Measuring Stakeholders' Expectation on Central Bank's Policy Rate

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OUTLINE

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> *… those times when **financial markets and the central bank have different expectations about what a central bank decision will be**. Such situations lead to surprises and often to **market volatility**.*
>
> *(Stanley Fischer, 2017)*

Bloomberg
Economist Estimates Survey

- Respondents : ± 20 – 30 economists
- Timeframe : Starting from weeks before the monthly Board of Governor's Meeting
- Question : Estimation of Bank Indonesia's policy rate that will be set in the meeting

Develop a new measure of stakeholders' expectation on Bank Indonesia's policy rate, as a complement to Bloomberg survey.

Utilize textual data to develop the new measure, by employing machine learning-based technique.

#1 BACKGROUND

Expectation of unchanged policy rate

The central bank of Indonesia (Bank Indonesia, BI) is expected to keep its benchmark interest rate (BI rate) at 7.50 percent at Thursday's Board of Governors' Meeting (14/08) as inflation has eased to 4.53 percent (year on year) in July while the country's current account deficit may nearly double in the second quarter of 2014 to 4% of GDP from 2.06% of GDP in the previous quarter.

Expectation of policy rate hike

Although we continue to believe there is no urgency to increase interest rates, we believe the Bank is likely to hike pre-emptively and prioritize stability over growth. **Therefore, we now expect BI to raise the 7-day reverse repo rate by 25 bps to 4.50% on May 17.** More hikes are likely to follow, but the pace of tightening will remain sluggish under the new Governor.

Expectation of policy rate cut

Bank Indonesia is expected to cut the rate further, following Monday's announcement by the Central Statistics Agency (BPS) showing slowing inflation in February, says Eric Alexander Sugandi, an economist at Standard Chartered Bank in Jakarta.

LITERATURE REVIEW

Measuring Expectation on Policy Rate

Text Mining on Economic News

1 Market Based Method

Based on the movement of the price of certain instruments in financial markets, e.g.:
- Fed Funds Futures
- T-Bills
- Forward Rate Agreement (FRA)
- Overnight Index Swap (OIS)

2 Survey Based Method

Asks respondents about their expectation on policy rate in the future, e.g.:
- Blue Chip Financial Forecast Survey
- Primary Dealers Survey
- Bloomberg Economist Estimate Survey

Economic Policy Uncertainty (EPU) Index

Measuring Public's Consumer Confidence

Predicting Stock Market from Social Media

Measuring Perception on Central Banks' Communication

1 Data Collection

- Daily news articles from **Bank Indonesia's Cyber Library.**
- Data period: **January 2006 – February 2018.**
- **Data Filtering** to filter out news that are not relevant for measuring policy rate expectations.
  - **News articles** : **Published within 14 days prior to monthly Board of Governor's meeting**.
  - **Sentences** : **Contained keywords related to Bank Indonesia's policy rate**, e.g. "BI Rate", "BI 7-days reverse repo rate", and "Bank Indonesia's policy rate".
- Survey result from **Bloomberg Economist Estimates Survey**, as the benchmark indicator.

2 Data Annotation

- **Annotation** to 4,445 sentences, by adding a **categorical information about policy rate expectation**.

Policy Rate Expectation Category	Annotated Sentences	Percentage (%)
0 - No-Expectation	2,940	66%
1 - Policy Rate Unchanged	490	11%
2 - Policy Rate Hike	355	8%
3 - Policy Rate Cut	660	15%

3 Data Preprocessing

- **Transformation of sentences into numerical vectors**, with following information:

Bag-of-words (n-grams)	Number of words	Numbers and percetages quoted
Number of characters	Word embedding vector	

4 Model Construction

- **Using 5 machine learning algorithms** to find the best classification model for solving the task.

1. Logistic Regression	2. Naïve Bayes	3. Decision Tree
4. Random Forest	5. XGBoost	

- Dataset : Splitting **training-testing datasets with 80:20 ratio..**

5 Index Calculation

- **Expectation Index from News**

$$score(s_a) = \begin{cases} +1 : expecting\ policy\ rate\ hike \\ 0 : expecting\ no\ change\ in\ policy\ rate \\ -1 : expecting\ policy\ rate\ cut \end{cases}$$

$$Expectation\ Index\ News_t = \frac{1}{|C_a|} \sum_{s_a} \left(\frac{1}{|C_{s_a}|} score(s_a) \right)$$

- **Expectation Index from Bloomberg**

$$score(x)_t = \begin{cases} +1 : if\ prediction(x)_t > BI\ Rate_{t-1} \\ 0 : if\ prediction(x)_t = BI\ Rate_{t-1} \\ -1 : if\ prediction(x)_t < BI\ Rate_{t-1} \end{cases}$$

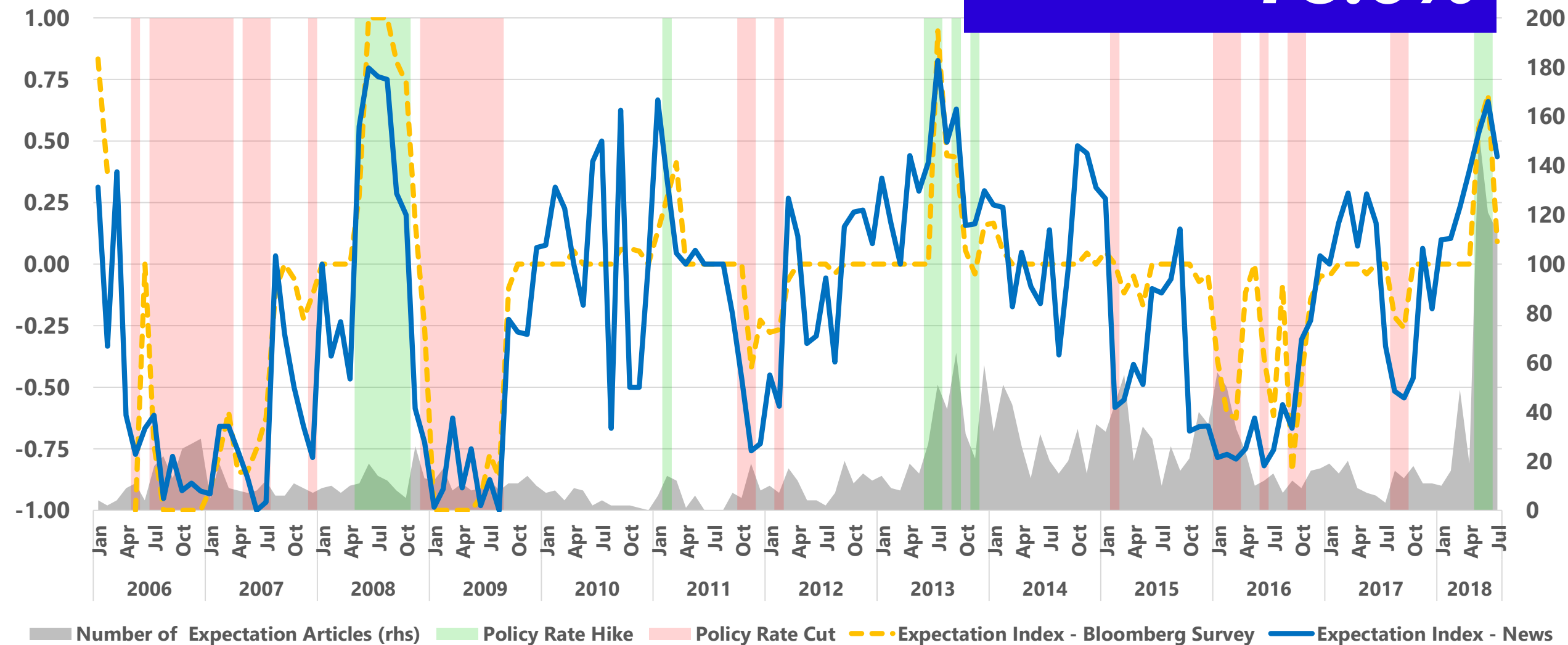$$Expectation\ Index\ Bloomberg_t = \frac{1}{|C_x|} \sum_x score(x)$$

#4 RESULT & ANALYSIS

Classification Model	Accuracy	Recall	Precision	F1
Logistic Regression	83.4%	**83.2%**	71.2%	**76.8%**
Naïve Bayes	80.6%	83.2%	64.5%	72.7%
Decision Tree	73.0%	65.7%	53.4%	58.9%
Random Forest	78.0%	72.6%	63.3%	67.6%
XGBoost	**84.1%**	75.9%	**75.6%**	75.7%

#4 RESULT & ANALYSIS

Correlation = 78.6%

Number of Expectation Articles (rhs) · Policy Rate Hike · Policy Rate Cut · Expectation Index - Bloomberg Survey · Expectation Index - News

CONCLUSION & FUTURE WORKS

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❝ *We develop **a new measure of stakeholders' expectation on Bank Indonesia's policy rate**. The correlation value indicates that the policy rate expectation index from news is **potential to be used as a new measure of policy rate expectation**.*

❝ *From methodological perspective, we show how to **utilize news articles data to develop the new measure, by employing machine learning-based technique**.*

Future Works	1	Opinion holder identification
	2	Data source addition (including English news)
	3	Classification model improvement (e.g. using deep learning)
	4	Expectation vs. Wish vs. Suggestion
	5	Expectation period identification