Paper 40

Formation Of Indonesia Economic Policy Uncertainty Index For 2014-2021

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Abstract – **This research uses information in printed newspapers to create a proxy for measuring uncertainty by forming Indonesia Economic Policy Uncertainty Index for 2014-2021. The index was built by analyzing an extensive data set of articles containing the terms 'economics' and 'uncertainty' in Bahasa. The text-mining topic modeling method of the Latent Dirichlet was applied to look for terms in the articles that referenced 'policy.' Based on the frequency of article publication, an index with a mean of 100 and a standard deviation of 1 was created. The IEPU index topics consist of eight main policy categories; monetary, fiscal, trade, domestic regulation, international regulation, geopolitics, energy/ resources, and politics. In addition, its movement can be described based on economic uncertainty events that happened on the timeline. This research also compares the formed index with pre-existing uncertainty indices, namely the VIX index, the GEPU index, and the WUI index for Indonesia.**

Keywords - **Uncertainty, Policy, Volatility, Text-Mining**

I. INTRODUCTION

Uncertainty is an epistemic condition (knowledge), including imperfect or unknown information. Uncertainty is a vague concept that reflects the state of being uncertain in the minds of consumers, managers, and policy-makers about future events. Moreover, it is also a broad concept, including macro and micro phenomena (Ahir et al., 2020). In Layman's terms, conditions that cause uncertainty can be seen as pervasive in 2020 and 2021, such as the US elections, Brexit in the United Kingdom, and those not finalized until mid-2021; the spread of the COVID-19 virus.

Several parties have attempted to use various methods to create a proxy index to explain policy uncertainty and analyze the relationship between market movements and policy uncertainty; both with an approach based on the volatility of the main economic and financial variables (Leahy & Whited, 1996)

One of the most widely used proxies is the Market Volatility Index (VIX) from the Chicago Board Options Exchange (CBOE) for uncertainty in the stock market. However, the weakness of the VIX is that it only captures uncertainty in the stock market – which depends on the liquidity and depth of the stock market, so the VIX can only be relied on in mature markets and industries and is not easy to replicate in other countries. There is also a news-based NVIX index issued by the Wall Street Journal (Manela & Moreira, 2017). Furthermore, the FEARS Index measures uncertainty based on investor sentiment and text data from internet searches (Da et al., 2011).

Recently, the EPU – Economic Policy Uncertainty Index (hence referred to as the "EPU index") proposed by Baker et al. (2016) has been frequently mentioned. The EPU Index was established to measure the uncertainty of national economic policies based on the relative frequency of articles in national newspapers containing at least one of three terms related to Economy (E), Policy (P) and Uncertainty (U) and depending on the frequency. Reports in the countries observed can be daily, monthly, or quarterly.

From previous studies, uncertainty has a major impact on investment growth as well as volatility in the economy and financial markets because there have been many attempts to establish uncertainty proxies to help investors and regulators in decision making.

Based on the authors' knowledge, there are currently 26 countries that have already formed their own EPU index, 1 Global Index, as well as several categorical and other indices based on the EPU methodology.

The EPU index is especially helpful for looking at uncertainty in countries with limited alternative uncertainty calculations – as long as there is a newspaper distribution in that country. In addition, the EPU Index is 'real-time' and 'forward-looking' and can be used as one of the components of calculating leading indicators of the economy.

While several authors have conducted research on the spillover effect of the Global EPU index and other countries on Indonesia, to the authors' knowledge, no one has already built an EPU Index for Indonesia during 2014-2021.

In an effort to establish the EPU index for Indonesia, the authors use the approach taken by Azqueta-Gavaldón (2017), which is to apply machine learning algorithms in particular the Latent Dirichlet Allocation algorithm.

Indonesia's EPU index captures the current state of economic uncertainty from time to time. Thus, the

establishment of the Indonesian Economic Policy Uncertainty Index as one of the leading indicators of the economy is expected to become the basis for further research, especially in the context of policy formation in Indonesia and investment decisions by investors.

II. METHODOLOGY

The data in this research used the articles from news articles taken from printed daily newspapers already transferred into MS Excel forms. The data was selected because the news produced is usually more comprehensive than news from digital media, has less repetition, and covers a longer time span. The period of the data taken was from January 2014 to December 2021. The selection of the time period is adjusted to the availability of data and events that occurred in between.

The news articles were taken from five national newspapers that fulfilled some initial prerequisites; nationally distributed print media, written in Bahasa, publicized daily and available since 2014. After conducting a conventional sampling survey on several respondents, the data used for the research are Media Indonesia, Bisnis Indonesia, Investor Daily, Kompas, and Kontan.

The articles processed contained forms of the term's economy and uncertainty in Bahasa as described in Table 1. The total number of articles associated with terms mentioned on Table 1 from January 2014 to December 2021 was 11.116 articles.

Table 1. Categories of terms searched in articles

Economic	*Ekonomi*
Uncertainty	*Ketidakpastian, ketidaktentuan, ketakpastian, ketidakjelasan, tidak pasti, tidak jelas, tidak tentu*

Next, the data (words) were preprocessed by removing stopwords and converting all words into lower case. Additionally. each word is then converted to its stem (e.g. Pemerintah = Perintah) with a total number of 90.450 words in the corpus.

To find the most likely value of topics, the authors calculated the coherence score of words for a different number of topics empirically, which indicates that the most likely number of topics for this corpus is at a minimum of 10 (Fig. 1.) with a coherence score of 0.49.

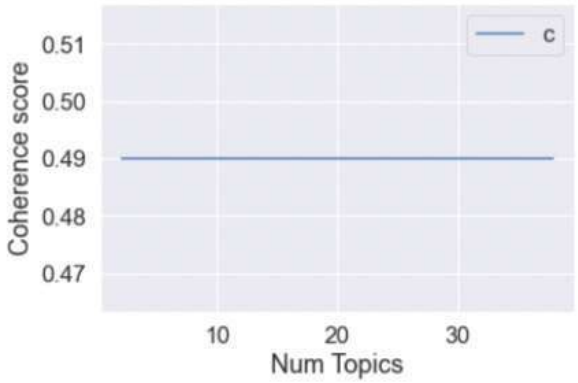

Fig.1. Visualization of coherence score to determine the 6number of topics

For the text-mining topic modeling method, this research used the Latent Dirichlet Allocation model, which is based on a generative probabilistic approach to infer the distribution of words that define a topic (Blei et al., 2003), and formed ten subtopics, which will be divided into eight main topics (Baker et al., 2016)

In attempting to test the robustness of the index formed, this research compared the IEPU index with the existing uncertainty index; CBOE Volatility Index (VIX), Global Economic Policy Uncertainty Index (GEPU) and World Uncertainty Index for Indonesia (WUI-IDN) by The Economist.

III. RESULTS

Table 2 shows ten topics (column 1) divided into ten policy subcategories (column 3) formed by the LDA model, which is already divided into eight main topics (column 4), together with the list of representative words (column 2).

Table 2. Topic categorization and representative words

Topic	Representative Words	Policy Subcategory	Policy Category
Topic1	*Ekonomi, tumbuh, tingkat, indonesia, global, persen, pulih, lambat, dunia, turun, sektor, perintah, kuartal, konsumsi, covid, kerja, investasi, dorong, negara, capai* [Economy, grow, level, Indonesia, global, percentage, recover, slow. World, down, sector, order, quarter, consume, COVID, work, investment, encourage, country, achieve]		International Regulation

Topic2	*Rp, bank, kredit, triliun, tumbuh, perban, PT, turun, biaya, miliar, capai, tingkat, target, Tbk, persero, dana, catat, uang, banding, modal* [Rp, bank, credit, trillion, grow, banking, LLC, down, cost, billion, achieve, level, target, public, company, fund, record, money, appeal, capital]	Banking	Domestic Regulation
Topic3	*Bunga, bank, suku, bi, rupiah, indonesia, uang, bijak, nilai, naik, ekonomi, tukar, inflasi, acu, turun, pasar, kuat, moneter, global, sentral* [Interest, bank, rate, BI, rupiah, Indonesia, money, wise, value, up, economy, exchange, inflation, reference, down, market, strong, monetary, global, central]		Monetary Policy
Topic4	*Dagang, negara, china, eropa, ekonomi, Inggris, Tiongkok, dunia, Trump, global, Asia, temu, perang, amerika, presiden, sepakat, negaranegara, Uni, Brexit, serikat* [Trade, country, China, Europe, economy, UK, world, Trump, global, Asia, meet, war, America, president, agree, states, union, Brexit]		Geopolitics
Topic5	*Pasar, saham, investor, dana, Indonesia, obligasi, asing, investasi, IHSG, utang, Rp, nilai, indeks, hasil, surat, triliun, modal, terbit, masuk, positif* [Market, share, investor, fund, Indonesia, obligation, foreign, investment, JCI, debt, Rp, value, index, result, certificate, trillion, capital, issue, income, positive]	Financial Market	Domestic Regulation
Topic6	*Perintah, pajak, menteri, anggar, terima, investasi, kerja, negara, atur, bijak, triliun, ekonomi, Rp, usaha, APBN, daerah, target, belanja, bangun, UU* [Order, tax, minister, budget, accept, investment, work, country, regulate, wise, trillion, economy, Rp, effort, state budget, regional, target, spending, build, law]		Fiscal Policy

Topic	Representative Words	Policy Subcategory	Policy Category
Topic7	*Usaha, bisnis, Indonesia, kembang, pandemi, kerja, COVID, rumah, uang, milik, masyarakat, properti, industri, produk, jual, sektor, laku, asuransi, syariah, butuh* [Effort, business, Indonesia, develop, pandemic, work, COVID, home, money, own, people, property, industry, product, sale, sector, sold, insurance, sharia, need]	Pandemic	Domestic Regulation
Topic8	*Industri, Indonesia, ekspor, produksi, harga, impor, usaha, juta, bahan, perintah, minyak, tani, energi, sektor, bangun, migas, produk, tingkat, barang, negeri* [Industry, Indonesia, export, production, price, import, effort, million, material, order, oil, farming, energy, sector, build, oil & gas, product, level, goods, country]		Trade Policy
Topic9	*Harga, naik, pasar, kuat, lemah, emas, level, turun, data, minyak, pekan, fed, dolar, analis, dagang, indeks, prediksi, gerak, sentimen, tekan* [Price, up, market, strong, weak, gold, level, down, data, oil, week, fed, dollar, analysis, trade, index, prediction, move, sentiment, push]		Energy/ Resources
Topic10	*Politik, presiden, orang, Indonesia, pilih, masyarakat, negara, dunia, hidup, pimpin, ubah, milik, Jokowi, sosial, jalan, hadap, hasil, ajar, publik, warga* [Politics, president, person, Indonesia, choice, people, country, world, life, lead, change, own, Jokowi, social, way, face, result, teach, public, citizen]		Politics

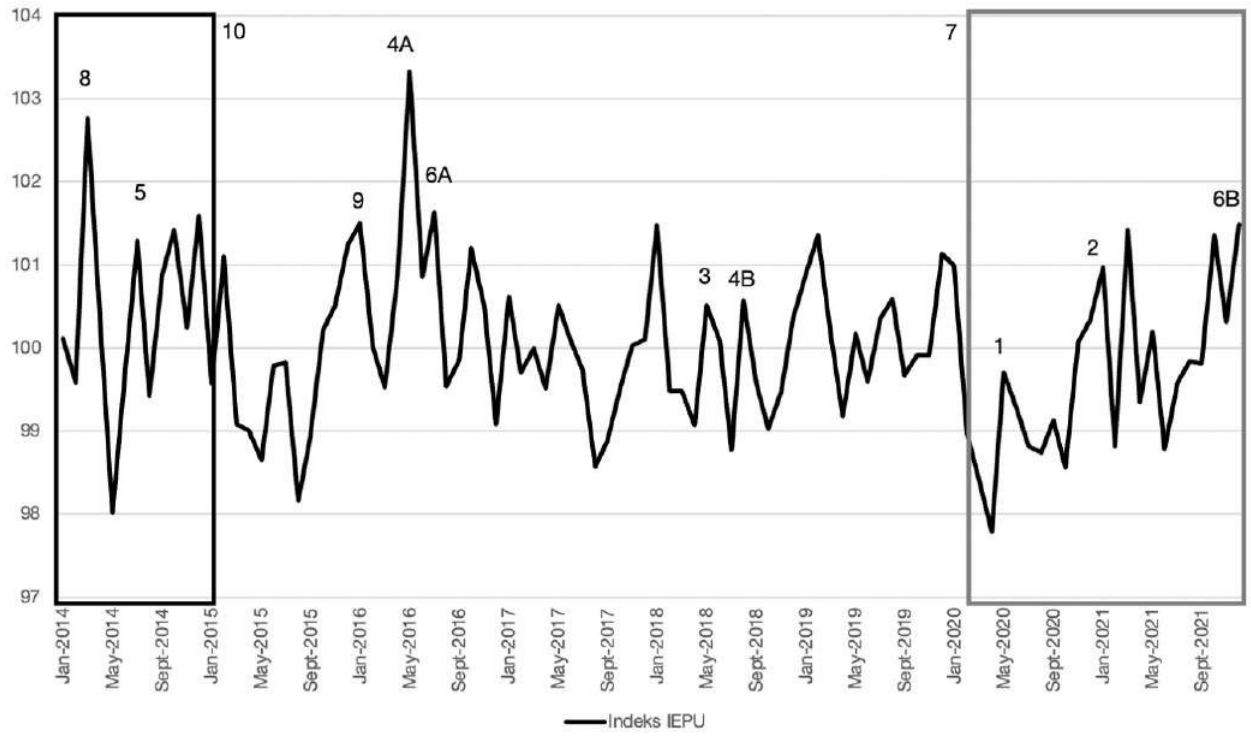

Fig. 2. The Indonesia Economic Policy Uncertainty for 2014-2021

IV. DISCUSSION

A. The Indonesia Economic Policy Uncertainty Index

Fig. 2 shows the Indonesia Economic Policy Uncertainty Index (IEPU) from January 2014 to December 2021. As previously stated, the index can be categorized into ten topics, inferring it to the IEPU index based on the category in Table 2.

Starting in 2014, articles on economic uncertainty in Indonesia at the beginning of the year reported sluggish exports (Topic 8, Trade), which had dragged on since 2013. However, in the same year, articles on economic uncertainty also discussed the topic of elections (Topic 10, Politics). In 2014, there was an election for President and Vice President, taking place in July 2014 (Topic 5, Domestic Regulation – Capital Market) when Joko Widodo and Jusuf Kalla declared victory – which was responded positively by the Indonesian capital market.

In the first quarter of 2016, articles of economic uncertainty were occupied by Saudi Arabia's decision to reduce oil prices to $29 per barrel and increase production (Topic 9 – Energy, Resources). Thus, this event was followed by an adjustment in the price of subsidized fuel.

In the second quarter of 2016, due to the United Kingdom's referendum on the decision to leave the European Union, often known as Brexit, there were signs that economic uncertainty was rising (Topic 4, Geopolitics, 4A). Meanwhile, in the third quarter of 2016, the Tax Amnesty policy was the main cause of a major increase in economic uncertainty. (Topic 6, Fiscal, 6A).

Mid 2018, articles on economic uncertainty were filled with the Fed's policy to gradually increase its interest rate until it reached 2.5% at the end of 2018. This event was then followed by an adjustment to Bank Indonesia's interest rate benchmark (Topic 3, Monetary). July 2018, the trade war between the United States and China began when each country enacted the increment of import duty on imported goods by up to 25%.

The years 2020 and 2021 can be regarded as the pandemic year (Topic 7, Domestic Regulations – Pandemic) due to the March 2020 confirmation of the first case in Indonesia. Since then, most of the articles on Indonesian economic uncertainty are related to mitigating the impact of the pandemic by restricting social activities. However, as this was a case of a global pandemic (Topic 1, International Regulations), most of countries affected also at the time, regulate international movement by closing flights to and from several countries with a high rate of COVID-19 spread.

One of the domestic regulations to tackle the impact of the COVID-19 pandemic issued by the government was the relaxation of banking credit as a countercyclical measure for the weakening economy (Topic 2, Domestic Regulations - Banking). In addition to the financial sector,

the government also has various policies to encourage economic growth during the pandemic, as well as increasing budgeted state spending for the prevention and treatment of COVID-19. However, nearing the end of 2021, the article of economic uncertainty that appears was whether the pandemic response budget should be continued until 2022 or not (Topic 6, Fiscal, 6B.)

B. Relationship Between IEPU And Other Uncertainty Index

Table 3 shows a correlation analysis between the IEPU index and other uncertainty indices; the VIX Index, the GEPU Index, and the WUI-IDN index. The results revealed that the correlation of the IEPU Index with the VIX Index and the GEPU Index showed a negative correlation. Meanwhile, the correlation of the IEPU Index with the WUI-IDN index showed a positive correlation.

Table 3. Correlation value of IEPU index and other economic uncertainty index

Comparison Index	IEPU - Category	Correlation Value
CBOE VIX	IEPU index	-0.2625
	IEPU index - International Regulation	0.1384
Global EPU	IEPU index	-0.1679
	IEPU index - International Regulation	0.3223
WUI - IDN	IEPU index	0.225

Considering that the first two indices are global indices, a positive correlation value was obtained when comparing the two indices to the IEPU index on topics related to international regulation. Based on these results, it is necessary to further examine the spillover of international volatility on economic uncertainty in Indonesia.

Meanwhile, there was a positive correlation between the WUI-IDN and economic articles from The Economist that focus on Indonesia. This is sufficient evidence of the IEPU index's robustness.

V. CONCLUSION

This research tries to show an establishment of an economic uncertainty index for Indonesia, based on articles from local newspapers using Bahasa Indonesia with a text mining analysis approach, in particular the unsupervised machine learning method of the Latent Dirichlet Allocation model.

The unsupervised nature of this method allows us to classify large data into topics, which can then be matched with the categories built by Baker et al. (2016). In addition, the movement within the index can also be easily described by events that happened within the timeline.

From the correlation test, we see that there is a negative correlation between the IEPU index and another global economic uncertainty index. However, when compared with another economic uncertainty index that focuses on Indonesia, it shows a positive correlation, which we believe can be seen as enough evidence of the robustness of the IEPU index.

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REFERENCES

1. Ahir, H., Bloom, N., & Furceri, D. (2020). 60 years of uncertainty. Finance & Development, 57(1), 58-60.

2. Azqueta-Gavaldón, A. (2017). Developing news-based economic policy uncertainty index with unsupervised machine learning. Economics Letters, 158, 47-50. https://doi.org/10.1016/j.econlet.2017.06.032

3. Azzimonti, M. (2015). Partisan conflict and private investment. ( ). Cambridge: National Bureau of Economic Research, Inc. https://doi.org/10.3386/w21273

4. Baker, S. R., Bloom, N., & Davis, S. J. (2016). measuring economic policy uncertainty.The Quarterly Journal of Economics, 131(4),1593-1636. https://doi.org/10.1093/qje/qjw024

5. Blei, D.M., Ng, A., Jordan, M.I., (2003). Latent Dirichlet allocation. J. Mach. Learn. Res.3, 993–1022.

6. DA, Z., ENGELBERG, J., & GAO, P. (2011). In search of attention. The Journal of Finance (New York), 66(5), 1461-1499. https://doi.org/10.1111/j.1540-6261.2011.01679.x

7. Leahy, J. V., & Whited, T. M. (1996). The effect of uncertainty on investment: Some stylized facts. Journal of Money, Credit and Banking, 28(1), 64 83. https://doi.org/10.2307/2077967

8. Manela, A., & Moreira, A. (2017). News implied volatility and disaster concerns.Journal of Financial Economics, 123(1), 137-162. https://doi.org/10.1016/j.jfineco.2016.01.032