Advances in Economics, Business and Management Research, volume 106
Fourth International Conference on Economic and Business Management (FEBM 2019)

Application of Textual Analysis in Economic Policy Uncertainty

Xiao Xu*
SHU-UTS SILC Business School
Shanghai University
Shanghai, China
julieowo@163.com

Yuhan Hu
SHU-UTS SILC Business School
Shanghai University
Shanghai, China
foamdust@126.com

Yuming Tian
SHU-UTS SILC Business School
Shanghai University
Shanghai, China
18930104976@163.com

***Abstract*—After the financial crisis, in order to alleviate the attendant rising unemployment, inflation, balance of payments imbalances, and the economic downturn, the government has to consider more involvement in addressing market failures by designating economic policies. This paper mainly introduces the economic policy uncertainty and some economic problems resulted from it. This paper explores the feasibility of textual analysis in solving EPU problems by method of case study and points out the limitations in the application process. Through literature review, the limitations of text analysis in China have been found - high context culture and a large number of unrelated economic policy reports have become obstacles. Based on the methodology of EPU and text analysis, the cases of the United States and Tunisia were analyzed to confirm the role of text analysis in measuring EPU issues. Finally, the conclusion is drawn that China should refer to the above two cases and combine the national conditions to solve the EPU problem.**

Keywords*—Economic Policy Uncertainty (EPU); text analysis; solutions

I. INTRODUCTION

Since the recession, the uncertainty of fiscal expenditure, financial regulation and monetary policy have pushed the level of EPU to a historically high level, leading to enterprises and households reducing or delaying their investment, employment and consumption, thus slowing down the process of economic recovery from the recession. Thus, solving the EPU is of considerable significance to economic development. Text analysis goes deep into the text, to discover the deep meaning that cannot be grasped by ordinary reading, and to excavate the deep meaning of economic policy uncertainty, which is very helpful to solve the problems it brings. Nowadays, scholars at home and abroad generally have a complete understanding of the market problems caused by EPU, and also use text analysis as an example to solve them. However, at present, a large number of domestic EPU research cases still focus on its causes and influencing factors, and lack of practical methods to predict its changes before the occurrence of EPU.Therefore, this research focuses on answering following questions: 1) Are the existing text analysis methods suitable for measuring EPU? 2)Can a more specific analysis of the text assess China's regional economic policy issues?

II. LITERATURE REVIEW

A. The Origin of Traditional Textual Analysis and Current Problems in China

At present, there are two main methods of text analysis in the field of text analysis: dictionary-based and computer-based. In contrast, a computer-based approach can process more data, but the results of the analysis are also influenced by outside noise (i.e. interference with information). The research on text analysis in foreign countries was carried out earlier, and in the late 50's, some scholars put forward to classify articles by calculating the number of times specific words appeared in articles. In 1960, Maron and Kuhns published the first paper on automatic classification of articles using text analysis [1]. After several decades of scholars' model optimization, foreign text analysis methods have changed from the initial theoretical research and small-scale practice to a wider application. At presents, the most widely used open source tools in the field of text mining are: IBM's Text Smart Excavator, Autonomy's Concept Agents and so on. However, the research on Chinese text mining is relatively lagging behind, and it is still in the stage of digesting and absorbing foreign related theories and technologies, and reforming foreign text analysis methods based on existing text conditions in China and preliminary experiments. The difficulty of research at present lies in the fact that the domestic text mining deals with Chinese text, which has complex context semantics. The method of text mining must take the cultural background of Chinese high-context into account, and then combine the context to obtain the complete semantics.

B. The Comparison Between EPU Research in China and Western Countries

At present, the mainstream literature at home and abroad generally believes that EPU originates from the inconsistent views of policy-making agencies and ordinary people on economic expectations. There are many foreign literatures on the impact of EPU on the economy. EPU is uncertainty about who will make economic decisions and when and what economic policies will be adopted [2]. With regards to the method of measuring EPU, there is a counter-cyclical relationship between economic activity and EPU by using stock volatility index as proxy measurement index: the increase

of EPU will reduce employment and output, lead to the decrease of investment, consumption and inflationary pressure, thereby slowing down economic growth [3][4].

Compared with foreign countries, domestic literature research on EPU is not very mature. Based on the data of China from 1952 to 2004, the research about the relationship between EPU and inflation has been done [5]. The results show that inflation uncertainty is negatively correlated with output growth. However, others took the change of prefecture-level city officials from 1999 to 2013 as a sample to empirically examine the impact of EPU on economic growth [6]. The results show that the policy instability caused by official change has a significant inhibitory effect on economic growth.

Theoretically, according to the literature review, the main body of this study is very important for predicting the trend of the stock market. The adjustment of national economic policy will affect the external economic environment, business direction, operating cost, profit and distribution of listed companies, thus directly affecting the changes of stock prices. For example, on 28 January 2000, President Bill Clinton announced a reduction in controls on drug prices in the United States [7]. The policy sent the shares of several big pharmaceutical companies up, after DJIA's 2.6 percent decline. If the trend of economic policy is known in advance, investors can adjust their positions in time to make profitable investments. However, the adjustment of national policy is unpredictable for ordinary investors, and the orientation of politics in the public media has become vane for investors [8]. This paper is also innovative in methodology. Because Chinese political culture is more implicit than that of the West, a systematic and practical text analysis model is needed. In the text analysis, this paper not only uses a variable, but also defines the political speech from multiple perspectives. Through the analysis of five factors, we can get a more accurate political situation assessment, so we can track the relationship between political communication and Chinese stock market more accurately.

III. METHOD

In this paper, we use Open Journal Systems, University of Leicester and other databases to conduct fuzzy matching retrieval with the theme of "Economic Policy Uncertainty" or "Text Analysis" and the scope of "Core Journals". According to Table I, each method dimension has 2 criteria which will be further explained as follow.

A. EPU

Economy policy uncertainty as the uncertainty about who will make economic policy decisions, what and when economic policy actions will undertake [4]. They focus on the uncertainty about the economic effects of near-term and longer-term policy actions. An index called EPU index to measure economic policy uncertainty by reflecting the frequency of articles in newspapers or public websites that contain the words like 'Economics' and its near meaning, expressing uncertainty in words such as modal verb likes like may, might. Economic policy uncertainty can affect economic outcomes [3]. Firm-level data is analyzed that yields better causal identification but merely focuses on one aspect of impact and macro data that contains multiple aspects of influences but offers weaker causal identification. The emergence of EPU will lead to fluctuations in stock prices. Concerns about market prospects can lead to reduced investment in policy-sensitive companies such as healthcare and real estate, and lower employment rates. These sectors are significant and large enough to affect the aggregate investment and employment.

From the article 'Economic policy uncertainty and real output: evidence from the G7 countries', seven countries are selected to test their responses to varying degrees of EPU [9]. In studying the relationship between economic impacts and EPU in countries, the EPU index has only used because of their high recognition of the reliability and advantages of it [9]. Compared to other methods for detecting EPU, they pointed out four main strengthens of the EPU index. After the empirical analysis through time-series data and EPU index, it is found that EPU is counter-cyclical in which both the impact on uncertainty shocks and the response of actual output to economic policies would increase with the factors like scale and specific country. Besides, the importance of countries in developing policies that can eliminate or reduce the negative impacts of EPU on their economy are emphasized [9]. For example, the control of yellow journalism, a more transparent tax system and a series of predictable policies on fiscal and monetary are likely to have specific effects on slowing down the impacts of EPU [9].

B. Text Analysis

Text analysis is mainly divided into information retrieval and collection, text preprocessing and mining, data visualization and evaluation prediction according to the degree of visualization [10]. Natural Language Processing (NLP) is the prototype of text analysis methods. In order to achieve the purpose of analyzing and predicting a specific problem, the kernel is to visualize unstructured text into structured data. Because the text is ambiguous and cannot be characterized, it often fails to play a clear role in the analysis of the problem, and it is more difficult to deal with the prediction aspect of the problem. Therefore, text mining plays an important role in text analysis, which is to retrieve and process useful related information in the text (mainly through formula calculation, frequency, intensity, etc.) [10]. It then shows the process of text mining, including text preprocessing, text transformation (property generation), feature selection (attribute selection), data mining and evaluation [10]. To simplify, basic text analysis is a process of data collection and application to certain types to define or predict certain problems. To further investigate the application, text analysis (also known as text mining or data mining) as the process of extracting valuable information from a large amount of historical data and quantitatively evaluating it. [11].

Both readability measure and dictionary-based methods are based on Lexicon-based method. The readability measure can be used to evaluate the persuasiveness and comprehensiveness of the reading content through a fog index. The dictionary-based approach is the most commonly used Lexicon-based method [12]. Usually, researchers set word lists according to

research purposes and then calculate the number of occurrences of specific words in the text.

Machine learning techniques are applied in text analysis of word training. Examples are listed as following. The advantages of Naive Bayes are mature methodology; ability to process large amounts of data; objectivity and reliability. However, it may be affected by noise during training. Support Vector Machines (SVMs) are relatively more accurate, but they are more suitable for analyzing positive text than the negative one [11]. The accuracy of information extraction when using the method of the neural network is the highest. Semantic analysis is generally used to extract the conceptual content of the text, as well as the analysis of the relationship between documents, which is calculated by a mathematical method called LDA.

IV. CASE STUDY

A. Text Analysis in American Presidential Speech

The article Empirical Analysis of the Link between Politics and Stock Market Behavior investigates the impact of EPU on the U.S. stock market from two perspectives: domestic policy and international perspective [13]. Besides, the research method is text analysis, which further confirms the correlation between the stock market and politics. It is found that the rise of EPU index will decrease the S&P 500 index and increase its volatility. Also, the increase of political rights means stable politics, increases the EPU index and promotes the fall of stock returns.

The third part of the study focuses on the specific application of text analysis in EPU problems. Through quantitative computer text analysis of 524 presidential speeches in the United States from 1897 to 2010, the purpose is to analyze the linguistic characteristics of political exchanges among presidents and to measure their impact on stock performance at that time [14]. In this study, DICTION software is the main content analysis package. The type of text analysis used in the software is the dictionary-based method mentioned earlier, which evaluates presidential speeches through word grabbing counts. Five variables include Certainty, Activity, Optimism, Realism and Commonality [15]. Among them, the impact of EPU on the performance of the U.S. stock market is mainly reflected in the degree of certainty. Research shows that a peaceful speech (expressed as a higher five variables) can predict a more stable political environment soon, thus increasing consumer confidence, which is also one of the factors leading to abnormal returns in the short term [15][16].

From this insight, through text analysis of political rhetoric content (such as speeches by state leaders), application in China can also base on establishment of a regression model with the Shanghai Stock Exchange Index (SSE) (dependent variable) as an independent variable. The feasibility of the model is tested by regression analysis, and the characteristics of political communication which have the greatest impact on the stock market are selected.

TABLE I. METHOD DIMENSIONS

Two dimensions of method	
Textual analysis dimension	***EPU dimension***
First criteria: Information extraction and pre-processing of text	First criteria: Observe changes in economic policies to make business operations compliant
Second criteria: Visualize information by quantifying a problem	Second criteria: Searching for the Track of Economic Policy Change and Predicting Reasonably

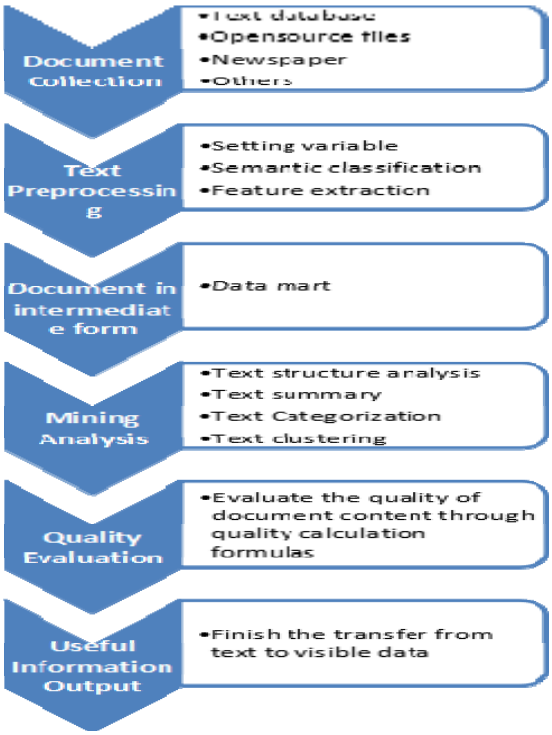
[a.] (source: compiled by authors)

B. Text Analysis to Stability of Tunisia's Economic Policy

The article: A wavelet technique for the study of economic socio-political situations in a textual analysis framework solves the problem of noise information existing in emergency tables when collecting text analysis data by using wavelet threshold technology, making Tunisia's economic socio-political changes before and after the revolution as an example [17]. It is pointed out that there are some noises in the text collected in the electronic newspapers which provide Tunisian actual economic news, which is considered as the interference items of the target information [17]. This will reduce the accuracy of the final text analysis results. Therefore, due to the different vanishing time of wavelet, this paper applies two techniques, hard threshold and soft threshold, by which the information wastes caused by noise is minimized, and the efficiency of information processing is enhanced. The result of text analysis using wavelet denoising method shows that Tunisia before the revolution was under a relatively stable economic policy (manifested in the emergence of lots of positive words). However, after the revolution, Tunisia's economic policy showed a disturbing situation (manifested in the increase of negative words describing the economy) [17]. Therefore, the corresponding economic current situation after the Tunisian Revolution has shown adverse effects such as inflation, deficit, and strike.

According to the case study, we summarized a basic process when using textual analysis to solve EPU problems which is shown in Fig. 1. Based on these two cases, the future research direction can be oriented towards how to better develop text analysis or how to improve the accuracy of EPU index. We suggest that future research can provide corresponding suggestions for EPU and text analysis. For example, in text analysis, current text mining products and applications are still tools designed for trained knowledge experts [18]. In order to popularize this approach, future research directions should focus on ways to simplify text mining. Although large companies like IBM have developed practical text mining software, for domestic EPU researchers, the text analysis method should become more accessible. Then the future research direction can be the popularization of text analysis. In addition, future text analysis can handle research in multiple languages, so the future direction can be to develop and interpret natural language queries, and different empirical examples can be used to prove different languages. For example, the accuracy of text analysis is sometimes influenced by the quality of the text, such as human factors. This type of

effect is known as text noise. But with the development of automation and artificial intelligence, more and more texts are converted from the human standard to the automatic standard [19]. This allows researchers to more easily exclude text noise interference during text analysis, resulting in more accurate analysis results. The future theme can also be placed in the development of automatic execution of the appropriate mining operating system, making text analysis more intelligent and accurate.



b. (source: compiled by authors)

Fig. 1. Flowchart of text mining.

V. Conclusion

To sum up, text analysis can play a key role in measuring economic policy uncertainty. We can quantify EPU by analyzing the content of relevant texts of economic policy, thus visualizing this phenomenon. This paper takes Tunisia as an example to verify the feasibility of text analysis in EPU research. However, text analysis still has some shortcomings in solving EPU problems. For example, the computational cost of semantic analysis methods is very high, and they are often operated in the order of several words per second. For very large text corpus, how to improve the efficiency and scalability of semantic analysis is still a challenge. For example, in terms of language, most text mining tools focus on processing English documents, while the study of other languages may be less in-depth. In fact, text analysis using other languages can bring more opportunities for improvement. By combining different language cultures to analyze national EPUs in various cultural contexts, text analysis methods can be subjected to more "feasibility tests" and eventually become a cross-cultural internationalization research method. The EPU index is mainly used to reflect the uncertainties of economic and policy in the world's major economies. However, the effectiveness of the index is also worth considering. In future research, we should consider the following questions: whether the accuracy of EPU index prediction is the most effective, and what factors are related to the accuracy of EPU index.

References

[1] M,E. Maron, et al., "On relevance probabilistic indexing and infotmation Retrieval,"[J] Journal of the ACM,1960, vol. 7, pp. 2016-244.

[2] S. Choi, M. Shim, "Financial vs. Policy Uncertainty in Emerging Market Economies," Open Economies Review, 2018.

[3] S.R. Baker, N. Bloom & S.J. Davis, "Measuring economic policy uncertainty," Quarterly Journal of Economics, 2016, vol. 131(4), pp. 1593-1636.

[4] N. Bloom, "The impact of uncertainty shocks,"Econometrica, 2009.05, vol.77(3), pp.623-685.

[5] T. Chen, "Uncertainty, Inflation and Output Growth," Economic Theory and Management, 2007, vol. 12, pp. 23-29.

[6] H. Yang, Y. Zhou, "Timing Choice of Environmental Policy under Uncertain Conditions," Quantitative Economic and Technological Economic Research, 2006, vol. 23 (1), pp. 69-76.

[7] P. Ackley, Measuring economic uncertainty using news-media textual data, MPRA Paper, No. 64874, 2015.

[8] D.W. Jansen, Q. Li, Z. Wang, and J. Yang, "Fiscal policy and asset markets: A semiparametric analysis," Journal of Econometrics. 2008, Vol. 147(1), pp. 141-150.

[9] D.A. Abdullah, and S.C. Hayworth, "Macroeconometrics of stock price fluctuations," Quarterly Journal of Business and Economics, vol. 32(1), pp. 50-67.

[10] K. Istook, & A. Servlets, 2018, "Economic policy uncertainty and real output: evidence from the G7 countries," Applied Economics, 1993, vol. 50(30), pp. 4222-4233.

[11] K. Lokesh, & K. Paul, "Text Mining: concepts process and applications," Journal of Global Research in Computer Science, 2013, Vol4(3), pp. 36-38.

[12] K.L. Sumathy & M. Chidambaram, "Text mining: concepts, applications, tools and issues — an Overview," International Journal of Computer Applications, 2013, vol. 80(4), pp. 29-32.

[13] L. Guo, F. Shi, & J. Tu, "Textual analysis and machine leaning: crack unstructured data in finance and accounting," The Journal of Finance and Data Science, 2016, vol. 2(3), pp. 153-170.

[14] C. Hsinchu, Z. Daniel, & Y. Ping, "Text Mining: advancement, challenges and future directions," International Journal of Reviews in Computing, 2014, vol.3(8), pp. 61-65.

[15] L. Xin, 2018, Empirical Analysis of the Link between Politics and Stock Market Behavior. University of Leicester. Viewed at May 13, 2019, available at < http://hdl.handle.net/2381/42163 >

[16] Y. Wang, B. Zhang, X. Diao & C. Wu, "Commodity price changes and the predictability of economic policy uncertainty," Economics Letters, 2015, vol. 127, pp. 39-42.

[17] A. Habiba, B. Salona, & B.O. Mohsen, "A wavelet technique for the study of economic socio-political situations in a textual analysis framework," Journal of Economic Studies, 2018, 00-00,.

[18] B. Perić, & P. Sorić, "A Note on the "Economic Policy Uncertainty Index," Social Indicators Research, 2018, vol. 137(2), pp.505-526.

[19] N. Bloom, M. Floetotto, N. Jaimovich, et al, "Really uncertain business cycles," NBER working paper, no.w18245,2012.