NBER WORKING PAPER SERIES

EXCHANGE RATES IN EMERGING COUNTRIES: ELEVEN EMPIRICAL REGULARITIES FROM LATIN AMERICA AND EAST ASIA

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Working Paper 17074
http://www.nber.org/papers/w17074

NATIONAL BUREAU OF ECONOMIC RESEARCH
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May 2011

I have benefitted from discussions with a number of colleagues, including Ed Leamer, Al Harberger, Alberto Naudon, Juan Marcos Wlasiuk, and Roberto Alvarez. The views expressed herein are those of the author and do not necessarily reflect the views of the National Bureau of Economic Research.

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NBER Working Paper No. 17074
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JEL No. F0,F31,F32,F41

ABSTRACT

In this paper I discuss some of the most important lessons on exchange rate policies in emerging markets during the last 35 years. The analysis is undertaken from the perspective of both the Latin American and East Asian nations. Some of the topics addressed include: the relationship between exchange rate regimes and growth, the costs of currency crises, the merits of "dollarization," the relation between exchange rates and macroeconomic stability, monetary independence under alternative exchange rate arrangements, and the effects of the recent global "currency wars" on exchange rates in commodity exporters.

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For years scholars and policy makers have tried to understand why long term economic performance has been so different in Asia and Latin America. A number of possible explanations have been given, including explanations based on culture, politics, colonial past, and institutions. There is little doubt that all of these are significant factors that affect long term growth and income distribution. But perhaps the most important cause behind the different outcomes in these two regions has to do with economic policies. By and large, the Asian countries have maintained macroeconomic stability (the 1997-1998 currency crises being, of course, an exception), while the Latin American nations have had an extremely volatile macroeconomy.[1]

It is, possibly, in the area of exchange rates where the contrast between the two regions has been more pronounced. While in the second half of the 20th century almost every Latin American country went from currency crisis to currency crisis, the Asian nations managed – with the already mentioned major exception of 1997-1998 – to maintain exchange rate stability.

However, during the last decade or so things have changed significantly. Most Latin American nations seem to have learned the lessons of the past, and have avoided two perennial (and related) problems: pegging their currencies at artificially high levels, and defending these pegs even when it was apparent that major adjustments (e.g. depreciation) were needed. This change became particularly evident in 2008-2011, during the so-called Great Recession. Contrary to what many observers feared, the vast majority of the Latin America nations were able to withstand major external shocks – including a sudden (and, as it turned out, short lived) reversal of capital inflows --, without experiencing currency collapses or balance of payments crises.

As many authors have noticed, a relatively stable (real) exchange rate that does not become overvalued is a key component of outward-oriented, export-based development strategies. In fact, a number of analysts have argued that China has deliberately maintained an undervalued exchange rate as a way of promoting exports. In addition, exchange rate stability tends to be reflected in a lower "country risk" premium– that is, it is translated into a lower cost of capital.

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[1] See, for example, the analysis in Edwards (2010).

The purpose of this paper is to analyze some of the most important exchange rates lessons in emerging economies during the last 35 years. The discussion draws from the experiences of both the Latin American countries, and the East Asian nations. Before proceeding, however, it is important to clarify that I do not attempt to provide an answer to the question of which is "the" optimal exchange rate regime for emerging markets. Indeed, the point of departure of my analysis is the recognition that "one size does not fit all," and that different exchange rate regimes are likely to be appropriate for different nations.

I have organized the discussion around *eleven* empirical regularities, or lessons, on exchange rates in emerging countries. Although I don't claim that these are the only regularities that apply to these countries, I do believe that these are the most relevant ones. As will be seen, some of these regularities are based on abundant empirical evidence – mostly those related to currency misalignments and the costs of crises --, while others are more recent, and, thus, are based on observations over a shorter time span. Naturally, there is a broad literature on most of the long-standing regularities. On the other hand, there is very little work (or almost none) on the more recent ones (*Regularities 10 and 11*, in particular).

The eleven regularities discussed in this paper may be classified in five areas: the first area deals with currency crises (*Regularities* 1, 4 and 8). The second area (*Regularities* 2, 3 and 4) is related to the relationship between exchange rate regimes and economic performance. The third area has to do with the effectiveness of macroeconomic, and in particular monetary, policy under alternative nominal exchange rate regimes (*Regularities* 5, 6, 7 and 9). The fourth one is related to the costs and causes of exchange rate misalignment (Regularities 8 and 9). And the final (fifth) area (*Regularities* 10 and 11) relates to the effects of the recent "currency wars" on the emerging markets.

I. Regularity Number One: Exchange Rate Crises are Very Costly

Existing empirical evidence – including the evidence in Reinhardt and Rogoff's (2009) massive study -- strongly suggests that currency crises are extremely costly in terms of growth slowdown, increased unemployment, and higher inflation.

I define an "exchange rate crisis" broadly. More specifically, a "crisis" occurs when there is either a large depreciation of the nominal exchange rate (a depreciation that exceeds 20%, in a two months period), and/or a "sudden stop" or a "current account reversal," where a country's current account deficit is reduced significantly in a short period of time.[2]

In Edwards (2004) I analyze this issue using dynamic panel regressions, and conclude that major current account reversals have had "a negative effect on GDP per capita growth, even after controlling for investment, in excess of 4 percentage points." Freund and Warnock (2005) use a multivariate statistical approach and find that reversals have been associated with a slowdown in economic growth. A similar conclusion is reached by Frankel and Cavallo (2007), using a somewhat different definition of crisis.

In Figure 1 I present data on (median) GDP per capita growth in the periods surrounding "current account reversal" crises. In this Figure a "current account reversal" is defined in two alternative ways: either as a situation where the current account deficit is reduced by at least 4% of GDP in one year, or a situation where the deficit shrinks by at least 2% of GDP in one year. The data in Figure 1 are broken down for three samples: "large countries"--countries in the top 25% of the world's GDP distribution, including a number of Latin American and Asian countries --, "industrial countries," and "all countries." As may be seen, in the three samples there is a rather pronounced decline in GDP growth in the year of the crisis. It is interesting to notice, however, that the drop in the rate of GDP growth appears to be short lived. In the "large countries" and "all countries" samples there is a very sharp recovery in GDP per capita growth one year after the reversal episode. Non-parametric χ^2 tests indicate that in the crisis countries, growth is significantly lower in the years surrounding the crisis than in a control group of counties that have not experienced a crisis (the p-values range from 0.07 to.0.00).

In order to analyze this issue further I estimate a number of GLS regressions on the (potential) effects of "depreciation crises" on short term growth. In this exercise, two

[2] In a recent paper, Guidotti et al (2004) consider the role of openness in an analysis of imports and exports behavior in the aftermath of a reversal. See also Frankel and Cavallo (2007). Freund and Warnock (2005) used a multivariate statistical approach and found that reversals have been associated with a slowdown in economic growth. A similar conclusion was reached by Frankel and Cavallo (2007), using a somewhat different definition of crisis.

alternative definitions of "crisis" are used: (a), a monthly nominal exchange rate depreciation that exceeds by three standard deviations the average exchange rate change for the country in question. This variable is called ***Cri_xr***. And, (b), a broader definition of "external crisis" that combines in one indicator changes in the nominal exchange rate (depreciation) with changes (declines) in the stock of international reserves. For details on this indicator see Eichengreen et al (1996) and Edwards (2004). This indicator is called ***Cri_index***.

Consider the following equation (1) for growth dynamics:

$$\Delta g_{jt} = \lambda[\tilde{g}_j - g_{jt-1}] + \varphi v_{jt} + \gamma u_{jt} + \varepsilon_{jt}. \quad (1)$$

Where $\tilde{g}_j$ is the long run rate of real per capita GDP growth in country j; the terms v_{jt} and u_{jt} are shocks, assumed to have zero mean, finite variance and to be uncorrelated among them. More specifically, v_{jt} is assumed to be an external terms of trade shock, while u_{jt} captures other shocks, including *currency crises*. Equation (1) has the form of an equilibrium correction model and states that the actual rate of growth in period t will deviate from its long run trend due to the existence of three types of shocks: v_{jt}, u_{jt} and ε_{jt}. Over time, however, the actual rate of growth will tend to converge towards its long run value, with the rate of convergence given by λ. Parameter φ, in equation (1), is expected to be positive, indicating that an improvement in the terms of trade will result in a (temporary) acceleration in the rate of growth, and that negative terms of trade shocks are expected to have a negative effect on g_{jt}.[3]

I estimate equation (1) using a GLS two-step procedure. In the first step I estimate a long run growth equation using a cross-country data set. These first stage estimates are then used to generate long-run predicted growth rates to replace $\tilde{g}_j$ in the equilibrium error correction model (1). In the second step, I estimate equation (1) using GLS for

[3] See Edwards and Levy Yeyati (2005) for details on this type of model for the dynamocs of growth.

unbalanced panels; I used both random effects and fixed effects estimation procedures.[4] The data set used covers 157 countries for the 1970-2006 period.

In Table 1 I present the results from the second step estimation of the growth dynamics equation (1), when random effects were used.[5] The estimated coefficient of the growth gap is, as expected, positive, significant, and smaller than one. The point estimates are on the high side, suggesting that, on average, deviations between long run and actual growth get eliminated at a steady pace. Also, as expected, the estimated coefficients of the terms of trade shock are always positive, and statistically significant, indicating that an improvement (deterioration) in the terms of trade results in an acceleration (de-acceleration) in the rate of growth of real per capita GDP. The point estimate is, in both regressions, 0.08, indicating that a deterioration in the terms of trade of 10% results in a temporary slowdown in the rate of growth of slightly less than 1%.

As may be seen from Table 1, in both regressions the coefficient of the currency crisis variable is *significantly negative*, indicating that crises result in a substantial decline in GDP growth. The point estimates suggest that this decline in growth per capita ranges from 0.91 and 1.27 percentage points in one year. This decline in growth continues through time, until short term growth converges back to its long term value. It is possible that the regression results reported in Table 1 are subject to endogeneity. After all, it may be the case that "devaluation crises" are more likely to occur in countries that have experienced a slowdown in growth. In order to address this issue I re-estimated the regressions in Table 1 using a GLS random effects instrumental variables technique. The results obtained, not reported here due to space considerations, are consistent with those in Table 1: currency crises are costly -- the IV point estimates (t-statistics) are -2.11 (2.35) and -1.42 (3.19), respectively.

II. Regularity Number Two: Countries with More Flexible Exchange Rates Have Tended to Grow Faster in the Long Run than Countries with Rigid Currency Pegs

Existing empirical evidence suggests that over the long term countries with more flexible exchange rate regimes – either floating rates or "intermediate regimes" that allow

[4] Due to space considerations, only the random effect results are reported.
[5] Results from the first step for long term growth are available from the author on request.

the exchange rate to act as a shock-absorber – have tended to outperform, in terms of GDP growth, countries that have more rigid nominal exchange rates. Reaching this conclusion, however, has not been easy, nor has it been free of controversies. Until recently, research on the issue of exchange rate regimes and economic performance was subject to two related limitations. First, the official data – that is, the data provided by the countries, or by international institutions such as the IMF -- are subject to a serious "survival bias." The problem is that only countries that have successfully defended their peg are included in the "fixed exchange rate" category. On the other hand, countries that adopted a fixed exchange rate, but failed to sustain it, have usually been classified (at least in the period following the devaluation crisis) as having a "flexible regime". This means that high inflation rates that follow exchange rate "crashes" are many times incorrectly attributed to a flexible rate system, rather than to the failed pegged system. Similarly, a growth de-acceleration that follows a currency crisis has often (and incorrectly) been associated with the new post-fixed rate exchange rate regime.

A second limitation of traditional studies on the relationship between exchange rate systems and economic performance is that for many years a number of countries misclassified their exchange rate regime. Indeed, some countries that informed the IMF that they had adopted a flexible exchange rate regime had a de facto pegged rate. Also, some countries that in reality had flexible regimes some times were labeled as peggers. This misclassification of regimes means that many times certain results are incorrectly attributed to a particular regime.

Recent research has dealt with both of these issues. Perhaps the best known study along these lines is by Levy-Yeyati and Sturzenegger (2003). These authors use data on the volatility of international reserves, the volatility of exchange rates, and the volatility of exchange rate changes for 99 countries, during the period 1990-1998, to determine their "true" exchange rate regime. The authors undertake a series of cluster analysis exercises to classify the countries in their sample into five categories: (1) fixed; (2) dirty float/crawling peg; (3) dirty float; (4) float; and (5) inconclusive exchange rate regimes.[6]

Using these *de facto* exchange rate classifications, Levy-Yeyati and Sturzenegger (2003) estimated a traditional cross country growth model to analyze whether the

[6] Also, see Reinhart and Rogoff (2004)

exchange rate regime affects long term growth. Their results indicate that emerging countries with more rigid exchange rates have experienced *slower growth* and higher output volatility than countries with more flexible exchange rate regimes. They also found that the exchange rate regime has no effect on output growth or output volatility in industrial countries. Other authors that have reached similar conclusions include Edwards and Levy-Yeyati (2005) and Reinhart and Rogoff (2004)[7].

III. Regularity Number Three: Dollarized Countries do not Outperform Countries with a Currency of their Own

The recurrence of currency crises in emerging countries during the 1990s and early 2000s generated an intense debate on exchange rate regimes. A number of economists argued that there were no compelling reasons for (some) emerging countries having national currencies. According to this view a number of emerging nations would benefit from adopting an advanced nation's currency as legal tender. This proposal has come to be known by the general name of ***"dollarization."***[8] The debate over "dollarization" is, of course, closely related to that on *currency unions*. Does it pay for two or more countries have a common currency? This question has moved into the fore of the discussion with the recent – first half of 2010 – difficulties faced by Greece, Ireland, Portugal and Spain, and (potentially) other members of the Euro-zone.

There is wide agreement among economists that countries that give up their currency, and delegate monetary policy to an advanced country's (conservative) central bank, will tend to have lower inflation than countries that pursue an active domestic monetary policy. Indeed, work by Engel and Rose (2002), Eichengreen and Hausmann (1999), and Edwards (2001) has found that dollarized countries have had a significantly lower rate of inflation than countries with a domestic currency.[9] Moreover, there is agreement that in countries with perennial macroeconomic instability – including bouts of hyperinflation --, dollarization is likely to result in the end of inflationary pressures

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[7] See also the analyses by Rodrik (1999); for a long term historical perspective that goes back to the 19th century see Blattman, Hwang and Williamson (2007).

[8] This general name is even applied to cases where the foreign currency used as a medium of exchange is other than the dollar, including the Euro or the Japanese Yen.

[9] See Frankel and Rose (2002), Calvo and Mishkin (2003), and Panizza et al. (2002).

and in price stability. This has been the case, for example, in Ecuador and Zimbabwe, two nations that have "dollarized" their monetary system. Also, in countries with chronic instability, the adoption of dollarization – and the price stability that follows --, is very likely to restore incentives and economic growth. The case of Zimbabwe, where the monetary system was de facto "dollarized" in early 2009, is a good illustration of this phenomenon. [10]

There is much less agreement, however, on the effects of dollarization on real economic variables in more "normal," or average, countries that have not been subject to major and chronic imbalances. According to its supporters, dollarization will positively affect growth through two channels: First, dollarization will tend to result in lower interest rates, higher investment and faster growth (Dornbusch, 2001). And, second, by eliminating currency risk, a common currency will encourage international trade; this, in turn, will result in faster growth. Rose (2000), and Rose and Van Wincoop (2001), among others, have emphasized this trade channel. Other authors, however, have been skeptical regarding the alleged benefits of dollarization. Indeed, according to a view that goes back at least to Meade (1951), countries with a hard peg – including dollarized countries – will have difficulties accommodating external shocks. This, in turn, will be translated into greater volatility, and in many cases into slower economic growth.

Until a decade or so ago, there had been few comparative analyses on economic performance under dollarization. Most empirical work on the subject had been restricted to the experience of a single country – Panama; see Goldfajn and Olivares (2001), Moreno-Villalaz (1999), Bogetic (2000) and Edwards (2001). Cross-country studies on currency unions have included very few observations on *strictly dollarized countries*. For instance, the Engel and Rose (2002) data set includes only seven countries that use another nation's currency, and only two -- Panama and Puerto Rico – that use a convertible currency as legal tender, and are thus "strictly dollarized" countries. The study on exchange rate regimes by Ghosh et al. (1995) does not include nations that do not have a domestic currency. The IMF (1997) study on exchange rate systems excluded

[10] Strictly speaking Zimbabwe's "Multi-currency Regime" – where the USD the South African rand and other currencies -- doesn't constitute official dollarization. However, the country may very well become officially "dollarized" by the end of 2012.

dollarized countries, and the paper by Levy-Yeyati and Sturzenegger (2003) does not include any nation that do not have a central bank.

In a series of papers Edwards and Magendzo (2003, 2006) analyze empirically the historical record of *strictly dollarized* economies. They investigate whether, as argued by its supporters, dollarization is associated with superior macroeconomic performance, as measured by faster GDP growth and lower GDP growth volatility. The reason for focusing on strictly dollarized countries is simple: the debate in the emerging and transition world is whether these countries ought to adopt an "advanced" country's currency as a way of achieving credibility. For Argentina, for example, it is very different to delegate monetary policy to the Federal Reserve, than delegating it to a *Mercosur* central bank run by Brazilians and Argentineans.[11]

In their analyses, Edwards and Magendzo (2003, 2006) use treatment regressions techniques that *estimate jointly* the probability of being a dollarized country, and outcome equations on GDP per capita growth and on GDP growth volatility.[12] See Table 2 for a list of dollarized nations that have enough data available for undertaking an analysis of economic performance. This Table also contains key information on the most important economic variables for these strictly dollarized countries as well as for a control group of nations with a currency of their own.

The results obtained from these studies may be summarized as follows: (a) with other things given, dollarized countries have had a slightly lower rate of growth than countries with a domestic currency; this difference, although small, is statistically significant. (b) GDP volatility has been *significantly higher* in dollarized economies, than in with-currency countries.

These results are robust to the technique being used; they hold when instrumental variables are used, and when a "matching coefficients" technique (that pairs every dollarized country with one or more non-dollarized "neighbors" that share their most important structural characteristics) is implemented. These results, then, indicate that the alleged superiority of "dollarized" regimes is not supported by the data; quite on the

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11 Edwards and Magendzo (2003) deal with all "common currency" countries, including currency unions countries.

12 Ideally, we would have liked to include consumption volatility. Unfortunately, most small dollarized countries do not have data on consumption. On treatment regression models see, for example, Maddala (1983), Greene (2000) and Wooldridge (2002).

contrary, they suggest that when both long run trend rates of growth as well as variability around those trends are considered, dollarized nations have fared, on average, more poorly than countries that have a currency of their own.[13]

IV. Regularity Number Four: Countries with Flexible Exchange Rates are able to Accommodate External Shocks Better than Countries with Rigid Rates

Supporters of flexible exchange rates have argued that under this type of regime it is possible to buffer real shocks stemming from abroad. This, in turn, will allow countries with floating rates to avoid costly and protracted adjustment processes.[14] Determining whether flexible exchange rate regimes are indeed able to insulate the economy from external shocks, and contribute to improving economic performance, is, ultimately, an empirical issue that can only be elucidated by analyzing the historical evidence.[15] This issue has been investigated by, among others, Broda (2004) and Edwards and Levy-Yeyati (2005). See, also, Aghion, Bacchetta and Ranciere (2009).

In Table 3 I report the results obtained from the estimation of equations similar to equation (1) for countries that fall under four different exchange rate regimes: (a) Flexible; (b) intermediate; (c) pegged; and (d) hard pegged (including dollarized and currency union countries). The main purpose of this analysis is to investigate whether the estimated regression coefficients for the terms of trade shocks differ across these four exchange rate systems.[16] In particular, I am interested in finding out if, as claimed by supporters of flexible rates, this coefficient is smaller for countries with flexible exchange rates than in countries with higher degrees of exchange rate rigidity.

As may be seen from Table 3, the sum of the contemporaneous and lagged terms of trade coefficients is lowest for flexible exchange rate nations, and highest for hard peggers. Intermediate and pegged regimes fall neatly in the middle of these two extreme results.

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[13] This does not mean that no country will benefit from dollarization. Indeed, and as argued earlier, countries with chronic instability and/or recurrent crises are likely to be gain from dollarizing their monetary system.

[14] Friedman (1953) was an early proponent of this view. The idea that hard pegs magnify external shocks acquired greater prominence in the aftermath of the Argentine currency and debt crisis of 2001-2002.

[15] Calvo (2000), among others, has argued that if there are "dollarized liabilities" a flexible exchange rate regime may result in large "balance sheet effects" and lower growth.

[16] See Edwards and Levy-Yeyati (2005) for details.

To summarize, these results, as well as those in Broda (2004) and Edwards and Levy-Yeyati (2005) among others, provide support to the notion that flexible exchange regimes allow countries to accommodate external shocks, including shocks to their terms of trade.[17]

V. Regularity Number Five: Under Capital Mobility and Fixed Exchange Rates, there is no room for (fully) Independent Monetary Policy (The Impossibility of the Holy Trinity)

A fundamental propositions in open economy macroeconomics is that *under free capital mobility*, the exchange rate regime determines the ability to undertake independent monetary policy.[18] According to this view, a fixed regime implies giving up monetary independence, while a freely floating regime allows for a national monetary policy (Summers 2000). This principle has received the name of the *"Impossibility of the Holy Trinity,"* and in its simplest incarnation may be stated as follows: it is not possible to simultaneously have free capital mobility, a pegged exchange rate, and an independent monetary policy.

Some authors, however, have argued that this is a false dilemma, since there is no reason for emerging economies to have free capital mobility. Indeed, the fact that currency crises are often the result of capital flow reversals – or "capital flight" -- has led some observers to argue that capital controls -- and in particular controls on capital inflows -- reduce the risk of a currency crisis. Most supporters of this view have based their recommendation on Chile's experience with capital controls during the 1990s. In the

[17] An important question is whether countries respond symmetrically to positive and negative terms of trade shocks. This issue has been addressed, among others, by Edwards and Levy-Yeyati (2005). Using a large data set for developing countries, these found out that the growth response is larger for negative than for positive shocks, a fact consistent with the presence of asymmetries in price responses (with downward nominal inflexibility leading to larger quantity adjustments). Interestingly, while the output response in both directions is larger under more rigid the exchange rate regimes, this asymmetry is not present under flexible regimes. Edwards and Levy-Yeyati (2005) also provide evidence supporting the view that, after controlling for other factors, countries with more flexible exchange rate regimes grow faster than countries with fixed exchange rates, confirming previous findings by Levy-Yeyati and Sturzenegger (2003) discussed above.

[18] This, of course, is an old proposition dating back, at least to the writings of Bob Mundell (1961) in the early 1960s. Recently, however, and as a result of the exchange rate policy debates, it has acquired renewed force.

aftermath of the East Asian crisis, Joseph Stiglitz was quoted by the New York Times (Sunday February 1, 1998) as saying:

> "You want to look for policies that discourage hot money but facilitate the flow of long-term loans, and there is evidence that the Chilean approach or some version of it, does this."

Also, consider the following quote from the *Asian Policy Forum*:

> "If an Asian economy experiences continued massive capital inflows that threaten effective domestic monetary management, it may install the capability to implement unremunerated reserve requirements (URR) and a minimum holding period on capital inflows." (Page 5).

More recently – in January 2011 --, and in the context of large capital inflows into the emerging countries, Olivier Blanchard, the Chief Economist of the International Monetary Fund, has said that capital controls on capital inflows, similar to those in place in Chile from 1990 through 1998, could "sometimes" play a positive role in slowing down speculative international flows[19]. Indeed, during 2010 and early 2011 a number of emerging nations, including Brazil, Colombia, and Thailand, took steps towards restricting capital inflows.

From a social welfare perspective the argument for some form of (market based) controls on capital inflows is simple. It is likely that free capital mobility – where domestic residents can borrow freely from abroad – will generate a "congestion" externality. Borrowers don't realize that by increasing their foreign exposure, they are generating an increase in country risk, and in the cost of borrowing for everyone in the debtor question. It is also possible that this "congestion" effect will result in a higher degree of vulnerability for the economy as a whole, and an increase in systemic risk.

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[19] See press conference at http://www.imf.org/external/mmedia/view.aspx?vid=760115700001

According to a long tradition in applied welfare economics, it is desirable (and welfare enhancing) to deal with these types of distortions by imposing a Pigovian tax that moves the economy closer to the undistorted equilibrium. In this context, then, a tax on borrowing, similar to the controls on capital inflows in Chile, would be warranted.[20]

At a more practical level, an important question is how successful have these type of controls been. Early empirical work– see, for example, Valdes-Prieto and Soto (1998), De Gregorio et al (2000), Forbes (2005) -- conclude that Chile-type capital controls were not overly effective. They affected macroeconomic variables, such as interest rates and the exchange rate, for short periods of time and only partially. A few months after the controls were imposed investors found ways of circumventing them.

However, in a recent study, Edwards and Rigobon (2009) use a model of exchange rate behavior under (implicit) bands – such as the ones that Chile had during the controls' period—and find that capital controls on capital inflows did help reduce nominal exchange rate volatility over the long run.

Much of the earlier empirical work on the "Impossibility of the Holy Trinity" relied on the estimation of "*offset coefficients*." These have tended to be significantly positive, but *lower than one*. This suggests that attempts to maintain an exchange rate that is undervalued in real terms – as has been the case of the Chinese *Yuan* since the late 1990s -- has important implications. An undervalued currency will tend to result in a current account surplus and, in most cases, in the accumulation of international reserves. This will generate monetary and inflationary pressures. The traditional way for dealing with this issue is through the sterilization of the international reserves changes. A limitation of this approach, however, is that sterilizing reserve changes may result in (rather large) financial costs. The actual magnitude of these costs will depend on a number of factors, including the extent of real undervaluation, the monetary policy stance as reflected by interest rate differentials between domestic and foreign securities, the extent of capital mobility, and the degree of substitutability of domestic and foreign financial assets.

[20] Edwards and Rigobon (2009).

VI. Regularity Number Six: Exchange Rate Adjustment Based on Inflation Rate Differentials Result in a Loss of Anchor and in Macroeconomic Instability.

An exchange rate policy that consists of adjusting the nominal exchange rate in proportion to (lagged) inflation rate differentials is inherently unstable and results in a loss of the macroeconomic anchor. Although this type of exchange rate system, known as "*crawling peg*," is currently out of vogue, there are a number of voices, —including voices in Latin America, Asia and international think tanks -- that clamor for its return.

At the simplest possible level a "crawling peg" regime may be summarized as follows.

$$d \log E_t = \emptyset \, (d \log P_{t-1} - d \log P^*_{t-1}). \tag{2}$$

Where $d \log E_t$ is the rate of nominal exchange rate adjustment (this is determined by the monetary authority), $d \log P_{t-1}$ is lagged domestic inflation, $d \log P^*_{t-1}$ is lagged foreign inflation, and $\emptyset$ is a factor of proportionality.

In the late 1960s, and through the 1980s, it was thought that by adjusting the nominal exchange rate by the difference of domestic and international inflation, it was possible to avoid disequilibria – and, in particular overvaluation –, and achieve stability. If $\emptyset = 1$ in equation (2), we have a "strict backward-looking crawling peg." This is sometimes referred to as "maintaining a *realistic* real exchange rate."

There is abundant empirical evidence, however, suggesting that this exchange rate rule tends to generate significant inflationary inertia. More specifically, if a regime that fully adjusts the nominal exchange rate to past inflation – one where $\emptyset = 1$ -- is implemented alongside a backward looking wage indexation system, the economy will lose its anchor. From a technical point of view, this means that the inflationary process will be characterized by a *unit root*, and will have an *infinite* variance. In this case inflation may wander around aimlessly, and achieve any level – this point was made early on by Felipe Pazos (1972), one of the fathers of the Latin American economics profession. A good example of a country that lost its anchor, and had trouble re-establishing it, is Brazil before the stabilization program and monetary reform of the mid

1990s that introduced the *real* as a new currency. This *Regularity* is intimately related to the next one, on how to combat inflationary inertia.

VII. Regularity Number Seven: Exchange Rate-Based Stabilization Programs are Dangerous, and have often generated severe Currency Overvaluation

Historically, many cases of inflationary inertia have been tackled by implementing "exchange rate-based stabilization programs." These consist of pegging the nominal exchange rate as a way of introducing price discipline. This approach to reducing inflation has been particularly popular – and costly – in the Latin American nations (see Edwards 2010, for an extensive discussion and for detailed analysis of several case studies).

The rationale behind this approach to stabilization is simple: if exchange rate indexation contributed to inflationary inertia (this is *Regularity* 6), pegging the nominal exchange rate will help eliminate it. Chile and Mexico are two examples of the many Latin American countries that during the 1970s, 1980s and early 1990s tried to deal with a very high degree of inflationary inertia by adopting pre-announced exchange rates paths. In both of these countries the pre-annonced rate of devaluation was set significantly lower than the ongoing rate of inflation. While the Chilean system converged to a strict peg exchange rate (at 39 pesos per dollar), the Mexican system was characterized by a narrowing nominal exchange rate band.[21] Neither of these programs, however, succeeded. In both countries inflation continued at a significant pace, pushing domestic costs – including wages – upward. This process generated overvalued real exchange rates and a decline in international competitiveness. In both cases the final outcome was a major and costly currency crisis – Chile in 1982; Mexico in 1994-95. In many ways, Argentina's experience with its quasi-currency board during 1991-2001 is an extreme case of an exchange rate-based stabilization program.

The rationale behind these exchange programs – and their likely failure -- may be explained as follows: Initially the economy is characterized by a high and persistent inflationary process, fed by a crawling peg exchange rate rule such as the one summarized in equation (2). This rule, in turn, has been put in place as a way of avoiding

[21] For different variants of exchange rate-based stabilization programs, see Edwards (1993)

real exchange rate overvaluation. At some point, however, there is a switch in the government preferences, and the authorities announce that from that point on their main priority is defeating inflation. In order to achieve the goal of eliminating inflation, a fixed exchange rate regime is put in place.

Under these circumstances, the actual time path followed by inflation will depend on the *degree of credibility* of the new pegged exchange rate. It is likely that, at least initially, the public will have some doubts on what the new regime will actually be -- either a genuinely fixed rate system, or a pegged exchange-rate regime with an escape clause. If the public has doubts on the sustainability of the fixed exchange rate, it will consider that there is a positive probability that the authorities will abandon the pegged rate and will revert to the old crawling peg regime. It can be formally shown that after the exchange rate has been pegged, the (remaining) degree of inertia will be (approximately) equal to the perceived probability that the program will be abandoned. This was indeed what happened both in Chile and Mexico; in both countries the credibility of the pegged regime was low, and inertia was barely affected by the adoption of the exchange rate-based stabilization program. As a result, inflation persisted, even if the nominal exchange rate was fixed, and an acute degree of overvaluation emerged.[22]

Pegging the currency value at the wrong level was, in fact, a recurrent mistake throughout Latin America during the 1990s and early 2000s.[23] Some of the countries that made that mistake during the last 25 years include Argentina, Brazil, Colombia, the Dominican Republic, Mexico, Uruguay and Venezuela. In many ways, clinging to the notion of fixed exchange rates in the 1990s was similar to the obsession with the gold standard during the interwar periods. As Liaquat Ahamed pointed out in his 2009 book *Lords of Finance*, the attachment to fixed currency values during the interwar period -- in those years currencies were fixed to gold --, was at the heart of the economic maladies of the time, including the triggering and magnification of the Crash of 1929 into the Great Depression.[24]

What makes this recurrent currency mistake surprising in the case of Latin America is that a number of prominent economists had argued, during the late 1980s and

[22] See Edwards (1998, 2001).
[23] This section draws partially on Edwards (2010).
[24] Ahamed (2009).

early1990s, that pegging the exchange rate to reduce inflation was an approach fraught with dangers. For example, referring to Mexico in the early 1990s, Rudi Dornbusch wrote:[25]

> "Exchange rate-based stabilization goes through three phases: The first one is very useful (…) [It] helps bring under way a stabilization…In the second phase increasing real [currency] appreciation becomes apparent, it is increasingly recognized, but it is inconvenient to do something (…) Finally, in the third phase, it is too late to do something. Real [currency] appreciation has come to a point where a major devaluation is necessary. But the politics will not allow that. Some more time is spent in denial, and then – sometime – enough bad news pile up to cause the crash."

One could argue that Mexican and other Latin American policymakers had to be aware of the dangers of fixed exchange rates during a disinflation effort. After all, during the early 1980s Chile had a traumatic experience with that approach to stabilization. As discussed in great detail in Edwards and Edwards (1991), during 1979 the so-called "*Chicago Boys*" tackled Chile's stubborn inflation – which at the time lingered at about 35 percent per year – by pegging the value of the currency at 39 pesos per U.S. dollar. During the next 24 months the country went through the three phases laid down by Rudi Dornbush in the quote above. Inflation declined slowly, capital inflows skyrocketed, exports struggled, the inflation-adjusted value of the currency strengthened significantly, and a huge trade deficit developed. This assault on competitiveness was compounded by labor legislation passed in 1981 that, literally, outlawed reductions in inflation-adjusted wages. In early1982, and partially in response to a slowdown of the global economy, international investors abruptly reduced their exposure to Chile. This sudden stop of capital inflows was followed by a major currency devaluation, negative growth, a significant increase in unemployment – in 1983 the rate of unemployment exceeded 20 percent -- , and massive bankruptcies. The three key lessons from this episode were that an artificial strengthening of the currency had to be avoided, that rigidly fixed exchange

[25] Dornbush (1997, p. 131).

rates were dangerous during a disinflation process, and that this danger was extreme if wages were mandated to increase at an unsustainable pace.

VIII. Regularity Number Eight: Real Exchange Rate Misalignment can be Very Costly; Central Bank Intervention may be justified from time to time, even under a flexible rates regime.

The emerging countries' currency crises of the 1990s and early 2000s underscored the need of *avoiding overvalued real exchange rates* -- that is, real exchange rates that are incompatible with maintaining *sustainable* external accounts. This important point has once again become very relevant in light of the recent (2010) Greek crisis and of the difficulties faced by other Eurozone nations, including Portugal, Ireland and Spain.

As pointed out above, one of the most significant historical cases of costly exchange rate overvaluation is that of Mexico during the first half of the 1990s. The overvaluation of the Mexican peso before the December 1994 crisis has been documented by a number of post-crisis studies. According to Sachs, Tornell and Velasco (1996), for example, during the 1990-94 period the Mexican peso was overvalued, on average, by almost 29 percent (see their Table 9). An ex-post analysis by Ades and Kaune (1997), using a detailed empirical model that decomposed fundamentals' changes in permanent and temporary, indicated that by the fourth quarter of 1994 the Mexican peso was overvalued by 16 percent. According to Goldman-Sachs, in late 1998 -- a few months before its crisis -- the Brazilian *real* was overvalued by approximately 14%.[26]

After the Mexican and East Asian crises, analysts in academia, the multilaterals and the private sector redoubled their efforts to understand real exchange rate behavior in emerging economies. Generally speaking, the RER is said to be "misaligned" if its actual value exhibits a (sustained) departure from its long run equilibrium. The latter, in turn, is defined as the real exchange rate that, for given values of "fundamentals" – terms of trade, interest rate differentials, productivity differentials, fiscal stance, degree of

[26] The East Asian nations did not escape the real exchange rate overvaluation syndrome. Sachs, Tornell and Velasco (1996), for instance, have argued that by late 1994 the real exchange rate picture in the East Asian countries was mixed and looked as follows: While the Philippines and Korea were experiencing overvaluation, Malaysia and Indonesia had undervalued real exchange rates, and the Thai Baht appeared to be in equilibrium. See also Chinn (1998).

openness, and so on --, is compatible with the simultaneous achievement of internal and external equilibrium.[27]

There have been two important, and related, developments in recent analyses of real exchange rate misalignment: First, there is a generalized recognition that even under flexible regimes the exchange rate *may* become misaligned. There are several reasons for this: (a) market participants may have incomplete information; (b) there may be "herd instinct" among investors; (c) in the short term there may be significant departures of "fundamentals" from their long run equilibrium values. It is important to notice, however, that the extent of misalignment tends to be significantly smaller under flexible regimes than under pegged systems. Second, most recent efforts to assess misalignment have tried to go beyond simple versions of purchasing power parity (PPP), and to incorporate explicitly the behavior of variables such as terms of trade, openness, real interest rates and productivity growth in estimating the "long run equilibrium value" of the real exchange rate.[28]

One of the most common methods for assessing real exchange rates is based on single equation, time series econometric estimates. In the late 1990s Goldman-Sachs (1997) implemented a real exchange rate model (largely) based on this methodology. It is interesting to consider what this type of models said with respect to the extent of overvaluation in East Asia, just before the 1997-1998 crisis. The Goldman-Sachs model suggested that overvaluation had been persistent in most East Asian countries for a number of years: in Indonesia the real exchange rate had been overvalued since 1993, in Korea in 1988, in Malaysia in 1993, in the Philippines in 1992, and in Thailand since 1990. In 2000 J.P. Morgan (2000) unveiled its own real exchange rate model. In an effort to capture better the dynamic behavior of real exchange rates this model went beyond the "fundamentals," and explicitly incorporated the role of monetary variables in the short run. During the last few years JP Morgan has continued to improve on its analyses, and introduced more accurate point estimates of the coefficients for different

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[27] For early theoretical discussions on real exchange rates, see Frenkel and Razin (1987) and Edwards (1989). For recent efforts to assess real exchange rate overvaluation around the world see Cline and Williamson (2010).

[28] To be sure the efforts to go beyond simple PPP calculations have a long history in academic work.

fundamentals. This model also suggests that the East Asian countries 'currencies were severely overvalued before the crisis.

An alternative approach to evaluate the appropriateness of the real exchange rate at a particular moment in time consists of calculating the *sustainable current account balance*, as a prior step to calculating the equilibrium real exchange rate. Deutsche Bank (2000) used a model along these lines to assess real exchange rate developments in Latin America. According to this model, the sustainable level of the current account is determined, in the steady state, by the country's rate of (potential) GDP growth, world inflation, and the international (net) demand for the country's liabilities. If a country's actual current account deficit exceeds its sustainable level, the real exchange rate will have to depreciate in order to help restore long run sustainable equilibrium. Using specific parameter values, Deutsche Bank (2000) computed both the sustainable level of the current account and the degree of real exchange rate overvaluation for a group of Latin American countries during early 2000. This approach has also been used in recent efforts to compute the degree of misalignment of the U.S dollar – see, for example, Obstfeld and Rogoff (2005), Mann (1999), Edwards (2005), Williamson (2007), Cline and Williamson (2010), and Cline (2010).

There are three fundamental costs of (real) exchange rate misalignment: First, it results in resource misallocation. Second, misalignment will also affect monetary policy. Situations of overvaluation result in international reserves losses, and thus in a decline in the monetary base; undervaluation, on the other hand, usually results in international reserves accumulation. In order to maintain monetary expansion within reason the central bank needs to sterilize these reserves changes, usually at a non-trivial cost. Third, and most importantly, situations of severe and persistent overvaluation often lead to deep currency crises, and to a precipitous drop in growth and employment – see Reinhardt and Rogoff's (2009).

The fact that misalignment may be costly even under a flexible exchange rate regime provides justification for central bank intervention in the foreign exchange market. A key question – and one that has not been resolved fully – refers to the extent, frequency, and modality of intervention (sterilized or non-sterilized; spot or forward; direct or indirect). Generally speaking, the authorities have to balance the costs and

benefits of active intervention, and keep in mind that massive interference with market forces will transform a flexible regime into a disguised pegged regime – this is what has been called "fear of floating."[29] For intervention to be effective under a flexible regime, it needs to be infrequent, well justified, fully explained to the public, and based on a firm belief that the market exchange rate is (significantly) out of line with respect to its long term equilibrium value.[30]

In a series of important contributions, John Williamson and his colleagues at the *Petersen Institute for International Economics* have used a variety of methods to calculate what they call the *FEER*, or Fundamental Equilibrium Exchange Rate – see, for example, Cline and Williamson (2010). Naturally, once an estimate for the long term value of the *equilibrium* exchange rate is available, it is possible to determine, using simple comparisons, whether a particular country's currency is out of line or overvalued (see Williamson, 2007). This type of analysis has been used both to assess economic conditions as well as for guiding political discussions on the relationship between different countries, including discussions between the United States and China. (See the discussion on *Regularity Number 9*, below, for more on the Chinese Yuan).

IX. Regularity Number Nine: There is an asymmetry between overvaluation and undervaluation

On July 21st, 2005, China announced that it was abandoning its decade-long policy of pegging its currency to the U.S. dollar at 8.28 Yuan per dollar. In the following weeks the Yuan rapidly appreciated relative to the greenback. A new regime based on a basket peg, a *maximum* daily exchange rate adjustment of 0.3% and bands of unknown width was put in place – or so it seemed. For years the Chinese authorities had been under pressure from the United States and European nations to reform the currency regime. There was consensus among analysts that the Yuan was undervalued, and that it provided China an unfair advantage in world international markets.

Initially there was some confusion on what China's "currency reform" really meant. Some analysts argued that it was the beginning of a new era, where the Yuan

[29] Calvo and Reinhart (2002) and Edwards and Savastano (2000).

[30] For a useful discussion on exchange rate information within the context of Chile's experience see Tapia and Tokman (2004).

would (mostly) reflect market forces; others argued that the extent of the reform was limited and that we were unlikely to see significant movement in the currency value. A few weeks after the reform was unveiled, the Chinese authorities stated that there would be no further adjustments of the Yuan-Dollar exchange rate in the immediate future. In spite of this, the Yuan continued to strengthen relative to the US dollar until the eruption of the sub-prime global financial crisis in 2007.

In mid 2008 the Yuan/USD rate was, de facto, pegged at 6.8 Yuan per dollar. At the time almost every observer agreed that the Chinese currency was undervalued by at least 20% -- see the studies in Goldstein and Lardy (2009) for a series of estimates.

During early 2010 China's currency value, once again, became politicized. A number of members of the U.S. Congress asked the Treasury Department to label China an "exchange rate manipulator." At the same time, senior Chinese officials accused the U.S. of protectionism and of being an international bully. Currency value issues have indeed been at the center of political discussions between the leadership of the U.S. and China. Using an eclectic approach, Subramanian (2010) calculated that in mid 2010 the extent of undervaluation of the Chinese Yuan was close to 30%.

From an economics perspective, two important, and interrelated, points may be made: first, there is a clear asymmetry between situations of currency undervaluation and currency overvaluation. The latter, simply cannot be sustained, and a country that that faces persistent overvaluation will have to impose increasingly tighter protectionist measures and will, eventually, experience a currency collapse (Edwards, 1989). Countries with currency undervaluation, on the other hand, will suffer inflationary pressures (as discussed above) and will face the costs of sterilization. They could, however, sustain such a situation for a relatively long period of time. Second, and as it has been recently pointed out by a number of analysts, strongly undervalued currencies in very large countries -- such as China and Germany -- impede the achievement of global balances. The reason is simple: large current account surpluses -- which are usually associated with undervalued currencies -- need to be offset in the global economy with large deficits. The problem, of course, is that large deficits result in a dynamics of net international investment positions (NIIPs) that is not sustainable in the long run. This suggests that, eventually, China's currency will have to move closer to its long term equilibrium.

Although it is not completely clear by how much it would have to strengthened, some calculations suggest that the most reasonable figure would be in the 15% to 20% range. (Goldstein and Lardy, 2009; Cline and Williamson 2010)

X. Regularity Number Ten: Even under Flexible Exchange Rates the extent for Independent Monetary Policy is Limited

According to traditional views -- going back, at least, to the Mundell-Fleming model --, countries with fixed regimes cannot undertake independent monetary policy (this is *Regularity 5* in this paper); on the other hand, and according to this view, countries with flexible exchange rates are able to conduct independent monetary policy. More recently, however, some authors, including Frankel et al (2004) and Edwards (2010), have argued that countries with flexible exchange rate do not have true monetary autonomy.[31]

One way of assessing the degree of monetary independence under flexible exchange rate regimes is to analyze the extent (and speed) with which changes in policy interest rates in the United States – or another advanced nation, for that matter – are transmitted into the emerging countries. Consider the following equation for the dynamic behavior of interest rate differentials:

$$x_t = \alpha\theta + (1-\theta)x_{t-1} + \sum_{i=1}^{k} \gamma_i y_{it} + \lambda \Delta x_{t-1} + \sum_{j=1}^{m} \phi_i z_{it} + \psi_t \,. \tag{3}$$

Where x_t is the differential between the (short term) domestic interest rate in an emerging country and the short term interest rate in an advanced nation, properly adjusted by expectations of depreciation and risk:[32]

$$x_t = r_t - r_t^* - \delta_t - \rho_t \ , \tag{4}$$

[31] See Hausmann et al (1999).
[32] This is similar, although not identical, to Shambaugh's (2004) variable of interest in his equation (1).

r_t, in turn, is the domestic currency nominal interest rate for securities of a certain maturity, r_t^* is the (international) nominal interest rate on foreign currency denominated securities of the same maturity, δ_t is the expected rate of depreciation of the domestic currency, and ρ_t is a measure of country risk. y_{it} is a vector of zero-mean, finite-variance shocks. In this analysis the most important (but not the only) y_{it} refers to changes in the Federal Funds interest rates.

In long run equilibrium, and with perfect capital mobility, this interest rate differential will be close to zero.[33] The speed at which convergence to long term equilibrium takes place is captured by parameter θ, and will depend on specific countries' conditions, but under free capital mobility it will be rather fast. γ_i, and λ are parameters, α, and ϕ_i are coefficients, the z_{it} are other possible *level* (as opposed to zero-mean shocks) determinants of the equilibrium long-run interest rate differential, and ω_t is an error term with the usual characteristics.

The coefficient of the change in the Federal Fund's interest rate in equation (3) captures the extent of monetary independence. If the Fed's actions have no effect on the emerging country, the coefficient of the change in the Fed Fund's rate will be -1.0. If, on the other hand, the Fed's policy affects domestic interest rates the coefficient will be negative but smaller than one. In the limit, if the Fed's policy is *fully transmitted* into the emerging nation, the coefficient will be zero.

In Table 4 I report separate results from pooled regressions, using *weekly data*, for two groups of countries: four from Latin America -- Brazil, Chile, Colombia, Mexico --, and three from East Asia -- Indonesia, Korea, and the Philippines. These regressions use data for the period spanning from the first week of January, 2000, to the last week of September of 2008 (just before the global financial crisis).[34] All seven of these countries had some form of flexible exchange rates during the period under study.

As may be seen, for most coefficients the results are very similar across the two regions. There is an important difference, however, in the coefficient of the change in the Federal Fund's interest rate. While it is negative and significant at conventional levels

[33] This assumes that both securities (domestic and foreign) have the same degree of credit risk.
[34] The data ends just after the collapse of Lehman Brothers.

for the Latin American countries -- with a point estimate of -0.75 --, it is insignificantly different from zero for the East Asian countries (with a point estimate 0.225). The rest of the coefficients of interest, however, are significant in both equations, and the point estimates are not significantly different across the two regions.

These differences across the Latin American and Asia results have implications for the dynamics of interest rate differentials in response to an increase in the Fed's policy rate. For example, the results in Equation 4.1 of Table 4 indicate that the dynamic adjustment in Latin America will be characterized by an immediate decline in the interest rate differential, followed by a cyclical convergence to the new long run equilibrium. That is, in Latin America there is a "*downward overshooting*." The estimates in Equation 4.2 of Table 4, on the other hand, indicate that in East Asia the adjustment toward a new equilibrium will be gradual and smooth; in contrast with the case of Latin America, there will be no "downward overshooting," or cyclical adjustment.

Even if the dynamic adjustment path is quite different, the final impact on interest rate differentials turns out to be very similar in both regions. Indeed, the following conclusions emerge from these estimates:

- In the case of Latin America, *a 50 basis points increase in the Fed's policy rate* results in a decline in the long term equilibrium interest rate differential of 25 basis points.
- In East Asia, on the other hand, the same interest rate shock by the Fed results in a decline in the equilibrium interest rate differential of 26 basis points.

These results indicate quite clearly that in recent times, and in spite of having adopted exchange rate flexibility, these seven Latin American and Asian countries have not enjoyed complete monetary independence. The estimates reported here indicate that there is a rapid – although not complete – "pass through" from the Fed's policy interest rate to these nations' short term domestic interest rates.

XI. Regularity Number Eleven: There has been an important Structural Break in the relationship between the USD Real Effective Exchange Rate and the Real Effective Exchange Rate of the Emerging Commodity Exporters

In the aftermath of the 2007-2009 global financial crisis policymakers throughout Latin America (and other commodity exporting countries, for that matter) have become concerned about the (real) strengthening of their currencies. Real exchange rate (RER) appreciations throughout the region have reduced competitiveness, hurt export, and generated political pressure from tradable goods' producers. Some countries have reacted to these developments by intervening heavily in the foreign exchange market (i.e. Argentina, Brazil, Colombia, Peru), while others have implemented, or stepped up, capital controls (Argentina, Brazil, Colombia). Of course, real currency appreciation is not a new phenomenon in Latin America.[35] Indeed, the region's economic history has been punctuated by wide currency cycles. This issue was investigated in detail in, among other places, the celebrated paper by Calvo, Leiderman and Reinhart (1993).

A number of analysts have argued that these recent real appreciations are very different from historical experiences of Latin American overvaluation. Indeed, an increasingly accepted story about recent episodes goes as follows: for a variety of reasons -- including an unsustainable current account deficit and an overly expansive monetary policy by the Fed (i.e. QE2) -- the USD needs to depreciate with respect to a basket of U.S. trading partners. However, because of China's decision of controlling the value of the renminbi, the USD cannot drop in value relative to the currency of its second most important partner. Consequently, and in order to achieve the required trade-weighted correction, the USD needs to significantly *over-depreciate* with respect to other currencies -- including those in Latin America. In this story, then, the strengthening of the Latin currencies is largely exogenous, and doesn't respond to particular policies or attributes of the Latin American countries themselves. Under these circumstances, the losses in competitiveness are the result of "*collateral damage*" from the global currency wars (mostly – but not exclusively – between the US and China).[36]

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[35] Capital controls have recently also been imposed in other regions, including in Asia.

[36] Of course, other factors have also been at play in recent gyrations of the Latin American currencies. The most important ones are terms of trade improvements and (large) interest rates differentials.

Two important questions emerge in this context: First, is there, indeed, a negative relationship between the USD real effective (basket) exchange rate, and the Latin American countries REER? And second, if this negative relationship does exist, is this a new phenomenon?

In order to address these issues I analyze the correlation between the USD real effective exchange rate and the REER in eight Latin American countries – Argentina, Brazil, Chile, Colombia, Ecuador, Mexico, Peru and Venezuela – in the period spanning from January 1976 and November 2010. In particular, I am interested in investigating whether periods of real appreciation (depreciation) of the (trade weighted) USD have been associated with periods of real depreciation (appreciation) in the Latin American currencies. Of course, for this question to be meaningful – and not a mere tautology --, each real exchange rate has to be defined relative to country-specific baskets. Moreover, the weights in the different RER basket indexes have to be different across countries.

In performing this analysis I break up the 1976-2010 period into three sub periods:

(a) *January 1976- December 1989*: This period is characterized, throughout Latin America, by slow growth, external shocks, rapid inflation and major external crises (including large devaluations). This period culminated with the so-called "Lost Decade," where the region experienced a ten-year negative per capita growth. The implementation of the Brady Plan marked the end of this period.[37]

(b) *January 1990 – December 2003*: This period corresponds to the so-called "Washington Consensus" reforms. In most Latin American nations trade was opened to international competition, basic market-oriented reforms were enacted, sweeping privatization programs were put in place, fiscal deficits were clipped, and inflation was greatly reduced. However, during most of this period many Latin American countries maintained some form of predetermined (or pegged) nominal exchange rate regimes. These included narrow bands, fixed exchange rates, currency boards, and crawling pegs. One of the most salient characteristics

[37] For details on this and the other sub-periods see Edwards (2010).

of this period is that many countries experienced major currency crises: Argentina, Brazil, the Dominican Republic, Ecuador, Mexico, and Uruguay.

(c) *January 2004 – November 2010*: This sub-period may be called the "New Epoch." During this period the Latin American countries experienced a revival and posted solid growth. One of the region most important achievements during these years is that it sailed through the global financial crisis without experiencing major setbacks. This ability to survive global financial upheaval was new to Latin America, and was the result of a combination of factors, including the abandonment (in most countries) of rigid nominal exchange rate regimes, the sizable accumulation of international reserves in the previous decade, and prudent fiscal policies. In addition, during this period commodity prices soared, and most Latin American countries experienced significant improvements in their terms of trade.[38]

In Table 5 I present correlation matrixes for (the logs) of nine trade-weighted RER indexes – the eight Latin America nations and the United States. The numbers below each correlation coefficient is a t-test statistic for the null hypothesis that the coefficient is zero. The data are provided for the three sub samples under consideration. In interpreting the results I concentrate on the first column for each panel of Table 5, on the (partial) correlation between the log of each Latin currency and the US. The correlations across the RERs for the Latin countries are of interest on itself, and unearth significant information. Analyzing them is, however, beyond the scope of this paper and, thus, will not be discussed here.

The results in this Table show that through time there has been an important change in the extent and direction of the correlation between the trade-weighted RER in the U.S. and the Latin American nations. The results may be summarized as follows:

- In the initial period (1976-1989) four of the correlation coefficients are significantly positive (Chile, Colombia, Ecuador and Venezuela), three of

[38] On the holding of international reserves see, for example, Aizenman and Marion (2002), Aizenman and Lee, (2008) and Edwards (1984, 2002).

the coefficients are significantly negative (Argentina, Brazil and Mexico), and one (Peru) is insignificantly different from zero. That is, during this period neither positive nor negative correlation dominates. Further, the magnitude of the coefficients is, for all cases, quite small.

- During the middle sub period (1990 – 2003) there are still four coefficients that are significantly positive (Chile, Ecuador, Mexico and Venezuela); two are significantly negative (Brazil and Colombia), one is marginally negative (Argentina), and Peru remains insignificant. Once again, and as in the earlier sub sample, there is a slight domination of the positive co-movements.
- For the most recent period – January 2004 through November 2010 – the pattern and magnitude of the correlation coefficients are very different, however. As may be seen from Table 5, seven out of the eight coefficients of correlation are *significantly negative*. Only one (for Argentina) is significantly positive.[39] Moreover, the absolute value of these negative correlations coefficients is quite large. For instance, the coefficient for Brazil is -0.704, the one for Colombia is -0.6, and for Mexico it is -0.515. In our two earlier sub samples the negative coefficients never exceeded, in absolute terms, 0.3.

These results provide support to the notion that in the last few years – since the mid-2000s – there has been an important structural breakpoint in the relationship between the U.S.'s RER and that of the Latin American countries. From that date the RER in almost all of the larger Latin American countries have been negatively correlated with the RER in the United States. This negative relationship is statistically significant, and in some countries – Brazil, Chile, Colombia, and Mexico – it is quite large. This means that since that time, real depreciations (appreciations) of the trade-weighted USD have been associated with real appreciations (depreciations) of the trade-weighted of the Latin American currencies. What is interesting – even surprising – is that this was not the case

[39] There are many possible explanations for the Argentine results, including the fact that the authorities intervened strongly during this period, and that the official data on inflation were manipulated.

until 2004. An important question – and one that is beyond the scope of this paper – is to investigate some of the possible channels through which the USD REER may exert an influence on Latin American REERs.

XII. Concluding Remarks

In this paper I have presented a series of propositions that are useful for exchange rate analyses in the emerging markets. These lessons have been extracted from Asia and, especially, from Latin America. The main conclusion from these propositions is one for pragmatism. An important point is that "one size does not fit all," and that different exchange rate regimes are likely to be appropriate for different countries. The second conclusion is that rigid approaches aimed at defending a specific currency value are dangerous. The third conclusion is that there is abundant evidence that (more) flexibility is conducive to better performance – countries with more flexible rates have grown faster on average, and have had a greater ability to accommodate exogenous shocks. A fourth conclusion has to do with inflation: to the extent that the fiscal stance is sustainable and central banks are independent (and focus on achieving their inflation targets), the fear that flexible rates will led to high inflation is misplaced. The fifth conclusion is that even under floating rates it is possible for the real exchange rate to become overvalued. Sixth, there is ample evidence suggesting that overvaluation is very costly. The sixth conclusion is that there is an important asymmetry between situations of over and undervaluation. In seventh place, for most countries "dollarization" is not the most appropriate monetary system. This type of arrangement may work well, however, in countries with a long history of imbalances and stability. Eighth, given the above, occasional central bank intervention to avoid over valuation – or an overly appreciated real exchange rate relative to its long run equilibrium – is justified. Intervention, however, has to be infrequent, well justified, fully explained to the public, and based on a firm belief that the market exchange rate is (significantly) out of line with respect to its long term equilibrium value. Finally, there is evidence suggesting that there has been an important change in the relationship between the real exchange rate of commodity exporting Latin American countries, and the RER in the US. While historically, there was no strong correlation – one way or another -- between these variables, since the mid

2000s there has been a significant and strong negative relationship. This suggests that the recent appreciation experienced by the commodity currencies is largely the result of the UDS weakness in global markets.

Table 1
Exchange Rate Crisis and GDP per capita Growth Regressions

(Random Effects GLS Estimates)

	(1)	*(2)*
Growth gap	0.80	0.80
	(42.51)*	(42.51)*
Change in terms of trade	0.08	0.08
	(13.28)*	(13.24)*
Cri_xr	-1.27	-
	(3.82)*	-
Cri_index	-	-0.91
	-	(3.89)*
Constant	-0.31	-0.23
	(2.96)*	(2.11)**
Observations	1971	1971
Countries	91	91
R-squared	0.49	0.49

Absolute value of t statistics are reported in parentheses; country-specific dummies are included, but not reported; *significant at 1%, **significant at 5%, *** significant at 10%.

Table 2
Dollarized and Non-Dollarized Countries: Basic Data

A. Dollarized Countries and Territories with Available Data

USA	Ecuador, El Salvador, Liberia*[I], Marshall Islands[I], Micronesia[I], Palau[I], Panama[I], and Puerto Rico
New Zeeland	Cook Islands
France	Andorra[I] (also Spanish peseta)
Australia	Kiribati[I], Tonga[I], Nauru and Tuvalu[I]
Italy	San Marino[I]
Denmark	Greenland
Switzerland	Liechtenstein[I]
Belgium	Luxembourg[I]

B. Summary Statistics (As of 2004)
(Mean)

	Dollarized	*Non-Dollarized*
Population	536,609	32,680,479
Initial GDP	8,185	4,310
Distance from Tropic	0.25	0.31
Distance from World Center	5,976	5,761
Credibility index	0.10	0.23
Independent (%)	47	90
Border (%)	26	21
Openness (%)	50	27
Island (%)	58	24
Tax heaven (%)	32	12

* Dollarized until 1982
[I] Denotes that country is independent at the time of this writing. Kiribati became independent in 1980; the Marshall Islands in 1987; Palau in 1995; and Tuvalu in 1979.

Table 3. Growth Dynamics Under Alternative Exchange Rate Regimes (GLS)

	(i) Flexible	(ii) Intermediate	(iii) Peg	(iv) Hard Peg
$[g^*_i - g_{t-1\ i}]$	0.887***	0.939***	0.774***	0.873***
	(0.033)	(0.038)	(0.029)	(0.067)
Δtt	0.032***	0.042***	0.081***	0.130***
	(0.010)	(0.011)	(0.008)	(0.020)
Δtt_1	0.020**	0.021**	0.045***	0.051***
	(0.010)	(0.010)	(0.008)	(0.020)
civil unrest	0.113**	-0.105	-0.087*	-0.128
	(0.054)	(0.080)	(0.052)	(0.251)
constant	-1.830***	2.193**	0.179	1.480
	(0.572)	(1.032)	(0.377)	(2.114)
Obs.	462	416	845	217
Δtt + Δtt_1	0.052***	0.063***	0.126***	0.169***
	[12.38]	[16.22]	[121.56]	[32.26]

Note: ***, **, and * represent 99, 95 and 90% significance. Heteroskedasticity-consistent standard errors in italics. $\chi 2$ in brackets. All regressions include year dummies.

Table 4: Interest Rate Differentials Panel Estimates: Latin America and Asia

Variable	Eq. 4.1 Latin America	Eq. 4.2 Asia	Eq. 4.3 Latin America	Eq. 4.4 Asia
C	0.841***	0.348***	0.996*	0.188
	(6.64)	(3.27)	(2.55)	(0.51)
DEVIATION90(-1)	0.820***	0.825***	0.822***	0.822***
	(48.31)	(21.66)	(48.47)	(36.82)
D(LOG(WTI_SPOT(-1)))	0.604	1.199***		
	(0.64)	(5.56)		
FF_DELTA	-0.752*	0.225	-0.734*	0.239
	(1.74)	(0.96)	(1.70)	(0.67)
FF_POLICY	-0.090***	-0.047**	-0.073**	-0.057*
	(3.25)	(2.54)	(2.05)	(1.61)
D(DEVIATION90(-1))	-0.388***	-0.256***	-0.393***	-0.25***
	(17.41)	(10.09)	(17.66)	(7.95)
D(LOG(EUR_USD(-1)))*100			0.107***	0.161***
			(3.02)	(5.20)
D(UST_10YR)			0.887**	0.500
			(2.31)	(1.41)
UST_10YR			-0.049	0.042
			(0.50)	(0.43)
Observations	1706	895	1706	895
Countries	4	3	4	3

Absolute value of t statistics is reported in parentheses; ***significant at 1%; **significant at 5%; *significant at 10%.

Table 5: Coefficients of Correlation Between Nine RER Indexes in the Americas: Three Sub-Samples, 1976 - 2010

A.- Sample (adjusted): 1976M01 1989M12
Included observations: 168 after adjustments

Correlation t-Statistic	LRER_US	LRER_AR	LRER_BR	LRER_CH	LRER_CO	LRER_EC	LRER_ME	LRER_PE	LRER_VE
LRER_US	1.000000								

LRER_AR	-0.219686	1.000000							
	-2.901337	-----							
LRER_BR	-0.169850	0.148561	1.000000						
	-2.220627	1.935549	-----						
LRER_CH	0.204774	0.693047	0.240442	1.000000					
	2.695447	12.38644	3.191512	-----					
LRER_CO	0.239739	0.637153	0.431658	0.861802	1.000000				
	3.181604	10.65102	6.165510	21.88995	-----				
LRER_EC	0.182690	0.591510	0.440818	0.762540	0.915202	1.000000			
	2.394087	9.451924	6.327504	15.18629	29.25975	-----			
LRER_ME	-0.259416	0.648448	0.467475	0.566219	0.566851	0.515212	1.000000		
	-3.460817	10.97480	6.813301	8.850696	8.865238	7.745103	-----		
LRER_PE	0.003973	-0.324665	0.020647	-0.247953	-0.415883	-0.488332	-0.122248	1.000000	
	0.051190	-4.422592	0.266080	-3.297630	-5.891992	-7.209838	-1.586953	-----	
LRER_VE	0.288626	0.439945	0.326974	0.640296	0.763706	0.776728	0.356794	-0.389135	1.000000
	3.883979	6.311954	4.457795	10.73991	15.24195	15.88893	4.920843	-5.442645	-----

B.- Sample (adjusted): 1990M01 2003M11
Included observations: 167 after adjustments

Correlation t-Statistic	LRER_US	LRER_AR	LRER_BR	LRER_CH	LRER_CO	LRER_EC	LRER_ME	LRER_PE	LRER_VE
LRER_US	1.000000								

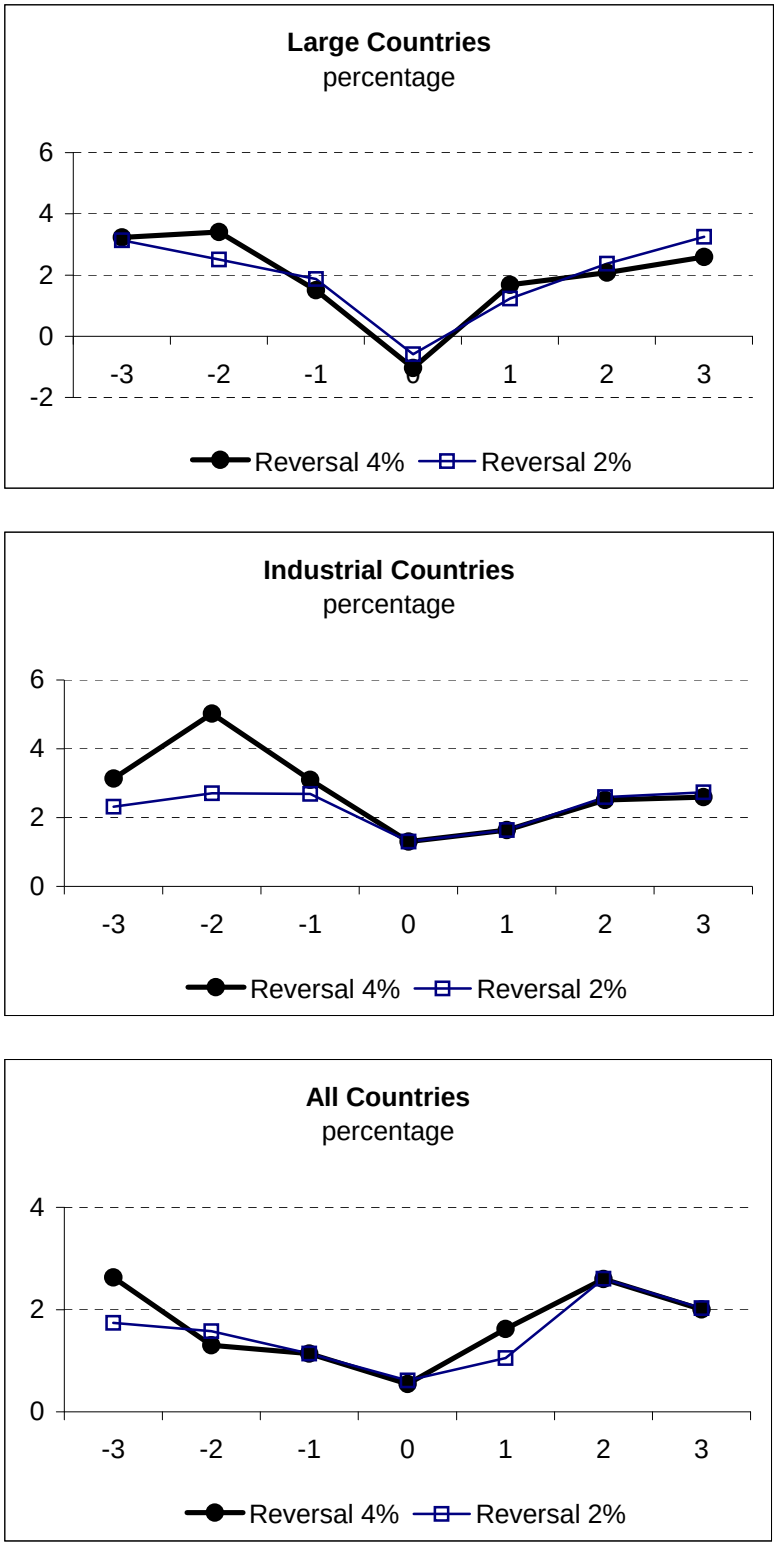
LRER_AR	-0.148641	1.000000							
	-1.930779	-----							
LRER_BR	-0.174457	-0.067942	1.000000						
	-2.275838	-0.874747	-----						
LRER_CH	0.423186	0.175650	0.275011	1.000000					
	5.999632	2.291892	3.674256	-----					
LRER_CO	-0.259718	0.385348	0.472404	0.439099	1.000000				
	-3.454692	5.364144	6.884792	6.277930	-----				
LRER_EC	0.729410	-0.337692	0.037019	0.595638	-0.189140	1.000000			
	13.69648	-4.608445	0.475838	9.525156	-2.474203	-----			
LRER_ME	0.703999	-0.167997	-0.447644	0.053393	-0.488411	0.529234	1.000000		
	12.73307	-2.189067	-6.430354	0.686824	-7.189614	8.012171	-----		
LRER_PE	0.007796	-0.189349	0.359847	0.008203	0.293704	-0.084866	-0.166501	1.000000	
	0.100142	-2.477039	4.954197	0.105374	3.946765	-1.094074	-2.169022	-----	
LRER_VE	0.820643	-0.038766	0.084601	0.646444	-0.112639	0.750046	0.405077	-0.049791	1.000000
	18.44698	-0.498331	1.090627	10.88355	-1.456143	14.56715	5.691145	-0.640369	-----

C.- Sample (adjusted): 2004M01 2010M11
Included observations: 83 after adjustments

Correlation t-Statistic	LRER_US	LRER_AR	LRER_BR	LRER_CH	LRER_CO	LRER_EC	LRER_ME	LRER_PE	LRER_VE
LRER_US	1.000000								

LRER_AR	0.529836	1.000000							
	5.622597	-----							
LRER_BR	-0.703979	-0.550169	1.000000						
	-8.920904	-5.929580	-----						
LRER_CH	-0.464461	-0.383647	0.828279	1.000000					
	-4.720163	-3.738931	13.30410	-----					
LRER_CO	-0.600452	-0.516337	0.850751	0.589648	1.000000				
	-6.757954	-5.426334	14.56853	6.570629	-----				
LRER_EC	-0.313252	0.104544	0.192136	0.074822	0.145521	1.000000			
	-2.968683	0.946083	1.762058	0.675287	1.323780	-----			
LRER_ME	-0.514573	-0.041531	0.109706	-0.104785	0.160671	0.620382	1.000000		
	-5.401104	-0.374098	0.993354	-0.948285	1.465073	7.119008	-----		
LRER_PE	-0.253704	-0.068320	0.670592	0.629102	0.557639	-0.003605	-0.309435	1.000000	
	-2.360565	-0.616322	8.135765	7.283869	6.046085	-0.032443	-2.928651	-----	
LRER_VE	-0.173583	-0.387910	0.503446	0.624398	0.209922	-0.266180	-0.528849	0.433400	1.000000
	-1.986327	-3.787782	5.244065	7.194383	1.932357	-2.485284	-5.608052	4.328226	-----

Figure 1: Evolution of Per Capita GDP Growth
(Median)



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