Exchange Rate Interventions and Insurance: Is Fear of Floating a Cause for Concern?

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Fear of floating has recently come to be seen as one of the central de facto characteristics of exchange rate regimes in emerging markets, after first being identified by Calvo and Reinhart (2002). The interpretation of this phenomenon is still open to question. Does the optimal monetary regime for emerging markets with open capital markets entail limited exchange rate flexibility? Is the famous trilemma of open economies really a dilemma (as formulated by Shambaugh, 2004) for emerging markets—a choice between open capital markets or monetary freedom with no separate choice of exchange rate policy? Or is the trilemma alive and well? Does the pervasive fear of floating indicate instead that many emerging markets inadvisably choose to limit exchange rate flexibility when a genuine floating regime would be preferable?

Although the literature on this topic could be classified along many dimensions, this paper focuses on the extent to which fear of floating is the optimal policy for emerging markets. The literature can be divided into works that focus on deriving fear of floating as the optimal ex post monetary policy, taking into account the particular economic environment and shocks faced by emerging markets, and works that focus on the ex ante effects of monetary policy, where anticipation of exchange rate policy can drive inefficient private sector decisions. The main factors that are claimed to support fear of floating ex post are the

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pass-through of (excessive) exchange rate volatility into domestic inflation, the costs to inflation credibility this might entail, and the contractionary effects of a devaluation on an economy with a high level of dollarized liabilities. In contrast, Caballero and Krishnamurthy (2004) argue that although limited exchange rate flexibility is often the optimal discretionary policy ex post, it distorts the private sector's incentives to insure itself ex ante against sudden stops in capital inflows. If the private sector anticipates that the exchange rate will be defended during a crisis, its own incentives to hoard international liquidity are weakened. Such anticipation can be the ex ante cause of the excessive dollarization that supposedly validates fear of floating ex post. Fear of floating is not optimal, but it is the equilibrium policy in the absence of a commitment to float during crises. Countries can improve their insurance against sudden stops by giving the private sector the right incentives, either through a commitment to a floating exchange rate or through various substitute policies that we discuss later in the paper.

The purpose of this paper is to explore the tension between these approaches and its implications for exchange rate policy in emerging markets. We examine the question of whether fear of floating is simply the optimal policy choice in a difficult environment or a suboptimal equilibrium with too little exchange rate flexibility during external crises. We take the view that these explanations are not necessarily mutually exclusive, in that fear of floating may have different aspects under different circumstances. In the face of less severe external shocks, when the supply of international liquidity is not exhausted, countries will optimally stress the ex post considerations while preferring to avoid the inflationary effects of exchange rate instability. This does not preclude that the exchange rate be allowed to float during severe crises, when international liquidity shortages are binding; the commitment to this stance ex ante provides maximal insurance against such events. In this view, while floating exchange rates can have important incentive effects, the exchange rate does not need to float freely under all circumstances for these effects to obtain. This leads naturally to the concept of state contingency. It is impossible to evaluate the consequences of fear of floating without understanding the circumstances under which such exchange rate rigidity occurred. Perhaps the significant unconditional fear of floating that the literature identifies masks conditional flexibility during external crises.

We develop a simple model that captures a trade off between ex ante and ex post considerations. The are two states of nature, a "good" state, during which international liquidity is sufficient, and a "bad" state, or crisis, during which constraints on the supply of international liquidity are binding. The optimal policy with commitment is indeed state contingent along the lines described above, with policymakers intervening to stabilize the exchange rate and prevent inflation pass-through when there is no crisis, but allowing the exchange rate to float if a potential crisis occurs, for its effect on expectations.[1] We also consider two second-best policy regimes: the discretionary policy, which is determined ex post with no commitment, and the noncontingent policy with commitment. As in Caballero and Krishnamurthy (2004), the discretionary policy will exhibit inefficient fear of floating during crises and forego the insurance benefits of the floating exchange rate, but it does not compromise the benefits of exchange rate stability during normal times. The noncontingent policy with commitment is viewed as a proxy for the process of building commitment to floating, during which time it might be necessary to avoid intervention altogether. Although this brings the benefits of improved ex ante insurance against external shocks, it also carries short-term costs in the form of the greater inflation pass-through that floating entails.

To empirically identify state contingency, we develop an indicator of potential sudden stops as a proxy for the bad state of nature described above. The indicator is derived from the spread on a broad index of high-yield debt. A rise in high-yield spreads is treated as a (common) exogenous negative shock to external financing conditions for emerging markets and, as such, as a potential sudden stop. We compare the behavior of the exchange rate regime in periods with and without external pressure and then classify the state-contingent exchange rate regime. It is important to emphasize that we evaluate state contingency with respect to potential sudden stops. This allows us to address the question of whether the exchange rate regime has an effect on the likelihood of actual sudden stops, which are treated as endogenous, and hence to evaluate the insurance provided by floating exchange rates.

Classifying exchange rate regimes according to their behavior during potential sudden stops reveals that many countries display little difference in the degree of exchange rate flexibility during potential crises and other times, and their exchange rate flexibility is uniformly low. These emerging markets are viewed as operating under a discretionary exchange regime. Another group of emerging markets

1. Preventing inflation pass-through is not the only ex post channel through which fear of floating can be justified. We focus on one channel to keep the model streamlined.

does not exhibit state contingency because their exchange rate flexibility is uniformly high. These countries cannot be described as exhibiting fear of floating, and we interpret these countries as noncontingent regimes committed to floating. Finally, a few countries do exhibit fully state-contingent exchange rate flexibility.

After characterizing exchange rate behavior in the face of potential crises, we then proceed to investigate the extent to which the choice of regime can be given a normative interpretation. In particular, does widespread fear of floating during potential crises imply that a commitment to floating would be beneficial? To answer this question, we explore insurance substitutes. As discussed in Caballero and Krishnamurthy (2004), sterilization of capital inflows and direct financial regulation can substitute for the incentives provided by a commitment to floating. We examine the data, but find little evidence of such substitute policies. The model suggests that fear of floating should therefore be associated with underinsurance against liquidity crises. We test this hypothesis by examining two outcomes, the likelihood of suffering a sudden stop and the link between the exchange rate regime and the self-insurance of the private sector. In both cases, we find evidence that fear of floating matters. Less flexibility during potential crises is associated with a greater probability of an actual sudden stop.[2] More flexible regimes, in turn, lead to greater hoarding of foreign exchange reserves by the private sector. Finally, we investigate the determinants of exchange rate regime choices. A key ingredient in the analysis is the credibility of monetary policymaking. The model suggests that state-contingent regimes require the most credibility, noncontingent floating an intermediate level of credibility, and discretionary policy the lowest level of credibility. The data give some support to this hypothesis, showing an association between floating exchange rates and the overall credibility of the monetary policy framework, as measured by the commitment to inflation targeting.

The outline of the paper is as follows. Section 1 describes the theoretical framework we use to approach the data. Section 2 describes the data and methodology and provides an outline of the empirical facts. Section 3 provides a more formal analysis of the time series measures of exchange rate flexibility. Section 4 examines the consequences of the choice of exchange rate regime. Section 5 analyzes the determinants of exchange rate flexibility, and Section 6 concludes.

2. This result is not by construction. Exchange rate regimes are characterized in relation to potential crises, while the measure of sudden stops is an actual outcome.

1. Fear of Floating: Theoretical Discussion

As stated above, various models have been proposed in the literature to explain fear of floating. Calvo and Reinhart (2002) suggest that fear of floating can be explained by a monetary policy dilemma trading off the seigniorage benefits of inflation against the cost of deviating from an inflation target in an environment with risk premium shocks and a high pass-through of the exchange rate to the national price level. In their model, fear of floating is increasing in the size of the risk premium shocks and the extent to which inflation targeting is valued over seigniorage. Other authors, such as Aghion, Banerjee, and Bacchetta (2003), emphasize the balance sheet channel. Most studies in this group take as given the presence of substantial dollar liabilities that raise the risk of bankruptcies in the event of a devaluation. However, Céspedes, Chang, and Velasco (2004) present a model in which the balance sheet effects of dollarized liabilities do not necessarily overturn the standard Mundell-Fleming analysis that floating rates are better in the presence of external real shocks, since floating also has effects on the asset side. Lahiri and Végh (2001) rationalize fear of floating as the optimal policy in an environment characterized by an output cost of nominal exchange rate fluctuations, an output cost of raising interest rates to defend the currency, and a fixed cost of intervention. The fixed cost generates a nonlinearity in which fear of floating only arises for large shocks. Despite deriving fear of floating from different imperfections, for our purpose these models share the important feature that fear of floating is a characteristic of the optimal ex post monetary policy.

Caballero and Krishnamurthy (2004) offer a different view. Fear of floating arises in their model out of a time-consistency problem. Although it is optimal to tighten monetary policy ex post assuming the country is suffering an international liquidity crisis, such a policy increases the extent to which firms fail to conserve international liquidity ex ante. The central monetary policy issue for a country facing such sudden stops is to make certain that the private sector takes sufficient precautions to insure itself against such crises. A floating exchange rate is the optimal policy from an ex ante perspective as it raises the return to holding international liquidity, leads to increased hoarding of dollar liquidity, and helps to ameliorate the underinsurance of the private sector. The difficulty in implementing this policy is that the floating exchange rate is no longer optimal once a crisis occurs, since an exchange rate depreciation leads to inflation, and thus the time-consistent equilibrium entails fear of floating. In developing our theoretical model, the central insight we take from this analysis is the existence of a commitment problem with respect to floating.

The framework that we outline below combines elements from both approaches to exchange rate flexibility, and we assume that fear of floating can have a different aspect under different circumstances. In particular, we assume that there are two states of the world. In the "good" state, there is no shortage of international liquidity and, hence, the issue of insurance does not arise. In this case, the government optimally focuses on the ex post issues. In particular, the excess volatility of foreign exchange markets creates incentives to limit exchange rate volatility and prevent its pass-through into domestic inflation.[3] In the "bad" state, a shortage of international liquidity is binding. The policy should focus on the prevention of, or insurance against, such crises. In this case, fear of floating is not the optimal response, taking into account the ex ante effects on the incentives of the private sector to insure itself.

We examine the choice of exchange rate flexibility under three different assumptions about the government and its ability to commit. The discretionary regime is the optimal policy when the government cannot commit to floating during sudden stops, and so the policy is determined ex post. Such a policy will be optimal in the "good" state, but it will contribute to underinsurance during sudden stops in the "bad" state. The state-contingent regime assumes that the government can commit to floating during sudden stops but is also free to intervene in the good state without compromising that commitment. Finally, in the noncontingent regime, the government can commit to its exchange rate regime, but the private sector does not observe the state of the world. The government must therefore choose the same exchange rate flexibility at all times, since intervention during normal times can compromise the commitment to floating during crises.

The restriction on feasible policies in the noncontingent regime might appear ad hoc, as it is not derived endogenously within the model but simply imposed as an assumption. We consider this regime for several reasons. First, we think it is a useful approximation to the feasible floating policy for a country that needs to build credibility for its commitment to floating. Barro (1986) formally models a similar situation in the context of building a reputation for inflation credibility. In that model, the private sector is uncertain about the preferences of the

3. The forward discount bias is often attributed to noise traders. See Frankel and Froot (1989).

policymaker and the policymaker takes into account the fact that the private sector learns about these preferences through his actions. The equilibrium exhibits periods in which policymakers that are tough on inflation drive inflation to a very low level to demonstrate this fact until a reputation is established. We conjecture that a policy of noncontingent floating can operate in a similar manner when a reputation for floating during crises has not been established. Furthermore, this policy regime appears to describe the behavior of some countries in our empirical investigation, so we are compelled to consider it as a theoretical possibility.

1.1 A Model

The model draws heavily on the framework of Caballero and Krishnamurthy (2004), postulating an overinvestment problem in the "bad" state, which is the mirror image of the failure to optimally hoard sufficient international liquidity as insurance against sudden stops. Crucially, the extent of overinvestment depends on expectations of exchange rate policy. The framework is extended by postulating a desire to limit exchange rate flexibility in the "good" state, when there are no insurance issues, but the pass-through of exchange rate volatility into the price level is still a cause for concern. The optimal policy must resolve the tension between these goals, under different constraints on the policymaker's commitment. To simplify the exposition, we present the model in reduced form without explicitly considering the microeconomic foundations of the mechanisms through which exchange rate policy acts.

Consider a three-period economy. At time 0, firms make investment decisions. At time 1, a crisis may or may not occur that requires firms to make some reinvestment to maintain the productivity of their asset. At time 2, the economy consumes its output, which depends on both the investment at time 0 and the reinvestment at time 1. If a crisis occurs in period 1, the government faces ex post incentives to tighten monetary policy to protect itself against inflation, as in the literature in which fear of floating is optimal, since the insurance aspects of exchange rate policy are already sunk, but ex ante insurance concerns are foremost. If no crisis occurs, excess exchange rate volatility is still undesirable through its effect on prices, and fear of floating is optimal.

The insurance aspect of monetary policy is that firms' investment decisions at time 0 depend on expectations of the exchange rate during the crisis. The country is assumed to hold a fixed amount of international collateral that it can either use to finance investment at time 0 or hoard as insurance against a crisis at time 1. The exchange rate determines the price at which international collateral can be traded on the domestic market at time 1 and thus provides incentives for its accumulation or usage. A pecuniary externality leads to an undervaluing of international collateral (relative to the price that maximizes output at time 2), so firms overinvest at time 0 and conserve too little international collateral for the possible crisis at time 1. Monetary policy affects the exchange rate and thus has the power to correct this mispricing, but to achieve this the government has to commit to allowing the exchange rate to depreciate during the crisis. This raises the return to holding international liquidity, lowers the return to investing, and moves the investment decisions of firms closer to the output-maximizing level. The time-inconsistency problem arises since once the crisis occurs, the investment decision is predetermined and the exchange rate depreciation just raises inflation. This is costly to the government, so ex post the government prefers to limit exchange rate flexibility.

The objective function of the government is given by $W(Y, |\pi|)$, where $|\pi|$ is the expected absolute inflation rate that prevails in period 1, Y is the expected output of the economy in period 2, $W_y > 0$, and $W_{|\pi|} < 0$.[4] The output that is produced in period 2 depends on whether a crisis occurred. The states of the world in which no crisis occurs and a crisis occurs are denoted G and B, respectively, and the probabilities of these states of nature are p and $1 - p$, respectively. The economy produces $Y^G(K)$ if no crisis occurs and $Y^B(K)$ if a crisis occurs, where K is the investment level of the private sector in period 0. The crisis generates a production shock that requires further investment, and although the productivity of the capital stock is restored, the country ends up investing more to produce each unit of output. Thus $Y^G(K) > Y^B(K)$.

The inflation rate depends on the government's monetary policy via the exchange rate. We formalize monetary policy as a choice over the flexibility of the exchange rate, F, which in general can differ across the good and bad states, F^G and F^B. If the exchange rate is flexible during the potential crisis, the exchange rate depreciates and inflation increases. If the government chooses an

4. This objective implies that the government is equally averse to inflation and deflation. If we hold output (Y) constant, the optimal inflation rate is zero.

inflexible exchange rate, then depreciation and inflation are limited. Likewise, we assume that if no crisis occurs, excess exchange rate volatility would be passed into the price level under a flexible exchange rate.[5] We define the exchange rate, e, as the domestic price of one unit of international liquidity (dollars), so that larger values represent depreciations.

$$\pi = \pi(e) \text{ and } \pi_e > 0;$$

$$e = e(F), \quad \left|e^G\right|_F > 0, \text{ and } e_F^B > 0.$$

In reduced form, $\left|\pi\right|_F > 0$.

The investment decision, $K(e^B)$, depends on the (rationally expected) exchange rate that prevails in period 1, e^B, but only in the event that the crisis occurs. If the crisis does not occur, then firms do not require any further foreign capital, so the exchange rate in the good state does not affect the firms' objective function. Investment is not under the direct control of the government, although it determines welfare through output, Y. Consequently, the government must pursue its monetary policies taking into account the incentive effect that the exchange rate has on decentralized private sector investment decisions.

Monetary policy affects the investment decision of firms. Under the assumptions of Caballero and Krishnamurthy (2004), firms overinvest (relative to the output-maximizing level at time 2) unless the exchange rate is allowed to depreciate during crises. If the exchange rate is flexible in the crisis, investment decreases toward the output-maximizing level. Y^B increases, since more international capital is available during the crisis for reinvestment, and firms do not take decisions that maximize output owing to an externality (see Caballero and Krishnamurthy, 2004, for details). At the same time, Y^G declines, since in the absence of a crisis it is optimal to invest all available international capital in the domestic economy. Nevertheless, the assumption of an overinvestment problem implies by definition that the gain in a bad state outweighs the loss in a

5. There is an asymmetry in the shocks in the two states of nature. In the bad state, a shortage of international capital tends to depreciate the exchange rate if the government allows it to, so that π is positive and increasing in exchange rate flexibility F. In the good state, external shocks can lead to appreciation or depreciation. Although $|\pi|$ increases with F, the sign depends on the shock in the good state.

good state, so that expected output, Y, increases with exchange rate flexibility in the bad state, F^B.

$K = K(e)$ and $K_e < 0$;

$Y_K^G(K) > 0$, $Y_K^B(K) < 0$, but $Y_K(K) < 0$.

In reduced form, we can write $Y^G(F^B)$ and $Y^B(F^B)$, where F^B is exchange rate flexibility in the bad state, with

$Y_{F^B}^G < 0$, $Y_{F^B}^B > 0$, and $Y_{F^B} > 0$.

Finally we can write the government's problem as

$$\max_{F^G, F^B} W(Y, |\pi|) = W\left[(1-p)Y^G + pY^B, (1-p)\left|\pi^G\right| + p\left|\pi^B\right|\right].$$

The above analysis demonstrates that the government faces a tradeoff in choosing exchange rate flexibility, since

$Y_{F^B} > 0$,

which is beneficial, while

$|\pi|_{F^B} > 0$ and $|\pi|_{F^G} > 0$,

which is undesirable. We will characterize the solution to this problem under the following three assumptions: the time-consistent discretionary policy, the optimal noncontingent policy with commitment, and the optimal state-contingent policy with commitment.

Case 1: The discretionary policy with no commitment

The time-consistent policy is chosen in period 1, taking investment decisions and the occurrence (or not) of the crisis as given. The fact that policy is chosen ex post implies that the government has the option of carrying out a state-contingent policy. We denote the exchange rate flexibility chosen in each state as F^B and F^G, where the index denotes the fact that the policy is chosen ex post in period 1.

If the crisis occurs, then the government solves

$$\max_{F} W(Y, |\pi|).$$

Once the crisis has occurred, monetary policy has no effect on aggregate output, which is predetermined by the aggregate capital stock and the remaining international liquidity. Therefore,

$$Y_F^B = 0,$$

and the first-order condition that determines the optimal F^B is given in terms of the marginal costs (MC_D^B) and benefits (MB_D^B) of exchange rate flexibility as

$$\mathrm{MC}_D^B = pW_\pi(Y,|\pi|)|\pi^B|_{F^B} \text{ and}$$

$$\mathrm{MB}_D^B = 0, \text{ so that}$$

$$0 = W_\pi(Y,|\pi|)|\pi^B|_{F^B}.$$

The government tightens monetary policy until either

$$W_\pi(Y,|\pi|) = 0,$$

in which case there are no further benefits to lowering inflation, or

$$|\pi^B|_{F^B} = 0,$$

in which case inflation cannot be lowered any further.

If the crisis does not occur then the government solves

$$\max_F W(Y,|\pi|).$$

The same reasoning implies that the optimal F^G satisfies

$$MC_D^G = pW_\pi(Y,|\pi|)|\pi^G|_{F^G} \text{ and}$$

$$MB_D^G = 0, \text{ so that}$$

$$0 = W_\pi(Y,|\pi|)|\pi^G|_{F^G}.$$

We obtain identical first-order conditions for the optimal flexibility, F, in both states. Under the simplifying assumption that the relation between absolute inflation, $|\pi|$, and flexibility is the same in both states, the discretionary policy exhibits no state contingency even though this is an a priori possibility.

Case 2: The noncontingent policy with commitment

Under this assumption, the government must commit to the same degree of exchange rate flexibility whether or not the crisis occurs. We denote the noncontingent optimal policy as F. The first-order conditions in terms of the marginal costs and benefits of flexibility are as follows:

$MC_{NC} = (1-p)W_{\pi}(Y,|\pi|)|\pi^{G}|_{F} + pW_{\pi}(Y,|\pi|)|\pi^{B}|_{F} = W_{\pi}(Y,|\pi|)|\pi|_{F}$ and

$MB_{NC} = (1-p)W_{Y}(Y,|\pi|)Y_{F}^{G} + pW_{Y}(Y,|\pi|)Y_{F}^{B} = W_{Y}(Y,|\pi|)Y_{F}$, so that

$W_{Y}(Y,|\pi|)Y_{F} = W_{\pi}(Y,|\pi|)|\pi|_{F}$.

In contrast to case 1, exchange rate flexibility carries both costs and benefits, since the decision is made ex ante when the incentive effects of exchange rate policy on expectations and output can be taken into account. At the margin, the optimal policy will trade off the insurance benefits of exchange rate flexibility ex ante (which operate through output) against the inflation costs ex post.

Case 3: The state-contingent policy with commitment

Under this assumption, the degree of flexibility is unconstrained across states of nature and the government can choose F^G and F^B separately. The first-order conditions for this problem differ according to the state.

In the bad state,

$MB_{C}^{B} = pW_{Y}(Y,|\pi|)Y_{F^B}^{B}$ and

$MC_{C}^{B} = pW_{\pi}(Y,|\pi|)|\pi^{B}|_{F^B}$, so that

$W_{Y}(Y,|\pi|)Y_{F^B} = W_{\pi}(Y,|\pi|)|\pi|_{F^B}$.

In the good state,

$MB_{C}^{G} = 0$ and

$MC_{C}^{G} = (1-p)W_{\pi}(Y,|\pi|)|\pi^{G}|_{F^G}$, so that

$0 = W_{\pi}(Y,|\pi|)|\pi|_{F^B}$.

During a potential crisis, it is optimal to trade off the insurance benefits of exchange rate flexibility against the cost of inflation. In other times, exchange rate flexibility offers no benefits (at the margin), so the optimal policy only takes into account the costs of inflation. This implies that the fully optimal policy is indeed state contingent, with more flexibility during potential crises.

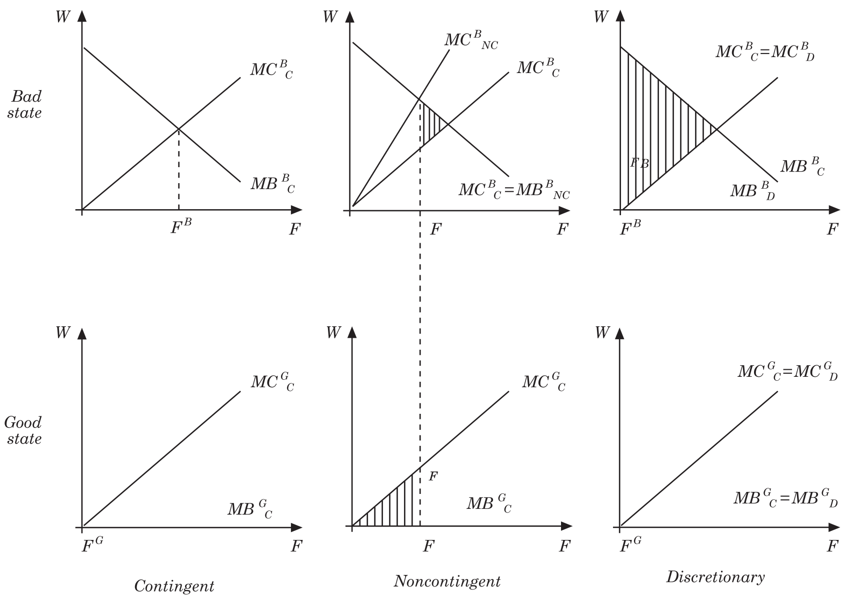
1.2 Comparing the Policy Regimes

The previous section solved the model under several different assumptions about the policy options of the government. We now need to rank these choices. The state-contingent policy dominates the noncontingent policy, which dominates the discretionary policy. The reason is simply that the set of feasible policies expands with credibility. The state-contingent policy sets a separate and fully optimal exchange rate policy for each state of nature, taking into account the ex ante insurance properties of exchange rate flexibility; as such, it must dominate any other policy option a fortiori, since every noncontingent policy is also a contingent policy and since it is always feasible, if superfluous, to commit to the discretionary policy. Likewise the discretionary policy implies the same exchange rate flexibility in both states of nature, so it is a feasible noncontingent policy, and the same argument applies.

Figure 1 illustrates the intuition. For each state of nature, the figure plots the marginal benefit and marginal cost of exchange rate flexibility as derived above, as well as the optimal degree of flexibility at the intersection of these schedules. For the noncontingent and discretionary regimes, losses in each state of nature relative to the fully optimal state-contingent policy with commitment are shaded. The noncontingent policy involves losses in both states of nature, as it entails too much flexibility in the good state and too little in the bad state. The discretionary policy is identical to the state-contingent policy in the good state, since it limits exchange rate flexibility, but it leads to suboptimal fear of floating in the bad state, since a flexible exchange rate would be preferable.

The next section examines the data on exchange rate flexibility through the model developed above and categorizes exchange rate regimes. We look for evidence of state-contingent flexibility that would mitigate the welfare implications of the fear of floating that the literature discusses. At the same time, we examine the outliers

Figure 1. Contingent, Noncontingent, and Discretionary Exchange Rate Flexibility[a]



a. For each state of nature, the figure plots the marginal benefit (MB) and marginal cost (MC) of exchange rate flexibility, as well as the optimal degree of flexibility at the intersection of these schedules. For the noncontingent and discretionary regimes, losses in each state of nature relative to the fully optimal state-contingent policy with commitment are shaded.

relative to the fear of floating category. These countries are not operating state-contingent regimes, but they are distinguished by their uniformly high level of flexibility.

2. Fear of Floating, Noncontingent Floating, and State-Contingent Flexibility

The methodological approach that we adopt to characterize exchange rate flexibility follows Calvo and Reinhart (2002). However, whereas Calvo and Reinhart characterize differences in unconditional exchange rate flexibility across countries relative to the benchmark floaters of Australia and the Group of Three (G3) countries, we extend this analysis to investigate whether exchange rate flexibility of emerging market floaters varies over states of nature.[6] We do not dispute that fear of floating characterizes the unconditional exchange rate regime across emerging markets, but we seek to determine whether this unconditional measure conceals flexibility with respect to shocks that are important from an insurance perspective.

The literature on the de facto classification of exchange rate regimes has burgeoned recently. Reinhart and Rogoff (2004) extend the analysis of Calvo and Reinhart (2002) by developing a de facto classification of exchange rate regimes, which shows a substantial number of deviations from the declared de jure regimes. The fear of floating manifests itself in the misclassification of regimes that de jure float, but de facto are less flexible. Levy-Yeyati and Sturzenegger (2003) develop a similar index, albeit based on a different classification methodology, and arrive at the same finding of extensive misclassification. Stambaugh (2004) constructs an alternative classification scheme. We follow the approach of Calvo and Reinhart (2002) for two reasons. First, the methodologies in the papers cited above are suited to the broad classification question of how to distinguish between fixed and flexible arrangements, whereas our investigation focuses on the differences within the group of de jure flexible regimes. Second, we want our results to be comparable with those reported in Calvo and Reinhart's paper, which started the fear-of-floating debate.[7]

To measure flexibility, we compare movements in exchange rates with movements in monetary policy instruments that affect the exchange rate. Examining the exchange rate in isolation is not informative about exchange rate policy, as it does not take into account the shocks that monetary policy faces. If the exchange rate is stable, we do not know whether it was due to policy choices despite shocks or to a lack of shocks. To deal with this problem, we define a flexible exchange rate as an exchange rate that is volatile relative to the

6. Germany has a fixed exchange rate as a member of the euro area, and it previously had limited flexibility under the exchange rate mechanism. Calvo and Reinhart's point, however, was that the currencies of the G-3 floated freely against each other.

7. Furthermore, the question of the correct classification methodology is far from settled. Different methodologies appear to be suitable for different purposes, and as Frankel (2003) notes, the correlation among different de facto measures is actually quite low. We therefore choose the measure that is most suitable for the questions we wish to address. For example, the correlation between the Reinhart-Rogoff (2004) and the Levy-Yeyati Sturzenegger (2003) classifications is 0.41, which is not much larger than the 0.33 correlation between the Reinhart-Rogoff (2004) and the much-maligned de jure classification.

instruments that could stabilize it. The implicit idea is that the policymaker faces a choice about how to accommodate a given external shock: it can be allowed to affect the exchange rate if policy is inactive, or the exchange rate can be insulated if policy is active. Exchange rate flexibility is about the relative volatilities of the exchange rate and instruments, not about the absolute volatility of either in isolation.

We follow Calvo and Reinhart (2002) in using changes in reserves and interest rates as measures of the monetary policy instruments available to the authorities and, hence, as measures of the degree of intervention. Using these variables is not without problems, however, and we review some of the issues here.[8] We risk errors of omission and commission in using changes in reserves or interest rates as measures of intervention, and these potential biases might be more or less relevant depending on whether the goal is to determine the within-country state contingency of exchange rate flexibility or to compare exchange rate regimes across countries. Nevertheless, we use these measures despite the many qualifications or issues of interpretation, because they are the best data that we have available and because they are used in previous studies with which we would like to compare our results.

Reserves can change for reasons unrelated to intervention, in particular the accrual of interest and the management of foreign currency debt. However, since we focus on large movements in reserves, we are not likely to misclassify an accounting change of reserves as an intervention because of the magnitude of the changes on which we focus. We are thus unlikely to be biased toward measuring too much intervention. On the other hand, reserve movements can be "hidden," for example when they involve credit lines or derivative transactions that are not reported on the balance sheet. We might miss some of these interventions and then misclassify regimes as not intervening when in fact they are. This would not be a problem if our intention was to establish fear of floating, as it would bias our results toward finding flexibility and thus make the hypothesis harder to establish. However, since one of our major goals is to investigate the circumstances in which the exchange rate regime becomes more flexible, it is possible that our findings could be explained by a change in the method of intervention toward "hidden" transactions. This could be a problem for establishing state contingency both within a country (if the change in the means

8. Calvo and Reinhart (2002) also discuss some of the same issues.

of intervention is correlated with the shocks we use to measure state contingency) and across countries (if countries with apparently flexible regimes are more likely to use "hidden" transactions).

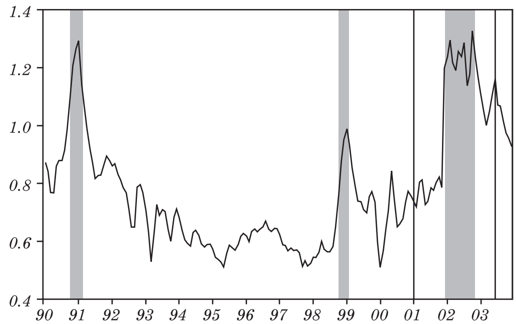
We also face several issues with regard to using interest rates as measures of foreign exchange intervention. The first is the extent to which the interest rate is genuinely an instrument of exchange rate management. Calvo and Reinhart (2002) present much anecdotal evidence that interest rates in emerging markets are active instruments of exchange rate management, but Shambaugh (2004) presents more systematic evidence that interest rate policy is not uniform across emerging markets, and countries with more flexible exchange rates have more autonomy in setting their interest rates. If interest rates are not just tools of exchange rate management, we risk misclassifying episodes as interventions when they are not. This would present a problem for the within-country results only to the extent that the shocks that we use to measure external crises had a direct effect on the domestic economy, separate from the exchange rate channel, and interest rate policy responded directly to these effects. This does not seem a very plausible assumption. The issues are more serious when we turn to cross-country comparisons, since the empirical measures of interest rates that are available across countries are far from uniform, and policy interest rates—which are the most natural counterpart to the theoretical analysis—are not always available. Thus the extent to which interest rate policy is directed toward exchange rate management may vary across countries, In addition, we may introduce biases related to systematic differences in the interest rate series we use across countries. If the extent of misclassification varies systematically with exchange rate flexibility (for example, if more flexible exchange rates increase the autonomy of monetary policy, so that the interest rate can be directed to domestic macroeconomic objectives), then there would be a bias toward finding fear of floating. This issue is relevant for the results in Calvo and Reinhart (2002), although they do not discuss it, and it makes it more difficult for us to establish circumstances in which exchange rates are flexible.

As in Calvo and Reinhart (2002) we first adopt a relatively atheoretical approach to exploring the data. To measure exchange rate volatility, we compute the probability that the monthly percentage change in the nominal exchange rate is within a given band. To measure instrument volatility, we examine the movement of foreign exchange reserves and interest rates. We denote the absolute value of the percent change and the absolute value of the change in variable x by $\hat{x}$ and $|x|$, respectively, and x^c represents a critical threshold. We are interested in the probability that the variables $\hat{x}$ or $|x|$ are less than x^c. We follow Calvo and Reinhart (2002) in considering percent changes for nominal exchange rates and international reserves (setting x^c equal to 2.5 percent), and absolute changes for nominal and real interest rates (setting x^c equal to 400 basis points). We use bands to measure volatility as they are less dependent on outliers than are variances, and they are also less likely to misidentify changes in instruments as interventions because they focus in big policy changes. We also carry out a more formal analysis using variances in the next section.

To examine whether flexibility varies when the country faces a potential sudden stop, we use a measure of high yield spreads (defined as the difference between Moody's seasoned Aaa and Baa corporate bond yields) to capture a source of exogenous financial pressure. Shocks are measured as the difference between the logarithm of the actual series and its trend as measured with the Hodrick-Prescott filter. In particular, we define a period of external pressure as an episode in which either the shock is one standard deviation above its average or the change in the actual series is one standard deviation above its average. These two dimensions imply that we are defining potential crises as periods when the level or the change in high yield spreads were particularly high. Consequently, the periods that qualify under this definition are October 1990 to April 1991; October 1998 to March 1999; January 2001; December 2001 to December 2002; and June 2003.

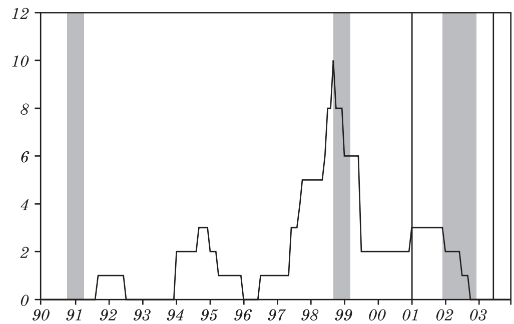
This variable is intended as an exogenous source of potential financial pressure. Since we are interested in the preventive properties of exchange rate regimes, it would not be correct to look at actual crises. Our goal is to examine exchange rate choices during episodes in which countries had a choice about whether to pursue a tight monetary policy or to let the exchange rate depreciate. We therefore pay careful attention, in our interpretation of the results, to whether we have excluded all false positives related to actual crises, when even fixed exchange rates can pass through periods of turbulence. At any rate, such "false positives" concerning exchange rate flexibility are more likely to occur in situations combining low levels of reserves and financial crises, which we already partially excluding with the sample selection (see below). The index of high yield spreads (HYS) and the periods identified as potential sudden stops are illustrated in figure 2.

Figure 2. The High-Yield-Spread Index and Potential Sudden Stops[a]



Source: Authors' calculations.
a. The line plots the high-yield-spread index; the shaded area represents potential sudden stops.

Figure 3. Actual and Potential Sudden Stops[a]



Source: Authors' calculations.
a. The line represents actual sudden stops; the shaded area represents potential sudden stops.

Figure 3 shows the relation between potential and actual sudden stops. The index of actual sudden stops in emerging markets is based on the definition of Calvo, Izquierdo, and Mejía (2004) and is discussed more fully in section 4. As the figure illustrates, while many actual sudden stops occurred during the period of turmoil in emerging markets in 1998–99, fewer occurred in 2001–2002, when the index of potential crises indicates a high level of external pressure. This less-than-perfect correlation between actual and potential sudden stops is not a problem for the analysis that follows. First, to classify exchange rate regimes, it is more important to identify a plausible exogenous shock than to explain all sudden stops. Second, we are interested in explaining when the common high-yield-spread shock becomes a country-specific sudden stop. The fact that the relation between high yield spreads and sudden stops exhibits some variation allows us to investigate which factors can account for this. In particular, the increased adoption of flexible exchange rates has been associated with increased insurance against potential external crises (see section 4).

2.1 Data

All our analyses use monthly data from the *International Financial Statistics* (IFS) published by the International Monetary Fund (IMF). The nominal exchange rate is the monthly end-of-period bilateral dollar exchange rate (source: IFS line ae). Reserves are measured using gross foreign exchange reserves minus gold (source: IFS line 1L.d). Regarding nominal interest rates, we follow Calvo and Reinhart (2002) in using policy interest rates whenever possible. As these vary by country, we use interbank rates for Argentina, Australia, Brazil, India, Indonesia, Malaysia, Mexico, Pakistan, Singapore, South Africa, and Thailand (source: IFS line 60B), deposit rates for Chile (source: IFS line 60L), discount rates for Colombia and Peru (source: IFS line 60). and Treasury bill rates for Israel and the Philippines (source: IFS line 60C).

The sample was chosen to include emerging economies that are sufficiently developed so as to have access to capital flows, so that they face the open economy policy dilemmas described above. In particular, we only incorporate countries that are included in the Morgan Stanley Capital International (MSCI) index.[9] In contrast to Calvo and Reinhart (2002), we consider only the period starting in 1990 because this is when voluntary capital flows to these economies become substantial. We exclude the transition economies because they experienced shocks and reforms of a very different nature in the 1990s. We further limit our analyses to exchange rate regimes with some de jure exchange rate flexibility, so that we include only regimes classified as managed floating or independent floating as reported to the IMF. Finally, we exclude regimes with severe macroeconomic instability since the macroeconomic issues are very different for economies with high inflation.[10] For each

9. J.P. Morgan's Emerging Markets Bond Index (EMBI) is probably a better-known index for emerging markets, but it has frequently changed the sample definitions. We therefore focused on the MSCI to define the sample used here.

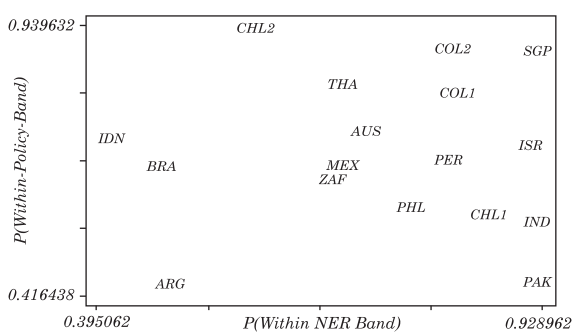
10. Reinhart and Rogoff (2004) assign these regimes to a separate category of "freely falling" in their de facto analysis, arguing that floating exchange rates are qualitatively different under very high inflation.

episode, we exclude the three months before and after any explicit change of exchange rate regime to avoid contaminating the results with transition effects.

2.2 Stylized Facts

We first use the measure of exchange rate flexibility described above to discuss the unconditional fear of floating described in the literature. We compute the relative frequencies of large exchange rate movements and large policy changes and plot them in figure 4. In particular we plot on the horizontal axis the sample probability that the nominal exchange rate remains within the band, which is a measure of exchange rate stability, and on the vertical axis the sample probability that the instruments remain within the band as a measure of instrument volatility. The volatility of policy instruments is a weighted average of the volatility of the nominal interest rate and the volatility of reserves, using the variance of each instrument's volatility as weights.

Figure 4. Fear of Floating: The Unconditional Evidence[a]



Source: Authors' calculations.
a. The horizontal axis plots the sample probability that the nominal exchange rate remains within the band, a measure of exchange rate stability; the vertical axis plots the sample probability that the instruments remain within the band as a measure of instrument stability.

To interpret the diagram, it is useful to consider the slope of the line connecting each point to the origin as a measure of exchange rate flexibility. The steeper the slope the more volatile the exchange rate relative to the policy instruments. Movements along a ray toward the origin represent more volatility in both the exchange rate and policy instruments, without changing the relative volatility of either;

these movements can thus be interpreted as a measure of the shocks with which exchange policy had to contend during the sample period. The diagram includes Australia, which Calvo and Reinhart (2002) use as a benchmark floating economy.[11]

Fear of floating can clearly be observed in this figure, although it is far from uniform as a de facto characterization of emerging market floating exchange rates. According to this crude measure of exchange rate flexibility, few emerging markets have exchange rate regimes that are more flexible than Australia. Only Brazil and the newly independent floating regimes of Chile, Indonesia, and Thailand appear to have more flexibility. Mexico and South Africa, which have a similar policy stance to Australia, appear to face more volatile external conditions. At the other extreme, Pakistan and India behave very similarly to pegs.

Drawing policy implications from this diagram is difficult, however, as it is not possible to determine the circumstances that led to these policy choices. To address this question, we need to compare exchange rate flexibility across periods with and without external pressure. Table 1 presents the evidence on the flexibility of the exchange rate and instruments, controlling for whether the country is faced by external pressure. We estimated the effects by running a regression of a binary variable (which takes a value of one if the variable is within the band and zero otherwise) and our indicator of periods of external pressure. This procedure is equivalent to comparing the probability that each variable is within the relevant band in periods with and without external pressure. We use this evidence to explore the extent to which there are emerging markets that are not characterized by fear of floating and, among those that are, to look for signs of state-contingent flexibility in the face of external pressure.

Figure 5 presents this data in a diagram, with a combined measure of instrument volatility as used in figure 1. Again the slope of the line connecting each point to the origin can be interpreted as exchange rate flexibility. The two panels compare exchange rate flexibility under the base case with that when the country faces external pressure. Two findings stand out from this diagram. First, this analysis appears to confirm that Brazil, Chile, Indonesia, and Thailand are characterized by more exchange rate flexibility under the normal circumstances of the base case. These countries are not accurately characterized by fear of floating. Second, the figure provides evidence of state-contingent

11. They argue that unlike the G-3, which are not useful comparators for emerging markets because their currencies are held as international reserves, Australia has a freely floating policy and is subject to similar external shocks to many emerging markets.

Table 1. Volatility of Exchange Rates, Reserves, and Interest Rates[a]

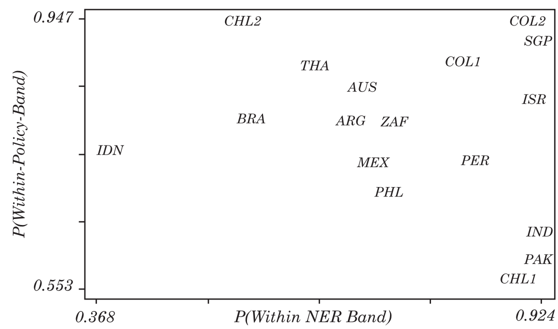
Country	IMF classification	Start	End	Nominal exchange rate		Reserves		Interest rates	
				Base case	*HYS shock*	*Base case*	*HYS shock*	*Base case*	*HYS shock*
Argentina	Managed float	Jan 2002	Dec 2004	0.667	0.300*	0.333	0.200*	1.000	0.200*
Australia	Independent float	Jan 1989	Dec 2004	0.681	0.786	0.500	0.536	1.000	1.000
Brazil	Independent float	Jan 1999	Dec 2004	0.543	0.267*	0.478	0.400	0.935	1.000*
Chile	Managed float	Jan 1989	Aug 1999	0.870	0.692	0.620	0.539	0.520	0.385
Chile	Independent float	Sep 1999	Dec 2004	0.526	0.667	0.895	0.933	0.973	1.000
Colombia	Managed float	Jan 1989	Sep 1999	0.802	0.846	0.663	0.846*	0.970	0.846
Colombia	Independent float	Oct 1999	Dec 2004	0.892	0.667*	0.838	0.733	1.000	1.000
India	Managed float	Jan 1989	Dec 2004	0.916	0.769	0.430	0.385	0.713	0.42
Indonesia	Independent float	Aug 1997	Dec 2004	0.368	0.524	0.719	0.667	0.750	0.762
Israel	Managed float	Dec 1991	Dec 1999	0.909	0.833	0.432	0.833*	1.000	1.000
Mexico	Independent float	Jan 1995	Dec 2004	0.693	0.667	0.480	0.706*	0.841	0.905
Pakistan	Managed float	Jan 1989	Dec 2004	0.924	0.964	0.160	0.179	0.785	0.857
Peru	Independent float	Aug 1990	Dec 2004	0.822	0.741	0.619	0.407	0.778	0.778
Philippines	Independent float	Jan 1989	Dec 2004	0.715	0.857*	0.420	0.464	0.806	0.857
Singapore	Managed float	Jan 1989	Dec 2004	0.917	0.893	0.762	0.786	1.000	1.000
South Africa	Independent float	Jan 1989	Dec 2004	0.722	0.464*	0.347	0.714*	0.993	1.000*
Thailand	Independent float	Jul 1997	Dec 2004	0.621	0.905*	0.724	0.762	0.931	1.000*

Source: Authors' calculations, based on International Monetary Fund, *International Financial Statistics*.
* The values in the base case and the HYS shock are significantly different at the 5 percent level.
a. Nominal exchange rate volatility is the probability that the monthly change is within a +/–2.5 percent band. Reserve volatility is the probability that the monthly change is within a +/–2.5 percent band. Interest Rate volatility is the probability that the monthly change is within a +/–400 basis point band.

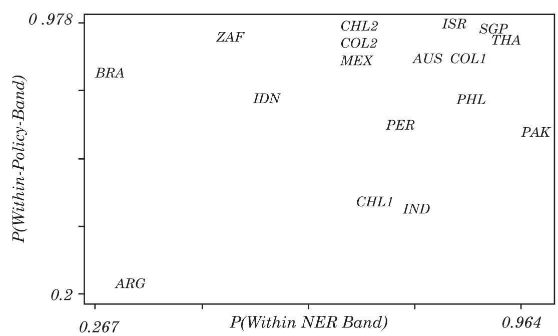
flexibility for some countries. In particular, both South Africa and Mexico exhibit similar flexibility to Australia during normal times but have a higher degree of flexibility during periods of external pressure.

Figure 5. Contingent Flexibility

A. Base case



B. High-yield-spread shocks



Source: Authors' calculations.

Under the interpretation of figures 4 and 5, the flexibility of the exchange rate changes in periods of external pressure if and only if the slope of the line connecting each point to the origin changes. Figure 6 develops a simple way of testing this hypothesis. We define exchange rate flexibility in normal times and under external pressure as F^G and F^B:

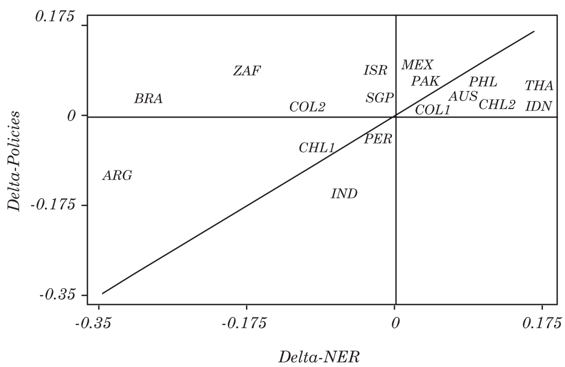
$$F^G = \frac{P(\text{Policy\_in\_band}/\text{No\_shock})}{P(\text{NER\_in\_band}/\text{No\_shock})};$$

$$F^B = \frac{P(\text{Policy\_in\_band/Shock})}{P(\text{NER\_in\_band/Shock})}.$$

The exchange rate regime is more flexible under external pressure if and only if $F^B > F^G$, which can be written, after taking logarithms and rearranging, as follows:

$$\Leftrightarrow \quad \ln P(\text{Policy\_in\_band/Shock}) - \ln P(\text{Policy\_in\_band/No\_shock})$$
$$> \ln P(\text{NER\_in\_band/Shock}) - \ln P(\text{NER\_in\_band/No\_shock})$$
$$\Leftrightarrow \quad \Delta(\text{Policies}) > \Delta(\text{NER}).$$

Figure 6. Contingent Flexibility: High-Yield-Spread Shocks[a]



Source: Authors' calculations.
a. The figure plots (in logs) the change of the policy response against the change in the nominal exchange rate response. Points above the diagonal represent countries that are more flexible during periods of external pressure; points below the diagonal exhibit the opposite behavior.

Figure 6 thus plots the change (in logs) of the policy response against the change in the nominal exchange rate response. Points above the diagonal represent countries that are more flexible during periods of external pressure, while points below the diagonal exhibit the opposite behavior. Many countries are located on or around the diagonal, suggesting that these countries do not exhibit much state contingency. Some of these countries, such as Chile, present high levels of flexibility in both normal and shock periods, while others, as Pakistan, present low levels of flexibility in both situations. Argentina, Brazil, the more recent Colombian regime, South Africa, Israel, and Mexico exhibit some state-contingency. A few countries, such as India, Indonesia, and Thailand, lie below the diagonal, suggesting that these countries pursue more flexible policies in normal times than in periods of external pressure. However, while this is potentially another form of fear of floating, Thailand and Indonesia are being compared to a relatively high base level of flexibility, so this interpretation is not necessarily appropriate. Finally, Australia is also included in this figure as a falsification exercise. HYS shocks should not have a significant effect on Australia, so we would not expect to observe any difference in flexibility during periods of external pressure. This is exactly what we observe.

In summary, the figures suggest two basic findings. First, the unconditional data include several countries that exhibit less fear of floating than the Australia benchmark. Second, a few countries exhibit fear of floating, but on average allow more exchange rate flexibility during periods of external pressure. South Africa, in particular, stands out in this regard. Contingent flexibility also seems to be an aspect of exchange rate behavior in Brazil, Colombia, and Mexico. Argentina similarly appears to fall in this category, but it is not clear whether the increased flexibility is a result of choice or necessity.[12]

3. Exchange Rate Flexibility Index: Time-Series Analysis

To further support the claims developed above, we undertook a more formal analysis of exchange rate flexibility. We constructed a time-series index of flexibility analogous to that presented in Calvo and Reinhart (2002). The exchange rate flexibility index is defined as:

$$F = \frac{\sigma^2_{\check{E}}}{\sigma^2_{\check{R}} + \sigma^2_{|i|}},$$

where $\sigma^2_{\check{E}}$ denotes the variance of the nominal exchange rate, $\sigma^2_{\check{R}}$ the variance of reserves, and $\sigma^2_{|i|}$ the variance of the interest rate. To implement the measure, we construct at each point in time *t* a thirteen-month rolling window centered on *t* and compute the sample variance of each component variable. We thus derive a time series measure of exchange rate flexibility. The interpretation of this indicator is similar to the analysis above. To evaluate the degree of flexibility of an exchange rate regime, we

12. The analysis in section 3 finds that the apparent state contingency is not statistically significant.

incorporate information about the flexibility of both the exchange rate and policy instruments. More flexible regimes should display a high degree of exchange rate volatility vis-à-vis instrument volatility and, hence, a high value of F, while less flexible regimes should register a flexibility index of close to 0. We use a symmetric window incorporating both leads and lags of each variable, since we want to evaluate the effect of a shock by comparing the exchange rate and policies before and after the event.

Before we implemented the analysis, we corrected the index for two sources of bias in cross-country comparisons. The unconditional average of the index for each country was regressed against dummy variables for the index rate series used to control for the fact that some countries use more volatile market interest rates, while other countries employ a more stable policy interest rate series. A further potential source of bias arises from the fact that the floating exchange rate might be more volatile for some countries than others owing to different terms-of-trade shocks. We therefore added a variable measuring the volatility of terms-of-trade shocks to the regression. The index of exchange rate flexibility was then corrected with the coefficients from this cross-country regression.

For each episode (that is, for each regime included in the analysis), we run the following regression on the corrected flexibility index:

$$F_t = \alpha + \sum_{m=0}^{M} \beta_m \mathrm{HYS}_{t-m} + \sum_{n=1}^{N} \gamma_n F_{t-n} + \varepsilon_t \,.$$

We thus identify

$$\frac{\alpha}{1 - \sum_{n=1}^{N} \gamma_n}$$

as the long-run basis regime effect (that is, when there is no external pressure from the high yield spread and after incorporating the dynamics of F) and

$$\frac{\sum_{m=0}^{M} \beta_m}{1 - \sum_{n=1}^{N} \gamma_n}$$

as the long-run difference in the flexibility index between normal and (potential) crises times. We use the Schwarz information criterion to choose the optimal lag structure of the model. Table 2 presents a summary of the results of these regressions.

The results of this analysis mostly confirm the less formal stylized facts presented in section 2, although we discuss some important differences below. Regimes are classified as contingent (C), noncontingent (NC) and discretionary (D) according to the following algorithm. The coefficients for the long-run base effect and contingent flexibility are calculated from the time-series analysis. The contingent regimes are identified as those for which the coefficient

$$\frac{\sum_{m=0}^{M} \beta_m}{1 - \sum_{n=1}^{N} \gamma_n}$$

is significantly different from zero at 5 percent significance according to a Wald test. The other two regimes are distinguished based on a comparison of the base level of flexibility with two benchmark floating regimes, Singapore and Australia. If the coefficient

$$\frac{\alpha}{1 - \sum_{n=1}^{N} \gamma_n}$$

for a regime is significantly less than that of Australia or Singapore for the same time period (on the basis of a one-tailed Wald test), then the regime is classified as discretionary (fear of floating).[13] Otherwise, it is classified as noncontingent floating.

This algorithm produces a classification similar to the picture obtained in figure 4. Table 2 suggests that only four countries, Brazil, Colombia (after 1999), South Africa, and Mexico exhibit contingent flexibility. [14] South Africa apparently exhibits a high degree of base-line flexibility that is not statistically different from either Australia or Singapore, suggesting its contingent flexible is in addition to a flexible exchange rate. The other three contingent regimes exhibit significantly less flexibility than the benchmarks in the base case, suggesting that there

13. Although the base-level coefficient for Australia is less than that for Singapore, the sample for each significance test differences according to the dates of each regime. It is thus necessary to carry out both tests in each case.

14. The statistical analysis does not identify Argentina as a member of this group, despite appearances to the contrary in figure 5.

Table 2. Exchange rate flexibility index

Country	*IMF Classification*	*Start*	*End*	$\frac{\alpha}{1-\sum_{n=1}^{N}\gamma_n}$	$\frac{\sum_{m=0}^{M}\beta_m}{1-\sum_{n=1}^{N}\gamma_n}$	*Dynamic structure (M,N)*	*Category*[e]
Argentina	Managed float	Jan 2002	Dec 2004	0.2486[c]	0.2186	(0,1)	D
Australia	Independent float	Jan 1990	Dec 1999	0.4204	0.1733	(1,1)	Benchmark
Brazil	Independent float	Jan 1999	Dec 2004	0.2559[c]	0.4711[b]	(1,1)	C
Chile	Managed float	Jan 1989	Aug 1999	0.0720[c]	–0.0195	(0,1)	D
Chile	Independent float	Sep 1999	Dec 2004	0.6504	0.2778	(1,2)	NC
Colombia	Managed float	Jan 1989	Sep 1999	0.1512	0.3797	(0,1)	D
Colombia	Independent float	Oct 1999	Dec 2004	0.2882[c]	1.2369[b]	(0,1)	C
India	Managed float	Jan 1989	Dec 2004	–0.0078[cd]	0.0516	(0,1)	D
Indonesia	Independent float	Aug 1997	Dec 2004	1.2486	–1.1495	(0,1)	NC
Israel	Managed float	Dec 1991	Dec 1999	0.6078	4.7612	(2,5)	NC
Mexico	Independent float	Jan 1995	Dec 2004	0.3028[c]	0.4450[b]	(0,1)	C
Pakistan	Managed float	Jan 1989	Dec 2004	–0.0713[cd]	–0.0271	(1,4)	D
Peru	Independent float	Aug 1990	Dec 2004	0.1034[cd]	–0.1455	(1,1)	D
Philippines	Independent float	Jan 1989	Dec 2004	0.2826[c]	0.2299	(0,1)	D
Singapore	Managed float	Jan 1989	Dec 2004	0.6044	0.1291	(0,1)	Benchmark
South Africa	Independent float	Jan 1989	Dec 2004	0.2820	0.2079[b]	(0,3)	C
Thailand	Independent float	Jul 1997	Dec 2004	0.7609	–0.2832	(0,1)	NC

Source: Authors' calculations, based on International Monetary Fund, *International Financial Statistics*.

a. Covariance matrix computed with Newey-West standard errors. Lag structure determined by Schwarz information criterion. Flexibility index is corrected by differences in the variance of terms of trade and differences in the variance of the interest rate used to compute the index.

b. Indicates a regime with significant contingency at the 5 percent level using a Wald test.

c. The base case is significantly lower than Singapore at the 5 percent level using a Wald test for the same period of time.

d. The base case is significantly lower than Australia at the 5 percent level using a Wald test for the same period of time.

e. The categories are contingent (C), noncontingent (NC), and discretionary (D).

are indeed circumstances in which exchange rate rigidity is desirable provided that it does not undermine insurance. The other regimes do not exhibit contingency, but they do exhibit significant differences in flexibility. The regimes classified as discretionary exhibit fear of floating in all states of nature. These countries show an apparent inability to commit to floating exchange rates. The countries in the sample classified as discretionary are Argentina, Chile (before 1999), Colombia (before 1999)[15], India, Pakistan, Peru, and the Philippines. Finally the noncontingent, flexible regimes are Chile (after 1999), Indonesia, Israel, and Thailand. Australia and Singapore would also be considered members of this category, but they were defined as such for the purposes of categorizing the other regimes.

4. The Benefits of a Commitment to a Float

The above discussion classified regimes with state-contingent policies. Interpreting the classification, however, requires an understanding of the extent to which the choice of exchange rate regime is associated with insurance against external shocks This question can be addressed on two separate levels. The interpretation of exchange rate behavior is complicated by the fact that, as discussed in Caballero and Krishnamurthy (2004), alternative insurance mechanisms are available that can substitute for exchange rate flexibility, such as capital controls, reserve requirements, and sterilization of capital inflows. We first examine the extent to which our classification of discretionary regimes can actually be characterized more generally as uninsured regimes by investigating these substitutes. Nevertheless, examining policies alone is not sufficient to determine that the choice of exchange rate regime is important. Thus, we proceed to examine the extent to which floating exchange rates are associated with improved insurance against external shocks in terms of outcomes. We examine two pieces of evidence: the relation between sudden stops and the exchange rate regime, and the dynamics of private holdings of foreign exchange reserves.

Table 3 accounts for other substitute insurance policies. Controlling capital inflows directly can prevent the underinsurance from arising, but at the cost of limiting integration with international capital markets.

15. Although the statistical analysis did not select Colombia (before 1999) as significantly less flexible than either Australia or Singapore, the regime was qualitatively very similar to Chile (before 1999) and was classified accordingly as discretionary.

Capital controls are measured according to the index in Kaminsky and Schmukler (2003). Capital controls are clearly more prevalent in countries with discretionary regimes, suggesting that this policy substitutes for exchange rate flexibility. Nevertheless, capital controls are an extremely suboptimal response to the underinsurance problem in that they provide insurance only at the expense of isolation from international capital markets.

Table 3. Substitute Insurance Mechanisms

Country	*Capital controls*[a]	*Sterilization*[b]	*Quality of bank supervision*[c]	*Reserve requirements*[d]
Contingent regimes				
Brazil	1.8	0.11	3.0	16.4
Colombia (after 1999)	1.0	–1.15	2.0	12.7
Mexico	1.0	–0.67	2.0	15.7
South Africa	2.1	0.18	3.0	11.4
Average	1.5	–0.38	2.5	14.1
Median	1.4	–0.28	2.5	14.2
Noncontingent (floating)				
Chile (1999-)	1.0	–0.53	3.0	12.7
Indonesia	3.0	–0.91	n.a.	n.a
Israel	1.5	–1.14	2.5	9.5
Singapore	1.5	–0.83	3.5	18.4
Thailand	1.1	–0.84	3.0	11.4
Average	1.6	–0.85	3.0	13.1
Median	1.5	–0.84	3.0	12.1
Discretionary (fear of floating)				
Argentina	3.0	–0.60	2.0	8.8
Colombia (before 1999)	2.2	–0.78	2.0	12.7
Chile (before 1999)	2.0	–0.23	3.0	12.7
India	3.0	–0.26	2.0	11.9
Pakistan	3.0	–1.14	1.0	8.8
Peru	1.1	–0.57	3.0	12.8
Philippines	2.5	0.21	2.5	14.5
Average	2.4	–0.48	2.2	11.7
Median	2.5	–0.57	2.0	12.7

Source: Author's compilation; see notes.
n.a. Not available.
a. Capital controls index is from Kaminsky and Schmukler (2003). A value of 3 equals high controls; 1 equals low or no controls;
b. Update of the results from Bofinger and Wollmershaeuser (2001). The estimate corresponds to the coefficient of the change in net foreign assets in a regression of the change in net domestic assets on net foreign assets and lagged net domestic assets. Monthly data from IFS, lines 11 to 17.
c. Computed using the definition in Abiad and Mody (2003), with data from Barth, Caprio, and Levine (2003). A value of 4 equals best quality; 0 equals worst quality. The index incorporates information on banks' adoption of a capital adequacy regulation in line with standards developed by the Bank for International Settlements; whether the supervisory agency is independent from executive influence and whether it has sufficient legal power and (material) supervisory power; the absence of exemptions to mandatory actions if an infraction is observed; and the extent to which supervision covers all financial institutions.
d. From Barth, Caprio, and Levine (2003). The actual risk-adjusted capital ratio in banks is as of year-end 2001, using the 1988 Basle Accord definitions.

The second policy option suggested by Caballero and Krishnamurthy (2004) is sterilization of capital inflows. Although the efficacy of such a policy has been questioned, our goal here is simply to examine the facts. We use the methodology of Bofinger and Wollmershaeuser (2001) to evaluate the importance of sterilized interventions, We run the following regression for each country using monthly data for the relevant period for each regime:

$$\Delta(\mathrm{NDA})_t = \alpha + \beta\Delta(\mathrm{NFA})_t + \gamma\Delta(\mathrm{NDA})_{t-1} + \varepsilon_t \,,$$

where NDA represents the net domestic assets of the monetary authority and NFA is net foreign assets. With full sterilization, we expect β to be equal to -1, and with partial sterilization β should be less than 0 but greater than -1. This regression is a very crude measure of sterilization that may suffer from biases related to omitted variables and potential endogeneity, so we focus on comparing the estimates across groups, rather than on the estimated levels. The second column of table 3 presents estimates of β for each regime. This evidence is less clear. The results suggest that while discretionary regimes use sterilization, suggesting a further substitute insurance mechanism, noncontingent floating regimes do so even more. It appears that as the floating exchange rate gains credibility, sterilization becomes a complementary rather than a substitute policy. State-contingent regimes, which can be associated with higher levels of credibility, sterilize least of all, suggesting that once credibility has been gained, it is no longer necessary to complement floating with additional policies.

Finally, we present measures of financial regulation from Abiad and Mody (2003) and Barth, Caprio, and Levine (2003). Better supervision and prudential regulation can monitor balance sheet mismatches and help prevent the build up of excessive dollar liabilities. At the same time, better-functioning and well-developed financial markets increase the stock of assets that can be presented as collateral. Table 3 shows that financial development does not substitute for flexible exchange rates—in fact, it is the opposite. The least liberalized financial markets are found in countries with discretionary regimes. Although the differences are small, the most liberalized financial markets are found among the state-contingent regimes. In sum, we find some weak evidence that discretionary regimes undertake alternative policies to insure themselves against external shocks. Policies such as capital controls can be very costly, however, and they are unlikely to be superior to a well-managed open economy with flexible exchange rates.

The next results examine the extent to which the choice of exchange rate regime, in particular flexibility during potential crises, is associated with better insurance outcomes. Caballero and Krishnamurthy (2004) argue that better insurance occurs through the mechanism of altering private sector incentives to conserve international liquidity. Although such a proposition is difficult to test directly, some evidence in this direction is provided in table 4, which presents regression results that link the exchange rate regime to the international liquidity held by domestic residents in banks. Two specifications are estimated, with and without lags of the dependent variable for absolute and relative measures of private reserves:

Table 4. Private Reserve Accumulation and the Exchange Rate Regime[a]

Dependent and explanatory variables	*(1)*	*(2)*	*(3)*	*(4)*
Dependent variable: private reserves				
Log(GDP)	1.426**	1.398***	0.050***	0.051***
	(0.016)	(0.704)	(0.294)	(0.016)
F	0.375***	0.449***	0.013***	0.010
	(0.044)	(0.075)	(0.005)	(0.008)
HYS		0.182*		–0.002
		(0.114)		(0.007)
F*HYS		–0.097		0.006
		(0.079)		(0.009)
Log(PR)_{t-1}			0.967***	0.967***
			(0.010)	(0.011)
Dependent variable: share of private reserves in total reserves				
Log(GDP)	0.046	0.049	–0.040***	–0.042***
	(0.123)	(0.121)	(0.014)	(0.013)
F	0.022**	0.020	0.011***	0.009***
	(0.010)	(0.018)	(0.002)	(0.003)
HYS		0.019		0.009
		(0.030)		(0.007)
F*HYS		–0.001		0.002
		(0.020)		(0.004)
$[\text{PR} / (\text{PR} + \text{PuR})]_{t-1}$			0.413***	0.411***
			(0.057)	(0.057)
No. countries	14	14	14	14
No. observations	1,280	1,280	1,274	1,274

Source: Authors' calculations, based on International Monetary Fund, *International Financial Statistics*.
* Statistically significant at the 10 percent level.
** Statistically significant at the 5 percent level.
*** Statistically significant at the 1 percent level.
a. Fixed-effect estimates. Standard errors (robust to clusters at the country level) are in parentheses.

$$\log(\text{PR})_{it} = \alpha + \beta \log(\text{GDP})_{it} + \chi F_{it} + \delta \text{HYS}_t + \phi \text{HYS}_t * F_{it} + \eta \log(\text{PR})_{it-1} + \mu_i + \varepsilon_{it} \quad \text{and}$$

$$\frac{\text{PR}}{\text{PR+PuR}}_{it} = \alpha + \beta \log(\text{GDP})_{it} + \chi F_{it} + \delta \text{HYS}_t + \phi \text{HYS}_t * F_{it} + \eta \left(\frac{\text{PR}}{\text{PR+PuR}} \right)_{it-1} + \mu_i + \varepsilon_{it}.$$

In these equations, i represents the country, t represents the month, PR represents private reserves as measured by international liquid assets in banks (source: IFS), PuR represents the international reserves held by the Central Bank as used in previous sections (source: IFS), GDP represents GDP in dollars (source: IFS), F is the (corrected) flexibility index used above, and HYS is the index of (potential) crises developed above. Country dummies are also included. As can be observed in table 4, there is a robust relation between private reserves and exchange rate flexibility, both in absolute terms and as a share of the total reserves of the country. As flexibility increases, the private sector hoards more dollar reserves. The interaction term is not significant, so it is exchange rate flexibility per se that is important and not just flexibility during crises.

The second set of regressions investigates the link between exchange rate flexibility and sudden stops. The hypothesis underlying these regressions is that the high-yield-spread series that we have used for classifying exchange rate regimes is a common external shock. Whether such a shock develops into a sudden stop depends on how insured the country is and, in particular, the dollar reserves on which it can draw during such an episode. To investigate this hypothesis, it is necessary to define sudden stops. The series constructed is based on Calvo, Izquierdo, and Mejía (2004), with the series updated to 2003. Calvo, Izquierdo, and Mejía (2004) define a sudden stop as a phase that meets the following two conditions: it contains at least one observation where the year-on-year fall in capital flows lies at least two standard deviations below its sample mean; and the phase ends once the annual change in capital flows exceeds one standard deviation below its sample mean. The beginning of a sudden stop is determined by the first time the annual change in capital flows falls one standard deviation below the mean. The appendix presents a complete list of the sudden stops identified by this methodology. We estimate the following equation:

$$\text{SUDDEN}_{it} = \alpha + \beta\text{HYS}_t + \chi F_{it} + \delta\text{HYS}_t * F_{it} + \mu_i + \varepsilon_{it},$$

where SUDDEN is a dummy taking the value of one if there is an (actual) sudden stop and zero otherwise. F is the (corrected) flexibility index described above, and the HYS is the a dummy taking the value of one if there is a (potential) external crisis, as defined above. Random or fixed country-specific effects are included in some specifications.

Table 5 shows the results of estimating the equation described above with a probit model, a linear probability model, and a logit model (without country effects, with country fixed effects, and with country random effects).[16] In all cases, the coefficient of the interaction term is negative and significant. Exchange rate flexibility during a potential crisis significantly reduces the probability that the shock will develop into a sudden stop. In the three models, the marginal effect of increasing flexibility from 0 to 1 during a crisis is to reduce the probability of a sudden stop by between 7.9 percent and 12.2 percent, which is quantitatively large in comparison with the average sample probability of a sudden stop during a potential (12.4 percent).[17] It is the interaction, not the main effect, which is significantly negative. Thus, from the point of view of insurance against sudden stops, it is only the commitment to floating during periods of external financial pressure that leads to better protection.

We now link this analysis with the earlier discrete classifications of exchange rate regimes. The crisis dummy is intended to pick up only one plausible source of exogenous external pressure, to enable the classification of exchange rate regimes. Likewise, the results in table 5 measure the extent to which that same source of external pressure (which is a common shock) converts into a sudden stop (which is a country-specific outcome). If the classification is valid, there should be a significant relation between the regime classification and the likelihood of being subject to a sudden stop, even if that sudden stop were not associated with a high-yield-spread

16. Fixed-effect estimates using the probit model with panel data are severely biased owing to the incidental parameters problem (Wooldrige, 2002), so we do not present them.

17. In the case of the logit model with fixed effects, five countries (710 observations) were dropped because all outcomes were negative (that is, these countries did not have sudden stops during the period). In this case, the marginal effect of moving the flexibility index from 0 to 1 is –27.9 percent, which is a large magnitude considering that the probability that these countries will have a sudden stop during a crisis is 16.8 percent.

Table 5. Exchange Rate Regimes and Sudden Stops

	Panel-probit model		*Panel–linear probability model*			*Panel-logit model*		
Explanatory variable	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*
F	0.327***	0.656***	0.069***	0.145***	0.140***	0.609***	1.223***	1.181***
	(0.094)	(0.104)	(0.022)	(0.026)	(0.021)	(0.170)	(0.202)	(0.177)
	[0.061]	[0.114]				[0.059]	[0.304]	[0.099]
HYS	0.172	0.113	0.033	0.020	0.021	0.327	0.231	0.230
	(0.116)	(0.138)	(0.023)	(0.021)	(0.022)	(0.222)	(0.250)	(0.245)
	[0.034]	[0.021]				[0.032]	[0.056]	[0.016]
F * HYS	–0.442**	–0.627***	–0.091**	0.122***	–0.120***	–0.822**	–1.127**	1.078**
	(0.199)	(0.240)	(0.040)	–(0.037)	(0.037)	(0.391)	(0.441)	(0.430)
	[–0.082]	[–0.109]				[–0.079]	[–0.279]	[–0.090]
Country effects	No	Random effects	No	Fixed effects	Random effects	No	Fixed effects	Random effects
No. countries	14	14	14	14	14	14	9	14
No. observations	2,279	2,279	2,279	2,279	2,279	2,279	1,569	2,279

Source: Authors' calculations.
* Statistically significant at the 10 percent level.
** Statistically significant at the 5 percent level.
*** Statistically significant at the 1 percent level.
a. Standard errors are in parentheses; marginal effects are in brackets.

shock on which we have focused. Table 6 addresses this question. It illustrates the sudden stops that occurred during the sample period and the exchange rate regime according to the classification in table 2. The link between exchange rate regimes and sudden stops appears to hold generally. In particular, sudden stops only occurred in countries with discretionary regimes.

Table 6. Country Episodes and Sudden Stops

Sudden stop		*No sudden stop*	
Country	*Regime*	*Country*	*Regime*
Colombia (before 1999)	Discretionary	Argentina	Discretionary
Chile (before 1999)	Discretionary	Brazil	Contingent
Peru	Discretionary	Chile (after 1999)	Noncontingent
Philippines	Discretionary	Colombia (after 1999)	Contingent
		India	Discretionary
		Indonesia	Noncontingent
		Israel	Noncontingent
		Mexico	Contingent
		Pakistan	Discretionary
		Singapore	Noncontingent
		South Africa	Contingent
		Thailand	Noncontingent

Source: Authors' calculations.

5. Determinants of State-Contingent Regimes

Emerging market exchange rate regimes vary considerably, and this variation is associated with important differences in the extent to which countries are insured against external shocks. What determines the choice of exchange rate regime? If the benefits of floating and, in particular, state-contingent regimes are so clear, why is fear of floating so pervasive? Our analysis suggests that an important obstacle to floating is the need to develop credibility for the exchange rate regime. This section examines two hypotheses—that the exchange rate regime is related systematically to the overall credibility of the monetary policy framework, and that credibility takes time to acquire, so that contingent floating is more likely to be found among countries that have a longer experience with a floating exchange rate regime than among countries that have recently implemented a float.

Table 7 tests these hypotheses. Monetary policy credibility is measured by the commitment to inflation targeting. We measure inflation targeting using the classification developed by Carare and

Stone (2003), which identifies countries that have implemented full-fledged inflation targeting regimes. They characterize such countries as those having a medium to high level of credibility, a clear commitment to their inflation target, and an institutionalization of this commitment in the form of a transparent monetary framework that fosters the accountability of the central bank. This measure fits particularly well our notion of inflation credibility. The table shows that this measure of credibility lines up with the theoretical analysis in section 1. State-contingent regimes are more likely to have high levels of monetary policy credibility, noncontingent floating regimes are intermediate, and the regimes with the lowest degree of credibility exhibit, in general, discretionary fear of floating.

With regard to the time to acquire credibility for floating, the table does not exhibit very clear results. Among the floating regimes, the unconditional average age of noncontingent regimes is only slightly less than that of contingent regimes. However, regime misclassifications might be weakening these results. In particular, Brazil and Colombia (after 1999) switched to more flexible regimes following a sudden stop, and they are classified as involuntary transitions according to the index developed by the IMF (2004). Both countries have avoided suffering additional external crises, but it is perhaps too early to tell whether they are floating out of choice or necessity. Israel was a borderline case in the classification, as it exhibited a quantitatively large coefficient in the measure of state contingency that was nevertheless statistically insignificant. In line with the hypothesis, Chile and Indonesia are more recent entrants to the group of floating exchange rates. On the other hand, the state-contingent regimes contain some of the most experienced emerging market floaters, including Mexico and South Africa. This analysis must be considered an ex post rationalization, however, so the hypothesis remains only weakly proven.

The table also includes a measure of derivatives market development, based on data from the Bank for International Settlements. Some researchers argue that the development of derivatives markets fosters the development of exchange rate flexibility, by enabling the allocation of exchange rate risk to those most able to bear it and by fostering a more sophisticated approach to financial risk management. Such instruments might also substitute for contingency in policies and hence aid the transition to floating exchange rates. The data loosely support this hypothesis. Derivatives market development is most stunted in countries with discretionary exchange

Table 7. Determinants of Exchange Rate Regimes

Regime and country	*Inflation targeting*[a]	*Voluntary regime change*[b]	*Age*[c]	*Derivatives market development*[d]
Contingent regimes				
Brazil	0.9	0.0	62	0.9
Colombia (after 1999)	1.0	0.0	61	0.3
Mexico	0.6	0.0	103	1.5
South Africa	0.3	1.0	180	13.5
Average	0.7	0.3	101.5	4.1
Median	0.8	0.0	82.5	1.2
Noncontingent (floating)				
Chile (after 1999)	1.0	1.0	62	2.2
Indonesia	0.0	0.0	67	n.a.
Israel	0.6	1.0	96	0.9
Singapore	0.0	1.0	180	258.6
Thailand	0.5	0.0	83	3.9
Average	0.4	0.6	97.6	66.4
Median	0.5	1.0	83.0	3.1
Discretionary ("fear of floating")				
Argentina	0.0	0.0	29	0.1
Chile (before 1999)	0.1	1.0	110	1.7
Colombia (before 1999)	0.0	1.0	111	0.0
India	0.0	1.0	180	n.a.
Pakistan	0.0	1.0	180	n.a.
Peru	0.0	0.0	132	n.a.
Philippines	0.0	0.0	112	n.a.
Average	0.0	0.6	122.0	0.6
Median	0.0	1.0	112.0	0.1

Source: Authors' compilation; see notes.
a. The percentage of time in each regime that a full-fledged inflation-targeting regime has been in operation. Source: Carare and Stone (2003).
b. A voluntary transition is a transition that is not driven by a crisis. Crisis-driven transitions are defined as those that are associated with a depreciation of more than 20 percent vis-à-vis the U.S. dollar, a doubling (or more) in the depreciation rate of the previous year, and depreciation in the previous year of less than 40 percent. Source: IMF (2004).
c. Age is defined as the number of months that the country was under the regime until the end of the regime (defined in table 2) and that the regime was not classified as a de facto free-falling regime by Reinhart and Rogoff (2004).
d. Foreign exchange derivatives transactions to GDP. Source: BIS (1999, 2002).

rate regimes. Comparisons between the contingent and noncontingent floating regimes are harder to make, as there are few data points and several significant outliers. Furthermore, it is impossible to ascertain whether derivatives markets foster flexible exchange rates, flexible exchange rates foster derivatives markets, or both developments are jointly determined by some underlying fundamental cause. As such this remains a correlation.

6. Conclusions

We have reexamined fear of floating from the perspective that when policymakers in emerging markets determine exchange rate policy, they face a tradeoff between limiting exchange rate volatility and allowing the exchange rate to float. Fear of floating might indeed be the optimal policy for these economies in normal times, because excess exchange rate volatility is legitimately feared for its effects on inflation or firm balance sheets. Fear of floating is not always the optimal policy, however, since a commitment to floating would improve insurance against potential sudden stops. We have categorized exchange rate regimes in the light of this framework. Policymakers with little commitment will only be able to implement discretionary policies with little exchange rate flexibility, and fear of floating will be the result. With intermediate levels of commitment, floating during crises will be feasible, but noncontingent policies must be used to demonstrate the commitment to floating. Finally with full commitment, the optimal regime is state contingent—floating during (potential) crises, but retaining the option to intervene, if necessary, on other occasions.

With this framework in mind, we explored the empirical evidence on exchange rate flexibility in emerging markets. We covered some of the same ground as Calvo and Reinhart (2002) in their original paper on fear of floating, although we found much evidence that the picture is significantly more complicated than this one-dimensional characterization. There is indeed a lot of fear of floating in emerging markets, as Calvo and Reinhart found, but our analysis of state-contingent flexibility allows us to be more certain both in attributing this to an inefficient discretionary equilibrium and in arguing that more commitment to exchange rate flexibility would be beneficial for insuring these economies against sudden stops. These economies seem to choose to control capital flows rather than undertake any substitute insurance policies in the context of open capital markets, and the overall credibility of their monetary policy frameworks tends to be low.

At the same time, we found several emerging markets that are not characterized by fear of floating at all. Chile and Indonesia—two recent converts to floating—appear to be serious about developing a reputation for floating, and they are forgoing exchange rate intervention to demonstrate this. In accordance with the theoretical analysis, these economies can be characterized as having intermediate levels of credibility. Other analyses have also highlighted the exchange rate flexibility of these economies. Hernández and Montiel (2001) identify Indonesia as the only Asian country to move to free-floating following the crisis, and Frankel (2003) presents Indonesia as a successful floating exchange rate, given its subsequent recovery despite being hit with the worst of the Asian crisis.

Finally we found that several of the more mature floating exchange rates exhibit precisely the state-contingent flexibility that our theoretical analysis suggests would be optimal in this environment. They appear to be able to intervene under certain circumstances without compromising their commitment to floating during potential sudden stops, when floating is really important. Such economies exhibit high levels of monetary policy credibility. The clearest examples of such countries that emerge from our analysis are South Africa and Mexico.[18] These two countries were more or less able to isolate their economies from the periods of extreme external turbulence in the late 1990s. For instance, both countries allowed big movements in the nominal exchange rate in the late 1990s, and neither had sudden stops in that period (Calvo, Izquierdo, and Mejía, 2004). Moreover, their decline in growth rates were quite mild in comparison with other countries.

The South African case presents a particularly interesting study for emerging market floating regimes. It is an open middle-income country that experienced seven currency crises between the end of the Bretton Woods system and 1985 (Bordo and Eichengreen, 2002), which is high even by current standards of emerging market volatility. Since 1985, however, South Africa has applied a floating regime, and its commitment to this regime does not appear to be in doubt.[19] The South African Reserve Bank has explicitly stated that it does not target the level of the exchange rate, although it has a policy of intervening to "smooth out large short-term fluctuations in the exchange rate" (Mboweni, 2004). The commitment to floating has clearly been tested on several recent occasions, yet South Africa did not experience a sudden stop despite the turmoil in emerging markets (Calvo, Izquierdo,

18. South Africa is perhaps a more appropriate benchmark than Australia, which is the usual comparator for emerging market exchange rate regimes. The particular financial market shocks on which we have focused clearly have an impact on South Africa, while they have no impact on the Australian exchange rate regime, indicating that they probably do not represent external shocks at all.

19. It is one of the few emerging markets that the Reinhart and Rogoff (2004) classification reports as a freely floating exchange rate. It is classified as such starting in 1995, prior to which it is classified as a managed float.

and Mejía, 2004). It appears that a floating exchange rate is not only a feasible policy for emerging markets, but one that can be successfully used to insure the economy against external volatility without forgoing the option of occasionally intervene in turbulent markets. For more recent floaters such as Chile, this experience should prove an invaluable guide.

APPENDIX
Sudden Stops by Country and Period

This appendix presents our sample of sudden stops, which we calculated using the updated Calvo, Izquierdo, and Mejía (2004) methodology. This sample is used in figure 3 and section 4.

— Argentina: September 1994 to December 1995; February 1999 to December 1999; January 2001 to September 2002.
— Brazil: October 1997 to June 1999.
— Chile: June 1998 to June 1999.
— Colombia: July 1998 to June 2000.
— India: none.
— Indonesia: June 1997 to September 1998.
— Israel: none.
— Mexico: January 1994 to March 1995.
— Pakistan: none.
— Peru: September 1997 to December 1998.
— Philippines: September 1991 to June 1992; June 1997 to June 1999.
— Singapore: none.
— South Africa: none.
— Thailand: July 1996 to September 1998.

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