Impact of Fed Tapering Announcements on Emerging Markets

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International Monetary Fund

June 2014

Abstract

This paper analyzes market reactions to the 2013–14 Fed announcements relating to tapering of asset purchases and their relationship to macroeconomic fundamentals and country economic and financial structures. The study uses daily data on exchange rates, government bond yields, and stock prices for 21 emerging markets. It finds evidence of markets differentiating across countries around volatile episodes. Countries with stronger macroeconomic fundamentals, deeper financial markets, and a tighter macroprudential policy stance in the run-up to the tapering announcements experienced smaller currency depreciations and smaller increases in government bond yields. At the same time, there was less differentiation in the behavior of stock prices based on fundamentals.

JEL Classification Numbers: F41, F42
Keywords: emerging markets, tapering, Fed policy announcements, vulnerability.

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I. INTRODUCTION

In the aftermath of the Global Financial Crisis, ultra loose monetary policy in advanced economies prompted a global search for yield with investors flocking into emerging markets (EMs), loosening financial conditions, and contributing to a broader mispricing of domestic assets. This trend got disrupted in May 2013 when the Fed signaled its intention to unwind its unconventional monetary policy. While unconventional monetary policies by the Fed were not expected to last forever, talks about reducing the quantity of asset purchases (or "tapering") did surprise markets and created bouts of volatility across EMs as investors realized that the transition to higher global rates had begun. These episodes of market pressure were marked by rising global risk aversion with sharp corrections in EMs—rapid currency depreciations, increases in external financing premia, declines in equity prices, and reversal in capital flows. Investors focused their attention particularly on countries with larger external financing needs and macroeconomic imbalances, exerting severe pressure on countries like Brazil, India, Indonesia, Turkey, and South Africa. These five countries saw, on average, bond yields rise by 2½ percentage points, equity market fall by 13¾ percent exchange rates depreciate by 13½ percent while reserves declined by 4.1 percent during May 22–(end of) August 2013. Since end-2013, there have been additional bursts of market pressure related in part, but not only, to the Fed's decision to taper.[2] During these episodes, countries that had taken policy action since May 2013 (e.g. reduced their macroeconomic imbalances or imposed capital flow measures), have shown more resilience, with little pressure on India and Indonesia, for example.
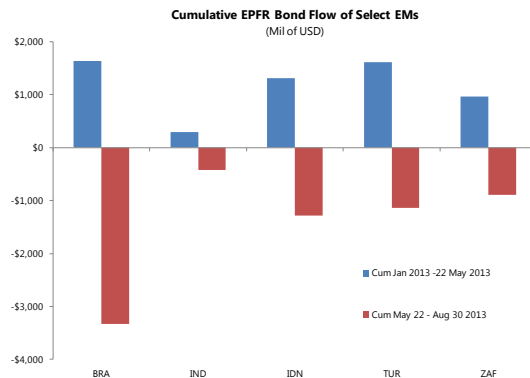
This paper provides a systematic analysis of market reaction in 21 EMs from January 1, 2013, to January 22, 2014 following FOMC announcements, and tries to uncover the factors that influenced them. It explores the role played by macroeconomic fundamentals (current account balance, fiscal balance, inflation, and foreign exchange reserves), financial depth and integration, trade linkages with China, capital-flow measures, and macroprudential policies in the differentiation of market reactions. Market reactions are analyzed using event study techniques around the dates of Federal Open Market Committee (FOMC) meetings and release of minutes. Alternative measures, such as expectations of changes in future short-

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[2] Additional factors include risks in China's shadow banking system, idiosyncratic developments in Argentina, and rising political and policy risks in Turkey.

term interest rates, and revision in market expectations of Fed purchases of quantitative easing (QE) assets, are also used to determine the differentiating factors.

The empirical analysis suggests that market pressures were more subdued in countries with stronger fundamentals, deeper financial markets, better growth prospects, greater degree of financial integration, and a tighter stance toward capital flows and macroprudential policies prior to the tapering talks. In particular, countries with larger current account surpluses, stronger fiscal balances, lower inflation, and more reserves saw smaller depreciation in their exchange rates and lower rise in bond yields. Countries with deeper domestic financial markets were less affected as the size of these markets meant that investors could move large amounts of capital outside the country or toward other domestic markets without significant changes in prices. Countries that, in the face of large capital inflows following the global financial crisis, had tightened restrictions on those inflows also experienced more muted markets reactions, suggesting that these tighter capital flow measures may have influenced the composition of flows toward less volatile ones. Similarly, countries with a tighter macroprudential policy stance in the run-up to the volatile episodes of 2013 fared better. The paper also finds that exposure to China can provide some buffers when the market volatility stems from FOMC announcements. However, when the negative news also emanate from China, then exposure to China does not serve as a significant buffer. The paper finds little significant association of equity prices with country characteristics around the FOMC announcements.

The literature on the role of country fundamentals in explaining market reactions around the tapering related bouts of volatility in global markets is at its infancy. For example, Eichengreen and Gupta (2014) look at the correlation between changes in bilateral nominal exchange rates between April and August 2013 and a set of fundamentals, such as fiscal balance and financial depth as proxied by size of external financing measured by the stock of portfolio liabilities. The paper finds that macro fundamentals are not important; the size of external financing played a significant role —and countries with "deeper" markets experienced larger exchange rate depreciations. Ahmed, Coulibaly, and Zlate, 2014, also correlate changes in exchange rate with macroeconomic fundamentals over one month and longer time windows. They find that investors do discriminate across emerging markets based on macroeconomic fundamentals. Chen, Mancini-Griffoli and Sahay (2014) considers a longer time span covering different phases of U.S. monetary policy. They measure and decompose surprises about Fed monetary policy decisions using Bernanke and Kuttner (2003) methodology and using two-year-ahead Fed Fund futures. Their main finding is that different fundamentals matter at different time periods, with current account and inflation only starting to matter recently during the tapering talk episodes. Finally, Aizenman, Binici, and Hutchinson (2014) use a different methodology to analyze the impact of tapering "news" announcements by Fed senior policy makers during November 27th, 2012 to October 3rd, 2013, on financial markets in emerging economies. They measure "news" by searches in Bloomberg. Further, using thresholds to define "robust" and "fragile" emerging markets, they find that news of tapering coming from Chairman Bernanke is associated with much larger exchange rate depreciation, drops in stock market, and increases in sovereign CDS spreads of the robust group compared to the fragile group.

This paper sheds new light on the role of country fundamentals and other characteristics in determining markets reaction. The empirical strategy in this paper focuses on the behavior of bilateral exchange rates against the U.S. dollar, bond yields (10-year and five-year), and equity prices. The methodology has three features that distinguish it from existing studies. First, we consider a two-day window around news about the Fed's monetary policy, mainly around FOMC meetings and release of minutes. This narrow time window helps better identify the news/events we want to focus our attention to—choosing a longer time span raises the risks of confusing the impact of other events that may have occurred during the same period. Second, we identify the negative events—that is events characterized by sharp declines in exchange rates, increases in bond yields, and fall in equity prices. And third, we gauge the role of country characteristics (fundamentals, economic and financial structure) by interacting a dummy for the negative events with a large number of country characteristics. In addition, this paper distinguishes between the depth of domestic financial markets and international financial integration and analyzes their importance in determining market reactions separately.

The rest of the paper is organized as follows. Section II provides some descriptive evidence on market reactions in EMs; Section III describes the empirical methodology; Section IV describes the results. Section V concludes with policy implications.

II. WHAT HAPPENED IN THE SUMMER OF 2013?

The release of FOMC minutes on May 22, 2013 together with Chairman Bernanke' speech before the Joint Economic Committee of the U.S. Congress triggered a global reassessment of expectations around the timing and path of adjustment in U.S. monetary policy. The New York Fed survey of markets' expectations of Fed bond purchases show markets (the 25th percentile of survey participants) revise down the amounts of agency and treasury bonds they were expecting the Fed to purchase in the Fall of 2013.

In the April survey, the most conservative of the surveyed market participants were expecting the Fed to maintain the decision to buy US$85 billion a month of bonds through its July 18–19 meeting and reduce that amount to US$55 billion at its December 17–18 meeting. It is not clear what the expected path of these purchases were between the July FOMC meetings and the December ones since no projections were given for the September 17–18 and the October 29–30 FOMC meetings.

How did Federal's tapering talks impact markets' expectations of bond purchases?
(y axis shows the amount of treasury and agency bond that markets expect the Federal to purchase, in Bil US$)
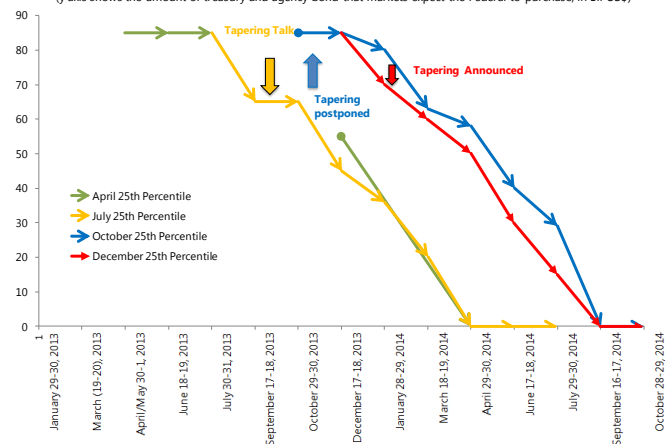
Foreign Exchange Rates
(Percent Change, "+" = Depreciation)
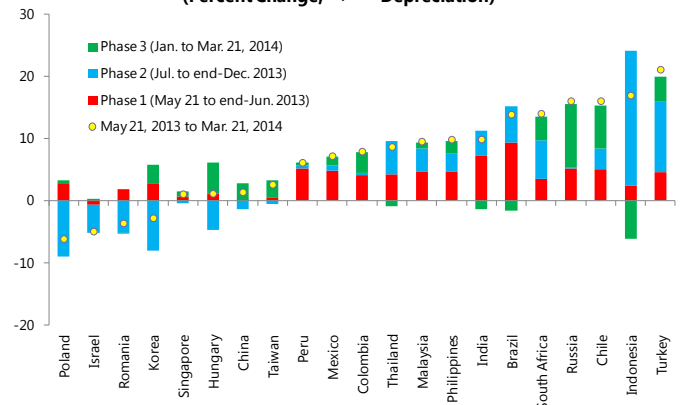
However, the July survey, which was done after Chairman Bernanke' speech, shows that markets were expecting the Fed to buy only US$65 billion in bonds per month at its September meeting and reduce that amount to US$45 billion after the December meeting. This revision in expectations was accompanied with a broad-based sell-off of EMs' assets. Between May 22 and end-June, currencies across EMs depreciated, spreads rose, and equities fell. On average, currencies across EMs (21 countries in sample) depreciated 3 percent, spreads rose 1 percentage
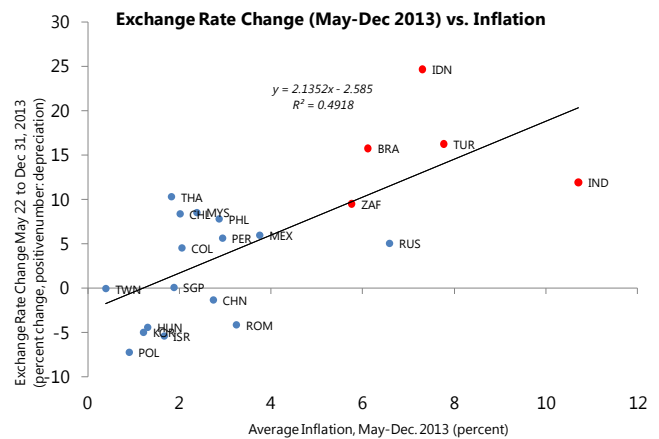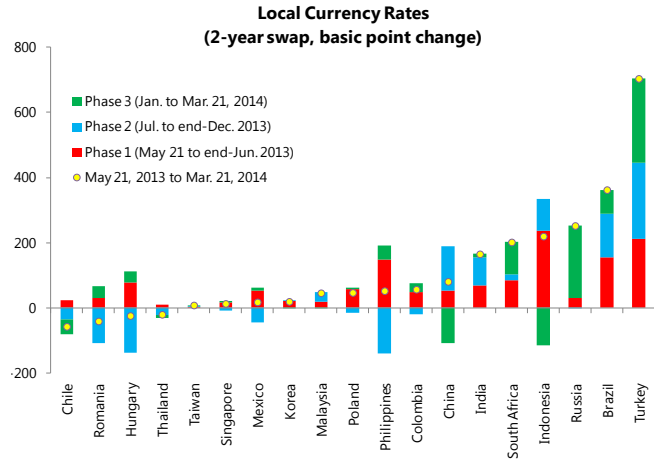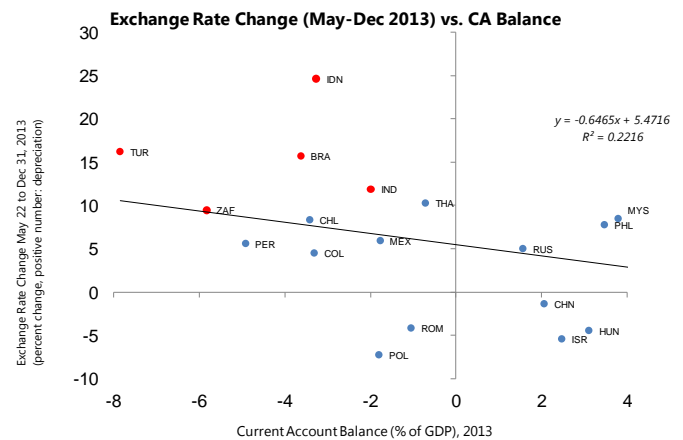
Local Currency Rates
(2-year swap, basic point change)

- Phase 3 (Jan. to Mar. 21, 2014)
- Phase 2 (Jul. to end-Dec. 2013)
- Phase 1 (May 21 to end-Jun. 2013)
- May 21, 2013 to Mar. 21, 2014

points, and equities fell 7 percent. This episode of broad selloff was then followed by greater differentiation during the second half of 2013. The differentiation seems to have been based on fundamentals, including external and macroeconomic imbalances (current accounts and inflation). This differentiation led investors to focus on India, Indonesia, Brazil, Turkey and South Africa.

Another bout of volatility hit EMs in mid-January 2014, but clearer communication by the Fed meant that the actual process of tapering began with less market impact. The bout of volatility in January, 2014 seems to have been triggered by a confluence of factor**s**, including news about China's shadow banking system, idiosyncratic developments in Argentina, and rising political and policy risks in Turkey and further pressure on South African markets. Interestingly, countries that had taken earlier policy action since May, 2013 showed more resilience—India and Indonesia for example experienced little pressure.

Overall, the volatility episodes in global markets that followed U.S. monetary policy announcements since May 2013 and the way EMs were affected seems to suggest that country fundamentals matter in determining markets' reaction. The sections that follow try to take a systematic look at the link between EMs' fundamentals, economic structure, and markets' reactions to the news about the Fed monetary policy.

Exchange Rate Change (May-Dec 2013) vs. Inflation

$y = 2.1352x - 2.585$
$R^2 = 0.4918$

Exchange Rate Change May 22 to Dec 31, 2013
(percent change; positive number: depreciation)

Average Inflation, May-Dec. 2013 (percent)

Source: Datastream, IFS and Staff Calculations

Exchange Rate Change (May-Dec 2013) vs. CA Balance

$y = -0.6465x + 5.4716$
$R^2 = 0.2216$

Exchange Rate Change May 22 to Dec 31, 2013
(percent change; positive number: depreciation)

Current Account Balance (% of GDP), 2013

Source: Datastream, WEO and Staff Calculations

III. DATA

The study uses data for 21 emerging markets, including Brazil, Chile, China, Colombia, Hungary, India, Indonesia, Israel, Korea, Malaysia, Mexico, Peru, Philippines, Poland, Romania, Russia, Singapore, South Africa, Taiwan, Thailand, and Turkey.[3]

The three key dependent variables considered are exchange rates (local currency/US$), local currency government bond yields (10-year and five-year), and equity prices. The data are daily and cover the period from January 1, 2013 to January 22, 2014.

The select country characteristics can be classified into several categories: (i) macro fundamentals: inflation, fiscal balance/GDP, current account/GDP, and reserves/GDP, (ii) financial depth as measured by bank credit/ GDP, M2/GDP, M3/GDP, stock market capitalization/GDP, and bid-ask spread in the market for 10-year local currency bond yields, (iii) EM growth prospects: current and one-year ahead growth forecasts, (iv) China's growth —one-year ahead growth, and trade linkage with China (v) financial integration: stock of portfolio assets and liabilities/ GDP, (vi) a measure of excess capital inflows relative to a pre-specified benchmark (determined by push and pull factors), (vii) capital flow measures, and macroprudential policy. Note that bank credit, M2, M3, stock market capitalization, and bid-ask spread are used as broad proxies of financial depth in all three sets of regressions—FX, bond yield, and equity price. Ideally, measures of development of sovereign bond markets should have been used in the bond yield regressions—but such detailed data are not available for a wide sample of countries.

For variables in categories (i)-(v) the data are lagged one-quarter. For (v)–(vii), the data are at the country-level and do not vary over time. Financial integration is measured in the last quarter of 2012, while the measure of excess inflows, capital flow measures and macroprudential policies are cumulated from 2000 up to the last quarter of 2012. Note that even though some of the country characteristics we consider are time-invariant, the framework (discussed below) allows us to use cross-country variation to analyze how markets differentiated across countries. All variables, data sources and summary statistics are described in Appendix Table A1.

IV. EMPIRICAL METHODOLOGY

To uncover the role macroeconomic fundamentals, economic and financial structures played in market reactions to the Fed's policy announcements we use an event study framework. The methodology can be decomposed into two steps.

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[3] For the purposes of this paper, following Rogoff et. al. (2004), emerging market economies include Korea, Singapore, and Taiwan, as these are included in the Morgan Stanley Capital International (MSCI) index.

Documenting market reactions

First we pool all the "events" (dates of FOMC meetings and release of minutes), and document market reactions around these events.

$$\Delta y_{c,i-m,i+m} = \alpha + \beta * D_i \qquad (1)$$

Where Δy is the two-day change in exchange rate, government bond yields, or equity prices; D_i is a dummy that marks the event of interest. Based on market reactions, we classify events as negative, positive, or non-events. Negative events are expected to be associated with a positive β coefficient in the exchange rate and bond yield regressions, and a negative coefficient in the stock price regression—FX increases (depreciates), yields increase, and stock prices decline around negative events. Positive events are associated with a negative β coefficient in the exchange rate and bond yield regressions, and a positive coefficient in the stock price regressions—FX decreases (appreciates), yields decrease, and stock prices increase around positive events. We use a rule of the thumb—that at least two of the coefficients need to be statistically significant for an event to be classified as negative or positive. Episodes that do not fall in either the two categories above are classified as non-events. Table 1 shows that during January 1, 2013, and January 22, 2014, there were 17 news events related to the Fed monetary policy.

Table 1. List of FOMC Meetings and Minutes

Meeting No.	Date of Meeting		Release of Minutes
1	January	29-30	20-Feb-13
2	March	19-20	10-Apr-13
3	April/May	30-1	22-May-13
4	June	18-19	10-Jul-13
5	July	30-31	21-Aug-13
6	September	17-18	9-Oct-13
7	October	16	
8	October	29-30	20-Nov-13
9	December	17-18	8-Jan-14

Source: IMF Staff Estimates.

Uncovering the role of country characteristics

Once the events have been identified, we estimate regressions by pooling the 17 events across the 21 EMs. The regressions relate two-day changes in the exchange rate, bond yields, or equity prices to a constant, dummies for the negative events, and interactions between the negative events dummies and country characteristics. Formally, the specification is as follows:

$$\Delta y_{c,i-m,i+m} = \alpha + \beta * D_i^N + \gamma x_{c,i-q} + \delta D_i^N * x_{c,i-q} + s_c \qquad (2)$$

Where D_i^N is a dummy for negative event i, $x_{c,i-q}$ is the characteristic for country c measured a quarter before the event, s_c is the country-fixed effect. Country fixed effects can control for any time-invariant country characteristics e.g. a country's propensity to intervene in foreign exchange markets, as long as it does not change over time.[4] Country fixed effects also control for all other country variables which are not likely to vary much over the one-year period we focus on in this study. $x_{c,i-q}$ can be both time-invariant and time varying. For regressions where $x_{c,i-q}$ is time-invariant, the variable will be collinear with the country fixed effect and will drop out.

Although the literature on identifying monetary policy shocks in the United States uses narrow intra-day windows around announcements (for example, Gurnayak, Sack and Swanson, 2005), this paper uses longer time windows as it focuses on reactions in emerging markets (and not in the United States) to monetary policy announcements in the United States. In the main analysis, we use a two-day horizon (one day window before and after the event). The meetings typically take place on Wednesdays—therefore we analyze differences in variables between Tuesday and Thursday of the week. The results in the paper are robust if four-day instead of two-day differences are used (difference in the variables between Monday and Friday of the week). Using a longer time window takes into account any concerns relating to time difference the United States and emerging markets.

Amongst macroeconomic fundamentals, the study looks at inflation, fiscal and current account balance, and reserves. The hypothesis is that countries with weaker fundamentals are harder hit—that is they experience a larger depreciation in exchange rates, a higher increase in bond yields, and a larger decline in equity prices.

Next we look at growth prospects in emerging markets. One of the hypotheses is that around tapering talks, markets also started reassessing growth prospects in EMs. Capital inflows into

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[4] As robustness check, in the FX regressions, we also control for foreign exchange interventions during the month of the event. Due to limited data on interventions, the sample reduces substantially, but the results remain qualitatively similar.

EMs prior to the tapering talks had contributed to loosen financial conditions in EMs and supported growth higher than it would otherwise be. Prospects for tighter monetary conditions in the United States meant that EM growth prospects had to be reassessed downward. In such a case, countries with better growth prospects should be hit less around negative events. The structural factors considered include financial depth (measured in various ways including bank credit to GDP, M2/GDP, M3/GDP, and bid-ask spreads), financial integration, and exposure to China. Financial depth is expected to enhance countries' resilience to shocks (see IMF, 2014a) and hence countries with deeper markets are expected to fare better than others (e.g. less of a depreciation of exchange rates, fall in equity prices, a rise in bond yields). This mechanism transpires in the experience of EMs during the summer of 2013 with more liquid markets experiencing overall a smaller depreciation. At the same time, in theory, deeper financial systems could lead to macroeconomic instability, as investors are able to unwind their positions faster in more liquid market.
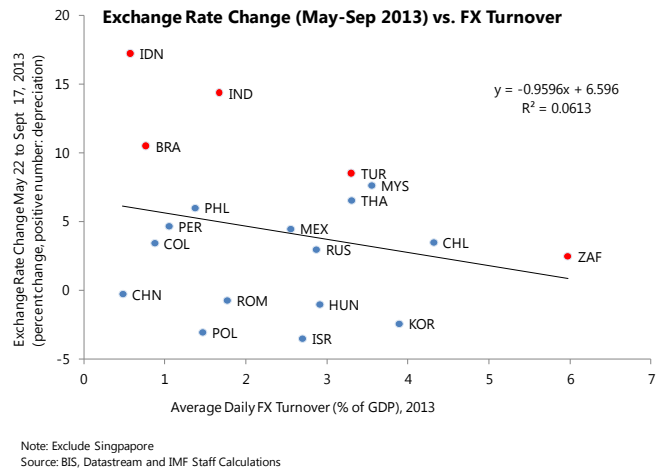
The impact of financial integration is a priori ambiguous. On the one hand, more financially integrated countries (financial integration measured as the ratio of the sum of foreign portfolio assets and liabilities to GDP) are more exposed to external shocks and could hence be expected to be affected more during periods of volatility. On the other hand, greater financial integration could mean better opportunity for diversifying risks, in which case one could expect the more financially integrated countries to be less affected during periods of volatility. Strong trade linkages with China could also provide some buffers to countries when China's economic prospects are good enough to offset potential adverse impact of tighter financing conditions or volatility related to the unwinding of unconventional monetary policy in the United States. At the same time, when the economic news from China are not good, countries with stronger trade linkages with China could be exposed to more market volatility. They could potentially be hurt twice due to bad news from China and volatility related to unwinding of monetary policy in the United States.
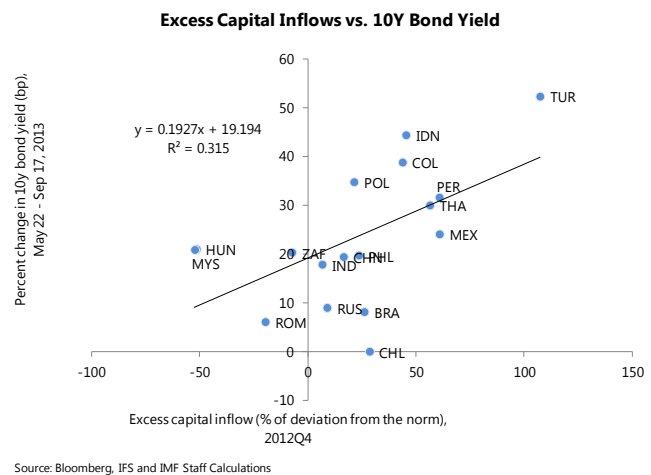
The study also looks at the role of countries' policy stance toward capital flows in the run-up to the volatility episodes of 2013–14. In particular, the paper looks at the role of capital flows

measures and macroprudential policies. The data on capital flows measures (CFMs) and macroprudential measures are from Zhang and Zoli (2014). The indicator of macroprudential measures include changes in loan-to-value and debt-to-income ratios, counter-cyclical capital requirements, dynamic provisions, reserve requirements, liquidity tools, and capital measures. The indicator of capital flows measures include measures aimed at curtailing FX transactions or residency-based financial transactions. The index from Zhang and Zolli (2014) takes values of -1, 0, and +1 depending on whether the policies were loosened, kept unchanged, or tightened respectively. We create a measure of cumulative stance of CFM and macroprudential policies at the country-level by cumulating the policies over the period starting from 2000. Many EMs put in place CFMs and macroprudential measures prior to 2013 as ultra loose monetary policy in advanced economies, a global search for yield, and seemingly better growth prospects in EMs led to large capital inflows into EMs. Left unchecked, the inflow of liquidity contributed to loosening monetary conditions in EMs, further fueling credit growth and imbalances in asset markets. The text chart shows a positive relationship between the overflow of capital into EMs and the bond market reaction during May 22–September 17, 2013,[5] suggesting that countries that seen most capital inflows in the run-up to 2013 were more impacted during the 2013 May-September volatility episodes.

V. RESULTS

Pooling the events during January 2013–January 2014

To determine markets reactions around the events listed in Table 1, we estimate Equation (1) which relates the two-day change in the variable of interest (exchange rate, bond yields, and equity) to a constant and a dummy around the events.

The regression results (shown in Table 2) suggest that markets reacted negatively to meetings (4), and (8), as well as minutes (3), (5), and (7). Markets' strong reactions on May 22 to the speech by Chairman Bernanke when he first signaled the Fed intention to taper perhaps faster than anticipated by markets also coincided with the release of minutes (3). Notably markets did not react negatively to the December meeting (meeting (9)) when the Fed actually announced tapering or a reduction in asset purchases starting January—perhaps because there was no "news" content in the announcement as tapering had already been priced in by markets.

Interestingly, the sample period is also characterized by positive events and non-events. Meetings (6) and (7), and minutes (4) and (6), are classified as positive events. There was a strong positive reaction following the September 18 meeting (meeting (6)) when the Fed announced it was postponing tapering of QE assets. Note that markets also reacted positively after the October 16 meeting (meeting (7)), which was an unscheduled one to discuss issues

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[5] The overflow is defined as the amount of capital inflows into EMs in excess of what can be explained by fundamentals, including U.S. growth, U.S. and domestic interest rates, the Fed QE, and the VIX. For details see IMF, 2014.

Table 2. Market Reactions to FOMC Meetings and Release of Minutes
Dependent Variable 2-day Changes Pre and Post Event
(in percent)

	(1) Exchange rate	(2) Government bond yields	(3) Stock prices
meeting_1	-0.13	0.01	-0.27
	(0.135)	(0.010)	(0.272)
meeting_2	0.11	0.03**	-0.09
	(0.092)	(0.011)	(0.259)
meeting_3	0.12	-0.04***	0.17
	(0.075)	(0.012)	(0.196)
meeting_4	1.94***	0.24***	-3.02***
	(0.229)	(0.046)	(0.311)
meeting_5	0.52***	0.00	0.67**
	(0.112)	(0.036)	(0.293)
meeting_6	-1.60***	-0.20***	1.50***
	(0.165)	(0.043)	(0.381)
meeting_7	-0.67***	-0.08***	0.01
	(0.176)	(0.023)	(0.196)
meeting_8	0.67***	0.07***	-0.32*
	(0.151)	(0.022)	(0.195)
meeting_9	0.59***	0.02	0.29
	(0.118)	(0.020)	(0.244)
minutes_1	0.65***	-0.01	-0.86***
	(0.133)	(0.007)	(0.261)
minutes_2	-0.19**	-0.01	0.70***
	(0.079)	(0.012)	(0.261)
minutes_3	0.47***	0.09***	-0.78***
	(0.099)	(0.019)	(0.236)
minutes_4	-0.90***	-0.02	1.67***
	(0.201)	(0.037)	(0.377)
minutes_5	0.75***	0.08	-0.86**
	(0.166)	(0.052)	(0.426)
minutes_6	-0.35***	0.01	0.65***
	(0.105)	(0.014)	(0.195)
minutes_7	0.56***	0.08***	-0.95***
	(0.092)	(0.013)	(0.241)
minutes_8	0.15	0.00	-0.30
	(0.109)	(0.012)	(0.246)
Observations	357	357	357
R-squared	0.615	0.358	0.418

Notes. Meetings (1) January 30th (2) March 20th (3) May 1st (4) June 19th (5) July 31st (6) September 18th (7) October 16th (8) October 30th (9) December 18. Release of Minutes (1) February 20th (2) April 10th (3) May 22nd (4) July 10th (5) August 21st (6) October 9th (7) November 20th (8) January 8th. Exchange rate is measured in local currency per US$. Government bond yields are 10-year (except for Philippines-5 Yr, Brazil-5 Yr, and Chile-9 Yr). Standard errors clustered at the country-level, are denoted in parentheses. ***, **, and * denote statistical significance at the 1, 5, and 10 percent levels respectively.

associated with contingencies in the event of government shutdown. Although the meeting was not related to monetary policy announcements, the markets believed that a government shutdown would perhaps lead to a delay in release of macro data, and hence most likely associated with a postponement of tapering. This paper mainly focuses on analyzing the determinants of market reactions around periods of turmoil (or negative events). However, positive events (and their interaction with country characteristics) are also included to check for robustness.

Another exercise we do is to analyze market reactions around events over a longer time period—where we consider all FOMC announcements over the period from 2009–2013. Our classification of negative events remains robust to using a longer time horizon.[6]

Market reaction and country characteristics

Regression results for changes in exchange rates are shown on Tables 3 through 8.

Results in Table 3 suggest that FX markets differentiated on the basis of macroeconomic fundamentals. Countries with higher current account balances, lower inflation, higher reserves (in relation to GDP), and a better fiscal position had lower depreciation of the exchange rate, and therefore, fared better around periods of turmoil than those with worse fundamentals.

The estimated coefficients are economically significant. For example, looking at the first column, the results suggest that a country with a one percent of GDP higher than average current account balance would see its exchange rate depreciate by 0.03 percentage points less than the average over a two-day period. For a country like Turkey, that has a current account deficit of 7 percent of GDP, compared with a sample average of a current account surplus of 0.39 percent of GDP, the estimated coefficient would imply the Turkish lira would depreciate an additional by 0.2 percentage points over the two-day window (around 30 percent annualized).

Importantly, the effect of macroeconomic fundamentals around the non-negative events is given by the coefficient on the non-interacted terms, which are not statistically significant. In other words, there was not much differentiation on the basis of fundamentals around announcements not characterized by turmoil. We also allow for separate interactions for positive events, and non-events. The estimated coefficient on the interaction with positive events is of an opposite sign, and statistically significant, suggesting that the magnitude of exchange rate "appreciation" is also lower during positive events. Therefore, better fundamentals are associated with dampened market reactions in either direction.[7]

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[6] These results are available upon request.

[7] Results available upon request. As a robustness check, we also allowed the coefficient on the interaction terms to vary by events. The results are broadly robust. Countries with better macro fundamentals experienced less depreciation around *each* negative event.

Table 3. FX Reaction and Macroeconomic Fundamentals
Dependent Variable 2-day Changes in Exchange Rate (Local Currency/US$) Pre and Post Event
(in percent)

	(1)	(2)	(3)	(4)
Dummy	1.030***	1.373***	0.800***	0.956***
	(0.091)	(0.133)	(0.170)	(0.084)
Interactions with				
CA/GDP	-0.031**			
	(0.011)			
Reserves/GDP		-0.011***		
		(0.003)		
Inflation			0.061**	
			(0.029)	
Fiscal balance/GDP				-0.053**
				(0.020)
CA/GDP	0.043			
	(0.068)			
Reserves/GDP		0.050		
		(0.044)		
Inflation			0.024	
			(0.056)	
Fiscal balance/GDP				0.007
				(0.013)
Observations	357	357	357	357
R-squared	0.234	0.241	0.233	0.236

Notes. The dummy takes a value for all negative events based on Table 1. These events are as follows: Meetings. June 19th, October 30th, Release of Minutes. May 22nd, August 21st, November 20th. All regressions include country fixed effects. Standard errors are clustered at the country-level. ***, **, and * denote statistical significance at 1,5, and 10 percent respectively.

Financial depth

Financial depth tends to enhance countries' resilience to shocks as countries with deeper financial markets experienced smaller exchange rates depreciations (Table 4). The results hold for all standard measures of financial depth except bid-ask spreads, which are used as a proxy measure of how well markets pricing signals work. Mexico is an example of a country with deeper financial markets than others and that has been less affected during the bouts of volatility in 2013 and early 2014. Mexico experienced a large depreciation in the aftermath of the May 22 tapering talk (perhaps because it was used as a proxy hedge for other EM currencies with less liquid financial markets), but its deep markets facilitated the needed adjustment in capital flows and portfolios rebalancing. Mexico experienced little volatility during the episodes of volatility after the summer of 2013. [8]

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[8] If measured by bank credit to GDP, Mexico's financial markets are not deep. However, its markets are relatively deep based on liquidity measures e.g. bid-ask spread or turnover in FX markets.

Table 4. FX Reaction and Financial Depth
Dependent Variable 2-day Changes in Exchange Rate (Local Currency/US$) Pre and Post Event
(In Percent)

	(1)	(2)	(3)	(4)	(5)
Dummy	1.442***	1.585***	1.450***	1.335***	0.981***
	(0.178)	(0.164)	(0.123)	(0.173)	(0.132)
Interactions with					
Bank credit/GDP	-0.005**				
	(0.002)				
M3/GDP		-0.004***			
		(0.001)			
M2/GDP			-0.005***		
			(0.001)		
Stock market cap/GDP				-0.004**	
				(0.001)	
Bid-ask spread					-0.253
					(1.430)
Bank credit/GDP	-0.074***				
	(0.025)				
M3/GDP		-0.090***			
		(0.023)			
M2/GDP			-0.095***		
			(0.026)		
Stock market cap/GDP				0.015*	
				(0.007)	
Bid-ask spread					-3.518***
					(1.096)
Observations	357	289	357	357	340
R-squared	0.250	0.286	0.264	0.242	0.231

Notes. The dummy takes a value for all negative events based on Table 1. These events are as follows: Meetings. June 19th, October 30th, Release of Minutes. May 22nd, August 21st, November 20th. All regressions include country fixed effects. Standard errors are clustered at the country-level. ***, **, and * denote statistical significance at 1,5, and 10 percent respectively.

The result is consistent with recent work which highlights the importance of developing a local investor base in emerging markets. IMF, 2014b, for example, presents evidence to show that EMs with a larger local investor base, deeper banking sectors and capital markets, and better institutions exhibit lower sensitivity to global financial shocks.

EMs' growth prospects

Table 5 shows that countries with better growth prospects (whether one looks at the actual level of activity in the quarter preceding the event or the one-year- ahead growth forecasts) have on average fared better. This result also implies that countries whose growth prospects have been reassessed downward experienced larger exchange rate depreciations. For example, growth prospects for Brazil, Turkey, South Africa, and India

Growth Revisions (consensus forecast, normalized)

had all been revised downward by about ¼ percentage points in 201314.
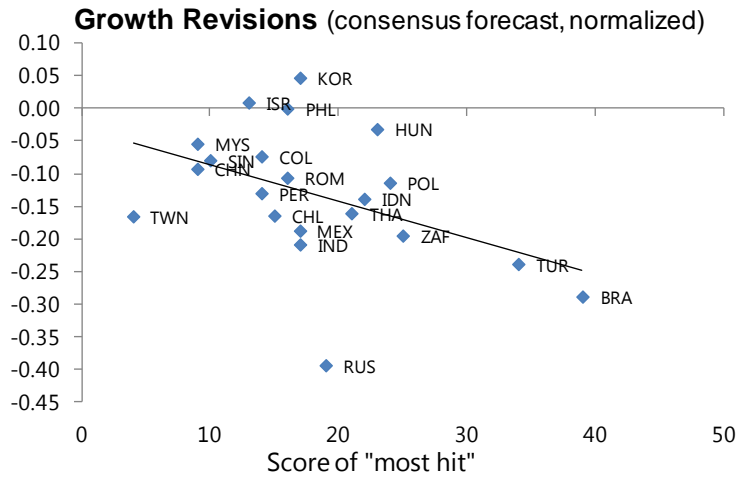
Trade linkages with China

Trade link to China

Results in Table 6 show the stabilizing role which exposure to China has had on markets' reaction to Fed monetary policy announcements in 2013. Exposure to China is measured by the sum of a country's exports to and imports from China as a ratio of its GDP.[9] The coefficient on the interaction between the negative event dummy and exposure to China is negative

and statistically significant. Countries with strong er trade links to China were less hit during the volatility episodes. These are mainly countries in the Asian supply chain.[10]
These results can be interpreted as linkages with China acting as a buffer, whereby investors tend to display more confidence in countries which have greater exposure to China. Both foreign and domestic investors are less likely to sell-off from such markets, and therefore exchange rates depreciate less and bond yields increase less in countries with stronger linkages to China.

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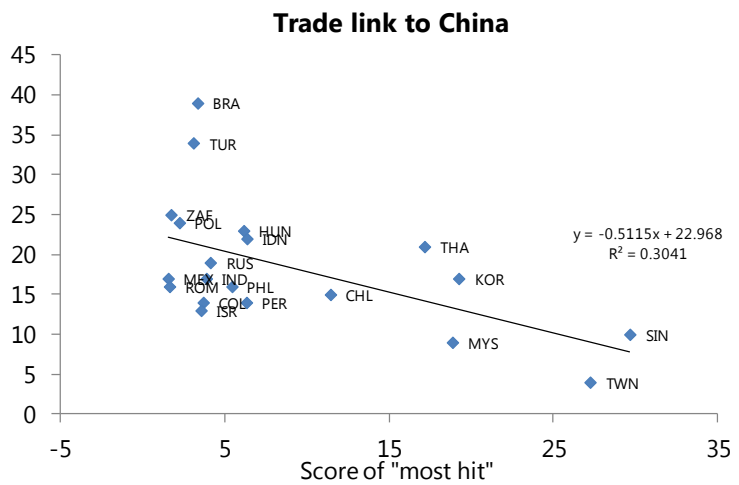
[9] Note that the exposure to China is measured simply by trade linkages in the paper. Exposure to China could also be measured through other direct and indirect channels e.g. through financial linkages of countries with China, or a rise in commodity prices.

[10] We also interacted the negative event dummies with exposure to the United States, and did not find any significant effect.

Table 5. FX Reaction and Emerging Market Growth Forecasts

Dependent Variable 2-day Changes in Exchange Rate (local Currency/US$) pre and Post Event (In Percent)

	(1)	(2)	(3)
Dummy	1.321***	1.515***	1.054***
	(0.185)	(0.285)	(0.231)
Interactions with			
Real GDP growth	-0.082*		
	(0.045)		
Annual growth forecast - 1 yr ahead - Consensus		-0.118*	
		(0.065)	
Annual growth forecast - current -- Consensus			-0.009
			(0.056)
Real GDP growth	0.008		
	(0.019)		
Annual growth forecast - 1 yr ahead		0.416***	
		(0.090)	
Annual growth forecast - current			0.103
			(0.074)
Observations	357	357	357
R-squared	0.233	0.249	0.229

Notes. The dummy takes a value for all negative events based on Table 1. These events are as follows: Meetings. June 19th, October 30th, Release of Minutes. May 22nd, August 21st, November 20th. Growth forecasts are from Consensus Economics. Exposure to China for a country is measured by exports to China as a fraction of the country's GDP. All regressions include country fixed effects. Standard errors are clustered at the country-level. ***, **, and * denote statistical significance at 1,5, and 10 percent respectively.

Interestingly, this is despite the fact that China's growth prospects in and of themselves did not have a significant impact on FX markets' reactions. In addition, when the volatility relating to the unwinding of monetary policy in the United States is combined with low growth in China, exposure to China does not act as a significant buffer. As shown in Column (4), the triple interaction between the event dummy, China's growth, and EM exposure to China is not statistically significant.

Capital flow management measures (CFMs) and international financial integration

Table 7 shows that countries that have imposed capital flows measures amidst large capital inflows (column 4) and countries with greater international financial integration (columns 5 and 6) have fared better, experiencing smaller exchange rate depreciation.[11] Highly integrated countries that imposed capital flow measures also experienced smaller depreciation—the triple interaction between the dummy, international financial integration and capital flow

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[11] As discussed above, international financial integration is measured by the stock of portfolio assets and liabilities in relation to GDP. The results are similar if we use a broader measure, which includes FDI and bank flows.

measures is negative and statistically significant.[12] The results support the hypothesis that greater financial integration offers better opportunity for diversifying risks, which helps dampen market reactions.

Table 6. FX Reaction and Emerging Market, China's Growth and Exposure to China
Dependent Variable 2-day Changes in Exchange Rate (Local Currency/US$0 Pre and Post Event
(In Percent)

	(1)	(2)	(3)	(4)
Dummy	1.060	1.348***	1.764	2.715
	(1.933)	(0.116)	(2.085)	(3.169)
Interactions with				
China's Annual growth forecast - 1 yr ahead - Consensus	0.004		-0.044	-0.167
	(0.247)		(0.265)	(0.405)
Exposure to China		-0.028***	-0.028***	-0.126
		(0.007)	(0.007)	(0.174)
China Growth*Exposure to China				0.013
				(0.022)
China's Annual growth forecast - 1 yr ahead - Consensus	0.757***		0.890***	0.951***
	(0.114)		(0.141)	(0.183)
Exposure to China		-0.033	0.065*	0.114
		(0.050)	(0.034)	(0.112)
China Growth*Exposure to China				-0.007
				(0.016)
Observations	357	340	340	340
R-squared	0.273	0.251	0.301	0.302

Notes. The dummy takes a value for all negative events based on Table 1. These events are as follows: Meetings. June 19th, October 30th, Release of Minutes. May 22nd, August 21st, November 20th. Exposure to China for a country is measured by the sum of exports to and imports from China as a fraction of the country's GDP. All regressions include country fixed effects. Standard errors are clustered at the country-level. ***, **, and * denote statistical significance at 1,5, and 10 percent respectively.

Macroprudential policies and financial depth

Table 8 shows that countries that have tightened macroprudential policies prior to 2013 experienced less FX depreciation. Nevertheless, the interaction terms between the event dummy, macroprudential, and financial depth (measured by stock market capitalization) is positive, suggesting that the marginal benefits of macroprudential policies diminish with financial depth. The results are different from capital flow measures, for which the benefits are increased with greater financial integration.

Overall, our findings suggest that a tighter stance on both CFMs and macroprudential in the run-up to the episodes of turmoil in 2013-14 helped mitigate negative market reactions. These results may imply that such measures tend to change the composition of investment towards less volatile and risky items; thus leading to lower sell-off in these countries during episodes of turmoil.

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[12] Based on our measure, countries which remained highly integrated despite a tight stance on capital flow measures include Korea, Russia, Brazil, and Thailand. The results are robust to dropping Singapore and Taiwan, which have very high degrees of international integration relative to the rest of the sample.

Table 7. FX Reaction, Financial Integration, Capital Flows and Capital Flow Measures
Dependent Variable 2-day Changes in Exchange Rate (Local Currency/US$) pre and Post Event
(In Percent)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dummy	1.122***	1.008***	1.140***	1.120***	1.119***	1.124***	1.121***
	(0.130)	(0.127)	(0.169)	(0.156)	(0.124)	(0.164)	(0.164)
Interactions of dummy with							
Excess capital flows	-0.001		-0.002	-0.001			
	(0.002)		(0.002)	(0.002)			
Capital flow measures		0.004	0.001	0.032		-0.001	0.020
		(0.016)	(0.018)	(0.024)		(0.017)	(0.019)
Excess capital flows*CFM				-0.001**			
				(0.000)			
International financial integration					-0.002*	-0.002*	-0.002*
					(0.001)	(0.001)	(0.001)
Internation financial integration *CFM							-0.001*
							(0.000)
Observations	272	340	255	255	357	340	340
R-squared	0.236	0.232	0.244	0.249	0.230	0.236	0.237

Notes. The dummy takes a value for all negative events based on Table 1. These events are as follows: Meetings. June 19th, October 30th, Release of Minutes. May 22nd, August 21st, November 20th. Capital flow measures are calculated based on an index from an IMF database which takes a value of 1 meaning tightening, -1 meaning loosening, and 0 meaning no action. The index is cumulated from 2000-2013 to create the CFM measure. All regressions include country fixed effects. Standard errors are clustered at the country-level. ***, **, and * denote statistical significance at 1,5, and 10 percent respectively.

Table 8. FX Reaction, Financial Depth and Macro Prudential Measures
Dependent Variable 2-day Changes in Exchange Rate (Local Currency/US$) pre and Post Event
(In Percent)

	(1)	(2)	(3)
Dummy	1.184***	1.702***	1.453***
	(0.126)	(0.149)	(0.168)
Macro prudential	-0.023**	-0.052***	-0.003
	(0.009)	(0.006)	(0.023)
Stock market cap/GDP		-0.008***	
		(0.001)	
Macro prudential * Stock market cap		0.001***	
		(0.000)	
M2/GDP			-0.004***
			(0.001)
Macro prudential * M2/GDP			-0.000
			(0.000)
Variables without interaction with dummy			
Stock market cap/GDP		0.018***	
		(0.005)	
Macro prudential * Stock market cap		0.001	
		(0.001)	
M2/GDP			-0.118***
			(0.035)
Macro prudential * M2/GDP			0.002
			(0.001)
Observations	340	340	340
R-squared	0.241	0.271	0.277

Notes. The dummy takes a value for all negative events based on Table 1. These events are as follows: Meetings. June 19th, October 30th, Release of Minutes. May 22nd, August 21st, November 20th. Capital flow measures are calculated based on an index from an IMF database which takes a value of 1 meaning tightening, -1 meaning loosening, and 0 meaning no action. The index is cumulated from 2000-2013 to create the CFM measure. All regressions include country fixed effects. Standard errors are clustered at the country-level. ***, **, and * denote statistical significance at 1,5, and 10 percent respectively.

Economic significance of the estimates

The chart below illustrates the benefits of stronger fundamentals, deeper financial markets, growth prospects in China and in other EMs, as well as capital flows and macroprudential policies. The chart shows the additional depreciation a country can face due to one standard deviation higher vulnerability than the average. For all country characteristics except inflation, lower values of the variables are defined to denote a higher degree of vulnerability. Countries which receive larger capital inflows but have looser macroprudential policy stance are also characterized as more vulnerable.

The average and standard deviations for various variables used in the chart are shown in Table A1. The estimates are economically significant, and can reach up to 0.3 percentage points depreciation over two days (around 50 percent annualized) for increases in vulnerability of one standard deviation above average in the areas listed in the chart below (inflation, current account, fiscal balance, etc.). For example, a one standard deviation higher
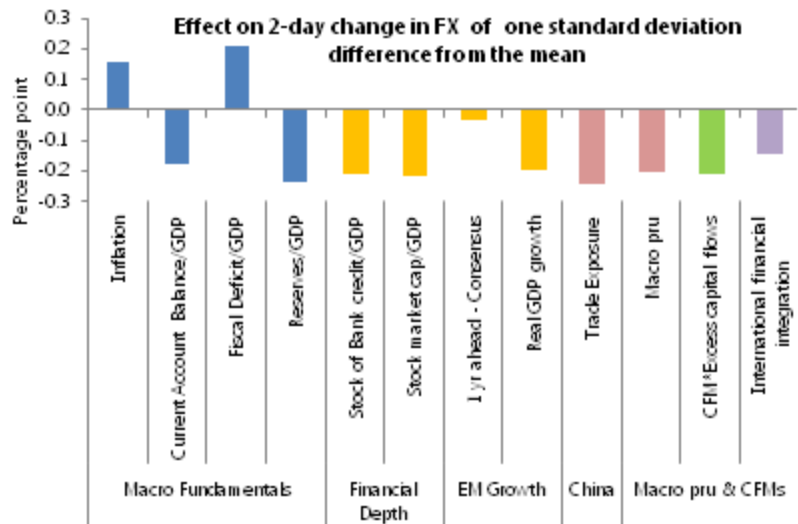
vulnerability stemming from a 2.6 percentage point lower inflation rate is associated with a 0.15 percentage point lower depreciation.

Effect on bond yields and equity prices

The results from the regression of two-day changes in 10-year bond yields around the events on countries' macroeconomic fundamentals and structural characteristics are qualitatively similar to those for exchange rates (Table 9).[13] Countries with stronger fundamentals—larger current account balances and reserves; deeper financial markets; larger exposure to China; and tighter macroprudential policy stance in run-up to 2013 events experienced smaller increases in bond yields during events of turmoil.

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[13] The results (not shown) are similar if five-year instead of 10-year government bond yields are used.

Table 9. Changes in Yields and Country Characteristics
(2-day Changes)

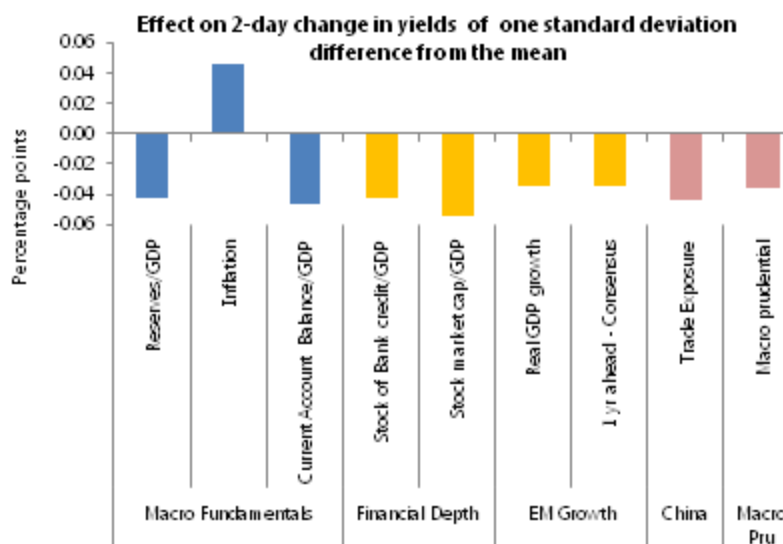| Interaction of event dummy with country characteristics	(1)	(2)	(3)	(4)	(5)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
dummy	0.138***	0.192***	0.186***	0.071	0.133***	0.222***	0.214***	0.195***	0.204***	0.106***	0.153***	0.209***	0.095	0.186***	0.158***	0.120***
	(0.023)	(0.042)	(0.029)	(0.046)	(0.025)	(0.044)	(0.052)	(0.042)	(0.038)	(0.027)	(0.032)	(0.047)	(0.063)	(0.040)	(0.032)	(0.033)
CA/GDP	-0.008*															
	(0.004)															
Reserves/GDP		-0.002**														
		(0.001)														
Growth			-0.014													
			(0.009)													
Inflation				0.018												
				(0.016)												
Fiscal balance/GDP					-0.000											
					(0.006)											
Bank credit/GDP						-0.001***										
						(0.000)										
M3/GDP							-0.001***									
							(0.000)									
M2/GDP								-0.001***								
								(0.000)								
Stock market cap/GDP									-0.001**							
									(0.000)							
Bid-ask spread										0.361						
										(0.321)						
Financial integration											-0.000					
											(0.000)					
Consensus forecast - 1 yr												-0.017				
												(0.013)				
Consensus forecast - current													0.009			
													(0.018)			
Exposure to China														-0.005**		
														(0.002)		
Macro prudential															-0.004**	
															(0.002)	
Excess capital inflows																0.001*
																(0.001)
Capital Flow Measures																
CA/GDP	0.006															
	(0.009)															
Reserves/GDP		0.002														
		(0.009)														
Growth			0.001													
			(0.003)													
Inflation				0.011												
				(0.011)												
Fiscal balance/GDP					0.005**											
					(0.002)											
Bank credit/GDP						-0.006										
						(0.004)										
M3/GDP							-0.006									
							(0.004)									
M2/GDP								-0.006*								
								(0.003)								
Stock market cap/GDP									0.001							
									(0.001)							
Bid-ask spread										-0.420						
										(0.379)						
Consensus forecast - 1 yr											0.027*					
											(0.015)					
Consensus forecast - current												0.006				
												(0.010)				
Exposure to China													-0.004			
													(0.006)			
Observations	357	357	357	357	357	357	289	357	357	340	357	357	357	357	340	272
R-squared	0.201	0.195	0.186	0.206	0.185	0.204	0.185	0.200	0.203	0.178	0.183	0.188	0.182	0.200	0.179	0.214

Notes. Government bonds are 10-year for most countries (9 or 8 years for countries where 10 year is not available). The dummy takes a value for all negative events based on Table 1. These events are as follows: Meetings. June 19th, October 30th, Release of Minutes. May 22nd, August 21st, November 20th. All regressions include country fixed effects. All regressions also include the variables without interaction with the negative event dummy (the coefficients not shown). Standard errors are clustered at the country-level. ***, **, and * denote statistical significance at 1,5, and 10 percent respectively.

The interaction coefficients on growth, inflation, fiscal balance, and financial integration, though of the expected sign, are not statistically significant.
The text chart below shows the magnitude of the effects stemming from one standard deviation higher vulnerability. The effects though smaller than for FX are still economically significant. For example, a one standard deviation higher reserves/GDP or lower inflation is associated with 4 basis points larger increase in yields over a two-day period.

Effect on 2-day change in yields of one standard deviation difference from the mean

(Percentage points)

Categories (left to right): Reserves/GDP, Inflation, Current Account Balance/GDP, Stock of Bank credit/GDP, Stock market cap/GDP, Real GDP growth, 1 yr ahead - Consensus, Trade Exposure, Macro prudential

Groupings: Macro Fundamentals | Financial Depth | EM Growth | China | Macro Pru

The evidence is less compelling for equity prices. Similar to findings on exchange rates and government bond yields, one would expect countries which are less vulnerable to have a smaller decline in equity prices. For example, we should expect the interaction of the event dummy with current account, reserves, and fiscal balance to be positive and statistically significant. Table 10 shows that interactions with most country characteristics are not statistically significant; and often have unexpected signs. However, we do find that countries which received large inflows in the run-up to the tapering episodes experienced larger decline in equity prices. The interaction of the negative event dummy with excess capital inflows is negative and statistically significant.

The finding that equity investors differentiated little across countries unlike bond investors may reflect a difference in the composition of investors across these markets. Perhaps equity markets were dominated by long-term investors who differentiated less based on variables like current account, inflation, etc. On the other hand, investors in bond and FX markets were motivated more by short-term profits and engaged in carry trade—hence greater need to differentiate based on e.g. external financing needs.

Table 10. Changes in Stock Prices and Macroeconomic Fundamentals
(2-day Changes pre and Post Event)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
Interaction of event dummy with country characteristics dummy	-1.531*** (0.173)	-1.551*** (0.272)	-1.008*** (0.336)	-1.335*** (0.253)	-1.641*** (0.160)	-1.646*** (0.379)	-1.443*** (0.379)	-1.584*** (0.295)	-1.411*** (0.302)	-1.881*** (0.215)	-1.480*** (0.221)	-0.255 (0.453)	-0.931*** (0.320)	-1.410*** (0.287)	-1.513*** (0.230)	-1.349*** (0.159)	-1.429*** (0.202)
CA/GDP	0.004 (0.023)																
Reserves/GDP		-0.000 (0.005)															
Growth			-0.142 (0.087)														
Inflation				-0.056 (0.058)													
Fiscal balance/GDP					-0.089** (0.039)												
Bank credit/GDP						0.001 (0.004)											
M3/GDP							-0.001 (0.003)										
M2/GDP								0.000 (0.002)									
Stock market cap/GDP									-0.002 (0.003)								
Bid-ask spread										5.584* (2.915)							
Financial integration											-0.001 (0.001)						
Consensus forecast - 1 yr												-0.297** (0.114)					
Consensus forecast - current													-0.141* (0.074)				
Exposure to China														-0.016 (0.016)			
Macro prudential															-0.000 (0.013)		
Excess capital inflows																-0.011*** (0.002)	
Capital Flow Measures																	-0.025 (0.030)
CA/GDP	-0.058 (0.165)																
Reserves/GDP		-0.137 (0.092)															
Growth			-0.003 (0.050)														
Inflation				-0.128 (0.104)													
Fiscal balance/GDP					0.043 (0.034)												
Bank credit/GDP						0.088** (0.034)											
M3/GDP							0.087* (0.043)										
M2/GDP								0.097** (0.041)									
Stock market cap/GDP									-0.030** (0.013)								
Bid-ask spread										5.531 (3.371)							
Consensus forecast - 1 yr												-0.105 (0.210)					
Consensus forecast - current													-0.166 (0.162)				
Exposure to China														0.212*** (0.066)			
Observations	357	357	357	357	357	357	289	357	357	340	357	357	357	340	340	272	340
R-squared	0.187	0.191	0.194	0.193	0.197	0.193	0.196	0.194	0.198	0.220	0.187	0.204	0.195	0.215	0.185	0.193	0.186

Notes. The dummy takes a value for all negative events based on Table 1. These events are as follows: Meetings. June 19th, October 30th, Release of Minutes. May 22nd, August 21st, November 20th. All regressions include country fixed effects. All regressions also include the variables without interaction with the negative event dummy (the coefficients not shown). Standard errors are clustered at the country-level. ***, **, and * denote statistical significance at 1,5, and 10 percent respectively.

Which country characteristics matter more?

In order to analyze the *relative* importance of specific country characteristics, and to answer the question: which variables matter more in determining market reactions to Fed announcements, we also estimate a specification including interactions with all determinants in one regression. Although estimating this specification is challenging because many variables are collinear, we report the findings in Table 11.

Columns (1) and (2) show results for two- and four-day changes for FX; columns (3) and (4) and columns (5) and (6) show the yields and equity prices. Not surprisingly, the evidence is less compelling than the results presented above. However, a restrictive specification like this also produces evidence for significant market differentiation. For exchange rate, there is more evidence of differentiation at a longer horizon (four-day). As before, the results are weak for equity prices.

The macro fundamentals that continue to matter include reserves, growth, inflation, change in current account, and foreign exchange denominated debt. We find more significant results on interactions with change in current account balance, and FX denominated debt compared to the specifications presented above. Countries (e.g. India) that improved their current accounts over the sample period on average experienced smaller depreciations around negative events the interaction between the change in current account balance and the event dummy turns out to be negative and statistically significant. In addition, we looked at the stock of foreign exchange denominated corporate debt; results suggest lower the stock of foreign currency debt, smaller the depreciation, and the effect is statistically significant.

Similarly, financial depth, and macroprudential policies turn out to be significant determinants of market reactions. Overall, these results provide some support for the main findings in the paper. Better the macro fundamentals, deeper the financial markets, and tighter the macroprudential policy stance in run up to 2013–14 episodes, lower the exchange rate depreciation, and smaller the increase in yields.

Effect of overall vulnerability: Principal component analysis

While the sections above focused on establishing the importance of specific country characteristics, they do not provide a holistic view of country-specific vulnerabilities. In this section, we implement a different approach from the panel analysis presented above that summarizes country vulnerabilities into one indicator. The approach is based on a factor analysis of all the variables used above. In particular, we extract the first principal component from the dataset with a large set of country-specific characteristics—fundamentals: current account/GDP, reserves, inflation, and fiscal balance/GDP; financial depth: bank credit/GDP, M2/GDP, stock market capitalization/GDP, and bid-ask spread; financial integration: stock of portfolio assets and liabilities/GDP; emerging market growth: real GDP growth, and one-year-ahead growth forecast from Consensus; policy: macroprudential, capital flow measures; and exposure to China.

Table 11. Which Country Characteristics Matter the Most?

	(1) Change in FX (two day)	(2) Change in FX (four day)	(3) Change in yields (two day)	(4) Change in yields (four day)	(5) Change in equity prices (two day)	(6) Change in equity prices (four day)
dummy	0.946*	2.905***	0.327**	0.489**	-1.414	-2.342
	(0.499)	(0.417)	(0.120)	(0.191)	(1.360)	(1.920)
Interaction of dummy with						
CA/GDP	0.014	0.076**	0.001	0.003	-0.060	-0.101
	(0.031)	(0.031)	(0.005)	(0.008)	(0.052)	(0.080)
Reserves/GDP	-0.004	**-0.027*****	**-0.003***	-0.004	0.024	0.038
	(0.006)	(0.007)	(0.002)	(0.003)	(0.018)	(0.027)
Growth	-0.021	**-0.119***	-0.011	-0.020	-0.144	-0.017
	(0.056)	(0.061)	(0.008)	(0.013)	(0.152)	(0.221)
Inflation	0.020	-0.023	**0.015****	0.007	-0.030	-0.040
	(0.028)	(0.025)	(0.006)	(0.010)	(0.070)	(0.108)
Fiscal Balance/GDP	-0.008	-0.000	0.010*	0.017**	-0.097*	-0.110
	(0.032)	(0.037)	(0.005)	(0.008)	(0.054)	(0.092)
Change in CA/GDP 09-12	-0.003	**-0.066****	**-0.024*****	**-0.029*****	0.066	0.140
	(0.026)	(0.026)	(0.005)	(0.007)	(0.067)	(0.121)
M2/GDP	0.003	**-0.005***	0.001	0.001	0.003	0.004
	(0.003)	(0.003)	(0.001)	(0.001)	(0.010)	(0.016)
Stock martket cap/GDP	**-0.007****	**-0.007***	**-0.004*****	**-0.007*****	0.007	0.017
	(0.003)	(0.004)	(0.001)	(0.001)	(0.009)	(0.013)
Consensus forecast-current	0.038	0.053	0.012*	0.038***	-0.180*	-0.378***
	(0.046)	(0.046)	(0.007)	(0.012)	(0.087)	(0.131)
Stock FX/GDP	**0.040*****	-0.005	-0.007	-0.008	0.060	**0.100***
	(0.012)	(0.015)	(0.004)	(0.007)	(0.039)	(0.053)
Financial Integration	0.001	0.003	0.002***	0.003***	-0.003	-0.008
	(0.002)	(0.002)	(0.000)	(0.001)	(0.006)	(0.009)
Macro prudential	0.011	**-0.031****	**-0.009*****	**-0.016*****	-0.012	**0.057****
	(0.011)	(0.014)	(0.003)	(0.004)	(0.027)	(0.026)
Exposure to China	-0.017	0.033	0.009*	0.018**	-0.079	-0.165
	(0.022)	(0.019)	(0.004)	(0.007)	(0.059)	(0.103)
Observations	323	323	323	323	323	323
R-squared	0.303	0.274	0.309	0.331	0.258	0.253
Number of country1	19	19	19	19	19	19

Notes. The dummy takes a value for all negative events based on Table 1. These events are as follows: Meetings. June 19th, October 30th, Release of Minutes. May 22nd, August 21st, November 20th. All regressions include country fixed effects. All regressions also include the variables without interaction with the negative event dummy (the coefficients not shown). Standard errors are clustered at the country-level. ***, **, and * denote statistical significance at 1,5, and 10 percent respectively.

We first normalize and standardize the variables such that they lie between zero and one; and higher values indicate lower vulnerability (or greater resilience); and then take the first principal component. For most variables, higher values denote greater resilience—with the exception of inflation and bid-ask spread (higher values denote of the latter is associated with lower financial depth). Based on the first principal component, some of the most resilient EMs includes Singapore, Taiwan, Malaysia, Korea, and Thailand.

We estimate a specification similar to Equation (1). The results are shown in Table 12. The main findings reported above remain robust. Exchange rate depreciates, government bond yields increase, and stock prices decline around negative events. The coefficient on the interaction between the dummy and the index of resilience is negative and significant for exchange rate and bond yields. More resilient a country is, lower is the magnitude of depreciation and increase in bond yields. In addition, country resilience does not matter significantly around non-negative events. Consistent with results reported above, resilience matters less to explain the reaction of stock prices.[14]

Table 12. Market Reaction and Country Resilience Principal Component
Dependent Variable 2-day Changes Pre and Post Event
(In Percent)

	[1]	[2]	[3]
		Government	
	Exchange rate	bond yields	Stock prices
Dummy	1.032***	0.130***	-1.589***
	(0.073)	(0.025)	(0.186)
Dummy*Resilience	-0.087***	-0.017*	-0.008
	(0.024)	(0.008)	(0.055)
Resilience	0.102	0.054	0.070
	(0.146)	(0.051)	(0.408)
Observations	306	306	306
R-squared	0.249	0.187	0.212

Notes. The dummy takes a value for all negative events based on Table 1. These events are as follows: Meetings. June 19th, October 30th, Release of Minutes. May 22nd, August 21st, November 20th. Capital flow measures are calculated based on an index from an IMF database which takes a value of 1 meaning tightening, -1 meaning loosening, and 0 meaning no action. The index is cumulated from 2000-2013 to create the CFM measure. All regressions include country fixed effects. Standard errors are clustered at the country-level. ***, **, and * denote statistical significance at 1,5, and 10 percent respectively.

Source: IMF Staff Estimates

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[14] Taking the first principal component of the relevant variables within each category, we also create separate indices for macro fundamentals, financial depth, emerging markets growth, exposure to China, and macroprudential policy; and interacted each of these with the negative event dummy. The findings suggest that even controlling for macro fundamentals—deeper the financial markets, better the emerging market growth prospects, greater the exposure to China, and tighter the macroprudential policy stance—the more muted is the market reaction. In addition, macro fundamentals continue to be a significant determinant of market reactions.

VI. ROBUSTNESS CHECKS

In this section we look at alternative measures of events. We first look at changes in expected future short term rates around FOMC announcements and interactions with country characteristics. We also look at changes in markets expectations of Fed assets purchases based on regular surveys undertaken by the New York Fed. The reason for using these alternative measures is to capture the surprise elements in markets expectations relating to Fed monetary policy and gauge the extent to which those surprises were associated with differentiated responses in various EM markets based on country characteristics. These identification strategies assume that only information that is not priced in by markets could have cause the heightened reaction in global markets during 2013 and early 2014.

Information from forward rates

Several rates are considered, including four-year-ahead three-month euro-dollar futures, five-year-ahead three-month OIS, and three-year ahead one-month Fed Fund futures. In order to capture forward looking expectations, we use the longest available time horizon through Bloomberg for the short-term rates.

The empirical framework used to assess the role of country characteristics is described by the following regression equation:

$$\Delta y_{c,i-m,i+m} = \alpha + \beta * \Delta i_{i-m,i+m} + \gamma x_{c,i-q} + \delta \Delta i_{i-m,i+m} * x_{c,i-q} + s_i \tag{3}$$

Where Δy is the change in the exchange rate, bond yields, or equity prices around the events, Δi is the change in the interest rates around the FOMC meetings and minutes dates. Table 12 shows the results with euro-dollar futures. The results are similar for other interest rate measures.

As shown in Table 13, using alternative measures of the events yields broadly similar results for changes in exchange rates. Countries with better fundamentals, greater financial depth, better growth prospects, greater exposure to China and with tighter macroprudential policies prior to 2013 all fared better during episodes of negative reactions to news related to Fed monetary policy. Importantly, the results (not shown) are robust to expectation of interest rates measured from contracts with different maturities.[15]

Markets expectations of Fed asset purchases

Finally, we use a different strategy to check the robustness of the results. As discussed above, based on the April and June surveys of the New York Fed, markets revised their expectations of the quantity of Fed purchases of QE assets. Based on the June survey, markets expected

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[15] Specifically, the results are similar if we use one, two, or three-year ahead Euro dollar futures, or we use one or two-year ahead Fed Fund futures, and one, two, three, or four-year ahead OIS rates.

Fed to purchase US$ 65 billion of QE assets in September (instead of expectations in April to purchase US$ 85 bn of assets).[16] The hypothesis examined in this sub-section is whether market reactions around revision of expectations of Fed purchases were associated with macroeconomic fundamentals, and country economic and financial structures.

The regression equation for this methodology is specified as follows:

$$\Delta y_{c,t-m,t+m} = \alpha + \beta * \Delta R + \gamma x_{c,t-q} + \delta \Delta R * x_{c,t-q} + s_c \tag{4}$$

ΔR is the variable denoting revision of expectations. It takes a value of 20 (US$ bn) for the month of June when markets revised their expectations downward by this amount, and zero otherwise. The other variables are as defined above. For these regressions, we use daily data on exchange rates from January 1, 2009, to January 22, 2014.

Table 14 shows the results. Across all the specifications, we find that when markets revised their expectations of Fed purchases downwards (in other words, they expected tapering to happen sooner), exchange rates depreciated. In addition, while less compelling than when using the two previous identification strategies, the results do provide some evidence that there was differentiation in markets reactions on the basis of fundamentals and country characteristics. In particular, countries with lower inflation, greater financial depth, and tighter capital flow measures in the run-up to the episodes, experienced lower depreciation when markets reinforced their expectations of tapering.

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[16] Results are similar for revision in expectations of Fed purchases in December 2013, or January, March and April 2014.

Table 13. FX Reaction to Tightening and Country Characteristics
2-day Changes Pre and Post Event
(In Percent)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
2 day change in euro-dollar futures (4 years ahead)	4.112*** (0.349)	5.239*** (0.541)	5.949*** (0.642)	3.584*** (0.677)	3.849*** (0.346)	5.570*** (0.773)	6.037*** (0.647)	5.464*** (0.540)	5.012*** (0.665)	3.611*** (0.442)	4.329*** (0.492)	7.600*** (0.738)	5.030*** (1.030)	5.048*** (0.468)	4.667*** (0.517)	4.450*** (0.491)	4.064*** (0.505)
Interaction of change in ED with																	
CA/GDP	-0.120*** (0.042)																
Reserves/GDP		-0.037*** (0.013)															
Growth			-0.505*** (0.158)														
Inflation				0.133 (0.127)													
Fiscal balance/GDP					-0.190*** (0.066)												
Bank credit/GDP						-0.020** (0.009)											
M3/GDP							-0.016*** (0.005)										
M2/GDP								-0.017*** (0.005)									
Stock market cap/GDP									-0.012** (0.006)								
Bid-ask spread										5.249 (4.648)							
Financial integration											-0.005 (0.003)						
Consensus forecast - 1 yr												-0.821*** (0.156)					
Consensus forecast - current													-0.226 (0.254)				
Exposure to China														-0.079** (0.029)			
Macro prudential															-0.096*** (0.032)		
Excess capital inflows																-0.006 (0.010)	
Caoital Flow Measures																	-0.017 (0.059)
CA/GDP	-0.000 (0.052)																
Reserves/GDP		0.068 (0.041)															
Growth			0.009 (0.014)														
Inflation				0.004 (0.051)													
Fiscal balance/GDP					0.003 (0.012)												
Bank credit/GDP						-0.055** (0.023)											
M3/GDP							-0.079** (0.028)										
M2/GDP								-0.076** (0.027)									
Stock market cap/GDP									0.014** (0.006)								
Bid-ask spread										-1.504 (1.234)							
Consensus forecast - 1 yr												0.277*** (0.084)					
Consensus forecast - current													0.014 (0.057)				
Exposure to China														-0.006 (0.029)			
Observations	357	357	357	357	357	357	289	357	357	340	357	357	357	340	340	272	340
R-squared	0.480	0.488	0.493	0.470	0.481	0.492	0.560	0.507	0.484	0.467	0.469	0.515	0.471	0.501	0.479	0.478	0.460

Notes. The euro-dollar futures are the expected 3-month interest rate in a year from the current. ***, **, and * denote statistical significance at 1,5, and 10 percent respectively.

Table 14. FX Reaction to Revision of Market Expectations of FED Purchases and Country Characteristics: 2 –day Changes

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
Revision in market expectation	-0.00908*** [0.002]	-0.01149*** [0.003]	-0.00802** [0.003]	-0.00410** [0.002]	-0.00960*** [0.001]	-0.01370*** [0.003]	-0.01373*** [0.003]	-0.01417*** [0.003]	-0.01257*** [0.003]	-0.00948*** [0.002]	-0.01135*** [0.002]	-0.00850** [0.002]	-0.00838 [0.004]	-0.01065*** [0.006]	-0.00816*** [0.002]	-0.01079*** [0.002]	-0.01272*** [0.003]
Interaction revision in market expectation with																	
CA/GDP	0.00036 [0.000]																
Reserves/GDP		0.00009 [0.000]															
Growth			-0.00035 [0.001]														
Inflation				**-0.00140** [0.001]**													
Fiscal balance/GDP					0.00033 [0.001]												
Bank credit/GDP						**0.00006** [0.000]**											
M3/GDP							**0.00004* [0.000]**										
M2/GDP								**0.00006*** [0.000]**									
Stock market cap/GDP									0.00003 [0.000]								
Bid-ask spread										0.01929 [0.024]							
Financial integration											0.00003 [0.000]						
Consensus forecast - 1 yr												-0.00023 [0.001]					
Consensus forecast - current													-0.00021 [0.001]				
Exposure to China														0.0001 [0.000]			
Macro prudential															-0.00053** [0.000]		
Excess capital inflows																-0.00001 [0.000]	
Capital flow measures																	**0.00032* [0.000]**
CA/GDP	-0.01326*** [0.003]																
Reserves/GDP		-0.00297 [0.002]															
Growth			-0.00093 [0.001]														
Inflation				-0.0015 [0.005]													
Fiscal balance/GDP					0.00154 [0.002]												
Bank credit/GDP						0.00450** [0.002]											
M3/GDP							0.00786*** [0.003]										
M2/GDP								0.00642** [0.003]									
Stock market cap/GDP									0.00161** [0.001]								
Bid-ask spread										0.09566 [0.436]							
Financial integration											-0.00010*** [0.000]						
Consensus forecast - 1 yr												0.01095*** [0.003]					
Consensus forecast - current													0.06199*** [0.009]				
Exposure to China																	0.01709*** [0.005]
Observations	25257	22701	25321	24278	26817	26817	21709	26817	26817	23402	27657	27237	27237	26340	26340	21072	26340
R-squared	0.002	0.002	0.002	0.002	0.001	0.002	0.003	0.002	0.002	0.002	0.001	0.002	0.003	0.001	0.001	0.001	0.002

Notes. Revision in market expectations of FED purchases on September 17-18, 2013 is measured based on Primary Dealers' survey done by New York Fed. The revision is based on change in market expectations between June and April surveys. See text for details. All regressions include country fixed effects. Standard errors are clustered at the country-level. ***, **, and * denote statistical significance at 1,5, and 10 percent respectively.

VII. CONCLUSION

The Fed's plans and subsequently decision to taper were accompanied by significant market reaction in many EMs. This paper has shown that markets differentiated across countries during the recent episodes of turmoil based on countries characteristics, including macroeconomic fundamentals and economic and financial structures.

Countries with better fundamentals and greater financial depth were less hit than others. Countries that had tighter macroprudential policies and had resorted to capital flow measures prior to May 2013 were also fared better. The paper also found that having strong trade ties with China can help dampen markets reaction when no bad news emanate from China. When bad news from China coincides with the initial reason for turmoil in EMs, having strong ties with China does not dampen markets reactions.

REFERENCES

Ahmed, Shahgil, Brahima Coulibaly, and Andrei Zlate, 2014, "Transmission of Shocks to Emerging Market Economies: How Important are Economic Fundamentals", mimeo, Federal Reserve Board.

Aizenman, Joshua, Mahir Banici, and Michael M. Hutchinson, 2014, "Transmission of Federal Reserve Tapering to Emerging Financial Markets", NBER Working Paper No. 19980.

Bernanke, B. S. and Kuttner, K. N. (2005), What Explains the Stock Market's Reaction to Federal Reserve Policy?. The Journal of Finance, 60: 1221–1257.

Chen, Jiaqian, Tomasso Mancini-Griffoli, & Ratna Sahay, 2014. "US Monetary Policy Impact on Emerging Markets: Different This Time?," *forthcoming* IMF Working Paper (Washington: International Monetary Fund).

Eichengreen, Barry & Gupta, Poonam, 2014. "Tapering talk: the impact of expectations of reduced Federal Reserve security purchases on emerging markets," Policy Research Working Paper Series 6754, The World Bank.

Gürkaynak, R.S., B Sack, E Swanson, 2005, "The sensitivity of long-term interest rates to economic news: Evidence and implications for macroeconomic models", The American Economic Review 95 (1), 425-436.

IMF, 2014a. "Financial Deepening in Emerging Markets", Board Paper, *forthcoming*.

IMF, 2014b, "Global Financial Stability Report, Chapter 2. How Do Changes in the Investor Base and Financial Deepening Affect Emerging Market Economies"?

Rogoff, Kenneth, Aasim M. Husain, Ashoka Mody, Robin Brooks, and Nienke Oomes (2004), "Evolution and Performance of Exchange Rate Regimes," IMF Occasional Paper 229.

Zhang, Longmei & Edda Zoli, 2014. "Leaning Against the Wind: Macroprudential Policy in Asia," IMF Working Paper 14/22 (Washington: International Monetary Fund).

Appendix I

Table A1. Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max	Sources
Change in FX (1-day before and after)	357	0.16	0.99	-3.10	3.65	Bloomberg
Change in Yields (1-day before and after)	357	0.02	0.15	-0.80	0.84	Bloomberg
Change in Equity (1-day before and after)	357	-0.11	1.63	-5.96	6.26	Bloomberg
Current Account/GDP	357	0.39	5.80	-7.22	18.60	Bloomberg
Change in Current Account/GDP	357	-1.33	3.39	-10.93	6.03	Bloomberg
Reserves/GDP	357	30.78	21.48	10.12	93.71	Haver
Real GDP Growth	357	3.71	2.35	-2.70	19.10	Bloomberg
Inflation	357	3.64	2.56	0.20	10.56	Bloomberg
Fiscal Balance/GDP	357	-1.31	3.93	-10.78	7.92	Haver
Corporate FX Debt/GDP	357	11.89	6.71	2.56	28.24	BIS
Bank Credit/GDP	357	74.69	40.60	20.25	148.89	IFS
M3/GDP	289	97.50	54.64	43.87	242.11	Haver
M2/GDP	357	79.01	57.83	18.48	243.49	Haver
Stock Market Capitalization/GDP	357	75.31	53.27	8.16	223.70	Bloomberg, Haver
Bid-Ask Spread of Governement Bonds	340	0.060	0.056	0.002	0.345	Bloomberg
One-year ahead Consensus Forecast of Real GDP Growth	357	4.27	1.51	0.02	8.16	Consensus Forecast
Current Consensus Forecast of Real GDP Growth	357	4.21	1.87	-1.80	9.20	Consensus Forecast
Portfolio Asset and Liabilities/GDP	357	57.62	69.30	7.02	336.87	IFS
Cummulative Macroprudential Index	340	6.90	8.67	-1.00	40.00	Zhang and Zoli (2014)
Excessive Capital Inflow	272	24.59	39.34	-52.36	107.25	IMF 2014
Cumulative Capital Flow Measure Index	340	3.45	5.13	-1.00	17.00	Zhang and Zoli (2014)
Export and Import to China/GDP	340	9.80	8.47	1.60	33.21	IFS

Source: IMF Staff Estimates.