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Exchange Rate Implications of Reserve Changes

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Abstract:

The relationships between exchange rates, capital controls and foreign reserves during the financial crisis suggest that reserve management plays a much more central role than has typically been emphasized in international finance models. Reserves seem to be important not only for stabilizing fixed regimes, but also to deter currency market pressure in intermediate and even floating regimes, and in so doing help to mitigate trilemma trade-offs.

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I. Introduction

Countries with fixed exchange rates require foreign exchange reserves, and sometimes capital controls, to maintain the pegged regime. Even countries that allow their exchange rate to be market determined often hold significant foreign reserve stocks and at times resort to capital controls. Exchange rate movements, in turn, influence the value of foreign-currency denominated reserves and often provide the impetus for capital control measures. This paper examines the relationship between exchange rates, capital controls and foreign reserves, focusing on changes in each of these measures across a large sample of countries during the global financial crisis and recovery.

There were significant exchange rate realignments during the global financial crisis. In 2008 and 2009 at least seven countries officially devalued their exchange rate[1] and a number of countries experienced unusually large changes in the relative value of their currency. While some of these same countries introduced capital controls and depleted reserves, other countries were able to maintain their exchange rate pegs at the expense of depleted reserves, and yet others did not experience major changes in currency value or reserve levels. One explanation for why reserves did not always co-move with exchange rates during the crisis is that large pre-crisis reserve accumulations in some countries provided protection against the market forces that battered currency values in countries with less substantial accumulations.

The causes and consequences of exchange rate movements are not well understood. Even when governments apparently successfully intervene to change the international value of their domestic currency, as Japan recently seems to have done, or succeed at stabilizing the value of the domestic currency, as Switzerland continues to do, the implications of these exchange rate policies for broader macroeconomic stabilization and economic growth remain contentious. Less controversial is the view that exchange rate crises have significant negative effects on growth. So while the literature continues to debate the relative benefits of fixed versus flexible exchange rate regimes, with recent empirical studies concluding that the choice of exchange rate regime makes little difference (Rose, 2011), studies focused on unusually large and rapid

[1] In December 2008: Angola 10%, Ukraine 30%; in January 2009: Belarus 20%; in February 2009: Argentina, Russia, Kazakhstan 18%; in March 2009: Armenia 30%, Switzerland 5%, Vietnam; in April 2009: Singapore, Fiji 20%.

exchange rate movements provide an unequivocal policy directive: countries should avoid situations that evolve into currency crises.[2]

Governments have a number of policy tools that, at least in theory, can be used to manage exchange rates and counteract currency crises. If market pressure is toward an undesired rise in the relative value of the domestic currency authorities can: (1) accumulate foreign reserves, (2) lower interest rates to discourage capital inflows, or (3) impose capital inflow controls. The tools available to countries facing undesired downward pressure on the relative value of the domestic currency are mirror images, though sales of foreign reserves are importantly constrained by the size of the country's accumulated stock, and evidence suggests controls on capital outflows are more difficult to maintain than those on inflows (Dell'Ariccia et al. 1999).

The currency crisis-prevention tool-kit is importantly constrained by the international finance trilemma. Policy makers would like to use monetary policy to control interest rates and help stabilize the economy, allow free mobility of capital inflows and outflows, and at the same time maintain a stable exchange rate. The crux of the trilemma is that countries can't simultaneously achieve all three of these goals. If countries allow capital mobility, they must choose between monetary policy independence and exchange rate stability. Likewise, if exchange rate stability is considered paramount, countries must give up monetary policy unless they are willing to impose capital controls. The role of reserves in the trilemma has generally been assumed to be minor.[3] Reserves are essential as part of the mechanics of stabilizing exchange rates, but their potential ability to deter currency market speculation, and in so doing mitigate trilemma trade-offs, has not been emphasized.

II. Reserves and Exchange Rate Regimes

Studies analyzing the motives for foreign reserve accumulations typically emphasize two potentially complimentary incentives: self-insurance and terms-of-trade improvement. The precautionary motive is based on the idea that reserve stocks can serve as self-insurance against adverse economic shocks of one form or another. Reserve accumulation may also be

[2] There are a number of different definitions of a currency crisis used in the literature; a fairly standard criteria is a fall in the value of the currency of more than 25% over a two month period.

[3] Obstfeld, Shambaugh and Taylor (2010) is an important exception.

the byproduct of a government strategy to keep the international value of the domestic currency low in order to boost export growth. The terms-of-trade motive for reserve accumulation, sometimes labeled pejoratively as the mercantilist motive, was advanced by Dooley, Folkerts-Landau and Garber (2003) as a description of the export-led development strategy followed by many East Asian countries, particularly China.

Empirical studies find evidence in support of both these motivations for reserve accumulation while at the same time finding it difficult to fully explain the dramatic increase in reserve accumulations by developing countries starting in 2000 (Jeanne (2007) and Jeanne and Ranciere (2007)). Three studies that come to the conclusion that reserve accumulations through 2007 were not excessive include: Obstfeld, Shambaugh and Taylor (2010) who gauge reserve adequacy against the size of the banking sector, Hashimoto and Ito (2007) who focus on the adequacy of reserves to maintain exchange rate stability, and Dominguez (2010) who focuses on the role for reserves in countries with underdeveloped financial markets.

There are a number of studies that examine reserve policy during the most recent global crisis. Aizenman and Sun (2010) document that some emerging market countries made the deliberate decision to allow the exchange rate to adjust rather than deplete their international reserves during the crisis. Obstfeld, Shambaugh and Taylor (2009) and Aizenman, Jinjarak and Park (2011) document the heavy reliance on swap lines of inter-governmental credit during the crisis, especially by developed countries that did not have large reserve accumulations. They suggest that swap lines may substitute for reserves for some countries. Dominguez, Hashimoto and Ito (2012) document substantial evidence of reserve depletion during the crisis, emphasizing that the country-specific timing of the crisis matters when measuring reserve changes. They show that most countries that sold reserves during the crisis, returned to accumulating reserves soon afterwards. As a consequence, unless reserve changes are measured on a monthly or quarterly basis, researchers will erroneously conclude that reserves were not used and played no role in crisis management.

Most countries, regardless of their exchange rate regime, hold foreign reserves. However, the recent dramatic build-up in global reserve stocks is largely driven by developing countries that are classified as maintaining *de facto* pegs or crawling pegs, with China at the top of the

list, followed by Saudia Arabia and Russia. The two developed countries that round out the top five reserve holders are Japan and Switzerland. In both cases, reserves were accumulated as part of government intervention strategies to stop excessive appreciation of the domestic currency, though Japan is classified as allowing its currency to float while the Swiss franc is in a moving band. Figure 1 shows the relative shares of global reserves held by countries whose *de facto* exchange rate regime is broadly classified as flexible, intermediate or fixed by Reinhart and Rogoff (2004) and Ilzetski, Reinhart and Rogoff (2010).[4] It is worth noting that in 2010 countries with exchange rate regimes that are classified as flexible made up almost 15% of global reserves.

Figure 2 shows the average ratio of foreign reserves-to-GDP for floaters, intermediate regimes and fixers starting in 1980. The data indicate that most countries were actively accumulating reserves in the five years prior to the global financial crisis regardless of regime, with those countries classified as having intermediate regimes showing the fastest growth in reserves-to-GDP since 2000. Reserves-to-GDP ratios declined the most for fixers and intermediate regimes in 2008-9, and reserves ratios across all three regimes rapidly "bounced back" to pre-financial crisis levels by 2010.

Figure 3 shows average monthly reserve changes for countries grouped by exchange rate regime starting in 2000. Those countries classified as having a *de facto* "freely falling" exchange rate (based on annual inflation rates above 40%) are also included as an additional exchange rate regime category. Even though free falling regimes are rare, they involve the largest and most volatile reserve movements. The wild swings in reserves for countries experiencing free falling exchange rates suggest that in times of crisis all three policy variables (interest rates, reserve changes and the exchange rate) tend to co-move.

In Table 1 countries are divided into quartiles based on their reserves-to-GDP ratios at the end of 2006 in order to examine whether higher reserve accumulations prior to the financial

[4] The *de facto* exchange rate regime classifications are available online at http://personal.lse.ac.uk/ilzetzki/IRRBack.htm. The monthly data cover the period 1947 through 2010; "fine" classification is on a 1 to 15 scale (1=no separate legal tender and 15= dual market in which parallel market data is missing) and is based on information from Pick's Currency Yearbook, Pick's World Currency Report, Pick's Black Market Yearbook, International Financial Statistics, the IMF's Annual Report on Exchange Rate Arrangements and Exchange Restrictions, and the United Nations Yearbook. In this paper the fine classifications are aggregated into 4 regimes: fixed (1-4), intermediate (5-12), flexible (13), and free falling (14) and are updated through 2011.

crisis protected countries from exchange rate instability. The table shows the percentage of countries within each reserve-to-GDP quartile that are classified as maintaining fixed, intermediate or floating exchange rates, as well as the percentage of countries that experienced changes in their *de facto* exchange rate regime during the global financial crisis. It is worth noting that no floaters are in the high reserves-to-GDP quartile. There are slightly more countries with intermediate exchange rate regimes than there are fixers in the highest reserve quartile, and 3 countries (8 percent) in the high quartile changed their regime category during the crisis. The largest share of countries classified as maintaining a floating regime is in the lowest reserve-to-GDP quartile, and the "medium-high" reserve-to-GDP quartile contains the largest number of countries that experienced an exchange rate regime change during the financial crisis.

Tables 2 through 5 report the names of the countries in each of the categories that are included in Table 1. Table 2 lists the countries that are in each of the pre-crisis reserves-to-GDP quartiles (based on end of 2006 data), while table 3 lists the countries whose exchange rate regime is classified as fixed, intermediate or flexible as well as the month and year in which countries changed from one regime to another. The countries listed along the diagonal of the matrix in Table 3 are those that did not change exchange rate regime classification over the thirty year period (1980 through 2010). The countries listed in the off-diagonal cells of the matrix are those that experienced an exchange rate regime change. The largest number of "switchers" started off in an intermediate regime and then switched to a fixed regime. Most of the Eurozone member countries (except Germany) are included in this group. Tables 4 and 5 provide information on country transitions to and from a "free falling" regime. In both tables 4 and 5 the majority of "free falling" regime transitions involve a movement into or out of an intermediate regime. Interestingly, very few of the "free falling" regime transitions occurred during the financial crisis (those countries in which they did occur include: Pakistan, Seychelles, Tanzania, Venezuela and Zimbabwe).

Table 1 also shows the percentage of countries within each reserve-to-GDP quartile that are classified as maintaining or increasing capital controls during the financial crisis. Countries are classified as maintaining "long-standing," "new," or "no" capital controls based on the Chinn-Ito

financial openness measure. A significant percentage of countries are classified as maintaining long-standing capital controls across all four reserve-to-GDP quartiles. Countries in the low reserves-to-GDP category had smallest percentage of countries that imposed new controls and the largest percentage of countries with no capital controls. Likewise, countries in the high reserves-to-GDP category had the lowest percentage of countries with no controls and the highest percentage of countries with long-standing controls. Table 6 reports the names of the countries in each of the capital control categories together with the corresponding Chinn-Ito financial openness measure.[5] The middle column reports the year in which new controls were put in place and repeats countries each time they added controls after 2007.

The final two rows in Table 1 report the percentage of countries in each reserves-to-GDP quartile that experienced either a large depreciation or a large decline in reserves during the financial crisis. A "large" change is defined as a 25 percent or greater depreciation of the currency or fall in reserves between August 2008 and February 2009. Tables 7 and 8 provide a list of the countries that experienced these large changes. Table 7 reports the 32 countries that experienced the largest depreciations of their currency during the financial crisis, along with the corresponding changes in reserves and Chinn-Ito capital control measure. Similarly, table 8 lists the 33 countries that experienced the largest reserve depletions during the financial crisis. While a number of countries both experienced large depreciations and large reserve depletion (Belarus, Congo, Mongolia, Poland, Russia, Serbia, Ukraine, Zambia and Zimbabwe), not all countries that experienced large exchange rate changes also depleted reserves.

Seychelles experienced the largest depreciation of its currency (110 percent) while at the same experiencing a large percentage *increase* in reserves (102 percent) during the global financial crisis. Figure 4 shows Seychelles' monthly foreign reserves (in USD) and the movements in the rupee per USD exchange rate over this period. In October 2008, facing the near-depletion of its foreign exchange reserves, Seychelles defaulted on interest payments due

[5] The Chinn-Ito data are available at: http://web.pdx.edu/~ito/Chinn-Ito_website.htm. The maximum Chinn-Ito financial openness measure in the updated version of the database (used here) is 2.44. Countries with this maximum score are classified as maintaining "no" capital controls. Countries that are continuously coded with a Chinn-Ito score below 2.2 between 2006 and 2011 are classified as maintaining "long-standing" controls. The minimum Chinn-Ito score is -1.86. There are 54 countries that score the "most financially open" value of 2.44 as of 2011 whereas there are 13 countries with the "least financial open" score of -1.86.

on a 230 million Eurobond issued 2 years previously. The government turned to the International Monetary Fund (IMF) for support, and in an attempt to meet the conditions for a stand-by loan, began implementing a program of radical reforms. These included a fundamental liberalization of the exchange rate regime, involving the devaluation and floatation of the rupee, the elimination of all foreign exchange controls, and accumulation of foreign reserves to cover at least three months of imports.[6]

Seychelles' pattern of increases in reserves immediately after a large devaluation is unusual. Reserves, which by definition are denominated in foreign currencies, will automatically increase in value in domestic currency terms after a depreciation, but countries rarely have the resources to actively purchase reserve assets after a large devaluation. A more typical pattern for countries that experience an undesired large depreciation is that they sell reserve assets as a crisis management tool. Of course, countries with low levels of reserves prior to a large depreciation may not have the option to further deplete reserves.[7]

Overall the percentages reported in Table 1 indicate that countries with higher pre-crisis reserve accumulations (as a share of GDP) tend to maintain fixed or intermediate exchange rate regimes, and have in place capital controls. There is little evidence from the quartile grouping to indicate that countries with higher reserve accumulations prior to the crisis experienced significantly fewer exchange rate regime changes (or major depreciations) during the financial crisis.

Figure 5 updates a figure in Reinhart and Reinhart (2008, pp. 9) that compares the mean absolute percent change in the exchange rate (along the vertical axis) with the mean absolute percent change in reserves (along the horizontal axis) for our full set of countries during the financial crisis. The sample average for countries coded as "floaters" is 4% for exchange rate changes and 5% for reserves, indicating that the non-floaters in the sample had exchange rates that were less variable and reserves that were more variable than the "average floater" experience.

[6] The IMF approved a 2-year U.S. $26 million stand-by loan for Seychelles in November 2008. Foreign reserves reached 2.5 months of imports at the end of 2012.

[7] See Dominguez, Hashimoto and Ito (2012) and Dominguez (2012) for a more detailed discussion of passive and active reserve changes that take into account interest income and valuation changes in reserves.

Figures 6 and 7 show average changes in reserves and exchange rates for countries grouped by exchange rate regime, including the free fallers. Figure 6 shows the average month-to-month changes in reserves and exchange rates during the financial crisis, and figure 7 shows the changes in the pre-crisis period (2004-2006) to serve as a benchmark. In both figures the average exchange rate depreciation for the free fallers is significantly larger than the average exchange rate changes for any of the other regimes and significantly larger than average changes in reserves. Average reserve changes are positive (though small) only for the countries in the free falling classification during the financial crisis, while average reserve changes for countries across all four regimes are positive in the pre-crisis period (with countries in the free falling category experiencing the largest reserve accumulations). The average exchange rate fluctuated much more in the crisis period than in the benchmark period. This suggests that policy actions during the financial crisis were consistent with allowing larger swings in the exchange rate in most countries than in the benchmark period, together with active depletions of reserves.

When monetary authorities acquire reserve assets they typically sterilize the effect of these purchases on the domestic monetary base by incurring domestic-currency liabilities (often termed "sterilization bonds").[8] Likewise, reserves held by the fiscal authority are typically financed with domestic government bills. Prior to the global financial crisis it was largely the fixers (most notably China) that were accumulating reserves on a massive scale. More recently the aforementioned Japan and Switzerland have also dramatically increased their reserve accumulations as a result of exchange rate policies. Anecdotal evidence suggests that not all of these reserve accumulations have been sterilized, though if most operations were unsterilized we would expect to see a strong positive association between the domestic money stock and foreign exchange reserves, which is not evident in the aggregate data (see Figure 8).

[8] If the central bank does not sterilize its foreign reserve purchases it increases its domestic liabilities when its foreign assets increase. If the central bank sterilizes, it effectively reduces its net assets. In both cases the net worth of the central bank is unchanged.

III. Capital Controls and Exchange Rates

During the Bretton Woods era controls restricting capital account transactions were used widely by countries in the system. Indeed Reinhart and Rogoff (2009) argue that these capital controls, even more than rapid economic growth, should be given credit for dramatically reducing the incidence of banking crises in this period. Capital controls were largely dismantled after the collapse of the Bretton Woods system in developed countries, and many developing countries followed suit in the 1980s and 1990s. The so-called Washington Consensus during this time period was that all countries would benefit if capital was allowed to flow freely across borders. This sanguine view of open capital markets shifted after the dramatic increases in capital inflows to emerging market countries in the early 1990s were suddenly reversed sending many countries into financial crises. Capital controls, under the less objectionable label of macro-prudential policies, have been further rehabilitated in the aftermath of the global financial crisis when many developing countries experienced a renewed round of capital inflows and the resulting appreciation pressure.

Although capital restrictions now seem to be more widely accepted as policy tools, even outside of crisis periods, evidence of the efficacy of these restrictions is less clear cut. Klein (2012) examines the efficacy of capital controls on inflows and outflows, as well as differences between long-standing and episodic controls. He makes the case that temporary controls are less effective than long-standing ones and conjectures that this is because evasion is easier in a country that already has experience with unrestricted capital markets. Argentina in 2001 is a good example of the difficulties of restricting capital in an economy previously accustomed to free mobility.[9]

One of the reasons that the efficacy of capital controls remains controversial is that it is difficult to accurately measure the intensity and enforcement of controls. Two countries might have the same capital restrictions on their books, but they each could approach implementation and enforcement of the restrictions differently. If authorities largely ignore violations of the restrictions, empirical work may erroneously conclude the controls, rather

[9] Auguste, Dominguez, Kamil and Tesar (2006) describe how Argentines used ADRs to evade the capital outflow restrictions put in place during 2001 as part of the *corralito*.

than enforcement, are ineffective. Another problem that arises in empirical analyses of controls is selection bias. Countries may impose controls during times of crisis as a last-resort policy tool. Controls imposed during normal times may behave quite differently than they do during times of crisis, but we have few examples of this in the time series. A related problem arises from the endogeneity of capital restrictions, which are likely to be imposed to stave off undesired exchange rate movements, making it difficult to distinguish the effect of controls on exchange rates from the influence of exchange rate movements on the establishment of controls. Finally, distinguishing the influence of capital controls during a financial crisis, when economic activity and capital flows are already subdued, is likely to be difficult.

A number of countries introduced capital controls during the global financial crisis; no countries dismantled controls already in place at the time of the crisis. Table 9 reproduces information from Forbes et al (2012, Appendix A and B), Klein (2012, table A.1) and Weber and Wyplosz (2009, Table 1) that describe the types of controls imposed by different countries before, during and after the crisis. All of the developed countries on the list (Cyprus, Iceland, Ireland and Portugal) imposed restrictions in the throes of banking crises. Many of the other countries on the list devalued their currencies (Angola, Ukraine, Kazakhstan), experienced unusually large depreciations of their currency (e.g. Russia), or experienced undesired appreciation pressure (e.g. Colombia, Brazil).

The Chinn-Ito financial openness measure used to create the capital controls indicator variables used in Tables 1 and 6 is an index that gauges a country's degree of capital account restrictiveness (with higher index scores denoting fewer restrictions). The index is described in Chinn and Ito (2006) and is based on the binary dummy variables that codify the tabulation of restrictions on cross-border financial transactions reported in the IMF's *Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER).* The downside of the Chinn-Ito measure is that it does not distinguish capital outflow and inflow restrictions; the advantage is that it is available for a broad sample of countries starting in most cases in 1970, and it provides a relative measure of the intensity of restrictions.

While measuring the size and effectiveness of capital controls during the financial crisis is beyond the scope of this study, the information reported in Table 1 indicates that controls

are used widely, especially in countries that maintain fixed or intermediate exchange rate regimes and hold significant reserve stocks. Furthermore, the information reported in tables 6 and 9 indicate that a number of countries imposed new or more restrictive controls during the financial crisis. The trilemma suggests that capital controls can, at least in theory, act as a substitute for exchange rate adjustments during times of crisis. In practice, however, the large exchange rate realignments that occurred during the crisis suggest that capital controls at best complemented exchange rate adjustments.

IV. Exchange Rates and Economic Growth

A number of recent studies have found little evidence that a country's choice of exchange rate regime has much influence on macroeconomic stabilization or growth (Rose, 2011). The strongest argument in favor of flexible rates is that "floaters" are better able to absorb economic shocks. The global nature of the financial crisis and subsequent recession meant that it was not feasible for the world as a whole to rely on exchange rate depreciation and export growth at the same time, but did those countries that maintained fixed exchange rates during the financial crisis suffer more than countries that allowed their exchange rate to adjust? Figure 9 shows how countries fared before, during and after the crisis based on their exchange rate regime. While average real GDP growth fell dramatically for countries across the three different regimes during the crisis, the average decline was largest for fixers, followed by those maintaining intermediate regimes. Floaters fared best.

Note that in figure 9 the exchange rate regime is based on the monthly classification associated with that country at the beginning of each of the three reported time periods. The reason for this is to avoid including countries that switched regimes during the time period in the new classification grouping. Tables 3-5 indicate that there are numerous countries that switch regimes, especially between fixed, intermediate and falling classifications. If the reason a country shifts regimes is related to their economic performance under their original regime, it will be inappropriate to attribute poor performance to the subsequent regime. Figure 8 does not include average real GDP growth for countries in the free falling exchange rate regime classification because quarterly GDP data are not available for the relevant countries (prior to

the crisis these include: Myanmar and Zimbabwe, during the crisis they include: Pakistan, Seychelles, Tanzania and Zimbabwe), though annual GDP data suggest that these countries experienced severe growth collapses that far exceed the negative growth experiences of the countries included in the figure.

The growth experience for countries grouped by exchange rate regime after the financial crisis is similar, in terms of regime ranking, to the pattern shown in the pre-crisis period. The countries with intermediate regimes experienced the highest average real GDP growth, followed by fixers. Floaters fared least well after the crisis, with an average real growth rate of below 2%. Although the simple averages reported in Figure 9 do not control for the many other factors that might influence economic growth, the message that intermediate regimes (that are neither fully fixed nor fully flexible) are associated with the highest average growth performance in non-crisis periods seems reasonable. Intermediate regimes can be thought of as the Goldilocks of regimes, simultaneously avoiding the worst characteristics of fixed regimes (overvaluation) as well as the drawbacks of floating regimes (volatility).

The average growth rankings by exchange rate regime in the post-crisis period shown in figure 9 are also consistent with the results in Dominguez, Hashimoto and Ito (2012). They find strong evidence that higher reserve accumulations prior to the crisis are associated with higher post-crisis GDP growth. Table 1 indicates that the majority of countries in the highest reserves-to-GDP quartile maintain intermediate exchange rate regimes.

V. Conclusions

Foreign currency-denominated reserves have always played an important role in fixed exchange rate regimes, but their role for countries with floating or intermediate regimes is less well understood. Similarly, the role and effectiveness of capital controls for countries that value exchange rate stability, but do not fix their rate, is difficult to measure. The data suggest that most countries, regardless of exchange rate regime, hold significant reserve stocks and at the same time maintain some degree of capital account restrictiveness. Put another way, a country's choice of exchange rate regime seems to have only minor implications for reserve and capital account management.

The analysis in this paper indicates that exchange rates fluctuated much more in the crisis period than they did either before or after the crisis. This suggests that policy actions involving reserve management and the use of capital controls during the financial crisis were consistent with allowing larger swings in the exchange rate in most countries relative to pre-crisis norms and controlling for exchange rate regime. On average countries depleted reserves during the global financial crisis and a number of countries imposed new restrictions on capital flows.

The relationships between exchange rates, capital controls and foreign reserves during the financial crisis suggest that reserve management plays a much more central role than has typically been emphasized in international finance models. Reserves seem to be important not only for stabilizing fixed regimes, but also to deter currency market pressure in intermediate and even floating regimes, and in so doing help to mitigate trilemma trade-offs.

References

Aizenman J. and Sun, Y., "The Financial Crisis and Sizable International Reserves Depletion: From 'Fear of Floating' to the 'Fear of Losing International Reserves'?" NBER Working Paper No. 15308, revised August 2010.

Aizenman, J., Jinjarak, Y., and Park, D., "International Reserves and Swap Lines: Subsitutes or Complements? " *International Review of Economics and Finance* 20, 2011, 5-18.

Auguste, Sebastian, Kathryn Dominguez, Herman Kamil and Linda Tesar, "Cross-Border Trading as a Mechanism for Capital Flight: ADRs and the Argentine Crisis," *Journal of Monetary Economics*, 53, 2006, 1259-1295.

Calvo, Guillermo A. and Carmen M. Reinhart, "Fear of Floating," *Quarterly Journal of Economics,* Vol. CXVII No. 2, May 2002, 379-408.

Chinn, Menzie D. and Hiro Ito, "What Matters for Financial Development? Capital Controls, Institutions, and Interactions," *Journal of Development Economics,* Volume 81, Issue 1, October 2006, 163-192.

Dell'Ariccia, Giovanni; Detragiache, Enrica; Milesi-Ferretti, Gian Maria; Mussa, Michael; Tweedie, A. J.; Eichengreen, Barry J., "Liberalizing Capital Movements: Some Analytical Issues, International Monetary Fund, Volume 1, Number 1, August 1999 , 1-21.

Dooley, M., Folkerts-Landau D., and Garber, P., "An Essay on the Revived Bretton Woods System", NBER Working Paper 9971, 2003.

Dominguez, Kathryn, "International Reserves and Underdeveloped Capital Markets", *in NBER International Seminar on Macroeconomics 2009*, edited by Lucrezia Reichlin and Kenneth West, University of Chicago Press for the NBER, 2010, 193-221.

Dominguez, Kathryn, "Foreign Reserve Management during the Global Financial Crisis," *Journal of International Money and Finance*, 31, 8, 2012, 2017-2037.

Dominguez, Kathryn, Yuko Hashimoto and Takatoshi Ito, "International Reserves and the Global Financial Crisis," *Journal of International Economics*, vol. 88, No. 2, 2012, 388-406

Forbes, Kristin, Marcel Fratzscher, Roland Straub, and Thomas Kostka. "Bubble Thy Neighbor: Portfolio Effects and Externalities from Capital Controls." NBER Working Paper no. 18052, 2012.

Hashimoto, Yuko and Takatoshi Ito, "Global Imbalances and Asian Foreign Reserves," unpublished manuscript, June 2007.

Ilzetzki, Ethan, Carmen M. Reinhart and Kenneth S. Rogoff, "Exchange Rate Arrangements Entering the 21st Century: Which Anchor Will Hold?" unpublished, 2010.

International Monetary Fund, *Annual Report on Exchange Rate Arrangements and Exchange Rate Restrictions*, 1996-2012.

Jeanne, O., "International Reserves in Emerging Market Countries: Too Much of a Good Thing?," *Brookings Papers on Economic Activity*, 2007, 1-55.

Jeanne, O. and Ranciere, R., "The Optimal Level of International Reserves for Emerging Market Countries: A New Formula and Some Applications," Working Paper, 2007.

Klein, Michael, "Capital Controls: Gates versus Walls," *Brookings Papers on Economic Activity,* Fall 2012, 317-355.

Obstfeld, Maurice, Shambaugh, Jay and Alan M. Taylor, "Financial Stability, the Trilemma, and International Reserves," *American Economic Journal: Macroeconomics*, vol. 2(2), April 2010, 57-94.

Obstfeld, M., Shambaugh, J., and A. Taylor, "Financial Instability, Reserves, and Central Bank Swap Lines in the Panic of 2008," *American Economic Review: Papers and Proceedings* 2009, 99:2, 2009, 480-486.

Reinhart, Carmen and Vincent Reinhart, "Capital Inflows and Reserve Accumulation: The Recent Evidence," NBER Working Paper # 13842, March 2008.

Reinhart, Carmen and Kenneth Rogoff, *This Time It's Different: Eight Centuries of Financial Folly*, Princeton: Princeton University Press, September 2009.

Reinhart, Carmen and Kenneth Rogoff, "The Modern History of Exchange Rate Arrangements: A Reinterpretation," *Quarterly Journal of Economics* 119, 2004, 1-48.

Rose, Andrew K., "Exchange Rate Regimes in the Modern Era: Fixed, Floating, and Flaky" *Journalof Economic Literature,* 49(3), 2011, 652-72.

Weber, Sebastian and Charles Wyplosz, "Exchange Rates During the Crisis," World Bank Policy Research Working Paper #5059, September 2009.

Table 1 Reserve Accumulations, Exchange Rate Regimes and Capital Controls

Percent of Countries 2008-2011

	High Reserves/GDP	Medium-High Reserves/GDP	Medium-Low Reserves/GDP	Low Reserves/GDP
Exchange Rate Regime				
Fixed Exchange Rate	44	34	48	53
Intermediate Regime	49	46	45	33
Floating Regime	0	2	3	10
Regime change	8	17	5	5
Capital Control Regime				
Long-standing controls	59	44	53	43
New Controls	28	24	28	13
No Controls	13	32	20	45
Large Depreciation GFC	15	15	18	20
Large Reserve Decline GFC	13	20	13	18
# of countries	39	41	40	40

Note: Reserves/GDP ratios are end-of-year 2006. Fixed, Intermediate and Floating Regime classification if country stayed in classification during 2008-2010; otherwise classified as "regime change". Country is classified as maintaining "long-standing capital controls" if controls are persistently imposed prior to 2007, classified as "new capital controls" if imposed during 2008-2011, classified as "no capital controls" if never imposed controls between 2006 and 2011. Large depreciations and large reserve declines are percentage changes greater than 25%.

Table 2 Reserve-to-GDP Quartiles

low Reserve-to-GDP in 2006				med-low Reserve-to-GDP in 2006				med-high reserves-to GDP in 2006				high reserves-to-GDP in 2006		
country	ifscode	res_gdp		country	ifscode	res_gdp		country	ifscode	res_gdp		country	ifscode	res_gdp
Australia	193	6.837444		Antigua Barb	311	14.10781		Albania	914	19.6917		Algeria	612	66.68005
Austria	122	2.324197		Argentina	213	14.48134		Angola	614	19.03688		Bhutan	514	62.46506
Bahamas	313	6.586665		Azerbaijan	912	11.89124		Armenia	911	16.79073		Bolivia	218	23.10238
Bangladesh	513	5.845546		Burundi	618	14.20892		Barbados	316	16.37297		Bosnia_Herzeg	963	29.59916
Belarus	913	1.969022		Cote D Ivoire	662	10.34166		Benin	638	19.26547		Botswana	616	70.74164
Belgium	124	2.292298		Cameroon	622	9.566186		Cambodia	522	16.22123		Bulgaria	918	34.78011
Brazil	223	7.792761		Chad	628	9.921821		Czech_Rep	935	21.88084		Cape_Verde	624	22.945
Brunei	516	4.477507		Chile	228	13.21421		Dominica	321	19.88959		China	924	39.42279
Burkina Faso	748	9.135001		Colombia	233	9.507487		Estonia	939	16.54962		Hong_Kong	532	70.11537
Canada	156	2.737312		Costa Rica	238	13.82626		Gambia	648	18.11111		Comoros	632	23.15594
Car	626	8.543419		Denmark	128	10.87421		Ghana	652	16.52866		Congo__Rep_	634	23.7984
Congo Dem_	636	1.750907		Djibouti	611	15.64759		Grenada	328	17.7234		Croatia	960	23.40826
Dominican Rep	243	5.934143		El Salvador	253	9.745214		Guyana	336	19.21924		Cyprus	423	30.78192
Ecuador	248	3.678144		Fiji	819	10.08153		Hungary	944	19.06993		Egypt	469	22.90063
Eritrea	643	2.093311		Gabon	646	11.67096		India	534	18.86969		Equat_Guinea	642	31.93523
Ethiopia	644	5.720013		Georgia	915	11.98288		Israel	436	19.98933		Honduras	268	24.17143
Finland	172	3.162393		Guatemala	258	12.98812		Jamaica	343	19.37191		Iraq	433	44.24039
France	132	2.081426		Guinea Bissau	654	13.73869		Japan	158	20.19394		Jordan	439	43.10336
Germany	134	1.625335		Iceland	176	13.77567		Kazakhstan	916	22.0545		Korea	542	25.10098
Greece	174	0.285727		Indonesia	536	11.31519		Latvia	941	21.89804		Kyrgyz_Rep	917	27.09623
Haiti	263	5.305596		Kenya	664	10.36637		Lithuania	946	18.8292		Lebanon	446	61.77921
Ireland	178	0.327501		Kuwait	443	12.5046		Mali	678	15.82131		Lesotho	666	46.49717
Italy	136	1.598425		Liberia	668	11.91887		Mauritius	684	19.5617		Libya	672	105.4068
Luxembourg	137	0.517642		Madagascar	674	10.57443		Mongolia	948	18.84284		Malaysia	548	52.33615
Malawi	676	4.338496		New Zealand	196	13.06557		Montenegro	943	16.12352		Maldives	556	25.61639
Mauritania	682	6.957762		Niger	692	10.16416		Mozambique	688	16.08787		Malta	181	46.02056
Mexico	273	8.007582		Oman	449	13.62337		Nicaragua	278	17.62696		Moldova	921	22.75469
Myanmar	518	8.603668		Poland	964	13.62286		Norway	142	16.88081		Morocco	686	31.04509
Namibia	728	5.631012		Rwanda	714	14.14185		Paraguay	288	18.35202		Nigeria	694	29.11017
Netherlands	138	1.752483		Senegal	722	14.24415		Peru	293	18.19164		Papua_New_G_	853	25.39797
Panama	283	7.790045		Seychelles	718	11.66529		Philippines	566	17.245		Romania	968	23.01906
Portugal	182	1.34724		Sierra_Leone	724	12.92551		Samoa	862	17.74505		Russia	922	29.92602
Qatar	453	8.89907		Sri_Lanka	524	9.67104		Slovenia	961	18.06794		Sao_Tome_Pr	716	27.344
South Africa	199	8.90859		St_Lucia	362	14.42015		St_Kitts_N	361	18.21355		Saudi_Arabia	456	63.44873
Spain	184	0.932723		Suriname	366	10.20047		St_Vincent_Gr	364	15.8012		Serbia	942	39.77809
Sudan	732	4.560122		Swaziland	734	13.94721		Togo	742	16.88458		Singapore	576	93.92611
Sweden	144	6.276018		Switzerland	146	10.29506		Tonga	866	16.26102		Slovak_Rep	936	22.70559
Tajikistan	923	6.314123		Turkey	186	11.54383		Tunisia	744	19.73596		Solomon_Is	813	22.84245
UK	112	1.684168		UAE	466	15.76141		Uganda	746	18.187		Syria	463	49.27987
US	111	0.512152		Uruguay	298	15.57648		Ukraine	926	20.31247		Thailand	578	31.57565
Zambia	754	6.725098						Venezuela	299	16.38546		Trinidad And Tobago	369	35.86967
												Vanuatu	846	23.15487

Table 3 *de Facto* Exchange Rate Regimes 1980-2010

Note: countries listed in the diagonal cells maintained the *de facto* regime through-out 1980-2010, countries in off-diagonal cells are those that started in the regime listed in each column header and switched (with date of switch given) to the regime type listed in each row header. Monthly regime classifications are from Ilzetzki, Reinhart and Rogoff (2010).

	Fixed regimes	**Intermediate regimes**	**Flexible regimes**
Fixed regimes	Belgium, San Marino, Luxembourg, Monaco, Panama, Antigua and Barbuda, Anguilla, Bahamas, Barbados, Dominica, Grenada, Belize, St. Kitts, St. Lucia, St. Vincent, Saudia Arbia, West bank and Gaza, Djibouti, Cameroon, Central Africa Republic, Chad, Congo, Benin, Gabon, Cote d'Ivoire, Lesotho, Mali, Niger, Senegal, Swaziland, Togo, Burkina Faso, Kiribati, Marshall Islands	UK 10 1990; Austria 8 1980; Denmark 1 1999; France 1 1987; Italy 12 1996; Netherlands 3 1983; Finland 1 1995; Greece 9 1989; Ireland 11 1996; Malta 1 2008; Portugal 7 1993; Spain 5 1994; Bolivia 11 2008; Costa Rica 10 2006; El Salvador 6 1990; Honduras 6 2005; Mexico 5 1992; Paraguay 2 2010; Venezuela 2 2003; Jamaica 11 1989; Cyprus 4 1992; Iran 1 2002; Jordan 9 1995; Kuwait 1 2003; Lebanon 3 1993; Egypt 10 1991; Bangladesh 4 2006; Sri Lanka 10 1989; Hong Kong 11 1983; India 8 1991; Nepal 2 1993; Nepal 1 2002; Philippines 9 1995; Burundi 12 2003; Equator Guinea 9 1984; Gambia 7 2003; Morocco 6 2004; Morocco 6 2005; Belarus 12 2003; China 1 1994; China 10 2008; Czech Rep 6 1997; Slovak Rep 1 2009; Latvia 7 2009; Hungary 10 2009; Lithuania 5 2007; Slovenia 12 2005; Macedonia 1 2001	Germany 1-1999 Iraq 1-2005 Malaysia 10-1998
Intermediate regimes	UK Sep-92; Costa Rica Oct-80; Haiti Jan-85; Honduras Apr-85; Mexico May-81; Mexico Feb-94; Nicaragua Jan-93; Venezuela Mar-83; Guyana Jun-82; Jamaica Jan-83; Jamaica May-93; Iraq Jan-82; Iraq Apr-03; Egypt Feb-03; Afghanistan Apr-08; Sri Lanka Aug-90; India Jul-95; Korea Mar-80; Malaysia Mar-08; Nepal Jul-95; Pakistan Jan-82; Angola Oct-09; Botswana Jun-80; Burundi Dec-83; Burundi Jan-05; Gambia Jun-07; Guinea Bissau Jan-84; Guinea Feb-91; Kenya Jan-87; Madagascar Apr-82; Morocco Oct-04; Mozambique Feb-03; Zimbabwe Aug-00; Belarus Apr-10; China Aug-05; Czech Rep Jan-02; Hungary Mar-10; Lithuania Nov-03; Lithuania Apr-09; Macedonia Jun-02	Norway Sweden Switzerland Canada New Zealand Colombia Singapore Mauritania Mauritius Tunisia	Turkey 8-2007 Haiti 1-2002 Gambia 10-1991 Nigeria 1-1990 Sierra Leone 7-2005 Zambia 1-2001 Albania 1-2002
Flexible regimes	Liberia 9-1998	Australia 11-1983 Iraq 8-2003 Malaysia 8-1997 Malawi 2-1984 Nigeria 2-1987 Zambia 1-2009	United States Japan

Table 4 Transitions from *de Facto* "falling" Regimes 1980-2010

Note: countries listed in the each column switched from a "free falling" regime to a *de facto* fixed, intermediate or flexible regime (with date of switch given). Monthly regime classifications are from Ilzetzki, Reinhart and Rogoff (2010).

Falling to Fixed regime

Country	Month	Year
Argentina	6	1985
Argentina	4	1991
Brazil	3	1986
Brazil	1	1989
Ecuador	3	2000
Nicaragua	5	1991
Venezuela	2	2008
Jamaica	1	1993
Suriname	10	2000
Angola	5	2004
Guinea	6	1986
Malawi	1	1995
Zimbabwe	4	1999
Zimbabwe	4	2009
Uganda	9	1986
Azerbaijan	2	1996
Bulgaria	1	1997
Tajikistan	11	1997
Estonia	7	1992
Lithuania	4	1995
Poland	1	1990

Falling to Intermediate regime

Country	Month	Year	Country	Month	Year
Italy	4	1993	Kenya	5	1994
Finland	4	1993	Madagascar	11	1995
Iceland	6	1984	Malawi	9	1999
Turkey	4	1981	Nigeria	10	1984
Turkey	2	1998	Nigeria	4	1996
Argentina	2	2003	Zimbabwe	7	1994
Bolivia	1	1987	Seychelles	2	2009
Brazil	7	1994	Tanzania	6	1985
Brazil	9	1999	Tanzania	8	1993
Chile	12	1982	Tanzania	2	2009
Costa Rica	11	1983	Uganda	1	1993
Dominican Rep	12	1985	Armenia	12	1995
Dominican Rep	9	1991	Belarus	1	2003
Dominican Rep	3	2004	Kazakhstan	6	1996
Ecuador	5	1984	Kyrgyz_Rep	12	1999
Ecuador	10	1993	Moldova	3	2000
Guatemala	7	1986	Russia	12	1999
Guatemala	5	1991	Tajikistan	8	2002
Haiti	4	2003	Slovak_Rep	4	1993
Honduras	4	1991	Latvia	9	1994
Mexico	12	1988	Mongolia	9	1997
Mexico	4	1996	Croatia	10	1994
Paraguay	5	1986	Slovenia	4	1993
Paraguay	2	1991	Macedonia	1	1995
Peru	11	1993	Romania	4	2001
Uruguay	12	1990			
Uruguay	10	1995			
Uruguay	10	2002			
Venezuela	4	1990			
Venezuela	7	1996			
Suriname	1	1988			
Suriname	12	1995			
Iran	3	1996			
Israel	10	1985			
Israel	1	1987			
Jordan	5	1989			
Lebanon	8	1991			
Myanmar	6	1991			
Myanmar	2	1994			
Indonesia	4	1999			
Korea	7	1998			
Lao	6	1990			
Pakistan	8	2008			
Philippines	3	1985			
Philippines	12	1997			
Thailand	1	1998			
Algeria	2	1995			
Burundi	6	1997			
Ghana	10	1990			
Ghana	8	1996			
Ghana	4	2001			

Falling to Flexible regime

Country	Month	Year
Turkey	4	2003
Haiti	3	1995
Congo Dem	12	1997
Gambia	3	1987
Ghana	6	1984
Ghana	10	1987
Uganda	9	1982
Zambia	8	2001
Albania	10	1993
Albania	2	1998

Table 5 Transitions to *de Facto* "falling" Regimes 1980-2010

Note: countries listed in the each column switched from a fixed, intermediate or flexible regime to a *de facto* "free falling" regime (with date of switch given). Monthly regime classifications are from Ilzetzki, Reinhart and Rogoff (2010).

Fixed to Falling regime		
Country	Month	Year
Argentina	4	1986
Brazil	9	1986
Brazil	4	1989
Chile	6	1982
Ecuador	3	1982
Venezuela	11	2007
Jamaica	10	1990
Jordan	10	1988
Philippines	7	1997
Thailand	7	1997
Malawi	8	1997
Uganda	10	1989
Moldova	6	1998
Tajikistan	10	1998
Poland	6	1991

Intermediate to Falling regime		
Country	Month	Year
Italy	9	1992
Finland	9	1992
Turkey	5	1984
Turkey	2	2001
Argentina	3	1981
Brazil	2	1999
Costa Rica	1	1981
Dominican Rep	2	1985
Dominican Rep	7	1987
Dominican Rep	9	2002
Ecuador	4	1987
Ecuador	10	1997
Guatemala	6	1989
Haiti	10	1991
Haiti	5	1993
Haiti	1	2003
Honduras	3	1990
Mexico	2	1982
Mexico	1	1995
Paraguay	4	1985
Paraguay	3	1989
Uruguay	12	1982
Uruguay	12	1991
Uruguay	7	2002
Venezuela	12	1986
Venezuela	10	1992
Suriname	4	1986
Suriname	5	1991
Suriname	2	1998
Iran	2	1994
Israel	9	1986
Lebanon	3	1984
Myanmar	4	1988
Myanmar	1	1993
Myanmar	8	1996
Indonesia	8	1997
Korea	12	1997
Lao	5	1988
Lao	1	1997
Pakistan	3	2008
Philippines	10	1983
Algeria	4	1994
Burundi	5	1996
Ghana	3	1994
Ghana	11	1999
Kenya	10	1991
Madagascar	5	1994
Nigeria	6	1991
Zimbabwe	5	1991
Zimbabwe	11	1997
Zimbabwe	1	2002
Seychelles	11	2008
Tanzania	9	1983
Tanzania	9	1991
Tanzania	10	2008
Uganda	1	1981

Flexible to Falling regime		
Country	Month	Year
Nicaragua	9	1982
Ghana	5	1986
Ghana	8	1989
Malawi	2	1994
Uganda	11	1983
Albania	1	1997
Mongolia	6	1993

Table 6 Capital Controls

No Capital Controls 2006-2011

Country	IFS code	Chinn-Ito
Armenia	911	2.439009
Austria	122	2.439009
Belgium	124	2.439009
Botswana	616	2.439009
Canada	156	2.439009
Czech_Rep	935	2.439009
Denmark	128	2.439009
Estonia	939	2.439009
Finland	172	2.439009
France	132	2.439009
Gambia	648	2.439009
Germany	134	2.439009
Greece	174	2.439009
Guatemala	258	2.439009
Guyana	336	2.439009
Hong_Kong	532	2.439009
Hungary	944	2.439009
Ireland	178	2.439009
Israel	436	2.439009
Italy	136	2.439009
Japan	158	2.439009
Jordan	439	2.439009
Latvia	941	2.439009
Liberia	668	2.439009
Micronesia	868	2.439009
Netherlands	138	2.439009
New_Zealand	196	2.439009
Nicaragua	278	2.439009
Norway	142	2.439009
Oman	449	2.439009
Panama	283	2.439009
Peru	293	2.439009
Portugal	182	2.439009
Qatar	453	2.439009
Singapore	576	2.439009
Spain	184	2.439009
Sweden	144	2.439009
Switzerland	146	2.439009
Trinidad_Tob	369	2.439009
UAE	466	2.439009
Uganda	746	2.439009
UK	112	2.439009
Uruguay	298	2.439009
US	111	2.439009
Zambia	754	2.439009

New Controls 2008-2011

Country	IFS code	Chinn-Ito	Year
Albania	914	-0.11297	2010
Azerbaijan	912	0.32817	2008
Azerbaijan	912	-0.64134	2009
Azerbaijan	912	-0.3776	2010
Bolivia	218	0.855658	2008
Bolivia	218	0.591914	2009
Bolivia	218	0.32817	2010
Bosnia_Herzeg	963	1.205755	2009
Brazil	223	0.150779	2010
Chile	228	2.175265	2008
Chile	228	1.911521	2009
Chile	228	1.647777	2010
Colombia	233	1.120288	2008
Colombia	233	-0.11297	2009
Comoros	632	-0.90508	2010
Djibouti	611	2.175265	2009
Djibouti	611	1.911521	2010
Dominica	321	1.120288	2008
Dominica	321	-0.11297	2009
Ecuador	248	2.175265	2009
Ecuador	248	1.911521	2010
Egypt	469	2.175265	2009
Egypt	469	1.911521	2010
El_Salvador	253	2.175265	2009
El_Salvador	253	1.911521	2010
Eritrea	643	-1.16883	2009
Georgia	915	0.688003	2009
Georgia	915	-0.54525	2010
Honduras	268	1.120288	2008
Honduras	268	-0.11297	2009
Iceland	176	-1.16883	2008
Jamaica	343	1.911521	2008
Jamaica	343	1.647777	2009
Jamaica	343	1.384032	2010
Korea	542	0.150779	2008
Lithuania	946	2.175265	2008
Lithuania	946	1.911521	2009
Lithuania	946	1.647777	2010
Malaysia	548	1.120288	2008
Malaysia	548	-0.11297	2009
Maldives	556	1.743865	2009
Mauritius	684	2.175265	2009
Mauritius	684	1.911521	2010
Mongolia	948	0.952632	2009
Paraguay	288	1.119403	2008
Paraguay	288	0.855658	2009
Paraguay	288	0.591914	2010
Philippines	566	-1.16883	2010
Russia	922	0.150779	2009
Rwanda	714	-0.90508	2010
Sao_Tome_Pr	716	0.510611	2009
Seychelles	718	2.175265	2008
Sierra_Leone	724	0.064426	2008
Sierra_Leone	724	-1.86397	2009
Slovenia	961	2.175265	2008
Slovenia	961	1.911521	2009
Slovenia	961	1.647777	2010
Sudan	732	-1.60023	2010
Tajikistan	923	0.064426	2008
Tajikistan	923	-1.16883	2009
Thailand	578	-0.11297	2008
Tonga	866	0.064426	2008
Turkey	186	0.064426	2008
Viet_Nam	582	-0.11297	2008
Zimbabwe	698	-1.16883	2009
Zimbabwe	698	-0.11297	2010

Long-Standing Controls

Country	IFS code	Chinn-Ito
Algeria	612	-1.16883
Angola	614	-1.16883
Antigua_Barb	311	1.383147
Argentina	213	-0.80811
Australia	193	1.120288
Bahamas	313	-1.86397
Bangladesh	513	-1.16883
Barbados	316	-1.16883
Belarus	913	-1.16883
Benin	638	-1.16883
Bhutan	514	-1.16883
Bulgaria	918	2.175265
Burkina_Faso	748	-1.16883
Burundi	618	-1.86397
Cambodia	522	1.205755
Cameroon	622	-1.16883
Cape_Verde	624	-1.16883
Car	626	-1.16883
Chad	628	-1.16883
China	924	-1.16883
Congo__Dem_	636	-1.16883
Congo__Rep_	634	-1.16883
Costa_Rica	238	1.205755
Cote_D_Ivoire	662	-1.16883
Croatia	960	1.120288
Cyprus	423	1.911521
Dominican_Rep	243	1.384032
Equat_Guinea	642	-1.16883
Ethiopia	644	-1.16883
Fiji	819	-1.16883
Gabon	646	-1.16883
Ghana	652	-1.16883
Grenada	328	-1.16883
Guinea_Bissau	654	-1.16883
Haiti	263	2.175265
India	534	-1.16883
Indonesia	536	1.120288
Iraq	433	0.064426
Kazakhstan	916	-1.16883
Kenya	664	1.120288
Kuwait	443	1.120288
Kyrgyz_Rep	917	1.120288
Lebanon	446	1.120288
Lesotho	666	-1.16883
Libya	672	-1.16883
Madagascar	674	-0.11297
Malawi	676	-1.86397
Mali	678	-1.16883
Malta	181	1.911521
Mauritania	682	-1.16883
Mexico	273	1.120288
Moldova	921	-1.16883
Morocco	686	-1.16883
Mozambique	688	-1.16883
Myanmar	518	-1.86397
Namibia	728	-1.16883
Niger	692	-1.16883
Nigeria	694	-0.54525
Papua_New_G_	853	0.064426
Poland	964	0.064426
Romania	968	2.175265
Samoa	862	-1.16883
Saudi_Arabia	456	1.120288
Senegal	722	-1.16883
Slovak_Rep	936	0.591914
Solomon_Is	813	-1.16883
South_Africa	199	-1.16883
Sri_Lanka	524	0.064426
St_Kitts_N	361	-1.16883
St_Lucia	362	0.064426
St_Vincent_Gr	364	-1.16883
Suriname	366	-1.86397
Swaziland	734	-1.16883
Syria	463	-1.86397
Togo	742	-1.16883
Tunisia	744	-1.16883
Ukraine	926	-1.16883
Venezuela	299	-1.07274

Table 7 Large Currency Depreciations against USD during the GFC

Country	IFS Code	Percent Depreciation	% Reserve Change	Chinn-Ito
Australia	193	34	1	1.12
Belarus	913	35	-32	-1.17
Brazil	223	46	-9	0.41
Colombia	233	34	-3	-0.11
Congo Dem	636	34	-86	-1.17
Czech Rep	935	33	-4	2.44
Hungary	944	45	24	2.44
Iceland	176	36	-19	-1.17
Indonesia	536	31	-14	1.12
Kazakhstan	916	26	-12	-1.17
Korea	542	41	-17	0.41
Lesotho	666	30	na	-1.17
Mexico	273	47	-7	1.12
Mongolia	948	28	-32	0.95
Namibia	728	30	-2	-1.17
New Zealand	196	38	-13	2.44
Nigeria	694	25	-20	-0.55
Norway	142	30	4	2.44
Paraguay	288	28	-10	0.86
Poland	964	62	-25	0.06
Romania	968	41	-14	2.44
Russia	922	45	-35	0.15
Serbia	942	42	-26	na
Seychelles	718	110	102	2.44
South Africa	199	30	-3	-1.17
Swaziland	734	30	-6	-1.17
Sweden	144	41	-17	2.44
Turkey	186	44	-11	0.06
UK	112	29	-10	2.44
Ukraine	926	59	-31	-1.86
Zambia	754	60	-32	2.44
Zimbabwe	698	>1000%	-74	-1.17

Note: Exchange rate depreciation and reserve percentage changes are based on monthly IFS data between August 2008 and February 2009. The Chinn-Ito financial openness measure is for 2009.

Table 8 Large Reserve Changes during the GFC

Country	IFS Code	Percent Depreciation	% Reserve Change	Chinn-Ito
Armenia	911	1	-29	2.44
Austria	122	16	-30	2.44
Belarus	913	35	-32	-1.17
Benin	638	17	-27	-1.17
Bulgaria	918	17	-30	2.44
Congo Dem	636	34	-86	-1.17
Croatia	960	20	-25	1.12
Ecuador	248	0	-44	2.18
Fiji	819	17	-46	-1.17
France	132	16	-45	2.44
Ghana	652	20	-41	-1.17
Guinea Bissau	654	17	-35	-1.17
Jamaica	343	22	-33	1.65
Macedonia	962	17	-27	0.06
Malawi	676	0	-48	-1.86
Malaysia	548	9	-26	-0.11
Mauritania	682	13	-25	-1.17
Mongolia	948	28	-32	0.95
Montenegro	943	17	-55	na
Niger	692	17	-25	-1.17
Papua New G	853	8	-31	0.86
Poland	964	62	-25	0.06
Portugal	182	16	-31	2.44
Russia	922	45	-35	0.15
Serbia	942	42	-26	na
Sri Lanka	524	6	-57	0.06
Sudan	732	9	-70	-1.86
Tajikistan	923	9	-74	-1.17
UAE	466	0	-46	2.44
Ukraine	926	59	-31	-1.86
Venezuela	299	0	-30	-1.60
Zambia	754	60	-32	2.44
Zimbabwe	698	>1000%	-74	-1.17

Note: Exchange rate depreciation and reserve percentage changes are based on monthly IFS data between August 2008 and February 2009. The Chinn-Ito financial openness measure is for 2009.

Table 9 Capital Controls, by Country and Category, 2000-2011

Country	Year Implemented	Asset Classes	Details
Argentina	2003-	multiple	Inflows and outflows
Angola	2009-	Foreign exchange	Inflows and outflows
Australia	continuous	Equities and FDI	inflows
Bolivia	2009-	Foreign exchange	Inflows and outflows
Brazil	2006, 2007, 2009, 2011	multiple	Inflows and outflows
Chile	2001, 2002	multiple	inflows
China	Continuous	multiple	Inflows and outflows
Colombia	2007, 2008-	Bonds and Equities	Inflows and outflows
Cyprus	2013	Money Market	Outflows
Hungary	2010-	FDI	Inflows
Iceland	2005, 2008-	multiple	Inflows and outflows
India	continuous	multiple	Inflows and outflows
Indonesia	2010-	Bonds	Holding period
Ireland	2008-	Money Market	Inflows and outflows
Kazakhstan	2009-	multiple	Inflows and outflows
Malaysia	continuous	multiple	Inflows and outflows
Mexico	2005-	FDI	Inflows
Morocco	Continuous	multiple	Inflows and outflows
Nigeria	2009-	Foreign exchange	Bank flows
Peru	2009, 2010-	Bonds and Equities	inflows
Philippines	continuous	multiple	Inflows and outflows
Portugal	2001-	Bonds and Equities	inflows
Poland	continuous	Equities and FDI	inflows
Russia	continuous	multiple	Inflows and outflows
So Africa	continuous	multiple	Inflows and outflows
Sweden	2002-	Money and Equities	inflows
Thailand	2010-	Bonds and Equities	inflows
Turkey	2007-	Money Market	inflows
Ukraine	2008-	Foreign Exchange	Inflows and outflows
Uzbekistan	2009-	Foreign Exchange	Inflows and outflows
Venezuela	2009-	Foreign Exchange	outflows
Vietnam	2009-	Foreign Exchange	Inflows and outflows
Zambia	2009-	Foreign Exchange	Inflows and outflows

Note: Information is from Forbes et. al. (2012, Appendix A and B), Klein (2012, table A.1) and Weber and Wyplosz (2009, Table 1).

Figure 1

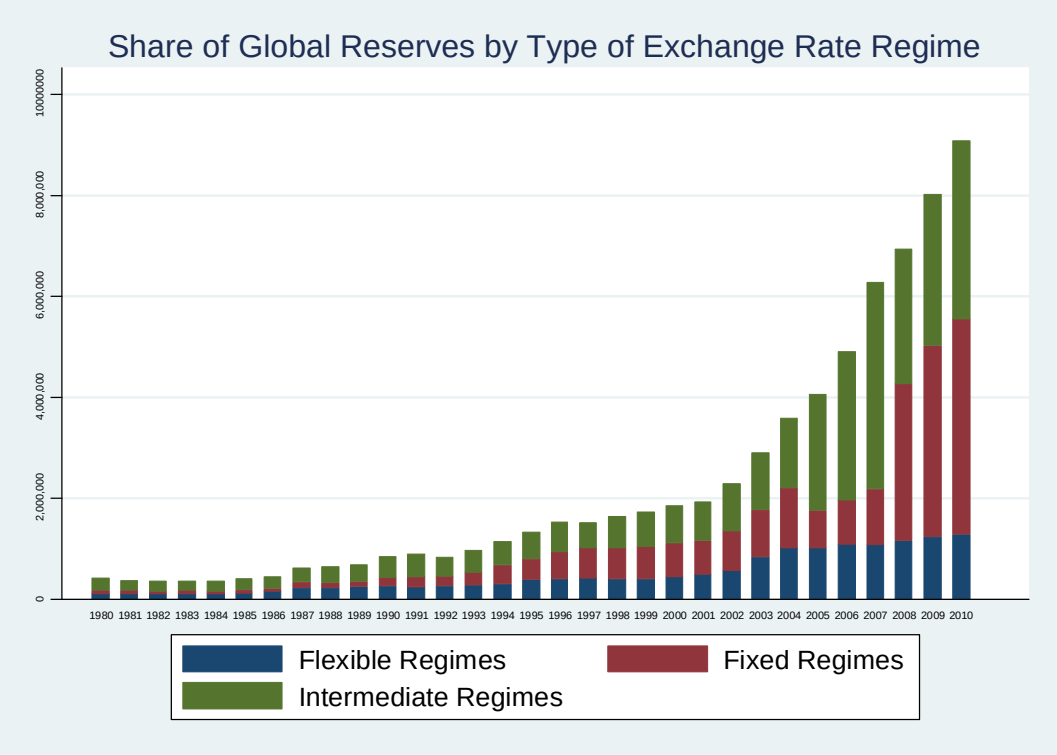


Figure 2

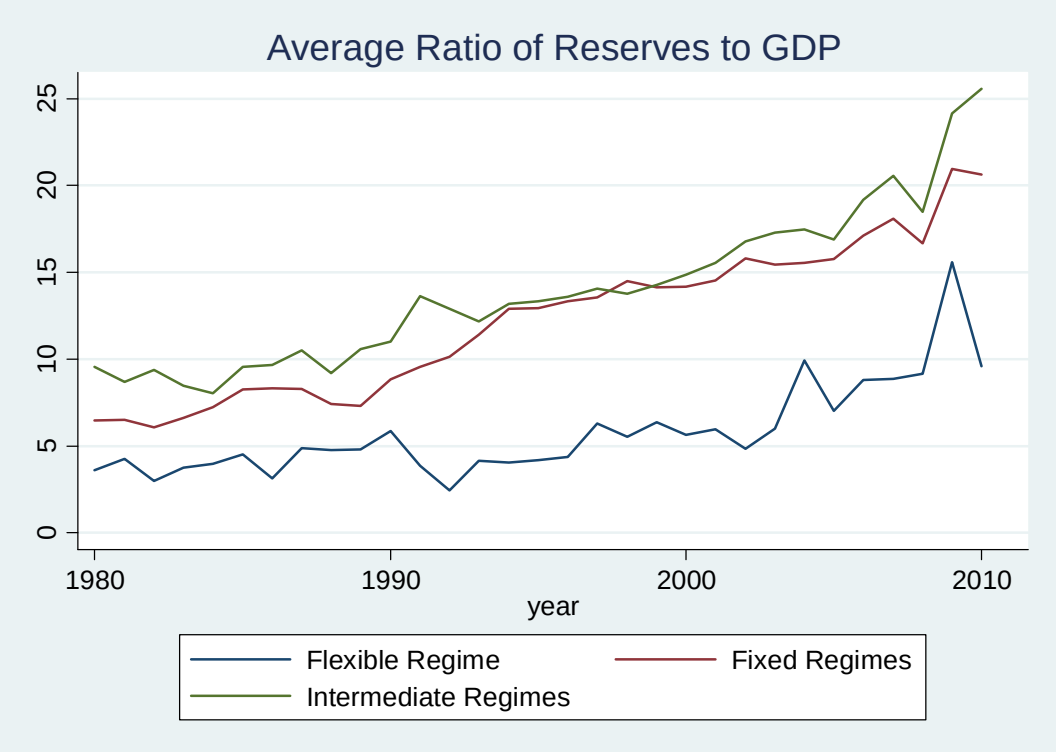


Figure 3

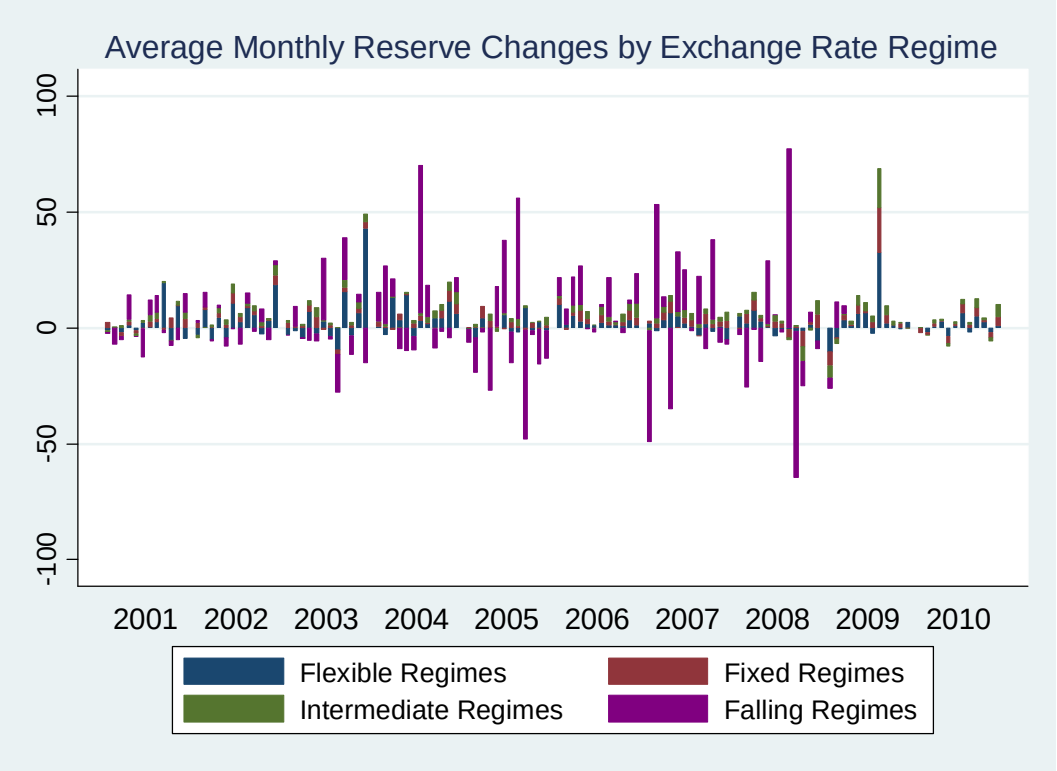


Figure 4

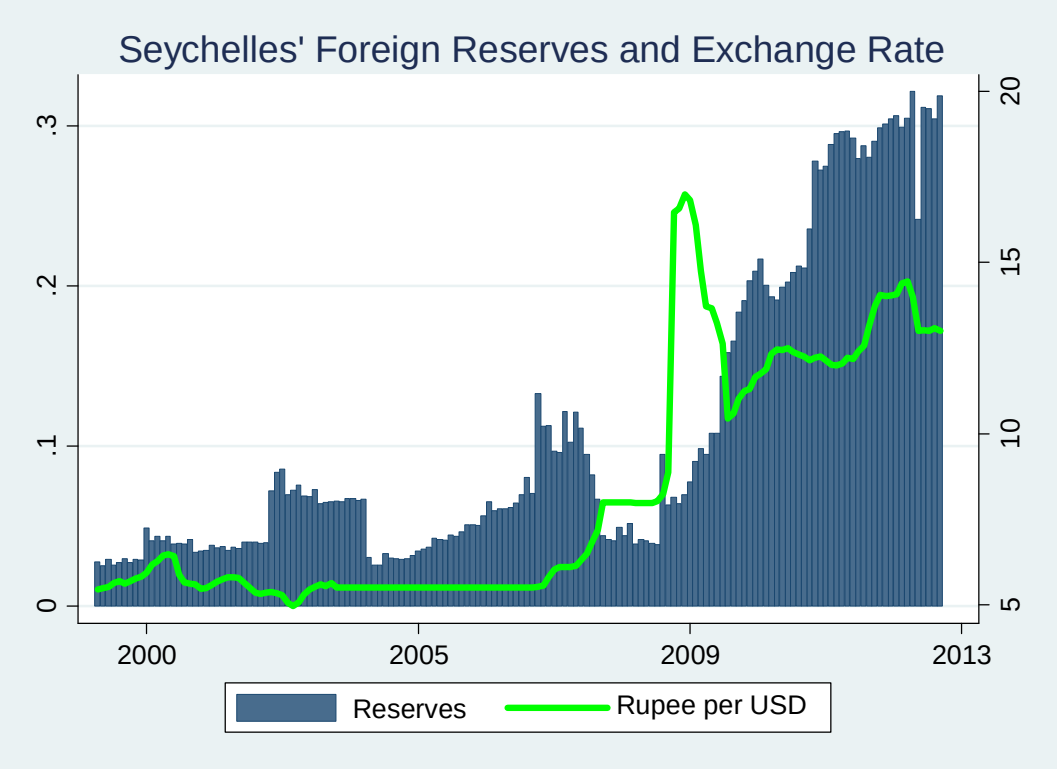


Figure 5

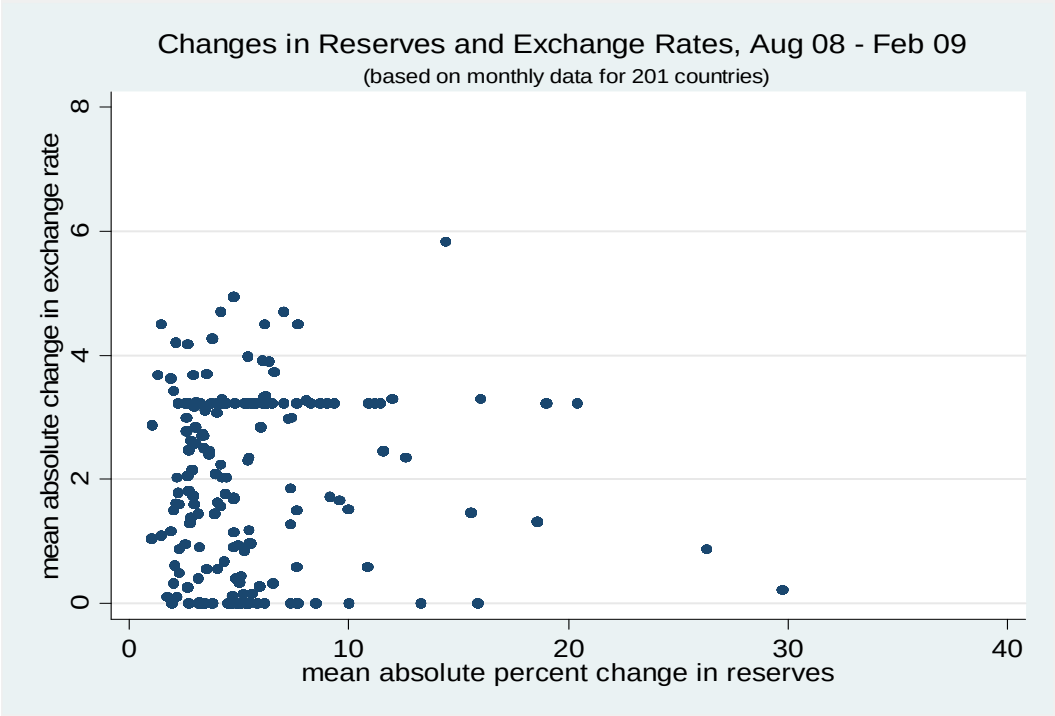
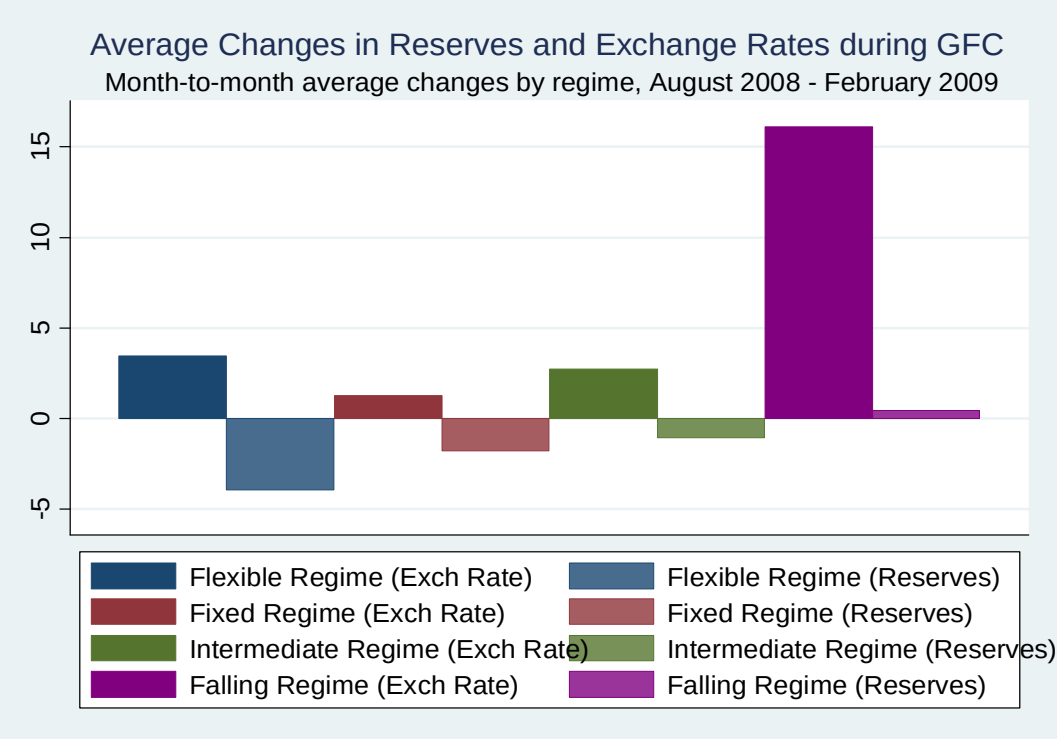
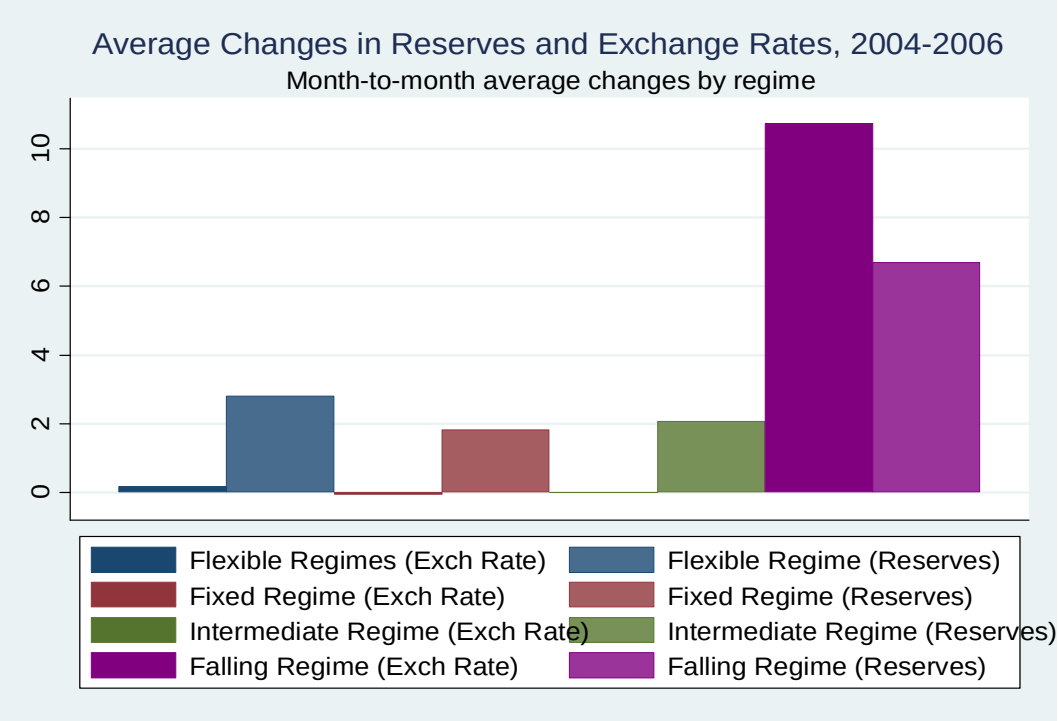


Figure 6



Note: Falling regimes include Pakistan, Seychelles, Tanzania and Zimbabwe.

Figure 7



Note: Falling regimes include Dominican Republic, Myanmar, Angola and Zimbabwe.

Figure 8

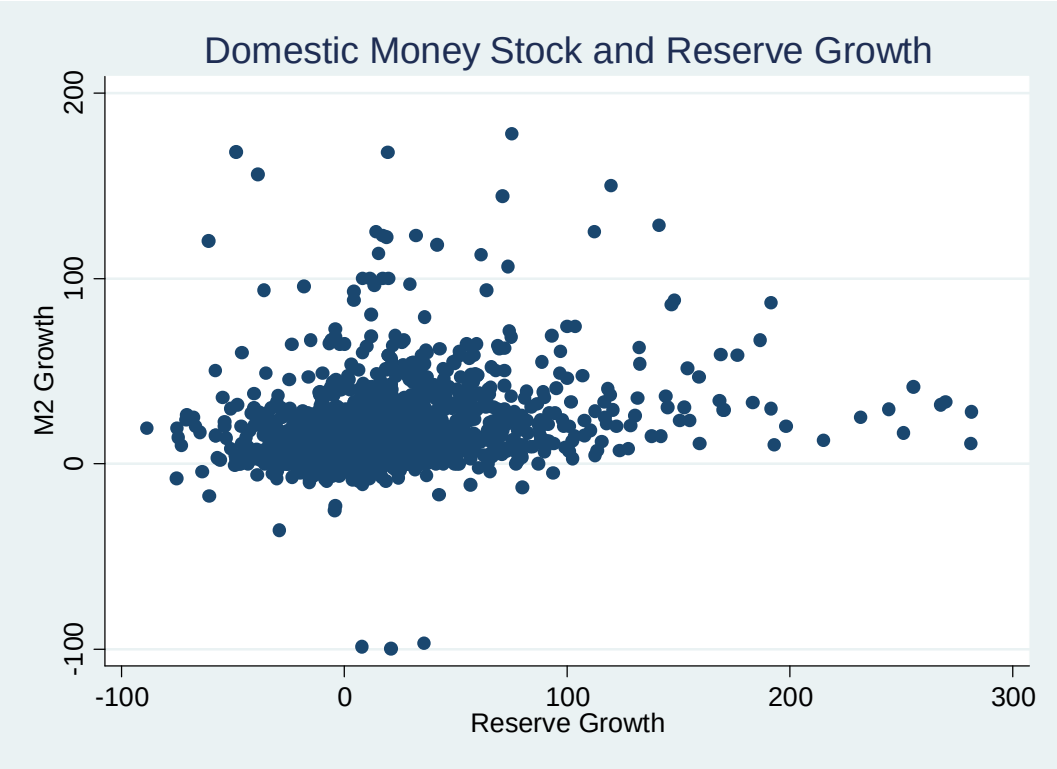
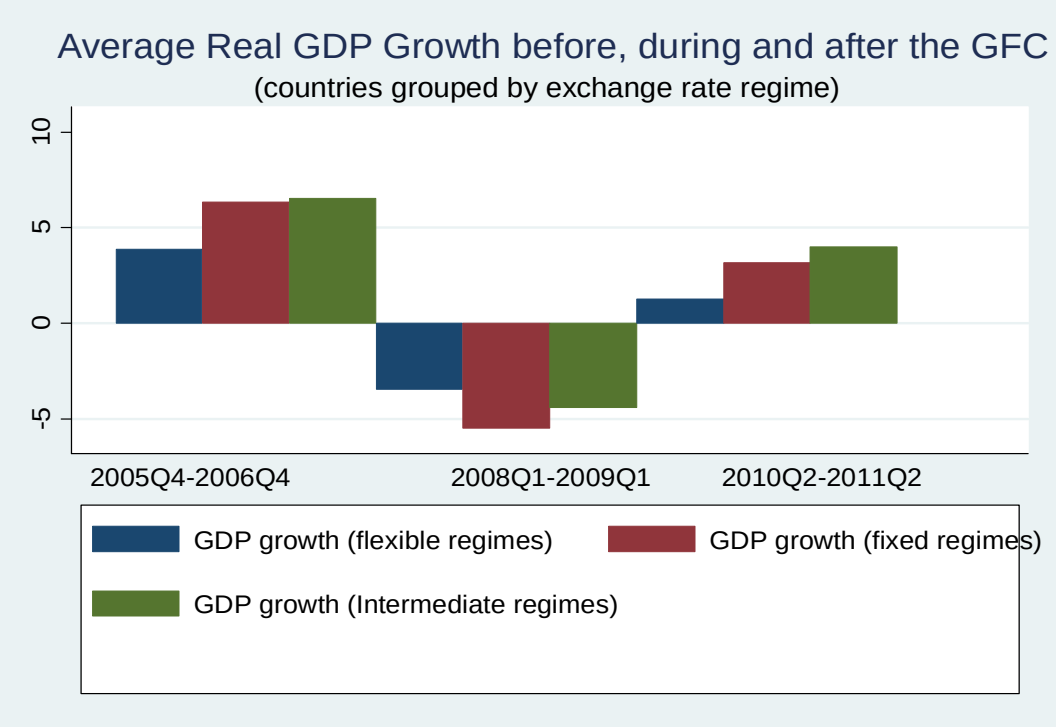


Figure 9



Note: Real GDP data are not available for countries with "free falling" regimes.