CSCI699 Introduction to Information Extraction: Project survey

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1 Introduction

In this project survey, I will describe how NLP or Information Extraction techniques allow us to solve the important issues in Monetary Policy research. The research interests of previous studies in Economics fall roughly into three categories: communication, committee members’ attitudes, and transparency. On the other hands, the most previous researches in Computer Science are interested in prediction and content analysis in central banks’ documents. I will give a brief explanation of the important concepts in Monetary Policy research and survey the related researches both in Economics and in Computer Science. In this survey, I focus on the works that use the documents issued by central banks.

2 Important Concepts in monetary policy research

Even though the specific goals slightly vary among central banks, they aim at keeping economy condition healthy and reduce uncertainty. The aim of monetary policy, more specifically a central bank’s goal is considered to promote maximum employment, stable prices, and economic growth. In recent years, monetary policy is usually a set of policy operations using several tools, such as purchasing government bonds, assets and setting reserve banks rate.

In most cases, at each time after a committee, the monetary policy decision become open to the public. At this point, central banks need to announce their decision properly. In other words, they need to communicate with the market participants. Blinder (2008) survey how the importance of central banks communications have been discussed in Economics. Woodford (2005) studied the importance of communications by central banks in the specific contexts.

Central banks also have to keep their Transparency by reporting how these decisions are made because “better public understanding makes the policy more credible and effective.” Geraats (2002) provides a survey to understand why Transparency is important in Economic from theoretical and empirical views.

The researchers in Economics also study attitudes of committee members in monetary policy meetings to know how consensus is formed.

3 Research in Economics

3.1 Communication

The most studies about communications between a central bank and the financial market participants use NLP techniques to extract features from the documents issued by a central bank and analyze the relationships between these features and economic indicators such as interest rates or monetary policy goals. Lucca and Trebbi (2009) use sentiment analysis with the FOMC minutes and show how the sentiments in the minutes affect Treasury rates. To find the effect of sentiment on Treasury rates, they use Vector Auto Regression (VAR) model, which is the mainstream econometric method in Macroeconomics.

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To understand why uncertainty matters in monetary policy see Bekaert et al. (2013).
in monetary policy such as rule-based interest rate and the Taylor-rule ⁶.

Hendry and Madeley (2010) study more specific aspect of the relationship between a central bank communication and Treasury rates by using Latent Semantic Analysis (LSA) [8]. They study how the communication of Bank of Canada (BOC) affects returns and volatility in short-term as well as long-term interest rate markets ⁷. They found that strong effects appear in interest rates.

Eyup and Odabaş (2016) classify the communication strategies [9]. They classify the policy statements into several categories from FRB, European Central Bank (ECB) and Central Bank of the Republic of Turkey (CBRT).

Keida and Takeda (2017) show the changes in monetary policy communication among the two different governors [13]. As an anecdotal evidence, Mr. Kuroda, the BOJ governor, uses the completely different style of speech and interviews than the former governor. Keida and Takeda (2017) use tf-idf and similarity evaluation using vector space model (SVM), and then compare the differences in the speeches of the two BOJ governors.

Tang (2017) studies whether the central bank communications affect interest rates [21]. The study presents the methods with the Naive Bayes model and find a strong relationship the labor-related contents in the minutes and monetary policy response to labor news.

3.2 Uncertainty and Transparency

Some studies use Natural Language techniques to make uncertainty index. Andrés (2017) use LDA to compose economic policy uncertainty index from news text [3]. Saltzman and Yung (2018) construct uncertainty measurements from the FOMC documents covering the long period (from 1970 to 2018) [18]. They also use VAR to find the relation between their uncertainty measurements and economic condition.

Acosta (2015) use LSA to make a transparency measurement over 32 years period from FOMC minutes. By using their measurements, this study shows that the Act’s requirement increased the central bank’s transparency [1].

3.3 Attitude of committee members

Suda et al. (2018) extract disagreements among FOMC members and study its effect on asset price [20]. They classify the topics in FOMC members speeches and define disagreement as the dispersion of the quantified sentiments. The study shows that the disagreement among FOMC members dilutes the announcement of the future monetary policy direction ⁸.

Apel and Grimaldi (2012) use semantic analysis to study the attitude of the committee members [2]. They use the minutes of the Swedish central bank and find the attitudes of the committee members is useful to predict monetary policy decisions.

3.4 Other critical issues

Loughran and McDonald (2011) point out a critical problem when we use NLP in Economics, claiming that word lists developed in other research domains might yield erroneous results. They show that three-fourths of the words identified as negative in the widely used dictionary are not considered negative in financial contexts [12].

4 Research in Computer Science

There is a lot of NLP studies that predict macroeconomic outcomes ⁹. Here, I focus on the studies related to monetary policy.

Rohlfis et al. (2016) predict monetary policy targets and Effective Federal Funds Rate (FFR) ¹⁰ by extracting the topics in FOMC statements with Latent Dirichlet Allocation (LDA) [17].

Moniz and Jong (2014) predict interest rate expectations using machine learning. They use Bank of England Monetary Policy Committee Minutes (MPCM) from 1997 to 2014 and ensemble methods to predict interest rate expectations in the financial market [15].

Ramachandran and DeRose (2018) classify FOMC meetings in 2017 [16]. Štajner et al. (2016) focus on the specific classification

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⁶To understand these rules, see 9.4.2 Monetary policy rules in Kuttner (2018) [11]
⁷In monetary policy, attenuating volatility of interest rate is considered as significant since high volatility means high uncertainty in future economic conditions. For example, see 9.4.1 Monetary policy implementation in Kuttner (2018) [11].
⁸This type of announcement is described Forward guidance, important tool in today’s monetary policy. To understand forward guidance, see 12.5.2 Quantitative easing and forward guidance in Kuttner (2018) [11].
⁹One of the early works is Wütrich et al. [23]
¹⁰To understand Target and Federal Funds Rate, see 9.4 An interest rate-centered view of monetary policy in Kuttner (2018) [11].
problem. They classify speculative and non-speculative speech in the transcripts of FOMC monetary policy meetings [19].

Miller and McCoy (2014) study the content changes in FOMC transcripts and found the changes between the per and the post-financial crisis [14]. They use LDA to extract topic from the transcripts and classify them.

Tan and Lee (2018) study the effect of emphasis on the listeners’ reception in FOMC members’ speech [16]. To this aim, they examine rhetoric patterns, hedging, in the transcripts of all FOMC meetings from 1977 to 2008.

References


