BANK FOR INTERNATIONAL SETTLEMENTS

Communication, Monetary Policy and Financial Markets in Mexico

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The views in this presentation do not reflect necessarily those of the BIS.

Motivation

- Extended literature analyzing the effect of central bank (CB) communication on financial markets.
  - Most of it focuses on the direct impact on financial variables or its expectations.
  - The purpose is to check if communication increases the "signal-to-noise" ratio.
- Another line of research focuses in transforming the CB communication into sentiment indicators and studying directly their effect or relationship with financial variables.
- This paper: We study the effect of CB communications on the reports of chief economists of private financial institutions (e.g. JPMorgan, BofA, Citi), which in turn can affect financial markets, together with the CB communication itself.

Why is this relevant?

- Based on their interpretation of CB communications, economic analysts make recommendations of portfolio positions for fixed income, equity and FX markets to their clients (investors, fund managers, firms, etc).
- CB also follow carefully what analysts write about its communications and maintain a close relationship with them (e.g. private meetings).
- This is a very important communication channel between authorities and financial markets in EME, recipients of capital inflows and where less analysis is made (versus AE).

Introduction

- We study the impact of the monetary policy decision (MPD) and the minutes of the monetary policy decision (MMPD) published by Central Bank of Mexico in analysts' reports.
  - Analysts discuss the outlook and the possible CB concerns in the days *prior* the publication of both the MPD and its minutes.
  - Then, *after* both the MPD and the MMPD they discuss and interpret them and make recommendations.
- We avoid sentiment issues
- We measure
  - The change of coverage of topics before and after the MPD and the MMPD
  - How much do topics in the MMPD are absorbed in reports

Data

- We use raw text of the analysts reports on CB minutes from 24 private financial institutions, between 2011 and 2019.
- 71 MPD in total
- Private banks issue one report before the MPD, one report just after, and reports before and after the release of the MMPD.

	Before MPD	After MPD	Before MMPD	MMPD	After MMPD
Sentences (average by bank)	16	23	11	163	25
Banks (average)	9	14	6		10
Total Sentences	10,513	22,008	4,380	12,879	16,856

Data

Feb 2015. Undisclosed Bank's report before MMPD

We expect the minutes to show that for the majority of Directors, perhaps all, the **balance of risks for global growth** continued to deteriorate while the outlook for global inflation has improved.

We expect the minutes to show that an extensive discussion about the **currency** took place among directors.

We expect the minutes to show directors are concerned with the possibility of renewed bouts of **volatility in global financial markets** and their potential impact on the **FX market**, particularly against the backdrop where the policy rate in the US is expected to increase during 2015.

Some directors *are expected* to have argued that given the current and expected environment, domestic policies should be strengthened, fiscal in particular, but monetary as well.

We expect the majority of directors:

To judge that there are still important downside risks to activity on the expectation that the slow recovery of **domestic demand** is expected to persist over the coming months.

To argue that inflation has evolved as expected and to continue to anticipate a constructive/benign inflation outlook for 2015 with core inflation tracking below the 3.0% target.

To judge that the balance of risk for inflation did not change from the previous meeting and to identify as a potential upside risk to inflation the possibility that the MXN remains at current levels for a prolonged period of time, or depreciates further.

Data

Feb 2015. Undisclosed Bank's report after MMPD

In our assessment, the policy rate bias going forward remains neutral, but we found the minutes distinctly hawkish.

The MPC showed significant concern with **financial market volatility** and **FX-related risks** and did not read much from the lower-than-expected 1H Jan inflation prints.

Furthermore, although the MPC was certainly not upbeat, it was also not particularly concerned with the outlook for **domestic activity**, although it judges that there are still important downside risks to activity.

Overall, the MPC seemed squarely focused on **financial and FX risks** and the need to strengthen domestic policies—fiscal as well as monetary—…

Furthermore, the MPC also seems focused in consolidating the recent reduction of inflation towards…

The majority of directors expressed concern over the impact on **financial stability of additional exchange rate depreciation**. One director stressed that the risk of financial instability is very relevant …

In addition, some directors went as far as highlighting the risk that **portfolio rebalancing** (i.e., outflows) that could impact the exchange rate and compromise domestic **financial stability**.

The majority of directors stressed the need to strengthen macro policy given the **drop in oil prices** and the possibility of higher rates in the United States.

Methodology: Semantic features for words

- We use GloVe, an unsupervised learning algorithm for obtaining vector representations for words.

- We fitted this model using text in Spanish with approximately 800 million words (all the Spanish version of Wikipedia, around 200 Mexican news sites that account for approximately 200 million sentences, and diverse content regarding financial and monetary economics.

Outline of (the results of) the paper

- Does this even work for financial texts in Spanish?
  - Probably needs its own paper. Comments are welcome!
- Can we visualize the topics of the sentences? Do they make sense?
  - We remove 5 PCA components to force sentences to be different (e.g. there are no sentences discussing "soccer" in the analysts' reports).
  - LDA clusters in two dimensions
- Can we measure how much do topics change?
  - If they do, are the magnitudes of the changes correlated with the magnitudes of changes in financial variables?

Does this even work for financial texts in Spanish?

- Word vectors are called word embeddings and capture semantic and syntactic regularities:
  - Words with similar meaning lie near in this vector space
  - Cosine distance between vectors translates into semantic dissimilarity
  - It is robust to catch synonyms and composition of words
  - **Using our data**, relationships like the following hold **in Spanish**:

king - queen ~ man – woman

brother - man + woman ~ sister

board + governors + decision ~ MPD

raise + rate ~ rate + hike

hacienda – fiscal + monetaria ~ banxico

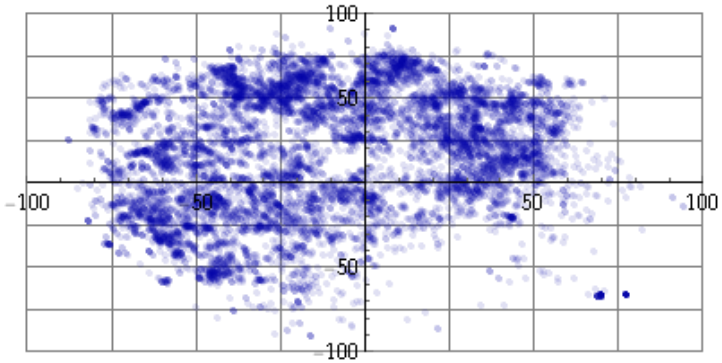
Does this even work for financial texts in Spanish?

Cosine of the angle between the 300-dimensional vectors for selected words

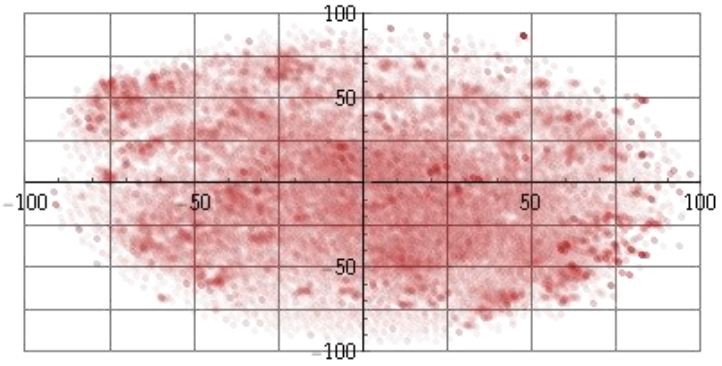
	banxico	monetaria	inflacion	banco + central	reserva + federal	estados + unidos	deficit	recaudacion	impuestos	ingresos	egresos	presupuesto	hacienda	fiscal	haciendas
banxico	1.00	0.62	0.58	0.38	0.25	0.01	0.22	0.13	0.12	0.17	0.25	0.23	0.20	0.25	0.01
monetaria	0.62	1.00	0.67	0.39	0.27	0.08	0.31	0.26	0.23	0.23	0.11	0.18	0.16	0.41	0.03
inflacion	0.58	0.67	1.00	0.33	0.20	0.07	0.39	0.22	0.26	0.32	0.17	0.19	0.11	0.30	-0.01
banco + central	0.38	0.39	0.33	1.00	0.43	0.19	0.17	0.08	0.10	0.18	0.01	0.15	0.26	0.26	0.01
reserva + federal	0.25	0.27	0.20	0.43	1.00	0.22	0.15	0.10	0.18	0.25	0.25	0.35	0.35	0.39	0.04
estados + unidos	0.01	0.08	0.07	0.19	0.22	1.00	0.00	0.10	0.13	0.18	-0.02	0.16	-0.01	0.14	-0.09
deficit	0.22	0.31	0.39	0.17	0.15	0.00	1.00	0.31	0.31	0.42	0.28	0.38	0.19	0.38	0.02
recaudacion	0.13	0.26	0.22	0.08	0.10	0.10	0.31	1.00	0.52	0.54	0.31	0.49	0.22	0.42	0.03
impuestos	0.12	0.23	0.26	0.10	0.18	0.13	0.31	0.52	1.00	0.60	0.29	0.40	0.36	0.48	0.21
ingresos	0.17	0.23	0.32	0.18	0.25	0.18	0.42	0.54	0.60	1.00	0.47	0.54	0.37	0.41	0.17
egresos	0.25	0.11	0.17	0.01	0.25	-0.02	0.28	0.31	0.29	0.47	1.00	0.68	0.33	0.38	0.00
presupuesto	0.23	0.18	0.19	0.15	0.35	0.16	0.38	0.49	0.40	0.54	0.68	1.00	0.40	0.45	-0.01
hacienda	0.20	0.16	0.11	0.26	0.35	-0.01	0.19	0.22	0.36	0.37	0.33	0.40	1.00	0.49	0.48
fiscal	0.25	0.41	0.30	0.26	0.39	0.14	0.38	0.42	0.48	0.41	0.38	0.45	0.49	1.00	0.01
haciendas	0.01	0.03	-0.01	0.01	0.04	-0.09	0.02	0.03	0.21	0.17	0.00	-0.01	0.48	0.01	1.00

Can we visualize the sentences?

- Two-dimensional representation of the relative frequency of the subjects of all the sentences written by Banco de México and analysts, 2011-2019
  - Every sentence had its 5 principal components removed before being projected in two dimensions

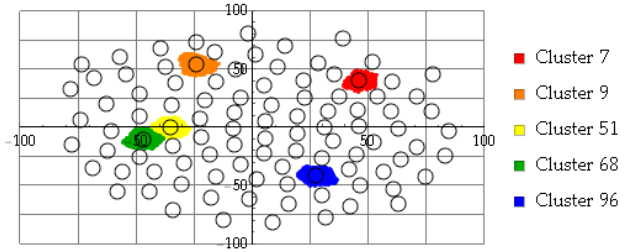


Written by Banxico



Written by Analysts

Can we visualize the sentences? Do they make sense?



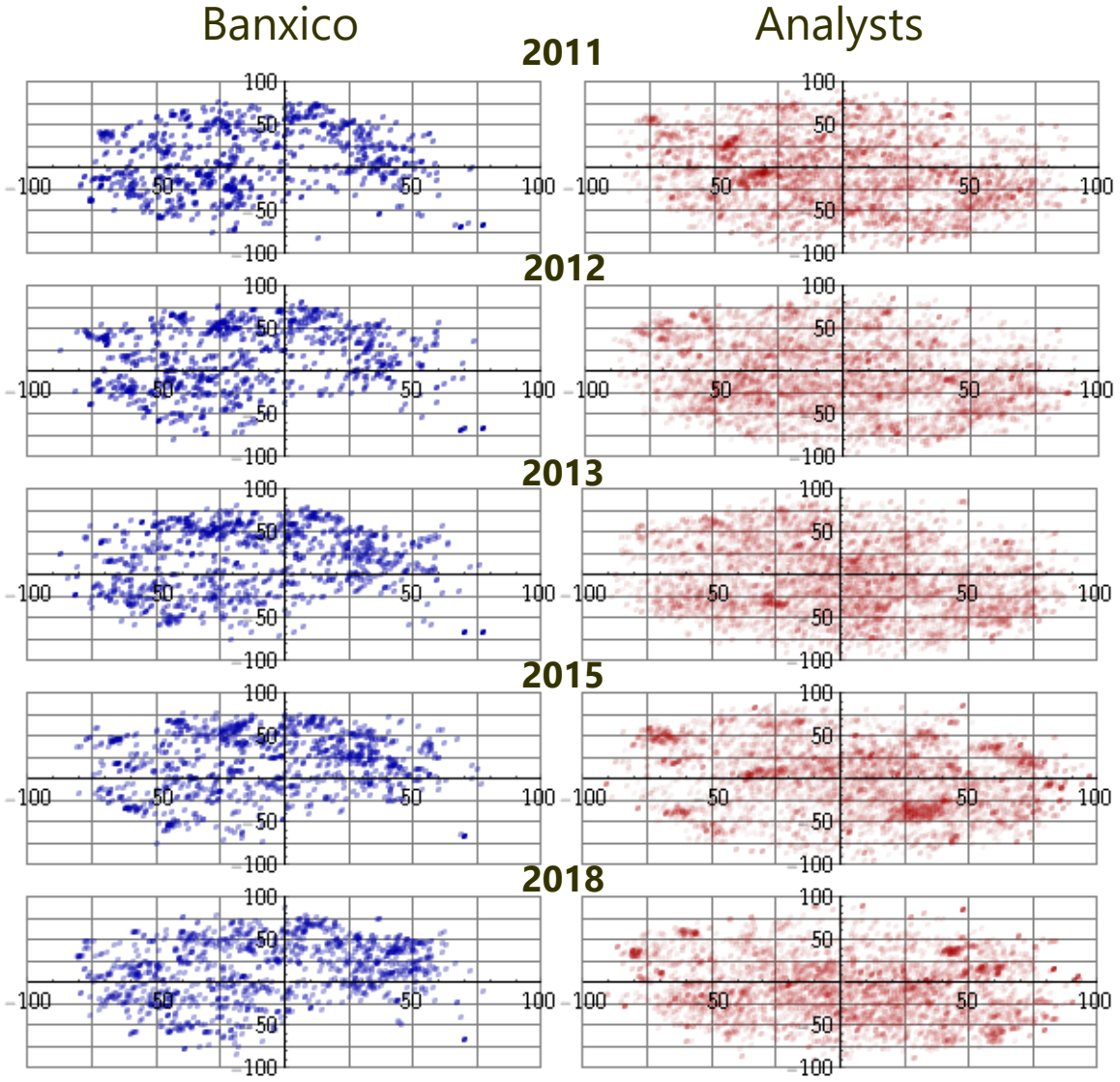
Cluster 7:
Negotiations, trade, tariffs, exchange rate and North America

Cluster 9:
"upward revision", "sustained growth"

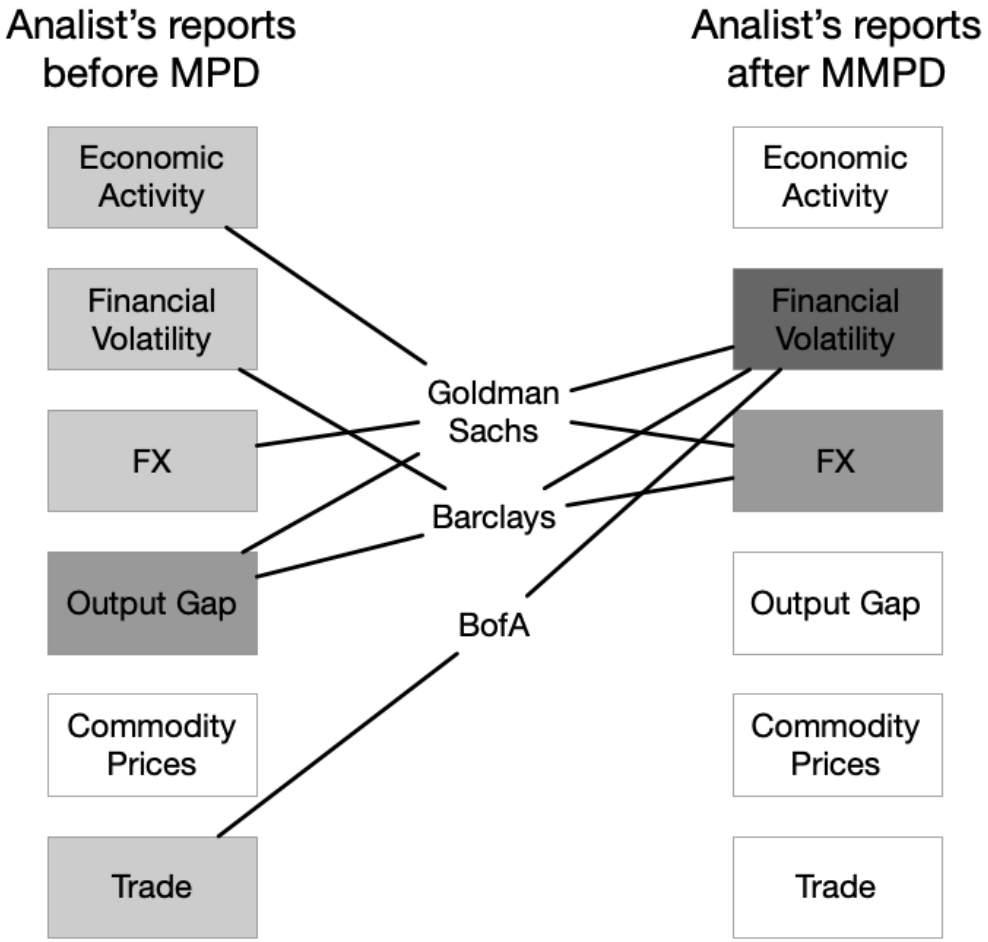
Cluster 51:
Inflation: gasoline, oil, food prices

Cluster 68:
Inflation levels: general prices

Cluster 96:
Opinions on Banxico's actions with respect to the Fed



Can we measure how much do topics change?



Can we measure how much do topics change?

- We see how topic coverage changes in the four moments around each MPD
  - Reports before the MPD
  - Reports after the MPD
  - Minutes of the MPD
  - Reports after the MMPD
- We model how sentences are distributed across topics in each moment as a Multinomial(n, p) and how this distribution changes across moments using the Hellinger distance between distributions

$$H(P,Q) = \sqrt{\frac{1}{2}\sum_i (\sqrt{p_i} - \sqrt{q_i})^2}$$

- We call this a measure of surprise, it is higher if topics coverage is dissimilar

Can we measure how much do topics change?

Topic	Mean change before & after MMPD	Mean change before & after MPD	Frequency in minutes and before & after MMPD	Frequency before & after MMPD	Topic interpretation
2	0.12	-0.20	9	25	Future decisions of MPC; tone of its communication
3	-1.46	2.02	13	29	Risk balances on inflation: short term
6	0.73	-0.12	31	41	MPC and its actions on inflation
8	-0.13	-0.37	0	32	Announcements about MMPD
14	0.74	-0.22	16	22	Interpretations of future CB actions
15	1.26	-0.04	23	33	References to CB communication
17	-0.80	-0.50	8	31	FX levels
21	-0.20	0.67	34	36	Labor market and its slackness
23	-0.89	1.69	27	31	CB views on growth risks
24	-0.10	-0.52	17	31	CB actions on FX and financial markets
25	0.04	0.42	21	21	Foreign outlook: developed countries
28	0.37	-0.40	24	37	Interpretations of forecasts on MPD
31	-0.32	-0.09	24	24	Real economy: consumption, industrial, investment
33	2.21	-0.29	2	24	About the tone of CB communication
35	-0.20	0.56	30	30	Output gap, growth and slackness
37	-0.85	0.96	18	25	Components of growth
39	-0.46	0.04	0	30	Rate forecasts
42	-0.03	0.08	22	22	Drivers of financial flows into Mexico
45	-0.08	-0.47	3	24	Forecasts, opinions: rate changes
46	-0.03	-1.44	21	27	On the votes for the MPD
47	0.53	-0.36	19	25	Drivers of voting in the MPD
48	0.23	0.91	18	21	Discussion about inflation drivers
51	-0.66	0.38	27	31	Inflation: core, gasoline and agricultural

CB minutes don't make forecasts about future rate changes (topic 39), neither they issue opinions on these forecasts (topic 45).

Changes in comments about the tone of Banxico's communication (topic 33) are more likely to be induced by the MMPD than by the MPD.

Comments about the drivers of MPD voting (topic 47) are induced by the MMPD rather than by the MPD.

Can we measure how much do topics change?

- The surprise induced by the MMPD on analyst reviews is (almost always) greatly reduced if the initial analyst distribution is updated with the sentences in the minute, this suggests that the emphasis on topics covered by the minutes is absorbed by the analysts narrative.
- We compute the surprises between analyst reviews and the uniform distribution to test whether the concentration of topics increases after the MPD and after the MPDD.
- Proximity to the uniform distribution (in which entropy is maximal) is interpreted as a low topic concentration, which suggests whether analysts don't agree in which topics are a priority and might have driven the MPD or that they write just about every topic.
- We found the concentration of topics to increase after the MMPD 58% of times, whereas the concentration of topics decreases 96% of the times after the MPD.

Financial variables?

Changes in the distribution of the topics are correlated with changes in financial variables: Absolute change of long term government bonds, and Absolute change and change of USDMXN

	20-year Bond		10-year Bond		USDMXN Abs Chg		USDMXN Chg	
	(1)†	(2)	(3)†	(4)	(5)†	(6)	(7)†	(8)
MMPD Surprise	0.321**	0.265**	0.248*	0.190*				
	(0.100)	(0.089)	(0.097)	(0.084)				
US Yield Curve Chg	0.063	0.098	0.219*	0.1968*	0.009	0.017	0.000	0.000
	(0.112)	(0.102)	(0.108	(0.096)	(0.012)	(0.012)	(0.021)	(0.005)
MPD Surprise					−0.014*	−0.012*	0.023*	0.020+
					(0.006)	(0.006)	(0.011)	(0.010)
Rate Spread Before					−0.003	−0.001	0.004	0.000
					(0.004)	(0.003)	(0.006)	(0.005)
Rate Spread After					0.000	0.000	−0.003	−0.001
					(0.003)	(0.003)	(0.006)	(0.004)
Intercept	−0.108	−0.074	−0.068	−0.042	0.022	0.015	−0.018	−0.007
Observations	63	63	63	63	64	64	64	64
R^2	0.329	0.147	0.297	0.143	0.312	0.180	0.235	0.080

Standard errors in parenthesis.
† Marked models include year fixed effects.
+ $p < 0.1$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Conclusion

- Conventional text analysis techniques seem to work well for financial texts in Spanish
- Defining the topics as a two-dimensional representation of sums of words in the same sentence, we observe more **coincidence** around the topics *after* the minutes.
- This could mean that the CB's messages are a good source of information regarding the explanation of the current and future monetary policy actions.
- After a CB communication, if the messages add some information to the markets, there is evidence of some reaction in financial variables.