To Devalue or Not to Devalue?
The Political Economy of Exchange Rate Policy[*]

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Abstract

Speculative currency attacks are a regular feature of the international political economy. Nevertheless, not all speculative attacks result in a devalued currency. Between January 1985 and December 1998 in 90 emerging economies, there were 88 speculative attacks but only 42 of them resulted in devaluations. The remaining 46 attacks did not lead to devaluations because politicians were willing and able to defend the exchange rate peg. To understand the causes of speculative attacks and defenses I develop a model of strategic interaction between speculators in currency markets and policymakers in governments. I argue that both markets and governments are uncertain about the government's ability to defend the exchange rate once a speculative attack occurs. This model shows that speculative attacks occur when fundamentals are weak or when there is uncertainty about the capability and/or willingness of governments to defend the currency peg. I argue that policymakers respond to institutional, electoral and partisan incentives when deciding whether to defend or to devalue their exchange rate. I test hypotheses from this model empirically on a sample of 90 emerging economies using a bivariate probit model with sample selection.

Introduction

The growth of international capital markets poses important challenges for politicians in emerging economies. Consider the plight of policymakers attempting to maintain a fixed exchange rate: not only must they have access to sufficient foreign exchange reserves but they must also make sure that markets know their willingness to defend the value of the exchange rate. This is not an unfounded concern: attacks on currencies in Mexico (1994), Asia (1997), Russia (1998) and Brazil (1999) are but a few examples where speculators forced policymakers to abandon an exchange rate peg. What precipitates these speculative attacks?

Current models focus on a variety of casual factors to explain speculative attacks: poor economic fundamentals, contagious behavior in markets and/or anticipated alterations in economic policy. While instructive, these models downplay the fact that not all attacks result in a currency devaluation. That is, we know that attacks against the peso, baht, real, etc. resulted in the fall of pegged exchange rate regimes; however, we know very little about the conditions under which policymakers successfully defend their exchange rate peg. But it is evident that attacks on and defenses of pegged exchange rate regimes are far from unusual events. As seen in figure one (and table four), there were 88 speculative attacks in 90 emerging economies between January 1985 and December 1998. Of these 88 attacks, however, less than half resulted in the abandonment of a pegged exchange rate (42). In the other 46 attacks, policymakers were both willing and able to defend the currency peg.

[FIGURE ONE ABOUT HERE]

Defending a pegged exchange rate imposes a real burden on a country. First, borrowing to supplement foreign exchange reserves increases the public sector deficit (and can raise debt service requirements). Second, raising interest rates can cause an economic contraction and depress economic activity. This contraction could aggravate the fiscal situation by reducing tax revenues. Third, if mortgage or other private sector lending rates are tied to money market rates, defending an exchange rate via the interest rate can cause economic distress among key sectors of the population. Additionally, as demonstrated during the Asian financial crisis, interest rate hikes tend to destabilize an already weak banking system (Drazen 1999; Lahiri and Végh 2000). Finally, imposing controls on capital flows, even for a short period, can damage international economic credibility for the long term.

There exists a large literature attempting to explain speculative currency attacks. First generation model crisis models demonstrate that balance of payments crises occur when economic fundamentals deteriorate to a level that is inconsistent with maintenance of the currency peg (e.g., Krugman 1979). Recognizing weakness in fundamentals, speculators sell the currency and force a central bank with finite reserves to abandon the peg. Second generation crisis models (e.g., Obstfeld 1994, 1996) rely on self-fulfilling expectations to generate multiple equilibria when fundamentals are in a "zone of vulnerability." Speculators, in anticipation of a real or imagined devaluation, convert their holdings of domestic currency even if the central bank is not short of reserves. If enough economic agents behave similarly, the devaluation is self-fulfilling since the central bank will run short of reserves and be forced to devalue.

Unfortunately these models simplify politics. In first generation models politicians do not pursue policies to defend the peg. In second generation models, where expectations of a policy change play a role in causing the attack, it is not clear why policymakers would not alter their behavior to affect these expectations. A step in this direction is taken by new crisis models as characterized by Krugman: "A government – no longer a simple mechanism like that in the classical model, but rather an agent trying to minimize a loss function – must decide whether or not to defend an exogenously specified exchange rat parity" (1996, p.350).

What is the nature of the loss function that politicians are attempting to minimize? Put differently, if defending an exchange rate requires policymakers to implement policies that risk slowing down the economy, what determines their willingness to take such actions? A major problem with extant crisis literature is that it does not specify the origin of politicians' policy preferences. Models from this literature ignore the fact that the ability and willingness of policymakers in democratic countries to respond to economic shocks is shaped by political institutions, electoral concerns and constituent interests. These policymakers must balance these domestic political concerns with their desire to maintain a fixed exchange rate. However, even if government policymakers want to defend the exchange rate peg, it is not a certainty that they will be successful.

I argue that the behavior of markets and policymakers can be understood as strategic interaction under uncertainty[1]. Both markets and governments are uncertain

[1] In game-theoretic terms uncertainty refers to a situation where nature moves after a player has moved; that the players do not know the probability that their action will lead to a specific outcome. Substantively this means that neither the government nor markets know the probability that an attempt to defend the exchange rate peg will be successful.

about the government's ability to defend the exchange rate once a speculative attack occurs. If policymakers were always politically willing and able to defend the currency, then attacks would never occur. Markets would only attack a currency peg when they were certain that they could force a devaluation. Because markets and governments are uncertain about whether a defense will succeed we observe speculative attacks. I argue that the willingness of policymakers to defend an exchange rate peg is a function of institutional, partisan, and electoral factors. Institutional and economic factors also play a crucial role in determining whether an attempt at defending the peg will be successful.

The arguments in this paper are developed in the following three sections. The interaction between speculative markets and governments is developed in section two. Section two also derives from the theoretical literature testable hypotheses that help us to understand the kinds of factors/variable that influence policymaker's decisions to defend or devalue the exchange rate. These implications and hypotheses are tested on a panel of 90 emerging economies from January 1985 – December 1998 using monthly data. The data, variables and methodology, specifically a bivariate probit model with sample selection, and results are then discussed. Finally, section three concludes and offers suggestions for future research.

I. Attacks and Defenses: A Theoretical Model

Strategic Interaction with Uncertainty

Speculative attacks and defenses are the result of strategic interaction between two players: international financial markets (markets) and policymakers in government (government). This interaction is represented in figure two. For the purpose of this model, I assume that both markets and governments are unified actors.[2] At any point in

[2] The justification for this assumption is twofold. First, I do not identify a speculative attack as occurring when there is *any* speculative activity, but rather when the level of speculative activity exceeds the normal (mean) level by at least two standard deviations. As a result, attacks occur when the level of speculative activity is extraordinarily (abnormally) high. It is unlikely, even in the case of a large market player like George Soros, that this level of speculation can be achieved by a small segment of the market. Second, while there are multiple players within a government, I treat the decision about whether to abandon or defend the exchange rate peg as a unified decision. Differences and divisions within governments will affect that decision, but individual parties or groups cannot make decisions regarding the exchange rate independent of the government or monetary authority.

Morris and Shin (1997, 1998) and Drazen (1999) develop first and second generation currency crisis models where the focus is on incomplete information among market participants. In these models multiple equilibria are generated because market participants have different

time markets have two choices: they can launch a speculative attack against a currency peg in the hopes of forcing a devaluation or they can choose not to attack. If the currency is attacked, the government then has to decide whether to defend or to abandon the currency peg.[3] A government decision to defend the currency, however, does not guarantee success. Once a government decides to defend, there is an unknown probability that a defense will succeed. It is this probability—as represented by a move by nature—that makes this process decision making under uncertainty. The interaction between markets and governments has four outcomes: (i) status quo exchange rate parity; (ii) parity maintained; (iii) devaluation; and (iv) abandonment. These outcomes are examined in turn.

[FIGURE TWO ABOUT HERE]

Consider first the status quo exchange rate parity. Here the government fixes the exchange rate at some level vis-à-vis the dollar and markets decide not to attack.[4] While this outcome provides no benefit for markets, it imposes no cost. Governments, on the other hand, benefit (b) from the status quo exchange rate peg. This benefit may be due to any of the following: (i) the status quo exchange rate level helps maintain a balance between internal and external prices; (ii) a pegged exchange rate provides exchange rate stability important for cross border trade and financial transaction[5]; (iii) by limiting monetary expansion, the currency peg is a potential source of anti-inflationary discipline; and/or (iv) the peg is a visible source of credibility and a transparent signal to international capital (see Eichengreen, et al. 1998 and Leblang 1999 for a discussion). In addition, to be maintained, the status quo parity does not require that the government change economic policy or implement "heroic" measures.

The status quo parity is substantively different from the parity maintained outcome. This latter outcome occurs when governments successfully defend the

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estimates regarding the level of economic fundamentals. These papers, however, assume that governments are homogenous in their preferences. Because I want to focus on differences among governments and not within markets, I ignore market heterogeneity. Future work will attempt to identify the characteristics of governments (government policy) that provide complete or incomplete information to markets. That is, it would be quite beneficial to examine the kinds of political institutions, policies, decisions, etc. that provide clear (or muddled) signals to speculative markets.

[3] I further assume that these decisions made by markets and governments the discrete realization of some underlying continuous process. In practice, attacks and defenses occur with varying degrees of intensity. However, for ease of analysis I employ the discrete setup described here.

[4] I use the dollar as a referent because most emerging economies with fixed exchange rates peg their currency to the US dollar.

[5] See Willett (1998) for a discussion.

exchange rate against a speculative attack. Thus, while both the SQ parity and the maintained parity keep the exchange rate at existing levels, the maintained parity outcome requires the government to use active economic policy (e.g.,, interest rate policy) to prevent a devaluation. As noted above, defense of an exchange rate parity is not without cost. Thus, the payoff to governments from the maintained parity is the benefit (b) of the peg less the economic cost(s) (-e) required for defense. In addition, this outcome is different to markets because while the exchange rate is maintained, speculators incur a transaction cost (-t). This cost can result from (potentially very large) interest rate differences between the target currency and the dollar or it can be conceived of as opportunities lost because capital is tied up in a speculative attack.

The final two outcomes also appear similar but are substantively different.[6] Both the devaluation and abandonment outcomes result in a depreciated exchange rate (regardless of whether the rate now floats or remains pegged at a new level). I define a devaluation as a situation where markets attack the currency and governments try, unsuccessfully, to defend the currency. In this situation the government not only pays the economic costs (e) associated with an exchange rate defense, but they lose the political benefits (-b) associated with an exchange rate peg as well. An abandonment, on the other hand, occurs when the government abandons the exchange rate parity without putting up an active defense. Here the government loses the political benefits of pegging (-b) but does not incur any economic cost.

From the point of view of markets, the abandonment and devaluation outcomes have similar results.[7] In both cases markets make a gross profit (g) from selling domestic currency for dollars, forcing a devaluation/abandonment and then converting those dollars back into domestic assets. The profit from speculative activity in either outcome is the same: it is the difference between gross profits and transaction costs (g – t).

Preferences over outcomes for Markets are arranged as follows: Abandonment = Devaluation > Status Quo > Parity Maintained. Governments, on the other hand, have preferences that are ordered as: Status Quo > Parity Maintained > Abandonment > Devaluation.

[6] I discuss the difficulties of empirically differentiating these outcomes below.

[7] An interesting modification would be to model the degree of depreciation resulting from a devaluation/abandonment as a function of the degree of currency speculation.

In deriving implications from this model, first consider the interaction without any uncertainty; that is, assume that θ is known to both markets and government and takes on a value of only zero or one. If $\theta = 1$, then a decision by the government to defend the exchange rate will be successful and governments will defend the currency peg. Knowing that an attack will fail, markets will choose to not attack the currency and the status quo exchange rate parity will be maintained. If, on the other hand, $\theta = 0$, then, when faced with an attack, governments will abandon the exchange rate (as in Krugman 1979). It follows that markets will initiate an attack because they stand to profit from an abandonment. While straightforward, this model predicts that the only observed outcomes are the status quo (no attacks) and the abandonment of the exchange rate parity. There will be no defenses (either successful or unsuccessful). This conclusion is, however, both unsatisfying and unrealistic. What is the origin of failed attacks?

Obviously, successful and unsuccessful attacks are a function of both the probability that a defense will be successful as summarized by θ and the difference in magnitude between b and e for governments and between g and t for markets. In appendix one I derive optimal strategies for both markets and the government as a function of the cost of a defense (e). Equilibrium outcomes, however, depend upon values attached to the parameters b, e, t, g and θ. Rather than assume that all policymakers have identical preferences and that these preferences remain fixed over time, in the next section I examine the factors that influence the value of these parameters. I argue that the political costs and benefits of a pegged exchange to policymakers change during electoral periods and are also a function of the preferences of their constituents. Further, I argue that the key parameter θ can be partitioned into two parts: one that reflects the *economic* capacity of a government to defeat a speculative attack and one that taps into the government's *political* ability to wage a defense.

Discussion and Hypotheses

Given that preferences of politicians influence attacks and defenses, it is important to understand their origin and nature. In this section I derive hypotheses regarding (i) why markets attack, (ii) why politicians defend and (iii) why defenses are (un)successful.

In considering whether to attack a currency, speculators in markets consider their probability of success. This decision to initiate a speculative attack has received enormous theoretical and empirical attention. A large body of research considers the

economic factors that cause speculative attacks. First generation crisis models argue that expansionary monetary policy (excessive credit creation) leads to overvaluation, inflation and large external imbalances, all of which provoke a speculative attack. Empirical work focuses on weak or inconsistent fundamentals as reflected by the size of foreign exchange reserves and the growth of domestic credit (e.g., Blanco and Garber 1986; Calvo 1995). Research in the tradition of second generation models focuses on factors such as an overvalued real exchange rate (e.g., Kaminsky, Lizondo and Reinhart 1997), the composition of foreign debt (e.g., Frankel and Rose 1995), weakness of the domestic banking sector (e.g., Demirguc-Kunt and Detragiache 1997), a deficit in the capital account, and other external economic factors (e.g., Dooley 1998).

I summarize the state of the economy as a combination of factors deemed to be important by first and second generation currency crisis models (e.g., reserves, domestic credit, bank liquidity, real exchange rate valuation, components of external debt, etc) and denote it by ϕ. (A discussion of the variables comprising ϕ is contained in appendix three). If ϕ is close to zero, then the economy is "ripe" for a speculative attack. On the other hand, if ϕ is close to one then the economy is not in a vulnerable position.

> H_1: Speculative attacks are more likely when ϕ is close to zero than when ϕ is close to one.

Markets do not just respond to economic fundamentals, however. The stimulus for a speculative attack in first generation models is excessive creation of domestic credit. Second generation models argue that markets shift from one equilibria to another as a result of questions about the future of government policy. Both credit creation and potential changes in policy are functions of political processes.

Models of the political business cycle assume that politicians care about re-election and that voters judge incumbents based on the state of the economy (e.g., Nordhaus 1975; Alesina, Roubini and Cohen 1997). In the period leading to elections incumbents implement expansionary economic policies in an attempt to prime the pump and increase their probability or re-elections. An extension of the electoral cycle for exchange rate policy is that policymakers would prefer to increase income through a real appreciation of the currency (or at the very least delay a depreciation) prior to an election (Frieden 2000). This delay ultimately results in a depreciation that is more severe than the one that would have occurred earlier (Frieden 1999; Edwards and Naim 1997). If

markets anticipate a devaluation after an election then they will hedge their bets and begin to speculate even before an election takes place.

It is also the case that elections themselves generate tremendous uncertainty about the policy objectives of future policymakers. This uncertainty can, in turn, trigger currency speculation. Lobo and Tufte (1998) and Frieden (1999) show that exchange rate volatility is greater in the periods surrounding elections in OECD countries and Leblang and Bernhard (2000a) find that speculative behavior in parliamentary democracies increases as the likelihood of a change in government increases.[8]

Given politicians' incentives to use monetary policy prior to an election, the need to devalue after an election, and an overall increase in policy uncertainty surrounding an election, it is expected that speculative attacks will be more likely during these periods.

> H_2: Speculative attacks are more likely in periods surrounding elections than during other periods.

Once a speculative attack occurs, policymakers have to decide whether or not to defend the exchange rate. I argue that the preferences of policymakers are driven by three factors: the electoral motivations of policymakers, the interest of their constituents, and the type of existing electoral institutions. Before discussing these influences, however, it is essential to reiterate the assumption that policymakers gain (or risk losing) some political benefit (b) from maintaining (abandoning) the pegged exchange rate. Jeffry Sachs and colleagues summarize thinking about these benefits as follows: "governments that commit to a peg and then renege on the promise typically face costs—loss of pride, voter disapproval, maybe even removal from office—that need not be proportional to the size of the devaluation" (1996, p.8).

All things equal, then, policymakers would prefer not to abandon the exchange rate peg. The intensity of this preference (that is, the value of b) increases in the run up to an election. While politicians like to stimulate the economy prior to an election, they prefer to do so without abandoning the exchange rate peg. This is because the political costs associated with abandoning the exchange rate parity are magnified e.g., Bernhard 1998). The advantages of monetary expansion would have to be balanced against the

[8] On the other hand, Eichengreen, Rose and Wyploz (1995) find no relationship between elections and speculative attacks in OECD countries. To the best of my knowledge, no work to date has examined this relationship in emerging economies, although Frieden, et al (1999) do find that devaluations are more likely after an election.

economic costs of an economic contraction and the loss of credibility associated with a devaluation.

> H_3: Given a speculative attack, governments are more likely to defend the exchange rate the run-up to an election than during other periods.

Policymakers also respond constituent interests conceived of in sectoral and partisan terms. Sectoral interests differ with regard to their preferences over both the stability and the level of the exchange rate (e.g., Frieden 1991, 1994, 1997). Concern for sectoral interests, however, does not lead to sharp hypotheses regarding a policymaker's willingness to defend an exchange rate peg. Consider, for example, the interests of a policymaker from a country that is heavily export oriented[9]. On the one hand, there is an incentive to defend the exchange rate because a currency peg diminishes exchange rate variability which in turn promotes exports. On the other hand, abandoning the currency peg generally leads to a devaluation which makes exports more competitive both internationally and domestically. An export boom may help restore the external balance which may have been a factor leading to the speculative attack in the first place. Given a speculative attack, policymakers are likely to be less responsive to the former consideration than to the latter for two reasons. First, a currency peg many not be essential for exchange rate stability because that are a number of instruments available that allow traders to shield their currency exposure (e.g., forward markets). Second, given a crisis, policymakers in countries that are heavily export dependent may attempt a number of discrete devaluations to both appease the appetite of speculative markets and to increase exports.

> H_4: Given a speculative attack, as a country's degree of outward orientation increases the willingness of policymakers to defend the exchange rate will decrease.

Finally, the benefits accrued by governments from having a fixed exchange rate depend upon the extent to which policymakers and their constituents value international credibility and the capital "bought" with that credibility. One way to conceive of this benefit is by examining the partisan preferences of policymakers. The literature on

[9] Similar conclusions can be derived if one begins with the theory of optimal currency areas.

partisanship assumes that parties on the Left place more emphasis on employment and income distribution while parties on the Right are more concerned with fighting inflation and maintaining price stability (Alesina 1989; Hibbs 1987). The implication is that policymakers from Left parties will have little credibility with international financial markets and will face a greater risk of capital flight (Garrett 1998). As such, the political benefits (b) from having an exchange rate peg will be greater for governments of the left than for governments of the right. Right governments typically are less in need of international and domestic credibility brought by an exchange rate peg. Left governments have a greater need for that credibility and will thus be more likely to defend the peg.

> H_5: Given a speculative attack, Right governments are less likely to defend an exchange rate as compared to governments from Center or Left parties.

Aside from electoral and constituent incentives, policymakers also respond to institutional pressures. Consider the nature of electoral institutions. Countries with proportional representation (PR) electoral systems are more likely to give political voice to fringe and/or minority parties; these parties often become key players in governing coalitions. In addition, fragmented party systems allow increased competition among politicians for particularistic policies and lead to what has been described by Haggard and Kaufman (1992) as a "bidding war" for political support. Not only is expansionary monetary policy used in these "bidding wars," but it is also a key component in keeping coalition governments together (Roubini and Sachs 1989). As such, policymakers in countries with PR systems will be willing to defend the exchange rate peg because they prefer the monetary policy flexibility associated with a floating exchange rate peg (Leblang 1999).

> H_6: Given a speculative attack, policymakers in countries with proportional representation electoral institutions will be less likely to defend the exchange rate peg..

Even if the benefits to government of defending the exchange rate far exceed the costs (b>c), there is no guarantee that the defense will succeed. In fact, most of the

compelling stories about successful speculative attacks focus on government failures. For example, Britain tried but ultimately failed to keep the pound in the ERM in September of 1992 and lost over two billion pounds in the process. In December of 1994, the Mexican government supplemented their foreign exchange reserves with billions of borrowed dollars in a failed attempt to defend the peso. Similar stories can be told about events in Thailand, Indonesia, Brazil and scores of other countries. Thus, once the decision to defend has been made, the likelihood of a successful defense is unknown. It is possible, however, to identify a set of factors that influence θ; a set of factors that allow governments and markets to have better estimates of the probability of a successful defense. These factors play into the decision of governments to defend and markets to attack currencies. I separate factors influencing θ into economic and political components.

Extant literature from economics suggests three factors that are the key to waging an effective defense: foreign exchange reserves (and associated borrowing power), real interest rates, and capital controls. Reserves are already incorporated into the state of the economy as summarized by ϕ; if a country has large holdings of foreign exchange then speculators should be deterred. Second generation models, however, suggest that self-fulfilling crises occur even when reserves are not diminishing. Once an attack occurs, governments can defend the exchange rate up to (and often beyond) their holdings of foreign exchange reserves.

> H_7: Given a speculative attack, governments will be more likely to defend the exchange rate if they have larger foreign exchange reserves

Recent empirical (e.g., Kraay 1998) and theoretical models (e.g., Drazen 1999; Lahiri and Véigh 2000) examine the effectiveness of an interest rate defense. Kraay finds no empirical relationship between the level of interest rates and the outcome of a speculative attack. Drazen and Lahiri and Véigh, on the other hand, present models where interest rates induce speculators to hold domestic currency rather than converting to assets denominated in foreign currency. In Drazen's (1999) model, the largest volume of speculative activity is a result of domestic speculators and higher interest rates makes the cost of borrowing to engage in speculation more costly.

H_8: Given a speculative attack, higher interest rates make a successful defense more likely.

Capital controls are also a weapon in the arsenal of governments attempting to defend the exchange rate peg. Controls on the outflow of capital – even if imperfect – allow governments to buy some time to get their domestic policies in order. Countries that have a pegged exchange rate regime and desire monetary policy that diverges from that of the anchor country typically have capital controls (e.g., Leblang 1997). Note that I am not arguing that controls put in place once a crisis emerges are effective, but that countries that already have controls in place are better able to withstand a speculative attack (see Eichengreen 2000 for a discussion of the former strategy).

H_9: Given a speculative attack, the existence of capital controls makes a successful defense more likely.

Even if governments are willing to defend an exchange rate (as determined by b) and they have adequate foreign exchange reserves, higher interest rates and capital controls, there is no guarantee that a defense will be successful. This is because political institutions limit the ability of a government to effectively and rapidly respond to economic shocks.

While there are a variety of institutional arrangements that may influence exchange rate behavior, I am more interested in those institutions that effect policy responsiveness (see, for instance, Bernhard and Leblang 1999 and Freeman, Hays and Stix 2000 for other arguments). Policymakers in systems with divided governments have different incentives and face different constraints (e.g., Cox and McCubbins 2000). The literature on political institutions argues that presidential systems—because they are more likely to have divided governments—act less decisively in response to a crisis. "When such divided government occurs…a broad syndrome of ill effects is said to arise. These problems include 'institutional warfare' of varying intensity, unilateralism (with either or both the executive and the legislature attempting to implement policy without the other's cooperation), various forms of gridlock, greater fiscal pork and rents, and a tendency toward larger budget deficits" (Cox and McCubbins 2000, pp. 2-3). This literature also suggests that policymakers in divided governments face collective action problems in devising responses to exogenous shocks. Because no individual politician

has to bear the cost of high deficits but all have to face their constituents when their preferred programs are cut, it is the case that some stabilization policies are not implemented. If a single political party controls all politically sensitive branches of government, then it is more likely to be able to successfully defend its currency.

> H_{10}: Given a speculative attack, policymakers that confront divided government and multiple checks and balances are less likely to successfully defend the exchange rate.

This section has developed a model of strategic interaction and derived hypotheses from the literature. The hypotheses suggest the variables that influence the preferences and capability of a government to defend the exchange rate in the face of a speculative attack. The next section discusses the statistical model, sample, variables, and data used to test the hypotheses. It also discusses the empirical results.

II. Attacks and Defenses: An Empirical Model.

Statistical Model

The structure of strategic interaction discussed in section one above helps us identify a number of important theoretical and methodological issues involved in empirical testing.[10] One way to proceed would be to identify the set of cases where speculative attacks occur and then attempt to differentiate between those attacks that lead to the abandonment of the peg and those that did not. This approach is instructive and useful for comparative case study work but suffers from problems of selection bias that thwart meaningful statistical analysis.[11] As noted above, governments cannot defend their currency unless an attack first occurs. Thus, those cases likely constitute a non-random sub sample of all cases where a speculative attack could have occurred. Non-random selection renders usual statistical techniques (including cross-tabulation,

[10] Scholars studying international conflict have recently been involved in developing statistical models to estimate models of strategic choice. Smith (1996, 1998) and Signorino (1999, 2000) have argued that ordinary logit and probit are inappropriate tools to estimate strategic discrete choice models. The empirical analysis below does not implement their suggestions but utilizes a selection model as advocated by Smith (1996).

[11] The problem discussed here is identical to that confronted by scholars of international conflict. In testing theories of conflict initiation and escalation, Reed (2000) shows that estimating separate models (of initiation and escalation) leads to significant bias.

regression, logit) unreliable (Achen 1986, Smith 1996). What is needed is a statistical model that (i) corrects for biased coefficients (due to non-random selection) in model of the decision to defend and (ii) recognizes that there are, most likely, common and correlated omitted variables related to attacks and defenses.

The statistical model utilized here is derived from Heckman's (1979) work on selection bias in non-random samples. Heckman was interested in estimating wages in sub samples of a population, specifically among women. If a model based only on those women who reported earnings was estimated, the estimated parameters would be biased because it would not take into account the wages of non-workers, had they chosen to enter the workforce (Heckman 1979). In Heckman's formulation, there are two equations: one to estimate whether a woman entered the workforce (the selection equation) and another to estimate her earnings given that she was in the workforce (the outcome equation). Because attacks and defenses are dichotomous variables, the appropriate model is a bivariate probit model with sample selection. This model has been developed elsewhere (Van De Ven and Van Praag, 1981) and is discussed in Greene (2000) and by Liao (1995).[12]

Following Greene (2000), the specification of a bivariate probit model is as follows:

$$\begin{aligned} y_D^* &= \beta_D' x_D + \varepsilon_D \\ y_D &= 1 \text{ if } y_D^* > 0,\ 0 \text{ otherwise,} \end{aligned} \tag{1}$$

and

$$\begin{aligned} y_A^* &= \beta_A' x_A + \varepsilon_A \\ y_A &= 1 \text{ if } y_A^* > 0,\ 0 \text{ otherwise,} \end{aligned} \tag{2}$$

where y_D^* is an underlying latent variable measuring the propensity to defend an exchange rate and y_A^* is an underlying latent variable measuring the propensity to attack

[12] Greene (2000) and others also refer to this as a bivariate probit model with censoring. See Greene (2000) for a derivation of the likelihood function and for other details regarding this model.

an exchange rate. The latent variables y_D^* and y_A^* are influenced by observed independent variables (x_D and x_A) and disturbances (ε_D and ε_A). The latent variables are not observed, but we do observe their dichotomous realizations (y_D and y_A).

A key difference between bivariate and univariate probit models has to do with the disturbance terms. Univariate probit models assume that the error is distributed normally usually with mean zero and a standard deviation of one. In the bivariate probit setup the error terms ε_D and ε_A are assumed to follow a bivariate normal distribution with $E[\varepsilon_D] = E[\varepsilon_A] = 0,\ Var[\varepsilon_D] = Var[\varepsilon_A] = 1$ and $Cov[\varepsilon_D, \varepsilon_A] = \rho$. If $\rho = 0$, then there is no correlation between the errors and univariate probit models are appropriate for equations one and two. However, if $\rho \neq 0$, then bivariate probit is appropriate and parameter estimates in the outcome equation will be unbiased.

Equation (2) is the selection equation and identifies the factors leading to a speculative attack. The decision to defend, y_D, is only observed when y_A = 1. In other words, there can only be a defense when an attack has already occurred. The decision to defend is censored if there is no speculative attack. Thus, there are three probabilities of interest that are generated by this model: the probability of an observation being uncensored—a speculative attack occurring (y_A = 1), the probability of an observation being an uncensored success—a speculative attack and a defense occurring ($y_A = 1$ and $y_D = 1$), and the probability of an observation being an uncensored failure—a speculative attack occurring with no defense ($y_A = 1$ and $y_D = 0$). All three quantities are discussed below.

A final note before proceeding: the bivariate probit with sample selection assumes that these three outcomes are an exhaustive list of possible outcomes. The model in figure two has four outcomes: status quo, maintained parity, devaluation and maintained parity. Empirically it is difficult, if not impossible, to differentiate a devaluation from an abandonment. Both outcomes correspond to a situation where the government gives up the exchange rate peg. An exploration of real world events also leads to the same conclusion: there are few if any instances where markets attack and governments abandon the exchange rate without a fight[13]. Even the attempt by Britain to defend the pound, although lasting only a few hours, is considered an unsuccessful defense. As a result, the bivariate probit model with sample selection is an appropriate

[13] Eichengreen et al (1998) find that "countries that have exited from pegged rates have generally waited to do so until their currency was under pressure" (p.5).

technique because it can take into account the three differentiable outcomes under investigation.

Empirical Analysis

In this section I discuss the sample, data, and variables used to test the hypotheses from section one.

Sample: The sample is comprised of monthly data for 90 emerging economies from January 1985 – December 1998.[14] Not all countries are included for all time periods, however. Aside from limitations due to data availability, observations were excluded on the basis of two criteria: the lack of democratic political institutions and the absence of a fixed exchange rate.

Since the hypotheses outlined in section one specify the effect of democratic events and institutions on the probability of speculative attacks, the sample is restricted to those countries and time periods where democratic institutions were in place. Democratic institutions are characterized as legally having multiple parties competing for legislative representation and where more than one party wins seats in the legislature.[15] Observations were excluded from the sample if they did not have democratic legislative institutions. Second, because I am interested in speculative attacks on and defenses of pegged exchange rate regimes, countries with floating exchange rate are excluded from the sample. A country is coded as having a pegged exchange rate regime if the 12-

[14] Industrial economies are excluded because there already exists significant empirical work on the political determinants of speculative attacks in OECD countries (e.g., Eichengreen, Rose and Wypolsz 1995, 1997; Leblang and Bernhard 2000a).

[15] The determination of the existence of democratic institutions was based on multiple sources. The Database on Political Institutions (DPI) produced by the Development Research Group of the World Bank includes a variable called the Legislative Index of Electoral Competitiveness (Beck, et al. 1999). This index, based on the work of Ferree and Shingh (1999) codes legislative elections from one to seven. Countries that receive a score of five or greater are coded as being democratic. A score of five or greater indicates that multiple parties are legal and one or more parties won seats in the legislature. A score of less than five indicates that either there is no executive or legislature, there is an unelected executive or legislature, or that there is only one party.

For this variable (and the others from DPI used below) annual observations were converted to a monthly frequency by the author. This entailed using sources such as POLITY III and POLITY IIId (Gurr, Jaggers and Moore 1998) which details the dates of polity changes (the beginning of democracy) and sources such as the Europa Year Book (various years), Keesings Contemporary Archive (various years) and the Political Handbook of the World (various years). These latter three sources were used to: (i) identify the months of changes in the political variables utilized below and (ii) update DPI through the end of 1998

month moving average of nominal exchange rate changes vis-à-vis the US dollar remains within a 2.5% band.[16] This criteria enables countries to move in and out of the sample as a function of their exchange rate behavior and is also wide enough to include countries that have utilized crawling pegs (e.g., Mexico).

These restrictions left a total sample of 7162 observations. The countries included in the analysis are listed in appendix two.

Data: In this section I describe the data and the way in which the dependent and independent variables are operationalized. Descriptive statistics are contained in table one. There are two dependent variables under investigation: speculative attacks and defenses of pegged exchange rate regimes. These variables are discussed in turn.

Speculative Attack: One of the difficulties in modeling speculative attacks is the difficulty associated with measuring the volume of currency traded in a given period. An alternative is suggested by Eichengreen, Rose and Wypolz (ERW) (1995). ERW develop an index of pressure in exchange rate markets based on the assumption that a government can respond to speculation against its exchange rate by (1) allowing the exchange rate to depreciate and/or (2) spending foreign currency reserves in international capital markets to buy up domestic currency.[17] Exchange market pressure is measured as[18]:

$$EMP_{i,t} = \frac{\Delta s_{i,t}}{\sigma_{\Delta s_i}} - \frac{\Delta r_{i,t}}{\sigma_{\Delta r_i}}$$

Here EMP is the index of exchange market pressure, *s* is the bilateral exchange rate of country *i* with the United States at time *t*, and *r* is the non-gold international reserves held by the central bank of country *i* at time *t*. A high index indicates that there is pressure on a nation's currency. The rationale is that an attack on a currency can be

[16] Rather than relying on the reported status of exchange rates that can be found in sources such as the International Monetary Fund's *Annual Report on Exchange Arrangements and Exchange Restrictions* (which does not report the months of exchange rate changes in a consistent form), a behavioral measure is employed. This behavioral measure captures countries that either have a formally stated pegged exchange rate regime and maintain it or have other types of stated exchange rate regimes but keep their currency relatively stable.

[17] This index is used by Kaminsky, Lizondo, and Reinhart (1997), Kaminsky and Reinhart (1996), Sachs, Tornell and Velasco (1996), Corsetti, Pesetti and Roubini (1998) and others.

[18] Eichengreen, Rose and Wyploz (1995, 1997) also include changes in domestic interest rates in their index with the rationale that policymakers can fend off outward capital flows by raising the short terms interest rate. Interest rates are excluded here since I am interested in examining the effect of interest rate policy as a defense against speculative attacks.

met by either a currency depreciation (an increase in *s*) or a loss in foreign exchange reserves (a decrease in *r*) by the central bank[19].

Because speculative attacks are periods where speculative pressure is intense, I follow Kaminsky and Reinhart (1996) and define the cutoff for a speculative attack as:

$$Speculative\ Attack_{i,t} = 1\ if\ EMP_{i,t} > 2\sigma_{EMP_i} + \mu_{EMP\,i}$$
$$= 0\ \text{otherwise}$$

The quantities, σ_{EMP} and μ_{EMP} are the country specific mean and standard deviation of EMP respectively. The cutoff of plus two standard deviations is selected so that extreme values of the exchange market pressure index should be identified as a speculative attack.[20] The empirical models below are unaffected if the cutoff for EMP is set at plus two or plus three standard deviations from the mean. There are 88 speculative attacks out of 7240 observations (1.22%).

Exchange Rate Defense: A successful defense of an exchange rate occurs when a speculative attack does not lead to the loss of a pegged exchange rate regime. Specifically, if there is a speculative attack against country i's currency at time t and country i still has a pegged exchange rate at time t+1 then the defense is a success. Likewise, a defense is not successful if an attack occurs at time t and the peg is abandoned at time t+1. Of the 88 attacks that are observed in this sample, 46 are successfully defended while the 42 led to the abandonment of the exchange rate peg. A list of these episodes is included in the first two columns of table four.

Independent Variables

Hypothesis one states that speculative attacks are more likely when the economy is in a vulnerable state. To characterize the state of the economy I use variables that have been (i) used in prior studies of speculative attacks and (ii) have been found to be

[19] Note that each component of the EMP index is weighted by its respective standard deviation to prevent changes in one variable driving the index. In practice, however, exchange market pressure is driven by changes in reserves. This is because observations are excluded from the sample when there are large exchange rate changes (per definition of the peg). The top panel in appendix four is illustrative: exchange market pressure varies as holdings of foreign exchange reserves change. It is also the case that measuring EMP without weights (see Nitithanprapas and Willett 2000) does not make much difference: the country specific correlation between weighted and unweighted measures of EMP range between .56 and 1.0. Malaysia, in the bottom panel of appendix three is a representative example.

[20] Selecting only extreme values of the EMP index as indicators of speculative behavior may reduce the number of crises in the sample and may also decrease the correlation of crises with economic fundamentals.

statistically significant predictors of these attacks. The rationale for and operational definition of variables making up ϕ are discussed in appendix three. These variables are indicators of: (i) real exchange rate overvaluation, (ii) foreign interest rates, (iii) banking sector crisis, (iv) domestic monetary policy, (v) external debt service, (vi) international openness, and (vii) contagion.

Hypotheses two through ten regard the intensity of the government's preference for defending the exchange rate parity and the factors that influence the probability that a defense will be successful. These hypotheses identify electoral, sectoral, partisan and institutional factors.

Electoral Period: Policymakers are expected to have preferences that change as a result of the electoral clock. The data for electoral periods was collected in two stages. First, using DPI it was determined whether a country has a parliamentary or a presidential political system. Second, presidential and parliamentary election dates were gathered from DPI, Keesings Contemporary Archives, and the other sources listed above. An election is coded one by matching the date of an election with the appropriate system; that is, a country month gets a one if there is a presidential election and it has a presidential system. Presidential elections in parliamentary systems are coded as zero.

One problem with coding the run-up to an election (or political campaign) is that is difficult to (i) identify if an election has been called early or (ii) identify the length of the electoral clock. As such, the political campaign is coded as the three months prior to an election and the election month itself. The post election variable is coded as the three months following an election.[21]

Sectoral Interests: It is hypothesized that the composition of sectoral interests will have a significant effect on the willingness of policymakers to defend the exchange rate peg. As a first cut I operationalize this variable in terms of the size of the export sector as exports/gdp and lag it one period. Because of the skewed nature of this variable, I use its natural log. Data for this variable come from the *World Bank's World Development Indicators 2000 on CD-ROM*.

Electoral Institutions: A dummy variable, coded one, is included if a country has proportional representation electoral institutions. Data for this variable are from Inter-Parliamentary Union (1993), Cox (1997) and Blais and Massicotte (1997).

[21] The results presented below do not change and in some cases get even stronger if the campaign and post periods are extended to as many as six months.

Foreign Exchange Reserves: First generation models suggest that currency crises are likely as central banks run short of international reserves. In fact, Krugman type models argue that the quantity of reserves is the key variable when it comes to predicting the timing of a speculative attack on a fixed exchange rate regime. Using a variant of the Krugman-Flood-Garber model, Blanco and Garber (1986) estimate the probability that the Mexican peso would be devalued each quarter during the 1973-1982 period. Cumby and van Wijnbergen (1989) use a similar model to explain attacks on Argentina's crawling peg in the early 1980s. These scholars, among others, find that the probability of a devaluation in each country was closely linked to that country's holdings of international reserves. Thus, a ratio of foreign exchange reserves to the monetary base is included. The expectation is that the higher this ratio, the less likely are speculative attacks and unsuccessful defenses. To avoid problems with simultaneity, this variable is lagged by one month. This variable is used in both the attack and the defense models.

Real Interest Rates: Recent theoretical and empirical work seeks to ascertain the extent to which high interest rates help policymakers defend their exchange rate in the face of a speculative attack (e.g., Kraay 1998; Drazen 1999; Lahiri and Végh 2000). I include the lagged value of the real interest rate and expect that higher levels of the real interest rate will help defeat speculative attacks.[22]

Partisanship: Partisan politics plays a role in both attacks and defenses. The DPI includes variables identifying the political party of the prime minister and/or the president, the three largest parties in the governing coalition and the largest party in the opposition (Beck et al. 1999). To collect this data, the DPI "asked whether the orientation of a party was immediately obvious from its name." Then, party orientation was cross checked with a website maintained by Wilfried Derksen and with information included in a number of publications.[23] The DPI categorized parties by placing their preferences regarding state control of the economy on a standard left-right scale.

[22] This variable was constructed as follows. Due to the lack of consistent definitions by local monetary authorities and large holes in some data series, and because I wanted to avoid stringing together different series for the same country, I used the interest rate series that had the least number of missing values. My order of preference was to use series for the central bank's discount rate (IFS line 60), the money market interest rate (IFS line 60b), the treasury bill rate (IFS line 60c) and the interest rate on deposits (IFS line 60l). Again, I used the series that had the most non-missing observations. I then took this series and deflated it by the annual rate of inflation (IFS line 64x).

[23] Derksen's website is www.agora.stm.it/elections/parties.htm. Other publications that were consulted included *Political Parties of Africa and the Middle East* and *Political Parties of Eastern Europe, Russia and the Successor States* published by Longman Current Affairs series.

Dummy variables for Left and Right governments were then constructed.[24] I include Right and leave Left as the omitted category.

Political Institutions: I use two variables to measure the effect of political institutions on the ability to defend an currency. A variable capturing the structure of government institutions is coded one if a parliamentary system is in place. A variable called unified government is included and is coded one if the party that controls executive branch also controls the lower house. The DPI (and author updates) provided these variables.

Capital Controls: They hypothesis that capital controls help policymakers defend an exchange rate peg is operationalized by including a dummy variable coded one if countries have controls on the capital account[25]. I use the lagged value of this variable because this measure is available annually and use of a lagged captures the prior existence of controls and also avoids measuring controls that are put in place as a result of a speculative attack. The data is from the International Monetary Fund's *Annual Report on Exchange Arrangements and Exchange Restrictions* (various years).

Other Controls: I include two control variables that indicate vulnerability of the country to prior crises. The first is a lagged endogenous variable to capture the fact that some speculative attacks may last longer than one month. It is anticipated that the occurrence of a speculative attack at time *t-1* will make a speculative attack at time *t* more likely. Second, I include a variable that counts the number of prior crises the country has experienced since January 1985 to capture the country's overall vulnerability to speculative attacks.

Empirical Results

The results from a bivariate probit model with sample selection are presented in table two.[26] Note initially that the model as a whole is statistically significant as indicated

[24] It was also possible to create a variable for Center governments. Preliminary analyses using a Left-Right-Center designation did not change the results presented below. In fact, that coding showed that there is little if any statistically significant difference between Left and Center governments.

[25] A more finely coded variable of capital liberalization (as developed by Quinn and Inclan 1997) is not available for a majority of countries and time periods included in my sample.

[26] The sample employed here raises problems because the sample is comprised of a pool of 90 cross sections and up to as many as 168 time periods (if a country has a pegged exchange rate from January 1985 – December 1998). The pooled nature of the sample necessitates the use of a statistical model to account for autocorrelated and heteroscedastic disturbances. Beck, Katz and Tucker (1997) have developed an approach that begins with the assumption that binary panel data are grouped duration data. As such, problems such as serially correlated errors can

by the chi-square statistic. A different chi-square statistic also rejects the null hypothesis that the attack and defense equations are independent; as such, bivariate probit with sample selection is the appropriate statistical model. The columns of table two contain maximum likelihood estimates from the bivariate probit model, robust standard errors and marginal effects. The univariate marginal effects indicate the change in probability of the dependent variable (defense or speculative attack) from zero to one as a discrete independent variable changes from zero to one and as a continuous independent variable increases by one standard deviation from the mean. Conditional marginal effects for three variables that appear in both the selection and outcome equations are included below the main results table (Greene 1996).

Consider first the selection equation. The dependent variable in this model is a speculative attack. As anticipated, the existence of an attack in the prior period makes an attack in the present period more likely (this effect is also captured by the variable measuring the number of prior attacks). There is also support that speculative attacks are contagious. The results for variables suggested by first and second generation currency crisis models (ϕ) are mixed. On the one hand expansionary monetary policy as measured by the growth in domestic credit and holdings of foreign exchange reserves have a statistically significant effect on the likelihood of speculative attacks, as suggested by first generation models. Second generation models that focus on exchange rate overvaluation, bank lending and external vulnerability do not receive as much support. While an overvalued exchange rate makes speculative attacks more likely, no measure of external influence (trade openness, debt service, foreign interest rates) is statistically significant[27]. In an alternative specification (not reported here), I included the real interest rate variable in the selection equation. Inclusion of that variable decreases the sample size by over 1,000 observations and was not statistically

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be resolved by including a set of dummy variables that take into account the length of time since the country's last "failure." In the present context, "time since prior failure" means the elapsed time since a country last experienced a speculative attack. When there are a large number of time periods, Beck, Katz and Tucker (1997) advocate the use of a set of cubic splines. In the selection equation I incorporated between eight and twelve linear splines. In no specification were these splines individually or jointly statistically significant. As a result, the reported results were estimated without any cubic splines. Heteroscedastic disturbances, or unequal variation across countries is dealt with through the use of Huber/White robust standard errors.

[27] This remains the case if I use alternative measure of external vulnerability. In earlier specifications I used the log of trade openness, a measure of total external debt, a measure of short term debt as a proportion of total external debt and an indicator of imports as a percentage of foreign exchange reserves.

significant. The parameter estimates of the other variables did not change substantively or significantly.

Results from the political variables are mixed as well. Contrary to conventional wisdom, capital controls make speculative attacks more likely. Because this variable is lagged, there is a great deal of confidence that the result is not a function of simultaneity. This result is consistent with models developed by Bertolini and Drazen (1997) and Drazen (1997) which argue that capital controls send a negative signal to markets, undermining confidence and increasing the likelihood of a speculative attack (Eichengreen 2000). According to these models, markets view capital controls as a negative signal regarding the government's commitment to fiscal responsibility and exchange rate stability.

Neither of the electoral variables is statistically significant, indicating either that markets do not respond to political uncertainty and monetary cycles or they do not exist around elections.

Turning attention to the defense equation, note first that the variable for foreign exchange reserves is not statistically significant. It appears that once an attack has occurred, the state of fundamentals does not have a (statistically) significant impact. This makes sense in terms of the decision structure in figure two: once a decision to attack has been made based on the value of (ϕ), markets have already processed information regarding fundamentals.

This is not the case with real interest rates. Contrary to prior studies (e.g., Kraay 1998), the findings here indicate that once an attack occurs, interest rate policy can be used effectively to defend a currency.[28] In fact, increasing real interest rates by one standard deviation (41%) increases the likelihood that a government will successfully defend the exchange rate by 15%.

In alternative specifications, not reported here, I examined three alternative ways that interest rate policy may effect the likelihood of a successful defense. First, I used three and six month moving averages of the real exchange rate to see if keeping interest rates high for longer period of times (e.g., Sweden 1992) matters. The marginal effect of interest rates in these specifications was still statistically significant and only decreased minimally. Second, to test a hypothesis based on Lahiri and Veigh (2000), I investigated whether real interest rates have a curvilinear effect on the probability of a successful

[28] This finding is most likely due to the use of very different statistical techniques employed here as compared to those used in Kraay (1998).

defense. This entailed adding the square of lagged real interest rates to the outcome equation; in this case the results did not allow me to reject the null hypothesis of no curvilinear effect. Finally, I explored whether raising real interest rates would help or hinder efforts to defend the currency. I did this by (i) including both the lagged level and the lagged rate of change of real interest rates and (ii) interacting the level and the rate to see if raising rates when rates were already high had a significant effect. In both cases the estimated results were not significantly or substantively different from those presented in table two.

The next set of hypotheses argue that the willingness and capability of policymakers depends on values of b and θ. The electoral hypothesis states that politicians are more likely to defend the currency in the run-up to an election than during other times of the year. The results in table two support this expectation in part. First, politicians are 63% more likely to defend the exchange rate exchange peg during the four month campaign and election period than during other non-electoral periods. The willingness to defend the peg, contrary to expectations, is actually 19% higher during the three months *after* an election. To get a clearer picture, the actual number of attacks and defenses in the ten months surrounding an election is graphed in figure four. It is clear that the number of attacks (and, as a result defenses) is substantively lower in the campaign and election period (period –4 through 0). In fact there five out of six defenses are successful during the campaign and election period while politicians defend the exchange rate peg seven out of eleven times in the three months after an election.

There is also support there is support for the partisan hypothesis: Right governments are more likely to abandon the exchange rate peg, given a speculative attack, than are Left or Center governments. As argued above, this is most likely due to the fact that they are less in need of the (domestic and international) anti-inflation credibility that comes with an exchange rate peg. Because they do not have to engage in protracted political negotiations when confronted with an economic crisis, policymakers in parliamentary and unified systems are also more likely to defend the exchange rate peg.

The hypothesis that policymakers respond to the domestic interests of crucial sectors cannot be rejected[29]. I did not state a directional hypothesis because while

[29] As a robustness check I also estimated the model using the proportion of the population employed in the agricultural sector as a measure of inward orientation. In that model, not

exporters may benefit from a currency depreciation, they also prefer exchanger rate stability. The coefficient on the exports/gdp variable is statistically significant and negatively signed, indicating that policymakers in countries with large export oriented sectors are less likely to defend their pegged rate in the face of a speculative attack. This preference may be the result of the development of deeper foreign exchange markets that allow speculators, exporters and importers to hedge and not be dissuaded from exchange rate volatility.

Finally, the results indicate that capital controls do help policymakers defend the exchange rate. The coefficient on the lagged capital controls variable is statistically significant and positively signed. Holding all other variables constant, policymakers in countries with capital controls are 12% more likely to defend the exchange rate peg than policymakers who cannot rely upon capital controls.

The bottom of the table two displays conditional marginal effects for the campaign and election, post election and capital controls variable. These effects are the combined effect of a variable on the likelihood that a speculative attack will occur and will be defended. Since there are only 46 defenses out of a total of 7162 observations, it is not surprising that the marginal effects are numerically small. However, they do provide some clarity to issues discussed above. While capital controls do make speculative attacks more likely (seen in the attack equation) they also make defenses more likely. The total effect of capital controls is to increases the probability of a successful defense by 0.4%. The same can be said for the electoral variables. The combined effect of these variables on the probability of a speculative attack and on its defense is statistically significant.

In tables three and four I present some indication of the predictive power of the model. Table three displays actual and predicted outcomes for both the speculative attack and defense model. As is clear, the speculative attack model dramatically over-predicts speculative attacks.[30] On the other hand, the defend equation does an excellent job predicting successful (91%) and failed (79%) defenses. The predicted and actual defense episodes are listed in columns three and four of table four.

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reported here, the variable for agricultural employment is statistically significant and positive, indicating that inward orientation leads policymakers to defend the exchange rate peg.

[30] This may be due, in part, to the use of probit techniques. Probit models assume that there is a rough 50-50 split in the distribution of zeros and ones. In this sample, this is clearly not the case. Replicating the selection equation using either scobit or King and Zeng's (1999) logit for rare-events data does improve the performance of the selection equation. However, there is no available method for combining either of these models into a selection model.

In order to further evaluate the model, I seek to see how the model performs out of sample. To do this I estimate the model in table two using observations from January 1985 – December 1994. I then forecast the likelihood of a successful defense given a speculative attack (P[Defense=1|Attack=1]). Predicted probabilities for the period January 1995 – December 1998 are presented in table five. Entries in the upper panel are in sample predictions and are based on the entire sample while those in the lower panel are based on the restricted sample. Interestingly, there is no difference in performance: in both cases the model never predicted a successful defense when one did not occur, but in six cases a failed defense was predicted when policymakers were actually successful.

A useful feature of the bivariate probit model with sample selection is that it allows us to do counterfactual analysis. In figure four I plot the predicted (in sample) probabilities of a successful defense for Brazil and Malaysia. Consider Brazil. The circles represent the probability that a defense would have been successful had an attack occurred. The probability of a successful defense, had a speculative attack occurred is close to zero for all periods until July of 1998 when it increases dramatically. This is as expected by the electoral hypothesis because July 1998 was three months before elections were to occur. What is interesting is that the probability of a successful defense drops dramatically in October when the election actually occurred. However, the probability of a successful defense increases again after the election. The actual devaluation of March 1999 occurred well after the post election period ended.

The bottom panel of figure four plots the same probabilities for Malaysia. Table four indicates that the Malaysian currency was attacked in July, August and September of 1997 and that the defense was unsuccessful in September of that year. In sample probabilities indicate that had an attack occurred prior to August of 1997, a defense would have most likely been successful; they also indicate that the likelihood of a successful defense declined in both August and September of 1997. Thus, it is reasonable to conclude that markets did not attack the Malaysian ringett before July 1997 because they were deterred by the specter of a successful defense.

As a check on the robustness of the results presented in table two, I reestimated the model, including the measures of economic vulnerability (ϕ) in the defense equation. These results, included as table six, show that the electoral, constituent and institutional variables remain statistically significant and in the expected direction. I addition, most of the measures of economic vulnerability have a statistically insignificant effect on the

likelihood of a successful defense. The two variables that are statistically significant, banking crisis and US domestic interest rates have opposite signs to those expected: increasing either private sector lending or US interest rates makes a successful defense more likely.

A potential problem with the empirical work discussed above is that speculative attacks may be episodes that last longer than a month. Examining the list of attacks in table four lends partial support to this view: several countries experienced speculative attacks that lasted more than one month (e.g., Malaysia 1997m7 – 1997m9). I created a new defense variable with a three month window. This variable is coded one if a speculative attack occurs at time t and the currency peg is not abandoned at time t, t+1, t+2 and t+3. It is coded zero if an attack at time t led to an abandonment/devaluation in the three months following the attack. This new definition of a defense results in 34 successful defenses and 54 failed defenses. These episodes are listed in column five of table four.

Using this new measure of a defense I re-estimate the model from table two. These results are contained in table seven. There are two important differences in this specification. First, interest rate policy no longer has a statistically significant effect on the probability of a successful defense. This makes sense in that high interest rates can work in the short term, but in the long term, that is, as an attack is prolonged, they test the will of policymakers and constituents. Politicians can only maintain high interest rates for so long before having to give into other political interests. The second difference with this specification is that the campaign and election period is no longer statistically significant. As illustrated in figure five, there are few attacks prior to an election and even fewer defenses. Aside from these two differences, the overall effect of electoral, partisan and institutional incentives on the willingness of policymakers to defend the exchange rate peg does not change greatly.

III. CONCLUSION

To what extent is the domestic political capacity of politicians constrained by international capital markets? This question is been the focus of a large and growing body of scholarship, some of which argues that financial integration holds governments hostage (e.g. Haggard and Maxfield 1996, p.36) while other work suggests that capital mobility only tends to limit politicians' room to maneuver (Garrett 1998).

In this paper I argue that while the growth of capital markets has indeed been substantial, the decision by policymakers to abandon their exchange rate peg is a function of domestic political concerns. In the language of the New Crisis literature (e.g., Krugman 1996), policymakers have to decide whether the benefits from maintaining a pegged exchange rate are worth the costs. I examine the interaction between markets and politicians and find that speculative attacks occur when economic fundamentals are in an area of vulnerability but that attacks succeed when politicians are either unwilling or unable to muster the political and/or economic resources needed to defend the exchange rate peg. The empirical evidence, based on large heterogeneous sample of emerging countries demonstrates that it domestic political factors—specifically electoral, constituent and institutional factors—are key factors driving exchange rate defenses. As such, the empirical results support the contention that while financial markets do impose costs on governments, "political leaders have a degree of latitude in how they respond to internationalization. In large part, this range of choice is a function of the domestic institutional framework in which they must operate" (Milner and Keohane 1996, p.20).

This paper is a first step in a larger attempt to understand political responses to capital mobility generally and nature of speculative markets specifically. While I do develop a general model of speculative attacks and defenses, the nature of a cross-national and cross-temporal quantitative must ignore some fundamentally important variables. For example, the electoral and constituent variables employed here cannot pick up the true extent to which politicians are committed to an exchange rate peg. Observations such as that by Cukierman et al. that "the exchange rate [peg in Chile in June 1979] was a symbol of overall national stability" (1995, p.83) cannot be picked up by aggregate measures. Nor can the fact that in some countries the degree of commitment is dependent upon characteristics of a legislative body or the finance minister. Incorporating detailed case studies, such as those developed by Haggard (2000) can only help unpack the factors that lead policymakers devalue or defend the exchange rate peg. An interesting extension would be to see the extent to which the popularity and/or durability of a democratic government is influenced by exchange rate policy.

Finally, the findings in this paper do raise an interesting question that has been asked in other contexts: to what extend to markets process political information? While work in the rational expectations tradition has gone far in examining how markets process economic signals, we know very little about the information content of political

institutions (Freeman, Hayes and Stix 2000; Leblang and Bernhard 2000). The empirical finding presented in figure one make clear that markets are wrong over fifty percent of the time when deciding to attack a currency peg. The capacity of markets to understand and process the decision-making processes of policymakers is a very exciting and important area for future research.

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Appendix One: Making θ a Function of the Cost of Defense (e)

Let $\theta = f(e);\ \theta' > 0;\ \theta'' < 0$

The government will choose $\hat{e}$ to maximize:

(A1) $\theta(b-e)-(1-\theta)(b+e)$

or

$2b\theta - b - e$

First order conditions:

$2b\theta' - 1 = 0$

or

$\theta' = \frac{1}{2b}$

The government will choose $\hat{e}$ such that $\theta' = \frac{1}{2b}$

Decision Rules:

Government

(2) $\hat{\theta}(b-\hat{e})-(1-\hat{\theta})-(1-\hat{\theta})(b+\hat{e})$

If (2) > -b, then defend; if (2) < -b, then do not defend

Markets

(3) $(1-\hat{\theta})(g-t)-(\hat{\theta})t$

If (3) > 0, then attack; if (3) < 0, then do not attack.

Results:

		Government	
		(2) > -b	(2) < -b
Market	(3) > 0	Attack; Defend with uncertain outcome	Attack; No Defense
	(3) < 0	No Attack	No Attack

Appendix Two: Countries in the Sample

country	Number of Observations	Number of Attacks	Number of Defenses
albania	51	3	2
algeria	47	1	0
argentin	83	0	0
armenia	30	0	0
azerbaij	35	0	0
banglade	165	0	0
barbados	168	0	0
belarus	20	0	0
belize	168	0	0
benin	40	0	0
bolivia	132	1	1
botswana	119	3	2
brazil	41	1	1
burkinaf	17	0	0
capeverd	36	2	1
centrala	48	1	0
chile	61	0	0
colombia	48	1	0
comoros	80	0	0
congorep	57	2	1
costaric	128	0	0
cotedivo	36	0	0
croatia	35	0	0
djibouti	68	0	0
domrep	114	0	0
ecuador	30	1	0
egypt	138	1	0
elsalvad	143	2	0
equatori	31	1	0
estonia	25	0	0
fiji	147	5	3
gabon	45	2	1
gambiath	133	0	0
ghana	7	0	0
grenada	168	0	0
guatemal	137	1	0
guyana	119	2	0
haiti	127	0	0
honduras	102	3	1
hungary	16	0	0
india	125	6	4
indonesi	140	1	0
jamaica	95	0	0
jordan	62	0	0
kazakhst	34	0	0
kenya	107	4	2
korea	155	1	0
laopeopl	44	0	0
latvia	39	0	0
lebanon	28	0	0
lithuani	56	0	0

macedoni	33	0	0
madagasc	69	1	0
malawi	25	1	0
malaysia	155	4	3
mali	17	0	0
mauritan	13	0	0
mauritiu	141	1	1
mexico	95	2	1
moldova	57	1	0
mongolia	36	0	0
morocco	157	0	0
nepal	45	1	1
nicaragu	80	0	0
niger	27	1	1
pakistan	149	2	2
papuanew	131	0	0
paraguay	103	0	0
peru	70	0	0
philippi	136	2	2
poland	41	0	0
russia	21	2	1
senegal	117	1	0
sierrale	46	2	0
slovakre	51	0	0
solomoni	133	2	1
southafr	58	1	0
srilanka	158	4	4
stlucia	167	0	0
tanzania	37	1	1
thailand	144	1	0
togo	37	1	1
trinidad	128	3	2
tunisia	136	4	4
ukraine	24	0	0
uruguay	13	0	0
vanuatu	160	0	0
venezuel	63	3	0
zambia	11	0	0
zimbabwe	76	2	2

Appendix Three: Variables Used to Measure the State of the Economy (ϕ)

Real Exchange Rate (RER) Overvaluation: Kaminsky, Lizondo and Reinhart (1997) and Goldfajn and Valdes (1997) found overvaluation of the real exchange rate to be the most significant indicator of currency crises in the studies they surveyed. Observers of both the Mexican and Asian crises have argued that these attacks were the result of a rapidly appreciating domestic currency in real terms due to dramatic capital inflows (Sachs et al 1996; Radelet and Sachs 1998). A currency overvaluation becomes unsustainable in the long run when it results in a loss of competitiveness and in large(r) currency account balances. In the short term, an overvaluation renders a currency vulnerable to speculative attacks as economic agents attempt to profit by forcing the exchange rate back to its perceived equilibrium. [31]

Foreign Interest Rates: Currency crises are also more likely to occur when foreign interest rates are high. An increase in OECD interest rates, for example, has been identified as one of the key determinants of the debt crisis in 1982 as well as a prime reason why capital fled Mexico in late 1994 and early 1995 (Frankel and Rose 1995). As interest rates in Germany, Japan and the United States decline, capital flows into the developing world in search of a higher return. An increase in these interest rate triggers capital to flow out of developing and into the developed economies. Foreign interest rates are operationalized using the interest rate on short term (90-day) deposits in the United States.[32]

Banking Sector Crisis: Recent models of currency crises have focused on the twin crises: banking crises and currency crises (e.g., Demirguc-Kunt and Detragiache 1997). Sachs et al (1996), for example, argue that a rapid increase in commercial bank lending to the private sector indicates a greater risk of reversals of investor confidence. The quality of bank loans is likely to deteriorate significantly—and many are likely to become non-performing—when bank lending rises rapidly in a short period of time. Large lending means that banks are less able to effectively screen borrowers. This problem is exacerbated in the developing world where the ability and number of regulators is limited. The increase in bank lending is measured as the growth in claims on the private sector and is lagged by one period. As private sector claims increase, so does the likelihood of a banking and a currency crisis.

Domestic Monetary Policy: A variable measuring government monetary policy is also used as a control. Calvo (1995) and Sachs et al (1996) include measures of domestic credit growth in their currency crisis models. The growth in domestic credit is straightforward: it indicates an increase in the domestic money supply. As the money supply increases, there is more domestic currency in circulation that can be converted into foreign assets in the event that currency holders anticipate a devaluation. The higher the rate of domestic credit growth, the more likely it is that an (self-fulfilling) attack can be successful. This variable is lagged by one period.

Contagion: There is a large literature that views currency crises as contagious events (Eichengreen, Rose and Wypolz 1997; Masson 1998). I create a contagion variable by totaling the number of speculative attacks that occurred in all countries but country *i* in month *t*.

External Debt and International Openness: Recently, IMF policymakers and academics have developed a "third generation" of speculative attack models. The motivation for this renewed effort is the fact that the "usual suspects" leading to a currency crisis were not evident in the East Asian crises over the 1996-97 period. These scholars focus on moral hazard faced by international lending institutions, the composition of external debt, and capital controls (e.g., Frankel and Rose 1996; Corsetti, Pesenti, and Roubini 1998; Krugman 1998; Dooley 1998).

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[31] Following Kaminsky, Lizondo and Reinhard (1997) and Goldfajn and Valdes (1997) I measure overvaluation of the real exchange rate by using the residuals of a Hodrick-Prescott filtered real exchange rate series with lambda equal to 14400 for monthly data. The larger the residuals, the farther the real exchange rate is from its equilibrium value and the more likely is a currency crisis. The real exchange rate is calculated as the local currency per U.S. dollar adjusted for wholesale prices in both the local country and in the United States.

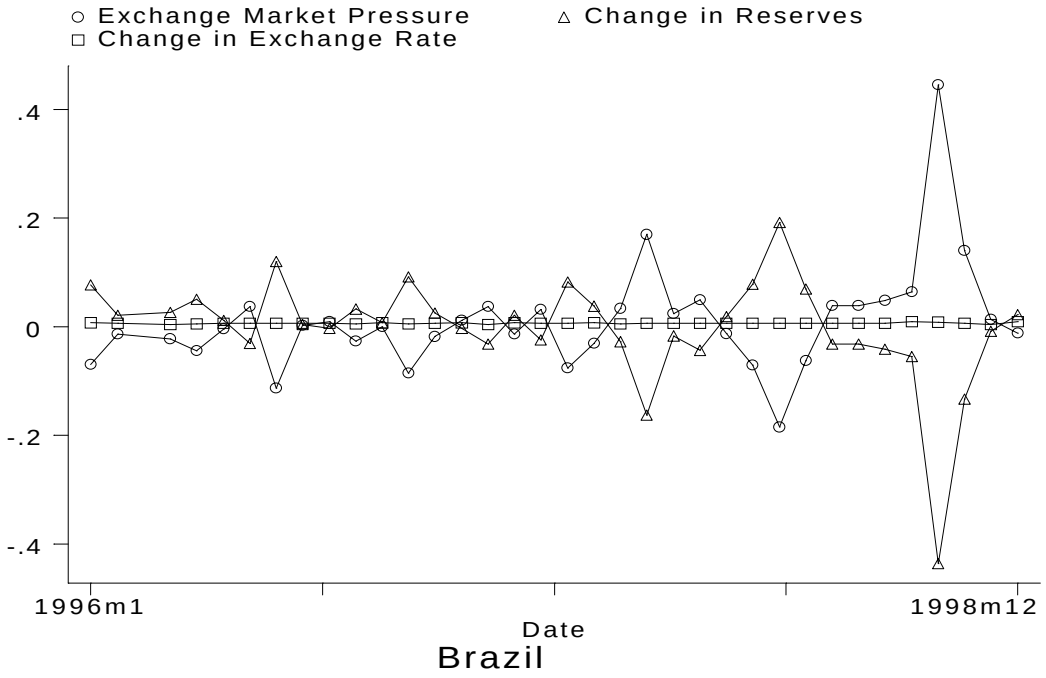
[32] I also tried the model using Germany's interest rate or an average of the US, German and Japanese interest rates. The substantive results did not change.

Two variables are included to take into account these international factors. International debt is measured by a country's debt service ratio. This variable measures the sum of principal and interest repayments in foreign currency paid on long-term debt, short- term debt, and repayments to the IMF. The amount is taken as a percentage of the total amount of exports. Debt service was selected rather than total long or short term debt (or other variables) because it is available for more countries and time periods than are other debt variables and due to the fact that the correlation between debt service and external debt is above .80. A variable for international openness measured as imports plus exports as a percentage of gross domestic product is also included. Prior literature has argued that countries with higher levels of international debt (debt service) or international openness are more vulnerable to the whims of international capital. Thus, it is expected that countries with higher levels of these variables will be more likely to experience speculative attacks. Data for these two variables comes from the World Bank's World Development Report on CD-ROM (2000).[33]

[33] It is important to note that these two variables as well as the variable measuring the size of the agricultural sector, are only available on an annual basis. The annual data was interpolated using cubic spline routines to construct the monthly series. To check that this process was not causing the reported results, two alternative specifications were used. First, the variables were lagged by twelve periods. Second, the variables were held constant over the course of the year. The motivation for both of these alternatives is that currency traders have at least mid-term estimates about what the level of debt service and openness will be in the next six to twelve months. In neither specification were the results substantively different from those reported below.

APPENDIX FOUR: Exchange Market Pressure Variables

Exchange Market Pressure Index and Component Variables for Brazil



Exchange Market Pressure Index and Unweighted EMP Index for Malaysia

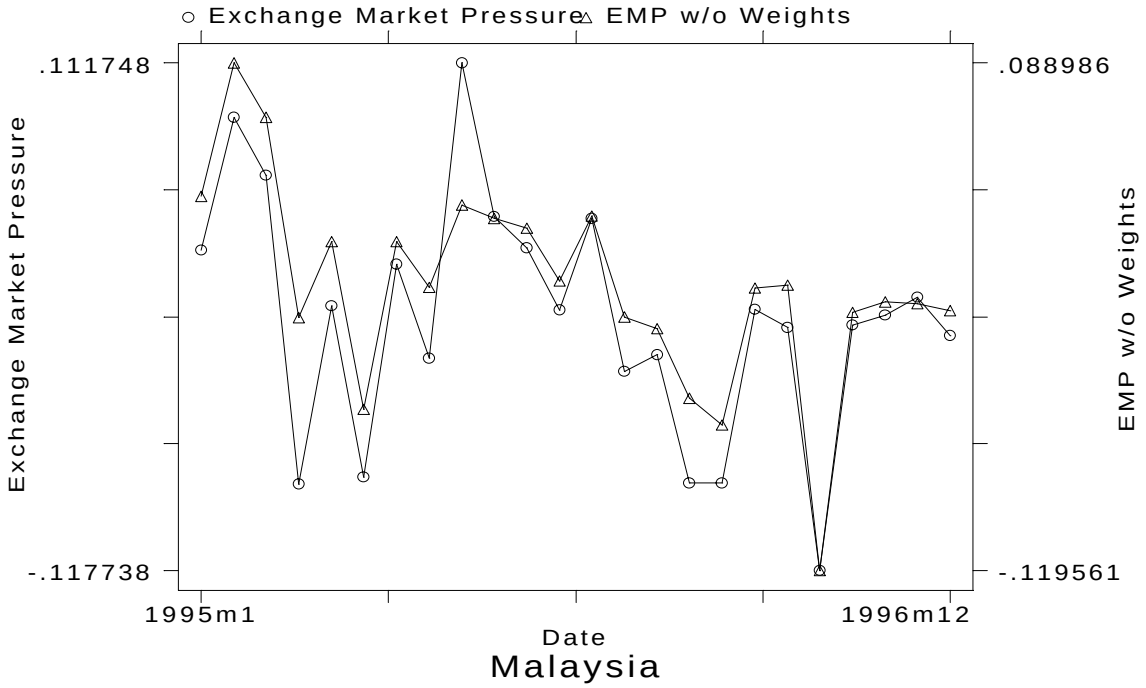


Figure One: Speculative Attacks and Defenses

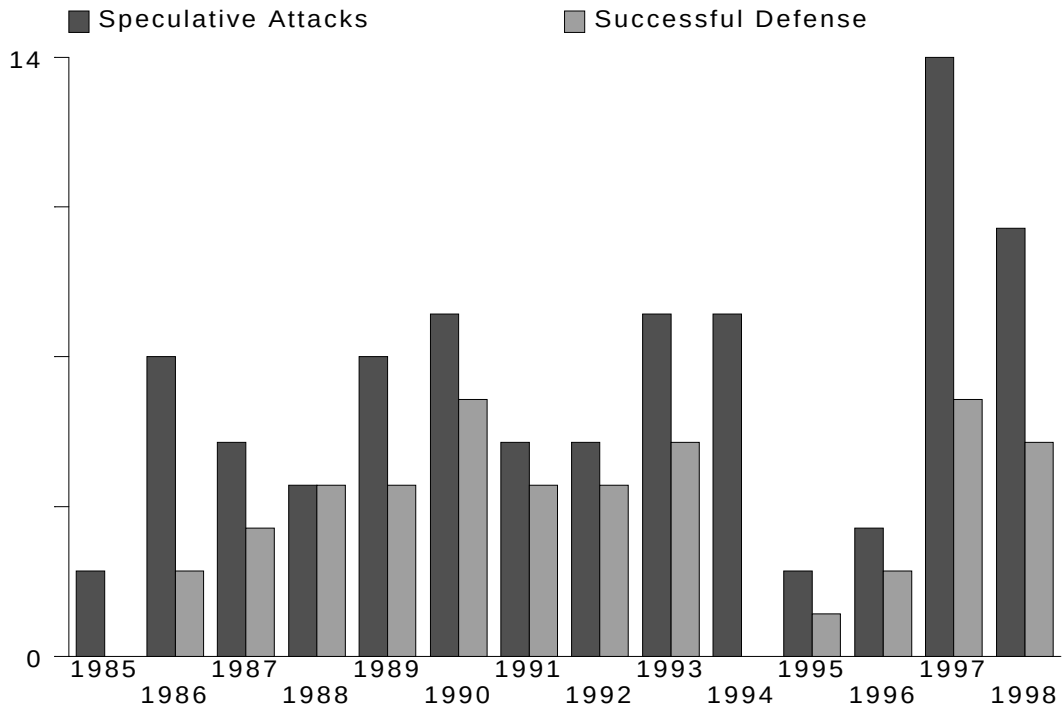


Figure Two: Strategic Interaction between International Capital Markets and Governments with Uncertainty.

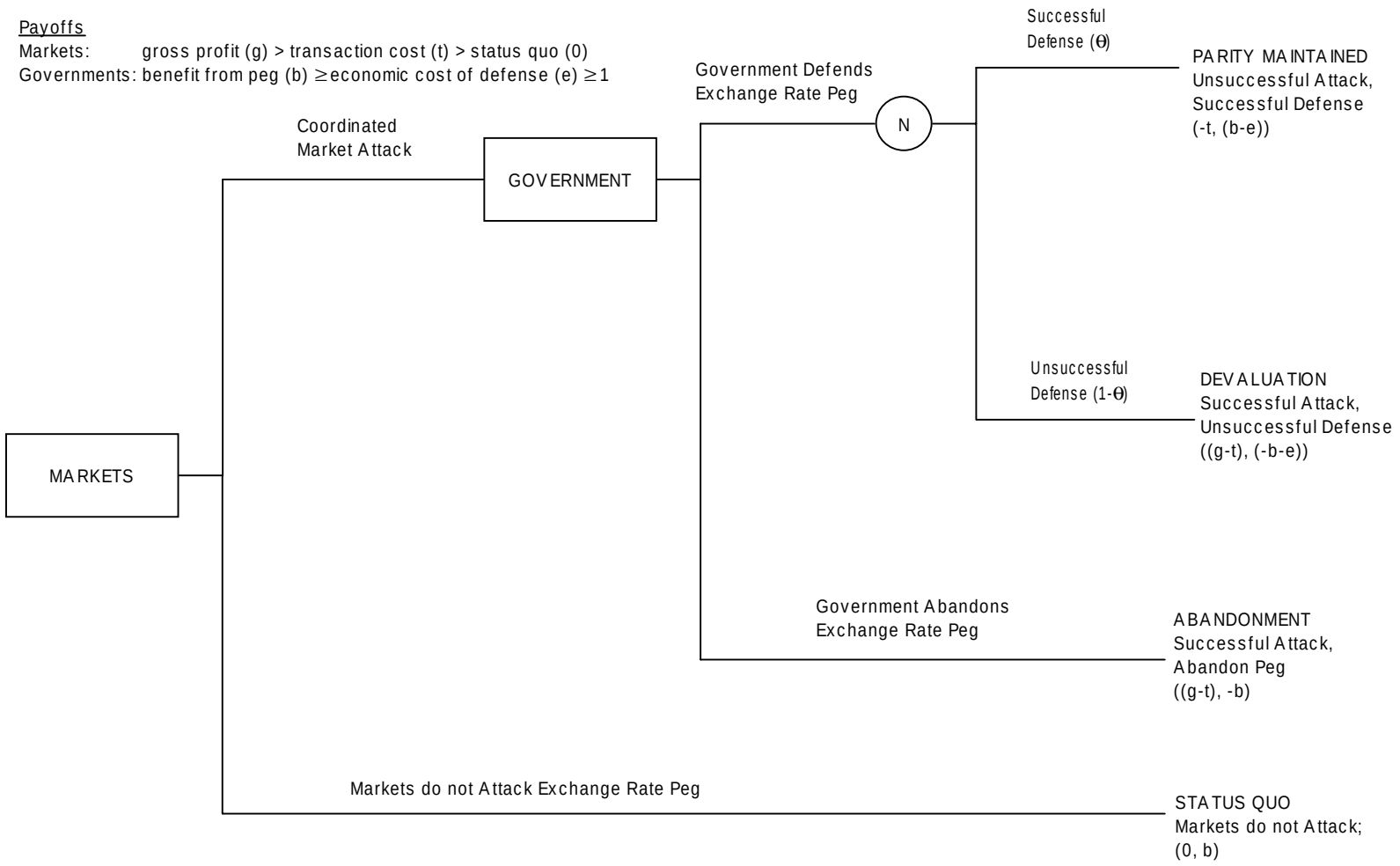


Figure Three: Attacks and Defenses Surrounding Elections

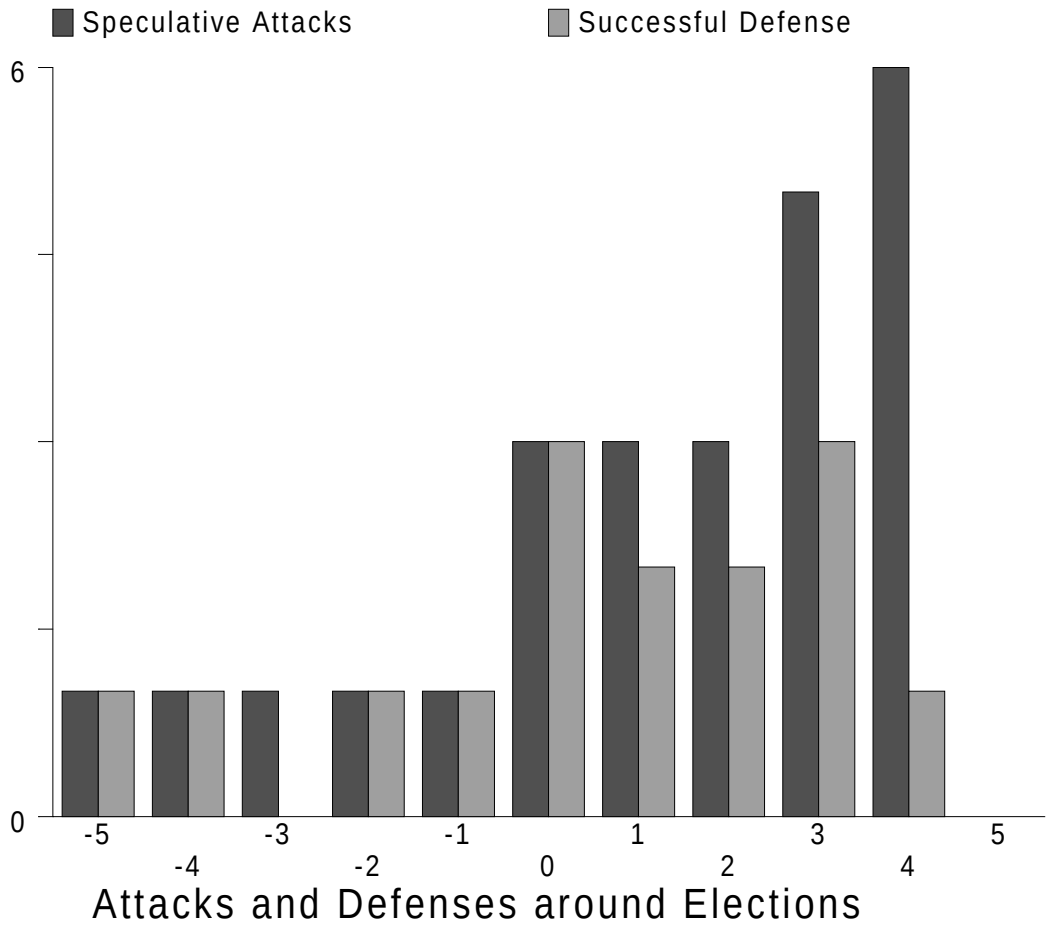
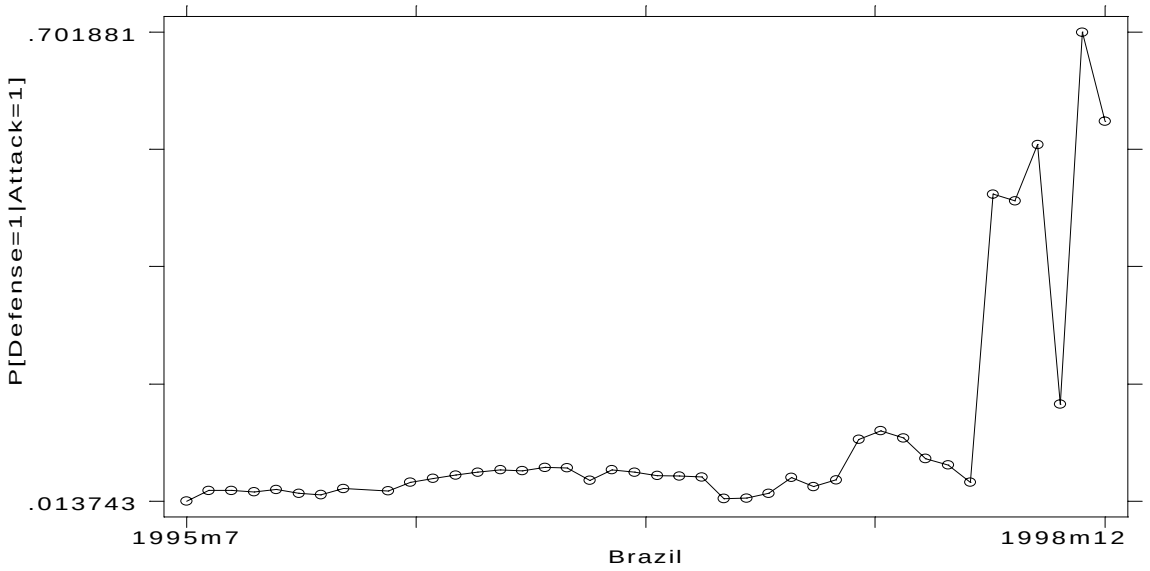


Figure Four: In Sample Predictions for Brazil and Malaysia

Brazil



Malaysia

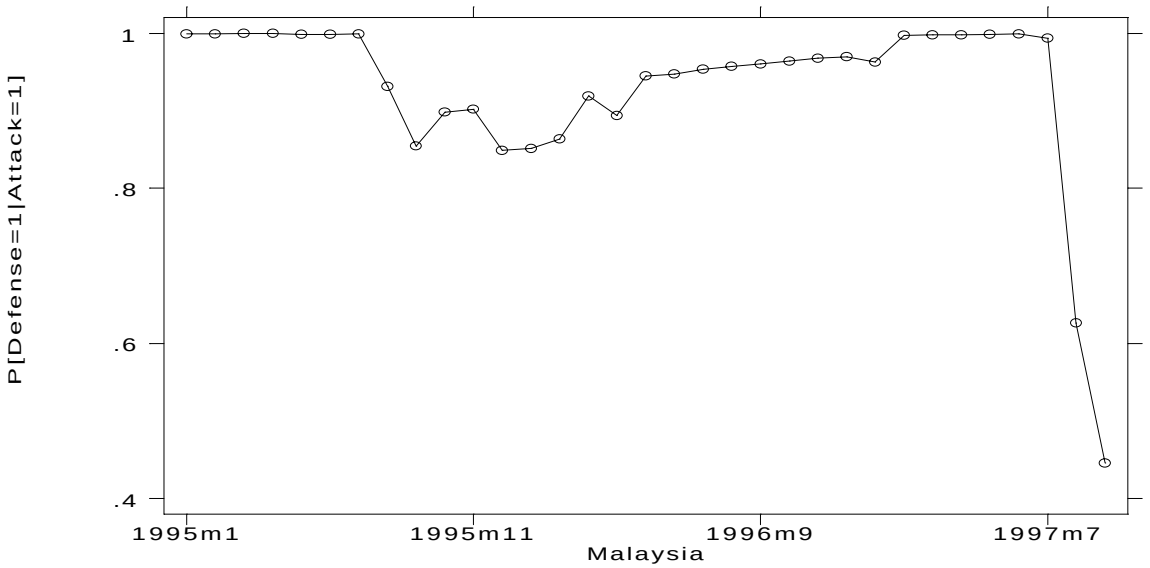


Figure Five: Attacks and Defenses Surrounding Elections—Three Month Window

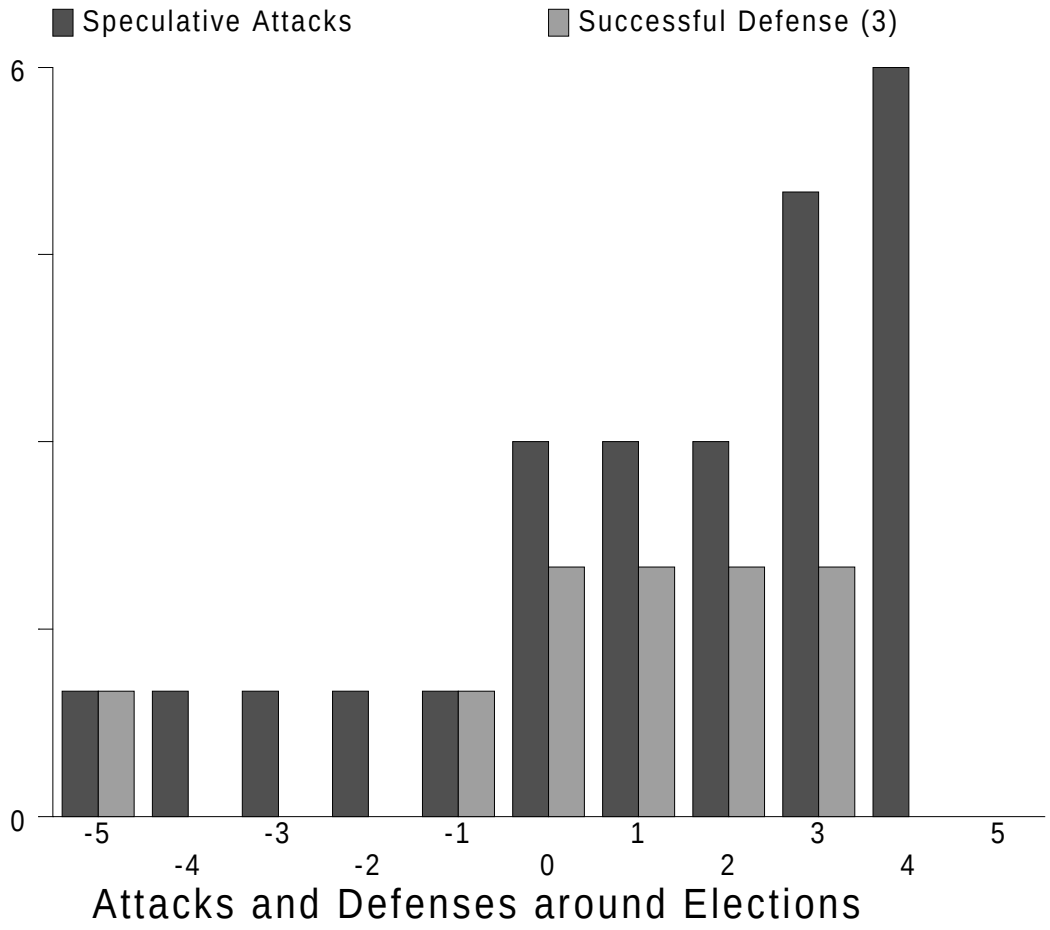


Table One: Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Successful Defense	88	0.52	0.50	0	1
Campaign and Election Period	7240	0.07	0.25	0	1
Post Election Period	7240	0.06	0.23	0	1
Right Government	7240	0.29	0.45	0	1
Parliamentary System	7240	0.38	0.48	0	1
Unified Government	7240	0.69	0.46	0	1
Proportional Representation	7240	0.42	0.49	0	1
Log(reserves/base money)	7240	-0.55	1.17	-6.67	3.09
Real Interest Rate	6257	2.45	40.91	-2099.87	180.75
Log(Exports/GDP)	7240	-1.01	0.70	-3.21	0.54
Capital Controls (t-1)	7240	0.80	0.34	0	1
Speculative Attack	7240	0.01	0.10	0	1
Speculative Attack (t-1)	7240	0.01	0.09	0	1
Exchange Rate Overvaluation	7240	-0.03	0.12	-3.87	0.47
Banking Crisis	7240	0.01	0.08	-0.77	6.36
Domestic Credit Growth	7240	0.01	0.10	-2.02	4.84
Debt Service	7240	6.31	5.00	0.01	38.88
Openness	7240	81.38	41.53	14.66	277.14
US Domestic Interest Rates	7240	5.21	1.32	3.00	8.70
Contagion	7240	0.53	0.86	0	5
Number of Prior Attacks	7240	0.60	1.03	0	6

Table Two: Speculative Attacks and Defenses: Bivariate Probit with Sample Selection

Variable	Coefficient	Robust Standard Error	Univariate Marginal Effects[#]
Defense Equation			
Intercept	-3.39*	0.357	
Campaign and Election Period	0.81*	0.321	0.63
Post Election Period	0.96*	0.292	0.82
Right Government	-0.64*	0.319	-0.16
Proportional Representation	-0.34	0.252	-0.13
Parliamentary System	0.70*	0.211	0.31
Unified Government	0.41*	0.171	0.13
Log(Reserves/Base Money)$_{t-1}$	-0.07	0.085	-0.02
Real Interest Rate$_{t-1}$	0.02*	0.005	0.15
Log(Exports/GDP)$_{t-1}$	-0.22*	0.115	-0.06
Capital Controls$_{t-1}$	0.49*	0.252	0.12
Attack Equation			
Intercept	-2.66*	0.221	
Speculative Attack$_{t-1}$	0.89*	0.211	0.52
Campaign and Election Period	0.17	0.150	0.04
Post Election Period	0.18	0.156	0.04
Real Exchange Rate Overvaluation	2.77*	0.879	0.07
Banking Crisis$_{t-1}$	0.20	0.172	0.00
Log(Reserves/Base Money)$_{t-1}$	-0.12*	0.041	-0.03
Domestic Credit Growth$_{t-1}$	0.43*	0.168	0.01
Debt Service	0.01	0.008	0.01
Openness	-0.01	0.002	-0.02
US Domestic Interest Rates$_{t-1}$	-0.01	0.033	0.00
Capital Controls$_{t-1}$	0.32*	0.126	0.05
Contagion	0.10*	0.043	0.02
Number of Prior Attacks	0.08*	0.036	0.01
ρ	0.917		
χ^2 for ρ	4.95**		
χ^2 for equations	51.97**		

Parameter estimates generated via bivariate probit with sample selection; standard errors are corrected for unequal variation across countries. N=7162 for attack equation and n=88 for defense equation.

[#]Marginal effect is for a discrete change of a dummy variable from zero to one and for an increase of one standard deviation from the mean for a continuous variable.

*z test; $p<0.05$

**χ^2 test; $p<0.05$

Variable	Conditional Marginal Effect [0 → 1]	χ^2	Prob > χ^2
Campaign and Election Period	0.004	6.41	0.040
Post Election Period	0.006	13.04	0.001
Capital Controls$_{t-1}$	0.004	7.07	0.029

Table Three: Predictions from Bivariate Probit Model in Table Two

Selection Equation: Speculative Attacks

		Predicted[#]	
		0	1
Actual	0	5043	2109
	1	32	56

Outcome Equation: Defend

		Predicted[#]	
		0	1
Actual	0	33	9
	1	4	42

Table Four: Speculative Attack Episodes and Defenses

Speculative Attack Episode[1]		Defense Episodes (from table two)		Defense (3 month window)
country	Date	Actual Defense[2]	Predicted Defense[3]	Actual Defense[4]
albania	1992m7	0	0	0
albania	1995m9	1	1	1
albania	1998m12	1	1	1
algeria	1994m4	0	0	0
bolivia	1988m1	1	1	1
botswana	1986m6	1	1	0
botswana	1992m7	1	1	1
botswana	1998m7	0	0	0
brazil	1998m9	1	1	1
capeverd	1996m2	1	1	1
capeverd	1997m8	0	0	0
centrala	1994m1	0	0	0
colombia	1997m9	0	0	0
congorep	1993m7	1	1	0
congorep	1994m1	0	0	0
ecuador	1985m12	0	0	0
egypt	1989m8	0	0	0
elsalvad	1986m1	0	0	0
elsalvad	1990m5	0	0	0
equatori	1994m1	0	0	0
fiji	1987m6	1	1	1
fiji	1987m7	1	1	0
fiji	1987m10	0	1	0
fiji	1989m5	1	1	1
fiji	1998m1	0	1	0
gabon	1993m12	1	1	0
gabon	1994m1	0	0	0
guatemal	1986m6	0	0	0
guyana	1987m1	0	0	0
guyana	1989m4	0	0	0
honduras	1990m3	0	0	0
honduras	1992m10	1	1	1
honduras	1993m7	0	0	0
india	1990m9	1	1	1
india	1990m12	1	1	1
india	1991m4	1	1	0
india	1993m3	0	0	0
india	1997m12	1	1	1
india	1998m6	0	1	0
indonesi	1986m9	0	0	0
kenya	1990m7	1	1	1
kenya	1991m3	1	1	0
kenya	1991m4	0	0	0
kenya	1997m8	0	0	0
korea	1997m11	0	1	0
madagasc	1994m5	0	0	0
malawi	1997m12	0	1	0
malaysia	1988m8	1	1	1

malaysia	1997m7	1	1	0
malaysia	1997m8	1	1	0
malaysia	1997m9	0	0	0
mauritiu	1997m1	1	1	1
mexico	1990m3	1	1	1
mexico	1994m12	0	1	0
moldova	1998m10	0	1	0
nepal	1997m12	1	1	1
niger	1998m8	1	1	1
pakistan	1990m10	1	1	1
pakistan	1998m7	1	1	1
philippi	1986m2	1	1	1
philippi	1990m1	1	1	1
russia	1998m8	1	1	0
russia	1998m9	0	0	0
senegal	1994m1	0	0	0
sierrale	1985m2	0	0	0
sierrale	1986m7	0	0	0
solomoni	1989m3	1	1	1
solomoni	1997m12	0	1	0
southafr	1996m4	0	0	0
srilanka	1988m7	1	1	1
srilanka	1989m5	1	1	1
srilanka	1989m6	1	0	0
srilanka	1993m1	1	0	1
tanzania	1997m7	1	1	1
thailand	1997m7	0	0	0
togo	1996m1	1	1	1
trinidad	1992m1	1	1	1
trinidad	1993m2	1	1	0
trinidad	1993m4	0	1	0
tunisia	1987m2	1	1	1
tunisia	1991m3	1	0	1
tunisia	1991m4	1	0	1
tunisia	1992m11	1	1	1
venezuel	1986m12	0	0	0
venezuel	1989m3	0	0	0
venezuel	1995m12	0	0	0
zimbabwe	1988m2	1	1	1
zimbabwe	1993m1	1	1	0

Notes:
[1] Country and dates identify those periods when a speculative attack occurred.
[2] Defense is coded one if a speculative attack occurred at time t and the country had a fixed exchange rate at time t+1.
[3] Predicted defense according to the model in table two.
[4] Defense is coded one if a speculative attack occurred at time t and the country had a fixed exchange rate at time t+1 and t+2 and t+3.

Table Five: In and Out of Sample Predictions from Bivariate Probit Model[#]

In Sample Predictions (Jan 1995 – Dec 1998)

		Predicted	
		0	1
Actual	0	9	6
	1	0	14

Out of Sample Predictions (Jan 1995 – Dec 1998)

		Predicted	
		0	1
Actual	0	9	6
	1	0	14

[#]Predictions are for the period: January 1995 – December 1998. In sample predictions are based on the model in table two estimated on observations for January 1985 – December 1998. Out of sample predictions are based on the model in table two estimated on observations for January 1985 – December 1994.

Table Six: Speculative Attacks and Defenses: Robustness Check

Variable	Coefficient	Robust Standard Error	Marginal Effects[#]
Defense Equation			
Intercept	-4.37*	2.24*	
Campaign and Election Period	1.37*	0.68	
Post Election Period	2.08*	0.82	
Right Government	-1.40*	0.62	
Proportional Representation	-0.77	0.55	
Parliamentary System	1.54*	0.58	
Unified Government	0.89*	0.43	
$\text{Log(Reserves/Base Money)}_{t-1}$	0.16	0.25	
$\text{Real Interest Rate}_{t-1}$	0.02*	0.01	
$\text{Log(Exports/GDP)}_{t-1}$	-0.70*	0.34	
Real Exchange Rate Overvaluation	-5.88	4.47	
$\text{Banking Crisis}_{t-1}$	-21.30*	8.63	
$\text{Domestic Credit Growth}_{t-1}$	2.02	2.79	
Debt Service	0.02	0.06	
$\text{US Domestic Interest Rates}_{t-1}$	0.22*	0.11	
$\text{Capital Controls}_{t-1}$	0.72	0.41	
Attack Equation			
Intercept	-2.82*	0.26	
$\text{Speculative Attack}_{t-1}$	1.07*	0.21	
Campaign and Election Period	0.18	0.15	
Post Election Period	0.21	0.16	
Proportional Representation	0.17	0.10	
Parliamentary System	0.19	0.12	
Unified Government	-0.03	0.12	
Right Government	-0.18	0.11	
Real Exchange Rate Overvaluation	2.61*	0.92	
$\text{Banking Crisis}_{t-1}$	0.44	0.17	
$\text{Log(Reserves/Base Money)}_{t-1}$	-0.10*	0.05	
$\text{Domestic Credit Growth}_{t-1}$	0.46*	0.17	
Debt Service	0.01	0.01	
Openness	-0.01	0.02	
$\text{US Domestic Interest Rates}_{t-1}$	0.02	0.04	
$\text{Capital Controls}_{t-1}$	0.32*	0.12	
Contagion	0.11*	0.04	
Number of Prior Attacks	0.06*	0.03	
ρ	0.53		
χ^2 for ρ	0.34		
χ^2 for equations	54.22**		

Parameter estimates generated via bivariate probit with sample selection; standard errors are corrected for unequal variation across countries. N=7162 for attack equation and n=88 for defense equation.

[#]Marginal effect is for a discrete change of a dummy variable from zero to one and for an increase of one standard deviation from the mean for a continuous variable.

*z test; $p<0.05$

**χ^2 test; $p<0.05$

Table Seven: Speculative Attacks and Defenses:—Defense with Three Month Window

Variable	Coefficient	Robust Standard Error	Marginal Effects[#]
Defense Equation			
Intercept	-3.20*	0.511	
Campaign and Election Period	0.479	0.356	0.026
Post Election Period	1.104*	0.291	0.10
Right Government	-0.757*	0.321	-0.17
Proportional Representation	-0.178	0.336	-0.06
Parliamentary System	0.494*	0.259	0.19
Unified Government	0.340*	0.176	0.11
$\text{Log(Reserves/Base Money)}_{t-1}$	0.141	0.105	0.08
$\text{Real Interest Rate}_{t-1}$	0.013	0.008	0.13
$\text{Log(Exports/GDP)}_{t-1}$	-0.50*	0.20	-0.13
$\text{Capital Controls}_{t-1}$	0.26*	0.12	0.07
Attack Equation			
Intercept	-2.71*	0.24	
$\text{Speculative Attack}_{t-1}$	1.07*	0.22	0.89
Campaign and Election Period	0.16	0.15	0.05
Post Election Period	0.19	0.15	0.06
Real Exchange Rate Overvaluation	2.44*	1.02	0.07
$\text{Banking Crisis}_{t-1}$	0.14	0.14	0.00
$\text{Log(Reserves/Base Money)}_{t-1}$	-0.12*	0.04	-0.04
$\text{Domestic Credit Growth}_{t-1}$	0.44*	0.17	0.01
Debt Service	0.01	0.01	0.01
Openness	-0.01	0.002	-0.01
$\text{US Domestic Interest Rates}_{t-1}$	0.01	0.03	0.00
$\text{Capital Controls}_{t-1}$	0.31*	0.13	0.06
Contagion	0.11*	0.04	0.02
Number of Prior Attacks	0.08*	0.04	0.02
ρ	0.79		
χ^2 for ρ	4.66**		
χ^2 for equations	33.77**		

Parameter estimates generated via bivariate probit with sample selection; standard errors are corrected for unequal variation across countries. N=7162 for attack equation and n=88 for defense equation.

[#]Marginal effect is for a discrete change of a dummy variable from zero to one and for an increase of one standard deviation from the mean for a continuous variable.

*z test; $p<0.05$

**χ^2 test; $p<0.05$