The Impact of Monetary Surprises on Exchange Rates: Insights from a Textual Analysis Approach on a Panel of Countries

Working Paper

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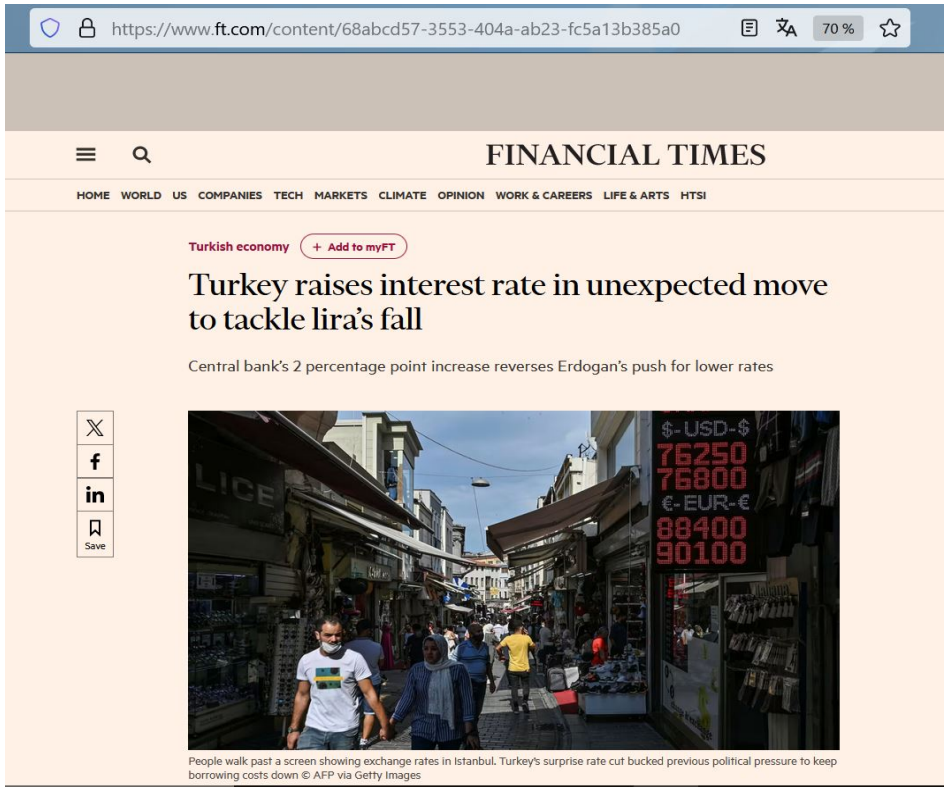
Introduction



Monetary surprise : a monetary policy decision that contradicts the expectations of the financial markets regarding this decision.

图 1: Article of Financial Times about a surprise rate hike of The Central Bank of the Republic of Turkey on 24 September 2020

Introduction

图 2: FocusEconomics article on 24 September 2020 monetary policy communication of The Central Bank of the Republic of Turkey: the decision contained a surprise

Introduction

- Exchange rates react instantly to surprising monetary policy announcements
- Transmission of monetary policy: exchange rate channel
- Uncovered Interest Rate Parity describes an absence of arbitrage opportunities: a rise (fall) in domestic key interest rates is accompanied by an appreciation (depreciation) of the domestic currency through immediate purchases (sales) on Forex market.

Introduction

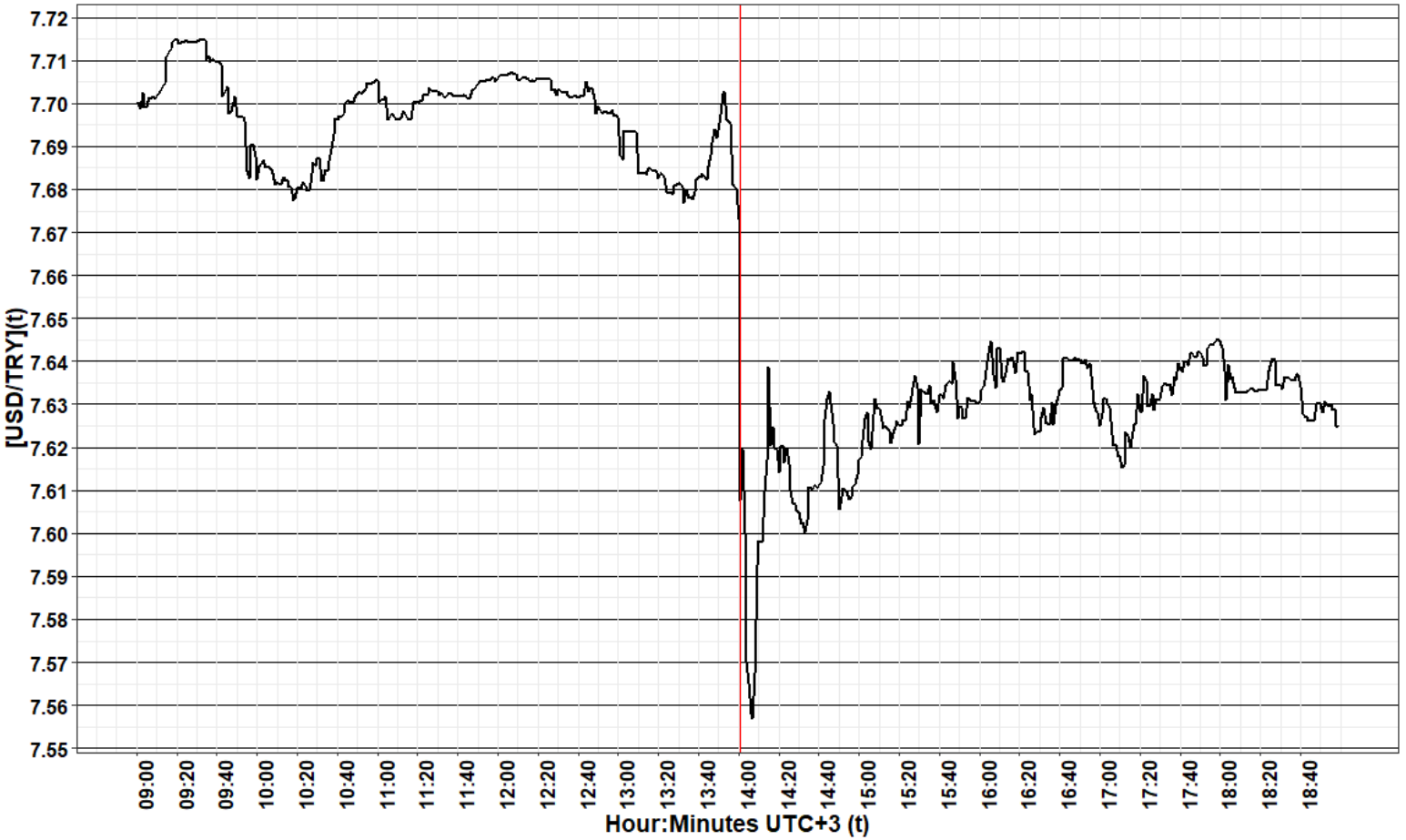


图 3: US Dollar against 1 Turkish Lira on 24 September 2020 : the Turkish Central Bank's monetary policy decision contained a surprise

Introduction

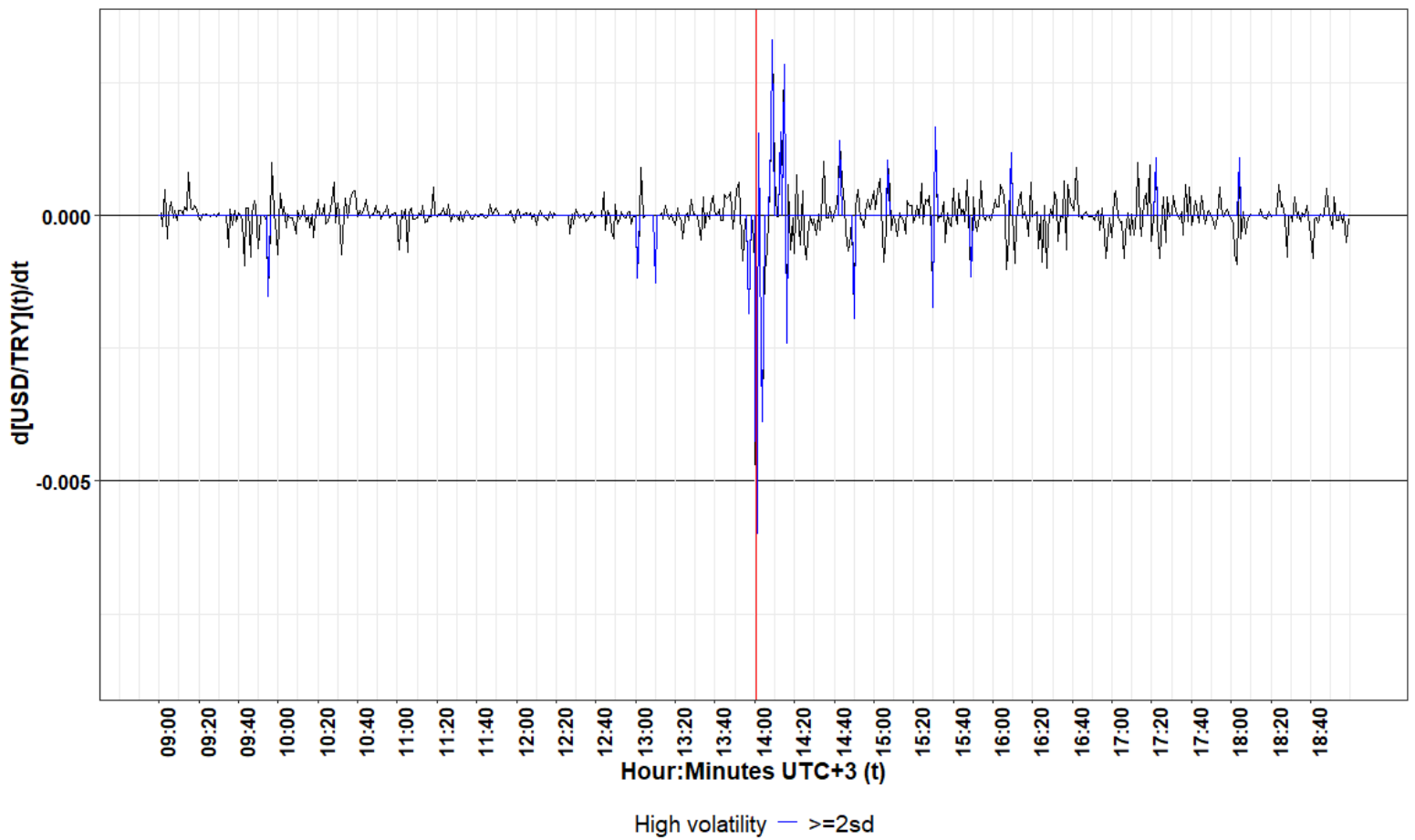


图 4: 24 September 2020 Central Bank of the Republic of Turkey surprise : derived signal

Introduction

1. Several methods used in the litterature to identify surprises :
   - Prices of option contracts on fed funds futures: used to determine financial market expectations regarding future changes in the Fed's monetary policy
   - Overnight Index Swaps
2. These methods have their limitations

Introduction

Research question: How can a textual analysis method applied to press articles identify surprises and measure their causal effect on exchange rates?

Introduction

Method to answer that :

- Database of press articles
- Calendar of monetary policy decisions
- Measuring the up-to-the-minute effect of monetary surprises on the exchange rate by comparing two groups : suprising (*treatment*) and not surprising (*control*) decisions

Litterature Review I

[1] Davis S.J. Baker S.R., Bloom N.
Measuring economic policy uncertainty.
The Quarterly Journal of Economics, Oxford University Press, 131:1593–1636, March 2016.

[2] Sack B. Swanson E. Gürkanyak R. S.
Do actions speak louder than words? the response of asset prices to monetary policy actions and statements.
International Journal of Central Banking, 1, May 2005.

[3] Kuttner K. N.
Monetary policy surprises and interest rates: Evidence from the fed funds futures market.
Journal of Monetary Economics, 47(Issue 3):523–544, June 2001.

Data

Press articles from:

- 2 data sources for press articles referring to monetary policy decisions: *Factiva* and *FocusEconomics*. 746 articles.
- Search by keywords in the articles : ["surpris"], ["unexpect"], ["unanticipat"], ["than expect"], ["than anticipat"], ["not expect"], ["not anticipat"]
- Context window around each keyword to check that it is a monetary surprise linked to the decision in question
- Checks on the dates of monetary policy announcements in press articles.

Data

- Creation of a calendar of monetary policy decisions supplemented by a surprise indicator variable worth one if the decision contains a surprise, zero otherwise.
- 2 distinct groups of monetary policy decisions: with or without surprises
- Exchange rate data:
  - *histdata.com* : exchange rates on a one-minute scale
  - 11 pairs: AUD/USD, CAD/USD, GBP/USD, CZK/USD, HUF/USD, MXN/USD, NZD/USD, SEK/USD, TRY/USD, EUR/USD.

Data

Press articles database is matched to exchange rate data for getting the following database:

- 11 countries from January 2018 to November 2023, 510 monetary decisions including 78 surprises
- Statistical unit: a maximum amplitude of variation for one minute of monetary policy communication to one day of monetary policy decision for a currency pair

Data

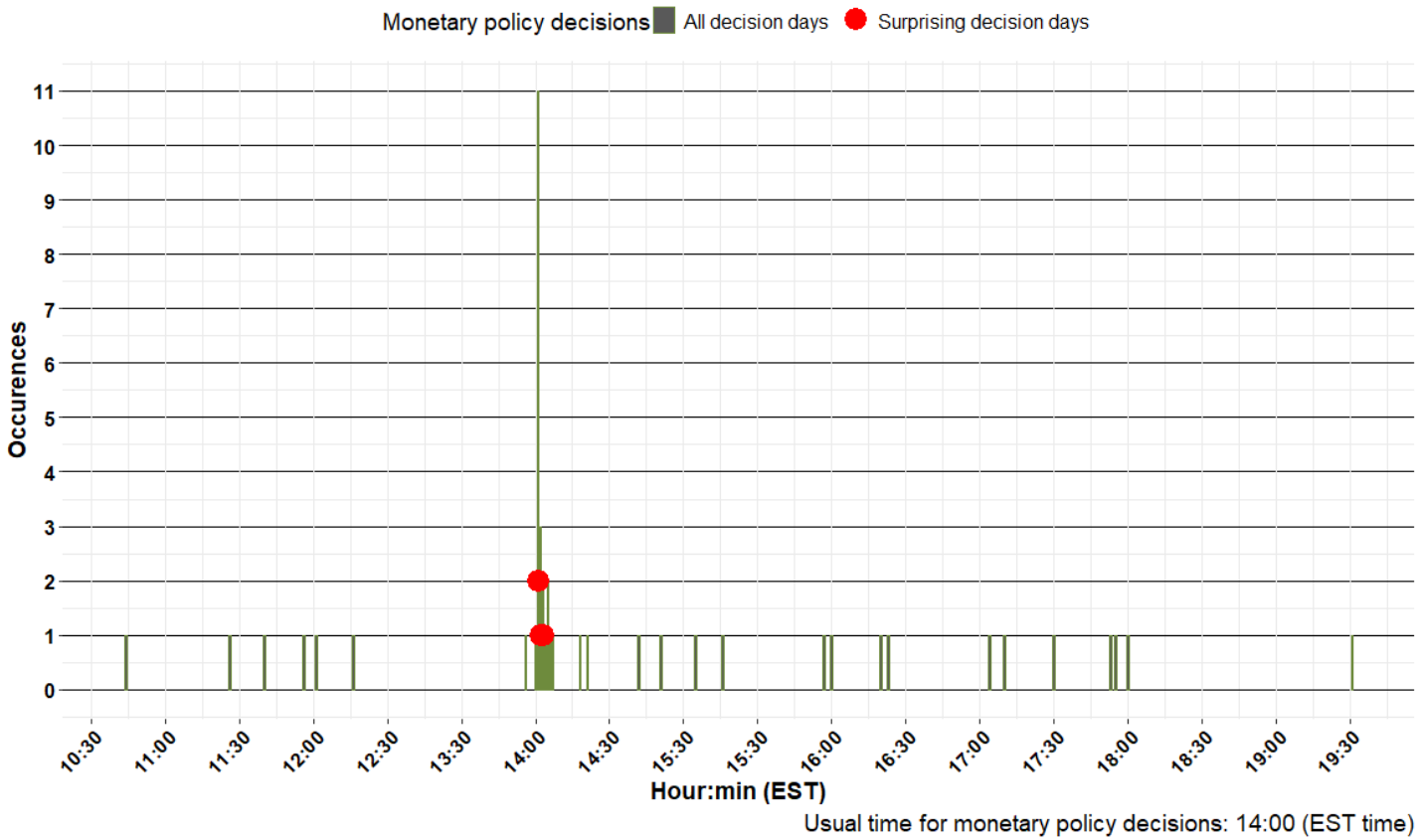


图 5: Distribution of hour:minutes for which amplitudes of variation on decision days were maximum : Mexico

Data

图 6: Boxplots and Wilcoxon test for surprising and non-surprising decision groups, exchange rates amplitudes of variation (one-minute scale)

Econometric modelling

$$Y_{i,t^*} = \alpha_i + \alpha_t + \beta_1 * 1_{SURPRISE_{i,t^*}} + \beta_2 * Y_{i,t^*_{[-1]}} + \beta_3 * Y_{i,t^*_{[-2]}} + \beta_4 * log(\sigma)_{i,t<t^*} + \epsilon_{i,t^*} \quad (1)$$

With :

- i a currencies pair, t^* a minute of monetary policy decision communication
- Y_{i,t^*} the amplitude of variation of exchange rate at the minute the decision is communicated
- $1_{SURPRISE_{i,t^*}}$ an indicator variable worth one if the decision contains a surprise, zero otherwise
- $Y_{i,t^*_{[-1]}}$ and $Y_{i,t^*_{[-2]}}$ the lagged amplitude of variation at the 2 previous decisions at moments of central bank communication
- $log(\sigma)_{i,t<t^*}$ the volatility of the amplitude of variation over the day of decision before the communication minute

Results

	With Turkey	Without Turkey
Whole period	0.0024***	0.0019***
	(0.0005)	(0.0003)
Before Covid19 (2018-2019)	0.0039**	0.0023**
	(0.0012)	(0.0008)
During Covid19 (2020-2021)	0.0021***	0.0019***
	(0.0004)	(0.0003)
After Covid19 (2022-2023)	0.0009	0.0009
	(0.0005)	(0.0006)

图 7: Summary of the parameters obtained for the surprise variable (within models). Fixed effects of time and country are included in all estimations. HC robust standard errors are reported within parentheses. Statistical significance: *p $<$ 0.10; **p $<$ 0.05; ***p $<$ 0.01.

New method: Natural Language Processing

- The study can also be carried out using Natural Language Processing (Large Language Models) to tag surprises more efficiently and quickly
- We have tested this method by using ChatGPT4 to classify the articles we had used
- 450 FocusEconomics articles have been tagged by ChatGPT4
- 94% of our initial tagging on these 450 days of decisions are correlated with the ChatGPT4 one

Improvements

- Natural Language Processing: use several LLMs to tag surprises efficiently, have a larger database, and add robustness:
  - Increasing the number of years and countries
  - Number of criteria for classifying surprises: Interest rate Hike/Cut/Quantitative Easing/Surprise Announcement on Forward Guidance or Monetary Normalisation/Inflation Expectation/Intensity of Surprise. These criteria can be added to the model
- Different time pace for the calculation of amplitudes:2, 5, 10 minutes

Conclusion

- Impact of monetary surprises on exchange rates at the time of monetary policy announcements
- Uncovered Interest Rate Parity
- Textual analysis method on business press articles. Database of monetary policy decisions: 11 countries, 2018-2023, 78 surprises
- Surprising and unexpected decisions are compared

Conclusion

- The amplitudes of variation for surprises are [0.19p.p.;0.39p.p.] higher compared to the expected decisions on a one minute scale.
- Other events in addition to monetary surprises can imply high amplitudes of variation.
- Large Language Models can be used. Other dependent variables can be studied (bond spreads, OIS, stock market indexes, etc.).

Conclusion

Thank you for your attention.