Taper Tantrums: QE, its Aftermath and Emerging Market Capital Flows

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Abstract

This paper examines the implications of unconventional monetary policy (UMP) and its continued unwinding for emerging market capital flows and asset prices with an emphasis on quantifying the magnitude of these effects. We combine U.S. Treasury data on emerging market flows and prices with Fed Funds Futures data to estimate the surprise component of Fed announcements. Results from a commonly employed affine term structure model indicate that monetary policy shocks represent, in small part, revisions in market participants' expectations about the path of short term interest rates and, even more significantly, changes in their required risk compensation. The importance of revisions in risk compensation is true despite the fact that these shocks are extracted from relatively short-maturity futures contracts. While this interpretation characterizes the conventional (pre-crisis) period, the risk compensation effects are even more pronounced in the later unconventional monetary policy period. Controlling for a range of pull and push factors, panel regression results then suggest that the global impact of alternative monetary surprise measures varies significantly across the pre-crisis, Quantitative Easing (QE) and policy "tapering" periods. In particular, the effect of monetary policy shocks on global asset values is larger than that for physical capital flows. Relative to debt, emerging market equity positions and valuations are more sensitive to monetary policy shocks during the QE and normalization periods. There is an order-of-magnitude difference between the QE and the tapering periods for the effects of monetary policy on all types of emerging-market portfolio flows. Finally, the primary advantage of extracting the monetary surprise magnitude is that we can directly estimate a dollar amount in terms of U.S. investor position and flow changes to emerging markets. The quantification exercise suggests that the impact of U.S. monetary policy on emerging market capital flows depends critically on the size, sign and dispersion of the policy surprises.

1. Introduction

The massive surge of foreign capital to emerging markets in the aftermath of the global financial crisis (GFC) of 2008–2009 has led to a contentious debate about the international spillover effects of developed-market monetary policy with particular emphasis on the United States (Fratzscher, Lo Duca, and Straub 2013, Rey 2014). The monetary policy decisions of the U.S. Federal Reserve during the crisis had a primarily domestic focus to stimulate growth in its aftermath. Nevertheless, these policy actions led to substantial spillover effects for emerging-market economies (Fratzscher, Lo Duca, and Straub 2013). As interest rates in developed economies remained low, investors were attracted to the higher rates in many emerging economies (Fratzscher 2012).

Over the four-year period between mid-2009 and 2013Q1, cumulative gross financial inflows into the developing world increased from $192B to $598B. This is more than twice the rate of the four-year period ending in 2006Q1, and capital flows into emerging markets more than doubled as a percent of GDP. These massive foreign capital inflows led Brazilian President Dilma Rousseff to evocatively claim that advanced economy monetary policy had unleashed a "monetary tsunami" in the developing world.[1] The governor of Taiwan's central bank, Perng Fai-Nan echoed this sentiment, "The U.S. printed a lot of money, so there's a lot of hot money flowing around. We see hot money in Taiwan and elsewhere in Asia. . . . These short-term capital flows are disturbing emerging economies." Later, announcements by the Fed suggesting that an unwinding of quantitative easing was imminent appeared to trigger a selloff in emerging markets; talk of tapering may have signaled looming increases in borrowing costs and other market disruptions in emerging countries.

Such arguments beg an empirical question: what, if any, are the implications of unconventional monetary policy (and its unwinding) for emerging market capital flows and asset prices? More importantly, how large are these effects? This paper answers these questions using a dataset on global capital flows and positions from the U.S. Department of Treasury. While these data has been previously used in other contexts,[2] we consider a novel application – namely, to analyze the impact of unconventional monetary policy on emerging market flows and asset prices.

[1] http://articles.economictimes.indiatimes.com/2012-03-28/news/31249809_1_india-and-brazil-brazil-today-brazilian-president-dilma-rousseff
[2] Examples include Curcuru et al (2010) and Bertaut, Griever and Tryon (2006).

The starting point for our analysis is a confirmation of the link between the measures of monetary policy shocks, net capital flows, and local equity and bond market returns. However, to test for the presence and nature of the effect of unconventional monetary policy on emerging market capital flows, we first need to identify monetary policy shocks at the zero lower bound, and this task is not straightforward. As Christiano, Eichenbaum and Evans (1999) make clear, the literature has not converged on any particular set of assumptions to identify an exogenous shock to monetary policy (even for the pre-crisis period). Although the practice and particular details vary, the main methods of identifying monetary policy shocks fall into three categories in the literature: panel estimation with announcement period indicators, structural VARs (Zha 1997, Dedola, Rivolta, and Stracca, 2015), and high frequency identification schemes. The benefits of each lie in the data used for monetary policy shock identification and are usually dependent on the frequency of the chosen data.

For example, a few studies examine the effect of unconventional monetary policy on capital flows using panel data on emerging markets by including indicators for the dates of FOMC meetings and speeches by the Chair, along with a number of fundamental control variables (Fratzscher, Lo Duca and Straub 2013; Ahmed and Zlate 2014; Aizenman, Binici and Hutchison 2014). These studies have the advantage of controlling for more factors than a VAR approach and for avoiding reliance on short-term fluctuations that may be attributable to idiosyncratic effects.[3] These studies find that unconventional monetary policy in the U.S. is an important driver of capital flows into emerging economies (Ahmed and Zlate 2014), although some episodes of QE are found to be stronger or have a countervailing effect (Fratzscher, Lo Duca and Straub 2013). Additionally, Fratzscher, Lo Duca and Straub (2013) find that the effect of QE on asset prices is greater than that on flows.

For variables that both fluctuate and are reported at a high frequency (intraday, daily or even weekly), such as financial data, high frequency identification (HFI) is often utilized to identify surprises in an event study approach (Gilchrist, Yue and Zakrajsek

[3] Underlying the validity of the event study approach are the following assumptions. First, policy makers must determine the announcement prior to observing asset price movements within the announcement window—this rules out simultaneity. Second, all changes in expectations about the unconventional policies occur during the event windows and these changes in expectations are fully priced during the event windows. Finally, the key identifying assumption is that news about the economy on the FOMC date does not affect the policy choice--only information available on the date previous is relevant. Unfortunately, only financial data tend to meet the frequency requirements of this approach—the majority of real variables are available only at lower frequencies that do not satisfy high frequency identification assumptions.

2014; Neely 2010; Mishra, Moriyama, N'Diaye and Nguyen 2014). The usefulness of the method arises from a rational market assumption: if prices fully reflect all available information, then the effects of an unexpected event will be reflected immediately in relevant prices. Results in this branch of the literature suggest that U.S. unconventional monetary policy had a significant effect on interest rates in both advanced and emerging economies. Focusing on both the QE and taper periods, Mishra, Moriyama, N'Diaye and Nguyen (2014) find that taper talk had a significant effect on bond yields, exchange rates and equity prices, but that better country fundamentals and stronger trade ties to China mitigated the effect. Karolyi and McLaren (2016) show that the initial tapering announcement in 2013 had negative valuation impacts overall, but that emerging market stocks with larger positive cumulative abnormal returns around earlier LSAP purchase announcements were particularly hard hit in 2013. Our nearest neighbor in this literature uses factor analysis to separate "market" and "signal" factors from changes in bond yields around FOMC events, finding that unconventional monetary policy surprises had larger effects on equity prices, exchange rates, bond yields and mutual fund flows than those during conventional periods, finding additionally that "signal" shocks—those that portend the path of future interest rates—generate larger and more ubiquitous spillovers (Chen et al. 2014).

In this paper, we use a recent high frequency identification scheme that extracts the unexpected element from futures contracts based on the Fed Funds rate. We then regress capital flow measures on those extracted shocks in a panel setting. While expectations of Fed policy actions are not directly observable, futures prices are a "natural, market-based proxy" for those expectations (Kuttner 2001).[4] Changes in the price of a Fed Funds futures contract may reflect, in part, changes in the perceived probability of future Fed policy.

Frequently, however, market reactions are spurred by what the FOMC says rather than what it does. Given that actual rate changes have been largely absent in the crisis and post-crisis periods, this is especially relevant at the zero lower bound of interest rates, when the Fed must rely heavily on forward guidance. Gürkaynak, Sack and Swanson (heretofore referred to as GSS) (2005, 2007) propose alternative shock measures that

[4]Fed funds futures are used by banks and fixed-income portfolio managers to hedge against unexpected shifts in short-term interest rates. Traders can use the fed funds futures rate to take speculative positions relative to interest rate movements and Federal Reserve actions. https://www.cmegroup.com/trading/interestrates/files/IR143_30_Day_Fed_Funds_Futures_and_Options_Fact_Card.pdf

capture changes in market expectations of policy over slightly longer horizons. We measure monetary policy shocks using the methods proposed by GSS (2007) and by Kuttner (2001).

During ordinary times, monetary policy might generate spillovers to emerging markets through a number of conventional channels (Kim 2001; Obstfeld and Rogoff 1995). However, because the period of unconventional monetary policy has involved heavier management of expectations and efforts to exert direct control further along the yield curve, additional transmission channels are possible.[5] One particular unifying question is the degree to which monetary shocks represent revisions in market participants' expectations about the path of short-term interest rates and/or changes in their required risk compensation. To interpret the nature of the shocks extracted from the Fed Funds futures market, we use a commonly employed affine term structure model (see Kim and Wright (2005)). We find that our monetary policy shocks represent, in small part, revisions in expectations about future Fed policy, but even more significantly, they capture changes in required risk compensation, despite the fact that the measures employ relatively short maturity futures contracts. This is especially true during the periods of unconventional monetary policy.

Using panel data and HFI, we examine the impact of monetary policy surprises around FOMC meetings on capital flows from the United States to a range of emerging markets. The benchmark specification estimates the impact of monetary surprises on the following for both equity and debt as a percent of annual GDP: (i) total positions, (ii) flows, (iii) valuation changes and (iv)"volumes" (the sum of TIC flows and the residual gap).

Our results reveal heterogeneity along three principal lines: flows versus prices, debt versus equity, and quantitative easing versus tapering. Among these, the most robust finding is that valuation changes of both debt and equity appear to have played a key role in the change in overall positions observed between sub-periods. That is, in nearly every specification, the effect of monetary policy shocks on asset values is larger than that for physical flows, consistent with Fratzscher, Lo Duca and Straub (2013). This is consistent with the notion that our shocks may capture a revision in required risk compensation across financial markets. We also find that equity positions and valuations are more sensitive to monetary policy shocks than are the same for debt over the period of

[5] See Fratzscher et al 2014 for a comprehensive summary.

unconventional monetary policy and normalization, but there is no such clear pattern between equity and debt where volumes or flows are concerned.

A third striking feature of our results lay in the order-of-magnitude difference we find between the effects of monetary policy on all types of emerging-market portfolio flows between the QE and the tapering periods. While we detect some significant effects of monetary policy on flows and valuations during the period of unconventional monetary policy (QE), the effects are not consistent over all dependent variables. In contrast, during the period following the first mention of tapering we find a consistent and large effect of monetary policy shocks on nearly all variables of interest. Indeed, this is consistent with the fact that the link between monetary policy shocks and variation in required risk compensation is the most pronounced during this period.

Finally, an important advantage of extracting the magnitude of the monetary surprises directly from the Fed Funds Futures data is that we can directly estimate a dollar amount in terms of the changes in U.S. investor position and flow into emerging markets, controlling for a variety of push and pull factors. Previous studies that use period indicator variables or alternative approaches to examine U.S. monetary policy spillovers are only able to make qualitative statements about the direction of impact.[6] In contrast, our quantification exercise suggests that the impact of U.S. monetary policy on emerging market capital flows depends critically on the magnitudes, signs, and distribution of monetary policy shocks. We therefore find that a more nuanced picture emerges from our approach, whereby we can make distributional predictions that are more in line with emerging markets' varied experience across both markets and time periods. The approach allows us to use incorporate more information on how these distinct asset classes and their measures co-move over time.

The paper proceeds as follows. Section 2 briefly describes the related literature on U.S. monetary policy and capital flows to emerging markets with an emphasis on identifying monetary policy shocks and measuring spillovers at the zero lower bound. Section 3 presents our methodology for extracting monetary policy surprise measures using high-frequency identification and explores their relationship to revisions in expectation about future short rates and term premia. Section 4 describes the data and

[6] Looking at Figure 1 in the appendix, it is not unreasonable to posit that not all episodes of expansion or contraction have the same effect on investors' expectations, and therefore on the prices and physical flows of emerging-market assets.

methodology for measuring capital flows and presents summary statistics. Section 5 presents the benchmark specification and the regression results. Section 6 concludes.

2. Related Literature

The literature on the pattern of international capital flows separates determinants into ‘push factors’, which are common, global factors associated with external shocks, and ‘pull factors’, which are country-specific. ‘Push’ factors operate by reducing the attractiveness of investing in developed countries. Global volatility (the VIX an often employed proxy), global liquidity, global interest rates and global growth are considered push factors—their variation is thought to drive phenomena such as search for yield or flight to safety which may affect developed market flows to or from emerging economies (Calvo et al 1993). There is strong evidence in the literature for the impact of global risk aversion and developed-economy interest rates, and there is some evidence for the effect of advanced-economy output growth (Fratzscher 2012; Fratzscher et al 2014; Passari and Rey 2015; Milesi Ferretti and Tille 2011; Broner et al 2013; Forbes and Warnock 2012).

‘Pull’ factors, on the other hand, operate through improvements in the risk-return characteristics of emerging-market assets. These include country characteristics such as financial sector development, domestic interest rates and asset returns, integration with global financial markets, fiscal position and domestic growth shocks. While the balance of evidence suggests that push factors are a more powerful determinant of capital flows, there is some evidence that domestic output growth, domestic interest rates or asset returns and country risk indicators have an impact on capital flows, as well (Ahmed and Zlate 2013; Fratzscher 2012). Capital flows driven by pull factors may be more desirable when the intrinsic quality of these assets attracts foreign investors, as they may be more committed to these positions and less likely to unwind them quickly. Overall, the literature suggests that portfolio debt and equity flows appear to be dominated by push factors, although this is not to say that domestic factors lack relevance completely (Fratzscher 2012; Fratzscher et al 2014; Fernandez-Arias 1996).

A third set of factors that falls partially under each of the previous two are related to contagion, trade linkages, financial linkages and location, which may also play a role in driving portfolio and banking flows. These are addressed in a separate literature on financial contagion. Although we do not measure contagion as such, by measuring the impact of U.S. monetary policy on flows to and from a broad set of emerging markets, we are attempting to identify the size of flows induced by a global financial shock.

2.1 U.S. Monetary Policy and Capital Flows to Emerging Markets: Spillovers at the Zero Lower Bound

Given that the period of unconventional monetary policy has involved heavier management of expectations and efforts to exert direct control further along the yield curve, additional channels of transmission are in operation. These have been collected together as the "portfolio balance", "signaling", "confidence" and "liquidity channels" of monetary transmission (Krishnamurthy and Vissing-Jorgensen 2011; Neely 2010; Fratzscher 2012; Fratzscher et al 2014; Lim et al 2014). Based on the usual decomposition of yields on safe long-term government bonds, there are two potential elements of the yield curve that central bank bond purchases could affect: the average level of short-term interest rates over the maturity of the bond and the term premium. Specifically, the yield on an *n*-year bond is the average of expected overnight rates over the life of the bond and a term premium:

$$Y_{t;t+n} = Y_{t:t+n}^{EH} + YTP_{t;n} \tag{1}$$

where $Y_{t:t+n}^{EH}$ is the average short term rate expected over the period t to $t+n$ (that is, the component of the yield that would drive yield variation if the expectations hypothesis were to hold), and $YTP_{t;n}$ is a maturity-specific term premium. We next address each potential channel's relationship to the yield in turn.

First, the portfolio balance channel results from a confluence of forces. Quantitative easing involves the purchase of longer-duration assets, which reduces the effective supply of such assets to private investors, thereby raising their price and lowering yields. As investors rebalance their portfolios in response to quantitative easing, the prices of the assets they buy should rise as well, decreasing their respective yields.[7] Thus, we can expect that, if the portfolio balance channel dominates, a loosening of monetary policy via quantitative easing will result in increased flows to emerging markets as investors substitute toward emerging-market assets in search of higher yields. Likewise, we would expect that a contractionary monetary policy incentivizes investors to rebalance in favor of U.S. Treasuries. Thus, if the portfolio channel is in operation we

[7] http://www.federalreserve.gov/newsevents/speech/bernanke20120831a.htm

expect that monetary policy shocks will be inversely correlated with emerging market flows and valuations.

Additionally, if investors demand a premium for holding longer-term bonds, then the term premium ($YTP_{t;n}$ above) will also be influenced by the relative supply of long term assets. If the Fed removes long-term securities from the market, i.e. duration risk, investors should require a smaller premium to hold the reduced quantity of long-term securities. Overall yields can fall once again prompting a rebalancing toward higher yield emerging market assets.

Although quantitative easing does not directly affect short-term interest rates, it may serve as a signal to markets regarding the future path of interest rate policy. This signaling channel operates as follows. If taken as a commitment by the Fed to keep future policy rates lower than previously expected, the signaling channel would suggest lower yields associated with a lower the average expected short-rate, $Y^{EH}_{t:t+n}$ in equation (1) (Fratzscher et al 2014; Neely 2010; Lim et al 2014).

In the context of emerging market capital flows, the ongoing large scale asset purchases (LSAPs) can signal that large interest rate differentials between advanced economy yields with respect to emerging markets are expected to persist. As explored in the literature on capital flows, the interest rate differential may trigger a carry trade, resulting in sizeable capital flows into emerging markets (Galati, Heath and McGuire 2007). As in the case of the portfolio balance channel, we would expect the coefficient on a monetary policy shock dominated by the signaling channel to be negative.

The confidence channel of unconventional monetary policy, which is closely related to the signaling channel, can influence portfolio decisions and asset prices by altering the risk appetite of investors; for example, an announcement of tapering might serve as a signal that the FOMC is feeling sanguine about global economic prospects, lowering relative risk aversion and, consistent with predictions from the literature on capital flow determinants, increasing capital flows to emerging markets. Reduced confidence, in contrast, can lead to capital outflows from emerging markets or a flight to safety.

Quantitative easing can also affect portfolio decisions and asset prices by altering the liquidity premium (Krishnamurthy and Vissing-Jorgensen 2011; Neely 2010), and thus the efficiency of markets. In practice, LSAPs are credited in the form of increased reserves on private bank balance sheets (Krishnamurthy and Vissing-Jorgensen 2011).

Since such reserves are more easily traded in secondary markets than are long-term securities, the liquidity premium decreases. Thus, liquidity-constrained banks can extend credit to borrowers, resulting in decreased borrowing costs and elevated lending levels. However, before we can identify the various channels through which unconventional monetary policy operates, we must first identify it.

3. Extracting Monetary Policy Surprise Measures Using High-Frequency Identification

The abundance of short-term interest rates that potentially measure federal funds rate expectations has led to a proliferation of asset price-based monetary policy expectation measures emanating from Kuttner (2001). Among the short-term variables found in use in this literature are the current-month federal funds futures contract price, the month-ahead federal funds futures contract price, the one-month Eurodollar deposit rate, the three-month Treasury bill rate, and the three-month Eurodollar futures rate.

Gürkaynak, Sack and Swanson (2005, 2007) propose alternative shock measures that capture changes in market *expectations* of policy over slightly longer horizons. We measure monetary policy shocks proposed by GSS and by Kuttner (2001). These are described below.

Federal funds futures have a payout that is based on the average effective federal funds rate that prevails over the calendar month specified in the contract. Thus, immediately before an FOMC meeting, at time t - Δt, the implied rate from the current-month federal funds future contract, ff^1, is largely a weighted average of the federal funds rate that has prevailed so far in the month, r_0, and the rate that is expected to prevail for the reminder of the month, r_1

$$ff^1_{t-\Delta t} = \frac{d1}{M1} r_0 + \frac{M1 - d1}{M1} E_{t-\Delta t}(r_1) + \rho^1_{t-\Delta t} \tag{2}$$

where d1 denotes the day of the FOMC meeting, M1 is the number of days in the month, and $\rho^1_{t-\Delta t}$ denotes any term or risk premium that may be present in the contract. By leading this equation to time t and differencing, the surprise component of the change in the federal funds rate target, which GSS call MP1, is given by

$$MP^1_{t} = (ff^1_t - ff^1_{t-\Delta t}) \frac{M1}{M1 - d1} \tag{3}$$

The scale factor M1/(M1 – d1) is necessary because the surprise is only relevant for the remaining part of the month, although it adds a complication. Note that to interpret the above as the surprise change in monetary policy expectations, we need to assume that the change in the risk premium ρ in this narrow window of time is small in comparison to the change in expectations itself. For example, for a policy action on the last day of a month, the change in the term premium is multiplied by thirty amplifying the noise in the measurement of the surprise. To surmount this problem, Kuttner (2001) suggests using the next month's contract (i.e., the month ahead contract in place of the current month contract) when a policy action takes place in the last week of the month.

GSS (2007) go a step further, constructing a measure to capture the change in the federal funds rate expected to prevail after the next FOMC meeting. Given the unexpected change in the federal funds rate following the current meeting, $MP1_t$, the change in the rate expected after the subsequent meeting, $MP2_t$, can be calculated as follows:

$$MP2_t = \frac{\mathrm{M2}}{\mathrm{M2 - d2}} \left(\Delta \mathrm{ff}_t^2 - \frac{\mathrm{d2}}{\mathrm{M2}} \mathrm{mp}_t^1\right) \tag{4}$$

where $\Delta \mathrm{ff}_t^2$ is the change in the federal funds futures contract for the month of the next FOMC meeting. This is contained in the two-month-ahead contract, as FOMC meetings are scheduled to take place once every six weeks. The robustness section presents results using a third monetary surprise measure that is simply the difference in the yield two-year treasury bond on the date of an FOMC meeting. The principle is the same—over a very narrow window, it is reasonable to state that change in the price of the asset reflects a change in the expectations component of yield i.e., the sum of expected future interest rates, which is driven by a monetary surprise.

Figure 1 plots the evolution of three monetary surprise measures over time following FOMC dates, demarcating the significant announcement dates for both the QE measures and taper talk dates. Panel 1, Table A presents the correlation between monetary policy surprise measures; while these shocks do share some modest correlation, they do not appear to be redundant.

3.1 Understanding the Monetary Surprise Measures

In order to understand the manner in which our monetary policy shocks affect global flows and valuations, we first need to better understand the nature of the revisions in expectations housed in our two variables. The purpose of constructing monetary policy shock measures at multiple horizons is to acknowledge the potentially changing role of expectations formation and risk pricing in the period of unconventional monetary policy. As aforementioned, monetary policy potentially influences both the expected path of short-term interest rates and the term premium. However, from mid-2008 until as recently as mid-2015, the Fed was not expected to deviate from zero short-term interest rates; it is not unreasonable, therefore, to suspect that monetary policy is qualitatively different in the periods of QE and of LSAP tapering in the sense that the relationship between monetary policy and the term structure of the interest rate is altered. In this section of the paper, we explore the relationship between our monetary policy surprise measures and the decomposition of the yield curve into a component associated with the expected path of the short interest rate and that associated with the term premium. This disaggregation permits an evaluation of the role for monetary policy surprises across the conventional and unconventional periods.

We appeal to a well-established affine term structure methodology from Kim and Wright (2005) that permits the decomposition of various government bond yields into information about future short rates and term premia. Kim and Wright estimate a standard latent three-factor Gaussian term structure model using zero-coupon Treasury yields from the Gurkaynak, Sack, and Wright (GSW, 2007) database. To facilitate empirical implementation, forecast data on the three-month T-bill yield from Blue Chip Financial Forecasts are incorporated into the model estimation. Their model yields a point-in-time daily estimate of the expected short rate over the life of any longer dated bond as well as the risk compensation market participants require for holding that bond.[8]

With these various components in hand, we separately regress changes (1) in bond yields, (2) in the expected path of the short rate, and (3) in the term premium onto our monetary policy measures to assess the relevant importance of our shock measures of each. We conduct these separate regressions for one, five and ten year maturity bonds, separating the MP shock effects of interest (those arising on relevant FOMC or policy announcement days) across three periods (pre-crisis, March 1994 – August 2008, QE, December 2008 – April 2013, and tapering, May 2013 – June 2016):

$$\Delta Y_{(n),t} = \alpha_0 + \sum_{j=1}^{2} \beta_j dummy_{pre} MP_{j,t} + \sum_{j=1}^{2} \gamma_j dummy_{QE} MP_{j,t} + \sum_{j=1}^{2} \delta_j dummy_{TT} MP_{j,t} + \varepsilon_t \tag{5}$$

[8] The Kim and Wright yield curve decomposition data are made available at http://www.federalreserve.gov/pubs/feds/2005/200533/200533abs.html

Where $Y_{(n),t}$ is either the zero coupon bond yield on an *n* year bond, the expectations hypothesis-implied average short rate component of an *n* year bond, or the term premium on an *n* year bond. We consider two event windows for the changes in the dependent variables – a daily change for event days perfectly coinciding with the day of the MP shock, and a two-day change that includes the event day plus the following to capture any relevant slow moving market effects.[9] We provide White standard errors to correct for heteroskedasticity (in parentheses). Finally, we allow the monetary policy shock coefficients to vary across the three periods.

Table 2 (Panel A) shows the daily regressions for the overall yield change, the change in the path of the expected short rate, and the change in the term premium, and Panel B shows two-day yield change regressions for the same event dates. First, across all cases under consideration, MP1 *does not* seem to affect yield changes or the changes in the relevant yield components for bonds that are at least one-year in maturity, regardless of the event window.[10] Henceforth in this section, we will focus on the implications of MP2 for yield curve variation beyond the one-year maturity. First, focusing on the coefficients associated with the conventional, pre-crisis period, we find that a positive MP2 shock is significantly associated with bond yield changes across maturities both for the one-day event (Panel A) and the two-day event window (Panel B), though this effect appears to diminish with maturity across both event windows. To provide a sense of the economic magnitude, a one-standard deviation MP2 shock would be associated, on average, with a 1.65 (1.90) basis point increase in the ten-year bond yield across the one-day (two-day) event window over the conventional policy period. Finally, we decompose the overall yield changes into changes in the expected path of the short rate and in the relevant term premia. The regression results suggest that MP2 shocks over the conventional monetary policy period largely play a role in altering the expected path of the short rate (though this effect diminishes with maturity). In contrast, we uncover only a modest role for MP2 shocks in altering term premia, where the risk compensation effects are only statistically significant for the two-day event window. In

9 We also considered regressions based on a three-day event window. While there still appears to be an important role for shocks housed in the Fed Funds futures contracts, the effects on bond yield and their yield components do start to diminish by day three.

10 The shortest maturity bond provided by Kim and Wright (2005) is one-year – it is conceivable that the near-term Fed Funds futures contract shock (MP1) may be more informative about movements at the extreme near-term of the yield curve.

sum, during the period of conventional monetary policy, it may be the case that our measured MP2 shock has more to do with revisions in expectations about the path of future short rates.

Next, we turn to the coefficients associated with MP2 shocks during the period of unconventional monetary policy (QE and eventual policy tapering). First, overall yield changes appear to be significantly affected by MP2 shocks across both the QE and tapering periods. This is particular true for the wider two-day event window (see Panel B). As an example, a one-standard deviation MP2 shock during the QE period would be associated, on average, with a 6.30 (8.06) basis point increase in the ten-year bond yield across the one-day (two-day) event window. One interesting point to note here is the fact that the MP2 shock effects on bond yields during the unconventional periods do not monotonically decrease over time. Since the effect of a shock on the expected path of future short rates is likely to be *relatively* short-lived over the life of a long-term maturity bond, we can speculate on the manner in which the MP2 shocks map into revisions in the price of interest rate risk. Indeed, despite a modest role for the MP2 shocks during the unconventional QE and tapering periods altering the expected path of future short rates, the largest effects are by far associated with sizeable and statistically significant revisions in term premia. Further, these risk premia effects do not monotonically diminish with maturity.

Taken together, during the period of unconventional monetary policy, it may be the case that our measured MP2 shock has more to do with variation in required risk compensation rate despite the fact that relatively short-term futures contracts are employed in the construction of the MP2 shocks in the first place. The important role for MP2 shocks in describing variation in risk compensation during the period of post-crisis unconventional policy may help us better interpret the manner in which our measured monetary policy shocks affect global flows and valuations in the sections to follow.

4. The Data

We use data from the U.S. Department of Treasury International Capital System (TICS). TICS provides data on U.S. transactions with foreigners in short- and long-term domestic and foreign securities by type and country on a monthly basis. The data are collected from issuers of U.S. securities issued directly in foreign markets and from large U.S.-resident end investors who do not use U.S. custodians for holdings of foreign securities (for example, pension funds, foundations, and endowments), as well as large

U.S. custodian banks and U.S. broker–dealers. Net debt and equity flows are gross sales to U.S. residents by foreigners less gross purchases from U.S. residents by foreigners.

Specifically, Bertaut and Tryon (2007) and Bertaut and Judson (2014) generate monthly estimates of U.S. cross-border investment by combining information from detailed annual Treasury International Capital (TIC) surveys with data from the TIC forms SLT and TICS.[11] We use this measure of capital flows because it yields a consistent, high frequency time series that can be decomposed into flows, estimated valuation changes, and a residual "gap" (the last component arising from the challenge of reconciling year-end holdings data with within-year cumulative valuation and flow data). These decompositions can provide a richer and timelier view of developments in both foreign portfolio investment in the U.S. and U.S. portfolio investment abroad than available from transactions data or survey data alone.

To obtain a measure of positions in securities by type and country, it is necessary to interpolate the annual holdings data using the growth rate of country-level fixed-income and equity indices, along with flow data from the monthly transactions data. Denote as $H_{i,t}$ U.S. holdings of assets from country i at time t. Then,

$$H_{i,t} = H_{i,t-1}(1 + V_{i,t}) + F_{i,t} + A_{i,t} \tag{11}$$

where $V_{i,t}$ is the total return on country *i*'s return index and $F_{i,t}$ is the net flow in U.S. dollars. $A_{i,t}$ accounts for the repayment of principal on asset-backed securities, acquisitions of equity through stock swaps, and flows consisting of non-marketable Treasury bonds (Bertaut and Judson 2014). As emerging market debt is increasingly denominated in local currency, the return used is the average of USD EMBI+ and the local currency bond index weighted by the currency composition of U.S. resident positions. Holdings observations in the first month of every year are the values from the annual survey; that is, annual observations are the interpolation end-points.

Making the above adjustments, however, leaves a substantial gap between the cumulation-implied holdings at the time of the next survey and the value of reporting holdings in that month. One complication that arises in constructing estimated positions for individual country holds is the geographic distortion caused by financial center transaction bias. By construction, the transaction data are recorded by country of first cross-border counterparty, rather than actual end buyer or seller of the security. Thus,

[11] Their data management efforts are made available at http://www.federalreserve.gov/Pubs/ifdp/2007/910/default.htm

estimates calculated in the above fashion will tend to overestimate holdings by residents of financial center locations and underestimate holdings by residents other countries. Figures 2 and 3 decompose equity and bond holdings by flows, valuation changes and the residual gap graphically.

If the gap for the year is negative, then the cumulation-implied holdings for the year overstates the year-end position in comparison with the survey. If the gap for the year is positive, the cumulation-implied holdings understate the year-end position. If the gap in a given month differs in sign from the overall gap accumulated during the year, the cause can be a very large drop in value, a very large drop in volume, or both because the valuation and volume enter the weighting formula multiplicatively.

In addition, the gap may be due to approximation and measurement errors in the construction of prices used to calculate the valuation adjustments, and transaction costs due which are included in reported transactions, but not in annual holdings surveys. The basic challenge is to distribute the observed error across the months between annual survey dates to arrive at a more accurate estimate of monthly positions.

Beginning with an initial survey position, an estimate of the current position at an inter-survey date t is constructed as follows:

$$\hat{\mathrm{S}}_t = \mathrm{S}_0(1+\hat{\pi}) + \sum_{\mathrm{i}=1}^{t} \hat{\mathrm{N}}_i(1+\hat{\pi}_{\mathrm{i,t}}) \tag{12}$$

Where S_0 is the latest survey observation for a given country, security, and holder, $\hat{\mathrm{S}}_t$ is the estimated position at time t, $\{\hat{\mathrm{N}}_i\}$ is the sequence of flows from time 1 to time t, and $\hat{\pi}_{\mathrm{i,t}}$ is the rate of increase of the price of security S over the period, with $\hat{\pi}_{0,0} = 0$. So, we assume that flows and prices are observed with error, and between-survey holdings represent estimated values. When t = T, S_T is known. The gap is thus: $\mathrm{G_T} = \mathrm{S_T} - \hat{S}_T$.

In short, Bertaut and Tryon and Bertaut and Judson extrapolate the time 0 survey position forward using the observed flow data and compute the residual *vis-à-vis* the reported survey at time T. The residual is then distributed across time periods according to each period's share of net transactions, discounted by the appropriate inflation rate. The cumulative flows will then match the annual surveys by construction, consistent with both endpoints.

$$H_{i,t} = H_{i,t-1}\,(1 + V_{i,t}) + F_{i,t} + A_{i,t} + Gap_{i,t} \tag{13}$$

In our final dataset, we define positions as outlined above decomposed into (i) valuations changes ($H_{i,t-1}V_{i,t}$), (ii) flows consisting of reported transactions ($F_{i,t}$) plus repayment of principal on asset-backed securities and stock swaps from mergers and acquisitions ($A_{i,t}$), and (iii) the gap ($Gap_{i,t}$). We also include a measure that we will call volumes, which consists of (ii) and (iii) added together (essentially fully attributing the gap to missing portfolio flows). We do so on the assumption that the error attributable to flow mis-measurement is like to be higher than that attributable to prices. When fully constructed, these data are monthly from 1994 until 2014. The countries in the panel include Argentina, Brazil, Chile, Colombia, India, Indonesia, Korea, Malaysia, Mexico, Peru, the Philippines, Russia, South Africa, Thailand and Turkey..

4.1 Control Variables

Our control variables include both "push" and "pull" variables suggested by the literature on capital flows. Controls for financial conditions include a measure of liquidity (the Ted spread), market risk (VIX), the U.S. GDP growth rate, the return on the S&P 500 Index, the change in the Fed Funds rate, the average of policy rates for the US, France, Germany and Japan, as well as a lag of the left-hand-side variable to account for autocorrelation. Country-specific controls include GDP growth rates, changes in local policy rates, emerging equity market returns on (measured as the annual growth of the MSCI total return index), government debt as a percent of GDP, the current account balance as a percent of GDP, the fiscal balance as a percent of GDP, the real effective exchange rate, and ICRG political risk.

4.2 Summary Statistics

Table 3 presents detailed summary statistics about the portfolio flow data and the pull and push control variables. Total holdings increase by 165% between the pre-crisis and the QE period and increase by a further 27% between the QE and Taper period.[12] The

[12] The pre-crisis dummy is equal to one in the period March 1994 to July 2008 and zero otherwise. The QE dummy is equal to one from the period December 2008 (when the U.S. interest rate reached the ZLB) to April 2013. The Taper dummy is equal to one for the period May 2013 (wherein Ben Bernanke first mentioned the possibility of tapering LSAP purchases) to Dec 2014. We elect December 2008 as the beginning of the QE period precisely because it is at this point that the Fed can no longer undertake conventional simulative monetary policy by lowering the interest rate (except to offer a negative interest rate in the vein of Bank of Japan and the European Central Bank). The period between the collapse of Lehman Brothers and the beginning of QE was marked by global "flight to safety" and its inclusion in

difference in means between the two periods is statistically significant. Measured cumulative flows in the data increase by 291% and decline by 31% over the full QE and Taper periods, respectively, although the latter is not statistically significant. Bond positions and equity positions also increase significantly over the QE and Taper periods although at a slower rate of increase between them.

However, note that both bond and equity valuations decline significantly between the QE and the Taper periods. Similarly, measured bond and equity flows are both lower in the Taper period where bonds experience a more significant valuation decline. Hence, the gap between the holdings data and the flows data increases for equities between the QE and the Taper period. We see this reflected in the drop in EMBI and MSCI returns between the QE and Taper periods.

Also, note that while the gap for bonds shrinks in the Taper period, it is still large compared to the pre-crisis period. Interestingly, the difference in flows is not statistically significant between the two periods. However, if we use flows plus the gap as the volume for bonds (or equities), it appears to be the case that volumes increased between the QE and Taper periods.

Turning to push factors, while the VIX measuring global volatility increases during the QE period relative to the pre-crisis period, it actually declines significantly between the QE and the Taper periods to a value below that during the pre-crisis average. The Ted spread declines over every consecutive sub-period (QE-pre-crisis and Taper-QE), which implies that lenders believe the risk of default on interbank loans is decreasing, and therefore liquidity increases (see Figure 4). Finally, while the S&P's average annual return in the Taper period may be very high relative to the QE and pre-crisis periods, this may be in part because the Taper period is shorter in length.

The policy rate in the destination emerging-market, a pull factor, reveals an interesting pattern (Figure 6). There is a statistically significant decline between pre-crisis and QE period, but not between the QE and taper periods indicating a significant drop in the emerging market policy rate in since the global unconventional monetary policy regime commenced. Table 3 shows that on average, the level of the policy rate in the sample is unchanged between the QE and Taper periods. However, on the whole emerging markets decreased interest rates during the QE period, and raised them during the taper period, although the net effect since the beginning of unconventional monetary

either neighboring sub-period muddles the analysis in the sense both that it is a period of extraordinary uncertainty and that it truly belongs to neither classification.

policy to the most recent observation is essentially level. Consistent with the valuation declines both the EMBI return and the MSCI emerging-market returns show a significant decline in the Taper period. With regard to variables capturing slow-moving macroeconomic conditions, we find that the fiscal balance, public debt and the current account deteriorated between the pre-crisis and QE periods and largely deteriorate further between the QE and tapering periods. The exception to this latter statement is the fiscal balance, which appears to have improved. Finally, the variable "political risk" (as measured by ICRG) shows a statistically significant improvement between each subsequent period.

5. Benchmark Specification and Regression Results

To examine the impact of monetary policy surprises around FOMC meetings on capital flows from the United States to a range of emerging markets we estimate the following benchmark specification using panel data:

$$
\begin{aligned}
y_{i,t} \;=\; \alpha y_{i,t\text{-}1} \;+\; & \sum_{j=1}^{2}\beta_j dummy_{pre} * mp_{j,t} + \sum_{k=1}^{2}\gamma_k dummy_{QE} * mp_{k,t} \\
+ & \sum_{l=1}^{2}\delta_l dummy_{taper} * mp_{l,t} + \eta' PUSH_t^{AE} + \theta_i' PULL_{i,t} + \varepsilon_{i,t}
\end{aligned} \tag{14}
$$

where $y_{i,t}$ is the capital flow or position measure of interest. We estimate the impact of monetary surprises on the following for both equity and debt normalized as a percent of annual GDP: (i) total positions, (ii) flows, (iii) valuation changes and (iv) "volumes" (the sum of TIC flows and the residual gap). The specification includes a lagged measure of the dependent variable to account for the strong autocorrelation we observe in the flows and holdings time-series.

β_j, γ_k and δ_l are the coefficients on the monetary surprise measures in the pre-crisis, QE and taper/unwinding periods, respectively. The two monetary policy surprise measures (MP1 and MP2) are included together in the regression under the assumption that they capture distinct elements of monetary policy. Interacting our monetary surprise measures with time dummies allows us to capture the differential effect of monetary policy over three distinct regimes while allowing our controls to have a regime-invariant effect. η' is a transposed vector of coefficients on a set of push variables mentioned above. Finally, θ' is a transposed vector of coefficients on a set of pull variables also mentioned above. Robust standard errors are White's corrected and clustered at the country level. We use the random effects model instead of fixed effects under the assumption that our sample is sufficiently long that country-level unobserved heterogeneity cannot be considered immutable. A Hausman test corroborates our choice, rejecting fixed effects.

5.1 Monetary Surprises and Capital Flows

Table 4 examines the impact of the monetary surprise measures on the various holdings and flow measures across the three sub-periods: the pre-crisis period, the QE period and the unwinding period. All dependent variables are normalized by scaling by the GDP of the destination country. Columns 1-4 present results for debt positions, flows, volumes and valuations, respectively. Columns 5-8 present the analogous measures for equity. Consistent with the previous literature, both holding and flows display significant autocorrelation as the positive coefficients on the lagged dependent variables show.

In the pre-crisis period, the coefficient on the MP2 monetary surprise measure in contrast is positive and statistically significant for debt flows and volumes measures (Columns 2-3). Based on our earlier exercise, recall that the MP2 measure captures, in part, revisions in the expected 'path' of monetary policy in the conventional policy period. A positive and statistically significant coefficient therefore suggests that a tightening shock may lead to outflows from emerging markets (as seen by the coefficient on the MP1 measure), the longer term effects of expectations via the confidence channel can be that in the pre-crisis period, markets interpret a tightening as a signal that the Fed is feeling sanguine about global market conditions such that debt positions, flows and valuations in emerging markets increase.

Turning to the equity data, we see that emerging market equity valuations scaled by destination GDP are inversely related to the MP1 monetary surprise measure, i.e., a US tightening surprise is correlated with a statistically significant decline in emerging-market equity valuations (Column 8) while equity volumes, which combine the flows with the residual gap scaled by destination GDP, are inversely related to the MP2 measure at the 15% level of significance (Column 7). The sign of the coefficient suggests that a tightening monetary shock in the U.S. leads to decreased valuations, measured as a percent of GDP. Such a pattern in emerging markets is consistent with a role for the signaling and portfolio balance channels. That is, a tightening monetary policy shock may be associated with emerging market portfolio outflows as foreign investors substitute into long-term U.S. bonds. Alternatively, a signal that today's 'tight' monetary policy portends future tightening, worsening credit conditions in the U.S. can drive a negative association between monetary policy shocks and portfolio flows. Conversely, a loosening monetary shock leads to increased inflows to emerging markets. In the pre-crisis period, for all the other capital flow and holdings measures, monetary surprises do not appear to be significantly correlated with U.S. capital flows to our emerging-market sample countries.

In contrast to the conventional policy period, the QE period displays a somewhat different pattern. The MP1 surprise measure is now positively and statistically significantly correlated with total debt positions, suggesting that on impact quantitative easing led to a decline in debt flows to emerging markets (Column 1) consistent with the confidence channel (or a lack thereof). In contrast, the MP2 measure, associated in large part with revisions in market participants require risk compensation during this period, is inversely and significantly correlated with positions, valuations and volumes, but not measured flows (Columns 1 and 4). Given that interest rates fell dramatically during this period and the U.S. quickly entered the ZLB regime, this pattern suggests that U.S. investors significantly increased their emerging market debt and equity holdings during the QE period. Equity positions and valuations are inversely correlated with the MP1 monetary surprise measure (Columns 5 and 8). However, none of the equity measures are significantly correlated with the MP2 or path measure of monetary policy. While it may seem a little puzzling that the flow measures do not exhibit statistical significance, one explanation may be that there is more noise in the measured flows data during periods of higher volatility.

The unwinding, or taper, period presents a significant shift in the pattern of results. Across both monetary surprise measures and alternative measures of debt and equity flows and valuations, we see inverse and statistically significant coefficients suggesting that the period of taper talk and the actual unwinding was associated with significant outflows from emerging markets. It is also noteworthy that the coefficients associated with the unwinding period are an order of magnitude larger than both the pre-crisis and the QE periods. The coefficients on both the MP1 and MP2 measures (again, with the latter shown to be related to revisions in market participants' required risk compensation) suggest that the market interpreted the unwinding of unconditional monetary policy as a signal that normalcy was being restored to the U.S. economy and, consistent with both the signaling and portfolio balance channels, expected monetary tightening in the U.S. both in the near term and ongoing in the future led to a massive retrenchment from emerging markets.

5.1.1 Push Factors and Capital Flows

In addition to the monetary surprise measures across sub-periods, Table 4 includes controls for a range of push and pull factors that can drive capital flows. In particular, liquidity and volatility in advanced financial markets can affect flows to emerging markets. Table 5 includes an indicator of global risk aversion, the VIX, and a transformed TED spread, our measure of global liquidity. The TED spread measure is orthogonalized to capture the component of the spread that is not due to changes in volatility or risk aversion.

Turning to the push variables, we see that in several specifications the TED spread, our measure of global liquidity is inversely correlated with capital flows. A decrease in global liquidity (measured by increasing spreads) leads U.S. investors to decrease their holdings and flows to emerging markets. This result is unsurprising in the sense that a liquidity squeeze can make it difficult for institutions to obtain capital, especially in times of heightened overall risk aversion (Fratzscher 2012). Debt positions, flows and valuations in emerging markets are inversely correlated with TED spreads consistent with the hypothesis that increased spreads represent reduced financial market liquidity and are therefore correlated with a decline in capital flows to emerging markets (Columns 1, 2 and 4). A similar inverse correlation is seen with equity positions and valuations (Columns 5 and 8). We would expect that an increase in the market volatility or risk aversion would cause capital flows to emerging economies to slow or reverse as investors reallocate their portfolios toward safer assets (Ahmed and Zlate 2014; Milesi-Ferretti and Tille 2011; Broner et al 2013). However, an increase in the VIX, or volatility, is only a mildly significant driver of changes in debt positions and valuations.

Next, we control for the S&P 500 Index return and U.S. real GDP growth rates as push factors. Results in the literature on capital flows suggests that the return on advanced economy equities should evince a negative relationship with emerging market equity flows, as an increase in the U.S. equity return increases the relative attractiveness of returns in the U.S. (Ghosh et al 2012; Forbes and Warnock 2012; Lo Duca 2012). However, we find that the S&P return is positively and significantly related to a range of debt and equity flow measures (Columns 3-5, 7-8). We could be observing here a wealth effect of the U.S. return on capital flows—an increase in the return to investment in the U.S. increases the total wealth available for investment activity. This result, however, is not without precedent, as Forbes and Warnock (2012) find a similar pattern.

Regarding the expected sign on the real GDP growth coefficient, there are two countervailing forces readily apparent. We might also expect real GDP growth in the U.S. to be negatively correlated with emerging market capital for the same reasoning outlined for the S&P return—the return differential shrinks, incentivizing investors toward advanced economies (Ahmed and Zlate 2014). However, there is some evidence that mature economy growth has a positive effect on emerging market flows via a wealth effect (Forbes and Warnock 2012). We find, however, that U.S. real GDP growth is only inversely related to bond valuations, equity positions and equity valuations in emerging markets.

We include in our "push" variables two indicators of the world interest rate—numerous studies have concluded that an increase in the external interest rate environment exerts a negative effect on emerging market portfolio flows (Dalhaus and Vasishtha 2014; Montiel and Reinhart 1999; Sarno and Taylor 1997) or that an increase in the spread between emerging market interest rates and that of advanced economies tends to exercise a positive effect on emerging market portfolio flows (Ahmed and Zlate 2014). The two variables that we use to capture the external interest environment are the change in the Fed Funds rate and the average of advanced economy interest rates. We find that the change in the Fed Funds rate is positively correlated with equity positions, and valuations but do not appear to drive debt flows and valuations. In contrast, the average advanced economy interest rates are inversely related with debt positions and debt volumes but positively related to emerging market debt and equity valuations.

5.1.2 Pull Factors and Capital Flows

Regarding country-specific pull factors, we find that an increase in the emerging-market policy rate is on average directly correlated with debt flows and equity positions, flows and volumes (Columns 2, 5 - 7). An increase in the MSCI emerging market equity return is inversely correlated with debt and equity positions (Columns 1 and 5) and debt valuations. Although we might expect to see a positive relationship between such measures of domestic returns and capital flows the literature on emerging market capital flows also produces some contrasting evidence in domestic returns (Ahmed and Zlate 2014; Forbes and Warnock 2012).

Turning to macro pull factors, there is some evidence in the literature that real GDP growth in the destination country plays a role in determining emerging market flows, although it is less robust (Fratzscher 2012; Forbes and Warnock 2012). We find that increased real GDP growth in the recipient country is associated with increased bond valuations, equity flows and equity valuations (Columns 3, 5 and 6). Inflation in emerging markets is, in contrast and unsurprisingly inversely correlated with debt and equity positions and flows (Columns 1-2, 5-6).

Turning next to slow-moving macroeconomic variables, there is some evidence that country vulnerability indicators such as the current account, fiscal balance and government debt impact portfolio flows because of their effect on the confidence of investors regarding growth potential and perceived risk (Eichengreen and Gupta 2014; Moore et al 2013; Chen et al 2014). However, these vulnerability measures also indicate increased financing needs, generating a mechanical relationship debt flows in particular. In this vein, we find that current account balances are inversely correlated with debt positions, flows and volumes (Columns 1-3). We also find, however, that a strong current account balance is positively correlated with equity positions and valuations (Columns 5 and 8). Similarly, the fiscal balance in the destination country is inversely correlated with debt positions, flows, volumes (Columns 1-3), but positively correlated with equity flows (Column 6). This division is consistent the forces described above—a positive fiscal balance indicates lower financing needs, but a negative fiscal balance might also disincentivize investment. For debt flows, the effect of financing needs appears dominant, but the positive relationship between the fiscal balance and equity valuations is consistent with increases perception of risk in the face of a public deficit.

The gross government debt ratio is inversely correlated with debt positions, flows and volumes (Columns 1-3) and positively correlated with equity flows (Column 6). The observed differences on debt versus equity may be capturing a substitution effect to the extent that foreign investors shift into emerging market equity as government debt levels rise. However, this is somewhat of a puzzling finding if we believe that rising government debt portends rising fiscal risk for the economy as a whole.

We also include in the regressions the ICRG political risk index, which is increasing in perceived institutional quality. The positive and significant coefficient on this factor is consistent with the prediction that capital flows to a country increase as political risk declines (Fratzscher et al 2013; Eichengreen and Gupta 2013). Finally, real exchange rate appreciation is inversely correlated with capital inflows with respect to debt positions, flows, volumes and valuations. This result is not unexpected, since real exchange rate appreciation is often itself used as a measure of increased capital flows (Calvo et al., 1993).

5.2 Quantifying the Magnitude of Capital Flows related to Monetary Surprises

The advantage of extracting the magnitude of the monetary surprises directly from the Fed Funds Futures data is that we can directly estimate a dollar amount in terms of U.S. investor position and flow changes to emerging markets controlling for a variety of push and pull factors. To get a sense of the economic magnitudes in question, Table 5 presents the response of capital flows and valuations to the two monetary policy shocks evaluated at the mean as well as for a one standard deviation shock from the mean.

We consider two examples of emerging-market capital flow measures with significant coefficients for both monetary surprise measures in the QE and taper sub-periods. First, let's examine the debt positions measure. In the baseline regression (Table 4, Column 1) the coefficients on the two monetary surprise measures during the QE period are 0.69 and –0.629 percent of annual GDP, respectively. From Table 1 Panel A, the mean values for MP1 and MP2, the two monetary surprise measures, during the QE period are -0.003 and -0.008. Country GDP in the QE and Taper periods averaged $65B and $75B respectively. Combined with the coefficient estimates, this suggests that the average monetary policy shocks (loosening shocks during the QE period) appear to be accompanied by, on average, a $1.25M decline on impact and a $3.30M in emerging-market debt volumes increase over time.

In contrast, during the taper period, the coefficients on the two monetary surprise measures are -5.7 and -4.6 percent of annual GDP, respectively (Table 4, Column 1). From Table 1 Panel A, the mean values for MP1 and MP2, the two monetary surprise measures, during the taper period are -0.0002 and 0.005. Together, these coefficient estimates for reversals in the unwinding period, the mean-magnitude shocks are correlated with a $0.94M increase in emerging market debt volumes on impact and outflows on average of $17.91M over time.

One standard deviation on either side of the mean for the monetary surprise measures distribution during the QE period, is correlated with changes in debt volumes that range from [-$10.4M, +$7.91M] for the MP1 measure and [-$11.38M, $11.38M] for the MP2 measure. Similarly, one standard deviation from the mean for monetary surprise measures during the tapering period, is correlated with debt volume changes that range from [-$37.94,M $39.82M] and [-$60.84M, $25.01M] for the MP1 and MP2 measures, respectively. Table 5 presents detailed capital flow changes predicted by the quantification exercise for all the debt and equity capital flow measures we examine in this paper.

The key benefit of extracting the magnitude of the monetary surprises is that we are able to quantify the distributional impact of U.S. monetary policy on our emerging-market capital flow measures. Previous studies that use dummy variables or alternative approaches to examine U.S. monetary policy spillovers are only able to make qualitative statements about the direction of impact. In contrast, our method allows for a quantification of the effects. It is interesting to note that a more nuanced picture emerges from the distributional predictions of the quantification exercise. The magnitudes suggest that the impact of US monetary policy on emerging market capital flows depends on both the magnitude and distribution of monetary policy shocks.

5.3 Robustness Checks

To ensure the robustness of the patterns we document, we conducted a number of alternative exercises.

We repeated the estimations with our final monetary surprise measure the difference in the yield two-year treasury bond on the date of an FOMC meeting. The principle is the same as the first two monetary policy measures (MP1 and MP2)—over a very narrow window, it is reasonable to state that change in the price of the asset reflects a change in the expectations component of yield i.e., the sum of expected future interest rates, which is driven by a monetary surprise. Table 6 presents the results that remain robust especially for the taper/unwinding period.

To examine whether the yield on the two-year bond is capturing expectations about the path of the short rate over the life of the bond or about changes in risk compensation we appeal to Kim and Wright’s (2005) decomposition of the bond yield into expected short rates and term premia. Figure 3 depicts the contribution from expected short rate and the term premium to the overall daily changes in the two year zero coupon bond yield on FOMC event days. The changes on FOMC dates tend to result in larger part from changes in the term premium, although the decomposition is frequently close to an even contribution.

We also experimented with longer horizons of the monetary policy shock, for example at the three and four month Fed Funds futures contract horizons (MP3 and MP4). These coefficients on these variables did not enter the regressions with consistent statistical significance. We do not therefore report these results but note that the exercise established that the relevant monetary surprise measures are MP1 and MP2.

The dependent variables in the benchmark regressions are scaled by the GDP of the destination country. We repeated the estimations with the previous period's holdings as an alternative scaling variable. We also conducted a set of estimations with destination-country fixed effects. The pattern of results is robust in both cases.[13]

To ensure that the choice to scale the dependent variables is not driving the results, we conducted the estimations without scaling the raw data. Table 8 shows that while the magnitude of the coefficient estimates reflect that the dependent variables have not been scaled, the pattern of results remains robust.

6. Conclusion

This paper examines the implications of unconventional monetary policy and its continued unwinding for emerging market capital flows and asset prices with an emphasis on quantifying the magnitude of these effects. We use U.S. Treasury data on emerging market flows and asset prices alongside Fed Funds Futures data to extract a surprise component of Fed announcements. High frequency identification (HFI) using Fed Funds futures data allows us to extract the unexpected element of changes in the market's expectations of Fed policy.

Using this methodology, we examine the impact of monetary policy surprises extracted around FOMC meetings on capital flows from the United States to a range of emerging markets. Panel regression estimates reveal substantial heterogeneity in the monetary policy shock implications for flows versus asset prices, debt versus equity, and during across the various policy periods. The most robust finding is that the evolution in overall emerging market debt and equity positions between various policy sub-periods appear to be largely driven by U.S. monetary policy induced valuation changes. In nearly

[13] Not reported but available from the authors.

every specification, the effect of monetary policy shocks on asset values is larger than that for physical capital flows.

Further, there is an order-of-magnitude difference between the effects of monetary policy on all types of emerging-market portfolio flows between the QE period and the subsequent tapering period. We detect some significant effects of monetary policy on flows and valuations during the period of unconventional monetary policy (QE). However, the effects are not consistent over all dependent variables. In contrast, during the period following the first mentioning of policy tapering, we uncover a consistent and large effect of monetary policy shocks on nearly all variables of interest.

Using high frequency identification allows us to make several unique contributions to the literature on the spillover effects of U.S. monetary policy on emerging market capital flows. Panel estimation using dummies only for event dates thought to contain a surprise fed funds rate change may miss dates that contain a surprise insofar as rates did not change---so it is important from an identification standpoint to have dummies for dates with known surprises and dummies for dates with no previously-identified surprises. High-frequency identification using Fed Funds futures data allows us to identify monetary surprises regardless of whether or not there was a widely recognized surprise, as we are able to extract changes in market expectations of Fed policy in a direct manner.

Likewise, simple changes in the Fed Funds rate may lead to an attenuated estimate of the effect of monetary policy on real and financial variables—i.e., sometimes the lack of any change is itself a surprise. Once again, high-frequency identification captures surprises that may arise from no change in Fed policy. Finally, using dummies to identify a monetary policy shock obscures the magnitude of the shock. With Fed Funds futures data in hand we are able to quantify the magnitude of the monetary surprises. In turn, conditioning on the magnitudes of the monetary surprises allows us to quantify the impact on capital flows to emerging markets. Our paper is the first to do so using portfolio flows.

A key advantage of extracting the magnitude of the monetary surprises directly from the Fed Funds Futures data is that we can directly estimate a dollar amount in terms of US investor position and flow changes to emerging markets controlling for a variety of push and pull factors. By extracting the magnitude of the monetary surprises we are able to quantify the distributional impact of US monetary policy on our emerging-market capital flow measures. A more nuanced picture emerges from our approach, whereby we can make distributional predictions that are consistent with emerging markets' varied experience across debt and equity, during the periods of quantitative easing and of its unwinding.

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Appendix 1: Description of Variables

Variable	Description	Source
Bond/equity positions	Sum of bond/equity flows, valuation changes and gap	Bertaut and Tryon (2007), Bertaut and Judson (2009)
Total positions	Equity positions plus bond positions	Bertaut and Tryon (2007), Bertaut and Judson (2009)
Bond/equity flows	TICS Reported transactions plus repayment of principal on asset-backed securities and stock swaps from mergers and acquisitions	Bertaut and Tryon (2007), Bertaut and Judson (2009)
Total flows	Equity flows plus bond flows	Bertaut and Tryon (2007), Bertaut and Judson (2009)
Bond/equity valuation changes	Cumulative change in the value of time t holdings between time t and t+n as measured by a weighted average of local currency and dollar-denominated asset returns	Bertaut and Tryon (2007), Bertaut and Judson (2009)
Bond/equity flows (% of holdings)	Ratio of current flows (t) to previous period holdings (t-1)	Bertaut and Tryon (2007), Bertaut and Judson (2009) and author's calculations
Bond/equity gap	Difference between the year-end annual survey holdings data and the cumulation-implied holdings, distributed over between-survey months proportional to the size of monthly flows	Bertaut and Tryon (2007), Bertaut and Judson (2009)
VIX	Implied volatility of S&P 500 index options	FRED database
Fed Funds rate	Federal reserve target interest rate	FRED database
Change in Fed Funds rate	Monthly first difference of the Fed Funds rate	FRED database
Ted spread	3-month LIBOR minus 3-month T-bill interest rate	FRED database
S&P annual return	Annual return on the S&P index	Standard and Poor's
Policy rate	Domestic (EM) central bank target interest rate	Datastream
Change in policy rate	Monthly first difference of domestic policy rate	Datastream
EMBI annual return	Year-on-year growth of MSCI total return index	Datastream
MSCI annual return	Year-on-year growth of MSCI total return index	Datastream

Figure 1: Monetary policy surprises around FOMC events

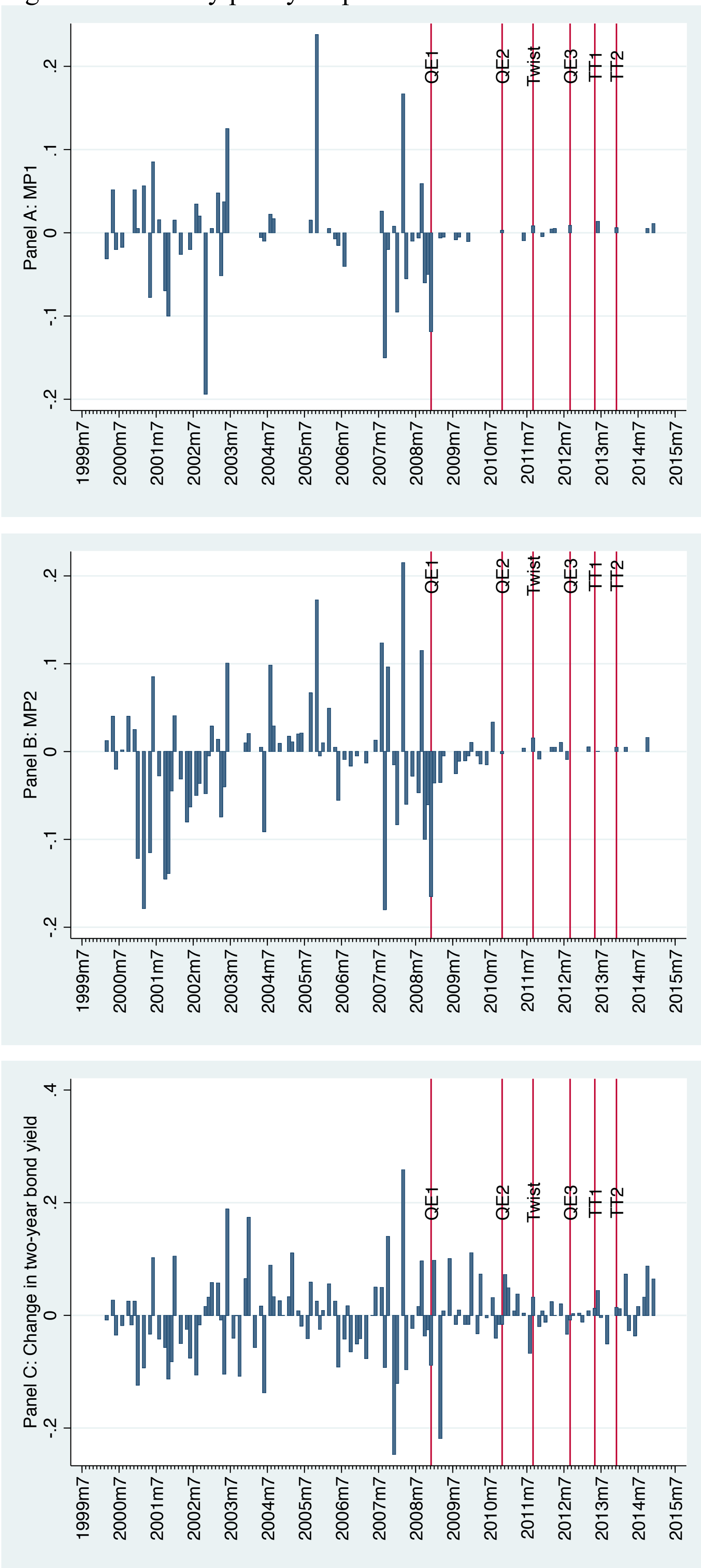


Figure 2: Equity Holdings Decomposed by Flows, Valuation Changes & A Residual "Gap"

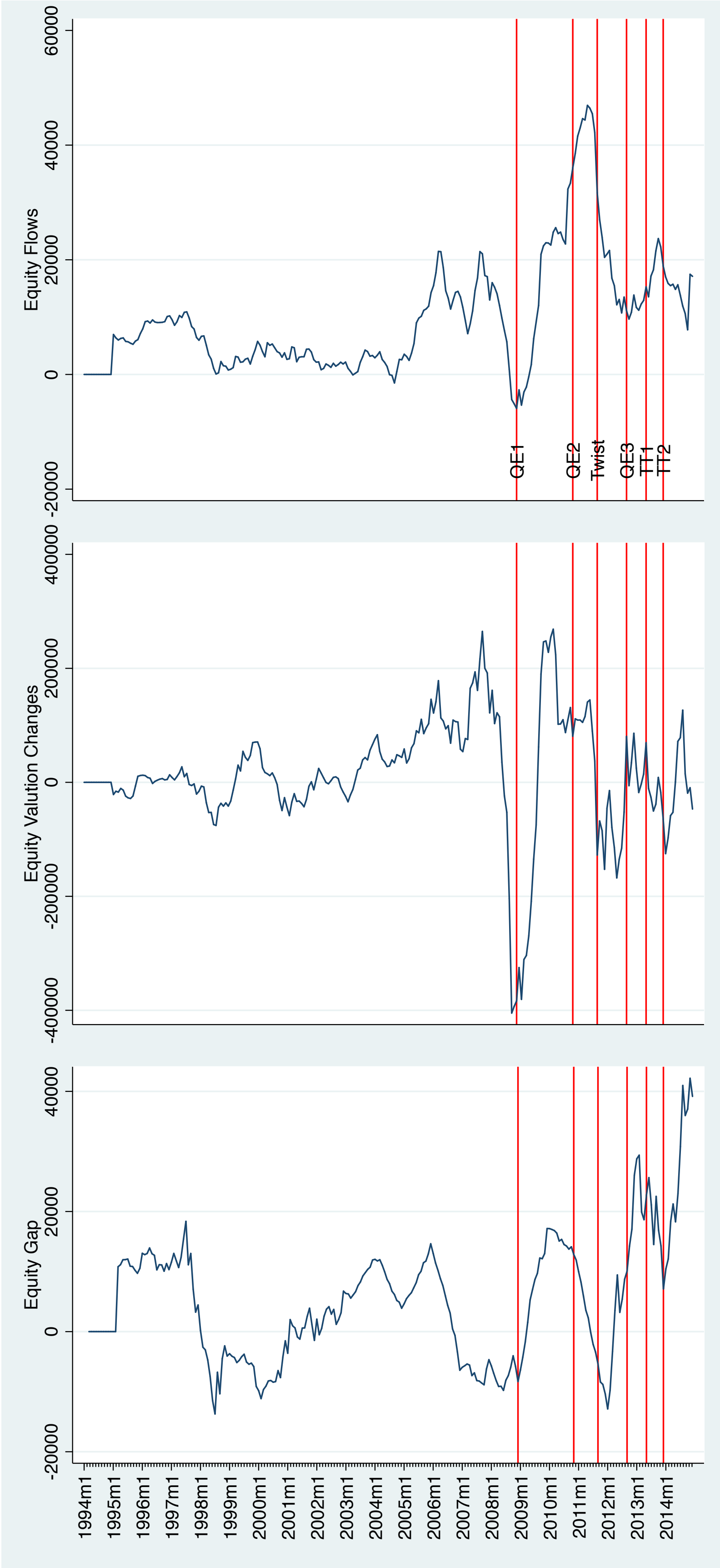


Figure 3: Bond Holdings Decomposed by Flows, Valuation Changes & A Residual "Gap"

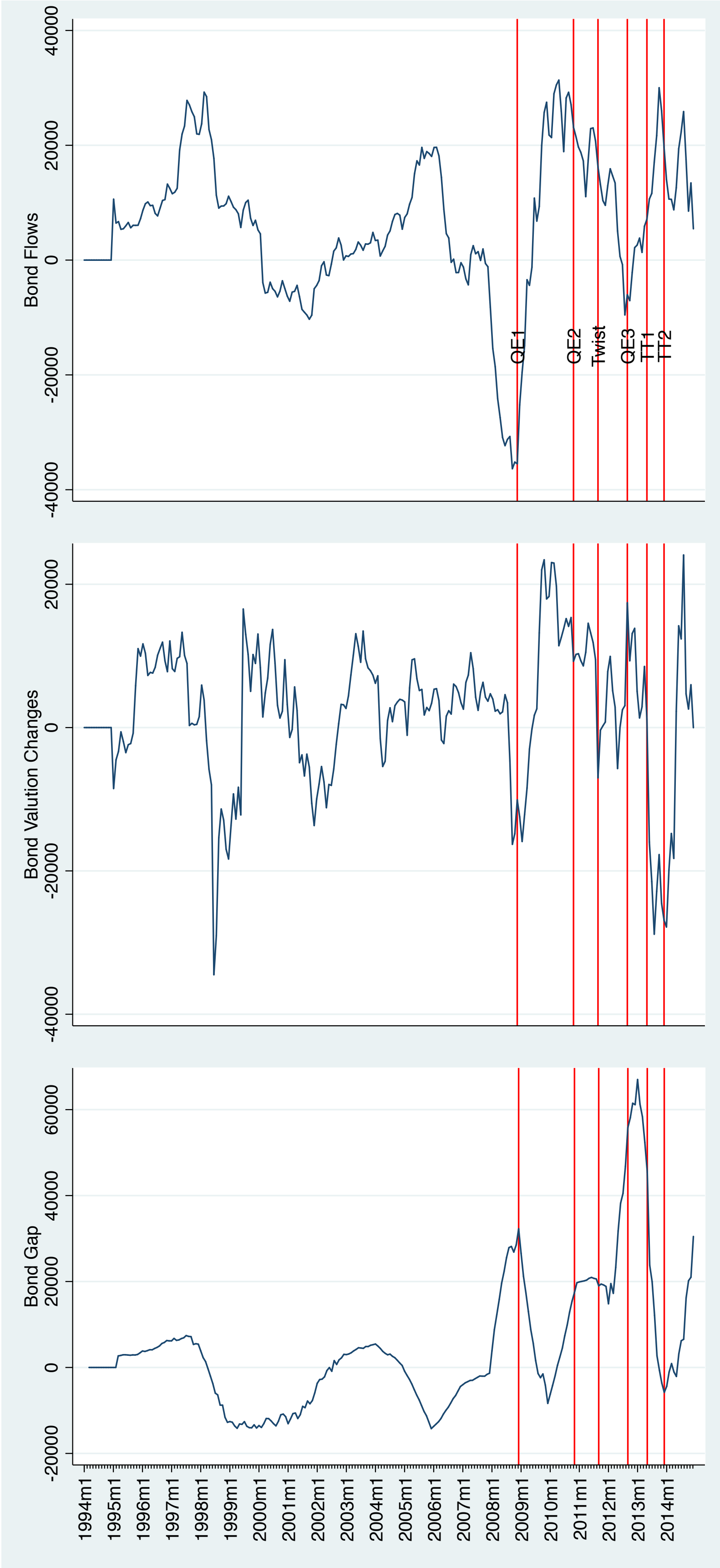
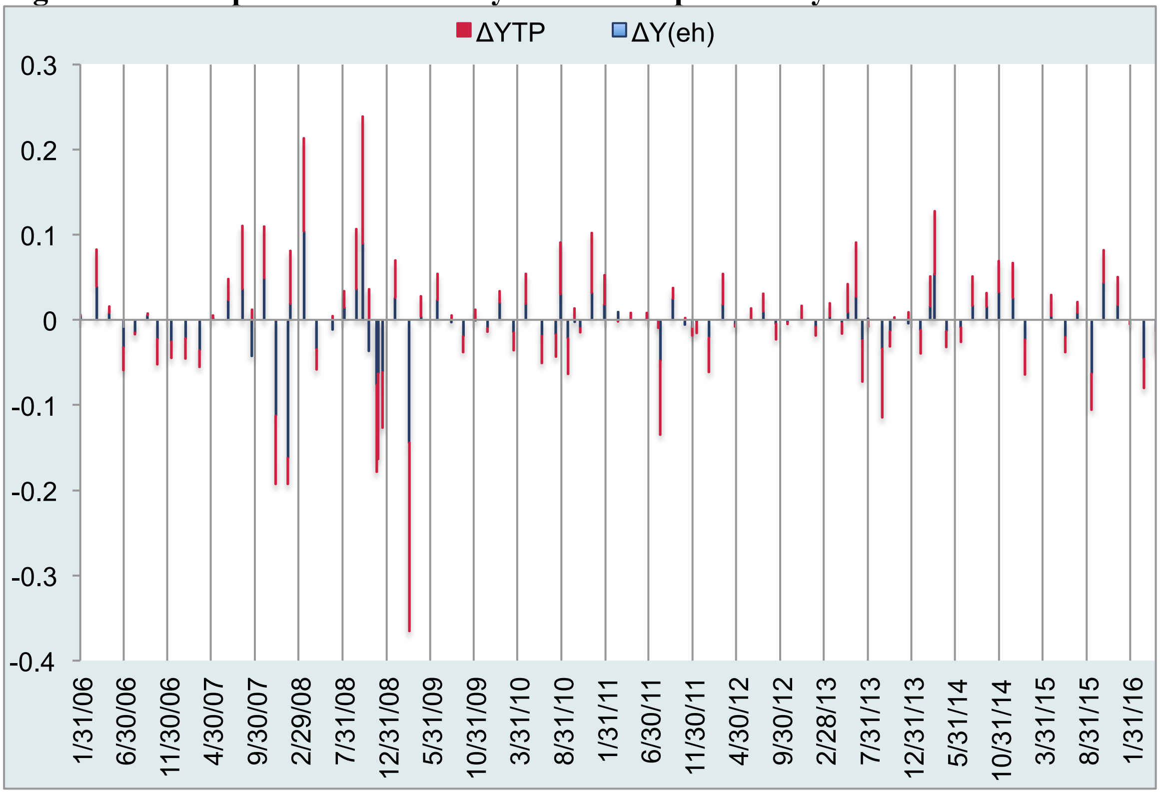


Figure 4: Decomposition of the two year zero coupon bond yield



Source: Kim and Wright (2005)

Figure 5: The Ted Spread Declines Steadily over the UMP Period

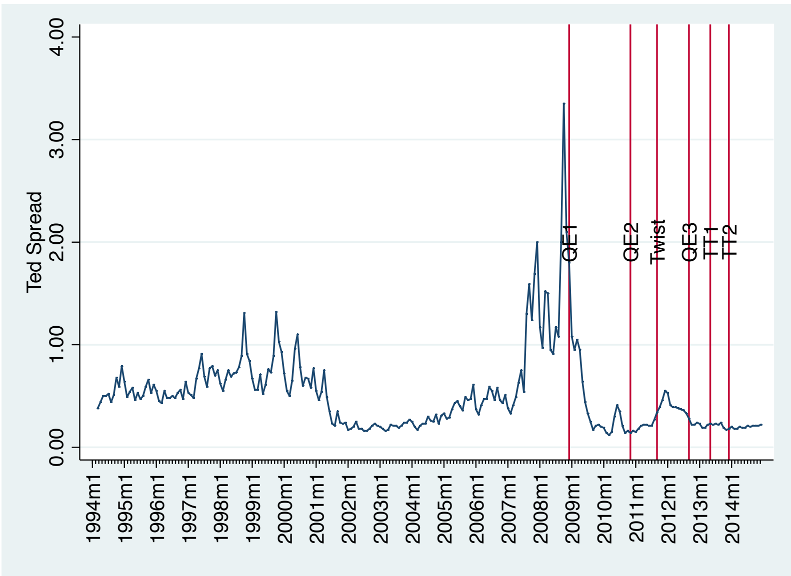


Figure 6: The Average Policy Rate Declines over the QE period and Rises Slightly During Taper Talk

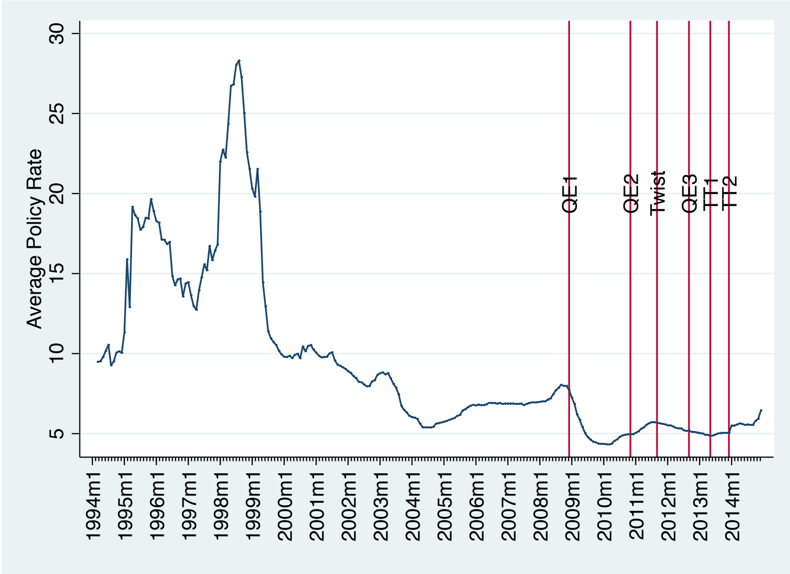


Table 1. Monetary Policy Shocks: Descriptive Statistics and Correlations

Panel A: Comparison of Means

Subsample means (standard deviations in parentheses)					**T-Tests of Means**		
Variables	Full sample	Pre-crisis	QE period	Taper period	Pre-crisis v. QE	Pre-crisis v. taper period	QE v. taper period
MP1	0.001	0.005	-0.003	0.000	***	***	***
	(0.00)	(0.07)	(0.02)	(0.01)			
MP2	-0.005	-0.004	-0.008	0.005	***	--	**
	(0.00)	(0.07)	(0.04)	(0.01)			
2 yr T-Bond Yield	-0.004	-0.010	0.002	0.015	***	***	***
	-(0.01)	(0.08)	(0.06)	(0.05)			

*** p<0.01, ** p<0.05, * p<0.1

Panel B: Correlations Between Monetary Surprise Measures

	MP1	MP2	2 Yr T-Bond Yield
MP1	1		
MP2	0.4781	1	
2Yr T-Bond Yield	0.3022	0.5317	1

Table 2. Regressions of Monetary Policy Shocks on Yield Changes

Panel A: t-1 to t

VARIABLES	Difference Zero coupon bond yield (1yr)	Difference Zero coupon bond yield (5yr)	Difference Zero coupon bond yield (10 years)	Difference $Y_{eh}(1)$	Difference $Y_{eh}(5)$	Difference $Y_{eh}(10)$	Difference Term premium (1yr)	Difference Term premium (5yr)	Difference Term premium (10 years)
MP1*precrisis	0.175	0.103	0.0365	0.156	0.00846	0.00169	0.0281	0.0283	-0.00234
	(0.130)	(0.152)	(0.104)	(0.128)	(0.0334)	(0.0290)	(0.0715)	(0.106)	(0.0808)
MP2*precrisis	0.532***	0.397***	0.241**	0.445***	0.0898***	0.0582***	0.103	0.144	0.0798
	(0.113)	(0.143)	(0.102)	(0.107)	(0.0218)	(0.0181)	(0.0652)	(0.101)	(0.0806)
MP1*QE	-0.0254	0.235	0.449	-0.158	0.283	0.234	-0.000872	0.128	0.263
	(0.399)	(1.314)	(1.547)	(0.217)	(0.551)	(0.432)	(0.443)	(0.965)	(1.128)
MP2*QE	0.667**	1.235	1.232	0.457***	0.389	0.292	0.424	0.824	0.858
	(0.306)	(1.037)	(1.232)	(0.160)	(0.447)	(0.351)	(0.344)	(0.758)	(0.894)
MP1*TT	-0.0710	0.118	0.320	-0.181**	0.240	0.199*	-0.0392	0.0462	0.171
	(0.0880)	(0.302)	(0.389)	(0.0789)	(0.150)	(0.119)	(0.0984)	(0.231)	(0.287)
MP2*TT	1.626***	1.674***	1.127**	1.434***	0.185	0.0959	0.629***	0.959***	0.710**
	(0.182)	(0.407)	(0.469)	(0.127)	(0.178)	(0.140)	(0.137)	(0.290)	(0.336)
Constant	-0.00188***	-0.000960	-0.000893	-0.00120**	-0.000980***	-0.000766***	0.000232	0.000246	0.000149
	(0.000663)	(0.000945)	(0.000968)	(0.000548)	(0.000350)	(0.000273)	(0.000324)	(0.000628)	(0.000681)
Observations	4,087	4,087	4,087	4,087	4,087	4,087	4,087	4,087	4,087
R-squared	0.027	0.013	0.009	0.026	0.009	0.008	0.009	0.008	0.007

Panel B: t-1 to t+1

VARIABLES	Difference Zero coupon bond yield (1yr)	Difference Zero coupon bond yield (5yr)	Difference Zero coupon bond yield (10 years)	Difference $Y_{eh}(1)$	Difference $Y_{eh}(5)$	Difference $Y_{eh}(10)$	Difference Term premium (1yr)	Difference Term premium (5yr)	Difference Term premium (10 years)
MP1*precrisis	0.164	0.182	0.206	0.0889	0.128	0.100	0.0166	0.0620	0.0885
	(0.114)	(0.152)	(0.195)	(0.113)	(0.104)	(0.0850)	(0.0505)	(0.101)	(0.129)
MP2*precrisis	0.578***	0.498***	0.308**	0.501***	0.0707	0.0396	0.164***	0.238**	0.154
	(0.137)	(0.154)	(0.151)	(0.112)	(0.0689)	(0.0542)	(0.0503)	(0.0920)	(0.0974)
MP1*QE	-0.453	-0.545	-0.390	-0.404	-0.0493	-0.0230	-0.223	-0.350	-0.277
	(0.359)	(1.069)	(1.354)	(0.352)	(0.548)	(0.440)	(0.349)	(0.791)	(0.977)
MP2*QE	0.398	2.075**	2.713**	-0.123	1.136***	0.907***	0.585*	1.475**	1.897**
	(0.306)	(0.896)	(1.100)	(0.270)	(0.426)	(0.340)	(0.299)	(0.662)	(0.799)
MP1*TT	-0.0167	0.348	0.705	-0.251**	0.489*	0.402*	-0.0389	0.150	0.379
	(0.130)	(0.474)	(0.634)	(0.104)	(0.277)	(0.222)	(0.130)	(0.336)	(0.441)
MP2*TT	1.637***	2.054***	1.575*	1.412***	0.287	0.177	0.800***	1.303***	1.092*
	(0.265)	(0.702)	(0.917)	(0.177)	(0.428)	(0.343)	(0.176)	(0.456)	(0.604)
Constant	-0.00831*	-0.00174	-0.00259	-0.00435	-0.00588	-0.00472	0.00328	0.00438	0.00315
	(0.00475)	(0.00770)	(0.00895)	(0.00391)	(0.00368)	(0.00293)	(0.00257)	(0.00541)	(0.00638)
Observations	174	174	174	174	174	174	174	174	174
R-squared	0.259	0.164	0.144	0.258	0.153	0.151	0.121	0.122	0.122

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 3. Emerging Market Capital Flows: Summary Statistics

Subsample means (standard deviations in parentheses)					**Comparison of means**		
Variables	Full sample	Pre-crisis	QE period	Taper period	Pre-crisis v. QE	Pre-crisis v. taper period	QE v. taper period
Net flow measures (in millions USD unless otherwise noted) (i.)							
Total positions	30758.35	19935.85	52905.74	67392.62	***	***	***
	(41536.26)	(27392.31)	(54662.20)	(58015.94)			
Total flows	94.27	55.45	216.85	149.70	***	**	--
	(788.39)	(451.43)	(1078.54)	(1672.09)			
Bond positions	8502.66	5956.74	12752.54	19784.44	***	***	***
	(11252.18)	(7004.18)	(13663.76)	(20623.46)			
Equity positions	22255.68	13979.11	40153.20	47608.18	***	***	***
	(33570.97)	(23420.78)	(44300.65)	(44294.58)			
Bond flows	35.75	21.02	87.73	48.89	***	--	--
	(689.22)	(386.70)	(879.04)	(1594.79)			
Equity flows	58.52	34.42	129.12	100.81	***	***	--
	(357.63)	(242.03)	(538.33)	(533.30)			
Bond valuation changes	8.89	7.94	61.51	-93.99	***	***	***
	(450.67)	(408.35)	(392.44)	(789.55)			
Equity valuation changes	69.75	84.25	389.14	-363.57	**	***	***
	(3214.38)	(2440.73)	(4371.18)	(3957.35)			
Debt volume (flows + gap)	65.25	17.46	210.97	120.78	***	***	*
	(597.30)	(390.51)	(874.45)	(991.90)			
Equity volume (flows + gap)	92.55	48.41	185.02	250.34	***	***	--
	(545.50)	(403.41)	(701.22)	(950.23)			
Residual gap for bonds	29.50	-3.57	123.24	71.89	***	**	**
	(583.30)	(179.88)	(646.09)	(1678.86)			
Residual gap for equity	34.02	13.99	55.90	149.53	***	***	***
	(457.76)	(333.61)	(526.75)	(931.82)			
Bond positions (% of GDP)	2.14	2.12	2.02	2.70	*	***	***
	(1.71)	(1.82)	(1.29)	(1.68)			
Equity positions (% of GDP)	3.86	3.38	4.84	5.58	***	***	***
	(3.33)	(2.93)	(3.70)	(4.36)			
Bond flows (% of GDP)	0.01	0.01	0.01	0.00	--	*	*
	(0.15)	(0.15)	(0.15)	(0.18)			
Equity flows (% of GDP)	0.01	0.01	0.01	0.01	--	--	--
	(0.06)	(0.07)	(0.05)	(0.05)			
Bond volumes (% of GDP)	0.02	0.01	0.03	0.02	***	--	**
	(0.15)	(0.15)	(0.13)	(0.15)			
Equity volumes (% of GDP)	0.02	0.02	0.03	0.02	***	--	--
	(0.10)	(0.11)	(0.08)	(0.13)			
Bond valuation changes (% of GDP)	0.00	0.00	0.01	-0.01	**	**	***
	(0.11)	(0.13)	(0.05)	(0.08)			
Equity valuation changes (% of GDP)	0.02	0.01	0.07	-0.03	***	**	***
	(0.39)	(0.38)	(0.41)	(0.36)			
"Push" variables							
VIX	20.42	19.51	24.54	14.63	***	***	***
	(8.07)	(6.35)	(10.36)	(2.45)			
Ted Spread	0.51	0.56	0.36	0.20	***	***	***
	(0.39)	(0.34)	(0.30)	(0.02)			
S&P annual return	10.96	11.08	8.14	22.24	***	***	***
	(18.24)	(17.00)	(21.56)	(4.71)			
Avg. adv. interest rate	2.46	3.27	0.60	0.25	***	***	***
	(1.44)	(0.82)	(0.18)	(0.07)			
Fed Funds rate	2.92	4.10	0.14	0.09	***	***	***
	(2.32)	(1.73)	(0.04)	(0.01)			
Change in Fed Funds rate	-0.01	-0.01	0.00	0.00	--	--	*
	(0.18)	(0.20)	(0.04)	(0.01)			
US real GDP growth	2.50	3.11	0.84	2.14	***	***	***
	(1.86)	(1.36)	(2.25)	(0.62)			
"Pull" variables							
Domestic GDP growth	4.17	4.40	3.88	3.41	***	***	**
	(4.34)	(4.53)	(4.22)	(2.23)			
Change in REER	0.06	0.07	0.25	-0.29	*	**	--
	(3.08)	(3.39)	(1.93)	(2.25)			
Inflation	19.91	26.18	4.99	4.92	***	**	--
	(176.56)	(210.23)	(3.11)	(2.87)			
Policy rate (change)	-0.04	-0.04	-0.07	0.08	--	--	***
	(9.64)	(12.35)	(0.35)	(0.58)			
Policy rate	8.90	11.17	5.22	5.33	***	***	--
	(11.82)	(14.53)	(2.64)	(2.68)			
EMBI annual return	11.22	13.11	11.58	2.29	*	***	***
	(22.43)	(23.82)	(20.84)	(11.47)			
MSCI annual return	16.97	19.93	15.04	3.61	***	***	***
	(45.21)	(47.27)	(43.50)	(22.37)			
Fiscal balance	-0.55	-0.45	-0.74	-0.77	***	***	--
	(1.14)	(1.18)	(1.03)	(0.97)			
Public debt	11.67	11.89	11.02	11.75	***	--	**
	(6.67)	(7.26)	(5.17)	(4.91)			
Current account balance	0.12	0.27	0.12	-1.07	--	***	***
	(4.66)	(4.82)	(4.30)	(3.82)			
Political risk	65.54	65.91	65.06	63.44	***	***	***
	(8.02)	(8.49)	(6.42)	(7.33)			

*** p<0.01, ** p<0.05, * p<0.1

(i.) Net debt and equity flows are gross sales to U.S. residents by foreigners less gross purchases from U.S. residents by foreigners.

(ii.) Reported new flows data as a percentage of cumulation implied monthly holdings.

Table 4. The Impact of US Monetary Policy Shocks on Emerging Market Portfolio Flows (Benchmark Specification)

		Bond positions	Bond flows	Bond volumes	Bond valuation changes	Equity positions	Equity flows	Equity volumes	Equity valuation changes
	VARIABLES	% of GDP	% of GDP	% of GDP	% of GDP	% of GDP	% of GDP	% of GDP	% of GDP
Monetary policy shocks	ch_gs2*Precrisis	0.0572	0.165***	0.150**	-0.110***	0.141	-0.0104	-0.0149	0.00584
		(0.0456)	(0.0628)	(0.0623)	(0.0278)	(0.147)	(0.0145)	(0.0209)	(0.0975)
	ch_gs2*QE	-0.473***	-0.130	-0.146	-0.138***	-2.410***	-0.0875**	-0.0942+	-1.515***
		(0.170)	(0.146)	(0.154)	(0.0417)	(0.706)	(0.0446)	(0.0621)	(0.488)
	ch_gs2*Taper	-0.818***	-0.317*	-0.563***	-0.377***	-2.388***	-0.0995+	-0.596***	-1.912***
		(0.244)	(0.170)	(0.214)	(0.0786)	(0.540)	(0.0663)	(0.187)	(0.488)
Push factors	Ted spread	-0.0131***	-0.00836***	-0.00540**	-0.00982***	-0.0638***	-0.000475	-0.00154	-0.0709***
		(0.00414)	(0.00286)	(0.00260)	(0.00247)	(0.0146)	(0.00195)	(0.00263)	(0.0160)
	VIX	0.000501	-0.000593*	-0.000408+	0.000772***	-0.000535	-0.000127	-0.000835*	0.00104+
		(0.000352)	(0.000359)	(0.000274)	(0.000175)	(0.000640)	(0.000193)	(0.000500)	(0.000684)
	S&P annual return	0.000598**	0.000230	0.000375+	0.000348***	0.00326***	0.000146*	-7.86e-05	0.00384***
		(0.000288)	(0.000326)	(0.000230)	(0.000130)	(0.000985)	(7.58e-05)	(0.000138)	(0.000961)
	US real GDP growth	0.00226	-0.000693	0.000133	-0.00163*	-0.0159***	4.54e-05	-0.00192	-0.0208***
		(0.00321)	(0.00393)	(0.00290)	(0.000867)	(0.00376)	(0.00112)	(0.00212)	(0.00484)
	Avg. AE interest rate	-0.00672*	0.000599	-0.00913***	0.00322**	0.0140	-9.07e-05	-0.00721**	0.0263***
		(0.00353)	(0.00492)	(0.00315)	(0.00139)	(0.00980)	(0.00168)	(0.00296)	(0.00984)
Pull factors	Policy rate	-0.000290	-7.51e-05	-0.000131	-0.000185*	-0.000594***	0.000273***	0.00187***	-0.00246***
		(0.000295)	(0.000101)	(0.000186)	(0.000106)	(0.000209)	(0.000102)	(0.000328)	(0.000367)
	Real GDP growth	0.00149	4.62e-05	0.00117	0.000649+	0.00153	0.000617*	0.00157**	-0.00172
		(0.00121)	(0.00102)	(0.000948)	(0.000437)	(0.00286)	(0.000338)	(0.000703)	(0.00271)
	MSCI annual return	-0.0461***	-0.00186	-0.00523	-0.00901**	-0.0940***	-0.00541	-0.00353	-0.0221
		(0.0157)	(0.00876)	(0.0111)	(0.00443)	(0.0273)	(0.00426)	(0.00496)	(0.0193)
	Inflation	-0.000121	-0.000187	0.000388	9.27e-05	-0.00133	-5.33e-05	-0.00120*	0.000581
		(0.000464)	(0.000173)	(0.000344)	(8.77e-05)	(0.00110)	(0.000148)	(0.000658)	(0.00120)
	Current account (% of GDP)	-0.00218**	-0.00186***	-0.00164*	0.000450*	0.00308+	0.000150	0.00110**	0.00348**
		(0.00107)	(0.000482)	(0.000954)	(0.000248)	(0.00205)	(0.000434)	(0.000497)	(0.00170)
	Government debt (% of GDP)	-0.00224***	-0.00235***	-0.00162***	-8.96e-05	0.000833	0.000627**	-0.000249	0.00183
		(0.000772)	(0.000676)	(0.000449)	(0.000247)	(0.00131)	(0.000264)	(0.000495)	(0.00137)
	Fiscal balance (% of GDP)	-0.00626*	-0.00575**	-0.00194+	0.000155	0.0154	1.71e-05	0.00506**	0.0176*
		(0.00359)	(0.00263)	(0.00125)	(0.00106)	(0.0128)	(0.000834)	(0.00249)	(0.00940)
	ICRG Political risk	0.00149***	-5.20e-05	0.00119***	9.80e-05	-0.000128	0.000374**	7.68e-05	-0.000129
		(0.000462)	(0.000364)	(0.000350)	(0.000185)	(0.00156)	(0.000177)	(0.000418)	(0.00116)
	REER	-0.000559+	-0.000797***	-0.000457+	-0.000385*	-0.00147**	0.000128+	2.35e-05	-0.00176*
		(0.000351)	(0.000269)	(0.000297)	(0.000214)	(0.000691)	(8.24e-05)	(0.000288)	(0.000981)
Lagged dependent variables	Bond position (t-1)	0.989***							
	(% of GDP)	(0.00301)							
	Bond flows (t-1)		0.0458						
	(% of GDP)		(0.0336)						
	Bond volumes (t-1)			-0.0145					
	(% of GDP)			(0.0373)					
	Bond valuation changes (t-1)				-0.0302				
	(% of GDP)				(0.0328)				
	Equity position (t-1)					0.996***			
	(% of GDP)					(0.00260)			
	Equity flows (t-1)						0.221***		
	(% of GDP)						(0.0263)		
	Equity volumes (t-1)							0.146***	
	(% of GDP)							(0.0466)	
	Equity valuation changes (t-1)								0.0131
	(% of GDP)								(0.0274)
	Constant	0.000517	0.123***	0.0141	0.0109	0.180+	-0.0377***	0.0371	0.141
		(0.0466)	(0.0362)	(0.0323)	(0.0193)	(0.124)	(0.0135)	(0.0335)	(0.102)
	Observations	2,714	2,714	2,714	2,714	2,714	2,714	2,714	2,714
	Number of countrycode	15	15	15	15	15	15	15	15

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.10, + p<0.15

Table 5. The Quantitative Impact of US Monetary Policy on Emerging Market Capital Flows.

Panel A: Quantitative Easing

QE period						
	MP1 shocks			MP2 shocks		
	μ	**μ-σ**	**μ+σ**	**μ**	**μ-σ**	**μ+σ**
Bond positions	-1.25	-10.41	7.91	3.30	17.99	-11.38
Debt flows						
Debt volume				1.78	9.70	-6.14
Debt valuation				1.33	7.24	-4.58
Equity positions	6.45	53.74	-40.84			
Equity flows						
Equity volume						
Equity valuation	7.31	60.95	-46.32			

Empty cells indicate a statistically insignificant result. All values in USD Million; (-) indicates outflows; (+) indicates inflows.

Panel B: Tapering/Unwinding Period

Taper/Unwinding period						
	MP1 shocks			MP2 shocks		
	μ	**μ-σ**	**μ+σ**	**μ**	**μ-σ**	**μ+σ**
Bond positions	0.94	39.82	-37.94	-17.91	25.01	-60.84
Debt flows	0.35	14.96	-14.25	-6.68	9.32	-22.68
Debt volume	0.91	38.27	-36.46	-11.06	15.44	-37.55
Debt valuation	0.13	5.33	-5.08	-9.76	13.62	-33.14
Equity positions	1.95	82.45	-78.55	-35.67	49.80	-121.13
Equity flows	0.12	5.05	-4.81	-1.24	1.73	-4.20
Equity volume	0.37	15.75	-15.00			
Equity valuation	1.64	69.40	-66.12	-38.84	54.22	-131.89

Empty cells indicate a statistically insignificant result. All values in USD Million; (-) indicates outflows; (+) indicates inflows.

Table 6. The Impact of US Monetary Policy Shocks on Emerging Market Portfolio Flows (Alternative Monetary Shock Measure: Two-year Treasury Bond Yields)

		Bond positions	Bond flows	Bond volumes	Bond valuation changes	Equity positions	Equity flows	Equity volumes	Equity valuation changes
	VARIABLES	% of GDP	% of GDP	% of GDP	% of GDP	% of GDP	% of GDP	% of GDP	% of GDP
Monetary policy shocks	ch_gs2*Precrisis	0.0572	0.165***	0.150**	-0.110***	0.141	-0.0104	-0.0149	0.00584
		(0.0456)	(0.0628)	(0.0623)	(0.0278)	(0.147)	(0.0145)	(0.0209)	(0.0975)
	ch_gs2*QE	-0.473***	-0.130	-0.146	-0.138***	-2.410***	-0.0875**	-0.0942+	-1.515***
		(0.170)	(0.146)	(0.154)	(0.0417)	(0.706)	(0.0446)	(0.0621)	(0.488)
	ch_gs2*Taper	-0.818***	-0.317*	-0.563***	-0.377***	-2.388***	-0.0995+	-0.596***	-1.912***
		(0.244)	(0.170)	(0.214)	(0.0786)	(0.540)	(0.0663)	(0.187)	(0.488)
Push factors	Ted spread	-0.0131***	-0.00836***	-0.00540**	-0.00982***	-0.0638***	-0.000475	-0.00154	-0.0709***
		(0.00414)	(0.00286)	(0.00260)	(0.00247)	(0.0146)	(0.00195)	(0.00263)	(0.0160)
	VIX	0.000501	-0.000593*	-0.000408+	0.000772***	-0.000535	-0.000127	-0.000835*	0.00104+
		(0.000352)	(0.000359)	(0.000274)	(0.000175)	(0.000640)	(0.000193)	(0.000500)	(0.000684)
	S&P annual return	0.000598**	0.000230	0.000375+	0.000348***	0.00326***	0.000146*	-7.86e-05	0.00384***
		(0.000288)	(0.000326)	(0.000230)	(0.000130)	(0.000985)	(7.58e-05)	(0.000138)	(0.000961)
	US real GDP growth	0.00226	-0.000693	0.000133	-0.00163*	-0.0159***	4.54e-05	-0.00192	-0.0208***
		(0.00321)	(0.00393)	(0.00290)	(0.000867)	(0.00376)	(0.00112)	(0.00212)	(0.00484)
	Avg. AE interest rate	-0.00672*	0.000599	-0.00913***	0.00322**	0.0140	-9.07e-05	-0.00721**	0.0263***
		(0.00353)	(0.00492)	(0.00315)	(0.00139)	(0.00980)	(0.00168)	(0.00296)	(0.00984)
Pull factors	Policy rate	-0.000290	-7.51e-05	-0.000131	-0.000185*	-0.000594***	0.000273***	0.00187***	-0.00246***
		(0.000295)	(0.000101)	(0.000186)	(0.000106)	(0.000209)	(0.000102)	(0.000328)	(0.000367)
	Real GDP growth	0.00149	4.62e-05	0.00117	0.000649+	0.00153	0.000617*	0.00157**	-0.00172
		(0.00121)	(0.00102)	(0.000948)	(0.000437)	(0.00286)	(0.000338)	(0.000703)	(0.00271)
	MSCI annual return	-0.0461***	-0.00186	-0.00523	-0.00901**	-0.0940***	-0.00541	-0.00353	-0.0221
		(0.0157)	(0.00876)	(0.0111)	(0.00443)	(0.0273)	(0.00426)	(0.00496)	(0.0193)
	Inflation	-0.000121	-0.000187	0.000388	9.27e-05	-0.00133	-5.33e-05	-0.00120*	0.000581
		(0.000464)	(0.000173)	(0.000344)	(8.77e-05)	(0.00110)	(0.000148)	(0.000658)	(0.00120)
	Current account (% of GDP)	-0.00218**	-0.00186***	-0.00164*	0.000450*	0.00308+	0.000150	0.00110**	0.00348**
		(0.00107)	(0.000482)	(0.000954)	(0.000248)	(0.00205)	(0.000434)	(0.000497)	(0.00170)
	Government debt (% of GDP)	-0.00224***	-0.00235***	-0.00162***	-8.96e-05	0.000833	0.000627**	-0.000249	0.00183
		(0.000772)	(0.000676)	(0.000449)	(0.000247)	(0.00131)	(0.000264)	(0.000495)	(0.00137)
	Fiscal balance (% of GDP)	-0.00626*	-0.00575**	-0.00194+	0.000155	0.0154	1.71e-05	0.00506**	0.0176*
		(0.00359)	(0.00263)	(0.00125)	(0.00106)	(0.0128)	(0.000834)	(0.00249)	(0.00940)
	ICRG Political risk	0.00149***	-5.20e-05	0.00119***	9.80e-05	-0.000128	0.000374**	7.68e-05	-0.000129
		(0.000462)	(0.000364)	(0.000350)	(0.000185)	(0.00156)	(0.000177)	(0.000418)	(0.00116)
	REER	-0.000559+	-0.000797***	-0.000457+	-0.000385*	-0.00147**	0.000128+	2.35e-05	-0.00176*
		(0.000351)	(0.000269)	(0.000297)	(0.000214)	(0.000691)	(8.24e-05)	(0.000288)	(0.000981)
Lagged	Bond position (t-1)	0.989***							
dependent	(% of GDP)	(0.00301)							
variables	Bond flows (t-1)		0.0458						
	(% of GDP)		(0.0336)						
	Bond volumes (t-1)			-0.0145					
	(% of GDP)			(0.0373)					
	Bond valuation changes (t-1)				-0.0302				
	(% of GDP)				(0.0328)				
	Equity position (t-1)					0.996***			
	(% of GDP)					(0.00260)			
	Equity flows (t-1)						0.221***		
	(% of GDP)						(0.0263)		
	Equity volumes (t-1)							0.146***	
	(% of GDP)							(0.0466)	
	Equity valuation changes (t-1)								0.0131
	(% of GDP)								(0.0274)
	Constant	0.000517	0.123***	0.0141	0.0109	0.180+	-0.0377***	0.0371	0.141
		(0.0466)	(0.0362)	(0.0323)	(0.0193)	(0.124)	(0.0135)	(0.0335)	(0.102)
	Observations	2,714	2,714	2,714	2,714	2,714	2,714	2,714	2,714
	Number of countrycode	15	15	15	15	15	15	15	15

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.10, + p<0.15

Table 7. The Impact of US Monetary Policy Shocks on Emerging Market Portfolio Flows (Unscaled Dependent Variables)

	VARIABLES	Bond positions	Bond flows	Bond volumes	Bond valuation changes	Equity positions	Equity flows	Equity volumes	Equity valuation changes
Monetary policy shocks	MP1*Precrisis	-150.6	225.5	20.27	-179.5	-1,898+	7.073	64.41	-2,033+
		(216.4)	(175.6)	(207.8)	(145.4)	(1,216)	(178.9)	(238.5)	(1,300)
	MP2*Precrisis	-12.22	182.2	85.61	-116.1	214.5	-178.1+	-190.9	309.7
		(226.4)	(216.4)	(197.7)	(83.09)	(630.0)	(122.1)	(144.7)	(719.5)
	MP1*QE	4,566	4,476*	5,113+	-228.7	-45,180***	-3,301**	-3,946+	-40,638***
		(3,351)	(2,561)	(3,118)	(562.8)	(15,118)	(1,588)	(2,652)	(13,874)
	MP2*QE	-4,580*	-2,253	-3,378+	-1,430***	9,458*	1,416+	2,167	7,631*
		(2,471)	(1,700)	(2,115)	(524.2)	(5,136)	(935.9)	(1,918)	(4,388)
	MP1*Taper	-38,511***	-20,030**	-31,862***	-9,749***	-121,682***	-8,441**	-19,298**	-94,010***
		(10,689)	(9,575)	(10,554)	(3,166)	(36,550)	(3,924)	(7,796)	(30,570)
	MP2*Taper	-33,461***	-14,500+	-13,053**	-20,746***	-86,962***	-4,181*	-854.7	-80,425***
		(9,708)	(9,144)	(5,151)	(7,460)	(25,131)	(2,145)	(6,376)	(22,301)
Push factors	Ted spread	-58.05***	-26.45***	-7.150	-37.78***	-603.9***	-8.869	-1.787	-590.0***
		(17.01)	(7.415)	(9.624)	(9.343)	(185.2)	(7.299)	(9.585)	(189.3)
	VIX	1.401	-2.611	-3.857**	2.943*	3.500	0.747	-1.452	12.82
		(2.071)	(2.038)	(1.510)	(1.543)	(6.801)	(0.856)	(2.077)	(10.90)
	S&P annual return	2.776**	1.933	0.785	2.287**	30.80**	0.993**	0.694	30.10**
		(1.189)	(1.668)	(0.649)	(1.046)	(13.14)	(0.468)	(0.927)	(12.02)
	US real GDP growth	-5.544	-17.61*	2.756	-9.467*	-164.7**	-2.703	-3.113	-155.8**
		(9.247)	(10.61)	(8.067)	(5.276)	(79.50)	(6.938)	(14.46)	(65.47)
	Avg. AE interest rate	-32.88**	-11.18	-67.01**	8.445*	212.3*	-9.435	-45.01*	276.2**
		(15.65)	(28.63)	(27.03)	(4.559)	(109.1)	(8.872)	(26.72)	(119.0)
Pull factors	Policy rate	-0.879	-0.138	-0.449	-0.0274	-4.387	0.734	3.002***	-7.629***
		(0.869)	(0.664)	(0.766)	(0.377)	(3.058)	(0.797)	(0.941)	(2.516)
	Real GDP growth	4.933	-2.152	-2.934	3.162	7.953	0.217	8.695*	0.910
		(4.801)	(3.680)	(3.153)	(2.633)	(25.66)	(2.267)	(5.051)	(19.44)
	MSCI annual return	-56.66+	5.611	-8.734	-44.87**	-415.9*	1.377	-57.67*	-318.4+
		(37.18)	(40.92)	(27.87)	(19.84)	(232.6)	(24.21)	(33.85)	(199.5)
	Inflation	1.309	-0.317	0.709	-0.321	-8.821+	-1.147	-1.366	-6.979
		(1.401)	(1.045)	(1.222)	(0.508)	(6.017)	(1.181)	(2.615)	(6.038)
	Current account (% of GDP)	-2.672	-8.622**	-6.994***	1.555+	15.85	-2.295	3.008	13.16
		(2.477)	(4.107)	(2.508)	(1.068)	(11.04)	(2.195)	(4.524)	(13.48)
	Government debt (% of GDP)	-5.126*	-10.26*	-5.529	0.550	21.99	7.211**	5.171	12.05
		(3.064)	(5.935)	(4.845)	(0.920)	(15.58)	(3.433)	(3.809)	(10.62)
	Fiscal balance (% of GDP)	-2.038	-22.88**	-17.74***	6.605	96.81+	-2.637	6.553	84.74
		(12.48)	(11.55)	(6.491)	(8.090)	(60.73)	(3.996)	(8.002)	(62.88)
	ICRG Political risk	1.290	-0.0210	3.936**	0.892	6.148	3.020*	0.892	3.799
		(2.301)	(3.051)	(1.979)	(0.810)	(8.697)	(1.549)	(2.671)	(7.175)
	REER	-3.333**	-4.217***	-2.253+	-1.879+	-11.21+	0.274	-0.337	-11.57
		(1.439)	(1.374)	(1.553)	(1.146)	(7.135)	(0.504)	(2.265)	(9.407)
Lagged dependent variables	Bond position (t-1)	1.008***							
		(0.00373)							
	Bond flows (t-1)		0.265***						
			(0.0319)						
	Bond volumes (t-1)			0.0630***					
				(0.0170)					
	Bond valuation changes (t-1)				-0.0908***				
					(0.0201)				
	Equity position (t-1)					0.999***			
						(0.00248)			
	Equity flows (t-1)						0.348***		
							(0.0722)		
	Equity volumes (t-1)							0.252***	
								(0.0540)	
	Equity valuation changes (t-1)								0.0604*
									(0.0336)
	Constant	302.8+	630.2**	289.8	41.37	330.5	-255.1**	76.01	171.0
		(192.9)	(271.9)	(237.5)	(83.15)	(743.8)	(120.8)	(167.6)	(769.2)
	Observations	2,714	2,714	2,714	2,714	2,714	2,714	2,714	2,714
	Number of countrycode	15	15	15	15	15	15	15	15

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.10, + p<0.15