Portfolio Investment and U.S. Monetary Policy Announcements: an event study analysis using high frequency data from Mexico

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- The end of the financial crisis let the world economy sailing across uncharted territory characterized, mainly, by close to zero interest rates and weak economic growth in advanced economies
- In order to encourage economic activity, central banks in advanced economies were forced to draw upon unconventional monetary policy measures (UMP)
- Such environment motivated a ”search for yield” behavior in international financial markets, leading to significant movements of capital towards EMEs

These events have motivated researchers to analyze the spillovers from U.S. monetary policy:

- Fratzscher (2012) concludes that global shocks have had an important effect on portfolio flows to EMEs, but that these differ across countries depending on individual characteristics such as quality of institutions and macroeconomic fundamentals

- Chen et al. (2014) results suggest that EMEs macroeconomic fundamentals play an important role on country vulnerability to monetary policy events in the U.S.

- Bowman et al. (2014) find that Federal Reserve announcements resulted in sudden upswings in financial volatility and that every time an announcement drove down U.S. sovereign yields the same occurred in EMEs, being the most vulnerable those with the weaker fundamentals

- Dahlhaus and Vasishtha (2014) estimates point to small negative effects of policy normalization on capital flows but higher financial volatility in EMEs

What are the commonalities among these studies?

1. All analyze the impact of monetary policy in the U.S. to EMEs as a group
2. Most of them find that weak macroeconomic fundamentals are a source of vulnerability for EMEs

But studying countries individually is also important since some research suggest there is a certain degree of heterogeneity in the response of portfolio inflows

- Park and Um (2016) analyze the effects of UMP measures adopted by the U.S. on Korea. Their results suggest that the Korean bond market is significantly affected by announcements related to ”operation twist” and ”forward guidance”, while they also find that the effects of UMP on net foreign investment were significant only for short-term debt

This work contributes to the empirical literature by:

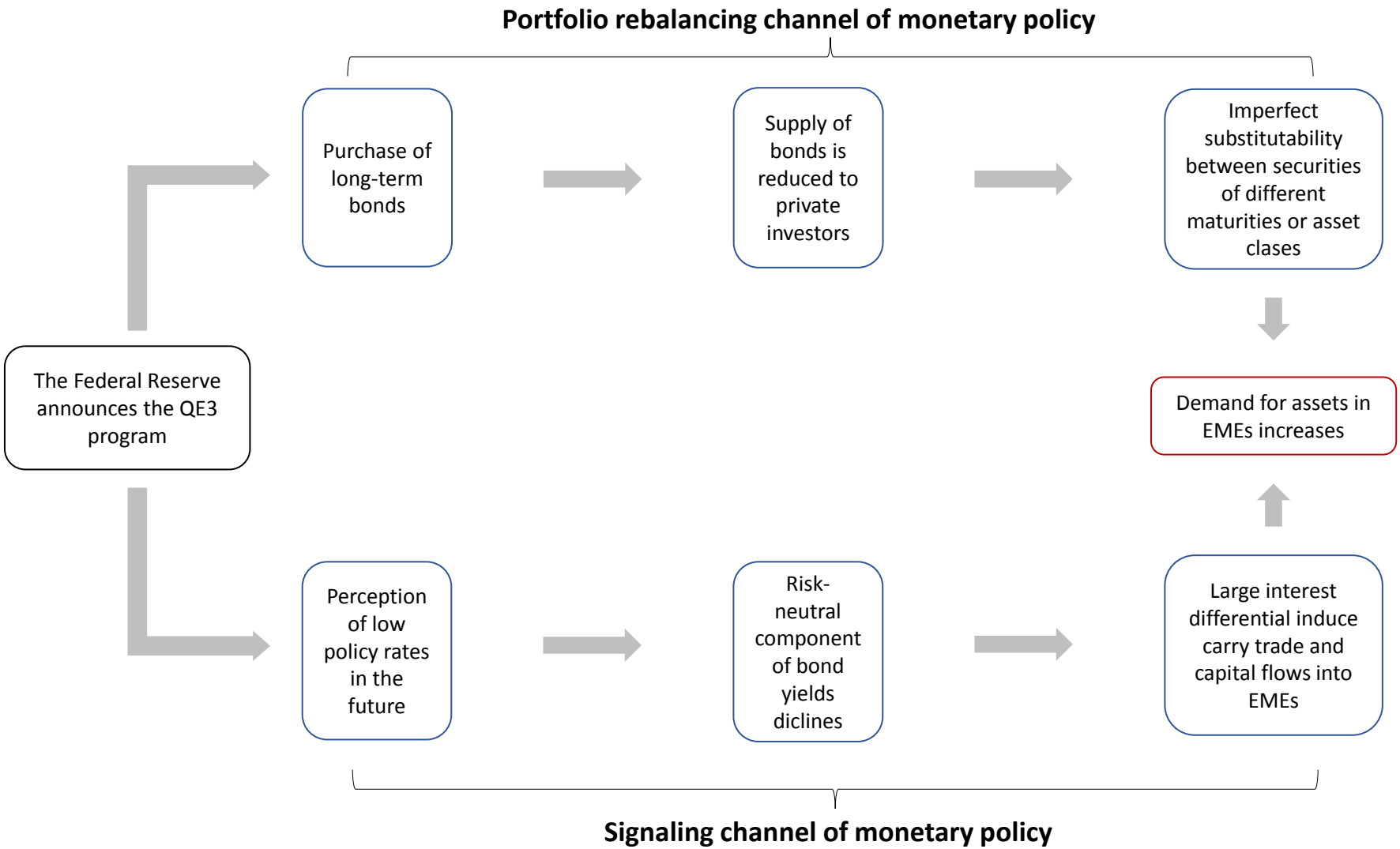
1. Using a new dataset containing daily information on debt and equity flows that maps BoP data better than any other dataset available for Mexico

2. Provide benchmark results for how one can expect portfolio flows to react before unexpected monetary policy announcements

- The hypothesis is that after unexpected monetary policy announcements by the Fed, portfolio flows will react quickly and accordingly to as if such announcements would ultimately drive down or up long-term yields

- In other words, the portfolio balance channel will be playing a key role in the entry and exit of portfolio flows

Hypothesis

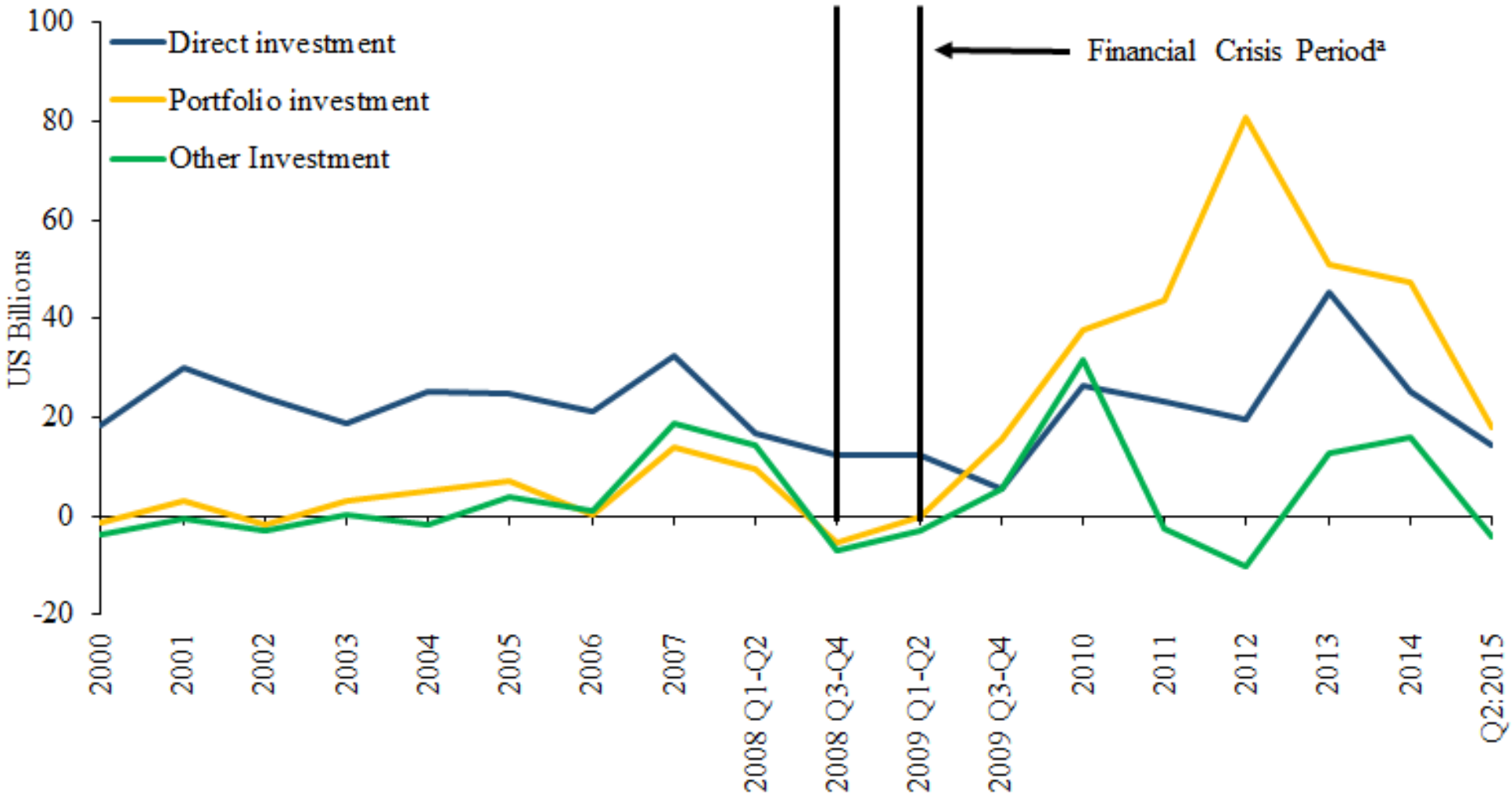

Portfolio rebalancing channel of monetary policy
The Federal Reserve announces the QE3 program
Purchase of long-term bonds
Supply of bonds is reduced to private investors
Imperfect substitutability between securities of different maturities or asset clases
Demand for assets in EMEs increases
Perception of low policy rates in the future
Risk-neutral component of bond yields diclines
Large interest differential induce carry trade and capital flows into EMEs
Signaling channel of monetary policy

1. Initial estimations with daily data produced some counterintuitive results
   - Delayed response by investors?
   - Omitted variable bias?

2. Accumulate data over a 5-day period (weekly) to try to account for a delayed response
   - This is not clear for equity: taper announcements remain negative but there are changes in significance
   - In the case of debt, now all estimated parameters have the expected signs so it favors the hypothesis
   - Not definitive but it plays a role

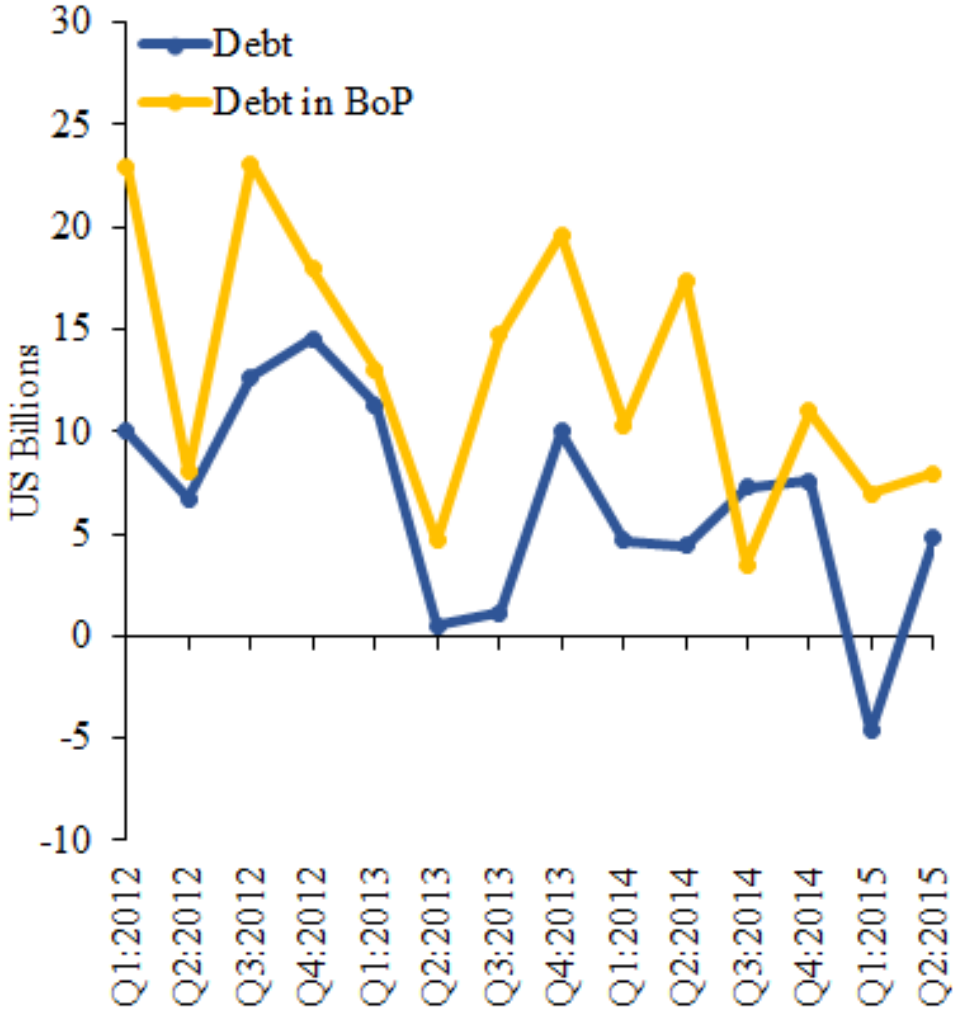
1. Estimates with daily data are robust to the inclusion of additional variables. No omitted variable bias!

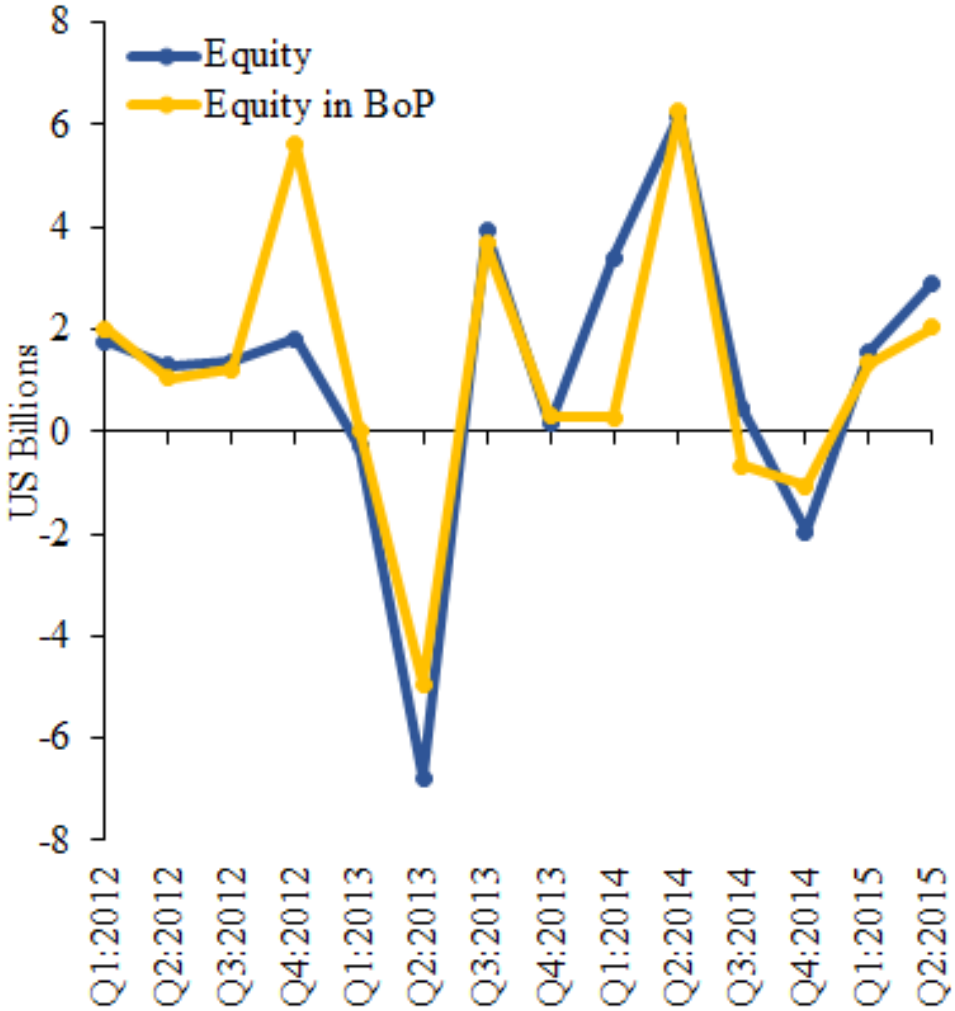
2. Results with weekly data plus additional variables do improve the results
   - Change in signs and significance of estimated parameters suggest that with weekly data the model suffers from omitted variable bias
   - Once this is accounted for, bond investors move more prudently respect to those interested in equity who react quickly


Direct investment
Portfolio investment
Other Investment
Financial Crisis Period[a]
US Billions
100
80
60
40
20
0
-20
2000
2001
2002
2003
2004
2005
2006
2007
2008 Q1-Q2
2008 Q3-Q4
2009 Q1-Q2
2009 Q3-Q4
2010
2011
2012
2013
2014
Q2:2015

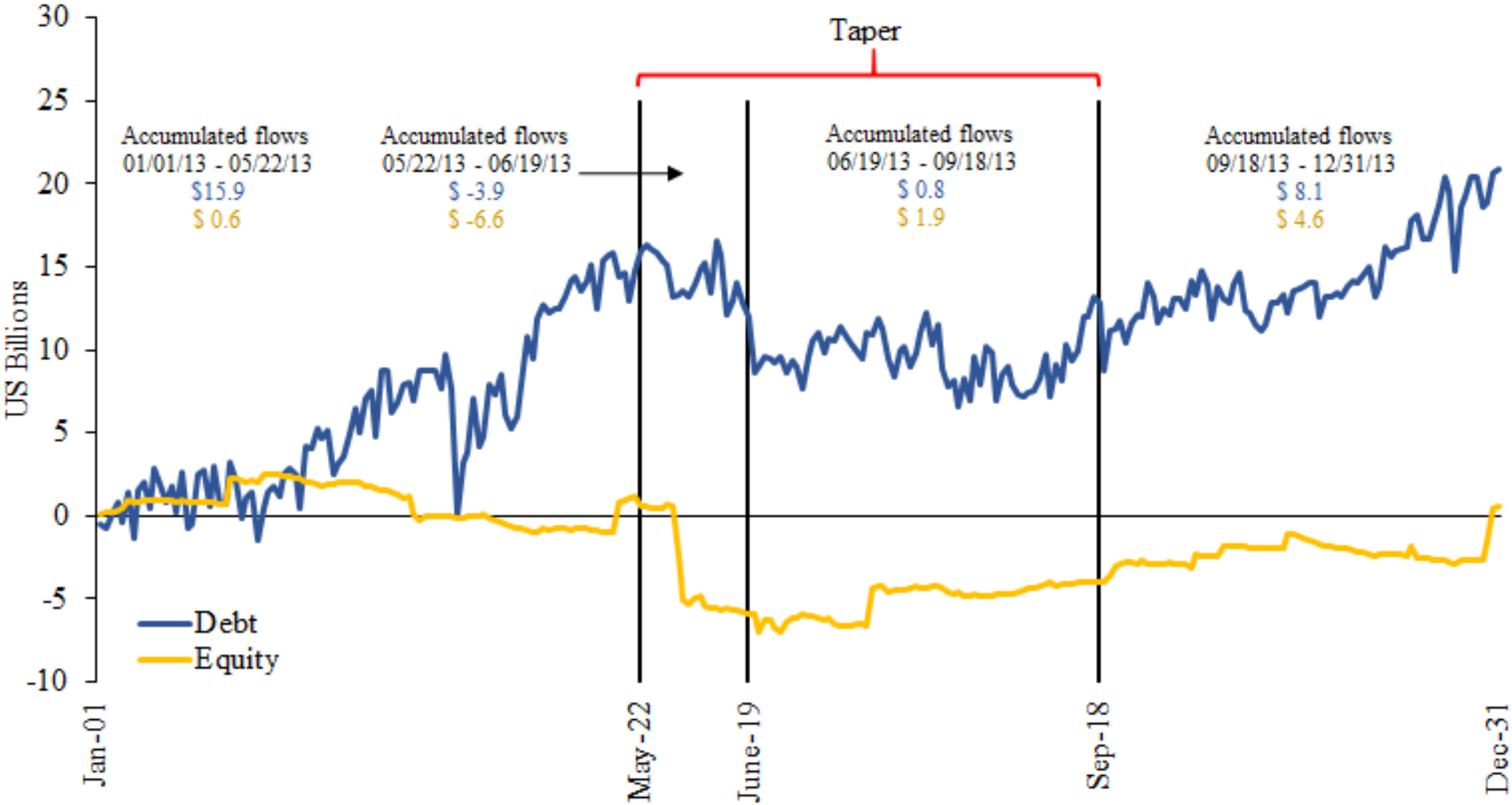
- BoP data has two disadvantages for policy implementation:
  1. The data is available with a significant delay
  2. The low frequency at which such data is published makes it not adequate to analyze the immediate response of portfolio flows
- We use a novel dataset with daily transactions of net foreign holdings of debt and equity
- These data represent transactions of the most liquid instruments in the PI category of the BoP
- The data matches quite well those in the BoP

High Frequency Data





U.S. Monetary Policy Announcements and Capital Flows



- We rely in an event study analysis in the spirit of Park and Um (2016)
- Such methodology usually suffers from endogeneity and omitted variable bias
  - In this case, endogeneity would arise if the Fed's reaction function were to include Mexican asset prices
  - Since U.S. monetary policy stance depends only on domestic factors, endogeneity is not an issue in this case
  - Regarding omitted variable bias, the authors state that this problem can be minimized by narrowing the time window of analysis as much as possible so that only innovations to U.S. monetary policy are captured
  - In these sense the authors estimate a model using only dummy variables representing changes in monetary policy in the U.S.

- Extending Park and Um (2016) for the case of Mexico the model becomes:

$$Y_t = \alpha + \beta_1 QE3_s + \beta_2 QE3_d + \beta_3 T_m + \beta_4 T_j + \epsilon_t \quad (1)$$

- where Y_t stands for daily gross inflows in equity or debt in billions of USD
- All dummies are set equal to one the next day after the announcement
- All flows variables are stationary
- The sample period used goes from January 3, 2012 up to July 9, 2015 as the data obtained from INDEVAL starts on that date

OLS Estimation on Daily Debt and Equity Flows to Mexico

	Equity	Debt
QE3 Hint Sept.	-0.035	1.420
	(0.908)	(0.259)
QE3 Conf. Dec.	-0.025	-1.087
	(0.935)	(0.387)
Taper May	-0.065	0.309
	(0.829)	(0.806)
Taper June	-0.012	**-3.512*** **
	(0.967)	**(0.005)**
N	853	853
R2	0.000	0.012
R2 adjusted	-0.005	0.007
RMSE	0.301	1.257
Autocorrelation tests[a]		
Durbin-Watson	**5.296** **	**73.511*** **
	(0.021)	**(0.000)**
Breusch-Godfrey	**5.300** **	**68.119*** **
	(0.021)	**(0.000)**

[a] The null in both tests is that of no serial correlation in the residuals.
P-values in parenthesis. $*$ significant at 10% $**$ significant at 5% $***$ significant at 1%.

- Enders (2004) suggest that in this type of models it is often necessary to introduce lags of the dependent variable following an appropriate criterion
- The model becomes:

$$\Upsilon_t = \alpha + \sum_{i=0}^{I} \rho_i \Upsilon_{t-i} + \beta_1 QE3_s + \beta_2 QE3_d + \beta_3 T_m + \beta_4 T_j + \epsilon_t \quad (2)$$

Where $I = 2$ for debt and $I = 0$ for equity flows according to BIC. Hence, for equity we use Newey-West standard errors.

Effect of QE3 and Taper Announcements on Daily Debt and Equity Flows to Mexico

	Equity[a]	Debt[b]
Y_{t-1}	-	**-0.334*** **
	-	**(0.000)**
Y_{t-2}	-	**-0.170*** **
	-	**(0.000)**
QE3 Hint Sept.	**-0.035*** **	**0.884*** **
	(0.002)	**(0.000)**
QE3 Conf. Dec.	**-0.025** **	**-0.955*** **
	(0.027)	**(0.000)**
Taper May	**-0.065*** **	**0.967*** **
	(0.000)	**(0.000)**
Taper June	-0.012	**-4.034*** **
	(0.266)	**(0.000)**
N	853	851
R2	0.000	0.120
R2 adjusted	-0.005	0.113
RMSE	0.301	1.182
Autocorrelation tests[c]		
Durbin-Watson	-	0.403
	-	(0.525)
Breusch-Godfrey	-	0.407
	-	(0.524)

[a] P-values obtained from Newey-West standard errors assuming the correlation dies after 7 days using Stock & Watson (2008) rule of thumb

Why such counterintuitive results?

1. If Park and Um (2016) are correct the model, in principle, should not suffer from either endogeneity nor omitted variable bias

2. Then, it is possible that such results are due to a delayed inverstors' response to unexpected announcements (Lo Duca (2012) and Hernandez-Murillo and Shell (2014))

Effect of QE3 and Taper Announcements on Weekly Debt and Equity Flows to Mexico

	Equity[a]	Debt[a]
Y_{t-1}	-	**-0.227*** **
	-	**(0.000)**
QE3 Hint Sept.	-0.004	**1.271*** **
	(0.934)	**(0.000)**
QE3 Conf. Dec.	**0.847*** **	**2.430*** **
	(0.000)	**(0.000)**
Taper May	-0.058	**-1.116*** **
	(0.283)	**(0.000)**
Taper June	**-0.897*** **	**-4.226*** **
	(0.000)	**(0.000)**
N	185	184
R2	0.016	0.093
R2 adjusted	-0.006	0.067
RMSE	0.716	1.813
Autocorrelation tests[b]		
Durbin-Watson	0.119	0.014
	(0.730)	(0.904)
Breusch-Godfrey	0.123	0.015
	(0.726)	(0.902)

[a] Bayesian Information Criterion (BIC) suggests the inclusion of one lag in the model for debt and none for equity.

[b] The null in both tests is that of no serial correlation in the residuals.
P-values obtained from OLS robust standard in parenthesis: $*$ significant at 10% $**$ significant

Is it true that there is no omitted variable bias?

- Park and Um (2016) state that this is true only for small time windows
- We make an effort to indirectly see if such bias is affecting our results
- We include additional variables
  - Must represent push and pull factors
  - Now holidays between Mexico and U.S. led to several mismatches in the data

The model becomes

$$\Upsilon_t = \alpha + \sum_{i=0}^{I} \rho_i \Upsilon_{t-i} + \beta' UMP_t + \gamma' X_{t-1} + \epsilon_t \tag{3}$$

- UMP_t is a matrix containing the four dummy variables described above
- X_{t-1} is a matrix of additional variables, all introduced with a lag to avoid endogeneity

Daily and Weekly Estimations with Additional Variables

	Daily Flows		Weekly Flows	
	Equity[a]	Debt[b]	Equity[b]	Debt[b]
Y_{t-1}	-	**-0.336*** **	-	**-0.235*** **
	-	**(0.000)**	-	**(0.001)**
Y_{t-2}	-	**-0.171*** **	-	-
	-	**(0.000)**	-	-
QE3 Hint Sept.	**-0.053*** **	**0.871*** **	0.092	**1.167*** **
	(0.039)	**(0.000)**	(0.157)	**(0.000)**
QE3 Conf Dec.	**-0.027** **	**-0.948*** **	**0.750*** **	**1.961*** **
	(0.035)	**(0.000)**	**(0.000)**	**(0.000)**
Taper May	**-0.066*** **	**1.006*** **	0.065	**-0.680*** **
	(0.001)	**(0.000)**	(0.638)	**(0.007)**
Taper June	0.009	**-4.094*** **	**-0.738*** **	**-3.765*** **
	(0.878)	**(0.000)**	**(0.000)**	**(0.000)**
Δi_{t-1}	-0.064	-0.027	-1.033	-1.943
	(0.669)	(0.988)	(0.647)	(0.385)
E_{t-1}	-0.005	0.024	-0.376	**-0.929** **
	(0.799)	(0.724)	(0.151)	**(0.048)**
VIX_{t-1}	-0.005	-0.003	-0.001	0.053
	(0.103)	(0.838)	(0.965)	(0.282)
Oil_{t-1}	0.002	0.029	**0.099** **	-0.121
	(0.505)	(0.228)	**(0.024)**	(0.577)
N	851	851	183	183
R2	0.00	0.122	0.065	0.119
R2 adjusted	-0.006	0.111	0.022	0.073
RMSE	0.302	1.184	0.709	1.808
Autocorrelation tests[c]				
Durbin-Watson	-	0.791	0.282	0.183
	-	(0.374)	(0.596)	(0.669)
Breusch-Godfrey	-	0.802	0.298	0.194
	-	(0.371)	(0.585)	(0.660)

1. These results suggest that omitted variable bias is less of a problem with daily data
2. It does affect weekly estimations
3. In the case of equity it is not clear that there exists a delayed response
4. But for debt flows it plays a more relevant role

Additionally, for debt flows the coefficient of T_m is smaller than that of T_j, which may also support the idea expressed above about a more determined investors' response after they assessed the effects of such announcements in their portfolios.

Generalized Hausman Test of Equality of Parameters

	Daily Flows		Weekly Flows	
Test	Equity	Debt	Equity	Debt
$QE3_{s1} = QE3_{s2}$	0.140	0.020	0.220	0.370
	(0.712)	(0.890)	(0.641)	(0.541)
$QE3_{d1} = QE_{d2}$	0.050	0.040	0.740	**4.71****
	(0.828)	(0.836)	(0.389)	**(0.030)**
$T_{m1} = T_{m2}$	0.010	0.320	1.560	**5.92****
	(0.914)	(0.571)	(0.212)	**(0.015)**
$T_{j1} = T_{j2}$	0.180	0.130	1.410	**3.09***
	(0.671)	(0.719)	(0.236)	**(0.079)**

The null is that both coefficients are equal.
The Hausman test uses as estimator of the variance of the differences $V(b - B)$ as $V(b) - V(B)$, while Wessie (1999) suggests to use $V(b) - cov(b, B) - cov(B, b) + V(B)$
P-values in parenthesis. $*$ significant at 10% $**$ significant at 5% $***$ significant at 1%.

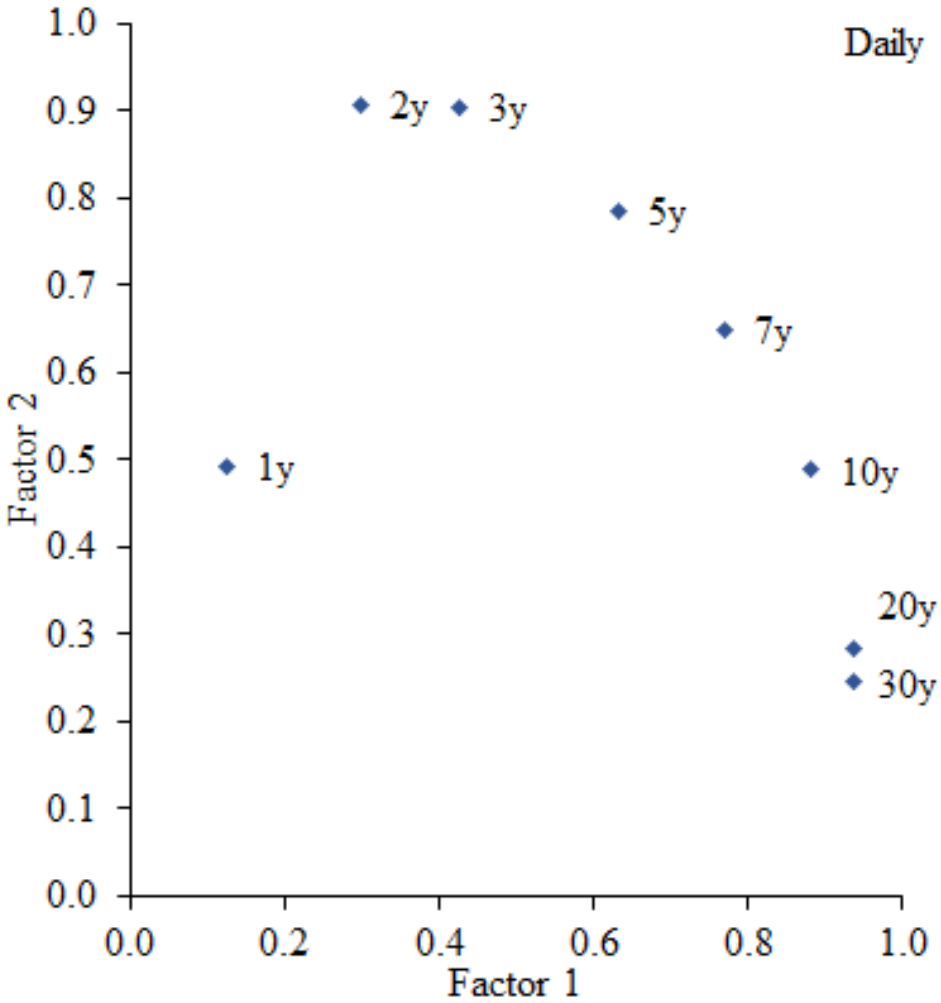
- In general, our results show that debt reaction to U.S. monetary policy is stronger relative to that of equity, which agrees with the findings in previous literature
- In particular, Lim et al. (2014) state that the portfolio balance channel is the main factor affecting investment in debt, but that it is not significant for equity
- In this regard, Chen et al. (2014) use a modification of Gurkaynak et al. (2005, 2007) to isolate both, portfolio and signaling channels of transmission
- Unfortunately, the results do not provide any insight

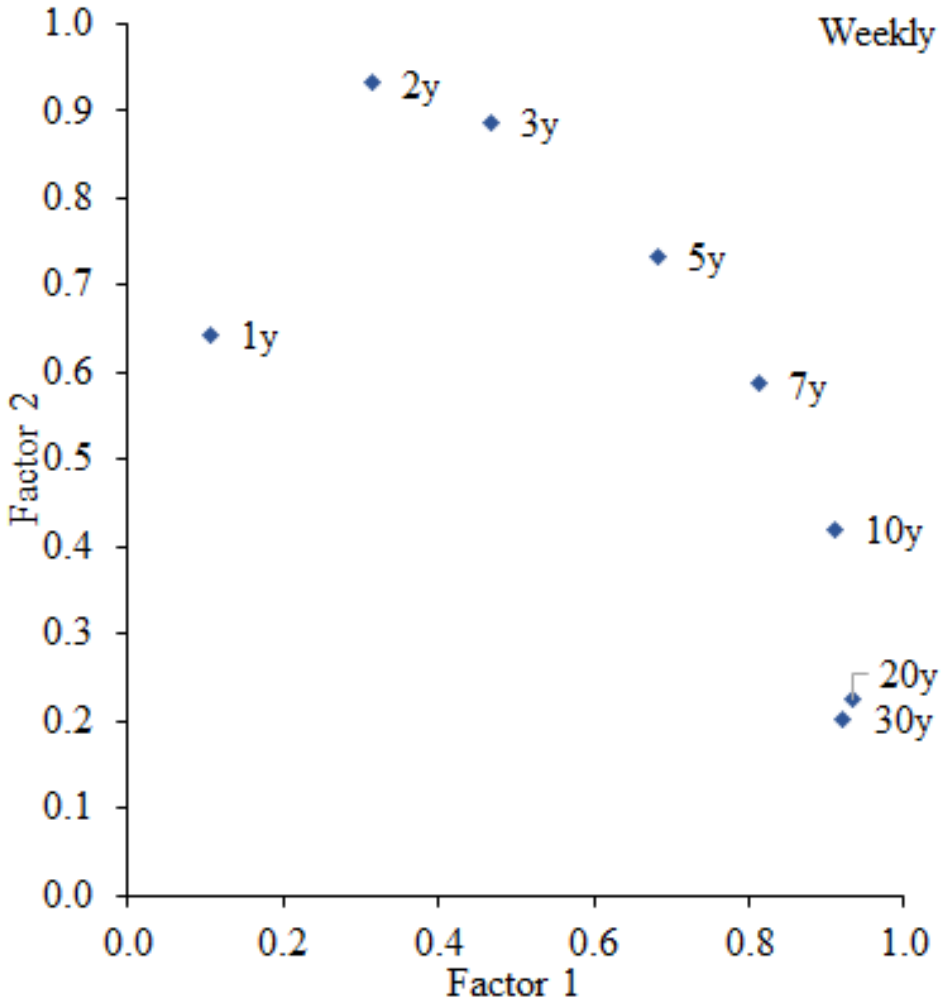
Market and Signal Effects on Debt and Equity Flows to Mexico Including Other Variables

	Daily Flows		Weekly Flows	
	Equity[a]	Debt[b]	Equity[b]	Debt[b]
Y_{t-1}	-	**-**	-	**-**
		0.333* **		**0.195*** **
	-	**(0.000)**	-	**(0.005)**
Y_{t-2}	-	**-**	-	-
		0.163* **		
	-	**(0.000)**	-	-
RPC1	-0.006	-0.005	-0.033	0.172
	(0.432)	(0.894)	(0.465)	(0.188)
RPC2	0.002	-0.033	0.000	-0.102
	(0.762)	(0.408)	(0.995)	(0.430)
Δi_{t-1}	-0.060	-0.082	-1.035	-1.942
	(0.685)	(0.963)	(0.645)	(0.405)
E_{t-1}	-0.005	-0.009	**-0.430***	**-0.998****
	(0.792)	(0.906)	**(0.086)**	**(0.037)**
VIX_{t-1}	-0.005	-0.004	-0.001	0.048
	(0.106)	(0.795)	(0.939)	(0.326)
Oil_{t-1}	0.003	0.026	**0.100****	-0.223
	(0.473)	(0.289)	**(0.030)**	(0.303)
N	851	851	183	183
R2	0.004	0.108	0.056	0.084
R2 adjusted	-0.004	0.099	0.023	0.047
RMSE	0.301	1.192	0.709	1.833

[a] P-values obtained from Newey-West standard errors assuming the correlation dies after 7 days using Stock & Watson (2003) rule of thumb.
[b] P-values obtained from OLS robust standard errors, Bayesian Information Criterion (BIC) suggests the inclusion of two lags in the model for debt and none for equity.
P-values in parenthesis: $*$ significant at 10% $**$ significant at 5% $***$ significant at 1%.

1. Debt and equity inflows appear to react immediately to unexpected U.S. monetary policy announcements
2. In particular if these are taken as bad news
3. Investors interested in debt instruments appear to be more cautious that those interested in equity when dealing with unexpected shocks
4. This suggest that a delayed investors' response may play some role in estimating the response of portfolio inflows


Daily
Factor 2
Factor 1
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0.0
0.2
0.4
0.6
0.8
1.0
1y
2y
3y
5y
7y
10y
20y
30y


Weekly
Factor 2
Factor 1
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0.0
0.2
0.4
0.6
0.8
1.0
1y
2y
3y
5y
7y
10y
20y
30y