Do Central Bank Words Matter in Emerging Markets? Evidence from Mexico [†]

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Abstract

This paper analyzes the price and quantity effects of monetary policy statements in an emerging market economy. Surprises in monetary policy are identified using intraday data on asset prices around monetary policy announcements in Mexico. I find that asset prices and the portfolio flows of domestic and foreign investors respond not only to changes in the policy rate but to information about its future path communicated via statements. The ability to manage expectations about future policy via statements is thus not exclusive to central banks in advanced economies and does not require the zero lower bound to be binding.

Keywords: Monetary policy surprises, exchange rate, yield curve, portfolio flows, high-frequency data, event study.

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1 Introduction

Central banks in advanced economies influence financial markets through their interest rate policies, forward guidance and asset purchases. It is not yet clear, however, whether monetary policy in emerging markets also has more than one dimension; they would otherwise have less room to operate relative to their counterparts in advanced economies. On the one hand, committing to a future policy seems unnecessary when the policy rate is unconstrained by the zero lower bound, as is generally the case for emerging markets. On the other hand, an inflation targeting regime and well-anchored inflation expectations allow them to pursue more forward-looking policies so as to reduce policy uncertainty.

This paper analyzes the price and quantity effects of monetary policy statements in an emerging market economy. The underlying question behind it is whether monetary policy in Mexico, a small open economy with a credible inflation targeting regime (De Pooter et al. 2014, Beauregard et al. 2021), is conducted exclusively through adjustments in the level of the policy rate. To address this question, I first construct a new dataset of intraday changes in swap rates around regular monetary policy announcements from 2011 to 2021,[1] and use it to identify monetary policy surprises following the methodology proposed by Gürkaynak et al. (2005).[2] I then characterize how asset prices and portfolio flows respond to those surprises. The effects on portfolio flows help to better understand the transmission mechanisms of monetary policy.

The main finding is that Banxico, the Mexican central bank, conducts its monetary policy communicating two types of information via statements. The first type relates to changes in the policy rate, and the second type captures guidance about its future path. They are henceforth referred to as target and path surprises, respectively.[3] The fact that path surprises are not only available but actually used by Banxico suggests that central banks in emerging markets indeed have the ability to manage expectations

[1] The swaps reference an interbank interest rate that closely follows the policy rate.

[2] Their methodology identifies surprises directly from asset prices, it does not involve textual analysis.

[3] The path surprises of emerging market central banks could also be considered as communication surprises or as a subtle form of forward guidance. Kuttner (2018) notes that although there is no consensus in the literature of what constitutes forward guidance, the likely trajectory of the policy rate communicated near the zero lower bound is more explicit than under a conventional regime.

about future policy via statements, even if the zero lower bound is not binding.[4] The multidimensionality of monetary policy (Gürkaynak et al. 2005, Altavilla et al. 2019, Swanson 2021) is thus not exclusive to advanced economies.[5]

Target and path surprises from Banxico influence both asset prices and portfolio flows. I use intraday changes for the exchange rate and bond yields to quantify the effects on asset prices, and a unique dataset of daily holdings of Mexican government bonds collected by Banxico and disaggregated by type of investor to assess the effects on portfolio flows. The analysis uses an event study methodology and local projections to quantify the contemporaneous effects and the persistence of target and path surprises. Event studies with high-frequency data overcome endogeneity concerns by isolating the surprise component of monetary policy decisions (Nakamura and Steinsson 2018).

The exchange rate only reacts to target surprises contemporaneously. A tightening in the policy rate appreciates the currency, in line with standard open economy models. The lack of response to path surprises seems puzzling since rational and forward-looking investors would be expected to respond to them, as is the case for the currencies of advanced economies (Rosa 2011, Ferrari et al. 2021). However, this result is explained by the relatively small variation of path surprises. Future research could explore whether this is characteristic of the Mexican peso given that, for instance, other emerging market currencies respond to U.S. path surprises (Hausman and Wongswan 2011).[6]

The response of bond yields to target and path surprises is significant and persistent. A tightening flattens the yield curve, but medium- and long-term yields react more to path than to target surprises, consistent with the evidence for the U.S. when its policy rate was not constrained by the zero lower bound (Gürkaynak et al. 2005). Banxico's path surprises thus improve the implementation of monetary policy in Mexico to the

[4]Central banks in advanced economies also communicated information about future policy before the global financial crisis, when the zero lower bound was not binding (Gürkaynak et al. 2005).

[5]The evidence for Mexico does not support a third factor, which could be associated with asset purchases (Swanson 2021). Several emerging market central banks indeed implemented asset purchases following the Covid pandemic akin to the ones in advanced economies after the global financial crisis (Rebucci et al. 2020). Banxico made two such extraordinary announcements in 2020, but they are excluded from the sample since it only comprises regular meetings.

[6]In this regard, Banxico's foreign exchange interventions to provide liquidity and to promote orderly market conditions may play a role in muting the response of the currency to path surprises.

extent that medium- and long-term yields influence the spending decisions of households and firms. Importantly, both types of surprises have a larger influence on the yield curve in Mexico than U.S. surprises have on the U.S. yield curve. This result reflects two non-mutually-exclusive channels according to the expectations hypothesis.[7] First, it is likely that long-term inflation expectations in Mexico are *less* firmly anchored than in the U.S. (Andreasen et al. 2021, Beauregard et al. 2021). Second, monetary policy surprises in Mexico may have a larger effect on the term premium, which could be explained by the presence of reach-for-yield investors (Hanson and Stein 2015); that is, when the target rate decreases, investors in need of higher returns switch to long-term bonds lowering their yields. Section 5 shows that Mexican banks exhibit a reach-for-yield behavior.

Domestic and foreign investors are key in the transmission of target and path surprises. Most investors increase their bond holdings in response to a monetary tightening,[8] restricting liquidity in the economy. Domestic investors rebalance their bond portfolios based on their business model, while foreign investors are key in the transmission of path surprises; thus, incoming portfolio flows respond to the monetary policy of the host country, not only to that of the home country, as shown in the existing literature.

The multidimensionality of monetary policy in emerging markets has important policy implications. Above all, it enhances the conduct of monetary policy in emerging markets. Their central banks, for instance, could deal with situations like periods of high inflation and the spillover effects of monetary policy in advanced economies better than previously thought by communicating information about future policy.[9]

This paper contributes to the literature in three respects. First, it assesses the role of path surprises in an emerging economy using intraday data to identify them. The multidimensionality of monetary policy has hitherto concentrated on advanced economies,[10] and intraday data is rarely used for emerging markets. Second, the effects of target

[7]Since prices are flexible in the long run, long-term expected real interest rates would not be affected.

[8]Banxico accommodates an excess demand for bonds.

[9]The spillovers tend to be larger on long-term yields (Obstfeld 2015, Kearns et al. 2022). Also, portfolio inflows can weaken the link between short- and long-term interest rates (Ito and Tran 2022).

[10]Blinder et al. (2008) review the literature on the influence of central bank communications on financial markets but mainly for advanced economies. Some evidence exists for emerging markets; Su et al. (2019) use content analysis to classify communications but the approach is prone to subjectivity.

and path surprises are not only analyzed on asset prices but on daily portfolio flows to better understand the transmission mechanisms of monetary policy. The literature for advanced economies generally considers only the effects on prices (not quantities), whereas for emerging markets, it mostly focuses on target (not path) surprises (Kohlscheen 2014, Solís 2023). Third, this paper takes the perspective of the host country to analyze the effects of its monetary policy on incoming portfolio flows. Traditionally, the literature on monetary policy spillovers takes the perspective of the home country.[11]

The rest of the paper is structured as follows. Section 2 describes how monetary policy surprises are identified. Section 3 shows that Banxico uses two types of monetary policy surprises. Sections 4 and 5 respectively characterize the response of asset prices and portfolio flows to both types of surprises. The last section concludes.

2 Identification of Monetary Policy Surprises

This section summarizes institutional details relevant to the measurement of the monetary policy surprises, and describes the asset prices used in the analysis.

The Bank of Mexico, also known as Banxico, became an independent central bank in 1994 and adopted an inflation targeting regime in 2001. The official inflation target is 3% with a range of ± 1%. A Governing Board comprising the governor and four deputy governors makes the monetary policy decisions. In 2008, Banxico adopted the overnight interbank interest rate as its monetary policy instrument; previously, it conducted monetary policy by setting a quantitative target for reserves (*el corto*) and by expressing monetary conditions in basis points. Solís (2023) discusses more institutional details and provides the dates and times of Banxico's announcements.

This paper uses swap rates to measure surprises in monetary policy decisions. The swaps market in Mexico references the 28-day interbank interest rate (TIIE28D), an

[11]The literature based on the traditional approach documents significant flows into financial assets in emerging markets after the global financial crisis (Fratzscher et al. 2018). Hausman and Wongswan (2011) document that stock prices respond more to U.S. target surprises, that exchange rates and long-term yields respond more to U.S. path surprises, and that short-term yields respond to both types of surprises. Bowman et al. (2015) and Fischer (2020) show that the effect of U.S. monetary policy surprises is particularly relevant for local currency sovereign yields.

interbank interest rate denominated in local currency that serves as a benchmark for banking loans in the country and that closely follows the policy rate.[12] Banxico reports the TIIE28D once a day based on quotes submitted by commercial banks. The 3-month swap of the TIIE28D is the main local derivative. Solís (2023) uses this swap to capture surprises in the policy rate. This paper extends his analysis by considering a broader sense of monetary policy surprises. The adoption of inflation targeting and well-anchored inflation expectations arguably allowed Banxico to pursue more forward-looking policies.

I consider swaps with maturities up to one year. Like other central banks, Banxico communicates information about its monetary policy outlook via statements. This information might influence market expectations about future policy actions. Unlike in several countries after the global financial crisis and the Covid-19 pandemic, the policy rate in Mexico has so far not been constrained by the zero lower bound. As a consequence, Banxico's monetary policy statements include information about future policy actions within a year out at most, it does not need to commit to a predetermined policy path for longer periods. Relatedly, using maturities up to one year is consistent with the approach of Gürkaynak et al. (2005) for the U.S. before the global financial crisis.[13]

Asset price changes are calculated on intraday windows containing regular monetary policy announcements. The monetary policy surprises use intraday differences from 10 minutes before to 20 minutes after each announcement for swaps with maturities of 3, 6, 9 and 12 months.[14] To measure the effects of the surprises, intraday differences over the same windows are also calculated for the Mexican peso (MXN) per U.S. dollar (USD) exchange rate and for yields of fixed-rate bonds issued by the Mexican government with maturities of 2, 5, 10 and 30 years.[15] For yields, the change is calculated directly using quotes before and after the announcements; for the exchange rate, 100 times log

[12]The average difference between the TIIE28D and the policy rate is around 30 basis points. Since this spread exhibits small variations, it essentially cancels out when computing changes in swap rates.

[13]Swanson (2021) argues for including maturities of more than one year out if the policy rate is constrained by the zero lower bound and the central bank uses unconventional monetary policy tools.

[14]When no information is available at any of those times, the next available quote is used to compute the changes. In extreme cases, in which there are no quotes in wider windows for a day, the open and close quotes are used to compute the differences. Those cases only happen on a few days for some swaps.

[15]The Mexican government issued 10- 20- and 30-year fixed-rate local-currency bonds for the first time in 2001, 2003 and 2006, respectively, following the implementation of a debt management strategy to develop its debt market that started in 2000 (Jeanneau and Tovar 2008, Banxico 2014).

differences are used to approximate the percentage change (or return) over the window.[16]

All the asset price information comes from Bloomberg. The data to calculate the intraday differences for the swap rates and the exchange rate are available since 2011, and since 2013 for bond yields other than the 5-year yield for which the sample starts in December 2014. The dataset covers up to the December 2021 announcement. Between January 2011 and December 2021, there have been 87 regularly-scheduled monetary policy announcements. Four unscheduled announcements, two of them in response to the Covid-19 pandemic, are excluded because the mechanism driving asset prices in those dates is potentially different from the one driving them on conventional announcements.[17]

3 Monetary Policy Dimensions

This section shows that two factors in monetary policy announcements move asset prices in Mexico. The first factor is associated with surprises about the current policy rate and the other factor, with surprises about its future path communicated via policy statements. Subsequent sections analyze how asset prices and portfolio flows respond to these factors.

3.1 Assessing the Number of Factors

As in Gürkaynak et al. (2005), the number of factors influencing asset prices is assessed using the matrix rank test developed by Cragg and Donald (1997). Let X be a $T \times n$ matrix of asset price changes around monetary policy announcements with T observations and n asset prices, and with a factor structure given by:

$$X = F\Lambda + \zeta, \tag{1}$$

in which F is a $T \times k$ matrix with k unobserved factors, Λ is a $k \times n$ matrix of factor loadings and ζ is white noise. For a given number of variables n, the Cragg–Donald test assesses the null hypothesis that k_0 factors ($k_0 < n$) explain most of the variability

[16] All the results discussed below using tight 30-minute windows remain using wider 50-minute windows, starting 20 minutes before and ending 30 minutes after each monetary policy announcement.

[17] See Solís (2023) for details about the extraordinary meetings.

observed in the data. The test minimizes the distance between the covariance matrix of the observed data and that obtained from all the possible models with k_0 factors. The test is a Wald statistic with an asymptotic χ^2 distribution and $(n-k_0)(n-k_0+1)/2-n$ degrees of freedom. Inference based on it requires that $(n-k_0)(n-k_0+1)/2 > n$.[18]

The test is performed for the exchange rate and bond yields to assess the number of factors they react to, and for swaps with maturities up to one year to give a structural interpretation to the estimated factors. To satisfy the inference requirement of the test, k_0 can be at most 2 for the exchange rate and the yields (since $n = 5$) and 1 for the swaps (since $n = 4$). To check robustness to the frequency of the data and to the sample period, the test is also performed using daily changes in asset prices around the announcements. Daily changes for all asset prices are calculated since 2004, except for the 30-year yield for which the data start in October 2006.[19]

Table 1 shows that two factors characterize the responses of asset prices to monetary policy in Mexico. The null hypothesis of no factors is strongly rejected in all cases, so asset prices in Mexico respond at least to one factor; Solís (2023) indeed shows that they respond to unanticipated changes in the current policy rate. The most interesting null hypotheses therefore involve one and two factors, $k_0 = 1, 2$. For the exchange rate and bond yields, the null hypothesis of one factor is rejected, but the null of two factors cannot be rejected even at the 10% significance level. Similarly, with swaps the null of one factor is rejected at the 5% significance level, regardless of the data frequency or the sample period. Consequently, two factors drive the response of asset prices to monetary policy announcements. The multidimensionality of monetary policy (Gürkaynak et al. 2005, Altavilla et al. 2019, Swanson 2021) is thus not exclusive to advanced economies.

Importantly, two factors in Banxico's monetary policy is not a recent phenomenon. Regardless of whether the test is performed for the exchange rate and bond yields or for swaps, it shows that asset prices have responded to two factors in monetary policy even before Banxico adopted its policy rate in 2008, since daily data go back to 2004.

[18] See Cragg and Donald (1997) and the appendix in Gürkaynak et al. (2005) for further details.

[19] The sample with daily data can start in 2004 even though Banxico adopted its policy rate in 2008 because the swaps reference the TIIE28D not the policy rate.

Table 1. Tests of the Number of Factors in Monetary Policy Announcements

	Frequency	$H_0 : k = k_0$	Wald Statistic	Degrees of Freedom	p-value	Observations
Exchange Rate & Yield Curve	Intraday	0	29.56	10	0.001	56
		1	10.07	5	0.073	56
		2	1.14	1	0.285	56
	Daily	0	40.20	10	0.000	135
		1	18.93	5	0.002	135
		2	0.00	1	0.978	135
Swaps	Intraday	0	28.30	6	0.000	87
		1	7.21	2	0.027	87
	Daily	0	33.06	6	0.000	190
		1	9.35	2	0.009	190

Notes: This table reports the results from the Cragg–Donald test. H_0 is the null hypothesis of $k = k_0$ factors against the alternative of $k > k_0$ factors, where $k_0 = 0, 1, 2$. The sample includes all regular monetary policy announcements up to December 2021, the starting date varies based on data availability: for the exchange rate and the yield curve with intraday data, it is December 2014 (due to the 5-year yield) and with daily data is October 2006 (due to the 30-year yield); for swaps with intraday data, it is January 2011 and with daily data is January 2004. The yield curve includes 2- 5- 10- and 30-year bonds. Swaps have maturities of 3, 6, 9 and 12 months.

In sum, asset prices in Mexico react to information provided by Banxico other than adjustments in the current policy rate. The next section explains how to estimate both factors, while section 3.3 relies on the evidence from swaps to interpret them.

3.2 Estimating the Factors

The factors F, as well as their loadings Λ, in equation (1) are estimated by applying principal components to the matrix of asset price changes X. The two factors implied by the Cragg–Donald test will be the first two principal components of X. These factors are orthogonal to each other and are linear combinations of the variables included in X, but they do not have a practical interpretation. Section 3.3 addresses this issue to understand their effects on asset prices and portfolio flows.

The two factors, F_1 and F_2, are estimated from X, when it is comprised of swaps for interpretation purposes. They are then normalized to have unit standard deviation and rotated to give them a structural interpretation.

Let U be a 2×2 rotation matrix for F such that

$$Z = F\,U, \tag{2}$$

in which Z denotes the rotated factors, Z_1 and Z_2. Four restrictions are imposed on U to uniquely identify it and being able to interpret the factors. The first three restrictions require the rotated factors to be orthogonal to each other and to have unit variance. The final restriction is set so that only Z_1 mirrors the changes in the 3-month swap, what Solís (2023) calls the policy rate surprises; the loading of the changes on Z_2 is thus zero.[20]

To further ease the interpretation and to be able to compare the magnitudes of the factors, they are rescaled so that Z_1 moves one-to-one with changes in the 3-month swap rate and Z_2 affects the 12-month swap rate in the same magnitude as Z_1 does. The base for rescaling is 2013, when intraday data for bond yields become available.[21] Table A.1 in the appendix verifies that changes in the 3-month swap move one-to-one with Z_1,

[20] The loadings on Z_1 and Z_2 for all four swaps can be expressed in terms of the parameters in U and the factor loadings Λ. To see this, substitute F from equation (2) into (1). The last restriction, however, only uses the two loadings in Λ for the 3-month swap. See the appendix in Gürkaynak et al. (2005).

[21] The rescaling does not affect the starting date of the factors.

whereas Z_2 has considerable explanatory power for changes in the 12-month swap.

Figure 1 displays the estimated factors changing the sample period and the data frequency. The figure compares the time series of Z_1 (top panel) and Z_2 (bottom panel) obtained with intraday and daily data since 2011 as well as with daily data since 2004. Z_1 is less sensitive to changes in the sample period and the data frequency. For instance, the Z_1 factors correlate among themselves around 0.97, whereas the Z_2 factors about 0.73. Also, the standard deviation of Z_2 obtained with daily data doubles relative to when it is obtained with intraday data (4.83 vs. 2.16 basis points), whereas it is similar for Z_1 (7.84 vs. 7.67 basis points), yet the standard deviation of Z_2 is smaller than Z_1, regardless of the data frequency. Intuitively, it is unlikely for the policy rate to reach the zero lower bound in Mexico, so the need of Banxico to rely on path surprises has been low (hence the smaller variation).

The figure confirms that two factors in Banxico's monetary policy is not a recent phenomenon, in line with table 1. Even though daily data yields longer time series, the core of the analysis relies on the factors identified with intraday data because there are gains in precision during the estimation and in terms of explanatory power.

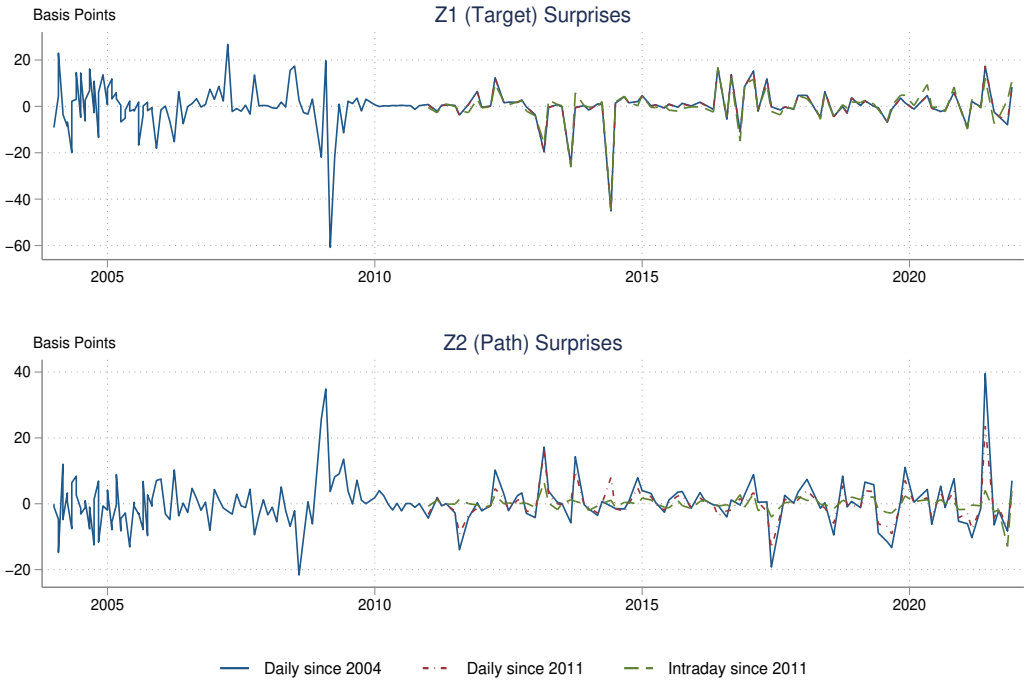
3.3 Interpreting the Factors

The factors Z_1 and Z_2 are henceforth referred to as the target and path factors or surprises. By definition, Z_1 moves one-to-one with surprises in the 3-month swap. Solís (2023) shows that asset prices in Mexico respond to those surprises. Accordingly, Z_1 can be related to surprises in the *current* policy rate, as it adequately captures the monetary stance in the short run. On the other hand, Z_2 is aligned with surprises in the 12-month swap that are unrelated to changes in the 3-month swap, so the second factor in principle might just capture a link to long-term yields.[22] However, figure 2 and table 2 support its association with surprises about the *future* path of the policy rate.[23] In general, path surprises from

[22]By construction, Z_1 is essentially the same as the policy rate surprises in Solís (2023), the correlation coefficient between the two measures is 0.997. Meanwhile, the correlation between Z_2 and the residual of a regression of the change in the 12-month swap on the change in the 3-month swap is 0.85.

[23]Gürkaynak et al. (2005) show that the first and second factors in the U.S. also relate to changes in the policy rate and about its future path communicated via statements, respectively.

Figure 1. Monetary Policy Surprises in Mexico: Intraday vs. Daily Data



Notes: This figure compares the evolution of the Z_1 (target) and Z_2 (path) surprises obtained with daily data since 2004 (solid line) and 2011 (dash-dotted line), and with intraday data since 2011 (dashed line). The sample includes all regular monetary policy announcements up to December 2021.

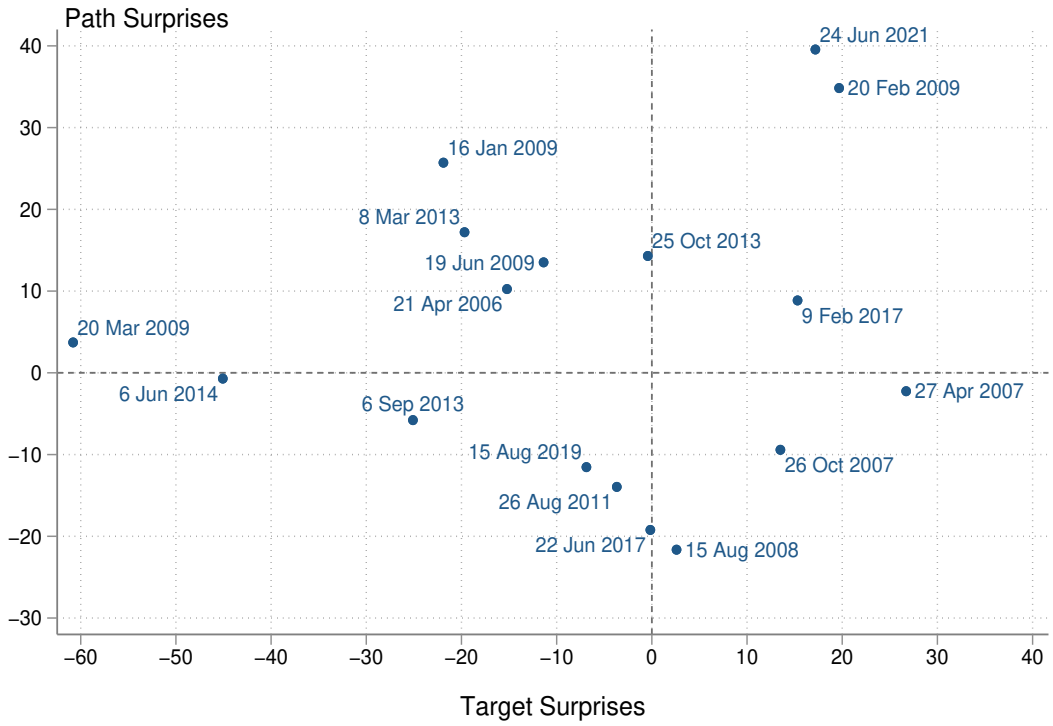
emerging market central banks could be considered as communication surprises or as a subtle form of forward guidance.[24]

Figure 2 compares the estimated target and path surprises for relevant dates over the sample period. While the analysis in sections 4 and 5 uses target and path surprises obtained using intraday data for efficiency in the estimation, the factors plotted in figure 2 are obtained using daily data (solid line in figure 1) in order to explore longer series (since 2004) in the interpretation of path surprises in section 3.3.1. In the figure, target surprises are in the horizontal axis, and path surprises are in the vertical axis; the units are basis points.[25] A positive value in any of the two surprises represents a tightening in

[24]Table 1 does not support a third factor, which could be associated with asset purchases (Swanson 2021). Several emerging market central banks indeed implemented asset purchases following the Covid pandemic akin to the ones in advanced economies after the global financial crisis (Rebucci et al. 2020). Banxico made two such extraordinary announcements in March and April 2020, but they are excluded from the sample since it only comprises regular meetings.

[25]Target and path surprises are orthogonal to each other by construction, so no correlation is to be expected between the dots in the figure.

Figure 2. Monetary Policy Dimensions



Notes: This figure plots the largest estimated target and path surprises (expressed in basis points) obtained from daily data, as explained in the main text. The sample includes all regular monetary policy announcements from January 2004 to December 2021.

Banxico's monetary stance, and a negative value represents an easing.

Banxico has used all four possible combinations of target and path surprises. The first quadrant shows announcements in which there was a tightening in target as well as in path surprises, whereas both surprises eased in the third quadrant. In the second and fourth quadrants, there was a tightening in one surprise and an easing in the other.

3.3.1 Statements and Path Surprises

Central bank statements convey information intended to influence expectations about future monetary policy decisions and to reduce policy uncertainty.

Table 2 shows that Banxico communicates information about the future path of the policy rate via statements. It summarizes the statements on announcement days in which, according to figure 2, they communicated relevant information beyond the current policy rate. Notice that all the excerpts reported in the table contain clear references to the

monetary stance in the future, and that several of them explicitly reference the future path of the policy rate.[26] The column labeled 'Path' indicates whether figure 2 associates the respective statement with a tighter (+) or looser (−) monetary stance going forward.[27] Importantly, the excerpts and the signs are in line with each other, which is remarkable given that no textual analysis is involved in the identification of the surprises.

The tightening cycle that started in mid-2016 due to rising inflation risks exemplifies the link between path surprises and the information contained in statements. The 2016 U.S. presidential election generated uncertainty about the bilateral relation of the two countries. Between early-November 2016 and mid-January 2017, the peso depreciated by more than 14%. In addition, the Mexican government raised the minimum wage and ended gasoline subsidies in early-2017. By mid-2017, inflation had risen for 10 consecutive months. In that context, Banxico raised its policy rate by 50 basis points on June and September 2016, more than the market expected according to surveys, followed by six more consecutive tightenings (three of 50 and three of 25 basis points). In the statement for the last hike on June 22, 2017, Banxico dropped the reference to do 'the necessary tightenings ahead' from the previous statement and indicated that it expected inflation to peak in the near future. The hike was mostly anticipated by the market (i.e., a null target surprise), but the wording of the statement suggested the end of the tightening cycle, essentially delivering a 'pure' path easing surprise (see figure 2).

Statements can also be associated with null path surprises. Contrary to survey expectations of no change in the policy rate, on June 6, 2014, Banxico cut the rate by 50 basis points, but in the statement indicated that 'no further reductions in the policy rate are expected in the foreseeable future.' Therefore, the policy rate was cut unexpectedly, but the statement portrayed the decision as a one-off cut, essentially delivering a 'pure' target surprise (see figure 2).

In sum, target surprises capture unanticipated changes in the policy rate, while path surprises relate to news about its future path communicated via statements.

[26] Namely, the statements for June 2009, March and October 2013, February and June 2017.

[27] Plotting the surprises obtained with daily (instead of intraday) data in figure 2 allows to assess the link between path surprises and statements over a longer period. Notice that half of the announcements in table 2 are pre-2011, before the start of the sample period with intraday data.

Table 2. Summary of Statements in Selected Dates

Date	Path	Description
21-Apr-2006	+	Statement announces an easing of monetary conditions but notes that 'for the foreseeable future there is no space available for further easing.'
26-Oct-2007	−	Statement indicates that the risk that the sharp decline in the U.S. real estate market weakens the U.S. economy (affecting economic activity in Mexico) has increased.
15-Aug-2008	−	Statement highlights that global inflationary pressures continue to rise but an improvement is foreseen in the medium term due to the prospects for lower global growth. Downside risks to the local economy have increased.
16-Jan-2009	+	Statement notes 'a higher than expected upward trend in inflation in the last quarter' and that 'instability in financial markets continues to be a risk factor for the inflationary trend.'
20-Feb-2009	+	Statement indicates that 'the strong financial turmoil represents a risk to the expected inflation path, even considering the greater contraction in demand and the reduction in commodities prices.'
19-Jun-2009	+	Statement indicates that 'the Board considers that its easing cycle is close to an end.'
26-Aug-2011	−	Statement notes that the current monetary policy stance is considered adequate but if it turns in an unnecessary tightening, the Board will reflect on the need to adjust it.
08-Mar-2013	+	Statement makes clear that the 50 basis point reduction in the policy rate 'does not represent the beginning of an easing cycle.'
25-Oct-2013	+	Statement highlights that 'no further cuts in the policy rate are appropriate in the foreseeable future.'
09-Feb-2017	+	Statement highlights the effects of the tightenings in 2016 and 'the ones required in 2017' to counteract inflationary pressures.
22-Jun-2017	−	Statement drops reference to do 'the necessary tightenings ahead' from the previous statement.
24-Jun-2021	+	Statement highlights additional shocks to those expected in headline and core inflation, and notes that their expected paths in the following quarters are higher than previously estimated.

4 The Effects of Monetary Policy on Asset Prices

The previous section shows that target and path surprises capture the responses of asset prices to monetary policy decisions. This section quantifies the response of the exchange rate and the yield curve to those surprises. The next section deals with portfolio flows.

4.1 Contemporaneous Effects

The following event-study regression measures the on-impact effects of the two types of monetary policy surprises on the exchange rate and the yield curve:

$$\Delta y_t = \beta_0 + \beta_1 Target_t + \beta_2 Path_t + \varepsilon_t, \tag{3}$$

in which Δy_t is the intraday change in asset prices around monetary policy announcements, as described in section 2. $Target_t$ and $Path_t$ are the two types of surprises obtained using intraday data.[28] All the variables are expressed in basis points. Finally, the error term ε_t captures variations in the dependent variables unrelated to the two surprises.

Table 3 reports the results of the estimation. The first column for each dependent variable shows the coefficient estimates when the regression only includes target surprises as the independent variable, while the second column adds path surprises as a regressor. Focusing on the first column, a target tightening surprise appreciates the currency and flattens the yield curve. As expected, the estimated coefficients for the target surprises are consistent with the ones reported by Solís (2023, Table 2) for the policy rate surprises.[29]

4.1.1 Response of the Exchange Rate

The Mexican peso appreciates when Banxico increases the policy rate. A 25-basis-point target tightening surprise leads, on average, to an appreciation of the currency of more than 55 basis points. As a reference, the currencies of advanced economies also responded

[28] As already mentioned, even though the surprises can also be obtained from daily data over a larger sample size, the analysis uses the surprises obtained with intraday data because there are gains in precision during the estimation and in terms of explanatory power.

[29] Solís (2023) defines the policy rate surprises as the intraday changes in the 3-month swap. Remember that the target factor is rescaled so that it moves one-to-one with the changes in the 3-month swap.

Table 3. Response of Asset Prices to Target and Path Surprises

	FX Returns		Δ 2Y Yield		Δ 5Y Yield		Δ 10Y Yield		Δ 30Y Yield	
Target	-2.31***	-2.31***	0.67***	0.68***	0.52***	0.43***	0.44***	0.44***	0.30***	0.30***
	(0.82)	(0.79)	(0.080)	(0.083)	(0.13)	(0.099)	(0.073)	(0.072)	(0.071)	(0.072)
Path		-2.12		0.95***		1.00***		0.78***		0.69***
		(1.57)		(0.17)		(0.21)		(0.16)		(0.19)
Constant	-9.17***	-9.17***	-0.32	-0.29	-0.56	-0.35	-0.60	-0.57*	-0.79**	-0.76**
	(3.21)	(3.19)	(0.42)	(0.32)	(0.47)	(0.37)	(0.40)	(0.33)	(0.39)	(0.34)
Obs.	87	87	71	71	56	56	71	71	71	71
R^2	0.26	0.28	0.72	0.84	0.39	0.64	0.55	0.69	0.37	0.53

Notes: The first column for each dependent variable shows the coefficient estimates in regressions of intraday yield changes or exchange rate (FX) returns on target surprises; the second column adds path surprises as a regressor. Target and path surprises are obtained from intraday data, as explained in the main text. Intraday changes are calculated starting 10 minutes before to 20 minutes after a monetary policy announcement. The sample includes all regular monetary policy announcements starting on January 2011 for the exchange rate, on January 2013 for 2- 10- and 30-year yields, and on December 2014 for 5-year yields; the sample ends on December 2021 in all cases. Figures are expressed in basis points. Heteroskedasticity-robust standard errors are shown in parentheses. *, **, *** asterisks respectively indicate significance at the 10%, 5% and 1% level.

around two times the magnitude of a policy rate surprise before the global financial crisis (Rosa 2011), when monetary policy was not constrained by the zero lower bound.[30]

Notice that the exchange rate responds to target but not to path surprises. This result seems puzzling since rational and forward-looking investors would be expected to respond to changes in the future path of the policy rate. In fact, the currencies of advanced economies respond to path surprises (Rosa 2011, Ferrari et al. 2021), and emerging market currencies other than the Mexican peso respond to U.S. path surprises (Hausman and Wongswan 2011).

The relatively small variation of path surprises explains the lack of response of the peso to them. In line with this, table A.2 in the appendix shows that the currency responds to path surprises obtained using daily data. This suggests that investors in the foreign exchange market take time to process the information in statements. Notwithstanding, although the standard deviation of path surprises more than doubles when using daily relative to intraday data, it is smaller than for target surprises, regardless of the data frequency (see section 3.2). Intuitively, it is unlikely for the policy rate to reach the zero lower bound in Mexico, so the need of Banxico to rely on path surprises has been low.

Future research can explore whether the lack of response to path surprises is characteristic of the Mexican peso. Hausman and Wongswan (2011) find that other emerging market currencies respond to U.S. path surprises, and the response is stronger in countries with a more flexible exchange rate regime. Although the peso operates under such a regime, Banxico occasionally intervenes in the market to provide liquidity and promote orderly conditions so, even though they are rules-based,[31] the interventions might unintendedly be muting the response of the currency to path surprises.

4.1.2 Response of the Yield Curve

Unlike the exchange rate, the yield curve responds to both target and path surprises. In particular, a tightening of either surprise flattens the yield curve. But the effect of

[30] After the global financial crisis, the currencies of advanced economies responded up to five times the magnitude of a policy rate surprise (Ferrari et al. 2021).

[31] For instance, Banxico intervenes after a 2% intraday depreciation (García-Verdú and Zerecero 2013).

path surprises on the yield curve is especially strong. Table 3 shows that medium- and long-term yields respond more to path than to target surprises,[32] consistent with the evidence for the U.S. when its policy rate was not constrained by the zero lower bound (Gürkaynak et al. 2005). Intuitively, information about the future path of the policy rate has relatively more weight on the middle to long end of the curve. In this sense, path surprises improve the implementation of monetary policy in Mexico, to the extent that medium- and long-term yields influence the spending decisions of households and firms.

Moreover, Banxico exerts a strong influence on the yield curve. In terms of magnitude, both types of surprises have a larger influence on the yield curve in Mexico than U.S. surprises (constructed by Gürkaynak et al. (2005)) have on the U.S. On average, a 25-basis-point target tightening surprise in Mexico vs the U.S. raises the 2- 5- and 10-year yields by 17 vs 12, 11 vs 7, 11 vs 3 basis points, respectively; while a 10-basis-point path tightening surprise raises them by 10 vs 4, 10 vs 4, 8 vs 3 basis points. This result reflects two non-mutually-exclusive channels according to the expectations hypothesis.[33] First, it is likely that long-term inflation expectations in Mexico are *less* firmly anchored than in the U.S. (cf. Andreasen et al. 2021, fig. 12, Beauregard et al. 2021, fig. 10). Second, monetary policy surprises in Mexico may have a larger effect on the term premium,, which could be explained by the presence of reach-for-yield investors (Hanson and Stein 2015); that is, when the target rate decreases, investors in need of higher returns switch to long-term bonds lowering their yields. Section 5.3 shows that Mexican banks exhibit such behavior. Future research can provide more evidence on both channels.

4.2 Persistence

Monetary policymakers are not only interested in the initial reaction to the surprises but on how persistent they are. While event studies capture the response to the surprises on the day of an announcement, their persistence over subsequent days is assessed using local projections. Jordà (2005) proposes using local projections instead of vector

[32] Also, comparing the R^2 statistic of the regressions with one and two factors indicates that path surprises explain more than 60, 25 and 40% of the variability in 5- 10- and 30-year yields, respectively.

[33] Since prices are flexible in the long run, long-term expected real interest rates would not be affected.

autoregressions to generate impulse responses that are robust to misspecification.

This exercise is only done for the yield curve because it involves daily frequencies. Daily returns of emerging market currencies do not react to policy rate surprises (Kohlscheen 2014), the response can only be detected using intraday data (Solís 2023). Unreported results confirm that the *daily* exchange rate returns do not respond to target nor path surprises in the days following Banxico's monetary policy announcements.

I run the following local projections for the daily changes in the yields:

$$y_{t+h} - y_{t-1} = \alpha_h + \beta_h^1 \, Target_t + \beta_h^2 \, Path_t + \eta_h^{'} z_{t-1} + u_{t+h}, \tag{4}$$

in which h indicates the horizon in days with $h = 0, 1, \ldots, 30$. $Target_t$ and $Path_t$ are equal to the target and path surprises (obtained with intraday data) on announcement days and zero otherwise. By construction, the factors are uncorrelated, but they are included simultaneously to increase efficiency. The parameters of interest are β_h^1 and β_h^2 because they measure the average response of the yields to the surprises at horizon h. Finally, z_{t-1} is a vector of lagged variables to control for potential drivers of the yields one day before an announcement. Since the factors are indeed surprises, there is no need to control for other variables; in fact, all the results are essentially the same when no controls are included.[34] However, they are considered here for comparison with the analysis using portfolio flows in section 5 for which it might be more reasonable to include controls.

The controls comprise the exchange rate, the daily return on the MSCI Mexico stock market index as a measure of local financial conditions, the 10-year U.S. Treasury yield from the Federal Reserve's H.15 dataset to account for global financial conditions, the Cboe's volatility index (VIX) as a measure of risk aversion and economic uncertainty, the J.P. Morgan Emerging Market Bond Index (EMBI) to capture developments in emerging market sovereign bonds, the West Texas Intermediate (WTI) crude oil price as it can influence bond issuance since Mexico is an oil exporter country, the 5-year credit default swap (CDS) for Mexico to account for sovereign default risk, the TED spread as an indicator of credit risk in the global financial sector and its local version calculated as the

[34]The results reported from event studies do not include the controls given the relatively small number of observations but when they are included (unreported), some effects are even stronger.

difference between the one-month interbank rate (TIIE28D) and the one-month Mexican Treasury bill rate. These controls are similar to the ones considered by Christensen et al. (2021) in their study of the liquidity premium in the Mexican bond market.

Figure 3 shows the persistence of bond yields to target (top row) and path (bottom row) surprises. All responses are assessed relative to a one basis point tightening of the respective surprise. The contemporaneous effect (when $h = 0$) on the yields is indicated with an arrow next to the vertical axis.

Monetary policy has a persistent effect on the yield curve. The effect of the surprises last days after an announcement. This post-announcement drift has been identified in advanced economies and attributed to slow-moving capital (Brooks et al. 2019). Big players like pension funds and foreign investors might take time to respond to the surprises. Section 5.3 provides evidence supporting this interpretation for Mexico.

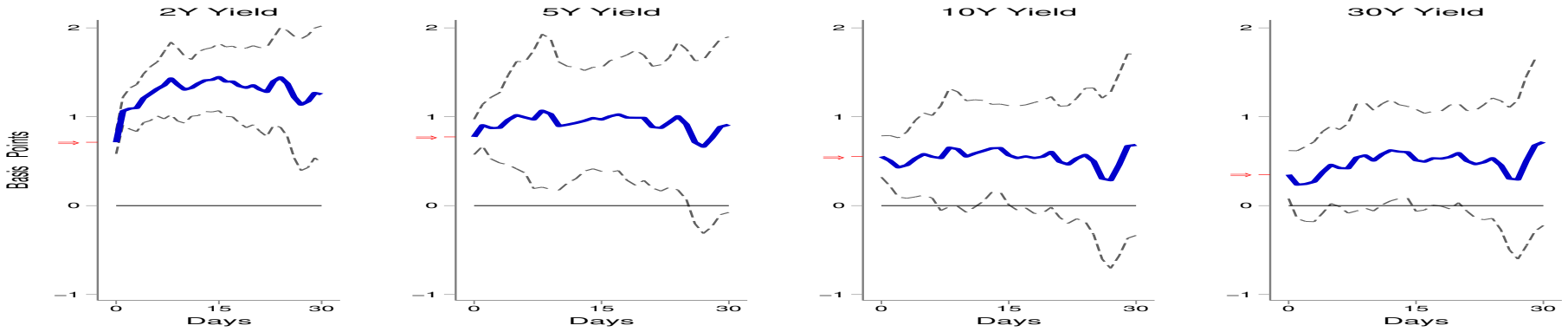
Three patterns characterize the effects of target and path surprises. First, the effect of path surprises at all maturities increases a few days later. Intuitively, financial markets take time to digest the implications of path surprises (Gürkaynak et al. 2005). Second, yields respond stronger to path than to target surprises in the days following an announcement, but the effects of target surprises are more persistent. Although the need of Banxico to rely on path surprises has been low (see section 4.1.1), they have a strong impact on yields when used. Lastly, the persistence of the effects decreases with the maturity of the bond. Traditionally, central banks exert more control over the short end of the yield curve with conventional monetary policies.

Overall, target and path surprises have a persistent impact on the yield curve.

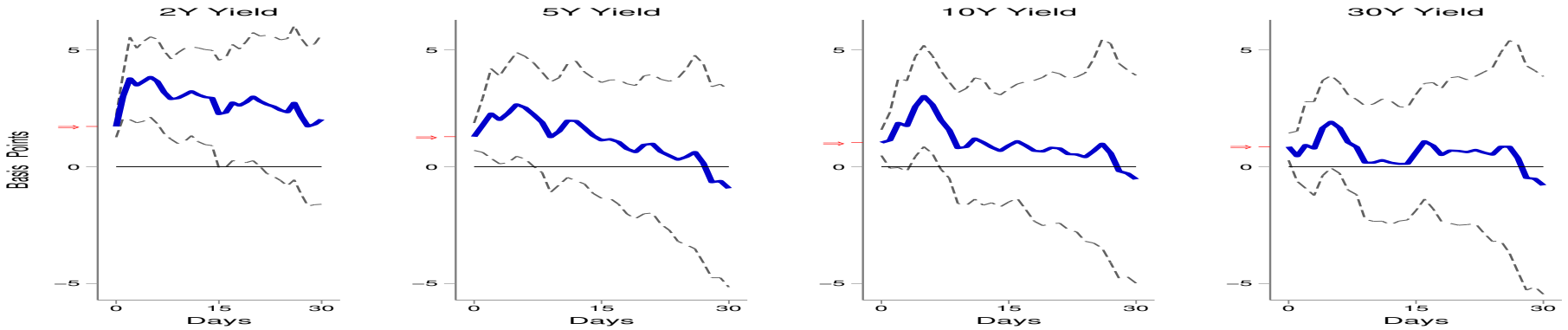
5 The Effects of Monetary Policy on Portfolio Flows

This section shows that target and path surprises also influence portfolio flows. The analysis helps to understand the mechanisms behind the transmission of monetary policy. In particular, foreign investors play an important role in the transmission of path surprises.

Figure 3. Response of the Yield Curve to Target and Path Surprises



(a) Target Surprises



(b) Path Surprises

Notes: This figure plots the coefficient estimates and 95% confidence intervals for 1 basis point target and path tightening surprises for yield changes from close of day $t-1$ to day $t+h$, where t is a day with a monetary policy announcement and $h = 0, 1, \ldots, 30$. An arrow in the vertical axis indicates the contemporaneous effect (when $h = 0$). The surprises are equal to the target and path surprises (obtained with intraday data) on announcement days and zero otherwise. The sample includes all regular monetary policy announcements from January 2011 to December 2021. The 95% confidence bands are based on robust standard errors.

5.1 Daily Data on Portfolio Flows

Banxico collects daily data on the value of holdings of different types of Mexican government securities, including Treasury bills (cetes), fixed-rate bonds (bonos), floating-rate bonds (bondes) and inflation-protected bonds (udibonos). I focus on the bonos because they play a prominent role in the Mexican bond market (Banxico 2014).

The holdings data are unique because Banxico collect them daily. In fact, analyzing the effects of monetary policy on portfolio flows is challenging because of the frequency of the data. Cross-border capital flows (including portfolio flows, foreign direct investment, and banking flows) are reported quarterly, although some sources report portfolio flows monthly or even weekly. This section exploits the availability of daily data on bonos holdings to analyze how portfolio flows respond to target and path surprises.

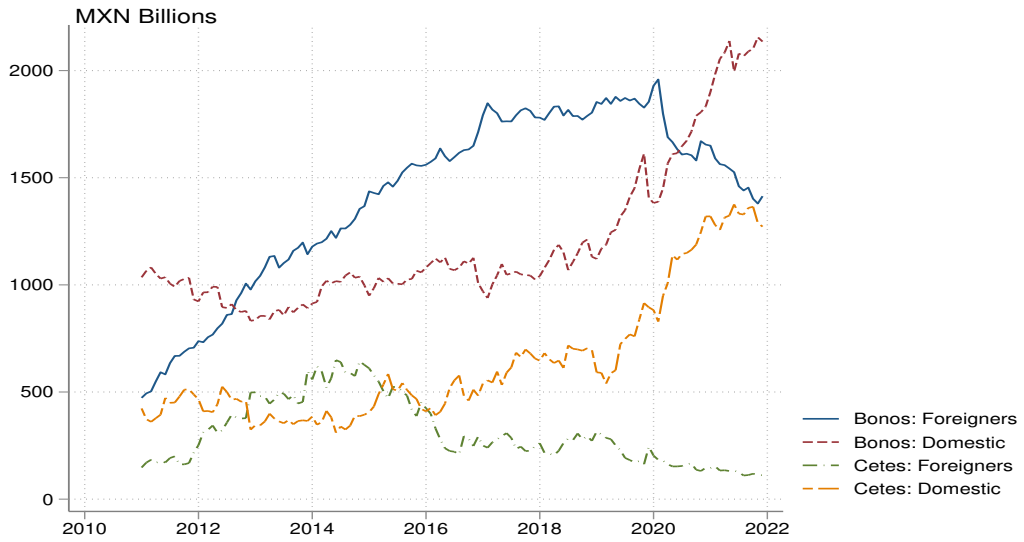
Banxico reports the bonos holdings of domestic and foreign investors. For reference, figure 4 compares the level of bonos and cetes holdings by residence from January 2011 to December 2021. Foreign investors were once the main players in the bonos market, they increased their holdings substantially since the bonos were included in the Citigroup's World Government Bond Index in 2010 and up to 2020,[35] when they reduced their exposure in response to the Covid-19 pandemic. Between late 2012 and early 2015, foreigners were also the main holders of cetes but rising hedging costs made short-term carry trade less attractive, which partly explains the decline since then.

Banxico categorizes domestic investors into banks, mutual funds, pension funds, insurers and non-financial investors (firms and households). Figure 5 displays the level of bonos holdings by domestic residents. Pension funds are key players in the bonos market, but recently non-financial investors and banks started accumulating a larger share of bonos. On the other hand, insurers and mutual funds maintain the smallest share of the market. In Mexico, insurers usually hold bonos to maturity, and most of the mutual funds are shot-term debt funds with highly liquid investments.

The holdings data need to be adjusted for valuation effects. Changes in the nominal value of bonos holdings can reflect a change in the amount of bonos and/or a change in

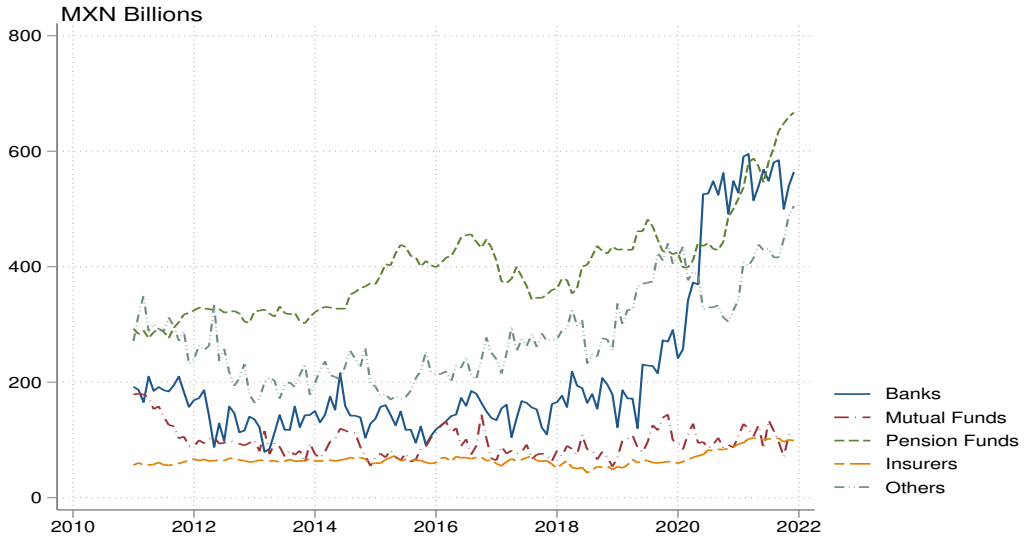
[35]This trend increased the liquidity premium in the bonos market (Christensen et al. 2021).

Figure 4. Holdings of Cetes and Bonos by Nationality



Notes: This figure shows the net holdings of Mexican Treasury bills (cetes) and fixed-rate sovereign bonds (bonos) by investor nationality from January 2011 to December 2021.

Figure 5. Holdings of Bonos by Type of Investor



Notes: This figure shows the net holdings of fixed-rate Mexican sovereign bonds (bonos) by type of domestic investor from January 2011 to December 2021.

the value of the bonos. Therefore, I deflate the nominal value of bonos holdings with a rate equal to the percentage change in the price. The daily percentage change in the price of the bonos is approximated as minus the duration times the daily change in the

yield. The duration of the bonos is calculated using the par yields from the Bloomberg Fair Value (BFV) curve for Mexico and the average maturity of the bonos reported by Banxico.[36] In this way, a change in the deflated value of bonos holdings only reflects a change in the amount of bonos regardless of price movements. This information on net purchases is then used to analyze the effects of monetary policy on portfolio flows. Although the adjustment is far from perfect, it is reasonable given the available data; for instance, the average maturity data is not broken down by tenor or by type of investor. Fortunately, the adjustment does not alter the conclusions as the next section shows.

5.2 Contemporaneous Effects

Similar to the case of asset prices, the following event-study regression quantifies the on-impact effects of target and path surprises on the flows of bonos:

$$\Delta H_t = \beta_0 + \beta_1 Target_t + \beta_2 Path_t + \varepsilon_t, \tag{5}$$

in which ΔH_t is the daily change in the (deflated) value of bonos holdings (i.e., the flows) by type of investor around monetary policy announcements. The rest is similar to equation (3). Table 4 reports the results.

Most bonos investors increase their holdings in response to a monetary tightening. By increasing the yields of bonos (see table 3), a monetary tightening incentivizes investors to buy them, which in turn restricts liquidity in the economy. This is precisely how most investors respond in table 4. For instance, pension funds buy about MXN 7 billion worth of bonos following a 25-basis-point target tightening surprise, while foreigners buy about MXN 23 billion worth of bonos after a 10-basis-point path tightening surprise; each case amounting to a little more than 1.5% of their average holdings.[37] Unsurprisingly given their small bonos holdings (see figure 5), insurers exhibit no reaction.

[36] The change in the log price of the bond, $\mathrm{d}\log(P)$, is approximately equal to $-D_{mod} \times \mathrm{d}y$, in which D_{mod} is the modified duration and $\mathrm{d}y$ is the change in the yield. Each day, the BFV yield closest to the average maturity is used to calculate D_{mod} and $\mathrm{d}y$. Banxico reports every month the average maturity (expressed in days) of the bonos outstanding. For the adjustment, the average maturity is expressed in years and rounded to the nearest integer; the same value is used for all the days in a month.

[37] Over the sample period, pension funds and foreigners hold on average around MXN 395 billion and MXN 1,415 billion worth of bonos, respectively.

Table 4. Response of Daily Bonos Flows to Target and Path Surprises

	Banks	Mutual	Pension	Insurers	Others	Foreigners
Target	-0.078	-0.26	0.26***	0.016	0.36*	0.26
	(0.27)	(0.20)	(0.076)	(0.024)	(0.18)	(0.20)
Path	-2.08*	1.89***	0.45	0.079	-0.14	2.26***
	(1.12)	(0.58)	(0.49)	(0.057)	(0.71)	(0.43)
Obs.	87	87	87	87	87	87
R^2	0.04	0.11	0.09	0.02	0.02	0.21

Notes: This table shows the coefficient estimates in regressions of different categories of bonos flows on target and path surprises. The flows are obtained as the daily change in the holdings of bonos. All flows are expressed in billions of Mexican pesos. Target and path surprises are obtained from intraday data, as explained in the main text. The sample includes all regular monetary policy announcements from January 2011 to December 2021. All regressions include a constant. Heteroskedasticity-robust standard errors are shown in parentheses. *, **, *** asterisks respectively indicate significance at the 10%, 5% and 1% level.

Table 5. Response of Daily Total Flows to Target and Path Surprises

	Cetes	Bonos
Target	0.15	0.44
	(0.18)	(0.32)
Path	-0.038	3.42***
	(0.80)	(0.80)
Obs.	87	87
R^2	0.00	0.15

Notes: This table shows the coefficient estimates in regressions of daily cetes and bonos flows on target and path surprises. The flows are expressed in billions of Mexican pesos. Target and path surprises are obtained from intraday data, as explained in the main text. The sample includes all regular monetary policy announcements from January 2011 to December 2021. All regressions include a constant. Heteroskedasticity-robust standard errors are shown in parentheses. *, **, *** asterisks respectively indicate significance at the 10%, 5% and 1% level.

Banks respond differently. While other investors increase their holdings of bonos following a monetary tightening, banks sell them. Intuitively, they now can achieve a higher yield with shorter-term securities. Section 5.3 discusses this result in more detail.

Banxico seems to accompany path tightening surprises with sales of bonos. The magnitudes for the responses to path surprises in table 4 suggest that there are more buyers than sellers. Table 5 confirms that the amount of bonos outstanding after a path surprise increases. It is unlikely that the government issues more bonos in response to path tightening surprises, but the central bank could indeed provide the extra bonos to meet the demand.

For robustness, table A.3 in the appendix reports the results of estimating equation (5) using the daily change in the value of bonos holdings with no valuation adjustment. In terms of magnitude, the adjustment makes little difference for domestic investors; for foreigners, although the effect of path surprises decreases, it is still statistically significant.

In summary, investors rebalance their bonos portfolios in response to monetary policy based on their business model and Banxico accommodates an excess demand for them.

5.3 Persistence

As in section 4.2, I use local projections to analyze the persistence of the effects on the holdings of bonos. Specifically, I run the following regressions:

$$H_{t+h} - H_{t-1} = \alpha_h + \beta_h^1 \, Target_t + \beta_h^2 \, Path_t + \eta_h^{'} z_{t-1} + u_{t+h}, \tag{6}$$

in which the dependent variable is the change in the holdings of bonos by type of investor over h days, $h = 0, 1, \ldots, 30$. The rest is similar to the case with asset prices in equation (4), except that the vector of lagged variables z_{t-1} now controls for potential drivers of the flows. The parameters of interest are again β_h^1 and β_h^2.

Figures 6 and 7 display the impulse responses for bonos flows.[38] As with asset prices, the contemporaneous effect (when $h = 0$) on bonos flows is indicated with an arrow next to the vertical axis, and all responses are assessed relative to a one basis point tightening surprise. Flows above and below the horizontal axis indicate purchases and sales of bonos, respectively. The flows are expressed in billions of pesos.

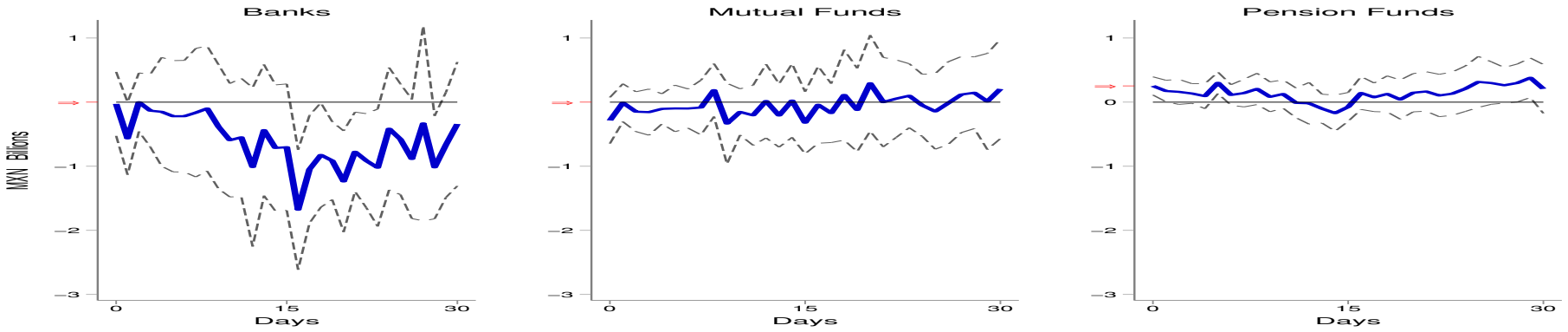
Investors response is sluggish. This delayed adjustment in the bonos holdings of some investors aligns with the post-announcement drift displayed by the yields (see figure 3) and is consistent with a slow-moving capital explanation in which big players take time to respond to the surprises (Brooks et al. 2019). See, for instance, the responses by banks to a target surprise and by foreigners to a path surprise.

Investors do rebalance their bonos portfolios based on their business model. For instance, after a target tightening surprise, pension funds buy bonos but banks sell them, reflecting their different investment profiles. Banks have a shorter investment horizon than pension funds. Specifically, the average maturity of the bonos held by banks is less than 5 years, while for pension funds it is more than 10 years (Banxico 2014).

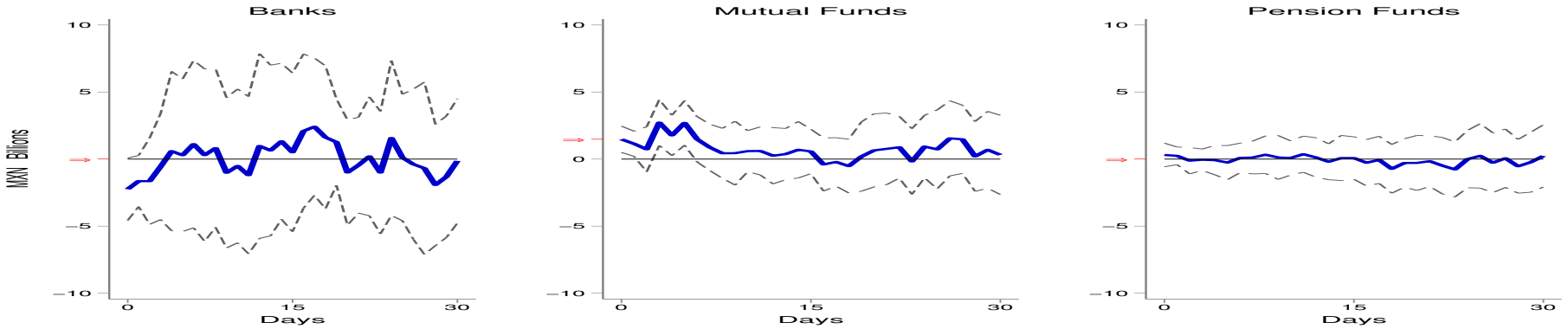
In particular, Mexican banks exhibit a reach-for-yield behavior. The response of banks to target surprises (top left panel of figure 6) implies that they buy bonos a few days after a target easing surprise. Intuitively, banks offset the negative effects of a target easing surprise on their current income by rebalancing their portfolio toward long-term bonds,

[38] For reference, figures A.1 and A.2 in the appendix show the impulse responses for cetes flows.

Figure 6. Response of Bonos Flows to Target and Path Surprises



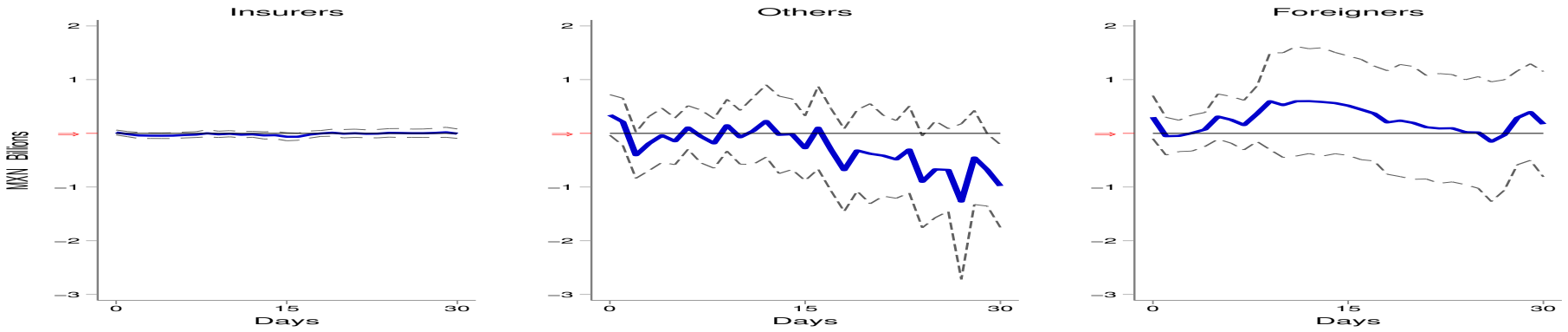
(a) Target Surprise



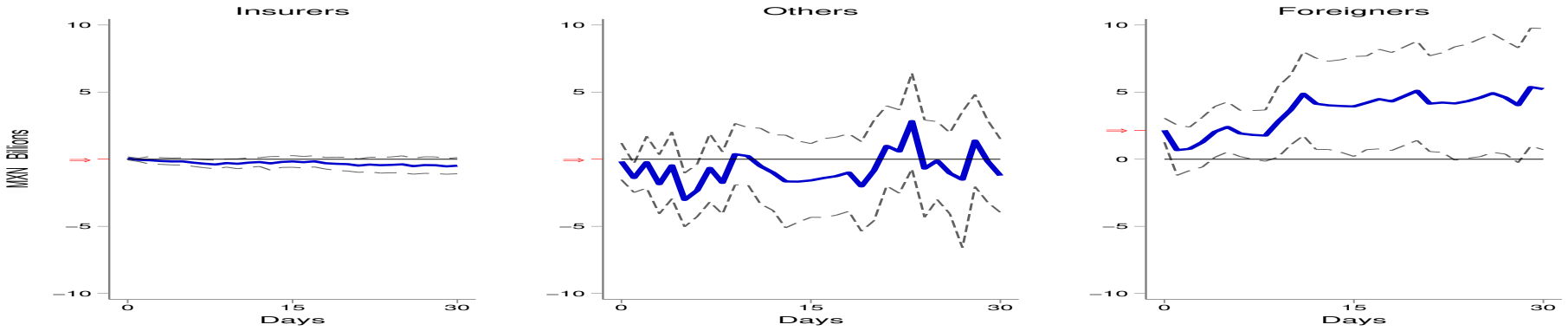
(b) Path Surprise

Notes: This figure plots the coefficient estimates and 95% confidence intervals for 1 basis point target and path tightening surprises for bonos flows from day $t-1$ to day $t+h$, where t is a day with a monetary policy announcement and $h = 0, 1, \ldots, 30$. An arrow in the vertical axis indicates the contemporaneous effect (when $h = 0$). The surprises are equal to the target and path surprises (obtained with intraday data) on announcement days and zero otherwise. The sample includes all regular monetary policy announcements from January 2011 to December 2021. The 95% confidence bands are based on robust standard errors.

Figure 7. Response of Bonos Flows to Target and Path Factors (cont.)



(a) Target Surprise



(b) Path Surprise

Notes: This figure plots the coefficient estimates and 95% confidence intervals for 1 basis point target and path tightening surprises for bonos flows from day $t-1$ to day $t+h$, where t is a day with a monetary policy announcement and $h = 0, 1, \ldots, 30$. An arrow in the vertical axis indicates the contemporaneous effect (when $h = 0$). The surprises are equal to the target and path surprises (obtained with intraday data) on announcement days and zero otherwise. The sample includes all regular monetary policy announcements from January 2011 to December 2021. The 95% confidence bands are based on robust standard errors.

which lowers their yields. Mexican banks thus respond like the yield-oriented investors described by Hanson and Stein (2015), for which a monetary easing induces them to take on more interest rate risk and to push down the term premia of bond yields. They are therefore key for Banxico to influence the term premium. This result supports one of the explanations discussed in section 4.1.2 of why the yield curve in Mexico responds stronger to monetary policy than the U.S. yield curve, yet it does not discard the other one.

Finally, foreign investors are key in the transmission of path surprises. They reallocate their portfolios toward bonos in the month following a tightening of the monetary stance going forward. Their role helps to explain the strong effect of path surprises on bond yields reported in section 4.1.2. The response of foreign investors is thus relevant for central banks in emerging markets. An important implication of this result is that portfolio flows to emerging markets respond not only to the monetary policy of advanced economies (Chen et al. 2014, Curcuru et al. 2015, Fischer 2020), but also to that of the host country.

In summary, domestic and foreign investors are key in the transmission of target and path surprises.

6 Concluding Remarks

This paper uses a new high-frequency dataset to identify monetary policy surprises in an emerging economy. The evidence shows that the central bank conducts monetary policy by adjusting its current policy rate and by managing expectations about its future path via statements, both of which influence asset prices and portfolio flows. The multidimensionality of monetary policy is therefore not exclusive to central banks in advanced economies and does not require the zero lower bound to be binding.

Having the ability to manage market expectations about the future path of the policy rate via statements improves the implementation of monetary policy in emerging markets. Their central banks can better influence medium- and long-term interest rates, which are relevant for the spending decisions of households and businesses. They also have more room than previously thought to deal with periods of high inflation as well as with the

spillover effects of monetary policies implemented in advanced economies.

Given the importance of statements documented here, central banks in emerging markets can follow best practices in monetary policy communications, including brief, clear and concise language without compromising the main message. References to non-monetary policy issues (e.g. structural reforms) should be minimal, if any.[39]

The results in this paper can be extended in several directions. For instance, decomposing the Mexican sovereign yields can provide additional evidence on the transmission of the two types of monetary policy surprises. In addition, the host country perspective for portfolio flows seems relevant for emerging markets in connection with macroprudential policies. In particular, given how foreign investors rebalance their portfolios in response to local monetary policy surprises, policymakers could be interested in the interaction of target and path surprises with different macroprudential policies, including capital controls. Finally, more research is needed to assess the extent to which the results reported here apply to other emerging markets.

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[39] On this regard, Banxico committed to issue clear and concise statements in February 2020. The guidelines are publicly available at `https://www.banxico.org.mx/publicaciones-y-prensa/miscelaneos/%7B4C09D772-2CDF-8BD6-3F04-65DE03CA6212%7D.pdf`.

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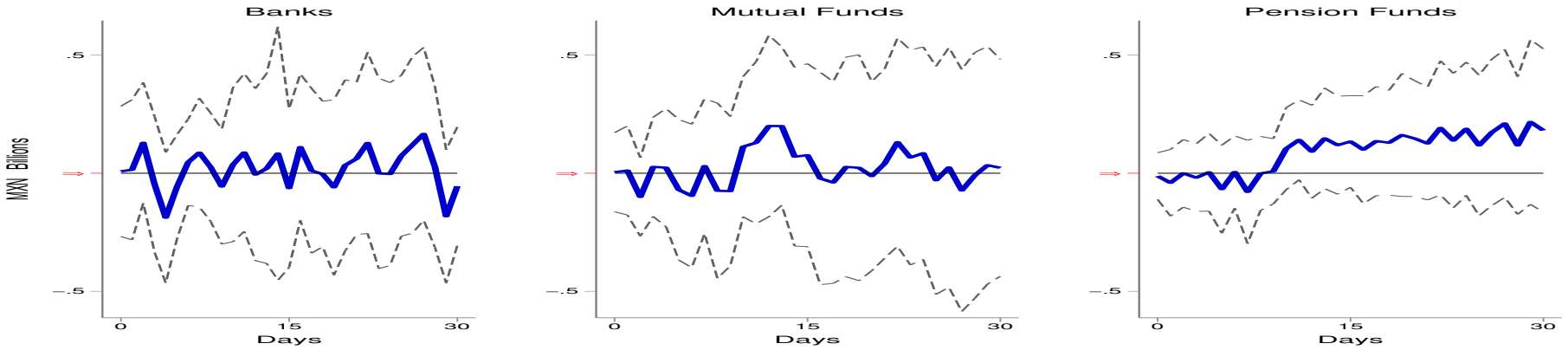
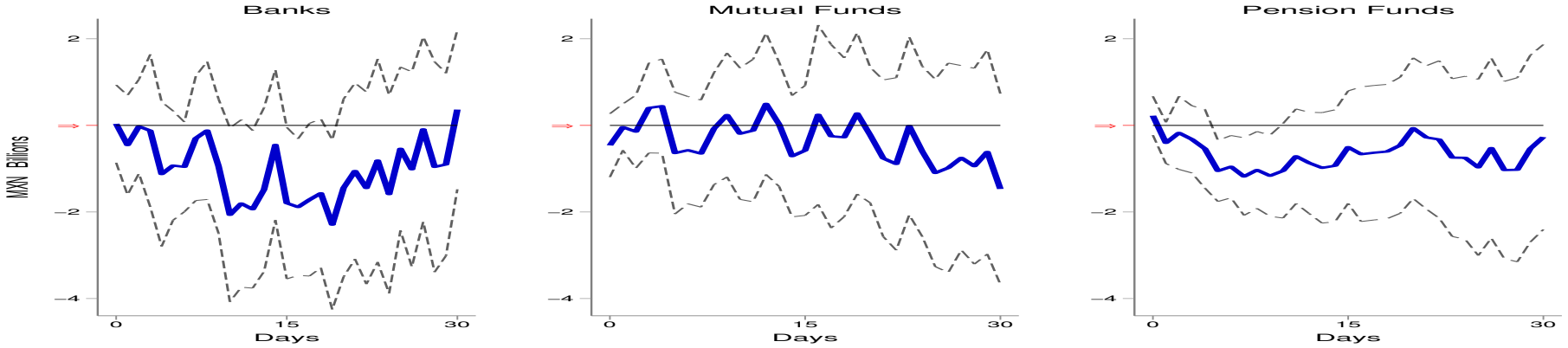
Online Appendix

Do Central Bank Words Matter in Emerging Markets? Evidence from Mexico

Figure A.1. Response of Cetes Flows to Target and Path Surprises



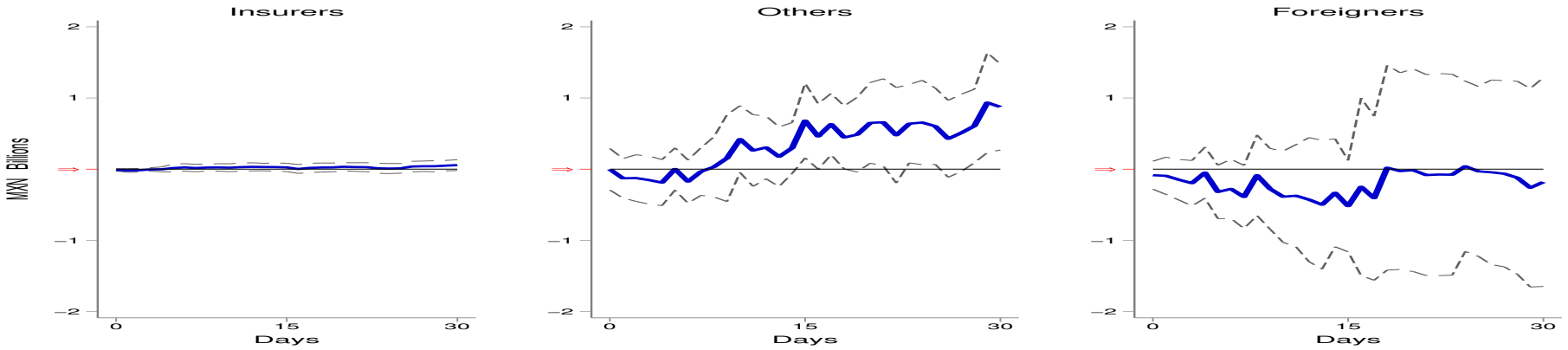
(a) Target Surprise



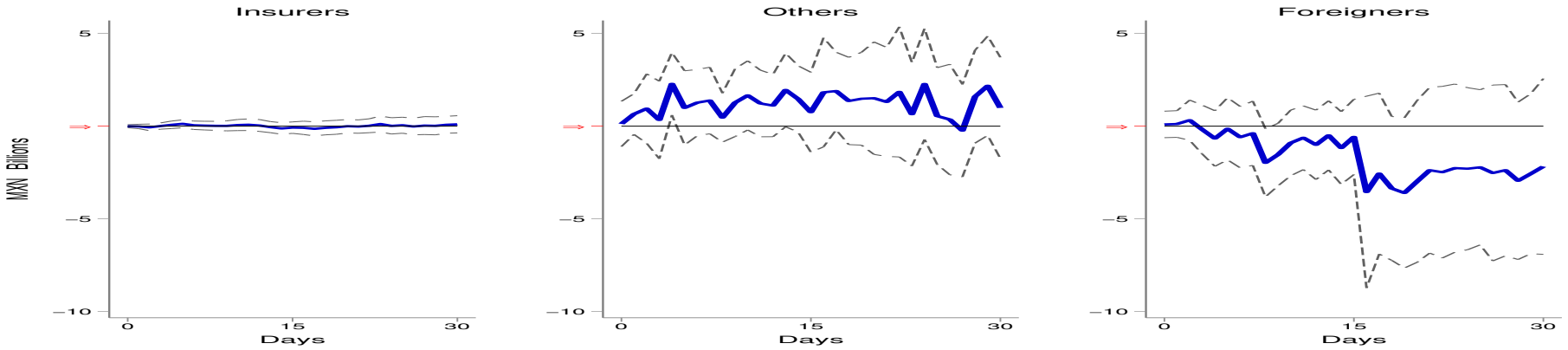
(b) Path Surprise

Notes: This figure plots the coefficient estimates and 95% confidence intervals for 1 basis point target and path tightening surprises for cetes flows from day $t-1$ to day $t+h$, where t is a day with a monetary policy announcement and $h = 0, 1, \ldots, 30$. An arrow in the vertical axis indicates the contemporaneous effect (when $h = 0$). The surprises are equal to the target and path surprises (obtained with intraday data) on announcement days and zero otherwise. The sample includes all regular monetary policy announcements from January 2011 to December 2021. The 95% confidence bands are based on robust standard errors.

Figure A.2. Response of Cetes Flows to Target and Path Surprises (cont.)



(a) Target Surprise



(b) Path Surprise

Notes: This figure plots the coefficient estimates and 95% confidence intervals for 1 basis point target and path tightening surprises for cetes flows from day $t-1$ to day $t+h$, where t is a day with a monetary policy announcement and $h = 0, 1, \ldots, 30$. An arrow in the vertical axis indicates the contemporaneous effect (when $h = 0$). The surprises are equal to the target and path surprises (obtained with intraday data) on announcement days and zero otherwise. The sample includes all regular monetary policy announcements from January 2011 to December 2021. The 95% confidence bands are based on robust standard errors.

Table A.1. Response of Swap Rates to Z_1 and Z_2 Factors

	3M-Swap				12M-Swap			
	Intraday		Daily		Intraday		Daily	
Intraday Z_1 Factor	0.998***	0.998***			1.080***	1.080***		
	(0.011)	(0.011)			(0.066)	(0.037)		
Intraday Z_2 Factor		–0.000				1.140***		
		(0.089)				(0.400)		
Daily Z_1 Factor			1.000***	1.000***			0.974***	0.974***
			(0.007)	(0.007)			(0.075)	(0.014)
Daily Z_2 Factor				–0.000				0.887***
				(0.012)				(0.024)
Constant	–0.205***	–0.205***	–0.326***	–0.326***	0.091	0.091	–0.375	–0.375***
	(0.062)	(0.063)	(0.062)	(0.062)	(0.362)	(0.247)	(0.488)	(0.139)
Obs.	87	87	190	190	87	87	190	190
R^2	0.994	0.994	0.992	0.992	0.859	0.935	0.641	0.971

Notes: For the 3-month swap rate, the table shows the coefficient estimates in regressions of intraday and daily changes in the 3-month swap rate on the Z_1 and Z_2 factors obtained from intraday and daily data, as explained in the main text. Similarly for the 12-month swap rate. Daily changes are calculated around monetary policy announcements; intraday changes are calculated starting 10 minutes before to 20 minutes after a monetary policy announcement. The sample includes all regular monetary policy announcements up to December 2021; the sample starts in January 2011 with intraday data, and in January 2004 with daily data. All variables are expressed in basis points. Heteroskedasticity-robust standard errors are shown in parentheses. *, **, *** asterisks respectively indicate significance at the 10%, 5% and 1% level.

Table A.2. Response of Asset Prices to Daily Target and Path Surprises

	FX Returns		Δ 2Y Yield		Δ 5Y Yield		Δ 10Y Yield		Δ 30Y Yield	
Target	-2.16***	-2.16***	0.68***	0.68***	0.55***	0.36***	0.42***	0.42***	0.29***	0.29***
	(0.76)	(0.68)	(0.082)	(0.090)	(0.14)	(0.077)	(0.080)	(0.088)	(0.076)	(0.085)
Path		-1.37*		0.23**		0.52***		0.28***		0.29***
		(0.71)		(0.12)		(0.070)		(0.11)		(0.093)
Constant	-9.17***	-9.17***	-0.21	-0.26	-0.63	-0.33	-0.54	-0.60	-0.74*	-0.81**
	(3.25)	(3.19)	(0.39)	(0.36)	(0.46)	(0.38)	(0.41)	(0.37)	(0.40)	(0.36)
Obs.	87	87	71	71	56	56	71	71	71	71
R^2	0.24	0.28	0.75	0.78	0.43	0.67	0.52	0.60	0.35	0.48

Notes: The first column for each dependent variable shows the coefficient estimates in regressions of *intraday* yield changes or exchange rate (FX) returns on target surprises; the second column adds path surprises as a regressor. Target and path surprises are obtained from *daily* data. Intraday changes are calculated starting 10 minutes before to 20 minutes after a monetary policy announcement. The sample includes all regular monetary policy announcements starting on January 2011 for the exchange rate, on January 2013 for 2- 10- and 30-year yields, and on December 2014 for 5-year yields; the sample ends on December 2021 in all cases. Figures are expressed in basis points. Heteroskedasticity-robust standard errors are shown in parentheses. *, **, *** asterisks respectively indicate significance at the 10%, 5% and 1% level.

Table A.3. Response of Daily Bonos Flows to Target and Path Surprises: No Valuation Adjustment

	Banks	Mutual	Pension	Insurers	Others	Foreigners
Target	-0.13	-0.29	0.16**	-0.0016	0.29	-0.11
	(0.27)	(0.21)	(0.073)	(0.022)	(0.18)	(0.12)
Path	-2.47**	1.79***	-0.14	-0.012	-0.59	0.59**
	(1.12)	(0.58)	(0.46)	(0.055)	(0.74)	(0.24)
Obs.	87	87	87	87	87	87
R^2	0.05	0.10	0.03	0.00	0.02	0.06

Notes: This table shows the coefficient estimates in regressions of different categories of bonos flows on target and path surprises. The flows are obtained as the daily change in the holdings of bonos without making a valuation adjustment. All flows are expressed in billions of Mexican pesos. Target and path surprises are obtained from intraday data, as explained in the main text. The sample includes all regular monetary policy announcements from January 2011 to December 2021. All regressions include a constant. Heteroskedasticity-robust standard errors are shown in parentheses. *, **, *** asterisks respectively indicate significance at the 10%, 5% and 1% level.