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What Happens when the Fed Tightens? Interest Rate Sensitivity and Currency Regime ♣

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Abstract

This paper studies empirically the sensitivity of local interest rates to international interest rates, and how it is affected by countries' choice of exchange rate regime. To establish the empirical regularities, the paper uses a reduced-form empirical approach to compute both panel and single-country estimates of interest sensitivity for a large sample of developing and industrialized economies during 1970-1999. When using the full sample, we find that more rigid currency regimes tend to exhibit higher transmission than more flexible regimes, and that the former typically possess lower interest rates than the latter. In the 1990s, however, we find that in many cases we cannot reject full transmission, even for several countries with floating regimes. Country-specific results suggest that only large industrial countries can or choose to benefit from independent monetary policy. During the 1990s, interest rates in European countries are fully sensitive to German interest rates, but insensitive to US interest rates.

JEL Classification Codes: F31, F32, F33, F36

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1. Introduction

The 1999-2000 hikes in US interest rates have started to spill over to other economies' interest rates, which in many countries have risen to reflect the higher rates in the US. In several cases in emerging markets, the increases have been proportionally larger than those experienced in the US, reflecting the fact that country and currency risks increased after the Fed decided to tighten monetary policy. Even though the pressure to increase interest rates was felt virtually across the board, one question remains unanswered. Are countries with flexible exchange rates more able to isolate their domestic interest rates from this type of negative international shock? This issue, which is at the heart of the debate on currency arrangements, is the central question of this paper.

The choice of exchange rate regime—floating, fixed, or somewhere in between—has long been a central question in international monetary economics. The well-known textbook prescription holds that economies facing mostly real shocks should opt for flexible regimes, while those primarily subject to nominal disturbances should adopt fixed exchange rates.

This conventional advice has been cast under a new light by the steady increase in magnitude and variability of international capital flows over the last decade, particularly for those developing countries that in the 1990s have become full-fledged participants in international financial markets. The financial turmoil in world markets in the last decade, and its dire consequences for a number of developing countries, have spread the view that emerging market countries should abandon "intermediate" regimes -- basket pegs, crawling pegs, bands, adjustable pegs – in favor of the two polar extremes of free floating

or firm fixing. The rationale offered for this view is that the sheer volume of international capital flows has rendered the intermediate regimes no longer viable.

In this framework, the relative merits of fixed and flexible exchange rate regimes have taken again center stage. Among the key hotly debated arguments is that of monetary independence. While proponents of flexible rates single it out as a key advantage of freely floating regimes, advocates of rigidly fixed exchange rates argue that developing countries cannot credibly exert any degree of monetary independence. Under the latter view, countries should adopt currency board-type arrangements or "dollarize"—i.e., abandon the domestic money in favor of a "strong" foreign currency. This would furthermore enhance policy credibility and thereby lead to lower nominal and real interest rates—another of the hotly debated arguments.

In spite of the increasing popularity of these extreme views among academics and policy makers alike, to our knowledge there are few systematic empirical studies of the relative merits of different exchange rate regimes.[1] In particular, there is little empirical evidence on whether floating exchange regimes really allow independent monetary policy, or whether tight exchange rate regimes increase credibility, reducing currency risk and/or country risk premia and hence interest rates.

The goal of this paper is to establish the major empirical regularities concerning the sensitivity of domestic interest rates to international interest rates under different currency regimes. This should help place the ongoing debate in the context of the observed facts, and allow an assessment of the competing claims cited above on the relative merits of alternative exchange arrangements. Monetary independence should be

[1] One remarkable exception is Ghosh et al. (1996), which focuses on the behavior of inflation and growth.

closely reflected in the extent to which countries can set their domestic interest rates independently of those prevailing abroad. Under pegged exchange rates and unrestricted capital flows, domestic interest rates cannot be set independently, but rather should track closely those prevailing in the country to which the domestic currency is pegged. By contrast, under a flexible exchange rate arrangement, the domestic interest rate should be less sensitive to changes in international interest rates—other things equal. Countries with intermediate regimes should also display less sensitivity to international interest rates than countries with firm pegs. However, this has not been the case in preliminary evidence for selected Latin American countries over the 1990s, reported in Frankel (1999) and Hausmann et al. (1999).[2]

These previous studies, however, have been limited to a handful of developing countries over short time periods, and included few or no control variables. In this paper, we extend those earlier exercises in several directions. First, we consider a much larger data set in both the cross-country and time-series dimensions, by working with a sample of industrial and developing countries since the 1970s up to the late 1990s, limited only by data availability. By including industrial countries in the sample, one can evaluate whether developing countries are particularly sensitive to international interest rates, perhaps due to lack of credibility. Second, we introduce a number of controls to deal with periods of turbulence and transitions across exchange regimes. Third, to assess the robustness of our results, we present estimates both for the overall sample as well as subsamples of industrial and developing countries and different time periods. Finally, to deal with the inaccuracies of standard exchange rate regime classifications, we also

[2] Contemporaneous work in progress by Borenztein and Zettlemeyer (2000) focuses on emerging markets, using a different methodology.

present empirical results for selected countries whose exchange arrangements are generally regarded as more clear-cut than the rest.

We take the estimated sensitivity of local rates to US interest rates as a summary measure of monetary independence. Even though we work mainly with US rates as our primary indicator of "foreign interest rates," we also take into account the emergence in recent years of other currency areas, most notably the Deutsche mark-European Monetary Union (DM-EMU) zone. Thus, we examine the sensitivity of European interest rates to German interest rates.

The rest of the paper is organized as follows. Section 2 briefly discusses the state of the current debate on exchange rate regimes. Section 3 introduces the methodology and data used in this paper. Section 4 presents pooled estimation results by exchange rate regime, income group, and decade. Section 5 takes a closer look at the evidence from individual countries. Section 6 summarizes the results and concludes. The Appendix describes the exchange rate regimes in each country in the sample.

2. The Current Debate on Exchange Rate Regimes

When it comes to international monetary economics, it is said that the exam questions stay the same over time, but the answers to them change. In the debate over the merits of fixed vs. floating, the preponderance of learned opinion has experienced several swings of the pendulum. At the time of Bretton Woods (1944), the architects of the postwar system favored fixed rates, attributing the economic instability of the interwar period in part to flexible exchange rates. During the 1960s, a growing number of economists came to favor floating rates, responding in particular to the widening U.S.

balance of payments disequilibrium, a view that events in the early 1970s ratified by force.

In the 1980s, the accumulating experience with high inflation in many parts of the world brought the pendulum back, at least in an intellectual sense. Setting a target for the exchange rate came to be viewed as one way for central banks to put some steel behind attempts at monetary stabilization. New theories of rational expectations and dynamic consistency said that a commitment to such a nominal anchor, if credible, would even allow disinflation without the usual costs of lost output and employment. In the late 1990s we have in a sense seen the completion of the half-century's second complete roundtrip of the pendulum, as the conventional wisdom blames exchange rate targets for crises in Mexico (1994), East Asia (1997), Russia (1998), and Brazil (1999). Thus the new language of speculative attacks, multiple equilibria, and moral hazard is in many ways simply a new overlay on an old debate.

And yet, a genuinely new element has recently been thrown into the mix. This is the proposition that countries are – or should be – moving to the corner solutions. They are said to be opting either, on the one hand, for full flexibility, or, on the other hand, for rigid institutional commitments to fixed exchanges, in the form of currency boards or full monetary union with the dollar or euro. It is said that the intermediate exchange rate regimes are no longer feasible – the target zones, crawls, basket pegs, and pegs-adjustable-under-an-implicit-escape-clause – are going the way of the dinosaur. A corollary of this theory is that the number of independent currencies in the world is declining, perhaps with a rising fraction of the world accounted for by a few large

regional blocs built around the dollar, the euro, and perhaps the yen or some other third currency in Asia.

2.1 The Role of Credibility and Monetary Independence in the Debate

Two elements have been central in the debate on the choice of exchange rate regimes: credibility and monetary independence. For this reason, in the present paper, we focus on the level of domestic interest rates – a proxy for credibility – and the sensitivity to international interest rates – a proxy for monetary independence.

This is not the place to enter into an extended discussion of the advantages of fixed and floating exchange rates. The main traditional points from the textbooks can be recalled succinctly. The two big advantages of fixing the exchange rate, for any country, are: (1) to reduce transactions costs and exchange rate risk which can discourage trade and investment, and (2) to provide a credible nominal anchor for monetary policy. The big advantage of a floating exchange rate, on the other hand, is the ability to pursue an independent monetary policy.[3]

Of the advantages of fixed exchange rates, academic economists tend to focus most on the nominal anchor for monetary policy. The argument is that there can be an inflationary bias when monetary policy is set with full discretion. A central bank that wants to fight inflation can commit more credibly by fixing the exchange rate, or even giving up its currency altogether. Workers, firm managers, and others who set wages and prices then perceive that inflation will be low in the future, because the currency peg will

[3] To be sure, other factors enter as well. Two other advantages of an independent currency are that the government retains seignorage, and floating allows smooth adjustment to real shocks even in the presence of price frictions. Most of the important factors, however, can be lumped into the major arguments presented in the text.

prevent the central bank from expanding even if it wanted to (without soon jeopardizing the viability of the exchange rate peg). When workers and firm managers have low expectations of inflation, they set their wages and prices accordingly. The result is that the country is able to attain a lower level of inflation, for any given level of output. This is an argument why countries like Italy, Spain, and Portugal, which had high inflation rates in the 1970s, were eager to tie their currencies to those of Germany and the rest of the EMS countries. In essence, they hoped to import the inflation-fighting credibility of the Bundesbank. The nominal anchor argument of course presupposes that one is pegging to a hard currency, one that exhibits strong monetary discipline. After the breakup of the Soviet Union, most of the 15 newly independent states wisely reached the judgment that the Russian rouble did not offer a good nominal anchor. The strength of the argument for basing monetary policy on an exchange rate target will also depend on what alternative nominal anchors might be available (money supply, nominal income, or price level).

The advantages of a flexible exchange rate can all be grouped under one major property: it allows the country to pursue independent monetary policy. The argument in favor of monetary independence, instead of constraining monetary policy by the fixed exchange rate, is the classic argument for discretion, instead of rules. When the economy is hit by a disturbance, such as a shift in worldwide demand away from the goods it produces, the government would like to be able to respond, so that the country does not go into recession. Under fixed exchange rates, monetary policy is always diverted, at least to some extent, to dealing with the balance of payments. Under the combination of fixed exchange rates and complete integration of financial markets, which characterizes

EMU, monetary policy becomes completely powerless. Under these conditions, the domestic interest rate is tied to the foreign interest rate. An expansion in the money supply has no effect: the new money flows out of the country, via a balance of payments deficit, just as quickly as it is created. In the face of an adverse disturbance, the country must simply live with the effects. After the fall in demand, for example, the recession may last until wages and prices are bid down, or until some other automatic mechanism of adjustment takes hold. By freeing up the currency, on the other hand, the country can respond to a recession by means of monetary expansion and depreciation of the currency. This stimulates demand for domestic products and returns the economy to desired levels of employment and output more rapidly than would the case under the automatic mechanisms of adjustment on which a fixed-rate country must rely.

A popular hypothesis is that countries are abandoning their independent currencies in favor of the firmest institutional constraints possible: either a currency board, or outright monetary union with one of the major-currency countries.

A currency board is a monetary institution that only issues currency that is fully backed by foreign assets. The introduction of currency board-like arrangements in Hong Kong (1983), Argentina (1991), Estonia (1992), Lithuania (1994), Bulgaria (1997), Bosnia (1998) and two smaller countries, constitutes a resurgence in their use worldwide. A currency board can help to create a credible policy environment by removing from the monetary authorities the option of printing money to finance government deficits.

Currency boards, which not long ago appeared a radical straightjacket, are now in some quarters deemed an insufficiently firm commitment. In January 1999, at the request of Argentina's President, the central bank submitted a report spelling out possible

ways to complete the dollarization of that country, that is, to replace the peso fully with the dollar as the legal currency. This plan may well never come to fruition. The timing of the initiative – immediately after the downfall of the real in neighboring Brazil and in advance of a presidential election in Argentina – suggests possible short-term objectives: impressing contagion-prone speculators and stability-craving voters. Nevertheless, many Latin Americans are suddenly taking the dollarization alternative seriously. Ecuador actually went ahead with dollarization.

The reasons why most countries would not want to adopt the currency of the United States or any other foreign power as its own are clear. It is a total surrender of monetary independence. Also it adds the insult of surrendering a symbol of national political sovereignty, which is demonstrably important to most people. Yet consider a country that already has demonstrated sufficient political support for monetary discipline to go as far as a currency board (and where the foreign currency already plays a large role in the economy). Is there anything further to be lost by going the rest of the way and giving up its currency altogether, beyond the symbolic loss of sovereignty?

The conventional interpretation would be that such a country still retains a degree of monetary independence that, though small, is not zero, and which it would be giving up if it were to dollarize fully. Argentina for example could always change the convertibility law if it wanted to, or short of that could switch its peg from the dollar to the euro, if US monetary policy disappointed.[4]

[4] Furthermore Argentina actually has a "quasi" currency board, which can in effect sterilize a certain proportion of reserve outflows, by allowing banks to acquire domestic dollar-denominated bonds as reserves.

The unfortunate truth is that most developing countries have been unable to make good use of whatever monetary independence they possess. Perhaps the additional loss of discretionary monetary policy for Argentina would be not just small, but zero. Perhaps an emerging-market country under a fixed exchange rate or currency board is in a worse position, as regards having to accept an interest rate that may not be appropriate to its current domestic cyclical conditions, than under dollarization.

Which factors are likely to dominate, the advantages of fixed exchange rates or the advantages of floating? Should countries adopt a currency board instead of just fixing? Should countries go all the way to dollarization? There is no one right answer for all countries. More evidence will help to determine the viable options. This paper contributes new evidence to the debate by studying the degree to which countries can pursue independent monetary policy and lower interest rates. We analyze exiting experiences from the widest possible spectrum of regimes, from full exchange rate flexibility to dollarization.

3. Methodology and Data

This section describes the data and empirical methodology used in the paper to assess quantitatively the links between domestic and international interest rates. Since we are interested in the total effect of foreign interest rates on local ones, and not in the channels through which the transmission occurs, we estimate a simple reduced-form specification of the type

$$r_{i,t}^{lc} = f_i + \beta\, r_t^* + \gamma' D_{i,t} + \delta' D_{i,t}\, r_t^* + \phi\,(\pi_{i,t} - \pi_t^*) + \varepsilon_{i,t}\,, \qquad (1)$$

where $i = 1,...,N$ and $t = 1,...,T$. Here $r_{i,t}^{lc}$ represents the domestic nominal interest rate in local currency of country *i* at time *t*; f_i is a country-specific effect;[5] r_t^* is the international interest rate; $D_{i,t}$ is a set of dummies (described below) that control for crisis periods, transition times, and hyperinflation periods, and $\pi_{i,t}$ and π^*_t are the domestic and foreign inflation rates, respectively.[6] All interest rates and inflation rates *x* are defined as *ln (1+x)*. We assume that the error term $\varepsilon_{i,t}$ has mean zero and is independently distributed across countries, but is possibly heteroskedastic and serially correlated.

We use the dummy variables in *D* to control for turbulent periods when the sensitivity of local interest rates to foreign ones may differ from its "normal" value. Specifically, we use three dummies. The first one is a "crisis" dummy that, following the literature on exchange rate crises, takes a value of one when the cumulative depreciation of the nominal exchange rate over a three-month period is equal to or greater than 15 percent. The second is a hyperinflation dummy that takes a value of one when monthly inflation is above 50 percent, and zero otherwise. Finally, we also use a "transition" dummy to control for changes in the exchange rate regime – specifically, exit from pegs to other regimes. Since such exits tend to be accompanied by considerable financial turbulence, in the absence of controls the new regime may be unduly associated with higher or more volatile interest rates and inflation, among other things.[7] The transition dummy takes a value of one in the month of the transition as well as those immediately

[5] Note that time specific effects cannot be included, because they would be perfectly collinear with r_t^*.

[6] A somewhat more general version of (1) would include separately domestic and foreign inflation, rather than entering them as a differential. Some experiments with this broader specification, however, showed that in general the differential specification was not rejected by the data.

[7] This is noted, for example, by Edwards and Savastano (1999).

preceding and following it.[8] To allow some additional flexibility in our specification, in equation (1) we also interact the three dummies with the foreign interest rate.

We estimate equation (1) separately for each currency regime, since preliminary evidence showed that neither the country effects nor the coefficients on the control variables are equal across regimes. For each regime, we are interested in two parameters, characterizing respectively the sensitivity of the local interest rate to the foreign rate (β in equation (1) above), and the average level of the local interest rate after controlling for the other factors. The latter can be summarized by a parameter α, defined as

$$\alpha = \frac{1}{N}\sum_{i=1}^{N} f_i ,$$

that is, the average of the country-specific effects under the regime in question.[9]

We present two types of estimates. In section 4, we report pooled fixed-effect estimates, combining all the available information as well as grouping countries by income level and breaking the sample by decade (1970s, 1980s and 1990s), to see if there are any significant differences along these dimensions. In section 5, we report country-specific estimates, for which $N = 1$ and hence the level parameter α is just the regression constant.

According to conventional wisdom, more flexible exchange rate regimes should allow countries additional room to pursue their independent monetary policy. Therefore,

[8] We also experimented with other specifications enlarging the transition period and dropping the corresponding observations. Likewise, we used different variations on our crisis dummy – using higher and lower depreciation thresholds and periods. These alternative specifications had only a modest impact on the parameters of interest.

[9] Strictly speaking, this definition would apply if under each exchange rate regime all countries possessed the same number of time-series observations. In practice, this is not the case, and our panel is heavily unbalanced. The formula then is amended using country weights given by the respective number of observations.

the sensitivity to international interest rates should increase with the rigidity of the exchange rate regime. In other words, for a given degree of capital mobility, we would expect $\beta_{\text{fixed}} \rangle \beta_{\text{intermediate}} \rangle \beta_{\text{floating}}$. In fact, in a fixed exchange rate regime with full capital mobility we should expect $\beta_{\text{fixed}} = 1$. At the opposite extreme, if domestic monetary policy is completely independent, we would expect $\beta_{\text{floating}} = 0$. In that case, exchange rates absorb all the shocks to international interest rates. However, it is more common for countries to pursue "dirty floating" arrangements under which they usually intervene in foreign exchange markets, and in those cases we should find $\beta_{\text{managed floating}} \rangle 0$.

In turn, the country-specific effect f_i measures, for each country and under each regime, the average level of the interest rate not accounted for by foreign interest rates, inflation and the turbulence dummies. Hence, it may be viewed as reflecting the mean level of currency risk and country risk not captured by these other variables. The average of the country-specific effects under each regime (α as defined earlier) is then a measure of the regime's mean currency risk plus country risk. Thus, if for example more rigidly fixed exchange rate regimes reduce devaluation expectations, for given country risk perceptions we should obtain $\alpha_{\text{fixed}} \langle \alpha_{\text{intermediate}} \langle \alpha_{\text{floating}}$.

3.1 Data

Our basic data source for interest rate information is the International Financial Statistics of the IMF. We work with monthly information on local money market rates for the 1970s, 1980s, and 1990s. We choose money market interest rates because they reflect market forces better than deposit rates. The latter, while much more widely available, are often subject to administrative controls and in many cases display little

movement over prolonged periods, which renders them uninformative for our purposes.[10] When available, we choose the 90-day money market rate; otherwise, we use the 30-day rate.

As international interest rates, we use the 90-day US T-bill rate. We also experimented with the LIBOR US dollar rate. The results were very similar, since these two rates are very highly correlated. Finally, for some experiments below, we use also the German 90-day T-bill rate.

The classification of exchange rate regimes is taken from the IMF. The Appendix lists the regime prevailing in each country over the sample period according to this source. The classification used here is based on a quarterly database from the IMF on exchange rate regimes encompassing a total of 10 categories, based on officially reported exchange arrangement for the period 1975-1996. We transform the IMF database to a monthly basis, complementing the original source with information contained in Cottarelli and Giannini (1997). Finally, the classification is extended until March 1999, using information from IMF reports and publications, including the Exchange Rate Arrangements and Restrictions and the International Finance Statistics, 1998 and 1999.[11] In addition to the original classification, we construct new categories to account for the

[10] In a number of cases we found that the money market data from IFS were identical to the deposit data. In such case, we discarded countries/periods for which the rates showed no variation or infrequent step-wise movements.

[11] More specifically, the tables used include the declared status as of March 31, 1997, September 30, 1997, March 31, 1998, September 30, 1998, January 1, 1999, and April 4, 1999. A difference in the last two tables, corresponding to 1999, is the fact that they present in some cases, the "de facto" exchange arrangement, as opposed to the previous tables where the "de jure" classification is presented. For consistency, in this article, the countries were classified for these months according to the "de jure" classification. In the cases where a change of regime occurred between two of the described tables and in absence of additional information, the changes were assumed to occur in the intermediate month.

specific currency to which some of the fixed regimes are pegged, when different from the US dollar or the French franc.

We present some empirical results (in Table 1 below) from estimating equation (1) using the detailed regime categories in the original source. However, to facilitate our analysis, in the rest of our experiments we condense these categories into three broader exchange rate regimes: fixed (pegs), intermediate (limited flexibility, crawls, bands, managed floating), and flexible (free floating). More specifically, peg regimes include: peg to the US dollar, peg to the French franc, peg to other currencies (comprising Indian rupee, South African rand, British pound, and Deutsche mark), peg to SDR (IMF basket), and basket pegs (including the so-called Bretton Woods basket peg). In turn, intermediate regimes include: limited flexibility with respect to a basket, limited flexibility with respect to a single currency, limited flexibility with respect to a cooperative arrangement (including the European Monetary System), managed floating, crawling pegs, and crawling bands. As a robustness check, we compared the results obtained with this condensed classification with those obtained using the classification of Ghosh et al. (1996). On the whole, the results were very similar.

We focus on industrial economies and middle-income developing countries. Within this broad group, sample coverage is dictated by the availability of adequate interest rate data. We dropped country/regime episodes possessing less than one year of consecutive monthly observations. We also excluded countries with population under one million, countries without availability of long exchange rate series (which automatically leads to the exclusion of Eastern European economies), low income countries (in which the incidence of interest rate controls is more widespread), and

countries with prolonged internal or external war periods. This leaves us with a total of 48 countries (18 industrial and 30 developing) in addition to the US, whose interest rate is used as an explanatory variable, and a total number of monthly observations exceeding 9,500.

Finally, the rest of the data—exchange rates, inflation, and country indicators such as population and income level on which the sample selection is based—come from the World Bank-IMF databases.

4. Interest Rate Sensitivity: Pooled Estimates

We first assess empirically the sensitivity of domestic to US interest rates by estimating equation (1) using the entire sample, as well as distinguishing between industrial and developing countries and considering subsamples defined by time period.

Table 1 presents the full-sample fixed-effects estimation results, using a five-regime classification of currency arrangements. The top half of the table excludes the hyperinflation, crisis, and transition dummies (as well as their interaction with the US rate), while the bottom half includes them. To avoid cluttering the table, here and in the rest of the paper, we only report the coefficients of interest – i.e., the slope parameter and the level parameter $\sim$ defined earlier – and omit the estimated coefficients on the inflation differential and the turbulence dummies.[12]

The top line of Table 1 shows that for the entire sample the sensitivity of domestic to foreign rates is 0.76 – and not significantly different from one at conventional

[12] These are available upon request in a set of expanded tables. Here we just note that the inflation differential typically carries a positive and highly significant coefficient. In turn, the hyperinflation dummy has a negative level effect and a positive slope effect (i.e., when interacted with the foreign

significance levels – when controls are omitted. The rest of the table shows the results obtained estimating separate panels by exchange rate regime. The pattern of slope coefficients that emerges across regimes seems to conform to conventional wisdom: it is highest (at 0.74) in the pegged regimes – interestingly, there seems to be little difference whether the peg is to the US dollar or to other currencies – followed by the intermediate regimes at 0.55. Floating regimes show the lowest interest sensitivity at 0.27. In fact, for the pure and managed floating regimes, the slope coefficient is estimated imprecisely and is not significantly different from zero.

The bottom half of the table shows the results obtained when adding the turbulence dummies. The main consequence is a substantial increase in the magnitude of the slope estimate under floating, which now rises to 0.48 and is significantly different from zero. On the whole, the ranking of slope coefficients across regimes remains unchanged, however – highest in fixed regimes and lowest in floating regimes, although the differences among them are fairly small. The sensitivity parameter under managed floating continues to be estimated very imprecisely.

The estimated constants under each regime also deserve mention. As noted earlier, they can be viewed as reflecting the level of the domestic interest rate characteristic of each regime, after removing the effects of inflation and the turbulence dummies. The table shows that, given other things, the level of local interest rates is lowest under fixed exchange rate arrangements, regardless of whether controls are

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interest rate); the crisis dummy usually shows the opposite pattern; and the transition dummy shows no definite pattern.

included.[13] At the other extreme, floating and managed floating regimes exhibit the highest interest rate levels, given other factors.

In spite of the simplicity of our empirical specifications, they capture a good deal of the observed variation in interest rates, as shown by the total and within R^2 statistics in the table.

[Table 1 here]

In tables 2-4, we take a closer look at these results breaking the sample by income level and time period. To keep the amount of information manageable, we proceed in the same fashion as Ghosh et al. (1999) and condense the various exchange rate regimes into only three broader categories: fixed, intermediate, and floating.

Table 2 divides the sample between industrial and developing countries. As before, the top half shows the results obtained using a specification excluding the turbulence dummies, while the bottom half reports estimation results obtained including them. As could be expected, the dummies make a difference for the point estimates only in the case of developing countries, and specifically for the floating regime, whose slope estimate changes from large and negative to zero when adding the turbulence indicators. In both cases, however, the slope estimate is very imprecise and not different from zero.

Apart from this, adding the dummies results in modest changes in the slope estimates, although it improves their precision in most cases. For the entire sample of developing countries, the slope estimate is close to 1, while for industrial economies it is just above 0.60 and significantly different from unity. As before, however, there are

[13] In fact, the level estimate is lowest for pegs to currencies other than the dollar. This might reflect the fact that during the sample period these currencies had, on average, lower interest rates than the US dollar.

important differences across regimes. In both subsamples, the largest slope coefficient corresponds to the pegged regimes – close to unity in the industrial countries, but considerably lower in the developing countries. In the industrial economies the intermediate regimes exhibit the least sensitivity to foreign interest rates. In the developing countries, no clear conclusion can be drawn since the slope estimate under floating is highly imprecise (and negative). Interestingly, slope estimates are uniformly lower in the developing country sample, regardless of regime. Rather than implying that developing countries enjoy more monetary independence than industrial ones under any regime, the likely explanation for this result is that over the full sample period developing economies are less integrated than industrial economies into world financial markets.

Finally, the regime constants show a pattern opposite to that of the slope estimates: for each regime, they are larger in the developing country sample than in the industrial country sample. The difference is particularly striking in the case of floating regimes. Other things equal, therefore, developing countries tend to exhibit higher interest rates than industrial countries. Across regimes, the same pattern found in Table 1 holds for both developing and industrial countries: the constant is lowest in pegged regimes than in the rest.

[Table 2 here]

With barriers to international capital movements declining steadily over the last two decades, the above results may conceal significant variation over time in the sensitivity of domestic to foreign interest rates. To explore this, Tables 3 and 4 further disaggregate the samples of developing and industrial countries by decade. Table 3 presents the results for developing countries by decade and regime, again both including

and excluding the dummies. It is apparent from the table that our slope estimates under floating regimes are very poor in all three decades of available data – most point estimates are negative and exhibit huge standard errors. Leaving floating regimes aside, the table does suggest an upward trend in the estimated slope coefficients across decades, both for fixed and intermediate regimes. In the 1990s, both fixed and intermediate regimes exhibit a high degree of sensitivity to foreign interest rates, which is not different from unity when the dummies are excluded (top half of the table) but declines somewhat for fixed regimes when the dummies are included (bottom half of the table).

[Table 3 here]

Table 4 presents the same information as the previous table for industrial economies. It is important to note that the industrial country sample does not include any fixed regimes after the 1970s; hence the fixed exchange rate results for the 1970s are just those shown in Table 2 above for the entire sample period. In the 1970s and 1980s, there is little difference between the slope estimates of intermediate and floating regimes, with the former slightly larger than the latter. In the 1990s, however, the result is reversed: floating regimes show a slope estimate close to one, while for intermediate regimes the estimate is small and not different from zero.

[Table 4 here]

To summarize this section, our full-sample results seem to accord with conventional wisdom in that fixed exchange rate regimes show greater sensitivity of domestic to foreign interest rates than the other regimes. In addition, fixed regimes also tend to exhibit lower average interest rates after other factors have been taken into account.

Using the full sample period, we also find that in general the sensitivity of domestic interest rates to foreign rates appears higher in industrial than in developing countries, a result consistent suggestive of more limited financial integration of the latter economies.

When looking at the results in more detail, however, some puzzles emerge. First, the pooled data do not yield any sensible slope estimates for the developing-country floating regimes. This brings back the concerns mentioned earlier regarding the accuracy of the IMF-based regime classification that we use here, which might list as floating a number of countries that in reality are pursuing active exchange market intervention. Second, among industrial countries the intermediate regimes exhibit an awkward pattern, with their slope estimate declining to nearly zero in the 1990s, which appears to run counter the worldwide trend towards increasing financial integration. It is worth noting that the EMU group accounts for the bulk of countries under this regime in the 1990s. This poses the question of whether US interest rates – rather than German interest rates – really provide the right measure of external financial conditions for this group of countries.

In summary, while our results using pooled data provide valuable insights, they also have limitations related to the accuracy of the underlying regime classification, as well as the more general concern of heterogeneity across countries, which the pooled estimates limit to the relatively trivial dimension of country-specific constants. To assess the relevance of these concerns, we next turn to country-specific estimation.

5. Interest Rate Sensitivity: Heterogeneous Estimates

To avoid possible heterogeneity biases that might be present in the pooled estimates of the previous section, here we focus on individual-country estimates of equation (1). Further, we focus on a few selected countries whose exchange rate regime can be categorized in a relatively straightforward manner, in order to avoid the risks of misclassification that arise when using a large number of countries.

Table 5 presents estimation results for 11 developing countries, grouped in four regime categories: dollarized economies (consisting only of Panama), hard pegs (currency boards, consisting of Argentina and Hong Kong), intermediate regimes (a category including currency bands, managed floats and similar arrangements, consisting of Chile, Indonesia, Israel, Singapore, and Thailand), and free floating regimes (Mexico after the Tequila crisis, Philippines, and South Africa). Whenever the data permit, we present estimates for both the entire available sample as well as the 1990s. The specification we use here includes the turbulence dummies. In a number of instances the residuals display serial correlation; rather than differencing the data and losing potentially valuable information, we report Newey-West standard errors robust to both heteroskedasticity and autocorrelation.[14] In addition to the point estimates and their standard errors, the table also reports the p-values from the test of the null hypothesis that the slope coefficient equals one (i.e., full sensitivity of domestic interest rates to foreign interest rates).

[14] We set the number of lags for the Newey-West covariance matrix computation at 3. Results with other lag specifications were similar in most instances.

The top row of Table 5 reports the results obtained for Panama, the only dollarized economy for which we have adequate data.[15] Somewhat surprisingly, the estimated slope coefficient is only 0.5, significantly smaller than one, a result similar to that reported by Frankel (1999). The next two rows present the estimates for the 'hard pegs' of Argentina and Hong Kong. The point estimates of the slope coefficient are close to one, although the estimate for Argentina is rather imprecise, and statistically it is neither different from zero nor from one at conventional confidence levels.

The next block in Table 5 reports the results for the intermediate regimes. Here all the slope estimates are statistically different from zero, and several of them are actually larger than one. Moreover, the estimates for the 1990s are generally larger than those for the longer samples available for four of the five countries, suggesting an upward time trend. In fact, in the 1990s we cannot reject the hypothesis that US interest rate changes are fully reflected in local rates in all countries in the table, with the exception of Israel.

The last block in the table presents the floating regimes, which yielded implausible slope estimates in the pooled regressions of the previous section. For Mexico, this continues to be the case in Table 5. The point estimate is large, negative and very imprecise, a likely reflection of the financial turbulence following the Tequila crisis that resulted in skyrocketing domestic interest rates at a time when they were declining in the US. For the Philippines, in contrast, we find a high slope coefficient, above unity in the 1990s. Finally, South Africa also exhibits a negative and insignificant point estimate

[15] Actually, Panama is an exception in that its interest rate data are quarterly and correspond to deposit rates rather than money market rates. Hence they are not strictly comparable to the data for other countries in the paper.

over the whole sample, but it becomes positive in the 1990s, when the characterization of the exchange regime as freely floating is probably more accurate.[16] In fact, in the latter period the slope estimate for South Africa significantly exceeds one at standard confidence levels. The pattern of the estimated constants across regimes is also reminiscent of that found in the previous section: they are generally higher in the floating regimes than in the rest.

On the whole, therefore, the developing country estimates do not show much difference across exchange regimes regarding the sensitivity of local interest rates to foreign ones. In most cases the estimates are consistent with the hypothesis of full transmission of foreign interest rate disturbances, regardless of exchange regime. Two important exceptions are Israel, where the slope coefficient is significantly smaller than one, and Mexico, where the estimates are too imprecise to permit any firm conclusion. In the rest of cases, however, the data suggest an increase over time in the slope coefficients, which rise beyond unity in the 1990s for a number of countries.

[Table 5 here]

We now turn to the industrial countries. The pooled estimates from the previous section revealed two surprising facts. First, intermediate regimes appeared to exhibit a declining sensitivity to foreign interest rates, which became practically negligible in the 1990s. Second, floating regimes showed the opposite trend, with their slope coefficient becoming equal to one in the 1990s. We next explore these two issues.

European countries account for the bulk of the intermediate regimes in the 1990s. Country-specific estimates, which we do not report here to save space, confirm the

[16] South Africa's multiple exchange rate regime was unified in 1995.

findings from the pooled regression, namely that the sensitivity of local rates to US T-Bill rates falls abruptly in the 1990s. As noted earlier, however, most of these countries have in fact belonged to the DM (now EMU) area for quite a few years, and it is unclear whether US rates provide the right measure of "foreign interest rates" for them.

To illustrate this fact, Table 6 presents estimation results for six of these economies using the German T-bill interest rate rather than the US T-bill rate as explanatory variable. The results are revealing. The slope estimates are all highly significant (with the exception of Italy in the 1990s, whose available sample is very short), they show a rising trend over time, and in the 1990s they actually exceed one – significantly so in all cases except Belgium. Thus, the declining pattern of the slope coefficients found in the pooled estimates is not a reflection of increased monetary independence but, on the contrary, a straightforward consequence of the fact that these countries have de-linked themselves from the US dollar area to become tightly linked with the DM.

[Table 6 here]

Finally, we turn to the industrial-country floating regimes. Table 7 reports regression results for three large economies (Germany,[17] Japan, and the UK) and three smaller ones (Australia, New Zealand, and Canada). The table shows a striking contrast between the two groups. The three smaller economies exhibit large slope coefficients exceeding one – significantly so in Australia and New Zealand. Further, the explanatory power of the estimated equations is fairly high. The larger economies, in turn, all possess slope coefficients below one. For Germany, the estimate is insignificantly different from

[17] Germany obviously does not float vis-à-vis her EMU partners, but can be viewed as floating vis-à-vis the US dollar.

zero in the 1990s, although its precision is poor. The UK slope estimate is just 0.10, and its precision is quite high. Finally, Japan has the highest slope coefficient in this group. Interestingly, its estimate rises somewhat in the 1990s, so that it is no longer significantly different from one, although its precision is relatively low. Again in contrast with the smaller economies, the explanatory power of the empirical equations is quite poor for the three large floating-regime economies.

[Table 7 here]

To summarize this section, the closer inspection of individual country data confirms some of the findings from the pooled regressions, and also helps solve some of the puzzles they posed. On the whole, we find little evidence in the 1990s against the hypothesis of full transmission of foreign interest rate disturbances into domestic rates, regardless of exchange regime and income level. On the contrary, we find an increasing trend in the degree of transmission, and slope coefficients that exceed one in several industrial and developing countries.

There are exceptions, however. The major one are the large industrial countries with floating regimes (Germany, the UK and, to a lesser extent, Japan), which exhibit slope coefficients well below unity. This suggests that these may be the only economies that truly possess, or make use of, monetary independence. Further, a logical consequence of the low sensitivity of Germany's interest rates to US rates is that the other countries in the DM-EMU area also exhibit low sensitivity to US rates – but not to German rates.

The other exceptions are scattered across exchange regimes, and to some extent represent unsolved puzzles. This applies in particular to Panama – a fully dollarized

economy that nevertheless exhibits a slope coefficient well below one. Among the developing-country intermediate regimes, Israel also appears relatively de-linked from the US dollar interest rates. Finally, among the floating regimes we could not draw any conclusive inference in the case of Mexico due to the poor precision of the empirical estimates.

6. Conclusions

The recent hikes in US interest rates have been quickly reflected in the domestic interest rates of many countries around the world. In this paper we have tested whether this transmission of international interest rate changes to local rates is affected by the exchange rate regime. This is an important question in the context of the debate on the choice of currency regime, in which the issue of monetary independence has played a central role. Proponents of free-floating arrangements have argued that countries adopting floating regimes would be able to pursue their own monetary policy goals, while advocates of hard pegs have questioned the feasibility of such a strategy in a world of high international capital mobility.

The paper has taken a first step towards assessing empirically the relative merits of these two views, by reviewing the empirical regularities on international interest rate linkages for a large sample of industrial and developing countries. The approach taken here extends and generalizes earlier studies that have focused on a small group of countries over brief time periods. Specifically, the paper has examined the evidence from industrial and developing countries over the last three decades, using both pooled and single-country empirical estimates. The objective is to establish the main stylized facts

that will need to be addressed in the debate on monetary independence and the choice of currency regime. To do this, we have employed simple reduced-form specifications relating domestic to world interest rates. In spite of their simplicity, the empirical models capture a large proportion of the variance in local interest rates, within and across countries.

The main results of the paper can be summarized in five points. First, when using the entire sample period, we found significant differences in the sensitivity to US interest rates across regimes. In accordance with the conventional wisdom, our pooled estimates suggest that fixed currency regimes tend to exhibit higher transmission than more flexible regimes.

Second, our results also suggest that interest rates are consistently lower in countries with fixed exchange rate regimes. This result holds both with and without additional control variables, and the difference appears particularly large in developing countries.

Third, in a large number of cases we cannot reject the hypothesis of full transmission (i.e., a slope coefficient equal to 1), particularly in the 1990s. Indeed, the data suggest an upward time trend in the degree of sensitivity of domestic to foreign interest rates, consistent with the gradual removal of barriers to international capital movements and the increased financial integration of developing economies with the rest of the world. As a result, our country-specific estimates for the 1990s reveal very few cases of less-than-full transmission of international interest rates to domestic ones, regardless of currency regime.

Fourth, country-specific results also suggest that only large industrial countries can or choose to benefit from independent monetary policy. The slope coefficients for Germany, Japan (before the 1990s) and the UK – large economies with floating regimes vis-à-vis the US – are statistically smaller than 1. In contrast, in other countries, including smaller industrial economies with floating regimes (Australia, Canada, and New Zealand), local interest rates fully reflect US rates. Among developing-country floating regimes, one possible exception to this rule might be Mexico, for which our empirical results are too imprecise to allow any definite conclusion.

Fifth, during the 1990s interest rates in European countries have become virtually insensitive to US interest rates – but fully sensitive to German interest rates. Thus, European countries have shifted from the US monetary area to the DM-EMU monetary area between the 1970s and 1990s, and the decline in the responsiveness of their interest rates to US interest rates does not signify any increase—rather the opposite – in their degree of monetary independence.

To conclude, the empirical regularities identified in the paper leave many questions open for future research, of which we shall mention three. First, in the 1990s we find little evidence against the hypothesis of full transmission, in both fixed and flexible regimes alike – except for large industrial economies. Does this mean that floating-regime countries are not able to pursue their independent monetary policy, or rather that they choose not to float, perhaps due to "fear of floating" (as discussed in Calvo and Reinhart [2000] and Hausmann, Panizza, and Stein [2000]) ?

Related to this, what is the role of financial integration in the observed increase in the degree of interest rate transmission ? The "Impossible Trinity" principle states that

countries can choose two of the following three: capital mobility, monetary policy, and exchange rate flexibility. However, the fact that we found virtually full transmission in the 1990s seems to imply that financial integration might be playing a bigger role than the above principle suggests.

Finally, in the paper we did not explore the channels or dynamics through with international interest rates are transmitted to domestic rates. For example, to understand better the determinants of the degree of transmission, it would be useful to explore separately the effects of international rates on country risk and currency risk. For this, however, we would need to move beyond the simple reduced-form specifications used in this paper. This is the subject of ongoing research.

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Table 1: Local Interest Rate Responsiveness to US T-bill Rate by Exchange Rate Regime

The table reports the constant and slope coefficients of the local interest rate (money market) on the US T-bill rate. The models are calculated by exchange rate regime. All regressions contain country fixed effects. Data are from industrialized and developing countries in the 1970s, 1980s, and 1990s. Controls are not reported, but they are included in all regressions. Newey-West standard errors are in parenthesis.

Controlling for inflation rate	Constant	US T-bill	R-squared within	Number of countries	Number of observations
Whole sample	0.05 **	0.76 **	0.56	48	9,482
	(0.00)	(0.23)			
Fixed:	0.04 **	0.74 **	0.31	14	558
	(0.01)	(0.28)			
pegged to US dollar ($)	0.05 **	0.68 **	0.38	8	364
	(0.01)	(0.34)			
pegged to other currencies	0.02 **	0.64 **	0.28	8	194
	(0.00)	(0.28)			
Intermediate:	0.08 **	0.55 **	0.39	39	6,160
	(0.00)	(0.07)			
band	0.05 **	0.60 **	0.17	30	4,098
	(0.00)	(0.07)			
managed floating	0.13 **	0.22	0.48	28	2,062
	(0.01)	(0.19)			
Floating	0.10 **	0.27	0.30	27	2,764
	(0.01)	(0.33)			

Controlling for inflation rate, crisis, hyperinflation, transition out of peg regimes	Constant	US T-bill	R-squared within	Number of countries	Number of observations
Whole sample	0.04 **	0.77 **	0.59	48	9,449
	(0.00)	(0.12)			
Fixed:	0.04 **	0.70 **	0.40	14	544
	(0.01)	(0.19)			
pegged to US $	0.06 **	0.68 **	0.44	8	364
	(0.01)	(0.25)			
pegged to other currencies	0.02 **	0.63 **	0.26	8	180
	(0.00)	(0.28)			
Intermediate:	0.08 **	0.55 **	0.42	39	6,141
	(0.00)	(0.08)			
band	0.05 **	0.59 **	0.24	30	4,079
	(0.00)	(0.07)			
managed floating	0.14 **	0.19	0.49	28	2,062
	(0.01)	(0.29)			
Floating	0.09 **	0.48 **	0.40	27	2,764
	(0.01)	(0.19)			

**: Significantly different from 0 at 5% confidence level.

*: Significantly different from 0 at 10% confidence level.

Table 2: Local Interest Rate Responsiveness to US T-bill Rate by Income Group

The table reports the constant and slope coefficients of the local interest rate (money market) on the US T-bill rate. The models are calculated by exchange rate regime. All regressions contain country fixed effects. Data are from industrialized and developing countries in the 1970s, 1980s, and 1990s. Controls are not reported, but they are included in all regressions. Newey-West standard errors are in parenthesis.

Controlling for inflation rate	Constant	US T-bill	R-squared within	Number of countries	Number of observations
Developing Countries					
Fixed	0.05 **	0.63 **	0.34	8	425
	(0.01)	(0.30)			
Intermediate	0.11 **	0.45 **	0.43	25	2,933
	(0.01)	(0.15)			
Free-Floating	0.24 **	-0.92	0.31	14	962
	(0.02)	(1.11)			
Industrialized Countries					
Fixed	0.00	1.03 **	0.51	6	133
	(0.01)	(0.19)			
Intermediate	0.05 **	0.60 **	0.20	14	3,227
	(0.00)	0.06			
Free-Floating	0.03 **	0.70 **	0.26	13	1,802
	(0.00)	(0.21)			

Controlling for inflation rate, crisis, hyperinflation, transition out of peg regimes	Constant	US T-bill	R-squared within	Number of countries	Number of observations
Developing Countries					
Fixed	0.05 **	0.62 **	0.42	8	421
	(0.01)	(0.21)			
Intermediate	0.11 **	0.43 **	0.46	25	2,933
	(0.01)	(0.20)			
Free-Floating	0.21 **	-0.02	0.44	14	962
	(0.02)	(0.25)			
Industrialized Countries					
Fixed	-0.01	1.06 **	0.47	6	123
	(0.01)	(0.18)			
Intermediate	0.05 **	0.60 **	0.20	14	3,208
	(0.00)	0.06			
Free-Floating	0.03 **	0.73 **	0.28	13	1,802
	(0.00)	(0.20)			

**: Significantly different from 0 at 5% confidence level.

*: Significantly different from 0 at 10% confidence level.

Table 3: Local Interest Rate Responsiveness to US T-bill Rate
Developing Countries by Decade

The table reports the constant and slope coefficients of the local interest rate (money market) on the US T-bill rate. The models are calculated by exchange rate regime. All regressions contain country fixed effects. Data are from industrialized and developing countries in the 1970s, 1980s, and 1990s. Controls are not reported, but they are included in all regressions. Newey-West standard errors are in parenthesis.

Controlling for inflation rate	Constant	US T-bill	R-squared within	Number of countries	Number of observations
1970s:					
Fixed	0.08 **	0.05	0.01	4	191
	(0.00)	(0.10)			
Intermediate	0.07 **	0.51 *	0.12	5	177
	(0.01)	(0.27)			
Free-Floating	0.22 **	-0.48	0.02	2	42
	(0.06)	(0.71)			
1980s:					
Fixed	0.16 **	0.86 **	0.17	2	42
	(0.04)	(0.01)			
Intermediate	0.13 **	0.42 **	0.50	13	1,091
	(0.02)	(0.18)			
Free-Floating	0.17 **	-0.01	0.02	4	294
	(0.02)	(0.45)			
1990s:					
Fixed	0.02	1.00 **	0.60	3	192
	(0.02)	(0.20)			
Intermediate	0.11 **	0.76 **	0.19	22	1,665
	(0.01)	(0.37)			
Free-Floating	0.41 **	-4.99	0.55	11	626
	(0.04)	(4.24)			

Controlling for inflation rate, crisis, hyperinflation, transition out of peg regimes	Constant	US T-bill	R-squared within	Number of countries	Number of observations
1970s:					
Fixed	0.08 **	0.06	0.01	4	187
	(0.00)	(0.13)			
Intermediate	0.06 **	0.57 *	0.48	5	177
	(0.01)	(0.30)			
Free-Floating	0.25 **	-0.77	0.03	2	42
	(0.07)	(1.22)			
1980s:					
Fixed	0.19 **	0.68 **	0.31	2	42
	(0.04)	(0.04)			
Intermediate	0.13 **	0.42 *	0.51	13	1,091
	(0.02)	(0.24)			
Free-Floating	0.18 **	-0.28	0.23	4	294
	(0.01)	(0.27)			
1990s:					
Fixed	0.04 **	0.70 **	0.83	3	192
	(0.01)	(0.06)			
Intermediate	0.11 **	0.90 **	0.26	22	1,665
	(0.01)	(0.30)			
Free-Floating	0.18 **	0.08	0.65	11	626
	(0.04)	(0.64)			

**: Significantly different from 0 at 5% confidence level.

*: Significantly different from 0 at 10% confidence level.

Table 4: Local Interest Rate Responsiveness to US T-bill Rate
Industrialized Countries by Decade

The table reports the constant and slope coefficients of the local interest rate (money market) on the US T-bill rate. The models are calculated by exchange rate regime. All regressions contain country fixed effects. Data are from industrialized and developing countries in the 1970s, 1980s, and 1990s. Controls are not reported, but they are included in all regressions. Newey-West standard errors are in parenthesis.

Controlling for inflation rate	Constant	US T-bill	R-squared within	Number of countries	Number of observations
1970s:					
Fixed	0.00	1.03 **	0.51	6	133
	(0.01)	(0.19)			
Intermediate	0.04 **	0.60 **	0.10	11	845
	(0.00)	(0.13)			
Free-Floating	0.04 **	0.53 *	0.11	7	382
	(0.01)	(0.27)			
1980s:					
Fixed	..	..	..	..	..
Intermediate	0.06 **	0.49 **	0.27	12	1,314
	(0.00)	(0.10)			
Free-Floating	0.06 **	0.38 **	0.14	7	616
	(0.00)	(0.19)			
1990s:					
Fixed	..	..	..	..	..
Intermediate	0.07 **	0.02	0.01	13	1,068
	(0.00)	(0.16)			
Free-Floating	0.02 **	0.92 **	0.19	10	804
	(0.00)	(0.29)			

Controlling for inflation rate, crisis, hyperinflation, transition out of peg regimes	Constant	US T-bill	R-squared within	Number of countries	Number of observations
1970s:					
Fixed	-0.01	1.06 **	0.47	6	123
	(0.01)	(0.18)			
Intermediate	0.04 **	0.56 **	0.11	11	845
	(0.00)	(0.14)			
Free-Floating	0.04 **	0.51 *	0.12	7	382
	(0.01)	(0.28)			
1980s:					
Fixed	..	..	..	..	..
Intermediate	0.06 **	0.49 **	0.27	12	1,314
	(0.00)	(0.10)			
Free-Floating	0.06 **	0.39 **	0.16	7	616
	(0.00)	(0.19)			
1990s:					
Fixed	..	..	..	..	..
Intermediate	0.07 **	0.13	0.10	13	1,049
	(0.00)	(0.16)			
Free-Floating	0.01 **	1.04 **	0.31	10	804
	(0.00)	(0.27)			

**: Significantly different from 0 at 5% confidence level.
*: Significantly different from 0 at 10% confidence level.

Table 5: Local Interest Rate Responsiveness to US T-bill Rate, by Country
Developing Countries

The table reports the constant and slope coefficients of the local interest rate (money market) on the US T-bill rate. Controls (for inflation, crisis, hyperinflation, transition out of peg regimes) are not reported, but they are included in all regressions. Newey-West standard errors are in parenthesis.

Regime and country	Sample	Constant	US T-bill rate	Test slope = 1 (p-value)	R-squared	Number of observations
Dollarized						
Panama	3/86 - 12/96	0.04 **	0.53 **	0.00	0.69	40
(quarterly)		(0.00)	(0.05)			
Fixed						
Argentina	3/91- 12/99	0.04	0.90	0.90	0.87	106
		(0.04)	(0.86)			
Hong Kong	1/94 - 12/99	0.00	1.07 **	0.72	0.15	72
		(0.01)	(0.19)			
Intermediate						
Chile	9/82 - 8/99	0.07 **	1.83 **	0.15	0.44	204
		(0.03)	(0.58)			
	90s	0.03	1.99 **	0.21	0.49	116
		(0.04)	(0.80)			
Indonesia	6/86 - 6/99	0.07 **	0.83 **	0.62	0.60	145
		(0.02)	(0.34)			
	90s	0.06 **	1.26 **	0.63	0.66	102
		(0.03)	(0.55)			
Israel	2/89 - 12/99	0.09 **	0.72 **	0.03	0.35	131
		(0.01)	(0.13)			
Singapore	9/73 - 12/99	0.00	0.86 **	0.00	0.72	316
		(0.00)	(0.04)			
	90s	0.00	0.86 **	0.21	0.41	120
		(0.01)	(0.11)			
Thailand	3/79 - 3/97	0.04 **	0.93 **	0.19	0.62	217
		(0.01)	(0.06)			
	90s	0.02	1.42 **	0.15	0.44	87
		(0.01)	(0.29)			
Floating						
Mexico	12/94-12/99	0.24 *	-1.76	0.34	0.78	61
		(0.13)	(2.90)			
Philippines	11/81-12/99	0.07 **	0.79 **	0.37	0.24	218
		(0.01)	(0.23)			
	90s	0.05 **	1.29 **	0.53	0.24	120
		(0.02)	(0.46)			
South Africa	2/79-12/99	0.13 **	-0.24	0.00	0.14	251
		(0.01)	(0.16)			
	90s	0.06 **	1.44 **	0.02	0.47	120
		(0.01)	(0.19)			

**: Significantly different from 0 at 5% confidence level.

*: Significantly different from 0 at 10% confidence level.

Table 6: Local Interest Rate Responsiveness to German T-bill Rate, by Country
European Industrial Countries with Intermediate Regimes

The table reports the constant and slope coefficients of the local interest rate (money market) on the German T-bill rate. Controls (for inflation, crisis, hyperinflation, transition out of peg regimes) are not reported, but they are included in all regressions. Newey-West standard errors are in parenthesis.

Country	Sample	Constant	German T-bill rate	Test slope=1 (p-value)	R-squared	Number of observations
Belgium	1/72 - 12/98	0.02 **	0.71 **	0.01	0.45	324
		(0.01)	(0.11)			
	90s	0.00	1.02 **	0.38	0.95	108
		(0.00)	(0.02)			
Denmark	1/72 - 12/99	0.05 **	0.81 **	0.22	0.27	336
		(0.01)	(0.15)			
	90s	0.00	1.25 **	0.01	0.83	120
		(0.00)	(0.10)			
Italy	1/79 - 8/92	0.09 **	0.50 **	0.00	0.32	164
		(0.01)	(0.14)			
	90s	0.07 **	0.53	0.28	0.16	32
		(0.04)	(0.43)			
Netherlands	1/72 - 12/98	0.02 **	0.78 **	0.03	0.48	324
		(0.01)	(0.11)			
	90s	0.00	1.05 **	0.00	0.99	108
		(0.00)	(0.02)			
Portugal	1/83 - 12/99	0.05 **	1.13 **	0.50	0.37	192
		(0.01)	(0.19)			
	90s	0.01	1.70 **	0.00	0.83	108
		(0.01)	(0.09)			
Spain	6/89 - 12/99	0.02 **	1.32 **	0.02	0.78	115
		(0.01)	(0.13)			

**: Significantly different from 0 at 5% confidence level.

*: Significantly different from 0 at 10% confidence level.

Table 7: Local Interest Rate Responsiveness to US T-bill Rate, by Country
Industrial Countries with Floating Regime

The table reports the constant and slope coefficients of the local interest rate (money market) on the US T-bill rate. Controls (for inflation, crisis, hyperinflation, transition out of peg regimes) are not reported, but they are included in all regressions. Newey-West standard errors are in parenthesis.

Country	Sample	Constant	US T-bill rate	Test slope =1 (p-value)	R-squared	Number of observations
Australia	12/83-12/9	0.02	1.36 **	0.16	0.61	150
		(0.01)	(0.25)			
	90s	-0.02	2.02 **	0.00	0.83	78
		(0.01)	(0.17)			
Canada	1/75-12/99	0.01 **	1.07 **	0.30	0.69	300
		(0.00)	(0.07)			
	90s	-0.01	1.49 **	0.15	0.45	120
		(0.02)	(0.34)			
New Zealand	3/85-12/99	-0.01	2.06 **	0.00	0.69	177
		(0.01)	(0.29)			
	90s	0.00	1.69 **	0.00	0.69	119
		(0.01)	(0.18)			
Germany	4/73-12/99	0.03 **	0.44 **	0.00	0.21	309
		(0.01)	(0.09)			
	90s	0.07 **	-0.16	0.00	0.02	108
		(0.02)	(0.34)			
Japan	1/73-12/99	0.01	0.65 **	0.00	0.30	324
		(0.01)	(0.09)			
	90s	-0.01	0.73 **	0.47	0.12	120
		(0.02)	(0.37)			
United Kingdom	9/92 - 12/9	0.05	0.10 **	0.00	0.03	88
		(0.13)	(0.01)			

**: Significantly different from 0 at 5% confidence level.
*: Significantly different from 0 at 10% confidence level.

Appendix Table: List of Countries in Sample and Their Exchange Rate Regimes

Country	Period		Exchange Regime Classification	
	from	to	detailed	aggregate
Argentina	Jan-80	Mar-81	Managed floating	Intermediate
	Apr-81	Jun-82	Independently floating	Floating
	Jul-82	Jun-89	Managed floating	Intermediate
	Jul-89	Nov-89	Peg to US$	Fixed
	Dec-89	Feb-91	Independently floating	Floating
	Mar-91	Mar-99	Peg to US$	Fixed
Australia	Oct-74	Nov-76	Limited flexibility with respect to a basket	Intermediate
	Dec-76	Nov-83	Managed floating	Intermediate
	Dec-83	Jun-96	Independently floating	Floating
Austria	Feb-70	Aug-71	Bretton Woods Basket Peg	Fixed
	Sep-71	Sep-94	Limited flexibility with respect to a basket	Intermediate
	Oct-94	Dec-98	Limited flexibility with respect to a cooperative arrangement	Intermediate
Belgium	Feb-70	Dec-71	Bretton Woods Basket Peg	Fixed
	Jan-72	Jan-99	Limited flexibility with respect to a cooperative arrangement	Intermediate
Bolivia	Jan-95	Dec-97	Independently floating	Floating
	Jan-98	Dec-98	Managed floating	Intermediate
	Jan-99	Mar-99	Crawling peg	Intermediate
Brazil	Mar-90	Sep-94	Independently floating	Floating
	Oct-94	Dec-98	Managed floating	Intermediate
	Jan-99	Mar-99	Independently floating	Floating
Canada	Jan-75	Mar-99	Independently floating	Floating
Chile	Jan-78	May-79	Independently floating	Floating
	Jan-80	May-82	Peg to US$	Fixed
	Jun-82	Jun-82	Managed floating	Intermediate
	Jul-82	Dec-98	Crawling peg to a basket	Intermediate
	Jan-99	Mar-99	Crawling Band	Intermediate
Colombia	Mar-95	Dec-98	Managed floating	Intermediate
	Jan-99	Mar-99	Crawling Band	Intermediate
Costa Rica	Jan-90	Dec-91	Managed floating	Intermediate
	Jan-92	Sep-95	Independently floating	Floating
	Oct-95	Dec-98	Managed floating	Intermediate
	Jan-99	Mar-99	Crawling Peg	Intermediate
Denmark	Jan-72	Mar-99	Limited flexibility with respect to a cooperative arrangement	Intermediate
Dominican Repı	Mar-96	Mar-99	Managed floating	Intermediate
Ecuador	Nov-86	Sep-94	Managed floating	Intermediate
	Oct-94	Sep-95	Crawling peg to a basket	Intermediate
	Oct-95	Dec-98	Managed floating	Intermediate
	Jan-99	Mar-99	Crawling Band	Intermediate
Egypt	Jan-97	Mar-99	Managed floating	Intermediate
El Salvador	Jan-97	Mar-99	Managed floating	Intermediate
Finland	Dec-77	Aug-92	Limited flexibility with respect to a basket	Intermediate
	Sep-92	Sep-96	Independently floating	Floating
	Oct-96	Mar-99	Limited flexibility with respect to a cooperative arrangement	Intermediate
Germany	Feb-70	Apr-70	Bretton Woods Basket Peg	Fixed
	May-70	Dec-71	Independently floating	Floating
	Jan-72	Mar-73	Bretton Woods Basket Peg	Fixed
	Apr-73	Mar-99	Limited flexibility with respect to a cooperative arrangement	Intermediate
Greece	Jan-90	Dec-94	Managed floating	Intermediate
	Jan-95	Dec-96	Independently floating	Floating
	Jan-97	Feb-98	Managed floating	Intermediate
	Mar-98	Mar-99	Limited flexibility with respect to a cooperative arrangement	Intermediate
Guatemala	Jan-97	Mar-99	Independently floating	Floating
Hong Kong, Chi	Dec-90	Mar-99	Peg to US$	Fixed
Indonesia	Jan-83	Jul-98	Managed floating	Intermediate
	Aug-98	Jul-98	Independently floating	Floating
Ireland	Mar-72	Apr-72	Bretton Woods Basket Peg	Fixed
	Jun-72	Dec-78	Peg to Pound Sterling	Fixed
	Jan-79	Mar-99	Limited flexibility with respect to a cooperative arrangement	Intermediate
Italy	Jan-71	Dec-71	Bretton Woods Basket Peg	Fixed
	Jan-72	Jan-73	Limited flexibility with respect to US$	Intermediate
	Feb-73	Dec-78	Independently floating	Floating
	Jan-79	Aug-92	Limited flexibility with respect to a cooperative arrangement	Intermediate
	Sep-92	Sep-96	Independently floating	Floating
	Oct-96	Mar-99	Limited flexibility with respect to a cooperative arrangement	Intermediate
Japan	Jan-70	Dec-72	Bretton Woods Basket Peg	Fixed
	Jan-73	Mar-99	Independently floating	Floating
Korea, Rep.	Aug-76	Dec-79	Peg to US$	Fixed
	Jan-80	Nov-97	Managed floating	Intermediate
	Dec-97	Mar-99	Independently floating	Floating
Kuwait	Jan-79	Mar-99	Limited flexibility with respect to a basket	Intermediate
Lebanon	Jan-82	Dec-94	Independently floating	Floating
Malaysia	Jan-70	Jun-72	Peg to Pound Sterling	Fixed
	Jul-72	Jun-73	Peg to US$	Fixed
	Jul-73	Aug-75	Independently floating	Floating
	Sep-75	Mar-93	Limited flexibility with respect to a basket	Intermediate
	Apr-93	Aug-98	Managed floating	Intermediate
	Sep-98	Mar-99	Peg to US$	Fixed

Appendix Table: List of Countries in Sample and Their Exchange Rate Regimes

Country	Period		Exchange Regime Classification	
	from	to	detailed	aggregate
Mauritius	Jan-88	Sep-94	Limited flexibility with respect to a basket	Intermediate
	Oct-94	Mar-99	Managed floating	Intermediate
Mexico	Apr-81	Jun-82	Managed floating	Intermediate
	Jul-82	Sep-82	Peg to US$	Fixed
	Oct-82	Nov-94	Managed floating	Intermediate
	Dec-94	Mar-99	Independently floating	Floating
Netherlands	Jan-70	Apr-70	Bretton Woods Basket Peg	Fixed
	May-70	Dec-71	Independently floating	Floating
	Jan-72	Dec-98	Limited flexibility with respect to a cooperative arrangement	Intermediate
New Zealand	Mar-85	Feb-85	Managed floating	Intermediate
	Mar-85	Mar-99	Independently floating	Floating
Norway	Jan-72	Nov-78	Limited flexibility with respect to a cooperative arrangement	Intermediate
	Dec-78	Oct-90	Limited flexibility with respect to a basket	Intermediate
	Nov-90	Nov-92	Limited flexibility with respect to a cooperative arrangement	Intermediate
	Dec-92	Apr-94	Independently floating	Floating
	May-94	Mar-99	Managed floating	Intermediate
Paraguay	Oct-90	Jun-98	Independently floating	Floating
Philippines	Oct-81	Jun-82	Limited flexibility with respect to US$	Intermediate
	Jul-82	Sep-84	Managed floating	Intermediate
	Oct-84	Mar-99	Independently floating	Floating
Portugal	Jan-83	Sep-90	Crawling peg to a basket	Intermediate
	Oct-90	Mar-92	Managed floating	Intermediate
	Apr-92	Mar-99	Limited flexibility with respect to a cooperative arrangement	Intermediate
Singapore	Aug-73	Jun-87	Limited flexibility with respect to a basket	Intermediate
	Jul-87	Mar-99	Managed floating	Intermediate
South Africa	Feb-70	Apr-72	Bretton Woods Basket Peg	Fixed
	May-72	Sep-72	Peg to Pound Sterling	Fixed
	Oct-72	May-74	Peg to US$	Fixed
	Jun-74	Jun-75	Managed floating	Intermediate
	Jul-75	Jan-79	Peg to US$	Fixed
	Feb-79	Mar-99	Independently floating	Floating
Spain	Jan-74	Jan-74	Bretton Woods Basket Peg	Fixed
	Feb-74	Dec-75	Limited flexibility with respect to a basket	Intermediate
	Jan-76	Dec-87	Managed floating	Intermediate
	Jan-88	May-89	Independently floating	Floating
	Jun-89	Mar-99	Limited flexibility with respect to a cooperative arrangement	Intermediate
Sweden	Jan-70	Dec-71	Bretton Woods Basket Peg	Fixed
	Jan-72	Jul-77	Limited flexibility with respect to a cooperative arrangement	Intermediate
	Aug-77	Apr-91	Limited flexibility with respect to a basket	Intermediate
	May-91	Oct-92	Limited flexibility with respect to a cooperative arrangement	Intermediate
	Nov-92	Mar-99	Independently floating	Floating
Switzerland	Sep-75	Sep-78	Independently floating	Floating
	Oct-78	Dec-79	Peg to Deutsche Mark	Fixed
	Jan-80	Mar-99	Independently floating	Floating
Thailand	Jan-77	Feb-78	Peg to US$	Fixed
	Mar-78	Jun-81	Limited flexibility with respect to a basket	Intermediate
	Jul-81	Mar-82	Managed floating	Intermediate
	Apr-82	Oct-84	Limited flexibility with respect to US$	Intermediate
	Nov-84	Jun-97	Limited flexibility with respect to a basket	Intermediate
	Jul-97	Jun-98	Managed floating	Intermediate
	Jul-98	Mar-99	Independently floating	Floating
Tunisia	Jan-84	Sep-86	Limited flexibility with respect to a basket	Intermediate
	Oct-86	Dec-98	Managed floating	Intermediate
	Jan-99	Mar-99	Crawling peg	Intermediate
Turkey	Apr-86	Dec-98	Managed floating	Intermediate
	Jan-99	Mar-99	Crawling peg	Intermediate
United Kingdom	Jul-72	Apr-72	Bretton Woods Basket Peg	Fixed
	May-72	Jun-72	Limited flexibility with respect to US$	Intermediate
	Jul-72	Feb-87	Independently floating	Floating
	Mar-87	Feb-88	Managed floating	Intermediate
	Mar-88	Sep-90	Independently floating	Floating
	Oct-90	Jun-92	Limited flexibility with respect to a cooperative arrangement	Intermediate
	Jul-92	Mar-99	Independently floating	Floating
Uruguay	Dec-92	Dec-98	Managed floating	Intermediate
	Jan-99	Mar-99	Crawling Band	Intermediate
Venezuela	Apr-96	Dec-98	Managed floating	Intermediate
	Jan-99	Mar-99	Crawling Band	Intermediate