Taper Tantrums: What is the Effect of Unconventional Monetary Policy on Emerging Market Capital Flows?

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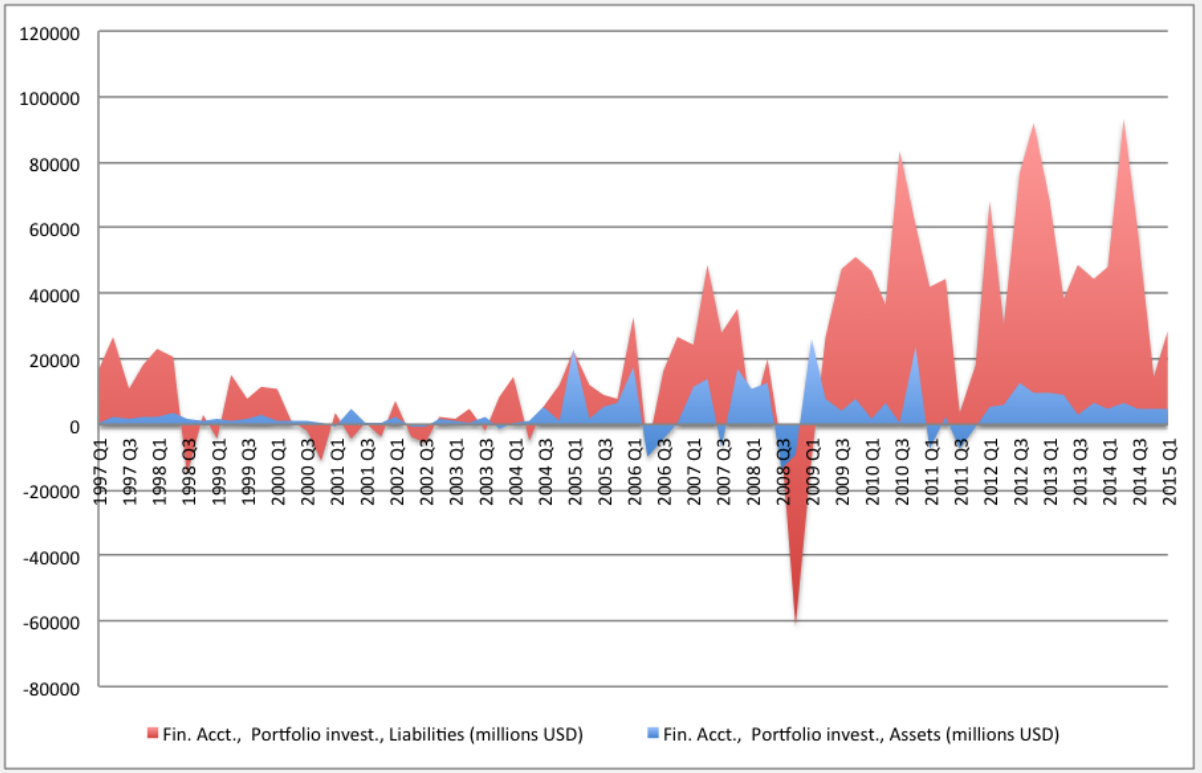
"This crisis started in the developed world...It will not be overcome simply through measures of austerity, fiscal consolidations and depreciation of [labor costs], let alone through quantitative easing policies that have triggered what can only be described as a monetary tsunami, have led to a currency war and have introduced new and perverse forms of protectionism in the world." - Dilma Rousseff, 2012

As interest rates in developed economies remained low, investors were attracted to the higher rates in Brazil, Chile, Taiwan, Thailand, and South Korea and many other emerging economies (Fratzscher 2012).



Portfolio Flows
Simple average including Brazil, China, India, Indonesia, Mexico, Russia, South Africa and Turkey.
Source: IMF BOP

Empirical questions

- Question: What, if any, are the implications of unconventional monetary policy (and its potential unwinding) for emerging market capital flows and asset prices?

- Question: How large are these effects?

This paper answers these questions using a dataset from the US Department of Treasury that has thus far not been used to analyze the impact of unconventional monetary policy on emerging market flows and prices.

The starting point for our analysis is to confirm the link between the measures of monetary policy shocks (both easing and tapering), net capital flows, and local equity and bond market prices (returns). This exercise requires the following:

- A measure of the relevant equity and bond flows originating in the United States to emerging markets and their impact on financial prices.
- A way to address the challenge of identifying monetary policy shocks at the zero lower bound.

Recent finance literature has focused on the method originated by Kuttner (2001) to estimate the surprise component of Fed announcements. To augment the methodology we will appeal to Gürkaynak, Sack and Swanson (2005) who separate "policy" versus "path" factors, an approach that is particularly useful in the context of ongoing forward guidance.

We apply this setup to the new data and measures of the unconventional monetary policy shocks to analyze whether:

a. The measured effects are larger during the crisis.
b. They manifest primarily in flows or in prices.
c. There are differential effects between equity and fixed income markets.

The contribution of the paper centers on two points:

1. We catalogue the magnitude of the spillover to the emerging world associated with the unorthodox monetary policies pursued in the developed world.
2. We exploit relevant country characteristics to help shed light on the potential economic determinants of external policy shocks.

International transmission mechanisms of UMP

ZLB period has involved heavier management of expectations and efforts to exert direct control further along the yield curve (**forward guidance**)

Consider the n-year yield on a bond as the sum of expected overnight rates and a term premium:

$$Y_{t,t+n} = \bar{Y}_{t,t+n} + YTP_{t,n} \tag{1}$$

Implies new channels of transmission.

Identifying monetary policy shocks

The literature has not converged on a particular set of identifying assumptions to identify an exogenous shock to monetary policy.

- Measuring the response of real and financial variables to changes in the monetary policy requires certain timing restrictions that guarantee monetary policy shocks affect the dependent variables in question and not vice versa.
- New Keynesian monetary theory suggests that rational actors observe the state of the economy and, knowing the parameters of the central bank's loss function, anticipate future rate changes and adjust their output and consumption decisions accordingly.
  - Thus, only unexpected elements of monetary policy should have an impact on real and financial variables.

Measuring monetary policy shocks

The main methods of identifying monetary policy shocks to test for spillovers fall into three categories in the literature:

1. Panel estimation with announcement or date dummies:
   - Using dummies only for dates thought to contain a surprise fed funds rate change may, however, miss dates that contain a surprise insofar as rates did not change.
   - Using dummies for FOMC meeting dates takes care of this shortcoming, but fails to capture any kind of magnitude that could distinguish "large" surprises from "small" ones.
   - 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
2. Structural VARs:
   - Presents the challenge of finding and defending additional restrictions to identify the model.

Measuring monetary policy shocks

3. Event study approach
   - For variables that adjust and are reported at a high (intraday, daily or even weekly) frequency, such as financial data, high frequency identification (HFI) is often utilized to identify surprises in the event study literature.
   - Without additional modifications, the assumptions underlying this approach are only valid for high frequency data such as financial prices.

Our approach combines high frequency identification of monetary policy shocks with panel regression techniques.

Extracting surprises from the Fed Funds futures market

Expectations of Fed policy actions are not directly observable, but futures prices are a natural, market-based proxy for expectations.

HFI relies on rationality in the financial market: if all prices fully reflect available information, then the effects of an unexpected event will be reflected immediately in prices.

- Fed funds futures are used by banks and fixed-income portfolio managers to hedge against unexpected shifts in short-terms interest rates.
- Traders can use the fed funds futures rate to take speculative positions relative to interest rate movements and Federal Reserve actions.

A revision in the price of Fed Funds futures immediately following a Fed event can be attributed to unexpected policy action.

Extracting surprises from the Fed Funds futures market

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.

- Immediately before an FOMC meeting, at time $t - \Delta t$, the implied rate from the current-month federal funds future contract, $ff1$, 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, $r1$

$$ff1_{t-\Delta t} = \frac{d1}{D1}(r0) + \frac{D1 - d1}{D1} E_{t-\Delta t}(r1) + \rho 1_{t-\Delta t} \tag{2}$$

where $d1$ denotes the day of the FOMC meeting, $D1$ is the number of days in the month, and $\rho 1$ denotes any term or risk premium that may be present in the contract.

Extracting surprises from the Fed Funds futures market

By leading this equation to time t and differencing, the surprise component of the change in the federal funds rate target is given by:

$$mp1_t = (ff1t - ff1t - \Delta t)\frac{D1}{D1 - d1} \tag{3}$$

The scale factor $\frac{D1}{D1-d1}$ is necessary because the surprise is only relevant for the remaining part of the month.

Forward guidance

A measure can also be constructed 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:

$$mp2_t = \frac{D2}{D2 - d2}(\Delta ff2_t - \frac{d2}{D2} mp1_t) \tag{4}$$

where $t - \Delta ff2$ is the change in the federal funds futures contract for the month of the next FOMC meeting.

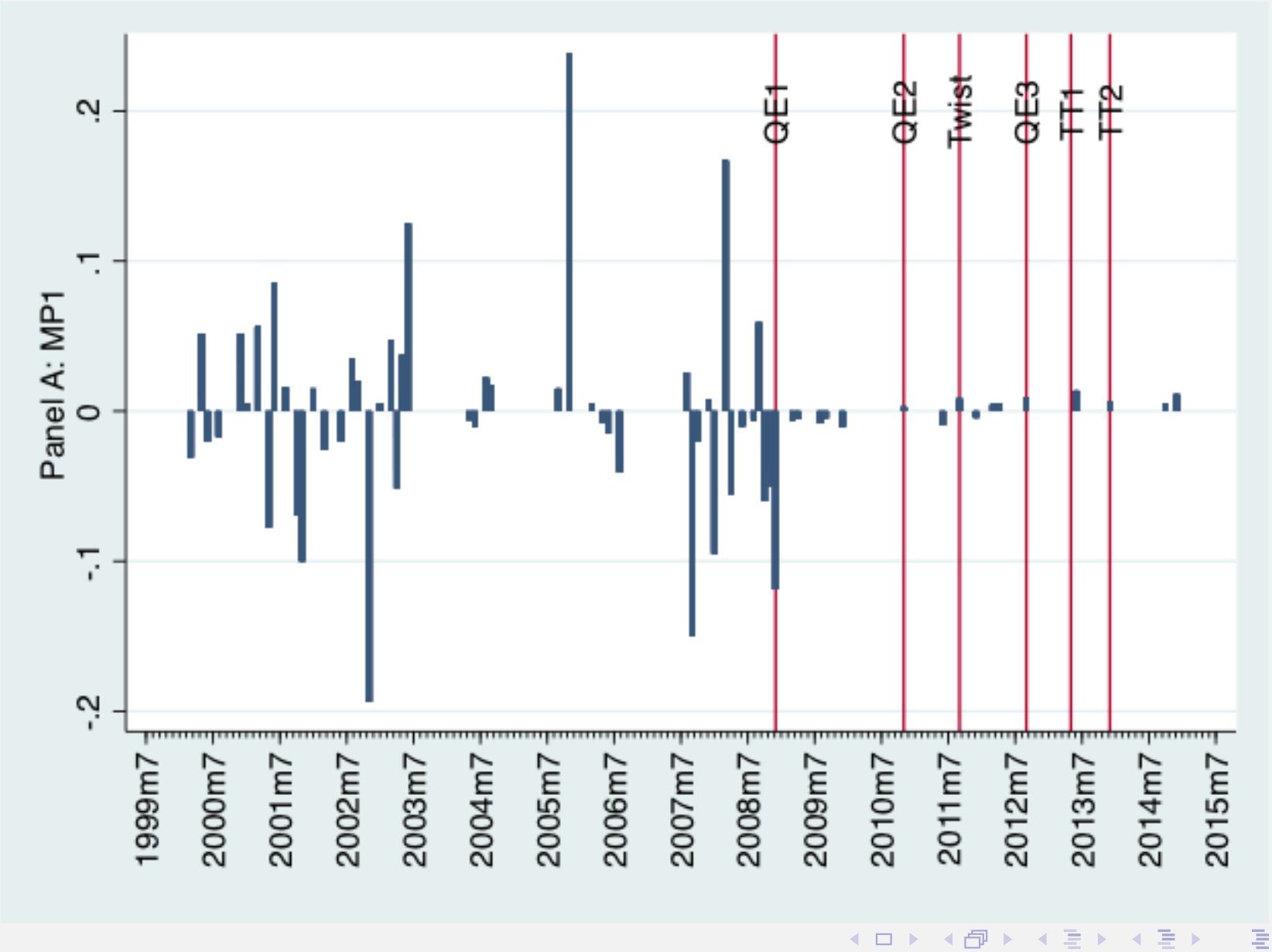
Forward guidance

Our final monetary surprise measure is simply the difference in the yield two-year treasury bond on the date of an FOMC meeting.

- Same principle: over a very narrow window, it is reasonable to assert 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.

Correlation of surprise measures			
	mp1	mp2	gs2
mp1	1		
mp2	0.4744	1	
ch_gs2	0.3408	0.6639	1

Our monetary policy shock measures, then, provide information about shocks increasingly far along the yield curve.


Panel A: MP1
.2
.1
0
-.1
-.2
QE1
QE2
Twist
QE3
TT1
TT2
1999m7
2000m7
2001m7
2002m7
2003m7
2004m7
2005m7
2006m7
2007m7
2008m7
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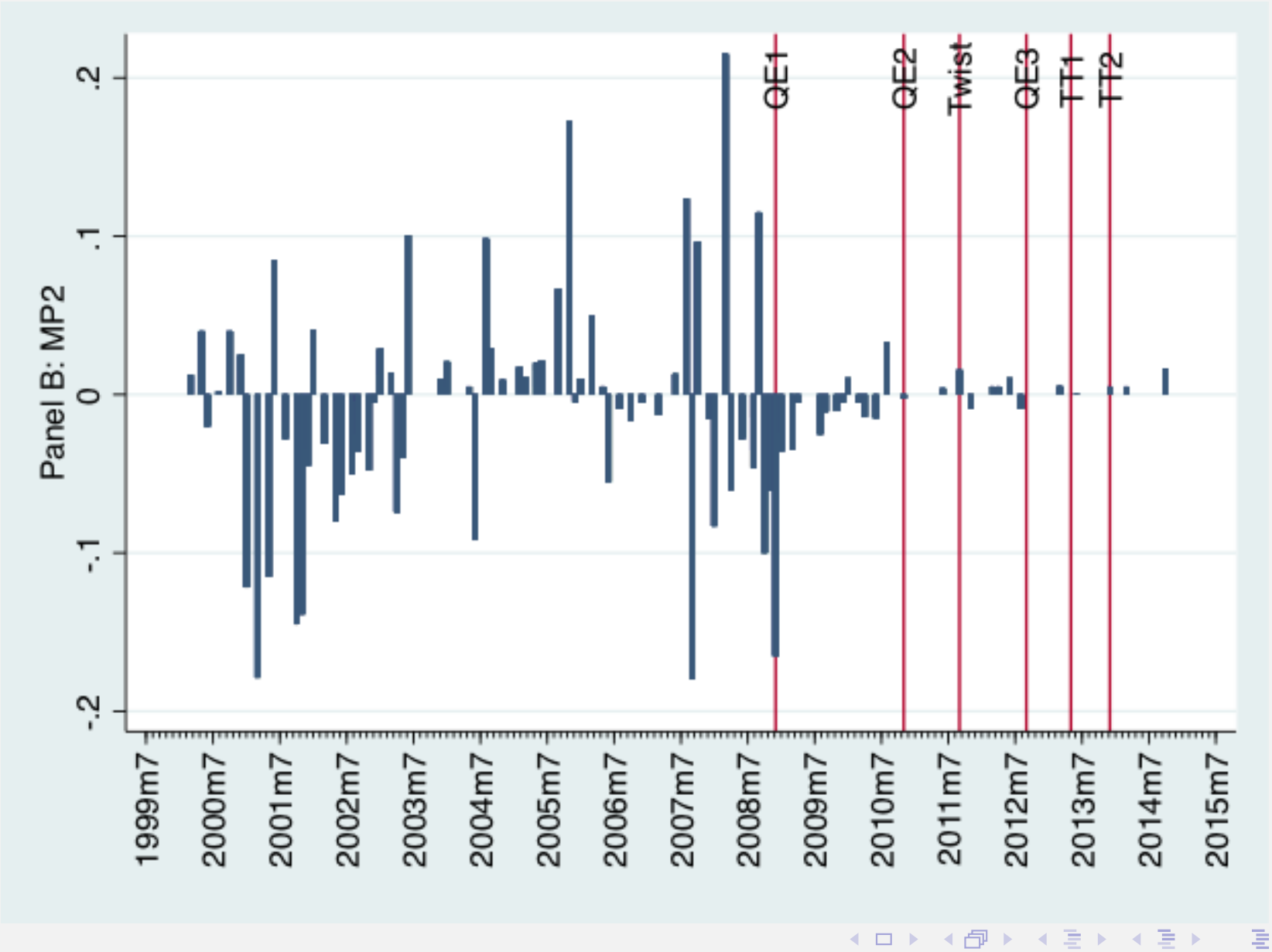
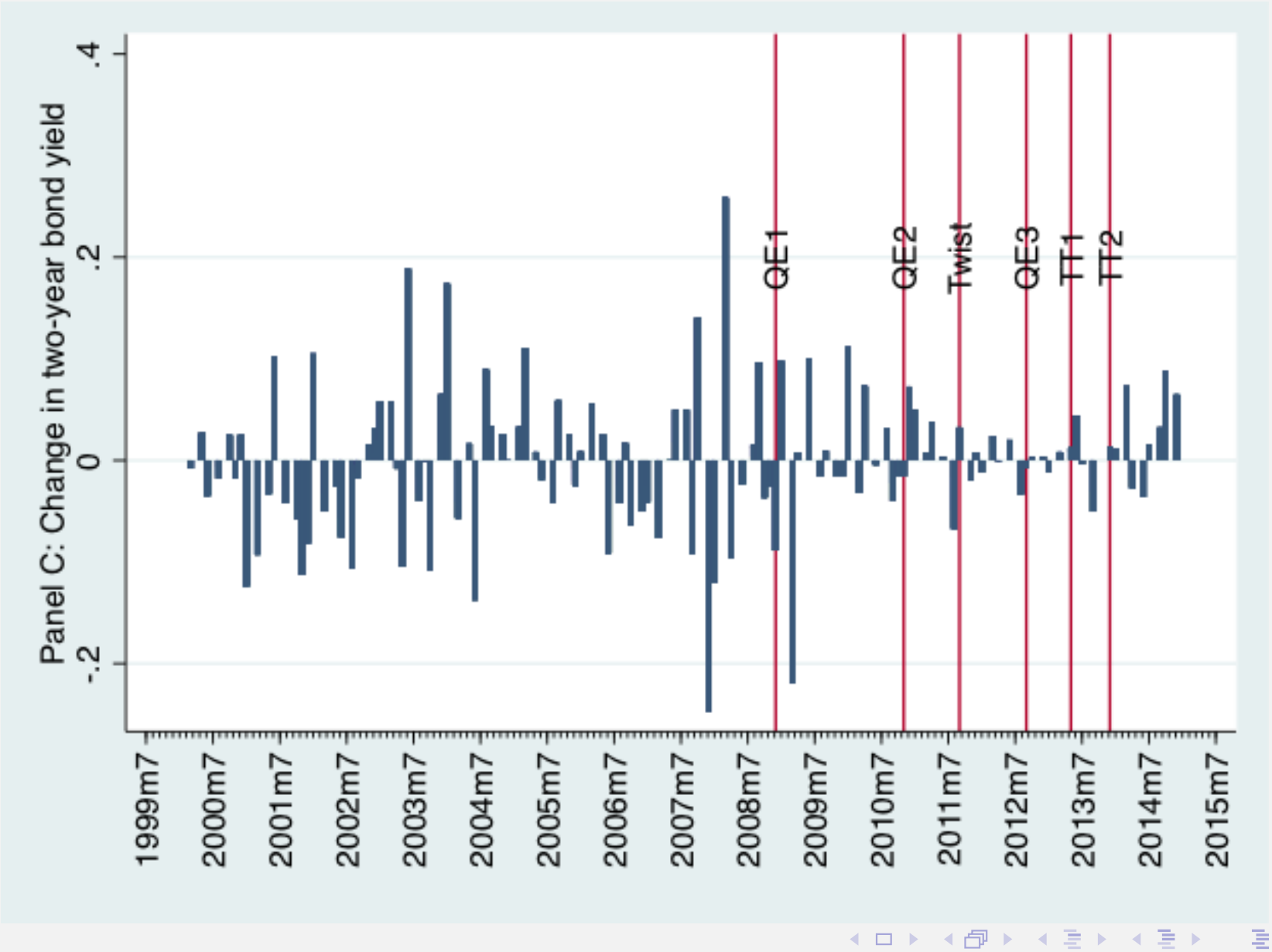
2010m7
2011m7
2012m7
2013m7
2014m7
2015m7


Panel B: MP2
.2
.1
0
-.1
-.2
QE1
QE2
Twist
QE3
TT1
TT2
1999m7
2000m7
2001m7
2002m7
2003m7
2004m7
2005m7
2006m7
2007m7
2008m7
2009m7
2010m7
2011m7
2012m7
2013m7
2014m7
2015m7


Panel C: Change in two-year bond yield
.4
.2
0
-.2
QE1
QE2
Twist
QE3
TT1
TT2
1999m7
2000m7
2001m7
2002m7
2003m7
2004m7
2005m7
2006m7
2007m7
2008m7
2009m7
2010m7
2011m7
2012m7
2013m7
2014m7
2015m7

Data description: capital flows

We use data from the US Department of Treasury International Capital System (TICS) to try to shed new light on the question of UMP spillovers (Bertaut & Tryon (2007) and Bertaut & Judson (2009))

- Data on US transactions with foreigners in short- and long-term domestic and foreign securities by type and country on a monthly basis
- Net debt and equity flows are gross sales to U.S. residents by foreigners less gross purchases from U.S. residents by foreigners
- Using the flows data allows us to track portfolio reallocation
- Provides a high frequency time series that can be decomposed into flows and estimated valuation changes

Data description: capital flows

To obtain a measure of percent net flows into securities by type and country, Bertaut et al. interpolate the annual data with transactions and price data.

Let $H_{i,t}$ be U.S. holdings of country i at time t, starting with first available annual survey data. Then,

$$H_{i,t} = H_{i,t-1}(1 + V_{i,t}) + F_{i,t} + A_{i,t} \tag{5}$$

where $V_{i,t}$ is the total return on the relevant index, $F_{i,t}$ is the net flow in US dollars and $A_{i,t}$ is repayment of principal on asset-backed securities (ABS) and stock swaps from M&A.

- $V_{i,t}$ is the average of EMBI+ and the local currency bond index weighted by the currency composition of US resident positions.

Data description: capital flows

These adjustments still leave a substantial gap between the cumulation-implied holdings at the time of the next survey and the value of reporting holdings in that month. Potential causes:

- Financial center transaction bias is not completely eliminated.
  - Overestimate holdings by residents of financial center locations and underestimate holdings by residents other countries.
- Approximation and measurement errors in the construction of prices.
- Transaction costs which are included in reported transactions, but not in annual holdings surveys.

Bertaut et al. extrapolate the time 0 survey position forward using the observed flow data and compute the residual with respect to 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.

$$H_{i,t} = H_{i,t-1}(1 + V_{i,t}) + F_{i,t} + A_{i,t} + Gap_{i,t} \tag{6}$$

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 plus repayment of principal on ABS and stock swaps from M&A

(iii) Residual gap

Data description

Holdings data is allowed to reset in the first month of every year in the sample. After excluding advanced economies and countries with missing controls data, the sample consists of monthly observations from 1994 to 2014 for 15 countries.

Argentina	Colombia	Korea	Peru	South Africa
Brazil	India	Malaysia	Philippines	Thailand
Chile	Indonesia	Mexico	Russia	Turkey

Table: List of countries in dataset

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
Net flow measures (in millions USD unless otherwise noted) (i.)							
Total positions	30758.35	19720.29	51081.43	67496.02	***	***	***
	(41536.26)	(27102.89)	(53664.27)	(58049.09)			
Total flows	94.27	56.82	186.67	154.64	***	**	
	(788.39)	(450.31)	(1058.45)	(1641.47)			
Bond positions	8502.66	5944.87	12160.02	19821.05	***	***	***
	(11252.18)	(7014.02)	(13127.19)	(20650.68)			
Equity positions	27920.92	18839.17	38811.85	46120.20	***	***	
	(38062.09)	(29752.43)	(44257.10)	(45307.46)			
Bond flows	35.75	21.45	72.12	55.89	**		
	(689.22)	(386.55)	(854.36)	(1570.25)			
Equity flows	58.52	35.37	114.55	98.75	***	***	
	(357.63)	(239.43)	(533.73)	(523.95)			
Bond valuation change	8.89	10.46	33.02	-68.35		***	***
	(450.67)	(409.02)	(392.98)	(788.04)			
Equity valuation chang	69.75	140.49	9.17	-348.06		***	
	(3214.38)	(2250.12)	(4971.50)	(3875.21)			
Bond flows (ii.)	0.61	0.47	1.09	0.50	*		
(% of holdings)	(9.05)	(10.05)	(6.65)	(5.06)			
Equity flows (ii.)	0.65	0.66	0.69	0.47			
(% of holdings)	(8.05)	(9.41)	(3.61)	(2.95)			
Bond gap	29.50	-4.46	116.86	74.69	***	**	
	(583.30)	(178.63)	(621.14)	(1649.60)			
Equity gap	34.02	13.98	49.87	155.96	**	***	**
	(457.76)	(334.86)	(513.36)	(920.78)			
"Push" variables							
VIX	20.46	19.53	25.56	14.54	***	***	***
	(8.06)	(6.36)	(11.01)	(2.43)			
Fed Funds	2.92	4.13	0.23	0.09	***	***	***
	(2.32)	(1.72)	(0.35)	(0.02)			
Fed Funds (change)	0.51	0.56	0.49	0.20	***	***	***
	(0.39)	(0.32)	(0.58)	(0.02)			
Ted Spread	-0.01	-0.01	-0.03	0.00	***		***
	(0.18)	(0.20)	(0.14)	(0.01)			
S&P annual return	10.98	11.41	5.49	21.98	***	***	***
	(18.28)	(16.87)	(22.97)	(4.73)			
"Pull" variables							
Policy rate	7.86	9.66	5.42	5.38	***	***	
	(6.66)	(7.99)	(2.68)	(2.69)			
Change in policy rate	-0.01	-0.01	-0.05	0.07			***
	(1.28)	(1.65)	(0.30)	(0.60)			
EMBI annual return	11.30	13.43	10.21	2.55	***	***	***
	(22.41)	(23.92)	(21.45)	(11.34)			
MSCI annual return	17.09	20.42	12.54	3.72	***	***	***
	(45.24)	(47.50)	(43.73)	(22.19)			

*** 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.

Preliminary results: pre-crisis period

- Bond flows are directly and significantly related to the surprise measures: a tightening in the US leads to larger flows to EMs.
- US tightening surprises are correlated with a statistically significant decline in emerging market bond valuations.
- For all the other capital flow and holdings measures, monetary surprises do not appear to be significantly correlated with US capital flows to our sample countries.
- The TED spread, our measure of global liquidity, is inversely correlated with capital flows.
- While the S&P 500 return is directly correlated with emerging market capital flows in many specifications, the EM policy rate and the MSCI return have varying impacts on both holdings and flows depending on the sub-period under consideration.

Table 2 (Panel A): Pre-crisis US Emerging Market Holdings & Flows and Monetary Surprises (MP1)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
VARIABLES	Tot. positions	Total flows	Bond position	Bond flows	Bond value	Bond ratio	Equity positio	Equity flows	Equity value	Equity ratio
Ted Spread	-393.9*	-91.02**	-123.9**	-130.9**	-30.64	-1.671**	-231.7	30.29	30.43	0.220
	(213.7)	(36.44)	(59.93)	(53.89)	(20.10)	(0.716)	(233.7)	(45.66)	(242.4)	(0.196)
VIX	-2.591	-0.499	2.238	0.151	2.639	-0.0569	-5.801	-0.467	-23.53**	-0.0296**
	(8.039)	(2.480)	(4.645)	(1.048)	(2.385)	(0.0395)	(7.245)	(1.694)	(11.35)	(0.0132)
MP1	-1,860	323.4	104.2	395.9*	-281.3*	4.201	-1,939	-102.3	-1,702	1.381
	(1,929)	(208.5)	(216.5)	(207.6)	(166.5)	(4.353)	(1,878)	(185.4)	(1,729)	(1.579)
S&P Return	22.50**	2.724***	3.184**	2.525**	1.166	0.0555***	18.97**	0.324	13.60**	0.0104*
	(8.940)	(0.900)	(1.570)	(1.137)	(0.795)	(0.0157)	(7.883)	(0.403)	(6.065)	(0.00596)
MSCI (EM) Return	1.079	0.147	0.412	-0.252	0.298	-0.0111	1.008	0.304	2.379	-0.00348
	(1.089)	(0.420)	(0.321)	(0.232)	(0.274)	(0.00678)	(1.153)	(0.426)	(1.650)	(0.00299)
Total Positions_L1	1.011***									
	(0.00504)									
d(EM Policy Rate)	-20.34	5.157	14.00	7.473	5.947	0.196***	-34.30**	-2.147**	-24.84*	-0.0439*
	(27.53)	(4.359)	(14.54)	(4.775)	(12.59)	(0.0579)	(15.58)	(1.016)	(14.28)	(0.0252)
d(Fed Funds Rate)	34.20	13.48	-174.9**	-36.91	-99.85**	0.177	225.5	61.22	-93.29	-0.756
	(286.5)	(81.18)	(69.21)	(54.60)	(50.14)	(1.416)	(312.2)	(101.6)	(257.5)	(0.657)
Total Flows_L1		0.158**								
		(0.0640)								
Bond Positions_L1			0.998***							
			(0.00341)							
Bond flows_L1				0.101***						
				(0.0323)						
Bond value_L1					-0.0658**					
					(0.0294)					
Bond ratio_L1						0.0391				
						(0.0249)				
Equity position_L1							1.011***			
							(0.00583)			
Equity Flows_L1								0.263**		
								(0.107)		
Equity value_L1									-0.111	
									(0.0992)	
Equity ratio_L1										0.149**
										(0.0604)
Constant	172.7	72.48	17.57	57.75*	-24.40	1.858***	225.0	12.54	587.3**	0.524**
	(260.7)	(49.28)	(90.33)	(31.43)	(37.78)	(0.669)	(207.5)	(26.72)	(240.2)	(0.215)
Observations	994	994	994	994	994	993	994	994	994	994
Number of Countries	14	14	14	14	14	14	14	14	14	14

Robust standard errors in parentheses

Preliminary results: QE period

Monetary surprise measures are inversely and significantly correlated with both positions and valuations, but not flows.

Table 3 (Panel A): QE US Emerging Market Holdings & Flows and Monetary Surprises (MP1)

VARIABLES	(1) Tot. positions	(2) Total flows	(3) Bond position	(4) Bond flows	(5) Bond value	(6) Bond ratio	(7) Equity positio	(8) Equity flows	(9) Equity value	(10) Equity ratio
Ted Spread	-351.5	-96.48***	-133.5**	-141.0**	-29.97	-1.783**	-180.1	35.95	61.57	0.297
	(224.3)	(34.79)	(59.64)	(54.78)	(20.69)	(0.722)	(246.5)	(41.19)	(254.9)	(0.240)
VIX	-2.307	-0.541	2.194	0.0919	2.936	-0.0576	-5.478	-0.561	-23.14**	-0.0294**
	(8.107)	(2.526)	(4.634)	(1.042)	(2.638)	(0.0392)	(7.189)	(1.753)	(11.16)	(0.0126)
MP1	-1,715	242.1	293.8	387.2*	-106.6*	4.277	-1,985	-168.1	-1,321	-1.659
	(1,467)	(208.7)	(222.5)	(200.3)	(58.33)	(3.241)	(1,477)	(232.3)	(1,252)	(1.807)
S&P Return	23.41**	2.562***	3.152*	2.336**	1.327	0.0535***	19.90**	0.354	14.46**	0.00938
	(9.448)	(0.861)	(1.624)	(1.133)	(0.889)	(0.0167)	(8.336)	(0.465)	(6.357)	(0.00590)
MSCI (EM) Return	1.467	0.0901	0.353	-0.340	0.368	-0.0120*	1.451	0.331	2.670	-0.00320
	(1.187)	(0.384)	(0.337)	(0.217)	(0.317)	(0.00662)	(1.217)	(0.389)	(1.807)	(0.00262)
Total Positions_L1	1.011***									
	(0.00501)									
d(EM Policy Rate)	-21.40	5.275	14.26	7.718	6.127	0.198***	-35.61**	-2.378**	-25.53*	-0.0461*
	(27.21)	(4.425)	(14.41)	(4.717)	(12.75)	(0.0626)	(15.01)	(1.152)	(14.08)	(0.0257)
d(Fed Funds Rate)	73.51	14.84	-205.4***	-48.32	-113.0**	0.0285	294.9	73.38	-88.58	-0.363
	(286.1)	(89.32)	(74.91)	(58.18)	(49.03)	(1.330)	(319.9)	(115.3)	(261.8)	(0.584)
Total Flows_L1		0.157**								
		(0.0643)								
Bond Positions_L1			0.998***							
			(0.00344)							
Bond flows_L1				0.100***						
				(0.0327)						
Bond value_L1					-0.0623**					
					(0.0288)					
Bond ratio_L1						0.0389				
						(0.0247)				
Equity position_L1							1.011***			
							(0.00579)			
Equity Flows_L1								0.260**		
								(0.102)		
Equity value_L1									-0.108	
									(0.0989)	
Equity ratio_L1										0.150**
										(0.0621)
Constant	126.4	79.08	25.66	68.11**	-33.27	1.971***	171.6	10.07	547.7**	0.480**

Preliminary results: Taper talk

The **taper talk period** reveals yet another significant shift in the pattern of results.

- Alternative monetary surprise measures are inversely correlated with emerging-market flows and positions consistently across alternative specifications.
  - Interestingly, the coefficient on the monetary surprise measures are an order of magnitude higher than that during the QE period.

Table 4 (Panel A): Taper Talk US Emerging Market Holdings & Flows and Monetary Surprises (MP1)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
VARIABLES	Tot. positions	Total flows	Bond position	Bond flows	Bond value	Bond ratio	Equity positio	Equity flows	Equity value	Equity ratio
Ted Spread	-3,800	-1,121	-3,081	-3,009	-6,219**	-14.67	-847.1	2,597*	-5,179	26.32
	(17,798)	(6,796)	(3,320)	(7,095)	(2,659)	(25.47)	(15,884)	(1,505)	(17,336)	(24.84)
VIX	606.4***	79.28	144.3***	77.24	113.2***	0.0147	467.9***	3.016	548.8***	-0.119
	(188.6)	(68.09)	(52.98)	(67.59)	(40.67)	(0.222)	(165.4)	(9.942)	(167.0)	(0.0744)
MP1	-460,775***	-56,731**	-131,477***	-39,281*	-55,891***	-159.0**	-331,245***	-10,723**	-277,979***	-34.25
	(130,435)	(28,215)	(48,155)	(20,340)	(17,975)	(61.88)	(100,404)	(4,223)	(96,415)	(33.90)
S&P Return	-51.56	3.950	-43.68*	-6.001	-19.95***	-0.0923	-7.147	7.991	-10.94	0.0700
	(63.26)	(13.61)	(26.19)	(12.39)	(7.350)	(0.0965)	(50.74)	(5.074)	(51.51)	(0.0558)
MSCI (EM) Return	-6.730	-2.406	1.053	-2.349	0.0882	-0.0137	-6.601	-1.141	-6.114	-0.0208**
	(9.173)	(1.680)	(1.296)	(1.937)	(2.027)	(0.0112)	(8.467)	(0.826)	(8.505)	(0.00854)
Total Positions_L1	0.989***									
	(0.00603)									
d(EM Policy Rate)	-987.4***	-163.4	-91.38	-174.7	-113.0**	-0.734	-879.8***	-5.154	-816.3***	-0.217
	(251.1)	(153.6)	(61.05)	(156.5)	(50.36)	(0.560)	(214.0)	(11.21)	(253.4)	(0.135)
d(Fed Funds Rate)	68,995***	-3,109	17,010**	-3,131	13,640***	-25.00	52,125***	712.8	53,093***	11.13
	(23,046)	(9,837)	(7,005)	(10,094)	(4,602)	(30.21)	(18,420)	(1,743)	(19,119)	(14.16)
Total Flows_L1		0.381***								
		(0.0775)								
Bond Positions_L1			0.999***							
			(0.00360)							
Bond flows_L1				0.539***						
				(0.109)						
Bond value_L1					-0.103***					
					(0.0385)					
Bond ratio_L1						0.265***				
						(0.0678)				
Equity position_L1							0.988***			
							(0.00794)			
Equity Flows_L1								0.0961***		
								(0.0304)		
Equity value_L1									0.0707	
									(0.0530)	
Equity ratio_L1										0.406***
										(0.108)
Constant	-4,991	-777.4	-138.0	-234.2	131.8	5.422	-5,103	-656.1	-6,192	-4.847
	(4,857)	(1,823)	(879.5)	(1,657)	(234.8)	(6.489)	(4,116)	(425.7)	(4,598)	(5.307)
Observations	210	210	210	210	210	210	210	210	210	210
Number of Countries	15	15	15	15	15	15	15	15	15	15

Robust standard errors in parentheses

Quantitative exercise: what are the magnitudes?

	QE (mp1*β)	TT(mp1*β)	QE coeff.	TT coeff.
Bond holdings	33.75	-334.98	-6,931	-131,477
Equity holdings	163.31	-843.95	-33,541	-331,245
Bond flows	0*	-100.08	0*	-39,281
Equity flows	0*	-27.32	0*	-10,723
Mean mp1 (QE)	-0.004869			
Mean mp1 (TT)	0.0025478			

* Flows not statistically different from zero

In the QE period, the average monetary policy shock (a loosening shock of about a half basis point) appears to have caused, on average, a \$33.74M increase in emerging-market bond holdings and a \$161.31M increase in equity holdings.

In the taper talk period, a mean-magnitude tightening shock led to a \$334.97M decrease in bond holdings, a \$834.94M decrease in equity holdings, a \$100M decrease in bond flows and a \$27.32M decrease in equity flows.

Future directions

Goal: an in-depth exploration of the magnitudes of the policy surprises and the impact on a variety of US holdings and flows measures, including:

- Examine the distributional effects of monetary surprises, i.e., what is the impact of a one standard deviation from the mean monetary shock on holdings and flows.
- Quantify the cumulative effect of monetary shocks during the QE period or the taper talk on US emerging-market holdings and flows.
- Examine the impact of destination country-specific characteristics in further detail to quantify the country-specific effects of US monetary shocks.

The advantage of extracting the magnitude of the monetary surprises directly from the futures data is that we can conduct exercises to 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.

Given the imminent rate increases by the Federal Reserve in the coming months, the exercise potentially has significant policy relevance especially for EM central bankers.

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.

The monetary policy decisions of the U.S. Federal Reserve, European Central Bank, Bank of England, and Bank of Japan during the crisis had a primarily domestic objective to stimulate and restore growth in its aftermath.

Nevertheless, these policy actions led to substantial spillover effects for emerging-market economies (Fratzscher, Lo Duca, and Straub 2013).

Where does this fit in the macroeconomic literature?

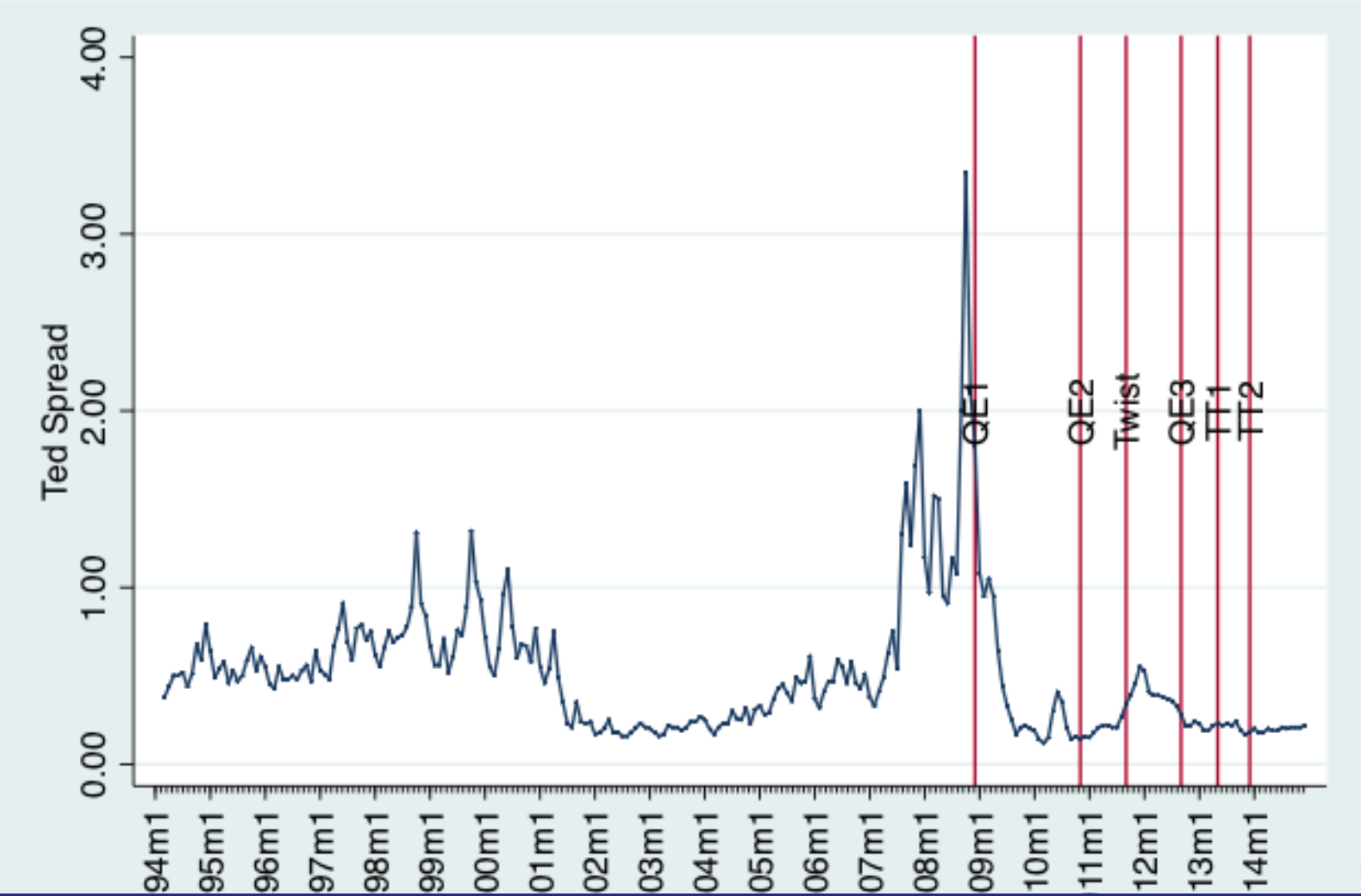
Determinants of capital flows to emerging and developing economies:

- "Push" vs. "pull" factors
  - "Push" factors found in the literature:
    - Advanced country interest rates
    - Risk aversion/global risk
    - Advanced country growth rates
  - "Pull" factors highlighted in the literature:
    - Domestic returns
    - Domestic growth rates
    - Domestic credit risk

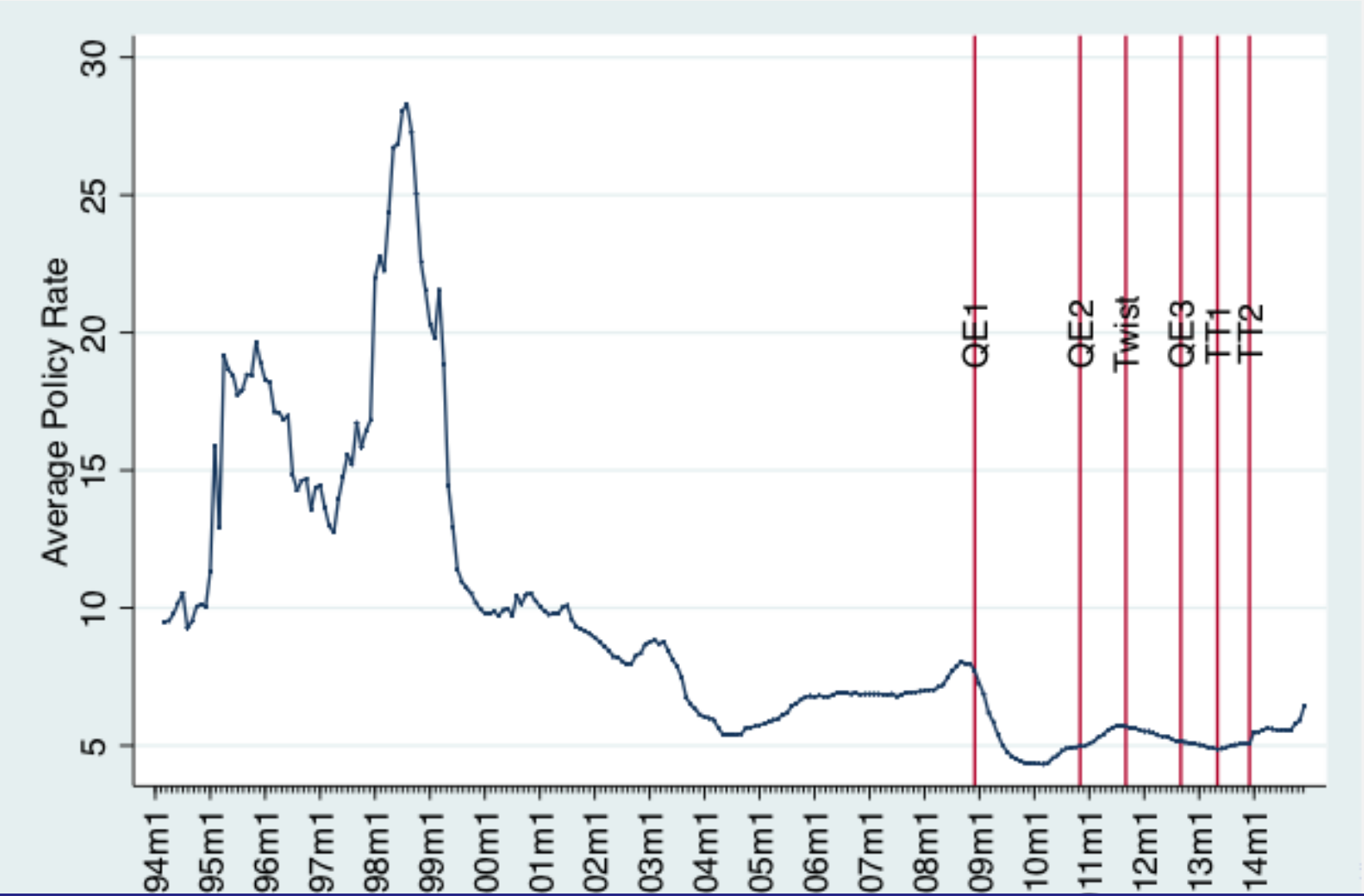
International spillovers of US monetary policy:

- Conventional channels: trade balances, changes in the real interest rate (and thus cost of capital), and currency management.

"Push" v. "Pull"


Ted Spread
0.00
1.00
2.00
3.00
4.00
QE1
QE2
Twist
QE3
TT1
TT2
94m1
95m1
96m1
97m1
98m1
99m1
00m1
01m1
02m1
03m1
04m1
05m1
06m1
07m1
08m1
09m1
10m1
11m1
12m1
13m1
14m1

"Push" v. "Pull"


Average Policy Rate
5
10
15
20
25
30
QE1
QE2
Twist
QE3
TT1
TT2
94m1
95m1
96m1
97m1
98m1
99m1
00m1
01m1
02m1
03m1
04m1
05m1
06m1
07m1
08m1
09m1
10m1
11m1
12m1
13m1
14m1

Principal transmission channels:

- Portfolio balance channel
- Signaling channel
- Confidence channel
- Liquidity channel

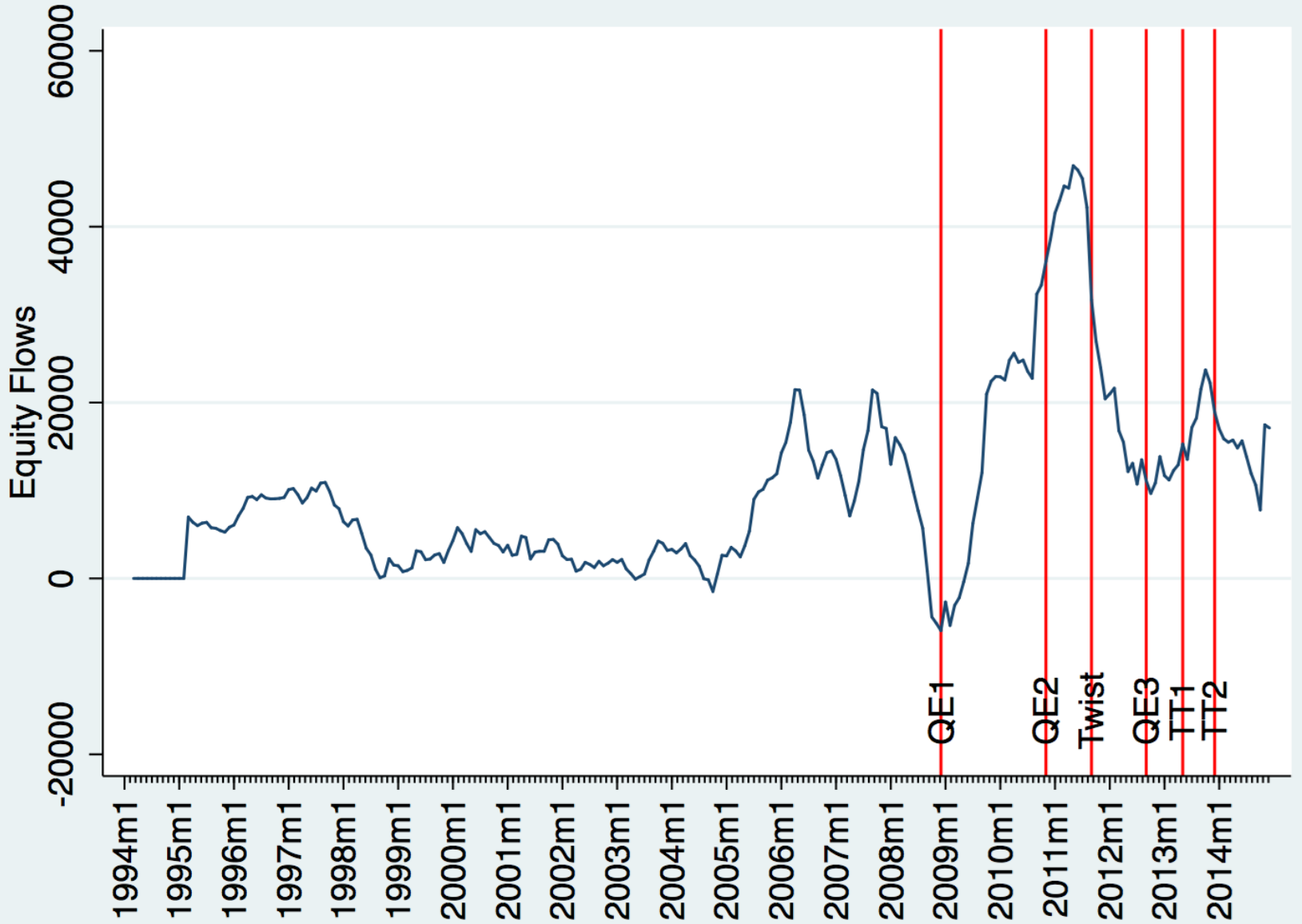
Data description: capital flows

U.S. holdings of foreign securities at the end of the year are also provided on an annual basis.

- Flow data from TICS suffers from a "financial center problem"
  - Not possible to discern the final destination of the investment if it passes through a third party country first
- Flows data from TICS also do not reflect valuation changes

Holdings data from TICS suffer no such issues.

- Possible to limit the financial center and value growth problems by resetting to the holdings data in periods when they are released


Equity Flows
60000
40000
20000
0
-20000
QE1
QE2
Twist
QE3
TT1
TT2
1994m1
1995m1
1996m1
1997m1
1998m1
1999m1
2000m1
2001m1
2002m1
2003m1
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2006m1
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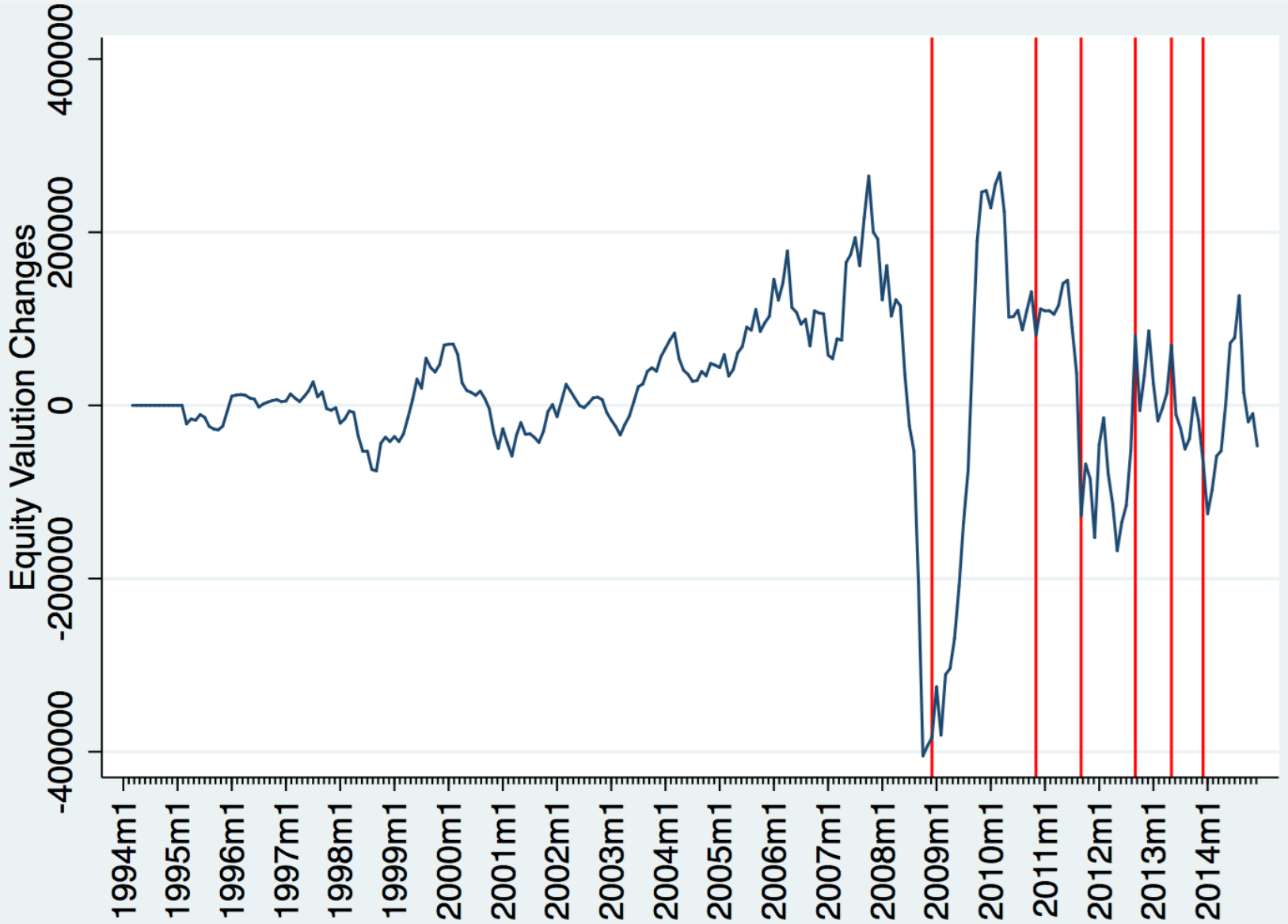
2011m1
2012m1
2013m1
2014m1


Equity Valution Changes
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-200000
0
200000
400000
1994m1
1995m1
1996m1
1997m1
1998m1
1999m1
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2001m1
2002m1
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2009m1
2010m1
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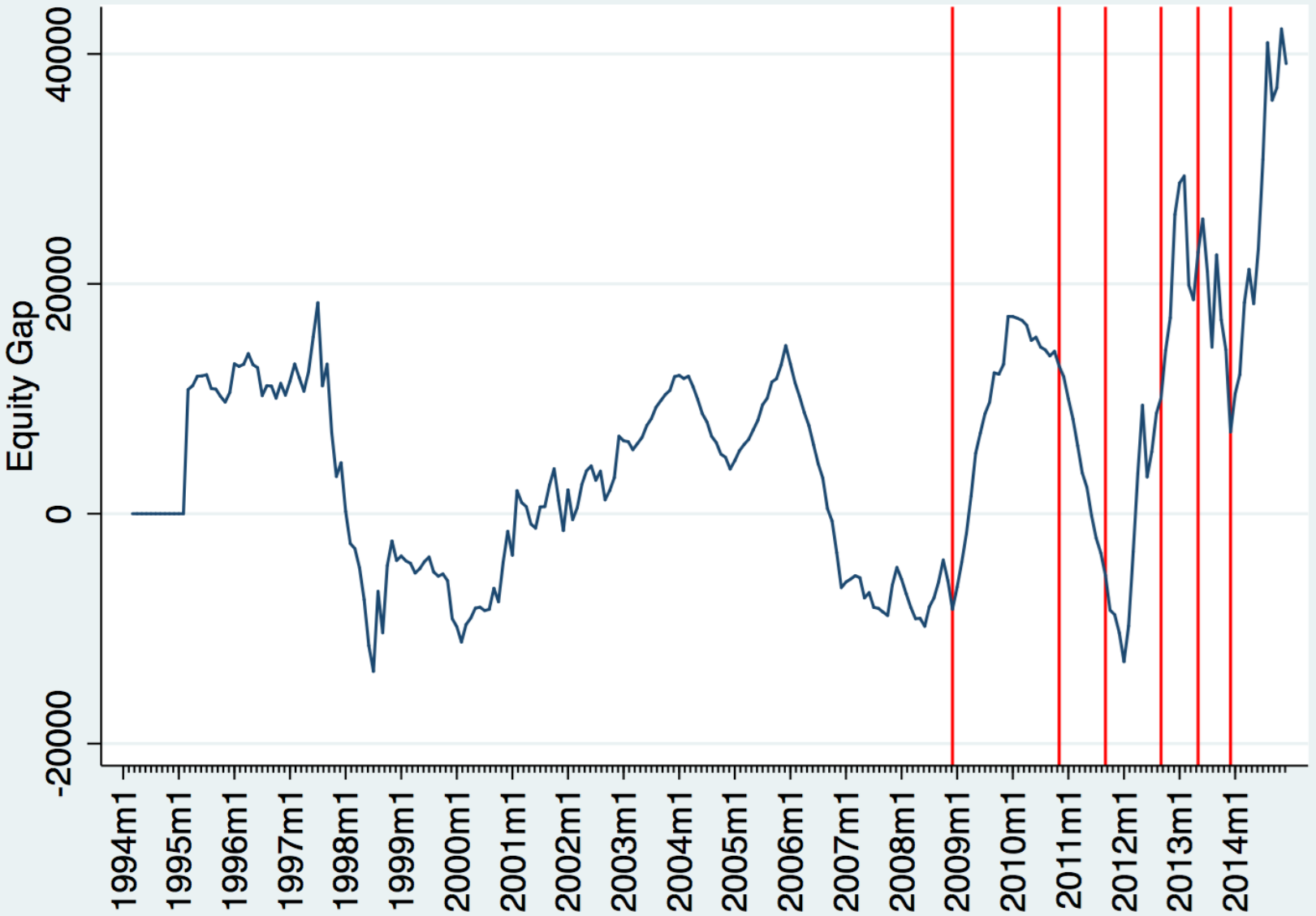
2012m1
2013m1
2014m1


Equity Gap
40000
20000
0
-20000
1994m1
1995m1
1996m1
1997m1
1998m1
1999m1
2000m1
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2002m1
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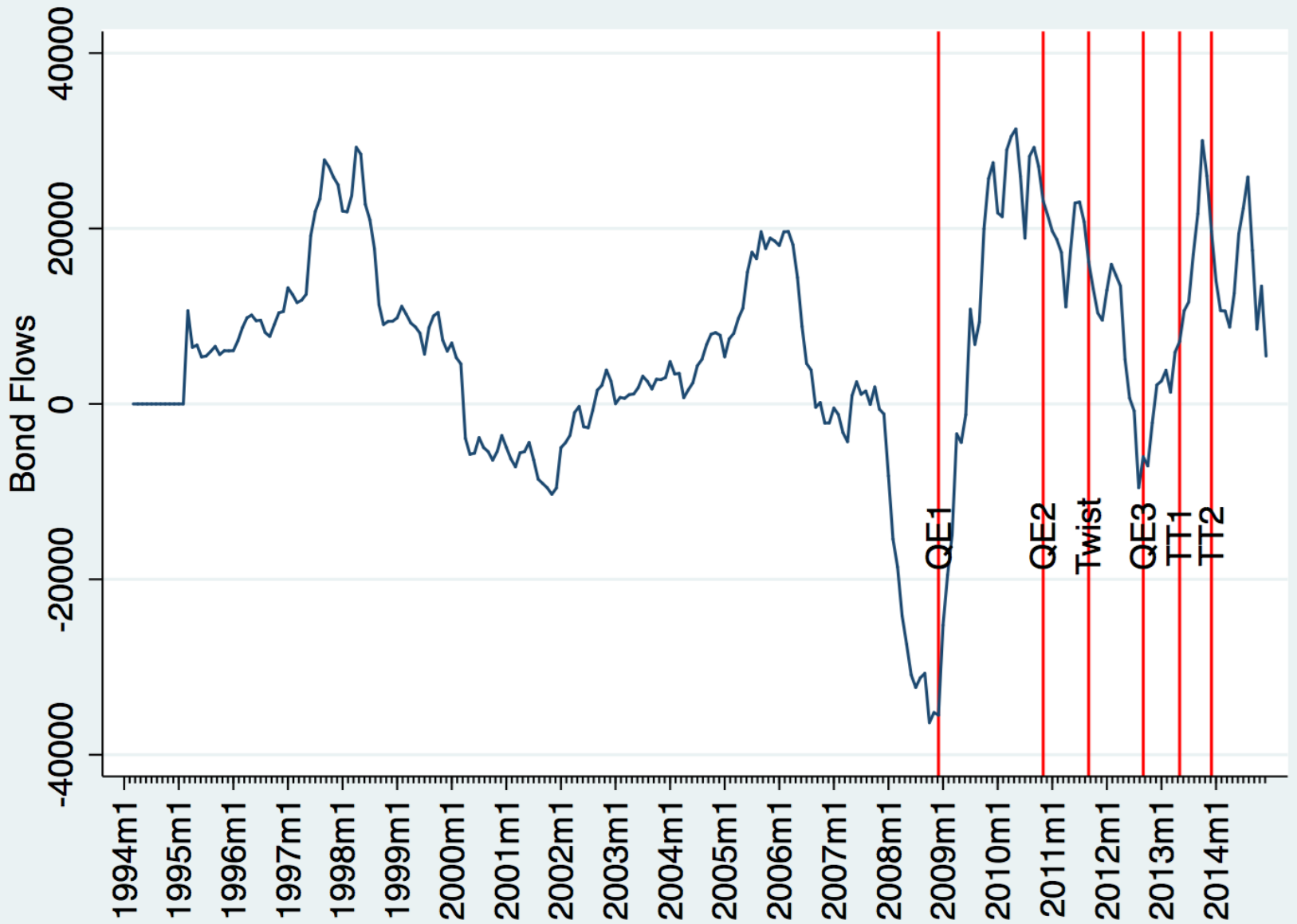
2009m1
2010m1
2011m1
2012m1
2013m1
2014m1


Bond Flows
40000
20000
0
-20000
-40000
QE1
QE2
Twist
QE3
TT1
TT2
1994m1
1995m1
1996m1
1997m1
1998m1
1999m1
2000m1
2001m1
2002m1
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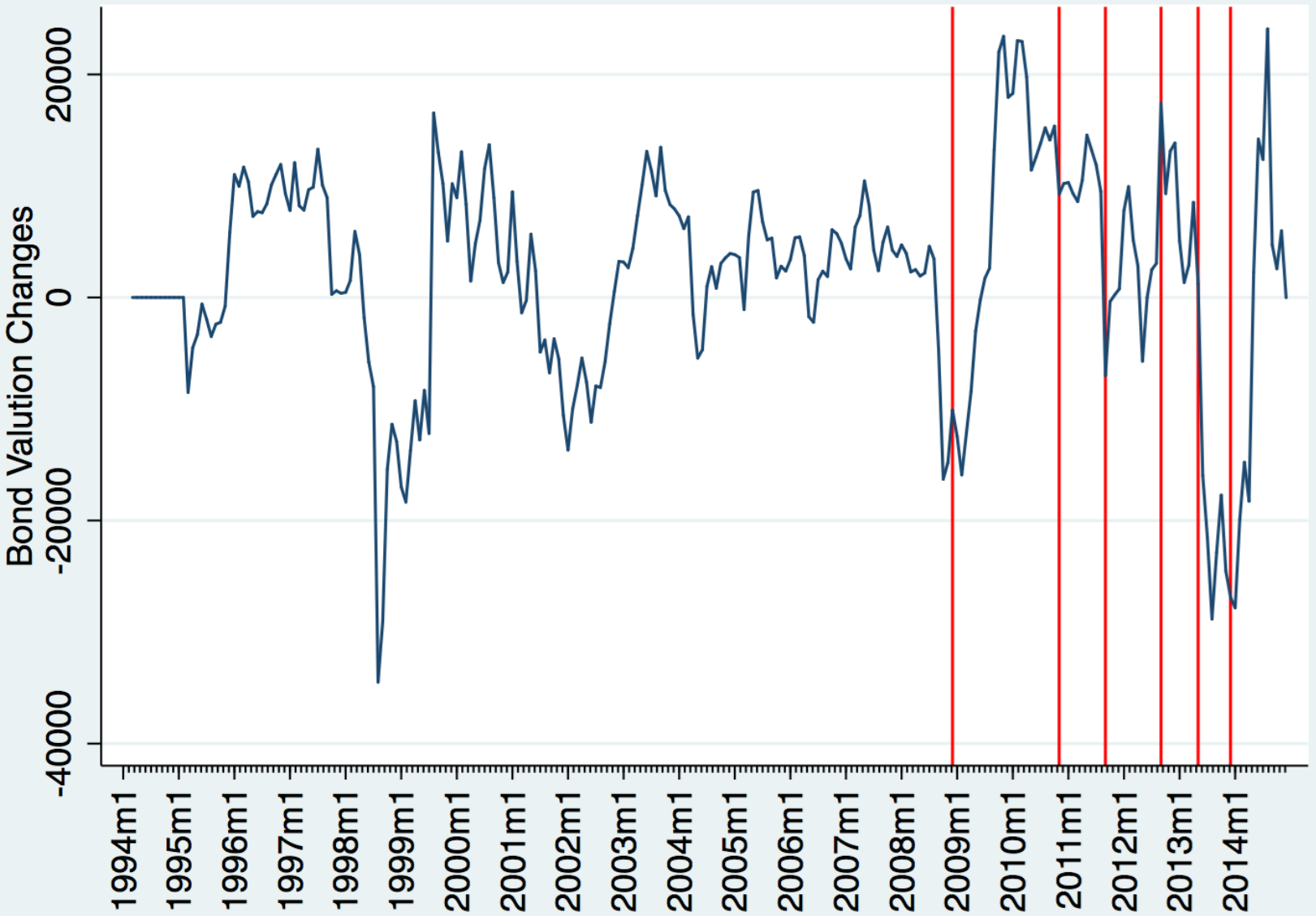
2009m1
2010m1
2011m1
2012m1
2013m1
2014m1


Bond Valution Changes
20000
0
-20000
-40000
1994m1
1995m1
1996m1
1997m1
1998m1
1999m1
2000m1
2001m1
2002m1
2003m1
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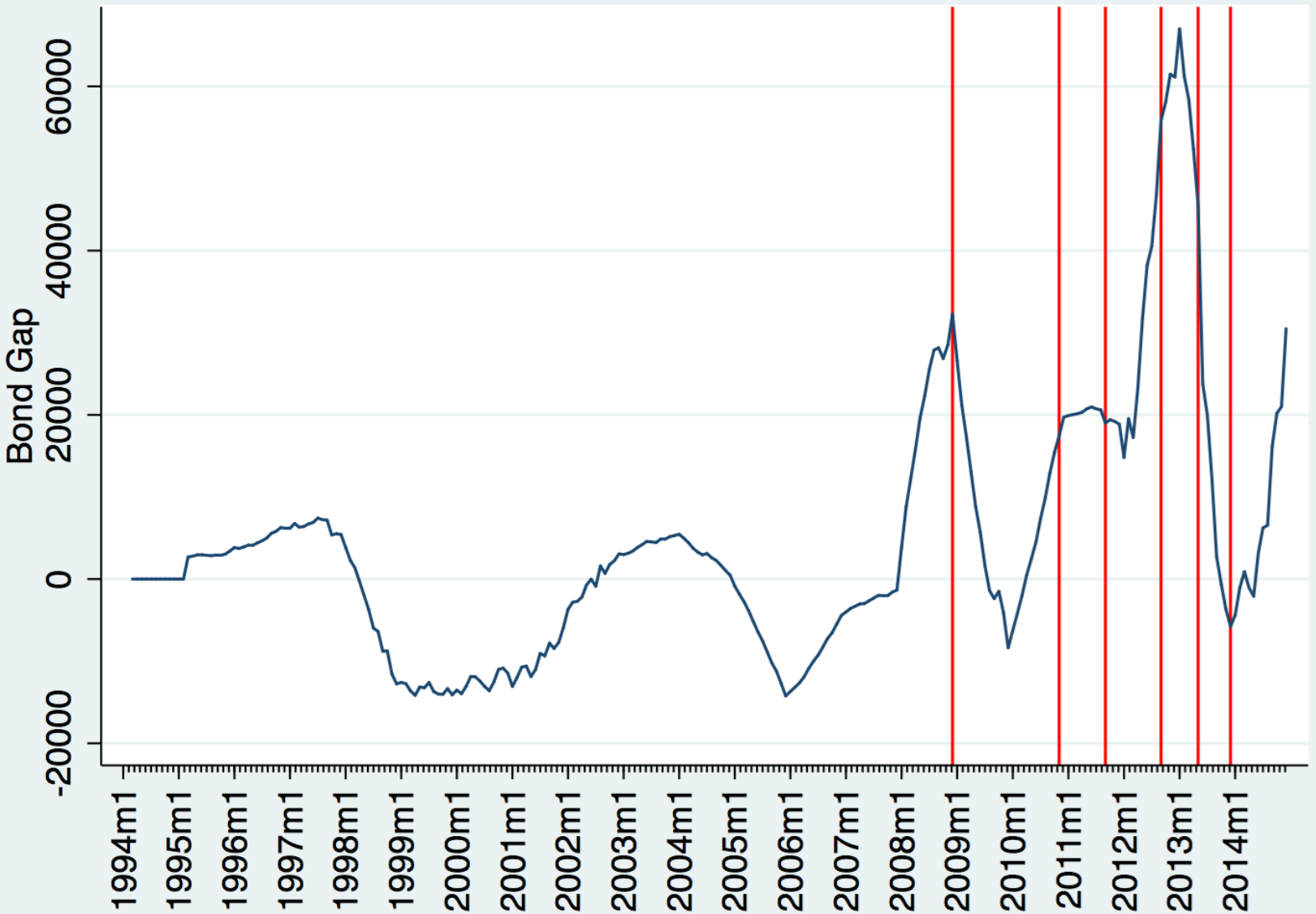
2009m1
2010m1
2011m1
2012m1
2013m1
2014m1


Bond Gap
-20000
0
20000
40000
60000
1994m1
1995m1
1996m1
1997m1
1998m1
1999m1
2000m1
2001m1
2002m1
2003m1
2004m1
2005m1
2006m1
2007m1
2008m1
2009m1
2010m1
2011m1
2012m1
2013m1
2014m1

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Mean mp1 (QE)	-0.004869			
Mean mp1 (TT)	0.0025478			

* Flows not statistically different from zero

- The coefficient on the bond holdings measure during the QE period is -6,931 and on the equity holdings is -131,477.
- The mean value of the first monetary surprise measure (mp1) during the QE period is -0.004869.

- The coefficient estimate on the bond holdings measure is -131,477 and on the equity holdings measure is -331,245.
- The average monetary policy shock during the taper talk period is 0.00255.