

# **Testing the Unstable Middle and Two Corners Hypotheses About Exchange Rate Regimes\***

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## **Abstract**

The recent rash of international currency crises has generated considerable interest in the role that exchange rate regimes have played in contributing to these crises. Many economists have argued that efforts to operate adjustable pegged exchange rate regimes have been a major contributor to “the unstable middle” hypothesis and some have argued that this unstable middle is so broad that only the two corners of hard fixes or floating rates will be stable in a world of high capital mobility – the two corners or bipolar hypothesis. Two recent empirical studies by researchers at the International Monetary Fund reach opposing conclusions on these issues. We examine the issue further and show that conclusions can be quite sensitive to how exchange rate regimes are grouped into categories and the measures of currency crises that are used. In general we find that the dead center of the adjustable peg is by far the most crisis prone broad type of exchange rate regimes but that countries need not go all the way to freely floating rates to substantially reduce the risks of currency crises.

## 1.1. Introduction

Today almost all international monetary economists accept the “unstable middle” hypothesis in the form that states that Bretton Woods type narrow band adjustable pegs will be highly crisis prone in the face of substantial capital mobility. There is disagreement, however, about stronger form of this hypothesis. Does it apply as well to adjustable pegs for low-income countries that do not yet face substantial international financial integration? Recent research at the IMF suggests that this is not the case. Adjustable pegs appear to have worked fairly well for many low-income countries (Rogoff et al 2003).

More prominently debated has been whether for countries facing high capital mobility, a move off dead center to other intermediate regimes such as crawling bands would be sufficient to substantially reduce crisis problems or whether it was necessary to go all the way to one of the extremes of “permanently” fixed or floating rates. The latter proposition has become known as the “two corners” or “bipolar” hypothesis. Eichengreen (1994) was an early advocate of this view and has been joined by a number of prominent economists (e.g., Obstfeld and Rogoff, 1995, Summers, 2000, and Fisher 2001).

These hypotheses have begun to attract empirical testing. The most common approach has been to look at what is happening to the distribution of different types of exchange rate regimes over time. A recent IMF study by Rogoff et al (2003), for example, conclude that “the *de jure* classification significantly overstates the number of true floats and pegs” (p.13) and “finds no support for the popular bipolar view that countries will tend over time to move to the polar extremes of free float or rigid peg. Rather, intermediate regimes have shown remarkable durability”. (p.1) “The so called ‘middle’

along the flexibility dimension continue to constitute one half of all regimes as it has throughout the past three decades” (p.8).

The other major empirical approach is to look at the frequency of crises across exchange rate regimes.<sup>1</sup> A first effort at such a broader comparison using the IMF’s new *de facto* classifications of regimes has recently been undertaken by Bubula and Otker-Robe (2003, hereafter BOR). They look at the frequencies of crises between 1990 (which is as far back as the new classifications that they constructed go) and 2001 for 168 IMF member countries. They conclude that they have found evidence in support of the strong form of the two corners hypothesis. Not only do they find that crises are much less frequent at the corners than in the middle, but they also conclude that there are no significant differences in crisis frequencies across the various types of intermediate regimes. The latter finding is quite startling since one of the most widely accepted propositions in international monetary economics is that narrow band adjustable pegs should be the most crisis prone type of exchange rate regime (i.e. the narrow form of the unstable middle hypothesis).

Given the potential importance of this conclusion, it is worth analyzing BOR’s conclusions carefully. While economists and policy officials are deeply in debt to the authors for their Herculean effort in constructing this new data set, we argue that their strong conclusions do not hold up to further analysis. There are three types of potential difficulties. [The first type of potential difficulties in their study is that their measure of](#)

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<sup>1</sup> Another alternative approach is to examine transitions of exchange rate regimes over time. Masson (2001) used a Markov chain model of exchange rate transition to test for the two corners hypothesis. He argued that either fixes or floats are absorbing states or that fixing and floating together form a closed set. For an absorbing state, there are no transitions away from the regime itself, while for a closed set; there can be transitions from intermediate regimes to fixes or floats. He concluded that the intermediate regimes would continue to constitute an important fraction of actual exchange rate regimes.

crisis dates is somewhat unusual. They construct currency crisis indices from only changes in exchange rates and interest rates and not changes in reserves. Leaving out the element of changes in international reserves will underplay the role of government interventions in foreign exchange market during a time of crisis, particularly for countries that adopt pegged exchange rate regimes.

The next issue concerns the categories into which exchange rate regimes are classified. This has been a problem with many studies. The dividing line between intermediate and corner regimes is not clear cut. For example, on the fixity side, should currency boards be included in the corner and on the flexible side should managed floating? We can make a good case that lightly managed floating should be placed in the corner and heavily managed floating in the intermediate zone, but we have no clear agreed criteria for distinguishing heavily versus lightly managed floating and neither the new IMF nor the Reinhart and Rogoff (2002) classifications are fully satisfactory in this regard. BOR distinguish between independent and tightly managed floats, but unfortunately this does not always conform to the heavily versus lightly managed floats.

In this paper we want to see if the BOR' results are sensitive to other crisis measures and different classifications of exchange rate regimes. To test the sensitivity of their results, we construct currency crisis indices as well as use Glick and Hutchison's crisis dates in place of BOR. For exchange rate regimes, we utilize BOR's thirteen way fine classification but explore the implications of using different groupings of broad classifications including both four-way and six-way classifications. We also use regime classifications by Reinhart and Rogoff (2002), Levy-Yeyati and Sturzenegger (2002). We find that BOR's support for the strong form of the two corners hypothesis is not robust to

these alternative proxies. Instead, our results show that while adjustable parities remain most crisis prone under different model specifications, other results can vary. This is consistent with the “unstable middle” hypothesis that adjustable parities are associated with the highest probabilities of currency crises among various types of exchange rate regimes.

The rest of the paper proceeds as follows. Section 1.2 discusses the role of exchange rate regimes and the likelihood of currency crises. In particular, we briefly review recent literature on the debate of the bipolar view of exchange rate regime and provide possible linkages to the onset of currency crises. In section 1.3 and 1.4, we discuss our methodology and data, providing the rationales for constructing our grouping of exchange rate regime based on our own judgments. Empirical results are presented in section 1.5. Section 1.6 describes the robustness checks, and Section 1.7 concludes.

## **1.2. The Relationship between Exchange Rate Regimes and Currency Crises**

Recent emerging market financial crises and the general increase in international capital mobility have led to a reassessment of the role of exchange rate arrangements in reducing vulnerability to economic crises. While most economists argue that the Bretton Woods style adjustable pegged regime is the most crisis prone type of exchange rate arrangement at present, there is considerably disagreement about the crisis proneness of other forms of intermediate regimes.

The flaw of adjustable pegs is due to the problem of “one-way speculative gambles”. In the timing of currency crisis, for example, a government faces downward pressure on the currency. In the short run, a government (or the central bank) can defend

its currency against depreciating by purchasing the domestic currency, selling its international foreign reserves, and raising interest rates to prevent capital outflows. In the long run, however, foreign reserves would eventually run out and a substantial depreciation will occur. Knowing this mechanism intuitively, speculators can determine the direction of any major change in exchange rates, making adjustable pegged exchange rate extremely vulnerable to speculative attacks. On the contrary, both genuinely fixed rates and floating rates are less susceptible to currency crises. For pure fixed rates, domestic policy instead of exchange rate will presumably do all the adjustments, whereas under floating rates, exchange rates will adjust to the negative shocks with currency being either strengthened or weakened.

However, not all forms of intermediate exchange rate regimes maybe equally vulnerable to one-way speculative attack. Regimes such as crawling band offer more flexibility than adjustable pegs in terms of adjusting to external shocks. There is growing empirical evidence indicating that that intermediate exchange rate regimes are likely to remain feasible and appropriate in many cases, in the form of dirty floats or unofficial pegs (Calvo and Reinhart, 2002, Levy-Yeyati and Sturzenegger, 2002, Bénassy-Quéré and Benoît 2002, and Rogoff, et al., 2003).<sup>2</sup> For example, Rogoff et al (2003) find no support for the bipolar view. They conclude that countries at a relatively early stage of financial development and integration are better off choosing fixed or relatively rigid regimes, while developed countries are better off choosing relatively flexible exchange

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<sup>2</sup> A fixed exchange rate usually refers to a central bank offering to supply or buy any quantity of domestic or foreign currencies at that rate. Floating exchange rate usually refers to when the exchange rate can fairly freely move, and the value is determined primarily by market demand and supply. With free floating, there is little or no government intervention. Intermediate exchange rate regime usually refers to the regime running between fixed and floating rate, and usually involving central bank intervention. The term dirty was used soon after the general move to floating exchange rates in the early 1970s. It means that a monetary authority states an official policy of letting the exchange rate float, yet frequently intervenes in the foreign exchange market to manage the exchange rate.

rate regimes. However, they do not find any strong evidence that countries will tend to move toward the two polar exchange rate regimes over time. Instead, their paper shows that intermediate regimes still remain as a feasible option to most developing countries. It can be seen from past currency crisis experience, where Thailand had a narrow band pegged largely to the dollar, Korea and Indonesia had crawling pegs/bands before the Asian crisis. Mexico, which had a crawling band, was unable to avoid the crisis either. On the other hand, Chile, Israel, and Colombia are examples of countries that have had well-managed crawling band regimes without experiencing currency crises (See Williamson 1996).

According to the bipolar view of exchange rate regimes, by contrast, intermediate exchange rate regimes are unstable over the long run, especially under high capital mobility. For example, Eichengreen (1994), Obstfeld and Rogoff (1995), Summers (2000), and Fisher (2001) argued that countries have tended to move away from the center of Bretton Woods style adjustable pegs to either genuine fixed regimes such as currency boards, currency unions, and dollarization or floating rate regimes. Intermediate regimes (e.g. soft pegs), on the other hands, are crisis-prone and not viable over long periods. Likewise, Bubula and Otker-Robe (2003) have found that intermediate regimes are more crisis prone than both hard pegs and floating regimes, providing some support for the “bipolar” view of exchange rate regimes.

This paper argues that the question of whether a particular type of exchange rate regime is more likely to increase the probability of currency crises is an empirical matter. Given the diverse circumstances in different countries, there is no one-size-fits-all

exchange rate regime.<sup>3</sup> To some developing countries with limited access to capital markets, intermediate exchange rate regimes may be more appropriate choices. To some others, they may not be. To better evaluate the effect of exchange rate regimes on the probability of currency crises, therefore, we need to pay special attention to the issue of how to classify exchange rate regimes as well as how to identify currency crisis episodes.

### **1.3. Methodology and Classification of Exchange Rate Regimes**

In investigating whether a particular type of exchange rate regime is more prone to currency crises, we basically follow Bubula and Otker-Robe (BOR)'s methodologies. We first compute the frequency of crises and examine the relationship between the incidence of crises and exchange rate regimes using a Logit regression. The frequency of crises is calculated by taking the total number of crisis episodes under a particular regime divided by the total annual observations across 90 countries over 1990-2001. A one-year lag of regimes is used to avoid the endogeneity problem since crises often lead to changes in regimes. We also check for robustness by excluding all crisis observations following the onset of a crisis. This helps minimize simultaneity bias in case a crisis lasts for more than one year. Unlike BOR, however, where they test this relationship by looking at the frequency of crises in thirteen different exchange rate regimes, we regroup their exchange rate regimes data into six categories<sup>4</sup>:

1. Hard Pegs (1-3)
2. Adjustable Parities (4-6)
3. Crawls (7-10)

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<sup>3</sup> See Frankel (1999)

<sup>4</sup> For BOR regime classifications, see Appendix II.

4. Tightly Managed Floats (11)
5. Other Managed Floats (12)
6. Independent Floats (13)

The rationales for our alternative breakdowns are as follows. Since in our view the major causes of currency crises are the development of disequilibrium exchange rates rather than destabilizing speculation<sup>5</sup>, and the relevant concept of disequilibrium in this context is a long term one. We thus view the ability to adjust exchange rates to longer run trends as the most important (although of course not the only) attribute of more flexible exchange rate regimes. From this perspective, a horizontal band, while offering somewhat more flexibility than a narrow band adjustable peg, would seem closer to the adjustable peg than to various types of crawling pegs and bands. Thus, we used all adjustably fixed parities, whether with wide or narrow bands, as our categories of dead center.

The various types of crawling pegs and bands form another type of natural grouping. However, close analysis of the role of exchange rate regimes in the Asian crisis revealed that *de jure* managed floats were often operated as *de facto* crawling bands and that for countries such as India, Indonesia, and Singapore, it was quite difficult to judge whether crawling bands or managed floats were better descriptions. Furthermore, there is no clear criterion for whether managed floats should be considered intermediate or corner regimes. Our intuition is that heavily managed floats are intermediate and lightly managed floats are corner, but we do not have generally agreed criteria for making this distinction. The IMF's new *de facto* classification has three types of floats: tightly managed, other managed, and independent floats in descending order of management, but

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<sup>5</sup> See Willett (2004a).

the analytical basis for their distinctions is not transparent and sometimes conflicts with the classification system of Reinhart and Rogoff (2002) and other analysts.

BOR divide their two categories of managed floats between their intermediate and floating classifications, placing tightly managed floats under intermediate regimes and other managed floats under the floating corner. While not unreasonable, it is also not obviously the best way of grouping.<sup>6</sup> Thus, we also explore the implications of treating tightly managed floats, other managed floats, and independent floats separately. We find that support for the two corners hypothesis is highly dependent on what is placed into the managed float category.

In this paper, we primarily focus on *de facto* exchange rate regimes, which are based upon governments' actual behavior in exchange rate policy<sup>7</sup>. This is because the previous IMF *de jure* exchange rate classification, which was often used in most empirical studies until the late 1990s, has a serious drawback- in practice, governments often deviated their actual exchange rate policy from what they were officially announced to be. Recognizing this potential problem, this paper conducts a study based on new IMF judgmental regime classification, which combines actual government exchange rate behavior with available information of policy framework.

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<sup>6</sup> See Nitithanprapas and Willett (2002). For BOR's definitions on tightly managed floats and other managed floats, see Appendix III.

<sup>7</sup> IMF has published a set of *de facto* exchange rate arrangements for all member countries. This exchange rate classification system is based on the information available on the operations of members' *de facto* policies, as analyzed by IMF staff, which differ from countries' officially announced arrangements. It provides 8 categories of classification: (1) Exchange arrangement with no separate legal lender, (2) Currency board arrangement, (3) Conventional pegged arrangement, (4) Pegged exchange rate within horizontal bands, (5) Crawling peg, (6) Crawling band, (7) Managed floating with no pre-announced path for the exchange rate, (8) Independently floating. See the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions (2004). This classification scheme closely corresponds to BOR's regime classification, except that BOR distinguish between forward and backward crawling peg/band under crawling category and tightly managed floating versus other managed floating under managed floating category, which results in a more detailed 13 categories of exchange rate regime classification.

Furthermore, the IMF and Reinhart and Rogoff classification systems do not adequately classify countries that have nominally free floating exchange rate regimes but engage in heavy intervention in practice. For example, the IMF and Reinhart and Rogoff classify Japan and Korea as independent and free floats, respectively, but it is known that both countries intervened heavily in their foreign exchange markets, particularly after the Asian crisis.<sup>8</sup>

### *Model Specification*

To test for the statistical significance of exchange rate regimes on the probability of currency crises, we use a logit model and a panel of 90 countries observed annually from 1990 to 2001. A logit model is defined as:

$$L_{i,t} = \ln \left[ \frac{P_{i,t}}{1 - P_{i,t}} \right] = \alpha + \sum_{j=1}^5 \delta_j ER_{i,t-1,j} + \sum_{k=1}^4 \beta_k x_{k,i,t-1} + \varepsilon_{i,t}$$

$$, \text{ where } P_{i,t} = \text{prob}(CC_{i,t} = 1 | x_{i,t}, ER_{i,t}) = \frac{1}{1 + e^{-(\alpha + \beta_k x_{k,i,t-1} + \sum_{j=1}^5 \delta_j ER_{i,t-1,j})}}$$

$CC_{i,t}$  is a currency crisis dummy variable, which takes a value of 1 in a crisis year for any country  $i$  at time  $t$ , and 0 if there is no currency crisis.  $\ln [P_{i,t}/(1-P_{i,t})]$  is the odd ratio of the logit estimation, while  $P_{i,t}$  is the probability that a currency crisis occurs (i.e.  $CC_{i,t}$  equals to 1). ER is an exchange rate regime dummy variable, which takes a value of 1 if a country adopts a particular exchange rate regime  $j$  one year before crisis year, and 0 otherwise. The coefficient of adjustable parities is dropped to avoid the problem of perfect multicollinearity. The magnitude and significance level of a slope coefficient of a regime dummy tell the difference of the average probability of banking crises between

<sup>8</sup> See, for example, Willett and Kim (2005).

that regime and the omitted regime.<sup>9</sup> By taking the antilog of  $L_{i,t} = \text{antilog} [P_{i,t}/(1-P_{i,t})]$ , we can simply solve for the value of  $P_{i,t}$  and obtain the probability of currency crises under a particular exchange rate regime.  $x$  is a  $k$ -element vector of standard economic and financial variables, which will be discussed in section IV.  $\beta_k$  are coefficients, which captures the effect of the change in a control variable  $k$  on the change in the odd ratio.  $\varepsilon_{i,t}$  is the error term. To minimize the problem of reverse causality, all the right-hand side variables are lagged by one year.

We apply BOR, Glick and Hutchison (1999, thereafter GH), and our own calculations of crisis indices along with our breakdown of exchange rate regimes to test the robustness of BOR's findings that there is no difference of the probability of crises under different types of intermediate regimes, and that both two-pole regimes are less crisis prone than the intermediate regimes. We also check the robustness of results by controlling for country fixed effects, which allows us to capture the difference across different countries in the sample. The trade-off for controlling for the fixed effects is that countries that did not experience any currency crisis would be removed from the sample, which will result in a loss of degrees of freedom in the estimation.

#### **1.4. Sample and Data**

The data set for this paper comprises annual observations from 1990 to 2001 on 90 countries, including 21 industrial countries, 42 emerging markets economies, and 27

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<sup>9</sup> We alternatively drop each of six regime dummies from regressions. The estimated coefficients tell the differences of the predicted probabilities of crises across regimes and their significance levels tell whether the probabilities are statistically significant different from each other. We do not report the chi-square test of the differences of the coefficients used by BOR, since the test shows the differences for a pair of regimes. Based on our six-way classification we are interested in the differences of the probability of crises between one regime and each of the other five regimes.

low-income developing countries<sup>10</sup>. We perform the analysis both for the entire sample and each country group, which have different characteristics in terms of financial development and the extent of capital mobility. We focus particularly on emerging market economies as these are the ones for which the implications of the unstable middle and two corners hypotheses seem most relevant. These countries usually have less well-developed financial markets; shorter historical experience of market-determined exchange rates; and much larger and more volatile capital flows, in relation to the size of their domestic capital markets more generally. They also use intermediate regimes much more frequently than the developed countries. For lower income developing countries, capital mobility is usually much lower and hence the one-way speculative option is less of a problem.

#### *1.4.1 Data for Exchange Rate Regimes*

Data for exchange rate regimes is taken from BOR. They improve the old IMF *de jure* exchange rate regimes by classifying *de facto* exchange rate regimes for all IMF member countries over the period 1990-2001 into three broad categories and thirteen sub-categories. Their classification is more accurate than the old IMF classifications since it uses a combination of quantitative and qualitative analysis in constructing the database<sup>11</sup>. It has some flaws, however. As indicated by Willett (2004c), BOR classify Korea as free floating for the post Asian crisis period, which is misleading. According to the evidence that Korea's international reserves substantially increase in the past few years, Korea in

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<sup>10</sup> See appendix I for the sample countries.

<sup>11</sup> Besides using quantitative analysis, they use available information contained in IMF staff and country reports, along with other relevant resources such as press reports and news articles, to identify a government's actual behavior of exchange rate policies.

practice should be classified as following a heavily managed floating exchange rate policy.

Another potential problem in their study is that the dividing line between tightly managed float and other managed float is not crystal clear. As we have discussed in the previous section, ideally, we want to distinguish between heavily managed float and lightly managed float in a more systematic manner depending on the degree of government interventions. However, there is no common agreement on how to distinguish between them. Therefore, in contrast to BOR, we test the probability of crises under tightly managed floats, other managed floats, and independent floating separately to better understand the nature of crisis proneness for each type of exchange rate regime.

For sensitivity tests, we check the robustness of our new BOR regime classification along with both the Reinhart and Rogoff (2002) and Levy-Yeyati and Sturzenegger (2002) regime classifications. We regroup Reinhart and Rogoff 's fine fourteen exchange rate regimes into seven broad categories: hard pegs, adjustable parities, crawls, moving bands, managed floats, freely floats, and freely falling.<sup>12</sup> For and Levy-Yeyati and Sturzenegger's classification, we keep their original four-way classification, that is, fixed, crawls, dirty floats, and floats. In addition, we also check our results with a four-way regime classification based on BOR's exchange rate data, that is, hard pegs (1-3), conventional pegs (4-6), intermediates (7-11), and floats (12-13). The reason of being that is sometimes it is difficult to argue that a crawling band entails greater exchange rate

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<sup>12</sup> Reinhart and Rogoff (2002) exchange rate regime classification includes: (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%, (4) De facto peg, (5) Pre announced crawling peg, (6) Pre announced crawling band that is narrower than or equal to +/- 2%, (7) De facto crawling peg, (8) De facto crawling band that is narrower than or equal to +/- 2%, (9) Pre announced crawling band that is wide than or equal to +/- 2%, (10) De facto crawling band that is narrower than or equal to +/- 5%, (11) Moving band that is narrower than or equal to +/- 2% (i.e., allows for both appreciation and depreciation over time), (12) Managed floating, (13) Freely floating, and (14) Freely falling.

rigidity than a tightly managed float. This sensitivity test should add some explanatory powers to our results.

#### *1.4.2 Data for Currency Crises*

We use data for currency crisis episodes from three different sources: BOR, GH and our own calculations. BOR compute exchange market pressure index (EMP) based on a weighted average of monthly percentage change in exchange rate vis-à-vis the anchor country and monthly variation in percentage points in the domestic interest rate using pooled precision weight. Currency crises are identified if the EMP index exceeds three times standard deviations plus its country-specific sample mean. Unlike BOR, GH construct their EMP index based on a weighted average of monthly percentage change in exchange rate and international reserves. The index increases with both devaluations and losses in reserves. Currency crises are then identified when this index exceeds two times country-specific standard deviation and country-specific mean.

For sensitivity tests, we also use a pooled precision index that is commonly used in the crisis literature (Eichengreen, Rose, and Wyplosz (1995), Kaminsky and Reinhart (1999), and Kamin, et al. (2001)). Following Eichengreen, Rose and Wyplosz (1996), we compute exchange market pressure indices (EMP) based on the weighted average depreciation of the domestic currency, the loss of international reserves and the increase in interest rates. A pooled precision weighting system is utilized to determine the weights of the three components based on the inverse of their respective standard deviations, i.e. precision weights. Currency crises are identified if the EMP index

exceeds certain thresholds. To check the robustness of our model, both thresholds of two and three standard deviations are used in this paper.

#### *1.4.3 Data for Macroeconomic and Control Variables*

The set of variables we use in all regressions include the ratio of M2 to international reserves, the rate of domestic credit growth, current account deficit/surplus as a share of GDP, and real effective exchange rate appreciation. These variables are broadly representative of the existing literature on currency crises. Kaminsky, Lizondo, and Reinhart (1998), for example, find each of these variables to be among the strongest indicators of currency crises. The data for these variables are from the International Financial Statistics and World Development Indicator, the World Bank. Appendix I provides definitions and sources of all variables used in the analysis. The current account surplus is expected to reduce the probability of crises. Real effective exchange rate appreciation is likely to cause currency overvaluation especially under pegged rates, which in turn increases the likelihood of currency crises. The ratio of M2 to foreign reserves and the growth rate of the ratio of domestic credit to GDP are expected to have a positive relationship with the probability of crises. These control variables are not included in BOR's estimations.

### **1.5. Empirical Results**

#### *1.5.1 The Frequency of Currency Crises of Various Exchange Rate Regimes*

Table (1) reports the annual frequency of currency crises under each type of exchange rate regime during 1990-2001. The frequency reported in columns (1)-(3) is

calculated by using the dates of currency crises from BOR. In column (1), we report the frequency of crises under different types of exchange rate regimes from BOR's original frequency calculations.<sup>13</sup> In the second column, we reproduce BOR's calculation by using their crisis dates and classifications of exchange rate regimes. Overall, our replication is generally consistent with BOR's original results.<sup>14</sup>

Using the full sample for 90 countries, columns (3) in table (1) show that the frequency of crises under different types of regimes varies substantially. The frequency of crises is the highest under adjustable parities (adjustable pegs and horizontal bands). For example, we find that the frequency of crises under adjustable parties of 13.58 percent is considerably higher than that of 12.79 percent, 10.98 percent, 8.46 percent, 4.26 percent, and 3.57 percent under crawls, tightly managed floats, independently floats, hard peg regimes, and other managed floats respectively. To check for the sensitivity of the results, we also compare BOR's crisis measures with those from GH and our calculations of crisis dates.<sup>15</sup> The findings of differences of crisis proneness across intermediate regimes are even stronger when using the GH measures of currency crises (e.g. columns (4), table (1)). Column (4) and (5) in table 1 report the raw data of the frequency of crises by using both GH's crisis dates and our own calculations, respectively.

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<sup>13</sup> They calculated for all 168 countries and reported in the monthly basis. We convert it into the annual basis for the purpose of cross comparison in column (1) and (2).

<sup>14</sup> The difference of frequency for some regimes, particularly under conventional fixed peg to a single currency, is due to our use of annual data instead of monthly data as used by BOR. Use of annual data is necessary for the use of crisis dates from the other studies. By using annual data, crises in 1990 are excluded due to unavailable data for the lag of regimes, which is employed to avoid the endogeneity problem or when the eruption of crises could lead to the change in exchange rate regime. From the total of 196 crisis episodes in BOR's sample, there are 17 crises occurred in 1990. The replication by using the annual data of 179 crisis may help explain the difference between BOR's results on the frequency of crisis under fixed rates to a currency (18.48 percent) and our finding (11.63 percent).

<sup>15</sup> We also planned to compare the crisis dates with Bordo et al (2001), but there wasn't a large enough overlap of the samples to make this analysis fruitful.

The frequency of crises under adjustable parities is almost twice as much as under crawls when using GH's crisis dates (19.51 percent vs. 10.59 percent). Another interesting finding is that we do not find strong evidence supporting the bipolar view when using GH crisis dates. For example, the frequency of crises is lower under crawling regimes (10.59 percent) than under independent floating regimes (13.04 percent) using GH's crisis dates in column (4). Likewise, tightly managed floats (13.04 percent) seem to be as crisis prone as one of the corner regime, that is, independent floating (13.04 percent). When using our crisis dates, as shown in column (5), we find the frequency of crises under adjustable parties of 13.75 percent is higher than that of 12.79 percent, 11.25 percent, 7.80 percent, 4.04 percent, and 4.10 percent under crawls, tightly managed floats, independently floats, hard peg regimes, and other managed floats respectively. This is similar to the results using BOR's crisis dates. Empirical results on investigating the probability of crises using a Logit model are presented in the following section.

### *1.5.2 The Probability of Currency Crises Under Various Exchange Rate Regimes Using BOR Crisis Measures*

Table 2 reports the estimates of the probability of crises under each exchange rate regime from the Logit regressions using BOR crisis dates for a full set of 90 countries. The results of regressions for a sample of industrial, emerging markets, and developing countries are reported in table 3. The analysis of the differences of crisis proneness across intermediate regimes (e.g. adjustable parities, crawls, tightly managed floats) is discussed first. Then we compare the probabilities of crises under the intermediate with two corner regimes (hard pegs and independently floats) to find whether the data supports the strong

form of the “two corners” hypothesis. We also point out the results that could be sensitive to the dividing line between intermediate and corner regimes.

Regression (1) table 2 replicates BOR’s model specification by performing logit estimations, but uses our six grouping of exchange rate regimes. Regression (2) includes a set of macroeconomic control variables. Regression (3) controls for the different country fixed effects. Each regression drops an adjustable parities dummy. The estimated coefficient of each regime dummy and its significance level tells whether the logits and predicted probability of crises under that regime is statistically significantly different from the adjustable parities regime. The marginal effect of each regime, which is the discrete effect of the change in a value of dummy variable from 0 to 1, on the probability of crises can be also read from the difference of the predicted values in the latter column of each regression<sup>16</sup>.

A surprising result of the simple correlations in the BOR analysis is that there is a little difference between the predicted probability of crises for adjustable parities (13.6 percent a year) and crawling pegs/bands (12.8 percent a year) as shown in regression (1) in table 2. This would suggest that to substantially reduce the likelihood of currency crises on the more flexible end of the spectrum, it would be necessary to go all the way to at least the other managed floating regime. If these results were robust, it would present strong evidence against the popular class of BBC (Band, Basket, and Crawl) proposals by Williamson (2000). The result turns out not to be robust, however. When a limited number of important economic control variables are added, the probability of crises under

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<sup>16</sup> The values of marginal effects are reported in table 3. For instance, table 2 regression (2) predicts that the probability of crises under adjustable parities (15.3 percent) is statistically significantly higher than that of hard pegs (4.5 percent) by 10.8 percent per year. This is consistent to the marginal effect of 0.108, which is reported in the first column in table 3.

adjustable parities rises to 15.3 percent, while crawls fall to 9.6 percent. When country fixed effects are added, the difference grows even greater (30.8 percent versus 11.1 percent). Adding country fixed effects in fact excludes some countries that do not experience a crisis. This helps explain the large increase in the probability for the adjustable parities. The difference of the probabilities of crises between adjustable parities and crawls is statistically significant with the p-values of 0.12 (regression (2)) and 0.07 (regression (3)).

Since the statistics of the overall model (the Wald statistics) show the highest values when the model includes control variables<sup>17</sup>, in the next tables we will report only regressions with this specification. The results in tables 3-4 are also comparable to those in table 2 when excluding control variables or including country fixed effects. That is, the difference of the probability of crises across regimes increases as control variables are added and becomes larger with country fixed effects.

In each regression in tables 3a-3b, one regime dummy is alternatively dropped. The reported marginal effects and their significance levels tell the differences of the predicted probability of currency crises under each regime with the omitted regime. With our six-way classification of exchange rate regimes, six regressions are reported.

By using the total sample, the results show that adjustable parities are the most crisis-prone regime type. As shown in table 3a regression (2), switching to crawling regimes significantly reduces the probability of crises by 5.7 percent. This crisis probability can be reduced by 12.9 percent, if a country switches from an adjustable peg to other managed floating regimes. The results also show that other managed floats are the least crisis-prone regime type. The predicted probabilities of crises of other managed

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<sup>17</sup> This result is consistent when using the likelihood ratio test and Pearson goodness of fit test.

floats are statistically significantly lower than all other intermediate regimes as well as independently floating regimes (regression (5) table 3a).

The hypothesis of the unstable middle is also relevant for the industrial countries (regressions (7)-(10) table 3a). The limited observations for industrial countries allow us only to compare adjustable parities with crawls, other managed, and independent floating<sup>1819</sup>. The models predict that adjustable parities generate probabilities of crises 7.4 and 6.3 percent higher than other managed and independently floating regimes. These differences have p-values of 16.9 and 11.9, respectively (regression (7), table 3a).

We also find consistent results when we look only at emerging market countries, the group for which the unstable middle and two corners hypothesis are likely most relevant. There is a fairly sizeable difference between the crisis probabilities of adjustable parities and crawling pegs/bands. Adjustable parities have the probability of crises 4.6 percent greater than crawls (regression (2) table 3b). The less statistical significance of the difference of the probability of crises between adjustable parities and crawls is likely due to the smaller sample size and the limited number of crisis observations.

The results based on the total sample, industrial, and emerging market countries offer a strong support for the unstable middle hypothesis. The adjustable parities are consistently associated with the highest probability of currency crises. The results suggest that crawls could reduce the likelihood of crises, and other managed floats could work

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<sup>18</sup> There are no identified currency crises among European countries after adopted the Euro currency in 1999. This leads to the prediction failure from the Logit estimations under the hard pegs. There is only one industrial country (Norway) classified as adopting tightly managed regime and there is no crisis during its adoption period (1993-1996).

<sup>19</sup> At first glance the analysis offers very surprising results. The probability of crises under crawls is higher than under adjustable parities (regression 7, table 3). A little digging, however, explains this anomaly. The only two industrial countries adopted crawling pegs/bands are Greece and Portugal (1990-1998). We suspect that whether or not these results are good predictors of what would happen if say Canada adopted a crawling peg.

roughly as well as independent floats in reducing the probability of crises. Thus the strongest form of the two corners hypothesis that countries need to go all the way to hard fixed or independently floats to avoid the crises, is not supported from our samples of industrial and emerging market countries.

When we turn to the lower income developing countries that typically face much lower capital mobility, exchange rate regimes seem to have less impact on the likelihood of currency crises. When we look only at the magnitudes of marginal effects across regimes, we find that crawls consistently have higher probabilities of crises than adjustable parities (regressions (8)-(9) table 3b). The analysis is consistent with the recent work at the IMF by Rogoff, et al (2003) that suggests that the performance of adjustable pegs is quite different for developing countries than for emerging market economies.

So far, our analyses have shown that adjustable parities are associated with the highest probability of crises and countries need to move away from this particular type of exchange rate regime in order to lower the likelihood of crises. We then take one step further and compare the difference of crisis probabilities between various types of intermediate regimes (adjustable parities, crawls, and managed floats) and the two corner regimes (hard pegs or independent floats). This is to see whether countries should move to one of the two extreme regimes to avoid the crisis. We find that for the total sample (regression (1), table 3a) and the emerging market sample (regression (1), table 3b), hard pegs always have much lower probabilities of crises than adjustable parities (by 10.8 percent) and crawling pegs/bands (by 5.1 percent), but not than various types of floats

(lower by 7.4 percent for tightly managed float, higher by 2.1 percent for other managed float, and lower by 3.5 percent for independent floats).<sup>20</sup>

As previously noted, it is not clear where the line between intermediate and flexible regimes should be drawn. BOR put tightly managed floats under intermediate and other managed floats in the flexible corner. In the earlier version of this paper we adopted an alternative strategy of assigning both of these categories under managed floats and found that this made a substantial difference in the estimates. This led us to separating all three categories. We discovered that for the total sample, other managed floats had substantially lower crisis probabilities than independent floating (regressions (5)-(6) tables 3a-3b).

However, when we compare the probabilities of crises between independently floats and other intermediate regimes (e.g. crawls and tightly managed floats), we do not find that the differences are statistically significant at the conventional level for the total sample and each country group (regression 6 tables 3a-3b). By using our six groupings of exchange rate regimes, we can explain why BOR found that the probability of crises under the floating corner is substantially lower than under the intermediate regimes (e.g. tightly managed floats). This is simply because they combine both other managed floating and independent floating regimes in one category. By assessing the probability of crises separately for these three categories, we find that independent floats could be as crisis prone as tightly managed floats, which is not consistent with BOR's finding of the two corners hypothesis.

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<sup>20</sup> However, these differences in crisis probabilities between hard pegs and other regimes are not statistically significant, except for the one with adjustable parities (regression (1), table 3a). The p-value is registered at 0.015.

### *1.5.3 The Probability of Currency Crises Under Various Exchange Rate Regimes Using GH Crisis Measures*

Consistent with the “unstable middle” hypothesis, the results in regressions (2)-(3) in table 4 indicate that adjustable parities are associated with the probability of crises of 10.4 percent higher than that of crawling pegs/bands. The results also confirm that other managed floats are less crisis prone than both tightly managed and independently floating regimes (regressions (4)-(6)).

We do find some substantial differences from the results using the GH crisis measures for a sample of emerging market economies<sup>21</sup>, however. One interesting finding is that in general currency crises are more likely to occur under the more flexible end of spectrum than the fixed end. For example, both tightly managed floating and independent floating are associated with higher probability of crises than adjustable parities and crawling pegs/bands (regressions (8), table 4).<sup>22</sup> This may be partially due to their relatively premature and less-developed financial market, as well as their much larger and volatile capability flow as compared with industrial countries, which is consistent with what Calvo and Reinhart (2000) called “fear of floating” behavior.

We retest tables 2-4 by excluding the crisis observations following the first crisis year to check whether the results are affected by the simultaneous bias when a crisis lasts more than one year. We do not find a significant difference in our results. In BOR study, they construct the exchange market pressure indices and identify the years of currency crises only when it starts; therefore, this test does not affect our results. In GH study, they use two-year crisis window criteria in dating currency crises, and by excluding crisis

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<sup>21</sup> We do not report the results for both industrial countries and developing countries as the total observations dramatically reduced when using GH’s crisis measure.

<sup>22</sup> The probability values of these differences vary from 0.15-0.43.

years after the onset of crises, it leads to a slightly change in the results. However, this difference is only marginal.

## **1.6. Robustness Checks**

### *1.6.1 The Probability of Currency Crises Using A Pooled Precision Weight Index*

Given the fact that we found there is a substantial difference in the probability of crises when using BOR and GH's crisis measures for the emerging countries, we therefore re-estimated our model with an alternative crisis index, i.e. a pooled precision weighted index. The results are presented in table 5 for both all countries and emerging market economies. As shown in regression (2) and (8) in table 5, we find that tightly managed floats are more crisis prone than adjustable parities (7.0 percent for all countries and 14.6 percent for emerging markets). However, this difference in the probabilities is not statistically significant at any conventional levels. On the other hand, adjustable parities are more likely to cause a crisis when comparing with hard pegs (18.2 percent), crawls (3.8 percent), other managed floats (13.1 percent) and independent floats (5.9 percent) in the case of all countries, as presented in regression (2) table 5. This result is statistically significant at the conventional level. In general, our findings are stable across different crisis indices and are consistent with the narrow form of the “unstable middle” hypothesis.

When we compare the crisis probabilities between the two corner regimes and various types of intermediate regimes, again, we do not find support for the strong form of the “two corners” hypothesis. Although hard pegs are associated with the lowest probabilities of crises, other managed floats have lower probability of crises than

independent floats. This can be seen from regression (1) table 5. The probability of crises for hard pegs is 18.2 percent lower than adjustable parities, 14.4 percent lower than crawls, 25.2 percent lower than tightly managed floats, and 5.1 percent lower than other managed floats. On the other hand, as shown in regression (5) in table 5, other managed floats present lower probability of crises than independent floats by 7.2 percent, which is statistically significant at 10 percent level ( $p$ -value = 0.101).

Overall, our results of using different crisis indices are consistent with the findings in the previous section, that is, adjustable parities are highly prone to currency crises. In terms of middle regimes, the probabilities of crises under crawls are slightly higher than independent floats by 2 percent as shown in regression (6) in table 5. The narrow form of the “unstable middle” hypothesis is supported from using different crisis measures.

### *1.6.2 The Probability of Currency Crises Using Alternative Measures of Exchange Rate Regimes*

To test whether our results are stable across various measures of exchange rate regimes, we use Reinhart and Rogoff (thereafter R-R), Levy-Yeyati and Sturzenegger (thereafter LY-S), and a four-way regime classification based on BOR’s data and re-estimates our models. The empirical results are presented in table 6a-6b, table 7, and table 8, respectively. The general results from using R-R regime are that middle regimes such as adjustable parities, crawls, and moving bands are relatively prone to crises, while managed floats have the lowest probability of crises among intermediate regimes. This is consistent with the ‘unstable middle’ hypothesis. Another interesting finding is that

freely falling is associated with the highest probability of currency crises and this result is statistically significant except for moving bands ( $p$ -value = 0.295 in regression (4)). For instance, in regression (1) to (6), freely falling continuously has higher probability of crises than hard pegs, adjustable parities, crawls, moving bands, managed floats, and freely floats by 15.2 percent, 9.7 percent, 9.5 percent, 6.4 percent, 13.1 percent, and 10.7 percent, respectively.<sup>23</sup> This suggests that freely floating regime is not crisis free.

Countries with high inflation should seriously consider move away from freely floating regime. This distinction between high inflation floating regimes and low inflation floating regimes is essential and very useful because of the economic distortions introduced by the former.

Unfortunately, when we turn to LY-S classification, we do not find any significant result in explaining the correlation between exchange rate regimes and currency crises. A possible explanation for that is the problem of the “inconclusive” category of their regime classification. LY-S define the exchange rate regimes into five groups: fixed, crawling peg, dirty float, flexible, and inconclusive according to the behavior of average percentage changes in the nominal exchange rate, the volatility of exchange rate changes, and the volatility of foreign reserve changes. Countries that do not exhibit “significant” variability in either variable are classified as inconclusive, and it decreases the size and the variance in our dataset. Further research on LY-S exchange rate regimes is required for the future study.

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<sup>23</sup> Countries that are classified as freely falling regime are Argentina, Belarus, Brazil, Bulgaria, Ecuador, Finland, Georgia, Ghana, Indonesia, Italy, Kazakhstan, Kenya, Lebanon, Lithuania, Macedonia, Mexico, Nigeria, Paraguay, Peru, Philippines, Poland, Romania, Russia, Slovenia, Tanzania, Thailand, Turkey, Ukraine, Uruguay, Venezuela, and Zimbabwe. Among them, only Belarus (1997-1998), Bulgaria (1991, 1994, 1996), Ecuador (1992), Finland (1991,1992), Kazakhstan (1994), Kenya (1993), Nigeria (1992, 1995), Peru (1992), Poland (1992), Romania (1997, 1998), Slovenia (1993), Tanzania (1993), Turkey (1994), Ukraine (1994), Venezuela (1994, 1995) had experienced currency crises.

When we turn to BOR's new four-way classification scheme, as shown in table 8 regression (2) and (6), we find that adjustable parities are associated with a higher probability of crises than hard pegs, other intermediates, and floats (12.8 percent, 4.9 percent, and 10.1 percent in regression (2); 8.8 percent, 3.5 percent, and 11 percent in regression (6)). These results are statistically significant for both all countries and emerging market economies. In addition, both polar regimes are less prone to the crises than the middle regimes. This is in general consistent with the "unstable middle" hypothesis, as we have expected.

### **1.7. Concluding Remarks**

We have argued in this paper that whether countries need to move to one of the polar regimes in order to substantially reduce the likelihood of currency crises has to be approached carefully by taking into account different measures of crises and the breakdown of exchange rate regimes. In this paper, we do not find evidence supporting the strongest form of the two corners hypothesis, but we do find strong evidence for the unstable middle hypothesis. Our empirical investigation showed that the dead center of the spectrum of exchange rate regimes, adjustable parities (including conventional adjustable pegs and horizontal bands) is by far the most crisis prone type of regimes. This finding holds up across all countries using BOR, GH and our own crisis measures, and for the group of emerging market countries using BOR and our own crisis measures. It becomes less relevant when it comes to the group of industrial countries and developing countries. Furthermore, we find the probability of currency crises varies substantially across different types of intermediate regimes. In particular, other managed floats are

consistently associated with the lowest probability of crises as compared with tightly managed floats and independent floats.

This result contradicts our general theoretical expectation that exchange rate regimes with more flexibility are presumably to be associated with a lesser likelihood of currency crises, and certainly contradicts an implication of the two corners hypothesis that the incidence of crises should fall as one moves closer to the corners. One possibility of course is that a disproportionate number of highly unstable countries adopt independent rather than managed floats and that our limited number of control variables does not adequately deal with this selection bias issue. It is also possible that the IMF distinctions across this set of categories may have problems. In particular Reinhart and Rogoff's distinctions between floating and freely falling regimes may prove useful for explaining the higher incidence of crises under BOR's independent float category (see Willett et al 2004).

We should emphasize that while we believe that our extension of BOR's pioneering work is informative, the gross correlations between frequency of crises and exchange rate regimes does not necessarily imply causation running from the currency regime to crises. There are many sources of currency crises and we must attempt to control for the most important of these before we can have confidence in our judgments about the crisis proneness of different types of currency regimes. For example, while these pegged regimes are generally considered to have been major contributors to the currency crises in the Philippines and Thailand, the rupiah was not obviously overvalued before the Indonesian crisis and there is considerable disagreement about whether the won was substantially overvalued before the Korean crisis. Emphasis on other

determinants of currency crises (especially for political considerations such as the effect of political institutions on currency crises) and their interactions with exchange rate regimes is an important area for future research.<sup>24</sup>

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<sup>24</sup> Preliminary results along these lines for the Asian crisis are presented in Willett et al (2004).

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**Table 1. The Frequency of Currency Crises of Various Exchange Rate Regimes**

	BOR's crisis dates			(4) GH's crisis dates	(5) Our Own crisis dates
	(1) Original All countries	(2) Replicated BOR All countries	(3) Sample of 90 Countries	Sample of 90 Countries	Sample of 90 Countries
1. Dollarization	0.00	0.00	0.00	14.29 <sup>#</sup>	0.00
2. Currency Union	4.80	5.16	5.00	14.29 <sup>#</sup>	4.76
3. Currency Board	6.60	7.89	4.88	0.00 <sup>#</sup>	5.88
<b>I. BOR Hard peg regimes (1-3)</b>	<b>4.92</b>	<b>5.20</b>	<b>4.26</b>	<b>10.00</b>	<b>4.04</b>
4. Conventional fixed peg to a single currency	18.48	11.63	8.96	6.67	9.86
5. Conventional fixed peg to a basket	16.92	16.02	18.64	23.08	19.35
6. Horizontal band	15.12	16.06	16.51	24.07	15.52
<b>II. Adjustable parities (4-6)</b>	-	-	<b>13.58</b>	<b>19.51</b>	<b>13.75</b>
7. Forward looking crawling peg	14.16	11.11	14.29	0.00 <sup>#</sup>	14.29
8. Backward looking crawling peg	14.16	16.09	9.26	18.18	9.26
9. Forward looking crawling band	8.40	8.47	14.75	8.11	14.46
10. Backward looking crawling band	17.28	13.64	13.64	14.29	14.75
<b>III. Crawls (7-10)</b>	-	<b>12.68</b>	<b>12.79</b>	<b>10.59</b>	<b>12.79</b>
IV. 11. Tightly managed floats	12.48	12.17	10.98	13.04	11.25
<b>BOR intermediate regimes (4-11)</b>	<b>15.60</b>	<b>13.41</b>	<b>11.69</b>	<b>14.96</b>	<b>13.04</b>
<b>V. 12. Other managed floats</b>	<b>7.92</b>	<b>7.73</b>	<b>3.57</b>	<b>14.29</b>	<b>4.10</b>
<b>VI. 13. Independent floating</b>	<b>9.36</b>	<b>7.97</b>	<b>8.46</b>	<b>13.04</b>	<b>7.80</b>
<b>BOR other floating (12-13)</b>	<b>8.64</b>	<b>7.85</b>	<b>6.20</b>	<b>13.64</b>	<b>6.08</b>

Note: BOR's regime classifications: I. Hard pegs = regimes 1-3; II. Intermediate regimes = regimes 4-11; III. Other floating = regimes 12-13. Our new grouping: I. Hard pegs = regimes 1-3; II. Adjustable parities = regimes 4-6; III. Crawling pegs and bands = regimes 7-10; IV. Tightly Managed Floats = regime 11; V. Other Managed Floats = regimes 12. VI. Independent Floating = regime 13.

<sup>#</sup> Indicates that observations of exchange rate regimes adopted by countries are fewer than 15.

**Table 2 The Probabilities of Currency Crises Using BOR Crisis Measures for All Countries**

Method: Logit Regressions; the dependent variable is BOR's Currency Crisis Dummy

	(1)		(2)		(3)	
	Coefficients	Prob. of Crises	Coefficients	Prob. of Crises	Coefficients	Prob. of Crises
Adjustable parities (constant)	-1.851** (0.000)	0.136	-2.141** (0.032)	0.153	-0.962 (0.875)	0.308
Hard pegs $t_{-1}$	-1.263** (0.019)	0.043	-1.345* (0.114)	0.045	-4.091** (0.038)	0.003
Crawls $t_{-1}$	-0.069 (0.809)	0.128	-0.531* (0.121)	0.096	-1.271* (0.070)	0.111
Tightly Managed $t_{-1}$	-0.242 (0.536)	0.110	-0.291 (0.555)	0.119	-1.426* (0.073)	0.096
Other Managed $t_{-1}$	-1.445** (0.007)	0.036	-1.989** (0.009)	0.024	-3.279** (0.001)	0.017
Independent Floats $t_{-1}$	-0.530* (0.138)	0.085	-0.725* (0.072)	0.080	-1.998** (0.005)	0.057
M2/Reserve $t_{-1}$			0.007** (0.011)		0.001 (0.926)	
Lending boom $t_{-1}$			0.001 (0.356)		0.000 (0.982)	
CA (% of GDP) $t_{-1}$			-0.101** (0.002)		-0.150** (0.003)	
REER $t_{-1}$			0.002 (0.230)		0.005* (0.072)	
No. of obs.	892		628		507	
Wald Chi-Square Test	13.04		22.23		57.56	
Prob > Chi-Square	0.023		0.0082		0.529	
Pseudo R2	0.0283		0.0738		0.145	
Log-Likelihood	-285.58		-197.496		-169.178	
Fixed Effect?	No		No		Yes	

\*\* , \* indicates the significance level of 5% and 15%. The numbers in parentheses are the probability values.

The Logit model is estimated by regressing the crisis dummy on the dummies of Hard Pegs, Crawls, Tightly Managed Floats, Other Managed Floats, and Floats. The "Coefficients" column reports the estimated coefficients from the logit model. The "Probability of Crises" column reports the predicted probability that currency crises occur (the crisis dummy = 1) under each exchange rate regime. For example, the regression (1) predicts that on average the probability of crises will be equal to 13.34% per year, if a country adopts adjustable parities. The marginal effect can be also read from the latter column, e.g. if a country changes a regime from Adjustable Parities to Hard Pegs, the probability of crises is statistically significantly decreased by 9.1% per year (=13.34% - 4.23%).

**Table 3 The Differences in the Probabilities of Currency Crises using BOR Crisis Measures**

Method: Logit Regressions (report marginal effects); the dependent variable is BOR's Currency Crisis Dummy

Table 3a: all countries and separate regression for industrial countries

	All Countries						Industrial Countries			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Hard pegs <sub>t-1</sub>		-0.108** 0.015	-0.051 0.242	-0.074 0.210	0.021 0.607	-0.035 0.409	-	-	-	-
Adjustable parities <sub>t-1</sub>	0.108** 0.015		0.057* 0.111	0.034 0.527	0.129** 0.000	0.072** 0.050		-0.109 0.474	0.074 0.169	0.063* 0.119
Crawls <sub>t-1</sub>	0.051 0.242	-0.057* 0.111		-0.023 0.660	0.072** 0.013	0.016 0.657	0.109 0.474		0.183 0.229	0.171 0.247
Tightly Managed <sub>t-1</sub>	0.074 0.210	-0.034 0.527	0.023 0.660		0.095* 0.054	0.038 0.480	-	-	-	-
Other Managed <sub>t-1</sub>	-0.021 0.607	-0.129** 0.000	-0.072** 0.013	-0.095* 0.054		-0.056* 0.073	-0.074 0.169	-0.183 0.229		-0.012 0.809
Independently Floats <sub>t-1</sub>	0.035 0.409	-0.072** 0.050	-0.016 0.657	-0.038 0.480	0.056* 0.073		-0.063* 0.119	-0.171 0.247	0.012 0.809	
M2/Reserve <sub>t-1</sub>	0.000 0.451	0.001 0.540	0.001 0.549	0.001 0.557	0.000 0.596	0.000 0.539	0.002 0.575	0.003 0.590	0.001 0.582	0.001 0.588
Lending boom <sub>t-1</sub>	0.000 0.462	0.000 0.349	0.000 0.367	0.000 0.382	0.000 0.440	0.000 0.367	0.000 0.428	0.000 0.463	0.000 0.540	0.000 0.475
CA (% of GDP) <sub>t-1</sub>	-0.004 0.187	-0.013** 0.003	-0.009** 0.004	-0.011** 0.019	-0.002 0.186	-0.007 0.019	-0.013 0.120	-0.021 0.132	-0.005 0.324	-0.007 0.129
REER <sub>t-1</sub>	0.000 0.819	0.000 0.816	0.000 0.817	0.000 0.811	0.000 0.812	0.000 0.817	0.005 0.020	0.009 0.149	0.002 0.294	0.003 0.041
No. of obs.	628	628	628	628	628	628	205	205	205	205
Wald Chi-Square Test	22.23	22.23	22.23	22.23	22.23	22.23	13.48	13.48	13.48	13.48
Prob > Chi-Square	0.0082	0.0082	0.0082	0.0082	0.0082	0.0082	0.0613	0.0613	0.0613	0.0613
Pseudo R2	0.0738	0.0738	0.0738	0.0738	0.0738	0.0738	0.1346	0.1346	0.1346	0.1346
Log-Likelihood	-197.496	-197.496	-197.496	197.496	-197.496	197.496	-64.050	-64.050	-64.050	-64.050

\*\* , \* indicates the significance level of 5% and 15%. The numbers in parentheses are the probability values.

# Countries that adopt hard pegs do not result in crises in our sample. Similarly, countries such as Norway that use tightly managed floats do not end up with crises.

+ Only Greece and Portugal adopted crawling regimes over sample period.

Table 3b: separate regression for emerging market economies and developing countries

	Emerging Market Economies						Developing Countries					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Hard pegs <sub>t-1</sub>		-0.087	-0.041	-0.083	0.043	-0.018		-0.039	-0.071	-0.035	-0.011	-0.018
		0.222	0.511	0.352	0.443	0.795		0.549	0.324	0.649	0.890	0.833
Adjustable parities <sub>t-1</sub>	0.087		0.046	0.004	0.130**	0.069	0.039		-0.032	0.004	0.028	0.021
	0.222		0.387	0.953	0.005	0.261	0.549		0.611	0.956	0.712	0.792
Crawls <sub>t-1</sub>	0.041	-0.046		-0.041	0.085**	0.023	0.071	0.032		0.036	0.060	0.053
	0.511	0.387		0.563	0.007	0.661	0.324	0.611		0.645	0.466	0.535
Tightly Managed <sub>t-1</sub>	0.083	-0.004	0.041		0.126*	0.064	0.035	-0.004	-0.036		0.024	0.017
	0.352	0.953	0.563		0.060	0.423	0.649	0.956	0.645		0.777	0.857
Other Managed <sub>t-1</sub>	-0.043	-0.130**	-0.085**	-0.126*		-0.062	0.011	-0.028	-0.060	-0.024		-0.007
	0.443	0.005	0.007	0.060		0.188	0.890	0.712	0.466	0.777		0.941
Independently Floats <sub>t-1</sub>	0.018	-0.069	-0.023	-0.064	0.062		0.018	-0.021	-0.053	-0.017	0.007	
	0.795	0.261	0.661	0.423	0.188		0.833	0.792	0.535	0.857	0.941	
M2/Reserve <sub>t-1</sub>	0.003	0.007	0.005	0.007	0.001	0.004	0.000	0.000	0.001	0.000	0.000	0.000
	0.448	0.221	0.266	0.193	0.450	0.303	0.702	0.746	0.745	0.746	0.753	0.756
Lending boom <sub>t-1</sub>	0.024	0.056	0.040	0.055	0.006	0.032	0.000	0.000*	0.000	0.000	0.000	0.000
	0.576	0.519	0.548	0.558	0.617	0.556	0.310	0.083	0.171	0.270	0.211	0.334
CA (% of GDP) <sub>t-1</sub>	-0.006	-0.014**	-0.010**	-0.014**	-0.002	-0.008*	-0.003	-0.005*	-0.006	-0.005	-0.003	-0.004
	0.331	0.034	0.043	0.045	0.297	0.142	0.353	0.108	0.174	0.339	0.421	0.366
REER <sub>t-1</sub>	0.000	-0.001	-0.001	-0.001	0.000	0.000						
	0.594	0.553	0.549	0.584	0.636	0.538						
No. of obs.	321	321	321	321	321	321	184	184	184	184	184	184
Wald Chi-Square Test	22.97	22.97	22.97	22.97	22.97	22.97	5.74	5.74	5.74	5.74	5.74	5.74
Prob > Chi-Square	0.0063	0.0063	0.0063	0.0063	0.0063	0.0063	0.6759	0.6759	0.6759	0.6759	0.6759	0.6759
Pseudo R2	0.0932	0.0932	0.0932	0.0932	0.0932	0.0932	0.0305	0.0305	0.0305	0.0305	0.0305	0.0305
Log-Likelihood	-98.351	-98.351	-98.351	-98.351	-98.351	-98.351	-57.135	-57.135	-57.135	-57.135	-57.135	-57.135

\*\*, \* indicates the significance level of 5% and 15%. The numbers in parentheses are the probability values

# Coefficients on REER are dropped due to a large number of observations are missing for developing countries.

**Table 4 The Differences in the Probabilities of Currency Crises using GH's Crisis Measures**  
Method: Logit Regressions (report marginal effects)

	GH Currency Crisis Measures						Emerging Market Economies					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Hard pegs $t_{-1}$		-0.120*	-0.016	-0.125	0.016	-0.078	-	-	-	-	-	-
		0.065	0.786	0.195	0.798	0.287						
Adjustable parities $t_{-1}$	0.120*		0.104**	-0.005	0.135**	0.042		-0.020	-0.210	0.027	-0.191	-
	0.065		0.033	0.956	0.005	0.535		0.739	0.156	0.648	0.361	-
Crawls $t_{-1}$	0.016	-0.104**		-0.109	0.032	-0.062	0.020		-0.190	0.046	-0.172	-
	0.786	0.033		0.180	0.389	0.314	0.739		0.212	0.456	0.427	-
Tightly Managed $t_{-1}$	0.125	0.005	0.109		0.140*	0.046	0.210	0.190		0.236*	0.018	-
	0.195	0.956	0.180		0.084	0.629	0.156	0.212		0.122	0.947	-
Other Managed $t_{-1}$	-0.016	-0.135**	-0.032	-0.140*		-0.094*	-0.027	-0.046	-0.236*		-0.218	-
	0.798	0.005	0.389	0.084		0.130	0.648	0.456	0.122		0.305	-
Independently Floats $t_{-1}$	0.078	-0.042	0.062	-0.046	0.094*		0.191	0.172	-0.018	0.218		-
	0.287	0.535	0.314	0.629	0.130		0.361	0.427	0.947	0.305		-
M2/Reserve $t_{-1}$	0.000	-0.001	-0.001	-0.001	0.000	-0.001	0.004	0.005	0.011	0.003	0.010	-
	0.551	0.476	0.461	0.453	0.477	0.494	0.201	0.299	0.270	0.351	0.222	-
Lending boom $t_{-1}$	0.000	0.000	0.000	0.000	0.000	0.000	0.091	0.108	0.234	0.066	0.225	-
	0.433	0.291	0.331	0.327	0.388	0.289	0.340	0.362	0.279	0.429	0.392	-
CA (% of GDP) $t_{-1}$	-0.008	-0.023**	-0.011**	-0.023**	-0.006	-0.018**	-0.013**	-0.016**	-0.034*	-0.010*	-0.033**	-
	0.231	0.002	0.016	0.030	0.113	0.030	0.039	0.049	0.066	0.136	0.032	-
REER $t_{-1}$	0.001	0.003**	0.001**	0.003*	0.001*	0.002*	-0.001	-0.001	-0.002	0.000	-0.002	-
	0.349	0.046	0.048	0.058	0.147	0.083	0.505	0.524	0.546	0.532	0.497	-
No. of obs.	297	297	297	297	297	297	141	141	141	141	141	-
Wald Chi-Square Test	20.65	20.65	20.65	20.65	20.65	20.65	14.13	14.13	14.13	14.13	14.13	-
Prob > Chi-Square	0.0143	0.0143	0.0143	0.0143	0.0143	0.0143	0.0785	0.0785	0.0785	0.0785	0.0785	-
Pseudo R2	0.1049	0.1049	0.1049	0.1049	0.1049	0.1049	0.1117	0.1117	0.1117	0.1117	0.1117	-
Log-Likelihood	-106.72	-106.72	-106.72	-106.72	-106.72	-106.72	-52.71	-52.71	-52.71	-52.71	-52.71	-

**Table 5. The Differences in the Probabilities of Currency Crises Using a Pooled Precision Crisis Index**

Method: Logit Regressions (report marginal effects); the dependent variable is a currency crisis dummy, which equal to one if the exchange market pressure index (EMP) is greater than two standard deviation of the mean. The crisis window is 12 months. The EMP is constructed from the weighted average of the percentage change in exchange rate, the percentage change in reserve, and change in interest rate.

	All Countries						Emerging Market Economies				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Hard pegs $t_{-1}$		-0.182**	-0.144**	-0.252**	-0.051*	-0.123**	-	-	-	-	-
		0.000	0.001	0.000	0.162	0.001					
Adjustable parities $t_{-1}$	0.182**		0.038	-0.070	0.131**	0.059*	-0.090*	-0.146**	0.007	0.017	
	0.000		0.382	0.299	0.001	0.102	0.077	0.046	0.874	0.736	
Crawls $t_{-1}$	0.144**	-0.038		-0.109*	0.092**	0.020	0.090*	-0.056	0.096**	0.106**	
	0.001	0.382		0.114	0.037	0.668	0.077	0.458	0.041	0.040	
Tightly Managed $t_{-1}$	0.252**	0.070	0.109*		0.201**	0.129*	0.146**	0.056		0.153**	0.163**
	0.000	0.299	0.114		0.003	0.066	0.046	0.458		0.033	0.040
Other Managed $t_{-1}$	0.051*	-0.131**	-0.092**	-0.201**		-0.072*	-0.007	-0.096**	-0.153**		0.010
	0.162	0.001	0.037	0.003		0.101	0.874	0.041	0.033		0.836
Independently Floats $t_{-1}$	0.123**	-0.059*	-0.020	-0.129*	0.072*		-0.017	-0.106**	-0.163**	-0.010	
	0.001	0.172	0.668	0.066	0.101		0.736	0.040	0.040	0.836	
M2/Reserve $t_{-1}$	0.000*	0.002*	0.002*	0.003*	0.001*	0.002*	0.003*	0.006*	0.008*	0.003*	0.002
	0.274	0.245	0.268	0.256	0.298	0.242	0.279	0.285	0.262	0.269	0.383
Lending boom $t_{-1}$	0.000	0.000	0.000	0.000	0.000	0.000	0.076*	0.152*	0.190*	0.069*	0.059*
	0.899	0.901	0.900	0.900	0.901	0.901	0.086	0.142	0.141	0.127	0.287
CA (% of GDP) $t_{-1}$	0.000	-0.001	0.000	-0.001	0.000	0.000	-0.002	-0.005	-0.006	-0.002	-0.002
	0.632	0.516	0.518	0.517	0.528	0.522	0.330	0.334	0.342	0.332	0.401
REER $t_{-1}$	0.000	0.004**	0.003**	0.005**	0.002**	0.003**	0.001*	0.002*	0.003**	0.001*	0.001*
	0.493	0.002	0.003	0.002	0.033	0.006	0.112	0.066	0.039	0.060	0.238
No. of obs.	604	604	604	604	604	604	303	303	303	303	303
Wald Chi-Square Test	21.88	21.88	21.88	21.88	21.88	21.88	17.96	17.96	17.96	17.96	17.96
Prob > Chi-Square	0.0093	0.0093	0.0093	0.0093	0.0093	0.0093	0.0216	0.0216	0.0216	0.0216	0.0216
Pseudo R2	0.0691	0.0691	0.0691	0.0691	0.0691	0.0691	0.0881	0.0881	0.0881	0.0881	0.0881
Log-Likelihood	-249.30	-249.30	-249.30	-249.30	-249.30	-249.30	-107.82	-107.82	-107.82	-107.82	-107.82

\*\* , \* indicates the significance level of 5% and 15%. The numbers in parentheses are the probability values.

**Table 6a. The Differences in the Probabilities of Currency Crises using R-R Regime Classification for All Countries**

	All Countries						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Hard pegs $t-1$		-0.054*	-0.056*	-0.088*	-0.021	-0.045	-0.152**
		0.102	0.103	0.067	0.523	0.432	0.004
Adjustable parities $t-1$	0.054*		-0.001	-0.033	0.033	0.009	-0.097**
	0.102		0.961	0.477	0.284	0.875	0.050
Crawls $t-1$	0.056*	0.001		-0.031	0.035	0.011	-0.095**
	0.103	0.961		0.498	0.285	0.859	0.045
Moving Bands $t-1$	0.088*	0.033	0.031		0.067*	0.043	-0.064
	0.067	0.477	0.498		0.151	0.544	0.295
Managed Floats $t-1$	0.021	-0.033	-0.035	-0.067*		-0.023	-0.131**
	0.523	0.284	0.285	0.151		0.705	0.010
Freely Floats $t-1$	0.045	-0.009	-0.011	-0.042	0.023		-0.107*
	0.432	0.875	0.859	0.544	0.705		0.010
Freely Falling $t-1$	0.152**	0.097**	0.095**	0.064	0.131**	0.107*	
	0.004	0.050	0.045	0.295	0.010	0.010	
M2/Reserve $t-1$	0.000	0.001	0.000	0.001	0.670	0.550	0.550
	0.900	0.538	0.491	0.510	0.505	0.586	0.586
Lending boom $t-1$	0.000**	0.000**	0.001**	0.000**	0.000**	0.000**	0.000**
	0.000	0.000	0.000	0.000	0.000	0.000	0.000
CA (% of GDP) $t-1$	-0.011**	-0.013**	-0.001**	-0.015**	-0.055**	-0.045**	-0.045**
	0.002	0.001	0.000	0.001	0.001	0.001	0.001
REER $t-1$	0.000	0.000	0.000	0.000	0.060	0.280	0.280
	0.771	0.867	0.791	0.810	0.955	0.776	0.776
No. of obs.	607	607	607	607	607	607	607
WaldChi-Square Test	62.59	62.59	62.59	62.59	62.59	62.59	62.59
Prob > Chi-Square	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Pseudo R2	0.0653	0.0653	0.0653	0.0653	0.0653	0.0653	0.0653
Log-Likelihood	-194.21	-194.21	-194.21	-194.21	-194.21	-194.21	-194.21

\*\* , \* indicates the significance level of 5% and 15%. The numbers in parentheses are the probability values.

**Table 6b. The Differences in the Probabilities of Currency Crises using R-R Regime for Emerging Countries**

	Emerging Market Economies						
	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Hard pegs $t-1$		-0.032 0.521	-0.024 0.505	-0.019 0.730	0.028 0.457	-0.079 0.384	-0.115** 0.045
Adjustable parities $t-1$	0.032 0.521		0.009 0.863	0.012 0.837	0.060 0.238	-0.048 0.602	-0.083 0.177
Crawls $t-1$	0.024 0.505	-0.009 0.863		0.004 0.937	0.051 0.128	-0.056 0.511	-0.092** 0.065
Moving Bands $t-1$	0.019 0.730	-0.012 0.837	-0.004 0.937		0.047 0.401	-0.060 0.551	-0.095* 0.124
Managed Floats $t-1$	-0.028 0.457	-0.060 0.238	-0.051 0.128	-0.047 0.401		-0.107 0.215	-0.143** 0.006
Freely Floats $t-1$	0.079 0.384	0.048 0.602	0.056 0.511	0.060 0.551	0.107 0.215		-0.035 0.690
Freely Falling $t-1$	0.115** 0.045	0.083 0.177	0.092* 0.065	0.095* 0.124	0.143** 0.006	0.035 0.690	0.048 0.423
M2/Reserve $t-1$	0.000 0.900	0.001 0.538	0.000 0.491	0.001 0.510	0.670 0.505	0.550 0.586	0.737 0.127
Lending boom $t-1$	0.012** 0.045	0.002** 0.012	0.001** 0.003	0.001** 0.001	0.002** 0.0243	0.001** 0.0146	0.012** 0.0129
CA (% of GDP) $t-1$	-0.011** 0.002	-0.013** 0.001	-0.001** 0.000	-0.015** 0.001	-0.055** 0.001	-0.045** 0.001	-0.003** 0.001
REER $t-1$	0.000 0.771	0.000 0.867	0.000 0.791	0.000 0.810	0.060 0.955	0.280 0.776	0.280 0.776
No. of obs.	319	319	319	319	319	319	319
WaldChi-Square Test	36.88	36.88	36.88	36.88	36.88	36.88	36.88
Prob > Chi-Square	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029
Pseudo R2	0.0754	0.0754	0.0754	0.0754	0.0754	0.0754	0.0754
Log-Likelihood	-98.95	-98.95	-98.95	-98.95	-98.95	-98.95	-98.95

\*\* , \* indicates the significance level of 5% and 15%. The numbers in parentheses are the probability values.

**Table 7. The Differences in the Probabilities of Currency Crises Using LY-S Regime Classification**  
Method: Logit Regressions (report marginal effects); the dependent variable is BOR's Currency Crisis Dummy

	All Countries				Emerging Market Economies			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Fixed <sub>t-1</sub>		-0.960 0.338	-0.870 0.384	-0.920 0.368		-0.088** 0.018	-0.063* 0.101	-0.052* 0.098
Crawls <sub>t-1</sub>	0.920 0.357		0.290 0.775	0.380 0.704	0.088* 0.071		0.059 0.265	0.070 0.170
Dirty Floats <sub>t-1</sub>	1.000 0.317	0.540 0.587		0.580 0.564	0.043 0.395	-0.003 0.947		0.026 0.627
Floats <sub>t-1</sub>	0.790 0.427	0.050 0.963	0.010 0.989		0.015 0.665	-0.033 0.405	-0.014 0.709	
M2/Reserve <sub>t-1</sub>	0.040 0.967	0.040 0.964	0.120 0.969	0.080 0.964	0.002 0.404	0.003 0.484	0.003 0.437	0.002 0.459
Lending boom <sub>t-1</sub>	5.360** 0.000	4.510** 0.000	3.640** 0.000	5.520** 0.000	0.024 0.432	0.022 0.672	0.020 0.658	0.022 0.559
CA (% of GDP) <sub>t-1</sub>	-4.320** 0.000	-4.030** 0.000	-3.260** 0.001	-4.390** 0.000	-0.008** 0.005	-0.013** 0.003	-0.011** 0.013	-0.010** 0.001
REER <sub>t-1</sub>	-0.570 0.569	-0.450 0.656	-0.440 0.657	-0.470 0.427	-0.001* 0.126	-0.001 0.299	-0.001 0.206	-0.001 0.161
No. of obs.	680	680	680	680	344	344	344	344
Wald Chi-Square Test	38.12	38.12	38.12	38.12	15.78	15.78	15.78	15.78
Prob > Chi-Square	0.0000	0.0000	0.0000	0.0000	0.0272	0.0272	0.0272	0.0272
Pseudo R2	0.0443	0.0443	0.0443	0.0443	0.0570	0.0570	0.0570	0.0570
Log-Likelihood	-221.56	-221.56	-221.56	-221.56	-110.74	-110.74	-110.74	-110.74

\*\* , \* indicates the significance level of 5% and 15%. The numbers in parentheses are the probability values.

**Table 8. The Differences in the Probabilities of Currency Crises Using Four-Way Classification of Regimes**  
Method: Logit Regressions (report marginal effects); the dependent variable is BOR's Currency Crisis Dummy

	All Countries				Emerging Market Economies			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Hard pegs $t_{-1}$		-0.128** 0.000	-0.080** 0.026	-0.027 0.360		-0.088* 0.214	-0.053 0.402	0.022 0.712
Adjustable parities $t_{-1}$	0.128** 0.000		0.049* 0.162	0.101** 0.001	0.088* 0.214		0.035 0.483	0.110** 0.017
Other Intermediate $t_{-1}$	0.080** 0.026	-0.049* 0.162		0.053 0.049	0.053 0.402	-0.035 0.483		0.075** 0.022
Floats $t_{-1}$	0.027 0.360	-0.101** 0.001	-0.053** 0.049		-0.022 0.712	-0.110** 0.017	-0.075** 0.022	
M2/Reserve $t_{-1}$	0.001* 0.183	0.003** 0.048	0.002* 0.068	0.001* 0.071	0.003 0.408	0.007* 0.150	0.006* 0.151	0.002* 0.208
Lending boom $t_{-1}$	0.000 0.548	0.000 0.391	0.000 0.405	0.000 0.411	0.023 0.585	0.053 0.534	0.042 0.563	0.015 0.565
CA (% of GDP) $t_{-1}$	-0.003 0.337	-0.015** 0.003	-0.011** 0.001	-0.006** 0.011	-0.006 0.339	-0.014** 0.048	-0.011** 0.033	-0.004* 0.111
REER $t_{-1}$	0.000 0.815	0.000 0.811	0.000 0.810	0.000 0.811	0.000 0.594	-0.001 0.550	-0.001 0.555	0.000 0.556
No. of obs.	618	618	618	618	321	321	321	321
Wald Chi-Square Test	23.87	23.87	23.87	23.87	12.98	12.98	12.98	12.98
Prob > Chi-Square	0.0012	0.0012	0.0012	0.0012	0.0725	0.0725	0.0725	0.0725
Pseudo R2	0.0809	0.0809	0.0809	0.0809	0.0785	0.0785	0.0785	0.0785
Log-Likelihood	-194.93	-194.93	-194.93	-194.93	-99.95	-99.95	-99.95	-99.95

\*\*, \* indicates the significance level of 5% and 15%. The numbers in parentheses are the probability values.

## Appendix I. Sample and Variable Descriptions

### 1. Sample Countries:

#### Sample for 21 Industrial countries

Australia	Finland	Italy	Norway	United Kingdom
Austria	France	Japan	Portugal	
Belgium	Greece	Kuwait	Spain	
Canada	Iceland	Netherlands	Sweden	
Denmark	Ireland	New Zealand	Switzerland	

#### Sample for 42 Emerging Market Economies:

Argentina	Ecuador	Kenya	Peru	Thailand
Bangladesh	Egypt	Korea	Philippines	Turkey
Botswana	Estonia	Latvia	Poland	Ukraine
Brazil	Hong Kong	Lithuania	Russia	Uruguay
Bulgaria	Hungary	Malaysia	Singapore	Venezuela
Chile	India	Mexico	Slovakia	Zimbabwe
China	Indonesia	Morocco	Slovenia	
Colombia	Israel	Nigeria	South Africa	
Czech Republic	Jordan	Pakistan	Sri Lanka	

#### Sample for 27 Developing Countries:

Algeria	Côte d'Ivoire	Lebanon	Romania	Uzbekistan
Bahrain	El Salvador	Macedonia, FYR	Saudi Arabia	Vietnam
Belarus	Ghana	Nepal	Syria	Yemen, Republic of
Bolivia	Georgia	Oman	Tanzania	
Cameroon	Iraq	Panama	Tunisia	
Costa Rica	Kazakhstan	Paraguay	United Arab Emirates	

## 2. Variable Descriptions

### Crisis Index

We use two types of crisis indices in this study. The first type is the crisis index constructed by BOR. They measured the speculative pressure in the exchange market based on the combination of a weighted average of monthly percentage change in exchange rate vis-à-vis the anchor country and monthly variation in percentage points in the domestic interest rate. Currency crises are identified if the EMP index exceeds three times standard deviations plus its country-specific sample mean.

The second type of crisis indices is constructed by Glick and Hutchison (1999). They measured the occurrence of currency crises based on exchange market pressure that looks at a weighted average of monthly real exchange rate changes and reserve loss. A crisis is identified when the EMP index exceeds two times country-specific standard deviation and country-specific mean.

### Exchange Rate Regimes

This paper uses Bubula and Okter-Robe's exchange rate regime classification, which is based on IMF *de facto* exchange rate regimes that covers all IMF members from 1990 to the end of 2001. Thirteen categories are provided: (1) dollarization, (2) currency unions, (3) currency boards, (4) conventional fixed peg to a single currency, (5) conventional fixed peg to a basket, (6) horizontal band, (7) forward looking crawling peg, (8) backward looking crawling peg, (9) forward looking crawling band, (10) backward looking crawling band, (11) tightly managed floating, (12) other managed floating with no predetermined exchange rate path, and (13) freely floating rates.

Based on this, we use a six-way classification in this paper including *hard pegs* (1-3), *soft pegs* (4-6), *crawls* (7-10), *tightly managed floats* (11), *other managed floats* (12), and *floats* (13).

Lending Boom: domestic credit growth as a percentage of GDP-the change in private lending to the banking sector from IFS line 32D.

M2/Reserve: the ratio of M2 over reserve from World Development Indicators (WDI).

CA/GDP: the ratio of current account balance over GDP from World Development Indicators (WDI).

REER: real effective exchange rate index. It is calculated from nominal effective exchange rate (a measure of the value of a currency against the weighted average of several foreign currencies) divided by a price deflator or index of costs. Data is obtained from both JP Morgan and World Development Indicators (WDI).

## Appendix II. Description of BOR’s exchange rate regime classifications

Classification Bucket	BOR	This paper
Exchange Regimes with another Currency as Legal Tender (Dollarization)	1	1
Exchange Regimes with No Separate Legal Tender (Currency Unions)	2	1
Currency Board Arrangements (CBAs)	3	1
Conventional Fixed Peg to a Single Currency	4	2
Conventional Fixed Peg to a Basket	5	2
Horizontal Bands	6	2
Forward looking Crawling Peg	7	3
Backward looking Crawling Peg	8	3
Forward looking Crawling Band	9	3
Backward looking Crawling Band	10	3
Tightly managed Floating	11	4
Other managed Floating	12	5
Independently Floating	13	6

**Note:** In their paper, Bubula and Otker-Robe (2003) categorized 1-3 as hard pegged regimes, 4-11 as intermediate regimes, and 12-13 as floating regimes. However, they compared the results between all pegged vs. all floating regimes, they did not count “tightly managed floating” as one of the pegged regimes. In other words, they defined 1-10 as pegged regimes as a whole and 11-13 as floating regimes.

### Appendix III BOR Definitions on Three Types of Floating Regimes

<p>Tight Managed Floating versus Other Managed Floating</p>	<p>The authorities influence exchange rate movements through active intervention to counter the long-term trend of the exchange rate, without specifying a predetermined exchange rate path, or without having a specific exchange rate target (“dirty floats”). Intervention may be direct or indirect. Indicators for managing the rate are broadly judgmental (e.g., balance of payments position, international reserves, parallel market developments), and adjustments may not be automatic.</p> <p>Distinction is made between “tightly managed floating” (where intervention takes the form of very tight monitoring that generally results in a stable exchange rate without having a clear exchange rate path, so as to permit the authorities an extra degree of flexibility in deciding the tactics to achieve a desired path) and “other managed floating” (where the exchange rate is influenced in a more ad hoc fashion)</p>
<p>Independently floating</p>	<p>The exchange rate is market determined; any foreign exchange intervention aims at moderating the rate of change and preventing undue fluctuations in the exchange rate that are not justified by economic fundamentals, rather than at establishing a level for the exchange rate. In these regimes, monetary policy is in principle independent of exchange rate policy.</p>