

Tapering Talk

The Impact of Expectations of Reduced Federal Reserve Security Purchases on Emerging Markets

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Abstract

In May 2013, Federal Reserve officials first began to talk of the possibility of tapering their security purchases. This tapering talk had a sharp negative impact on emerging markets. Different countries, however, were affected very differently. This paper uses data on exchange rates, foreign reserves and equity prices between April and August 2013 to analyze who was hit and why. It finds that emerging markets that allowed the real exchange rate to appreciate and the current account deficit to widen during the prior period of quantitative easing saw

the sharpest impact. Better fundamentals (the budget deficit, the public debt, the level of reserves, or the rate of economic growth) did not provide insulation. A more important determinant of the differential impact was the size of the country's financial market: countries with larger markets experienced more pressure on the exchange rate, foreign reserves, and equity prices. This is interpreted as showing that investors are better able to rebalance their portfolios when the target country has a relatively large and liquid financial market.

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Tapering Talk: The Impact of Expectations of Reduced Federal Reserve Security Purchases on Emerging Markets

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1. Introduction

In May 2013, officials of the Federal Reserve System first began to talk of the possibility of the U.S. central bank tapering its securities purchases (gradually reducing them from the prevailing \$85 billion monthly rate to something lower, presumably as a prelude to phasing them out entirely). A milestone to which many observers point is May 22, 2013 when Chairman Bernanke raised the possibility of tapering in his testimony to the Congress. This “tapering talk” had a sharp negative impact on economic and financial conditions in emerging markets.

Three aspects of that impact are noteworthy. First, not only was the impact sharp but, in the view of many commentators, it was surprisingly large. The most alarmed (some would say alarmist) commentators raised the possibility that some emerging countries might be heading towards a full blown crisis like that in Mexico in 1994 and Asia in 1998. Second, the impact was not felt uniformly; different countries were affected rather differently. Third, there were complaints from policy makers in the developing world about the Fed’s turn to tapering that were seemingly hard to square with earlier criticisms of quantitative easing by the U.S. central bank as a form of “currency war.”

This paper is a first attempt to shed light on these issues. We use data for a cross section of emerging markets to analyze who was hit by the Fed’s tapering talk and why. We focus on the change in exchange rates, foreign reserves and equity prices between April 2013, just prior to talk of tapering, and August 2013, by which time the response was largely complete (in September, new data on the condition of the U.S. economy led Federal Reserve officials to make statements that moderated prior expectations of tapering). We relate the reaction of these variables to several classes of potential determinants: (a) observable macroeconomic fundamentals like the budget deficit, public debt, foreign reserves and GDP growth rate in the prior period; (b) the size and openness of a country’s financial markets; and (c) the extent to which capital-flow-sensitive indicators like the real exchange rate and current account balance had been allowed to move in the prior period when quantitative easing was underway, there had been no expectations of tapering, and policy makers in emerging markets had complained of currency wars.

On the basis of this analysis we analyze who was hit and why. Our answers are as follows. First, there is little evidence that countries with stronger macroeconomic fundamentals (smaller budget deficits, lower debts, more reserves and stronger growth rates in the immediately prior period) were rewarded with smaller falls in exchange rates, foreign reserves and stock prices starting in May. What mattered more was the size of their financial markets; investors seeking to rebalance their portfolios concentrated on emerging markets with relatively large and liquid financial systems, these were the markets where they could most easily sell without incurring losses and where there was the most scope for portfolio rebalancing. The obvious contrast is with so-called frontier markets with smaller and less liquid financial systems. This is a reminder that success at growing the financial sector can be a mixed blessing. Among other things, it can accentuate the impact on an economy of financial shocks emanating from outside.

In addition, we find that the largest impact of tapering was felt by countries that allowed exchange rates to run up most dramatically in the earlier period of expectations of continued easing on the part of the Federal Reserve, when large amounts of capital were flowing into emerging markets. Similarly, we find a large impact in countries that allowed the current

account deficit to widen most dramatically in the earlier period when it was easily financed. Countries that used policy and in some cases, perhaps, enjoyed good luck that allowed them to limit the rise in the real exchange rate and the growth of the current account deficit in the boom period suffered the smallest reversals. This provides some intuition for how it was that the same countries could complain about quantitative easing while it was underway – QE had large, disconcerting impacts on local markets – and then also complain about tapering talk. Talk of tapering had a relatively large negative impact on those local markets that earlier allowed their asset prices to run up sharply and their current accounts to widen relatively dramatically.

We interpret these real exchange rate and current account measures as picking up the impact, positive, negative or neutral, of macroprudential policy broadly defined. Recall that we control for the stance of fiscal policy (since fiscal tightening can also limit the appreciation of asset prices in a period when capital is flowing in). In addition, we control for the intensity of capital controls in the prior period. These, similarly, do not appear to have exerted a consistently significant impact on the effects of tapering. Nor does their inclusion alter the estimated effect of the change in the real exchange rate. Evidently, neither capital controls, nor fiscal tightening, nor even a combination of the two, sufficed to damp down the effects of financial inflows. Instead, a broader array of macroprudential policies – limits on the rate of growth of bank lending, loan-to-value regulation for the mortgage market, and similar measures – may have made a difference by moderating either the upward pressure on the exchange rate or the widening of the current account deficit, and may therefore be called for in the future.

2. Data

In what follows we consider the impact of tapering on exchange rates, foreign reserves and stock prices, but we also calculate composite indices of overall capital market pressure. These indices are constructed as a weighted average of changes in exchange rates, reserves and stock market yields. These indices are constructed in a manner analogous to the exchange market pressure index of Eichengreen, Rose and Wyplosz (1995), which is a weighted average of changes in exchange rates, reserves, and policy interest rates, where the weights were the inverses of the standard deviation of each series. We first create this index using data for exchange rate and reserve losses, and then add the negative of the changes in stock yields (denoting the two versions Index 1 and Index 2, respectively).² For the weights, we calculate the standard deviations for each series using monthly data from January 2000 to August 2013. The weights are then the inverses of the standard deviations (see Appendix B).

Most of the data definitions and sources will be familiar. We calculate changes in the real exchange rate using data for the nominal exchange rate with respect to the US dollar and the consumer price index for the subject country and the United States. Alternatively, we use data for real effective exchange rates from the *Global Economic Monitor* database of the World Bank and the *International Financial Statistics* of the International Monetary Fund, although the latter covers far fewer countries. It turns out that exchange rate data constructed using different sources are highly correlated and in practice make little difference for our results. We therefore report the results using the data for bilateral real exchange rate in the regressions reported here. We

² We also did the same including changes in sovereign bonds yields and credit default swaps spreads, but these are available for far fewer countries (not all the countries in the sample having well-functioning government bond markets).

calculate the percent change in real exchange rates between 2009 and 2012 in two ways. We first take the percent cumulative change over the period from 2009 to 2012 and, as an alternative, the average of annual percent changes for 2012, 2011 and 2010. Since the two methods produce very similar series, we report only those for the latter.

Financial market size is measured by total external private financing—i.e. inflows of equity, bonds and loans (these are data for 2010-2012 from the IMF *Global Financial Stability Report*, transformed into logarithms). Alternatively, we measure financial market size as the portfolio liability stock from Lane and Milesi-Ferretti (2012), as stock market capitalization, and as aggregate GDP. Reassuringly, use of these alternatives had little material impact on the results, since most of the alternative measures are fairly highly correlated. Similarly, there are several common measures of reserve adequacy: reserves in months of imports, reserves as proportion of M2, reserves as a share of GDP, reserves relative to total external debt and reserves relative to short term debt. Below we report results for the ratio of reserves to M2. Results using other measures are similar.

Table 1: Effect on Measures of Market Conditions in BRICS countries, Indonesia and Turkey, April-July, 2013

	% Change in Nominal Exchange Rate	% Change in Stock Indices	% Change in External Reserves	Basis Points Change in Bond Yields	Basis Points Change in CDS	Capital Market Pressure Index I	Capital Market Pressure Index II
Brazil	12.52	-8.92	-1.69	55.78	64.06	3.46	5.00
Russia	4.63	0.42	-3.32	24.95	35.95	2.74	2.69
India	9.98	4.04	-4.77	n.a.	n.a.	7.15	6.57
Indonesia	3.58	-10.01	-13.61	64.75	64.06	5.06	6.47
China	-0.85	-6.49	0.38	23.54	51.78	-2.71	-1.80
South Africa	8.96	3.07	-5.42	57.68	48.17	3.98	3.26
Turkey	7.61	-12.16	-8.20	40.85	66.97	3.26	4.63

Note: An increase in nominal exchange rate is depreciation; increase in capital market pressure indices I and II imply a larger nominal depreciation or reserve loss; and a larger nominal depreciation, reserve loss, or decline in stock market index, respectively.

Table 1 offers an overview of the behavior of these measures of market conditions in the summer of 2013, displaying their values for the BRICS countries, and Indonesia and Turkey, well known cases on which much commentary focused. We see that with the exception of China their exchange rates all depreciated (China of course being known for its policy of seeking to stabilize its currency against the dollar). Similarly, reserves fell in six of seven cases (again China being an exception). But equity prices fell in just 4 of 7 cases (including in China), in a first hint of the heterogeneity we document below. Our composite indices show a negative

impact of tapering on financial conditions overall in the six other countries but not China (where, however, it should be noted that the stock market did decline).³

3. Overview

We now proceed to analyzing the entire class of emerging markets. We start with the same set of countries as in Ghosh et al. (2013), to which we add Ghana; Hong Kong SAR, China; Kenya; Ireland; Singapore; and Tanzania. This gives us the universe of countries included in the various definitions of emerging markets. We drop Eurozone countries (Estonia, Greece, Ireland, Italy, Portugal, Slovakia and Spain), since they have no meaningful national exchange rate, as well as countries that use the US dollar as their currency (Ecuador, El Salvador and Panama). We also drop Egypt because it experienced shocks independent of retrenchment. This gives us 53 countries.

Some emerging markets started experiencing effects immediately after the Fed Chairman's testimony on May 22, and those effects persisted through much of the summer. We therefore calculate cumulative changes in the variables of interest between the end of April and, alternatively, the end of June, the end of July and the end of August.

Table 2 shows that 36 of the 53 countries experienced some exchange rate depreciation between the end of April and the end of June.⁴ Even as some of these exchange rates recovered by the end of August, exchange rates for almost 60 percent of the countries remained below the levels at the end of April. The average rate of depreciation was over 6 percent, and exchange rates for half the countries had depreciated by more than 5½ percent.

Panel A of Figure 1 provides additional details on the distribution of exchange rate changes across countries between the end of April and end of July. The largest changes were in Brazil, India, Paraguay, South Africa, and Uruguay. Note that three of the BRICS countries are included in this list. All of these countries experienced exchange rate depreciations of 9 percent or greater during this period, with Brazil having the largest depreciation at 12.5 percent.

Reserves declined for 29 countries between April and July 2013, as shown in Panel B. The countries with the largest declines were the Dominican Republic, Indonesia, Pakistan, Sri Lanka, and Ukraine.⁵ In some countries the pace of decline accelerated considerably in August.

Stock markets declined on average as well. We have data for fewer countries for stock market indices (the indices are in nominal local currency, with the exception of Israel, which had data indexed in nominal USD). Twenty-five of the 38 countries for which we have data experienced some decline in their stock markets. The cumulative decline between April and August averaged at 6.9 percent, and the median decline was 6.2 percent, as shown in Panel C of Table 2. Panel C of Figure 1 shows the distribution of the effect on stock markets across countries, between the end of April and end of July. The effect on stock markets is much more

³ In addition, bond spreads widened and credit default swap spreads widened in all six cases for which they are available. Note the preceding footnote.

⁴ We extracted the data from Global Economic Monitoring database of the World Bank, on October 29, 2013. Data from other sources, including Bloomberg, was extracted in the same week.

⁵ Egypt's foreign reserves rose by 33 percent between the end of April and the end of July. Since this clearly reflected domestic political shocks, we drop it from the sample when proceeding to regression analysis.

heterogeneous than on exchange rates. Fully 40 percent of the countries did not experience a stock market decline. For seven emerging markets (Chile, the Czech Republic, Indonesia, Kazakhstan, Peru, Serbia, and Turkey), however, the decline was more than 10 percent. The stock market index for Peru declined by over 24 percent, a value that was 10 percentage points greater than the country with the second greatest decline, Serbia.⁶

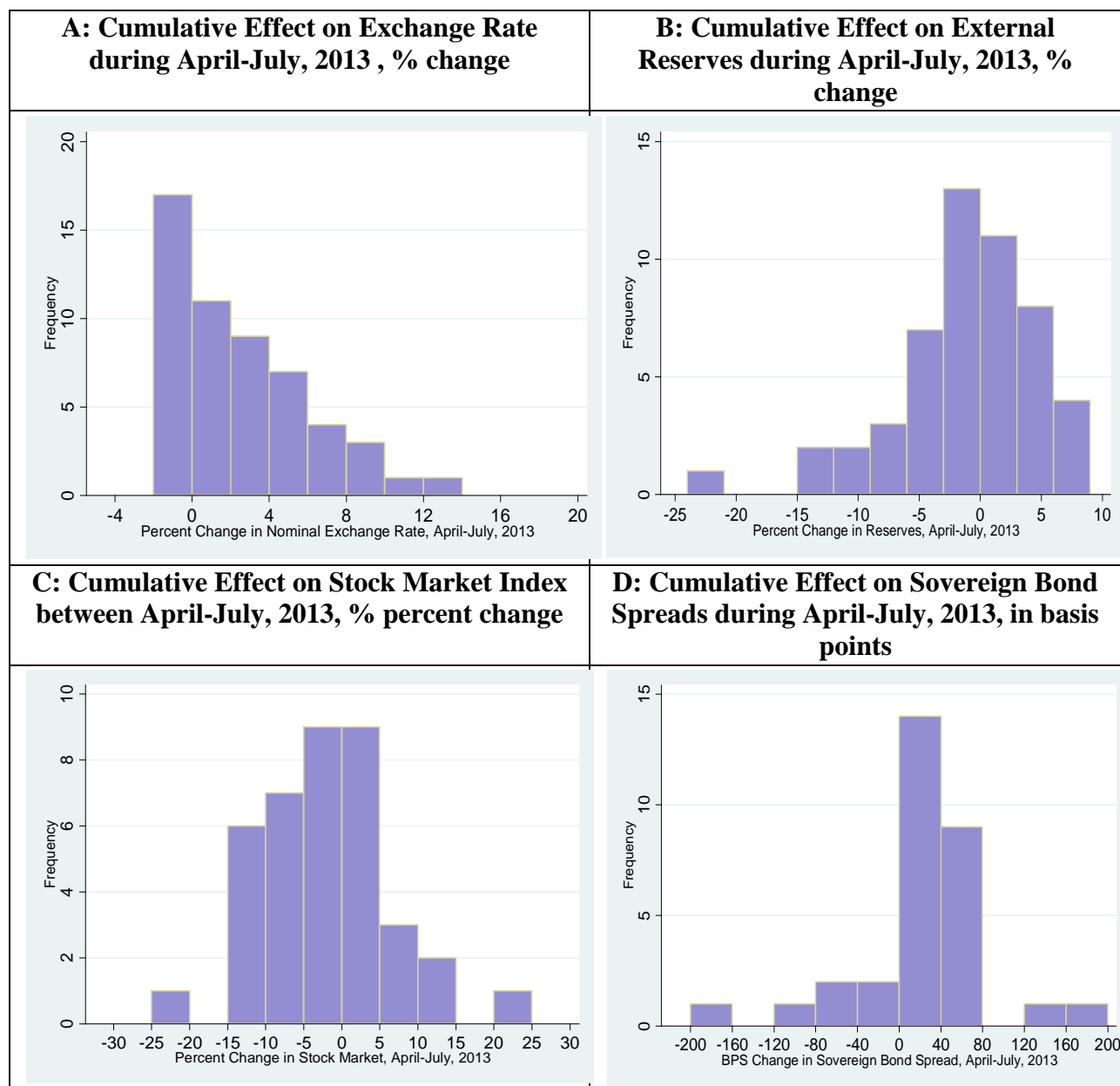
Table 2: Cumulative Percentage Changes in Capital Market Conditions

A. Exchange Rates			
	April-June	April-July	April-August
Fraction of Countries in which Exchange Rate Depreciated	36/53	35/53	30/53
(average for countries which experienced an exchange rate depreciation)			
Mean Depreciation (%)	3.14	4.26	6.21
Median Depreciation (%)	1.90	3.84	5.62
B. Cumulative Percent changes in Foreign Reserves			
	April-June	April-July	April-August
Fraction of Countries in which Reserves Declined	36/52	29/51	29/51
(average for countries which experienced a decline in reserves)			
Mean Decline (%)	-2.98	-5.15	-6.21
Median Decline (%)	-2.12	-3.18	-4.55
C: Cumulative Percentage Change in Stock Market Index			
	April-June	April-July	April-August
Fraction of Countries in which Stock Market Index Declined	25/38	23/38	25/38
(average for countries which experienced a decline in stock market index)			
Mean Decline (%)	-6.21	-7.56	-6.94
Median Decline (%)	-5.42	-6.37	-6.21
D: Cumulative Increase in Sovereign Bond Spreads			
	April-June	April-July	April-August
Fraction of Countries in which Bond Spreads Increased	24/31	23/31	23/31
(average for countries which experienced an increase in bond spreads)			
Mean increase (basis points)	54.31	48.52	61.39
Median increase (basis points)	44.95	37.57	58.0

Note: In the table above and throughout in the paper, an increase in nominal exchange rate is a depreciation.

⁶ The country with a large increase in stock prices was Pakistan where developments were driven by other events: Pakistan agreed to a \$5.3 billion loan from the IMF on July 5, boosting reserves and leading to rallies in stocks, bonds and the rupee (Bloomberg, July 5, 2013).

Figure 1: Effect on Exchange Rate, Reserves, Stock prices and Bond Spreads during April-July, 2013



Data on sovereign bond spreads are available for fewer countries, but almost three-quarters of countries for which there are data experienced an increase in spreads, the mean effect being about 50 basis points (Panel D of Figure 1). The countries with the largest increase in

bond spreads were Ghana, Indonesia, Morocco, Ukraine and Venezuela, with the latter two countries experiencing increases in spreads of over 150 basis points.⁷

Table 3 shows the bivariate correlations and corresponding p values of significance. Perhaps surprisingly, the effects are not highly correlated, with one notable exception in the relationship between stock prices and bond spreads. Again, the message appears to be that different emerging markets were affected in rather different ways.

Table 3: Correlation Coefficients across Cumulative Changes in Variables in April-August, 2013

	Exchange Depreciation	Decline in Reserves, %	Decline in Stock Prices %
Exchange Depreciation	1		
Decline in Reserves, %	0.20 (0.17)	1	
Decline in Stock Prices %	0.05 (0.75)	0.23 (0.17)	1
Increase in Bond Spreads	0.05 (0.78)	-0.24 (0.20)	0.57*** (0.00)

Note: values in the table are bivariate correlation coefficients; values in parentheses are the p values for the null hypotheses that the coefficients are equal to zero.

Finally, we consider the composite indices described above, first constructing the index as just the weighted averages of changes in exchange rates and reserves and then constructing another index combining these two variables with the percentage stock market decline.⁸

As the left hand panel of Figure 2 shows, the majority of countries (35 of 51) for which data are available for both exchange rate and reserves experienced pressure in at least one of these series. The countries experiencing the largest impact were India, Indonesia, Malaysia, Peru and Thailand. India and Peru were the outliers, with values of 7.2 and 6.4, respectively. Panel B shows that the effect was stronger when we take into account stock index declines as well, and that intensity increased progressively from June through August. Again the majority of countries (30 of 37) for which data are available experienced pressure on exchange rate, stock market,

⁷ The two countries for which spreads fell are Pakistan (198 basis points – on its case see above) and Argentina (82 basis points). Data on credit default swaps (CDS) are available for only half as many countries as the ones for which we have the data for exchange rates. For what it is worth, CDS spreads increased for almost all the countries for which the data are available during this period. The cumulative average increase was more than 50 basis points between the end of April and end of July. Eight countries experienced an increase of more than 40 basis points and three countries experienced an increase of more than 200 basis points. These three countries were Argentina, Ukraine, and Venezuela. These countries were perhaps affected due to other unrelated ongoing political and economic issues.

⁸ The number of countries for which we are able to construct these indices declines from 51 for the first to 37 for the second. If we also include increases in bond yields in the index the number of countries for which we would be able to generate an index declines to 25.

and/or reserves. The countries experiencing the largest impacts were Peru, India, Indonesia, Thailand, and Chile. See Table 4 for further details.

Figure 2: Distribution of Market Pressure Indices I and II

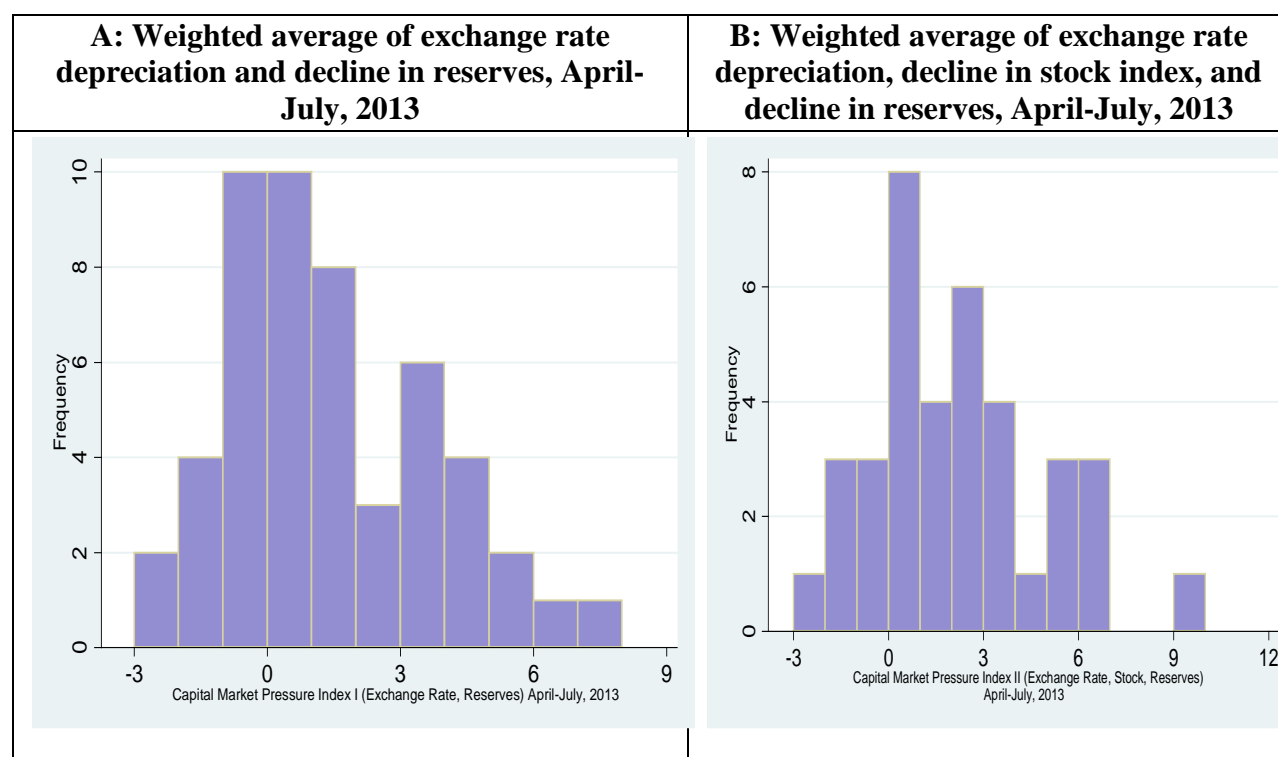


Table 4: Market Pressure Indices

	April-June	April-July	April-August
Market Pressure Index I: weighted changes in exchange rate and reserves			
Mean	1.07	1.37	1.61
Median	0.67	0.91	1.17
Number of Countries			
With positive values of Index I	36/51	35/51	31/51
Mean for Countries with Positive Values	1.88	2.48	3.56
Median for Countries with Positive Values	1.37	1.96	2.87
Market Pressure Index II: weighted changes in exchange rate, reserves and stock prices			
Mean	1.77	2.20	2.50
Median	1.49	1.87	2.22
Number of Countries			
With positive values of Index II	28/37	30/37	26/37
Mean for Countries with Positive Values	2.74	3.01	4.18
Median for Countries with Positive Values	2.41	2.64	3.14

4. Regression Analysis

We now regress three variables: (i) exchange rate depreciation, (ii) the composite index based on exchange rate depreciation and reserves losses (Index I), and (iii) the composite index based on exchange rate depreciation, reserve losses and the decline in stock prices (Index II) on measures of macroeconomic conditions and policy, financial market structure, and asset market conditions. Specifically, we estimate linear regression equations of the form:

$$Y_i = \alpha_k X_{k,i} + \varepsilon_i \quad (1)$$

where Y_i , the dependent variable, is either exchange rate depreciation, Index I or Index II for country i between the end of April and the end of August 2013. Note that the number of countries varies, since observations for stock markets are available for fewer countries than observations for exchange rates and foreign reserves.

The right hand side variables are denoted by X_k . Explanatory variables in equation (1) include GDP growth, the budget deficit, inflation, and the level of foreign reserves as measures of the economic fundamentals; the deterioration in current account deficit and real exchange rate appreciation as measures of local market impacts and loss in competitiveness; cumulative private capital inflows, the stock of portfolio liabilities, stock market capitalization and aggregate GDP as alternative measures of the size of the market; the exchange rate regime, public debt, capital account openness, the quality of the business environment (or institutional quality) as structural variables. Where results are similar using different proxies, we report only a representative subset.⁹ We take the values of these variables in 2012 or their averages over the period 2010–2012 (either way, prior to the advent of tapering talk). Since most of these variables are persistent and thus highly correlated across years, it turns out to be inconsequential whether we use the data for just one year or the period averages.

Since many of the explanatory variables are also correlated with one other, we include them parsimoniously in the regressions. From each category of variables we generally include only one variable at a time, while conducting robustness checks to make sure that the results are comparable when alternative measures are included in the regressions.

Table 5 reports our first set of regressions. There we estimate specifications with the size of the financial market in emerging markets, the stock of reserves, increase in current account deficit, and percent change in real exchange rate (details are in Appendix B). The results indicate that the deterioration in the current account and the extent of real exchange rate appreciation in the 2010–2012 period are associated with larger exchange rate depreciations (and of the composite indices) in the summer of 2013. This helps us understand how the same countries that complained about the cross-border impact of quantitative easing in the earlier period could also complain about talk of tapering in the summer of 2013. The same countries most affected by (or least able to limit) the earlier impact on their real exchange rates were the

⁹ Results hold broadly if we calculate the changes in exchange rate, reserves, or stock prices for April–July, 2013 period. Additional results are available from the authors on request.

same ones to subsequently experience large and sometimes uncomfortable real exchange rate reversals.

In addition, countries with larger financial markets, measured here by the magnitude of external financing, experienced larger exchange rate depreciation and reserve losses. As mentioned above, this may indicate that it was easier to rebalance portfolios by withdrawing from a few larger markets than to rebalance portfolios by selling assets in smaller markets. It suggests that having a large financial market that is attractive to foreign investors may be somewhat of a mixed blessing under these circumstances. Note, as mentioned above, that we consider several different measures of the size of the market, the portfolio liability stock from Lane and Milesi-Ferretti, stock market capitalization, aggregate GDP, etc. These are correlated with each other and give similar results in the regressions (see Appendix C). These results imply that the larger markets are more prone to the effects of liquidity retrenchment. In contrast, the stock of reserves held in the previous period does not appear to be associated with the effect on exchange rate or on the composite indices of exchange rate and reserves.

Table 5: Factors Associated With Exchange Rate Depreciation and Market Pressure Indices, April-August 2013

Dependent Variable	% change in Nominal Exchange rate (1)	Index I: Exchange rate, Reserves (2)	Index II: Exchange rate, Reserves, Stock Prices (3)	% change in Nominal Exchange rate (4)	Index I: Exchange rate, Reserves (5)	Index II: Exchange rate, Reserves, Stock Prices (6)
Increase in Current Account Deficit in 2010–12, over 2007–09	0.25** [2.58]	0.17* [1.77]	0.33*** [3.27]	0.21** [2.18]	0.07 [0.74]	0.23** [2.45]
Avg. Annual % Change in RER, 2010–2012				-0.37*** [2.82]	-0.35*** [3.21]	-0.54*** [3.66]
Size (Private External Financing, 2010–12, Log)	1.42*** [3.85]	0.71** [2.65]	0.58 [1.19]	1.20*** [3.16]	0.55** [2.15]	0.23 [0.41]
Reserves/M2 Ratio, 2012	-2.53 [0.73]	1.52 [0.46]	4.32 [1.03]	-1.15 [0.40]	1.45 [0.51]	4.88 [1.43]
Observations	45	43	32	43	41	30
R-squared	0.43	0.24	0.29	0.49	0.36	0.43
Adj. R-squared	0.39	0.19	0.21	0.44	0.29	0.34

Note: An increase in real exchange rate (RER) is depreciation; we take average annual percent change in RER during 2010, 2011 and 2012. Current account deficit (CAD) is current deficit as percent of GDP; we take average annual increase in CAD during 2010–12 over 2007–09. Robust t statistics are in parentheses. *** indicates the coefficients are significant at 1 percent level, ** indicates significance at 5 percent, and * significance at 10 percent level.

In Table 6 we include the additional explanatory variables, focusing first on the extent of exchange rate depreciation as the dependent variable. We consider economic growth, the fiscal deficit, public debt relative to GDP and inflation as indicators of aggregate economic policy and

performance.¹⁰ We also include exchange rate regime categorization and an index for controls on capital account, both of which come from data with the IMF Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER).

**Table 6: Factors Associated with Exchange Rate Depreciation, April-August 2013
(including other macro variables)**

Dependent Variable: Percent change in Nominal Exchange Rate between April-August, 2013								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Increase in Current Account Deficit, 2010-12 over 2007-09	0.20** [2.19]	0.21** [2.05]	0.20* [1.98]	0.19* [1.95]	0.20** [2.07]	0.16 [1.55]	0.13 [1.13]	0.22** [2.31]
Avg. Annual % Change in RER, 2010-2012	-0.35** [2.30]	-.39*** [2.84]	-.42** [2.66]	-.49*** [3.37]	-.38*** [2.79]	-.38*** [2.96]	-.29** [2.27]	-.37*** [2.76]
Size (External Financing, 2010-12, Log)	1.2*** [3.07]	1.3*** [3.28]	1.2*** [3.13]	1.1** [2.71]	1.2*** [3.08]	1.1*** [3.20]	.96** [2.31]	1.2*** [3.10]
Reserves/M2 Ratio, 2012	-1.17 [0.41]	-0.36 [0.13]	0.10 [0.03]	-0.64 [0.23]	-0.58 [0.21]	-1.92 [0.60]	-3.61 [1.20]	-1.22 [0.42]
Real GDP Growth, 2012	0.08 [0.30]							
General Public Debt, 2012		0.02 [0.82]						
Fiscal Deficit 2012, % of GDP			0.13 [0.67]					
Inflation, 2012				0.10** [2.10]				
Capital Control Index, 2012					0.01 [0.49]			
Increase in Capital Controls Index, 2010-12						0.19* [1.82]		
Exchange Rate Regime, 2012							.61*** [2.72]	
World Governance Indicator, 2012								0.22 [0.22]
Observations	43	42	43	43	43	43	42	43
R-squared	0.49	0.51	0.50	0.52	0.49	0.54	.58	0.49
Adj. R-squared	0.43	0.44	0.43	0.46	0.43	0.48	.52	0.43

Note: An increase in real exchange rate (RER) is depreciation; we take average annual percent change in RER during 2010, 2011 and 2012. Current account deficit (CAD) is current deficit as percent of GDP; we take average annual increase in CAD during 2010-12 over 2007-09. Robust t statistics are in parentheses. *** indicates the coefficients are significant at 1 percent level, ** indicates significance at 5 percent, and * significance at 10 percent level.

We also calculate changes in controls on capital flows between 2010 and 2012. For the business environment or institutional quality, we include “Doing Business” ranking of the

¹⁰ We also calculated change in inflation rate in 2010-2012 over 2007-2009, but it is not significant in the regressions. For GDP growth we also consider values in 2013 Q1, or growth forecast for 2013.

countries and the Worldwide Governance Indicator for 2012, reporting results from the latter in the table below.¹¹

The estimates do not provide much support for the notion that the standard measures of economic policy and performance were strongly associated with the extent of tapering. GDP growth, the budget deficit, public debt, level of reserves and the governance indicator do not exert a significant impact on the exchange rate. In contrast, financial market size, the increase in current account deficit and the extent of real exchange rate appreciation are still associated with the subsequent exchange rate impact.

Some additional results are worth mentioning. The one “macroeconomic fundamental” that shows up as significant in Table 6 is the inflation rate in the prior period. Inflation is, of course, one mechanism through which a country can experience real appreciation. So this coefficient may be picking up the same financial-market effects that we identified before.¹² That the indicator for the exchange rate regime enters negatively and significantly here is not surprising. It simply tells us that countries that pegged their currencies suffered less depreciation in the summer of 2013. More interesting will be whether they also saw less (or more) movement in their reserves and equity prices. Finally, there is some sign that countries which tightened their capital controls in the prior period experienced more currency depreciation when talk turned to tapering. It may be that these were the countries with the greatest perceived vulnerability (where policy makers responded by tightening controls – the change in controls was partly endogenous, in other words) and that perceived vulnerability translated into actual vulnerability. But if so, there is no sign that controls had a moderating effect starting in May.¹³ Table 7 reinforces the conclusion that controls alone were ineffectual as a macroprudential device. There, where the dependent variable is weighted average of the change in the exchange rate and change in reserves, the capital control measures lose their significance.

Note also that the exchange rate regime has no separate significant impact on the change in reserves (although it does continue to register significantly in Table 7) and no significant impact on the change in the equity price index.

¹¹ We also estimated the standardized coefficients to compare the coefficients of various variables quantitatively. These show that the coefficient of the size of financial markets is the largest followed by the coefficients of real exchange rate and current account deficit.

¹² Note however that the real exchange rate remains significant in the equation where inflation is included, so this cannot be all that occurring.

¹³ It also could be that our measure of controls is imperfect – that we are not picking up further changes in their incidence and extent in the first four months of 2013, since we use 2010–12 data.

Table 7: Factors Associated with Market Pressure Index I (consisting of Exchange Rate Depreciation and Reserve Loss)

Dependent Variable: Composite Index of Percent Change in Nominal Exchange Rate and Reserve Loss between April-August, 2013								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Increase in Current Account Deficit 2010–12, over 2007–09	0.06 [0.65]	0.07 [0.69]	0.05 [0.52]	0.05 [0.50]	0.03 [0.34]	0.06 [0.56]	0.02 [0.22]	0.05 [0.43]
Avg. Annual % Change in RER, 2010–2012	-.34*** [2.98]	-.37*** [3.22]	-.45*** [3.01]	-.46*** [3.57]	-.39*** [3.34]	-.36*** [3.19]	.35*** [3.03]	-.36*** [3.39]
Size (External Financing, 2010–12, Log)	0.56** [2.08]	0.61** [2.43]	0.58** [2.30]	0.47* [1.77]	0.42* [1.96]	0.54* [1.99]	0.36 [1.09]	0.57** [2.20]
Reserves/M2 Ratio, 2012	1.41 [0.49]	2.27 [0.81]	3.96 [1.47]	1.74 [0.66]	2.74 [1.01]	1.28 [0.43]	0.71 [0.25]	1.53 [0.55]
Real GDP Growth, 2012	0.05 [0.28]							
General Public Debt, 2012		0.02 [1.14]						
Fiscal Deficit 2012, % of GDP			0.24* [1.69]					
Inflation, 2012				0.08* [1.88]				
Capital Control Index, 2012					0.03 [1.53]			
Increase in Capital Controls, 2009-12						0.03 [0.51]		
Exchange Rate Regime, 2012							0.38* [1.93]	
World Governance Indicator, 2012								-0.62 [0.80]
Observations	41	40	41	41	41	41	40	41
R-squared	0.36	0.39	0.41	0.40	0.40	0.36	0.42	0.37
Adj. R-squared	0.27	0.31	0.32	0.31	0.31	0.27	0.33	0.28

Note: An increase in real exchange rate (RER) is depreciation; we take average annual percent change in RER during 2010, 2011 and 2012. Current account deficit (CAD) is current deficit as percent of GDP; we take average annual increase in CAD during 2010–12 over 2007–09. Robust t statistics are in parentheses. *** indicates the coefficients are significant at 1 percent level, ** indicates significance at 5 percent, and * significance at 10 percent level.

5. Conclusion

Our exploration of the effects of the Fed’s tapering talk in the summer of 2013 yields the following conclusions. First, emerging markets that allowed the largest appreciation of their real exchange rates and the largest increase in their current account deficits in the prior period of quantitative easing saw the sharpest currency depreciation, reserve losses and stock market declines when talk turned to tapering. Second, measures of policy fundamentals and economic performance (the budget deficit, the public debt, the level of reserves, and the rate of GDP

growth) do not indicate that better fundamentals provided better insulation. An important determinant of that differential impact, in addition to the prior run-up of the real exchange rate and current account deficit, was the size of a country's financial market: countries with larger markets experienced more pressure on the exchange rate, reserves and stock market when talk turned to tapering. We interpret this as investors seeking to rebalance their portfolios being able to do so more easily and conveniently when the target country has a relatively large and liquid market. This suggests that having a large and liquid market can be a mixed blessing when a country is subject to financial shocks coming from beyond its borders.

Finally, there is little evidence that the presence of controls or their tightening in the prior period provided insulation from talk of tapering. More important, we suspect, were macroprudential policies broadly defined, where these were used to limit the appreciation of the real exchange rate and widening of the current account deficit in response to foreign capital inflows. These patterns thus point to which countries are and are not vulnerable to external pressures once tapering again comes around.

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Appendix

Appendix A: Countries in the sample and data availability¹⁴

East Asia and Pacific		Europe and Central Asia		Latin America and Caribbean	
China	CHN	Albania	ALB	Argentina	ARG
Hong Kong SAR, China	HKG	Armenia	ARM	Brazil	BRA
Indonesia	IDN	Azerbaijan	AZE	Chile	CHL
Malaysia	MYS	Belarus	BGR	Colombia	COL
Philippines	PHL	Bosnia and Herzegovina	BIH	Costa Rica	CRI
Singapore	SGP	Bulgaria	BLR	Dominican Republic	DOM
South Korea	KOR	Croatia	HRV	Guatemala	GTM
Thailand	THA	Czech Republic	CZE	Jamaica	JAM
Vietnam	VNM	Hungary	HUN	Mexico	MEX
Middle East and North Africa		Kazakhstan	KAZ	Paraguay	PRY
Israel	ISR	Latvia	LVA	Peru	PER
Jordan	JOR	Lithuania	LTU	Uruguay	URY
Lebanon	LBN	Macedonia, FYR	MKD	Venezuela	VEN
Morocco	MAR	Poland	POL	Sub-Saharan Africa	
Tunisia	TUN	Romania	ROU	Ghana	GHA
South Asia		Russia	RUS	Kenya	KEN
India	IND	Serbia	SRB	Mauritius	MUS
Pakistan	PAL	Turkey	TUR	South Africa	ZAF
Sri Lanka	LKA	Ukraine	UKR		

¹⁴ Countries excluded in our sample—Eurozone nations: Estonia, Greece, Ireland, Italy, Portugal, Slovakia and Spain; Nations which use the US dollar as their currency: Ecuador, El Salvador and Panama; we also drop Egypt because it experienced shocks independent of retrenchment.

Appendix B:

Variable	Description
Percent Change in Nominal Exchange Rate	Percent change in official exchange rate over the period indicated in the text. Data expressed as local currency per USD. Original data are recorded as monthly averages. Source: World Bank GEM database.
Percent Change in Stock Market Indices	Percent change in stock price index over the period indicated in the text. Original data are indices of local currency, with the index = 100 in the year 2000. Exceptions: Kazakhstan and Morocco have data indexed to the year 2010 in local currency, Israel has data indexed to the year 2000 in USD, and Hong Kong SAR, China, and Serbia have data indexed to the year 2005 in local currency. Source: World Bank GEM database; IMF IFS database (for Hong Kong SAR, China, and Serbia only).
Percent Change in External Reserves	Percent change in total reserves over the period indicated in the text. Original data expressed in million USD. Source: World Bank GEM database.
Basis Points Change in Bond Yields	Absolute change in bond interest rate spreads over the period indicated in the text. Original data expressed in basis points over US Treasuries. Source: World Bank GEM database.
Basis Points Change in Country Default Swaps	Absolute change in 5 year credit default swap spread over the period indicated in the text. Original data expressed in daily basis points, with monthly averages taken. Source: Bloomberg.
Capital Market Pressure Index I	$MP\ Index\ I = \frac{\% \text{ Exchange Rate Depreciation}}{\sigma_{exchange\ rate}} + \frac{\% \text{ Decline in Reserves}}{\sigma_{reserves}}$ <p>The Capital Market Pressure Index I is calculated as the sum of the percentage changes for exchange rates and reserves weighted by their respective standard deviations. The numerators are the percentage change between April 2013 and August 2013. The denominators are the standard deviations of monthly data from January 2000 to August 2013.</p>
Capital Market Pressure Index II	$MP\ Index\ I = \frac{\% \text{ Exchange Rate Depreciation}}{\sigma_{exchange\ rate}} + \frac{\% \text{ Decline in Reserves}}{\sigma_{reserves}} + \frac{\% \text{ Decline in Stock Market}}{\sigma_{stock}}$ <p>The Capital Market Pressure Index II is calculated as the sum of the percentage changes for exchange rates, reserves, and stock market indices weighted by their respective standard deviations. The numerators are the percentage change between April 2013 and August 2013. The denominators are the standard deviations of monthly data from January 2000 to August 2013.</p>
Increase in Current Account	Current account deficit measured as percent of GDP. Calculated as the

Deficit	average annual change in 2010–2012 over the values in 2007–2009. Source: IMF WEO database.
Average Annual Percent Change in Real Exchange Rate	Real exchange rate is calculated as the nominal exchange rate (local currency to USD, period average) times the inflation index (2005=100) for the US divided by the inflation index for each country. We calculate year over year percentage change in RER and then average the values over 2010–2012. Source: IMF IFS database.
Financial Market Size	Logarithm of total emerging market private external finance flows (bond, equities, and loans) between 2010 and 2012. Source: IMF Global Financial Stability Report.
Market Size	Logarithm of real GDP levels for 2012. Source: World Bank WDI.
Stock Market Capitalization	Logarithm of stock market capitalization of listed companies in current USD for 2012. Source: World Bank WDI.
Portfolio Liability Stock	Logarithm of the sum portfolio liability stocks for equity and debt, millions of current USD for 2011. Source: Lane and Milesi-Ferretti, 2007.
Reserves/M2	Ratio of total reserves to money and quasi-money (M2) for 2012. Source: World Bank WDI database.
Real GDP growth	Percent change of real GDP between 2011 and 2012. Source: IMF IFS database.
General Public Debt	General public (government) debt as a percentage of GDP for 2012. Source: IMF WEO database.
Fiscal Deficit	General government fiscal deficit as a percentage of GDP for 2012. Source: IMF WEO database.
Inflation	Inflation based on percent change in average consumer prices for 2012. Source: IMF WEO database.
Capital Account Openness Index	Otherwise known as the Chinn-Ito index, this measures capital account openness using four components: the presence of multiple exchange rates, restrictions on current account transactions, restrictions on capital account transactions, and requirements on the surrender of export proceeds. Source: Chinn and Ito, 2008.
Capital Account Control Index	Index created using information on restrictions on capital account transactions for 2012, where a value of 0 implies a completely open capital account and a value of 100 implies a completely closed capital account. Source: IMF AREAER database.
Increase in Capital Controls	Absolute change of capital control index between 2010 and 2012. Source: IMF AREAER database.
Exchange Rate Regime	De facto exchange rate regime for 2012, classified into 10 categories. Source: IMF AREAER database.
Doing Business	Ease of Doing Business Ranking of governments for 2012. Source: Doing Business database.
Worldwide Governance Indicator	Average of six governance indicators in Worldwide Governance Indicators database for 2012. Source: Worldwide Governance Indicators.

Appendix C: Size of the Market

We consider several different measures of the size of the financial market. Incidentally, these are highly correlated with each other and give similar results in the regressions, as seen in Table A 1 below.

Table A1: Correlation between Different Measures of Size of the Market

	Stock Market Capitalization, 2012	Portfolio Liability Stock, 2011	Total inflow of bonds, equity, loans, 2010–2012	GDP, 2012
Number of observations	47	47	45	51
Capitalization	1			
Portfolio Liability Stock	0.81	1		
Average inflow of bonds, equity, loans	0.90	0.89	1	
GDP	0.90	0.80	0.92	1

Note: Stock Market Capitalization and GDP data is from WDI; Portfolio Liability stock from Lane and Milesi-Ferretti; Inflows of bonds, equity and loans, are total for 2010–2012, from IMF GFSR. All variables are log transformations.

Figure A1: External Private Inflows (total, 2010–2012, log) and Exchange Rate Depreciation during April–August 2013

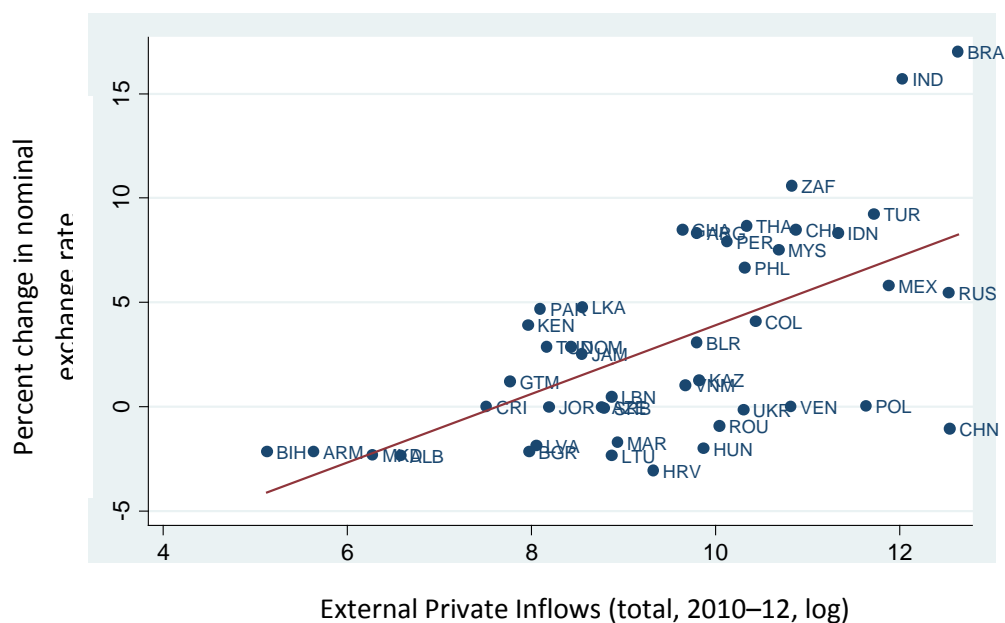


Figure A2: Stock of Portfolio Liabilities and Exchange Rate Depreciation during April-August 2013

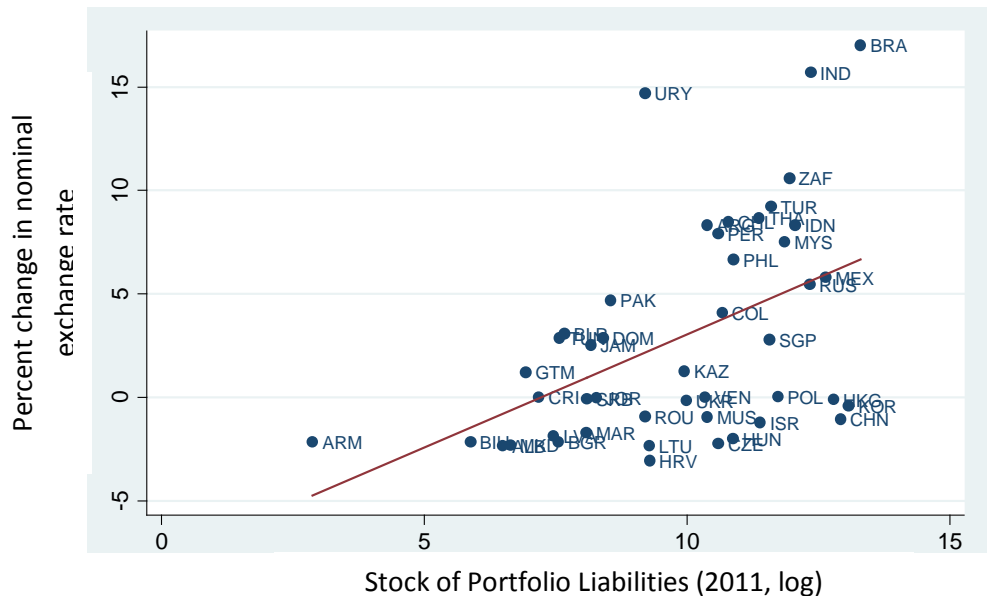
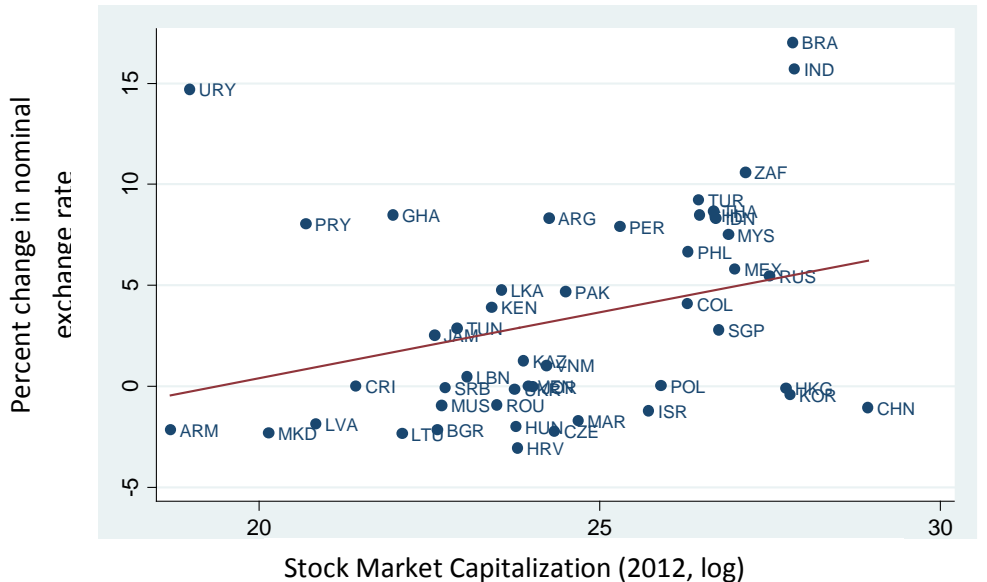


Figure A3: Stock Market Capitalization and Exchange Rate Depreciation during April-August 2013



Since the Chinn-Ito index of capital account openness is available only until 2011 as of December 2013, we constructed another capital control variable using the information directly from the IMF AREAER database, which has raw data until 2012. While the Chinn-Ito index combined data for a wider set of categories,¹⁵ we concentrated just on capital account transactions in constructing this variable. AREAER has entries for 62 categories covering restrictions on capital flows and it tabulates the data as a binary indicator—yes implying that there are some restrictions on capital flows within the category and no implying that there are no restrictions. We code these such that if a category has a restriction we gave it a value 1 and if the category has no restriction we gave it a value 0; we then added up all these values and scaled it to 0–100, to come up with the overall capital account controls measure—a larger value implies less open capital account and more controls. We correlate the values of this index for 2011 with the 2011 Chinn-Ito index data, and the correlation is about 0.83.

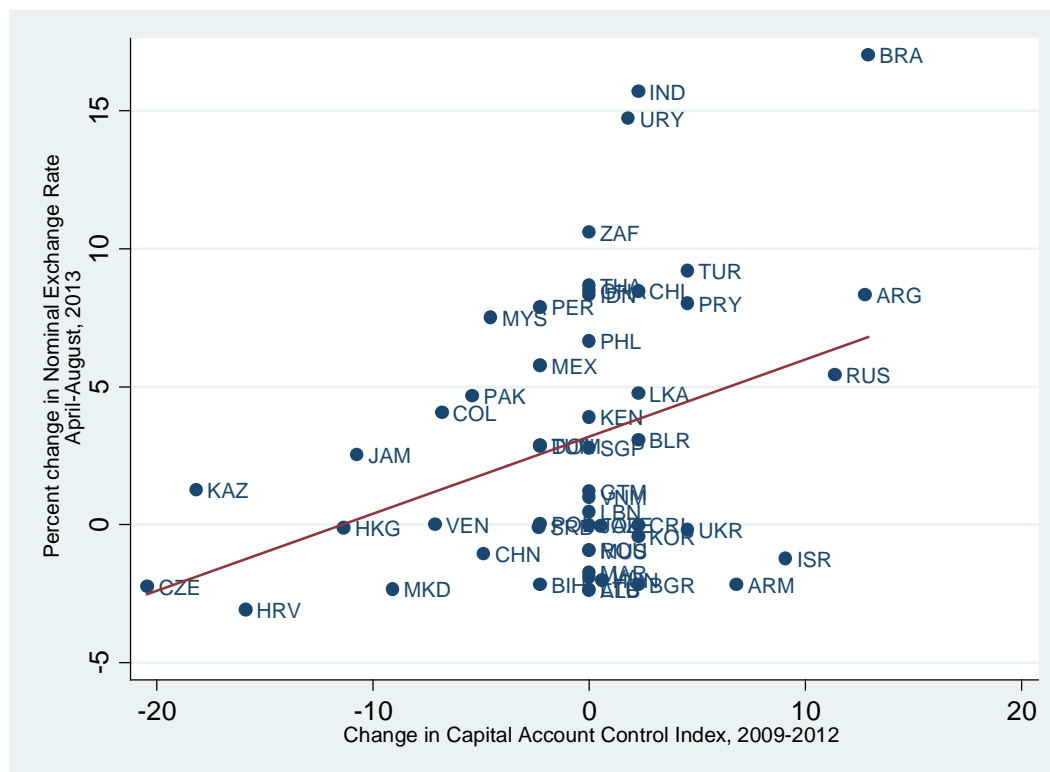
We use this measure in a number of different ways: its level in 2012; its absolute change between 2009 and 2012, with changes over shorter periods—2010–2012 and 2011–2012; and its percent change between 2009–2012. Figure A4 below shows that the exchange rate depreciation is not correlated with the level of capital account openness in 2012. Figure A5 shows that an increase in capital account controls is correlated with a larger effect on exchange rate.

Scatter plot showing the relationship between the Capital Account Control Index (CICI) in 2012 (X-axis) and the Percent change in Nominal Exchange Rate from April to August 2013 (Y-axis). The X-axis ranges from 0 to 100, and the Y-axis ranges from -5 to 15. A positive linear trend line is shown. Data points are labeled with country codes.

Country Code	Capital Account Control Index (2012)	Percent change in Nominal Exchange Rate (April-August, 2013)
BRA	60	17
IND	95	16
URY	8	15
PER	5	8
PRY	22	8
GHA	30	8.5
TUR	50	9
IDN	50	8.5
MYS	60	7.5
ZAF	65	10.5
THA	75	8.5
ARG	82	8.5
PHL	72	6.5
MEX	55	5.5
RUS	30	5.5
KEN	35	4
DOM	28	3
SGP	15	3
BLR	48	3
LKA	95	4.5
TUN	95	3
PAK	65	4.5
COL	60	4
JAM	62	2.5
VNM	72	1
SRB	75	0
UKR	80	0
CHN	95	-1
MAR	75	-2
VEN	68	0
MDK	60	-2.5
ALB	38	-2.5
HRV	35	-3
BIH	32	-2.5
HUN	28	-2.5
LTU	25	-2.5
SEN	18	-2.5
BGR	15	-2.5
ISR	18	-1.5
MUS	22	-1
ROU	12	-1
KOR	10	-1
HKG	8	-0.5
GTM	5	1.5
AZE	38	0
POL	60	0
LBN	62	0.5
KAZ	55	1.5

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Figure A5: Increase in Capital Controls 2009 to 2012 and Exchange Rate Depreciation during April-August 2013



FigureA6: Effect on Exchange Rate during April-July, 2013, Factors that Mattered

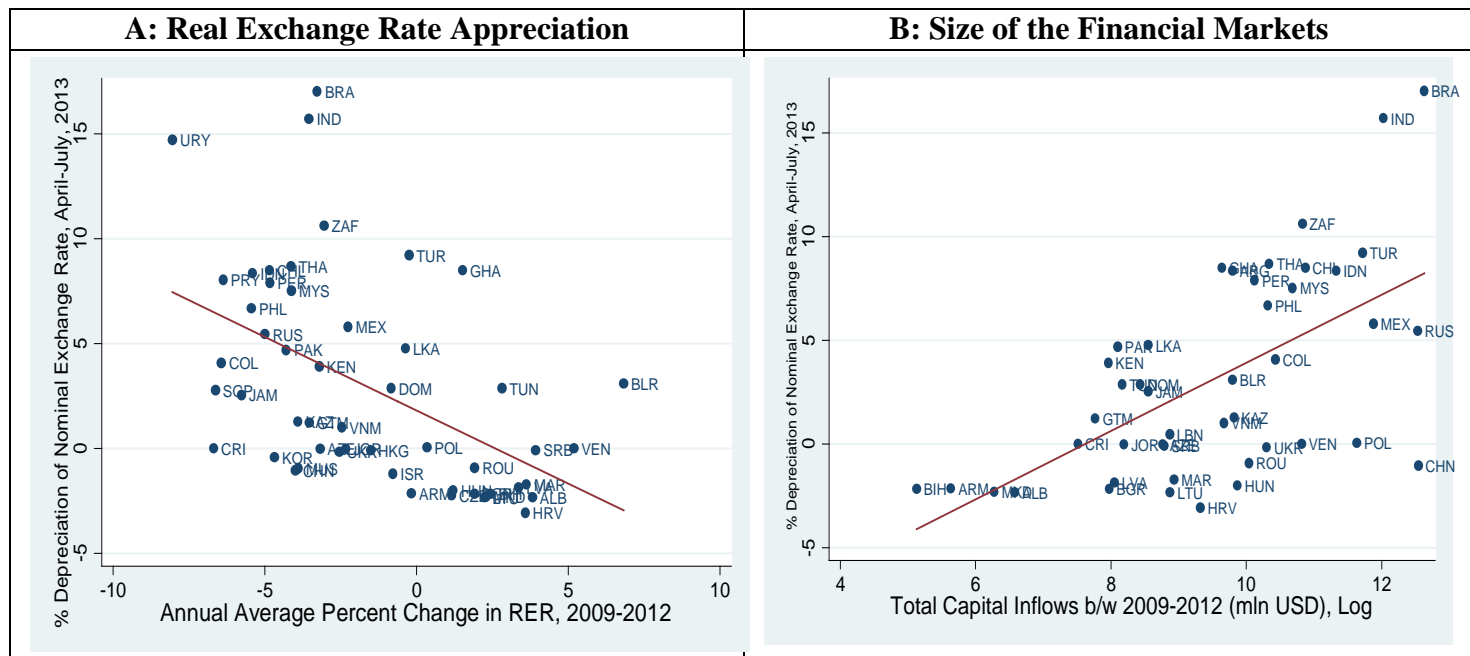


Figure A7: Effect on Exchange Rate during April-July, 2013, Factors that did not Matter

