly change in reserves relative to monthly base in the previous month.	Inconclusive: countries with low σ_e , low $\sigma_{\Delta e}$, σ_r . Flexible: countries with high σ_e , high $\sigma_{\Delta e}$, low σ_r . Dirty Float: countries with high σ_e , high $\sigma_{\Delta e}$, high σ_r . Crawling Peg: countries with high σ_e , low $\sigma_{\Delta e}$, high σ_r . Fixed: countries with low σ_e , low $\sigma_{\Delta e}$, high σ_r .	In a year that the regimes / parities were changed, $\sigma_{\Delta e}$ and σ_e are high, leading to misinterpretations of regimes. In addition, it does not exclude the instability period, the initial period where the regime changes. In case of trend in ER, σ_e depends on whether or not variables are detrended.
Grier and Grier (2001)	Classify countries in samples as either peggers or floaters according to the exchange rate movements in the first two months of 1997.	Pegged: countries with a predetermined pattern in exchange rate movement. Float: countries with a non predetermined pattern in exchange rate movement.	Provide only 2 way classification: Lump together some crawling peg and narrow peg regimes. Lump together some crawling band and float regimes. This short period of consideration may not eliminate the effects of short run fluctuation in exchange rate that do not actually reflect the long run exchange rate policy.
Fischer (2001)	Revised IMF classification	Hard peg: currency boards or those with no separate currency. Intermediate: conventional fixed pegs, crawling pegs, horizontal bands, and crawling bands. Float: either managed float with no specified central rate or independent float.	Lightly managed float should be distinguished from heavily managed float for "hollowing out" research.
Collins (1996) and Edwards (1996)	Old IMF classification	Pegged: a single currency peg or basket of currencies. More flexible: other than pegged.	Offering only 2-way classification. Middle regimes and float are in the same categories.

Study	Methodology	Classification	Comments
Frieden *et al.* (2001)	Based on old IMF classification. They classify 26 countries during 1960-1994. In a given year where regimes were changed, a country's regime is the one that occurred in the largest portion of that year.	Fixed: to single currency, basket, or frequent adjustment. Forward-looking crawling pegs and bands. Backward-looking crawling pegs and bands. Flexible: managed or independent float.	Distinguishes whether or not regimes can be used as a nominal anchor.
Williamson (1996)	Based on his judgement. He classify 47 countries during 1992-1995 periods.	ERM band Crawling peg Adjustable Peg Fixed Float Managed Float Unclassified (nature of regime is not known or regime changed during the period of obs. Or does not fit other categories.	
Glick and Hutchison (2000)	Assigns a discrete value on a scale of 0 to 1 according to a country's exchange rate classification in a given year. The classification data is from the IMF's Annual Report on Exchange Rate Arrangement and Restrictions.	Independent= 0 Managed float = 0.1 Wide –band CP = 0.2 Narrow-band CP or adjusted by indicator= 0.3 Peg with frequent changes = 0.4 Cooperative Float= 0.5 Basket Peg= 0.6 De facto peg = 0.7 SDR peg = 0.8 Single currency peg = 0.9	
Demaç (2000)	Use both official and behavioral classification as alternatives.	Official classification: 2 category dummy fixed and others 3 category dummy: fixed, intermediate, float. Behavioral Classification: Define a dummy that takes the value of one when a country's exchange rate changes by less than 5%. Use a data set on frequent and infrequent adjusted peg put together by Ghosh et al (1997)	It is not very helpful for hollowing hypothesis testing. It is not very helpful for hollowing hypothesis testing.

Study	Methodology	Classification	Comment
Ghosh *et al.* (1997)	Based primarily on the official classification as in IMF's annual report. Secondary classification is based on behavioral classification. The frequent adjusted peg is defined as all regimes with more than one change per year in either parity or for basket pegs in the weights.	Primary Classification Pegs: Single currency pegs, SDR pegs, other official basket pegs, and secret basket pegs. Intermediate: cooperative systems, unclassified floats, and floats within a pre-determined range. Float: floats without a predetermined range and pure float. Secondary Classification: Frequent adjusted peg. Infrequent adjusted peg.	
De Gregorio and Valdes (1999)	Based on the official classification as in IMF report Exchange Arrangements and Exchange Rate Restriction.	Use 0, 1, 2 as index of exchange rate flexibility. Fixed regimes (peg to single currency, peg to SDR, and cooperative Arrangements) =0. Flexible Regimes (peg to basket and Managed float and other flexible arrangements)=1. Float regimes (Free floating) = 2.	
Caramazza *et al.* (2000)	Use 3 indices of exchange rate flexibility based on the official classification, the variability of nominal exchange rate and the number of times there are substantial changes in the exchange rate (Dummies equal one under a flexible regime, and 0 otherwise).	Official classification: The index equals one if a flexible exchange rate regime in IMF's Annual Report and 0 if otherwise. The variability of nominal exchange rate; The index equals one if the standard deviation of monthly change of the exchange rate with respect to dollar was greater than 0.5 and 0 if otherwise. The number of times there are substantial changes in Exchange Rate: The index equals one if at least one monthly change of the exchange rate greater than 1 percent, and 0 if otherwise.	
Reinhart and Rogoff (2004) and an updated version in Ilzetki, Reinhart and Rogoff (2009)	Classify exchange rate arrangements into 14 categories based on historical chronologies and descriptive statistics.	No separate legal tender. Pre-announced peg or currency board arrangement. Pre-announced horizontal band that is narrower than or Equal to +/- 2%, de facto peg.	The comprehensiveness of the classification is very useful. Pre-announced peg/crawling, peg crawling band is distinguished from

Study	Methodology	Classification	Comment
		Pre-announced crawling peg, pre-announced crawling band that is narrower than or equal to +/- 2%. De facto crawling peg. De facto crawling band that is narrower than or equal to +/- 2%, pre-announced crawling band that is wider than or equal to +/- 2%. De facto crawling band that is narrower than or equal to +/- 5%. Moving band that is narrower than or equal to +/- 2% (i.e., allows for both appreciation and depreciation over time). Managed floating. Freely floating. Freely falling.	De facto one since the announcement can act as a channel that could generate speculative attacks.

TABLE 2. EXCHANGE RATE REGIME CLASSIFICATIONS : CENTRAL AMERICA 1970 - 2008

YEAR	GUATEMALA			EL SALVADOR			HONDURAS			NICARAGUA			COSTA RICA			DOMINICAN REPUBLIC		
	IMF REGIME	RR REGIME	AUTHOR REGIME	IMF REGIME	RR REGIME	AUTHOR REGIME	IMF REGIME	RR REGIME	AUTHOR REGIME	IMF REGIME	RR REGIME	AUTHOR REGIME	IMF REGIME	RR REGIME	AUTHOR REGIME	IMF REGIME	RR REGIME	AUTHOR REGIME
1970	2	2	2	2	3	2	2	2	2	2	2	2	2	2	2	2	3	2
1971	2	2	2	2	3	2	2	2	2	2	2	2	2	2	2	2	3	2
1972	2	2	2	2	3	2	2	2	2	2	2	2	2	3	2	2	3	2
1973	2	2	2	2	3	2	2	2	2	2	2	2	2	3	2	2	3	2
1974	2	2	2	2	3	2	2	2	2	2	2	2	2	2	2	2	3	2
1975	2	2	2	2	3	2	2	2	2	2	2	2	2	2	2	2	3	2
1976	2	2	2	2	3	2	2	2	2	2	2	2	2	2	2	2	3	2
1977	2	2	2	2	3	2	2	2	2	2	2	2	2	2	2	2	3	2
1978	2	2	2	2	3	2	2	2	2	2	2	2	2	2	2	2	3	2
1979	2	2	2	2	3	2	2	2	2	2	5	2	2	2	2	2	3	2
1980	2	2	2	2	3	2	2	2	2	2	5	2	2	2	2	2	3	2
1981	2	2	2	2	3	2	2	2	2	2	5	2	3	6	3	2	3	2
1982	2	2	2	2	3	2	2	2	2	2	5	2	3	6	3	2	3	2
1983	2	2	2	2	4	2	2	2	2	2	6	2	3	6	3	2	4	2
1984	2	2	2	2	4	2	2	2	2	2	6	2	3	3	3	2	4	4
1985	2	6	2	4	4	4	2	3	2	2	6	2	3	3	4	5	6	4
1986	2	6	2	2	4	4	2	3	2	2	6	2	3	3	3	5	3	4
1987	2	4	2	2	4	4	2	3	2	2	6	2	3	3	3	5	3	4
1988	2	4	2	2	4	4	2	3	2	2	6	2	3	3	3	4	6	4
1989	5	6	4	5	4	4	2	3	2	2	6	2	3	3	3	2	6	4
1990	5	6	4	5	2	4	3	6	3	2	6	2	3	3	3	2	6	4
1991	5	3	4	5	2	2	3	3	3	2	2	2	3	3	3	5	6	4
1992	5	3	4	5	2	2	5	3	3	2	2	2	5	3	3	5	4	4
1993	5	3	4	5	2	2	5	3	3	3	3	3	5	3	3	5	3	4
1994	5	3	4	5	2	2	3	3	3	3	3	3	5	3	3	4	3	4
1995	5	3	4	4	2	2	3	3	3	3	3	3	3	3	3	4	3	4
1996	5	3	4	4	2	2	3	3	3	3	3	3	3	3	3	4	3	4
1997	5	3	4	4	2	2	3	3	3	3	3	3	3	3	3	4	3	4
1998	5	3	4	1	2	2	3	3	3	3	3	3	3	3	3	4	3	4
1999	3	3	4	1	2	2	3	3	3	3	3	3	3	3	3	4	3	4
2000	4	3	4	1	2	2	3	3	3	3	3	3	3	3	3	5	3	4
2001	4	3	4	1	1	1	3	3	3	3	3	3	3	3	3	5	3	4
2002	4	3	4	1	1	1	3	3	3	3	3	3	3	3	3	4	3	4
2003	5	3	4	1	1	1	3	3	3	3	3	3	3	3	3	4	3	4
2004	5	3	4	1	1	1	3	3	3	3	3	3	3	3	3	4	6	4
2005	4	3	4	1	1	1	2	3	3	3	3	3	3	3	3	4	4	4
2006	4	3	4	1	1	1	2	3	3	3	3	3	3	3	4	4	4	4
2007	4	3	4	1	1	1	2	3	3	3	3	3	3	3	4	4	4	4
2008	4	3	4	1	1	1	2	3	3	3	3	3	3	3	4	4	4	4

Classification codes are:

1 • Hard Peg
2 • Conventional Peg
3 • Crawling Peg / Crawling Band
4 • Managed Floating
5 • Free Floating
6 • Free Falling

Appendix B

Due to limited availability of the data, I consider a long panel with many time periods for six Central American countries (N is small and $T \to \infty$). Examples of this kind of panels are data on a few regions, countries, firms or industries followed for many time periods. The focus here is on more efficient GLS estimation under richer models of the error process than those specified in the short panel case.

The dataset used is a Central America country-year panel obtained from the SECMA on annual GDP growth, total consumption as ratio of GDP, total investment as ratio of GDP, a measure of openness (exports plus imports over GDP), population growth and the initial level of GDP in 1970. In addition, I used a set of dummies that takes the value of one when an observation is classified in a particular exchange rate regime. The exchange rate regimes used were the ones by the IMF, RR and the author classification. There are 234 observations, so each country year pair is a separate observation because 6 *39 = 234.

A natural starting point is the two-way-effects model

$$y_{it} = \alpha_i + \gamma_t + x'_{it}\beta + \varepsilon_{it} \qquad (1)$$

When the panel has few individuals relative to the number of periods, the individual effects α_i (here country effects) can be incorporated into x'_{it} as dummy-variable regressor. Then there are too many time effects γ_t (here year effects). Rather than trying to control for these in ways analogous to the short panel case, it is usually sufficient to take advantage of the natural ordering of time (as opposed to individual effects) and simply include a linear or quadratic trend in time.

We therefore focus on the pooled model

$$y_{it} = x'_{it}\beta + u_{it} \qquad (2)$$

$$i = 1,...,N$$
$$t = 1,...,T$$

where the regressor x_{it} include an intercept, often time and possibly time squared, and possibly a set of individual indicator variables. I assume that N is quite small relative to T.

I consider a pooled OLS and PFGLS of this model under a variety of assumptions about the error u_{it}. In the short panel case, it is possible to obtain standard errors that control for serial correlation in the error term without explicitly stating a model for serial correlation. Instead, we could use cluster robust standard errors, given a small T and $N \to \infty$. Now, however, T is large relative to N, and it is necessary to specify a model for serial correlation in the error terms. Also given that N is small, it is possible to relax the assumption that u_{it} is independent over *i*.

I begin with a PFGLS estimator that uses the most flexible model for the error u_{it}, with flexible correlation across countries and a distinct AR(1) process for the error in each country. In principle, this is the best estimator to use, but in practice when T is not much larger than N, there can be finite-sample bias in the estimators and standard errors; see Beck and Katz (1995). Then it is the best, at least, to use the more restrictive option that permits AR(1) autocorrelation of the error with

$$u_{it} = \rho u_{i,t-1} + \varepsilon_{it} \qquad (3)$$

where ε_{it} is i.i.d.

Therefore, in order to investigate whether a particular exchange rate regime performs better in terms of GDP growth, the starting point is at the following equations:

For the IMF classification;

$$GROWTH_{it} = \alpha + \beta CONGDP_{it} + \delta INVGDP_{it} + \phi OPEN_{it} + \theta GDP70_i + \varphi YEAR_i + \lambda POP + R2_{it} + R3_{it} + R4_{it} + R5_{it} + \varepsilon_{it} \quad (4)$$

For the RR classification:

$$GROWTH_{it} = \alpha + \beta CONGDP_{it} + \delta INVGDP_{it} + \phi OPEN_{it} + \theta GDP70_i + \varphi YEAR_i + \lambda POP + RR2_{it} + RR3_{it} + RR4_{it} + RR5_{it} + RR6_{it} + \varepsilon_{it} \quad (5)$$

For the author classification:

$$GROWTH_{it} = \alpha + \beta CONGDP_{it} + \delta INVGDP_{it} + \phi OPEN_{it} + \theta GDP70_i + \varphi YEAR_i + \lambda POP + REG2_{it} + REG3_{it} + REG4_{it} + \varepsilon_{it} \quad (6)$$

where GROWTH is growth of GDP per capita in country i during year t; INVGDP is the investment to GDP ratio, CONGDP is growth of the consumption to GDP ratio, OPEN is an index of the degree of openness (imports plus exports over GDP), GDP70 is the initial level of GDP (1970) for country i, POP is population growth and YEAR is a time trend variable.

The following specifications were used: 1) Pooled OLS that assumes an AR(1) error and then gets standard errors that additionally permit flexible correlation over countries; and 2) PFGLS assuming an AR(1) error and flexible correlation across countries. This assumes

$$u_{it} = \rho_i u_{i,t-1} + \varepsilon_{it} \quad (7)$$

The results of these regressions and other statistical tests are shown in the following tables.

Table 1. GDP Growth and Exchange Rate Regimes

	Pooled OLS			PFGLS		
Classification / Variable	**IMF**	**RR**	**Author**	**IMF**	**RR**	**Author**
CONGDP	-0.04	-0.05	-0.05	-0.02	-0.01	-0.03
	(0.06)	(0.05)	(0.05)	(0.05)	(0.04)	(0.04)
INVGDP	0.55***	0.48***	0.54***	0.48***	0.46***	0.48***
	(0.08)	(0.08)	(0.08)	(0.07)	(0.06)	(0.06)
OPEN	0.10**	0.09**	0.10***	0.09***	0.08***	0.08***
	(0.58)	(0.05)	(0.05)	(0.04)	(0.05)	(0.04)
GDP70	0.04***	0.04***	0.04***	0.04***	0.04***	0.03***
	(0.01)	(0.00)	(0.01)	(0.00)	(0.01)	(0.01)
POP	2.19***	1.64***	2.14***	2.00***	1.52***	1.86***
	(0.50)	(0.41)	(0.50)	(0.43)	(0.35)	(0.43)
YEAR	-0.00***	-0.00**	-0.00	-0.00***	-0.00***	-0.00
	(0.00)	(0.00)	(0.00)	(0.01)	(0.00)	(0.00)
R2	0.02*			0.02*		
	(0.02)			(0.01)		
R3	0.01			0.00		
	(0.02)			(0.00)		
R4	0.01*			0.01*		
	(0.02)			(0.02)		
R5	0.01			0.01		
	(0.02)			(0.08)		
RR2		0.01			0.01	
		(0.02)			(0.01)	
RR3		0.01			0.01	
		(0.02)			(0.02)	
RR4		0.03**			0.02*	
		(0.02)			(0.02)	
RR5		-0.04*			-0.03**	
		(0.03)			(0.03)	
RR6		-0.03*			-0.00	
		(0.02)			(0.02)	
REG2			0.01*			0.01*
			(0.10)			(0.01)
REG3			0.01*			0.01*
			(0.01)			(0.00)
REG4			0.01**			0.01**
			(0.01)			(0.01)
R^2	0.39	0.40	0.38			

Standard errors in parenthesis.

Table 2. Tests for Equality of the Means by Regimes

IMF's CLASSIFICATION	A. GDP GROWTH			
	R1 vs. R2	R1 vs. R3	R1 vs. R4	R1 vs. R5
Mean (t)	-0.20 (0.90)	-0.73 (0.41)	-1.90 (0.04)	-2.17 (0.10)
	B. INFLATION			
Mean (t)	-8.40 (0.01)	-12.37 (0.00)	-9.16 (0.03)	-10.09 (0.00)
	C. CURRENT ACCOUNT / GDP			
Mean (t)	3.16 (0.38)	7.17 (0.02)	-1.96 (0.31)	-1.84 (0.41)
	D. FISCAL DEFICIT / GDP			
Mean (t)	6.69 (0.45)	2.64 (0.00)	-0.96 (0.02)	0.02 (0.98)

P-values in parenthesis.

Table 3. Tests for Equality of the Means by Regimes

RR's CLASSIFICATION	A. GDP GROWTH				
	R1 vs. R2	R1 vs. R3	R1 vs. R4	R1 vs. R5	R1 vs. R6
Mean (t)	-1.44 (0.37)	-1.57 (0.20)	-1.34 (0.32)	7.15 (0.19)	-3.54 (0.02)
	B. INFLATION				
Mean (t)	-4.93 (0.02)	-7.49 (0.00)	-11.42 (0.00)	N.A	-36.12 (0.00)
	C. CURRENT ACCOUNT / GDP				
Mean (t)	2.60 (0.46)	2.44 (0.38)	-4.39 (0.07)	7.25 (0.23)	3.64 (0.63)
	D. FISCAL DEFICIT / GDP				
Mean (t)	2.29 (0.94)	1.64 (0.10)	-0.58 (0.41)	8.66 (0.00)	22.18 (0.32)

P-values in parenthesis.

Table 4. Tests for Equality of the Means by Regimes

AUTHOR's CLASSIFICATION	A. GDP GROWTH		
	R1 vs. R2	R1 vs. R3	R1 vs. R4
Mean (t)	-0.53 (0.79)	-1.11 (0.28)	-1.27 (0.26)
	B. INFLATION		
Mean (t)	-5.74 (0.00)	-11.71 (0.01)	-11.96 (0.03)
	C. CURRENT ACCOUNT / GDP		
Mean (t)	3.11 (0.41)	6.37 (0.06)	-4.12 (0.20)
	D. FISCAL DEFICIT / GDP		
Mean (t)	6.85 (0.51)	3.05 (0.00)	-0.76 (0.13)

P-values in parenthesis.

Table 5. χ^2 Tests by Regimes

IMF's CLASSIFICATION	A. GDP GROWTH			
	R1 vs. R2	R1 vs. R3	R1 vs. R4	R1 vs. R5
χ^2	0.99 (0.32)	2.84 (0.09)	3.57 (0.06)	5.17 (0.02)
	B. INFLATION			
χ^2	16.82 (0.00)	24.81 (0.00)	14.66 (0.00)	18.66 (0.00)
	C. CURRENT ACCOUNT / GDP			
χ^2	0.92 (0.34)	11.43 (0.00)	0.60 (0.44)	0.09 (0.76)
	D. FISCAL DEFICIT / GDP			
χ^2	5.46 (0.02)	17.62 (0.00)	4.98 (0.03)	0.28 (0.60)

P-values in parenthesis.

Table 6. χ^2 Tests by Regimes

RR's CLASSIFICATION	A. GDP GROWTH				
	R1 vs. R2	R1 vs. R3	R1 vs. R4	R1 vs. R5	R1 vs. R6
χ^2	1.35 (0.24)	5.84 (0.02)	0.00 (0.95)	0.03 (0.87)	6.65 (0.01)
	B. INFLATION				
χ^2	7.91 (0.00)	15.68 (0.00)	11.76 (0.00)	N.A.	14.61 (0.00)
	C. CURRENT ACCOUNT / GDP				
χ^2	0.17 (0.68)	0.82 (0.37)	3.60 (0.06)	1.85 (0.17)	0.79 (0.37)
	D. FISCAL DEFICIT / GDP				
χ^2	7.64 (0.01)	2.37 (0.12)	0.34 (0.56)	6.00 (0.01)	1.72 (0.19)

P-values in parenthesis.

Table 7. χ^2 Tests by Regimes

AUTHOR'S CLASSIFICATION	A. GDP GROWTH		
	R1 vs. R2	R1 vs. R3	R1 vs. R4
χ^2	0.94 (0.33)	3.89 (0.05)	1.77 (0.18)
	B. INFLATION		
χ^2	9.66 (0.00)	18.93 (0.00)	14.98. (0.00)
	C. CURRENT ACCOUNT / GDP		
χ^2	0.093 (0.76)	5.7 (0.02)	0.72 (0.40)
	D. FISCAL DEFICIT / GDP		
χ^2	5.19 (0.02)	14.81 (0.00)	2.06 (0.15)

P-values in parenthesis.

Appendix C

Table 1. Balance of Payments Crises in Latin America, 1970 – 1999.

Argentina	1975M3, 1981M4, 1987M2, 1991M1
Bolivia	1972M10, 1980M1, 1985M9
Brazil	1979M12, 1983M2, 1987M1, 1991M1, 1999M1
Chile	1971M7, 1975M1, 1982M8
Colombia	1998M9
Costa Rica	1974M4, 1981M1
Dominican Republic	1985M1, 1990M8
Ecuador	1970M8, 1982M5, 1986M8, 1992M9, 1998M10
El Salvador	1986M1, 1990M5
Guatemala	1986M6, 1990M8
Haiti	1991M9
Honduras	1990M4
Jamaica	1978M5, 1983M11, 1991M9
Mexico	1976M9, 1982M2, 1986M1, 1994M12
Nicaragua	1979M4, 1985M2
Panama	1973M2
Paraguay	1984M3, 1989M3
Peru	1976M6, 1982M12, 1987M10, 1992M6
Trinidad and Tobago	1985M12, 1993M4
Uruguay	1972M3, 1982M11, 1987M12
Venezuela	1984M2, 1989M3, 1994M5

Source:. De Gregorio, Jose and Jong-Wha Lee. (2003). Growth and Adjustment in East Asia and Latin America. Central Bank of Chile. Working Papers. December, 2003.

Table 2. Episodes of Crisis and Distress 1970 -2003

Financial Sector Crises[1/]	Start Dates
Argentina	1980, 1989, 1995, 2001
Bolivia	1986, 1994
Brazil	1990, 1994
Chile	1976, 1981
Colombia	1982, 1999
Costa Rica	1987
Dominican Republic	2003
Ecuador	1982, 1996, 1998
El Salvador	1989
Guyana	1993
Haiti	1994
Jamaica	1995
Mexico	1981, 1994
Nicaragua	19980, 2000
Panama	1988
Paraguay	1995
Peru	1993
Uruguay	1981, 2001
Venezuela	1994

1/ Defined as the exhaustion of much or all of bank capital and usually involves a run on deposits.
Source: Finance and Development, September 2004

Financial System Distress and Averted Crises[2/]	Year
Bolivia	2003
Brazil	2002
Costa Rica	1994
Dominica	2003
Ecuador	2002
Guatemala	1991, 2000
Jamaica	1994, 2003
Paraguay	2002
Peru	2002
Trinidad and Tobago	1982
Venezuela	1978, 1985, 2002

2/ Defined as low or negative net worth without a systemic run on deposits.
Source: Finance and Development, September 2004

Table 3. Sudden Stops: 1990 - 2004

Country	Begins	Ends	Exchange Rate Regime
Costa Rica	1998M8	2000M8	Crawling Peg
Dominican Republic	1994M3	1995M5	Managed Floating
El Salvador	1999M2	1999M10	Conventional Peg
Honduras	1995M10	1996M9	Crawling Peg

Source:. Calvo, Guillermo, Alejandro Izquierdo and Luis Fernando Mejia. (2008). Systemic Sudden Stops: The Relevance of Balance Sheet Effects and Financial Integration. IADB Working Paper 637 and author's classification.

Table 4. Probability of Crises During Specific Regimes Using the Natural Exchange Rate Regime Classification (Percent)

	Bank Crisis (1980 – 1987)				Bank Crisis (1990 – 1997)			
Countries	**Peg**	**Limited Flexibility**	**Managed Floating**	**Freely Floating**	**Peg**	**Limited Flexibility**	**Managed Floating**	**Freely Floating**
Emerging	11.4	7.5	7.0	0.0	15.4	8.0	3.8	0.0
Developing	2.8	7.0	3.6	N.A.	2.6	7.1	4.5	N.A.
	Balance of Payments Crisis (1970 – 2000)				**Balance of Payments Crisis (1990 – 2000)**			
	Peg	**Limited Flexibility**	**Managed Floating**	**Freely Floating**	**Peg**	**Limited Flexibility**	**Managed Floating**	**Freely Floating**
Emerging	4.6	5.6	10.0	0.0	8.8	6.1	6.9	0.0
Developing	5.2	2.0	9.7	N.A.	0.0	2.8	15.4	N.A.
	Twin Crisis (1980 – 1997)				**Twin Crisis (1990 – 1997)**			
	Peg	**Limited Flexibility**	**Managed Floating**	**Freely Floating**	**Peg**	**Limited Flexibility**	**Managed Floating**	**Freely Floating**
Emerging	7.7	3.0	1.8	0.0	15.4	4.0	0.0	0.0
Developing	0.0	0.0	0.0	N.A.	0.0	0.0	0.0	N.A.

Source: Rogoff, Kenneth; Aasim Husain, Ashoka Mody, Robin Brooks and Nienke Oomes. (2003). Evolution and Performance of Exchange Rate Regimes. IMF. Working Paper 243.
N.A.= Not Available.
Note: Probabilities are calculated by dividing the number of occurrences of a crisis under a particular regime by the total number of regime years. Each crisis is counted only once and hence, if it persists over multiple years, the subsequent years are not taken into account for this calculation. Additionally, the years an exchange rate regime transition takes place (i.e., the year preceding, the year during, and the year following the transition) are excluded from this computation.