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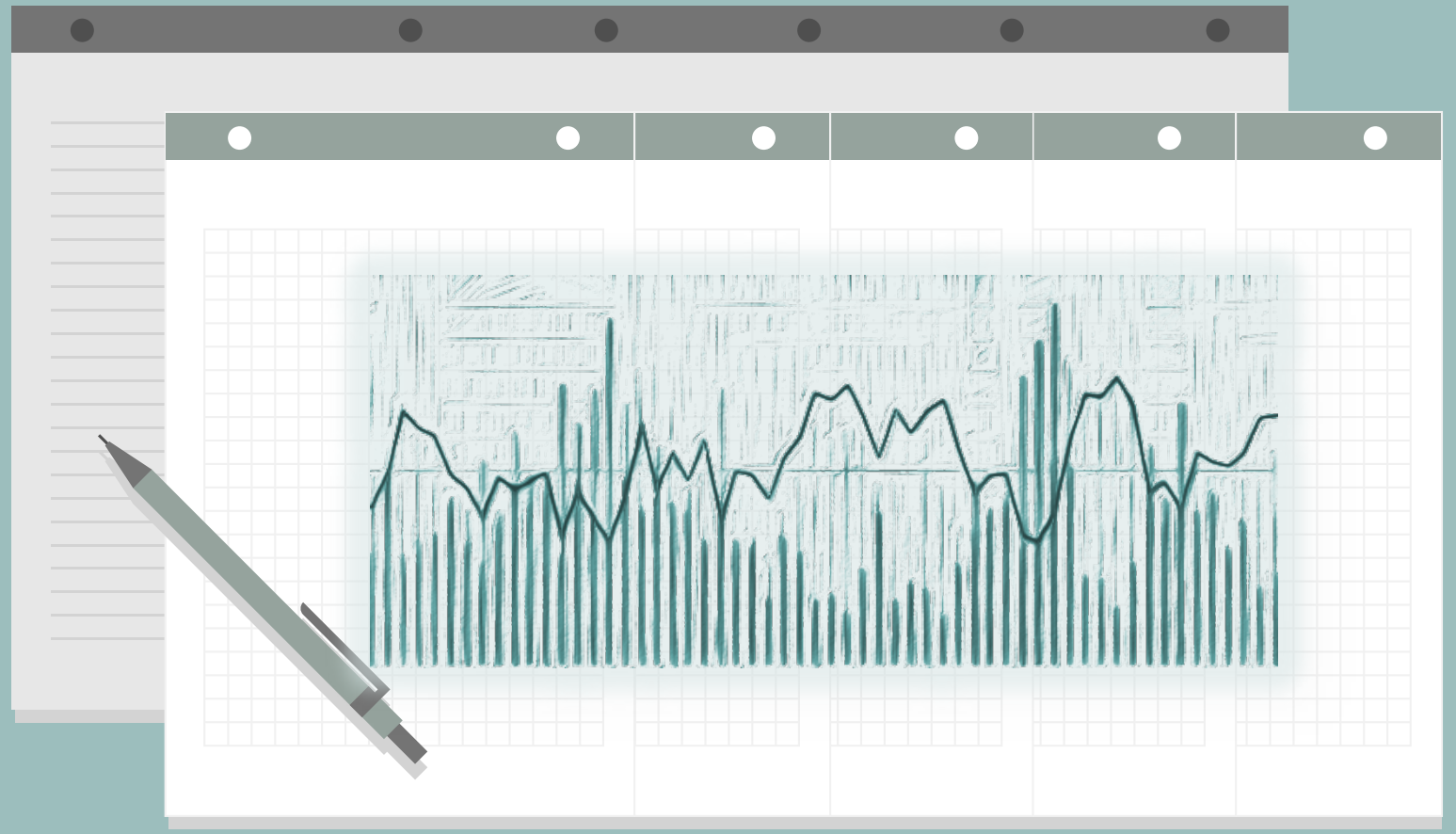

COMMUNICATIVE TONE OF BANK OF ALBANIA'S MONETARY POLICY REPORT:

A SEMANTIC ORIENTATION ESTIMATION

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OUTLINE

CONTEXT OVERVIEW

- The communication of a central bank plays an informative and guiding role with regard to the - economic and financial - expectations of the markets in the future.
- The selection of words used in the various forms of communication carried out by the central bank can be an indicator of the economic progress, at a national level.
- Focusing on the **monetary policy report,** this research's aim is to perform a quantitative assessment of the communication tone, present in each quarterly report.
- Purpose: compiling a quarterly index series (TSOI) with a two-decade timespan (2003 – 2024), calculated as the ratio between positive and negative terms in the text.
- The research accentuates the data acquiring methods:
  - content dichotomy in semantic analysis (Ko & Chang, 2021): determining the general semantic orientation (positive / negative) of a written content, based on its amount of words;
  - data gathering tools: the Python environment and programming language.

THEORETIC ASPECTS

Semantic orientation:

a concept used in the field of natural language processing (NLP) to evaluate the **terminology polarity** used in a written content.

- The semantic orientation analysis carries out a quantitative discernment of the content, highlighting its dichotomy: whether the content meaning is positive or negative.
- This type of analysis (borrowed from the science of linguistics) provides insight on the undertones of a written content.
- It has found considerable application during recent years, even in economic analysis and research.
- In the case of this research project, the data were provided through semantic orientation analysis.

Data collection and estimation methods for this research project are based on methodologies published by: [1] Albrecht, et al. (2020); [2] Correa, et al. (2021); [3] Ko & Chang (2021); [4] Chong & Ho (2022) of Bank of Malaysia, and; [5] Rutkowska & Szysko (2024).

DATA

Sample *n consisted of*: 86 monetary policy reports, beginning of 2003 – middle of 2024.

- To calculate the number of words in each report, it was deemed to avoid stop words: at the beginning, in the body, and at the end of the sentence.
- Positive (hawkish) and negative (dovish) word lists were provided by Correa, et al. (2021).
- The novelty this research offers: identifying in the text, and including in the calculation, the hawkish and dovish phrases:
  - These phrases were identified in text through the *Regular Expression* pattern formulas.
- On average, for the entire sample, the text content of each report:
  - has 6,413 words;
  - 180 terms (words + phrases) are included in the dichotomic terms; of those there are:
  - 95 positive connotation (hawkish) terms, and 85 negative connotation (dovish) terms.

METHODS

The data gathering steps are specified in Albrecht, et al. (2020):

A. Download (from the Bank of Albania webpage) and locally save the corpus of this research;

B. Separate corpus' *n* reports into *n* separate elements of a Pandas dataframe;

C. Clean the data (remove the unnecessary parts of text from the corpus' content);

D. Separate the content of each report into fragments (*tokens*), constituting the sentences.

Python libraries used:

- PdfPlumber,
- Pandas,
- NLTK,
- Regex.

METHODS

Methodology's "Machine Learning" aspect: *NLTK* → *tokenize* → *PunktSentenceTokenizer* (**PST**)

- NLTK's PST component serves as segmentation tool of a given text, by sentences;
- To effectively separate sentences, PST should initially be trained on a substantial collection of text, in the aimed language, where tokenization by sentences is well-defined;
  - for our purposes, PST's training was carried out through a well-formatted body of text, on the minutes of the European Parliament sessions on economic and financial matters;
    - ✓ *part of the collection of NLTK library's help materials;*
- The training helps PST to:
  - learn about text's specificities in order to model its optimal segmentations, by sentence, in the given language;
  - in turn, use the model in order to correctly identify the start and the end of sentences, in the text provided by the researcher.

METHODS

Steps followed for the estimation of collected data. For each report, it was proceeded with:

A. Calculation of content's total of words (after eliminating stop words);

B. Calculation of the totals for positive (hawkish) and negative (dovish) terms;

C. Calculation of the totals for false-positive and false-negative terms;

D. The final estimation of the TSOI index, according to the theoretical approaches of Correa, et al. and Rutkowska & Szyszko (2024), through the specification:

$$TSOI = \frac{100 * \left(\frac{p}{(p+n)} - \frac{n}{(p+n)}\right)}{t}$$

where, in the report's content: p → positive terms' total;

n → negative terms' total;

t → words' total;

The 100-words constant ensures measurement proportionality to be maintained, between voluminous-text and compact-text reports.

METHODS

Examples of dichotomous terms (positive and negative), considered in the TSOI index:

Positive terms:	Negative terms:
Words: 'improved', 'stable', ' favourable', ' enhanced', ' optimism', 'enabling', 'successfully', 'calm', 'steady', 'grew'.	Words: 'challenging', 'tensions', 'volatility', 'shrank', 'slowdown', 'costly', 'downside', 'poor'.
Phrases: 'economic activity has continued to grow'; 'budget balance in the first quarter marked a positive value'; 'in line with our price stability target'; 'investments expanded rapidly'; 'low levels of the unemployment'; 'fiscal surplus'; 'cyclical position remained at positive levels'.	Phrases: 'elevated prices and uncertainties'; 'exports of goods continued to shrink'; 'expenditures rose considerably'; 'revenues recorded negative contribution'; 'trade deficit expanding'; 'caused the economic activity to slow down'; 'growth pace reduction in their deposits'.

METHODS

The following is an illustration of how positive and negative phrases are identified in the text:

- Example of a *Regex* code to identify a particular range of positive phrases:

```
(?:maintain|gain|manifest|mark|experienc|increas)ed\b[^,.:;]{1,25}?stability
```

Some of the positive phrases the above code identifies:

- maintained stability; gained stability; marked stability; experienced stability; increased stability; manifested stability.

- Example of a Regex code a to identify particular range of negative phrases:

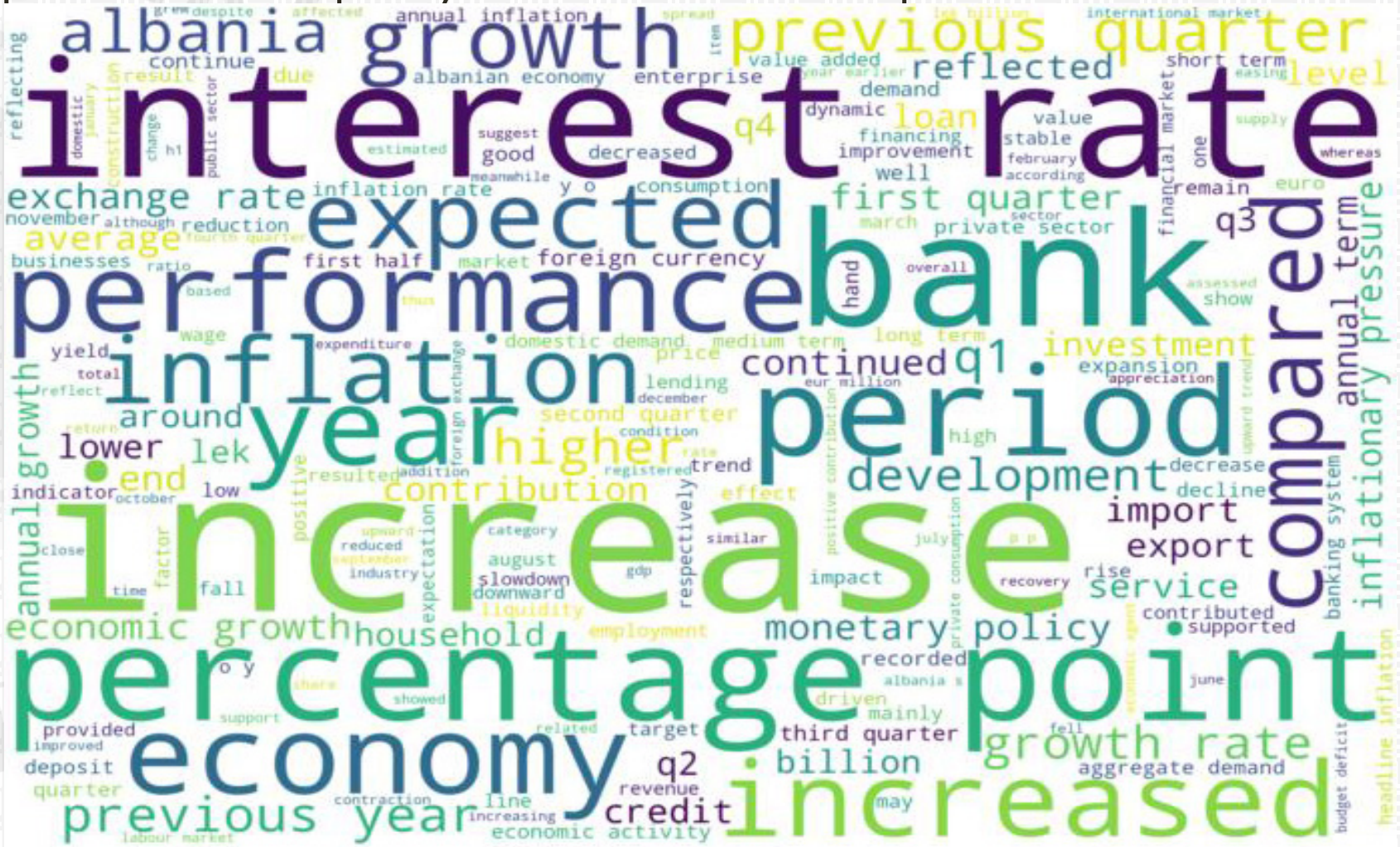
```
(?:significant\b|serious\b|\bpressing\b)[^,.:;]{1,22}?(?:challenges?|problems?\b|issues?\b|impacts?\b)
```

Some of the positive phrases the above code identifies:

pressing problem; serious challenge; pressing issues; significant challenge; serious impact; serious problems.

FEATURES OF THE SAMPLE

Words / phrases most frequently encountered in the corpus' content are illustrated below:

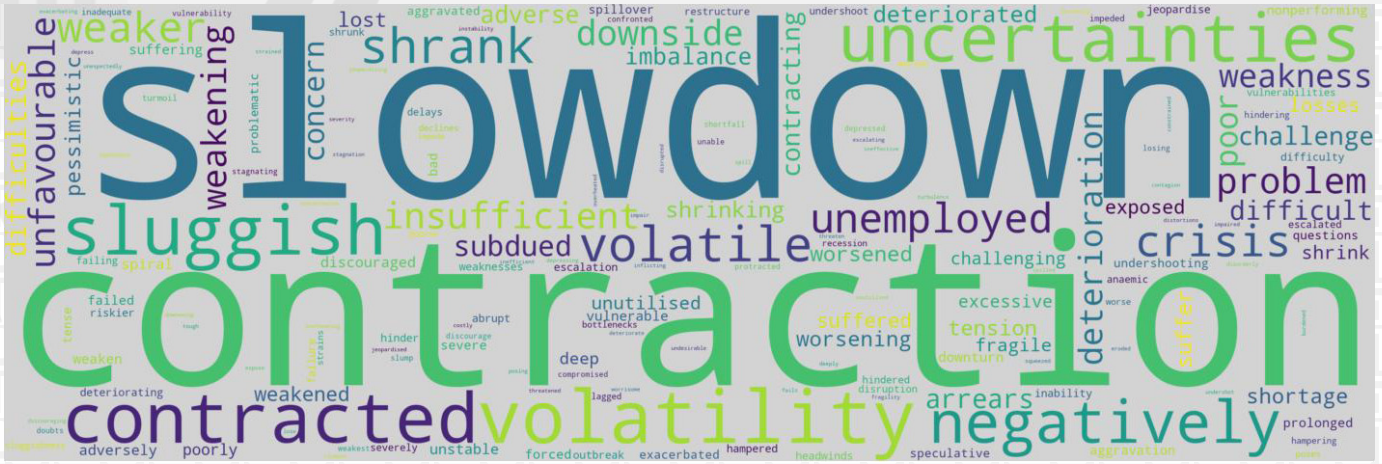


FEATURES OF THE SAMPLE

Words included in dichotomic terms, most frequently encountered in the corpus' content:

Positive connotation (hawkish)

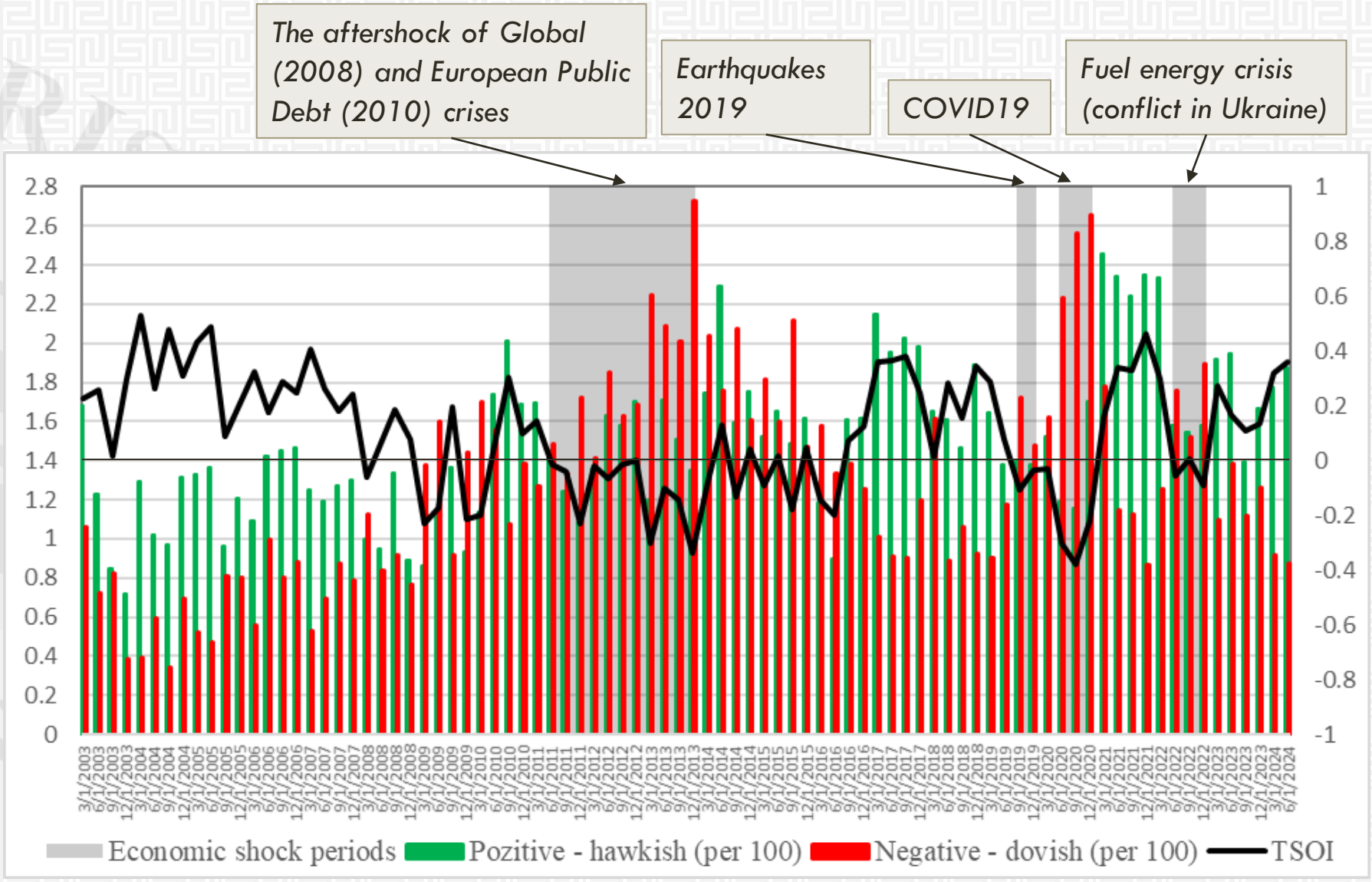
Negative connotation (dovish)



FINDINGS

Progression over time, of the communication ***Terminology Semantic Orientation Index*** (TSOI) – retrieved from Bank of Albania's monetary policy report text contents.

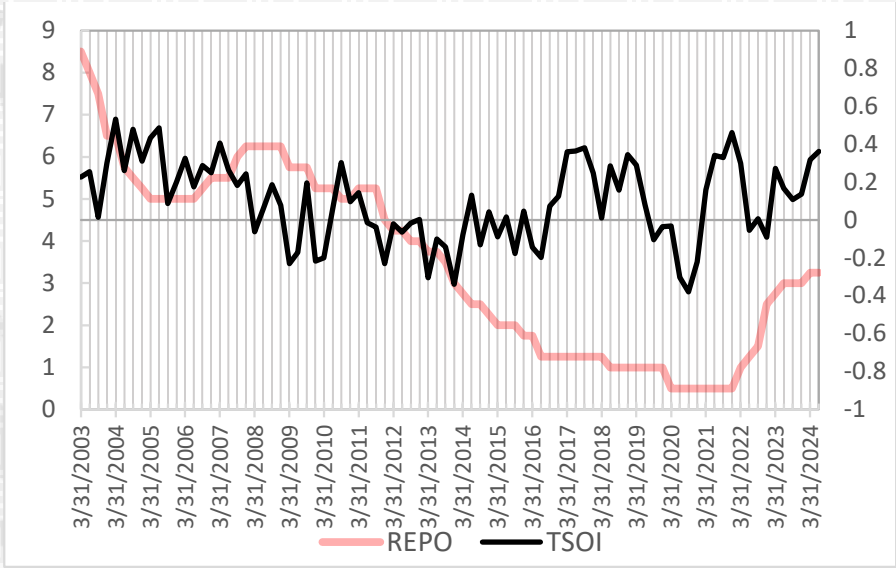
TSOI is noted to – generally – float over the 0 level when domestic economic conditions improve, and under the 0 level when these conditions deteriorate.

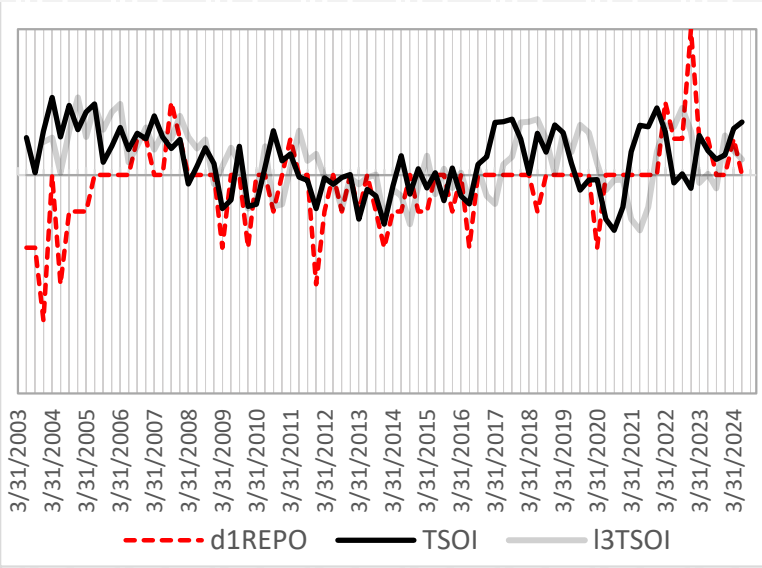


FINDINGS

Comparison of progression over time, between TSOI and interest rates:

- key interest rate (REPO).



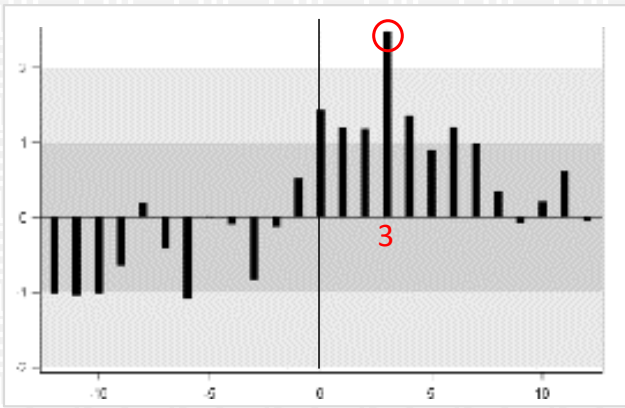


Note:

In line with economic theory, the changes in the key interest rate dynamics correlate positively with changes in TSOI's 3rd lag.

Correlation stats for:
[1] REPO rate (first difference), dhe
[2] TSOI.

- Realizations:		**83**
- Strongest correlation:	**(TSOI)**	**3 lags**
- Pearson coefficient:		**0.259**
- P-value:		**0.0182 ****



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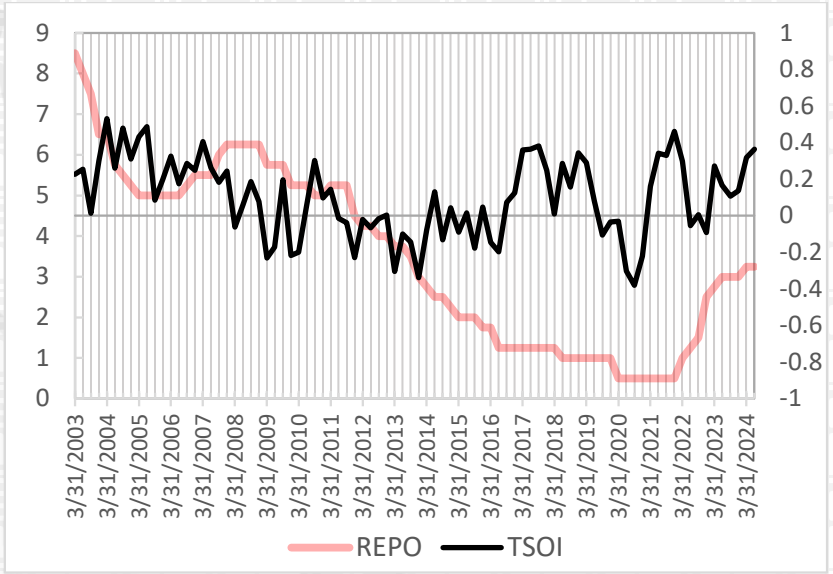
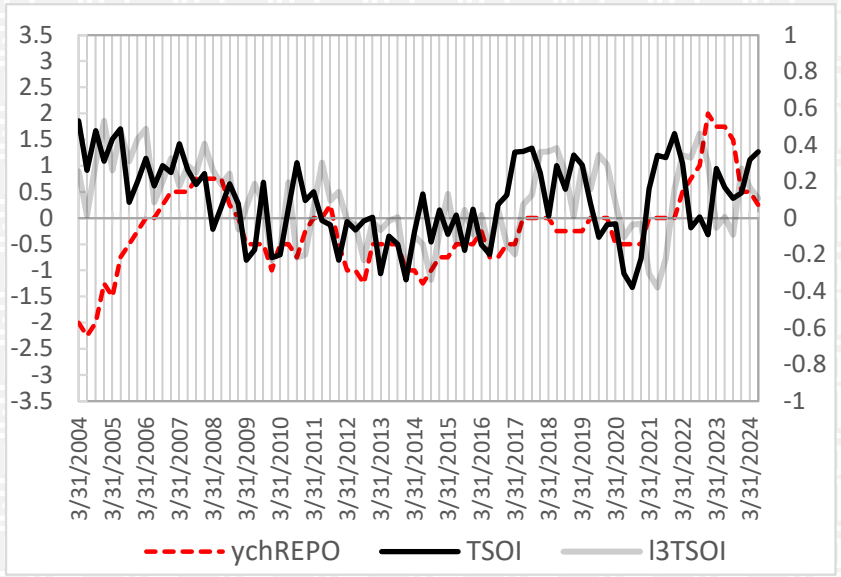


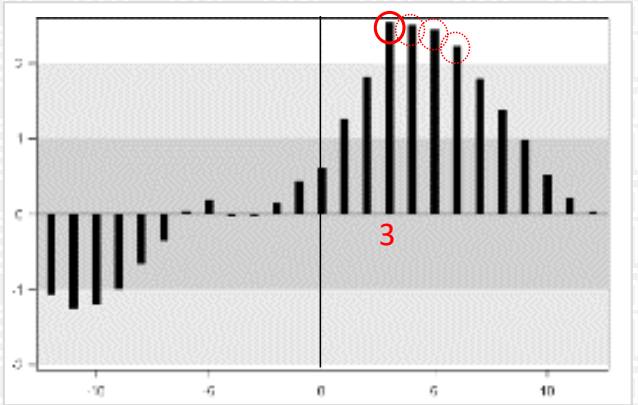


Note:

In line with economic theory, the changes in the key interest rate dynamics correlate positively with changes in TSOI's 3rd lag.

Correlation stats for:
[1] REPO rate (yearly difference), and
[2] TSOI.

- Realizations:		**82**
- Strongest correlation:	**(TSOI)**	**3 lags**
- Pearson coefficient:		**0.246**
- P-value:		**0.0257 ****



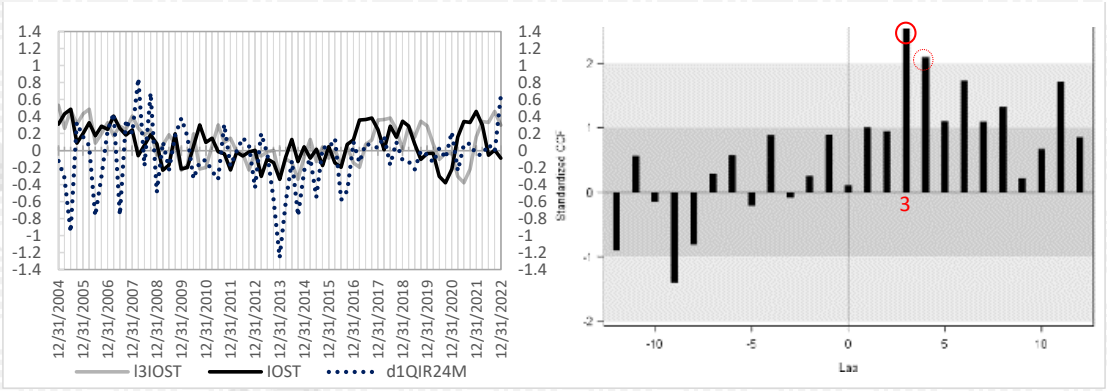
FINDINGS

Comparison of progression over time, between TSOI and rate:

- of interest, 24-month deposits;
- of interest, multi-year loans;
- of return, 12-month Treasury bonds.

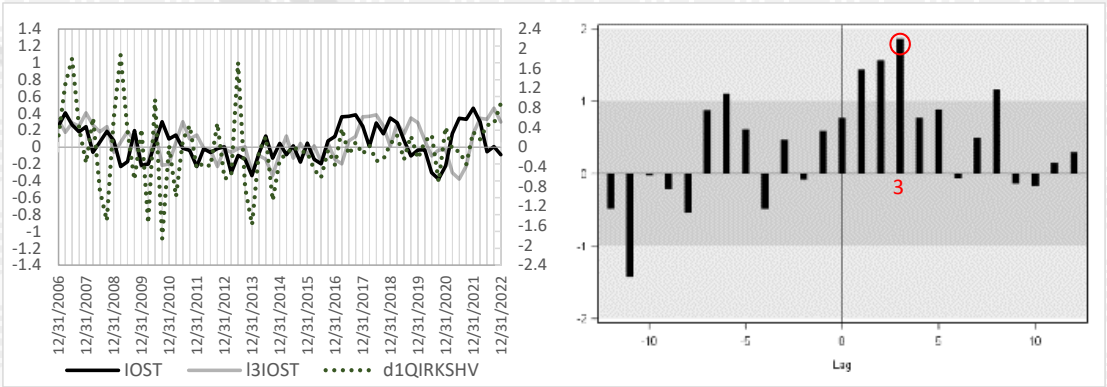
Note:

Charts show that changes in interest rates' dynamics correlate positively with changes in TSOI's 3rd lag.



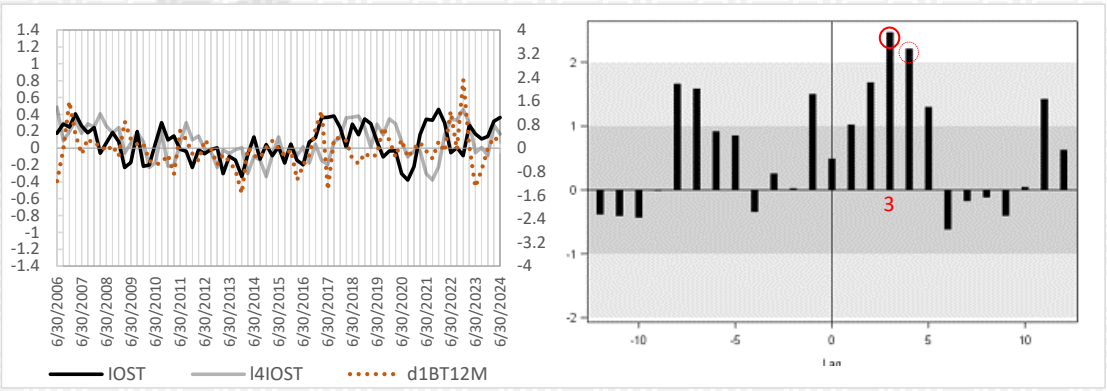
[1] interest rate, 24-month deposits (first difference), and
[2] TSOI.

- Realizations: 73
- Strongest correlation: (lOST) 3 lags
- Pearson's coefficient: 0.209
- P-value: 0.0751 *



[1] interest rate, multi-year loans (first difference), and
[2] TSOI.

- Realizations: 65
- Strongest correlation: (lOST) 3 lags
- Pearson's coefficient: 0.298
- P-value: 0.0159 **

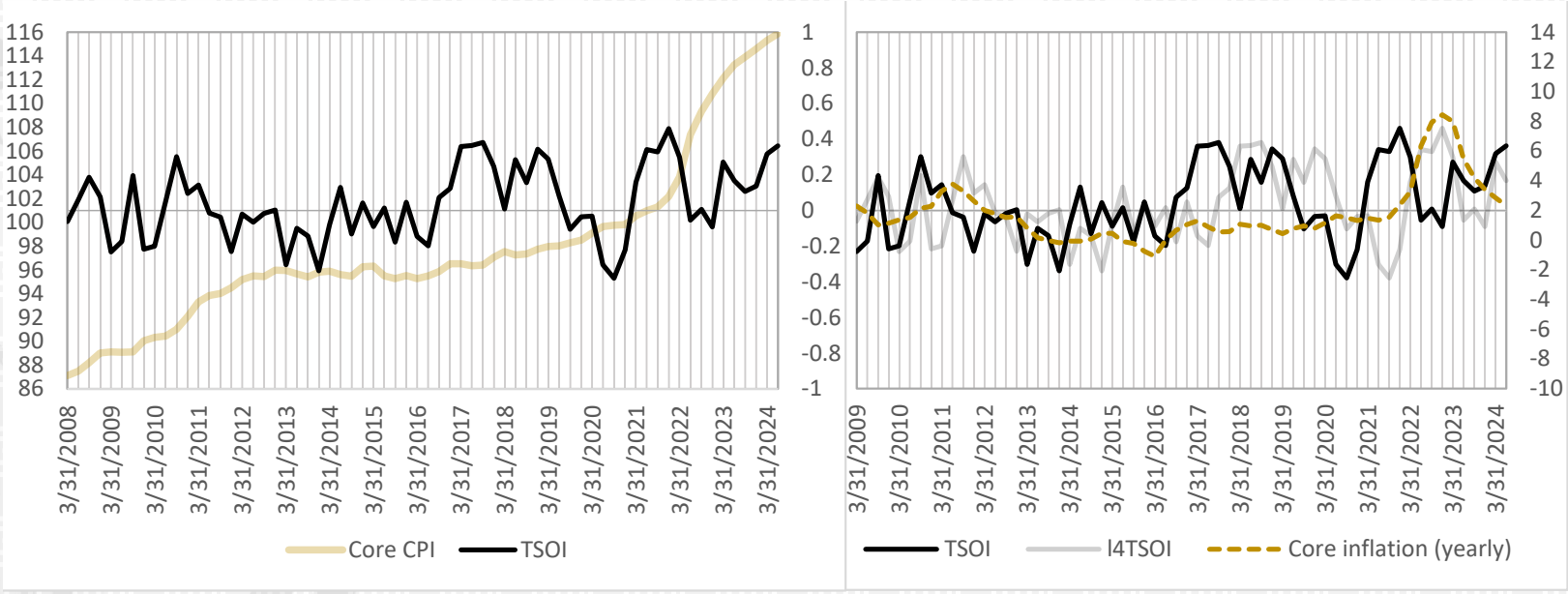


[1] rate of return, 12-month Tresury bonds (first difference), and
[2] TSOI.

- Realizations: 73
- Strongest correlation: (lOST) 3 lags
- Pearson's coefficient: 0.305
- P-value: 0.0086 ***

FINDINGS

Comparison of progression over time, between TSOI and yearly core inflation.

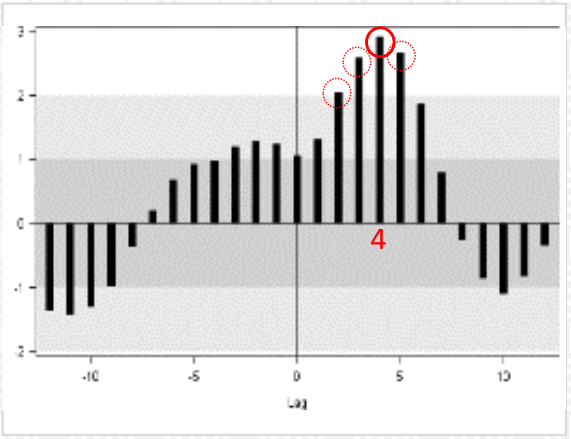


Note:

Chart shows that changes in economic growth's dynamics correlate positively with changes in TSOI's 4rth lag.

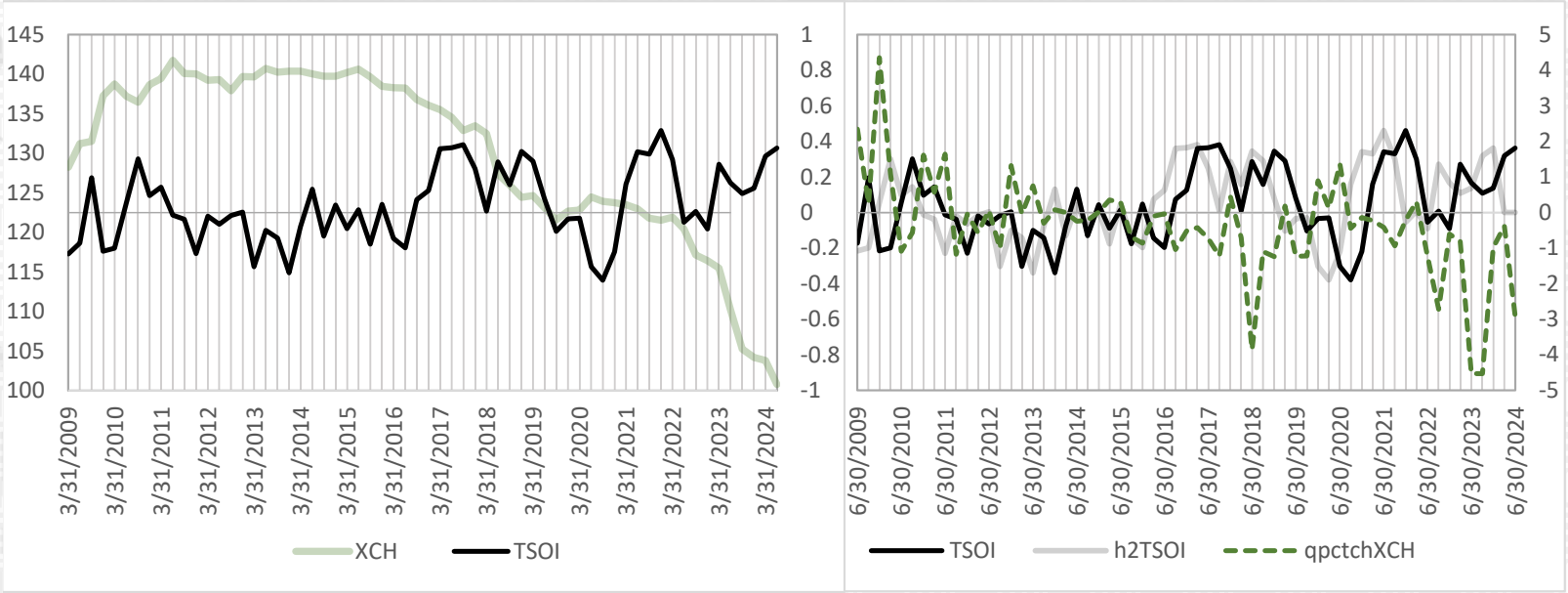
Correlation stats for:
[1] yearly core inflation, and
[2] TSOI.

- Realizations:		**62**
- Strongest correlation:	**(IOST)**	**4 lags**
- Pearson coefficient:		**0.376**
- P-value:		**0.0026 *****



FINDINGS

Comparison of progression over time, between TSOI and the Euro exchange rate.

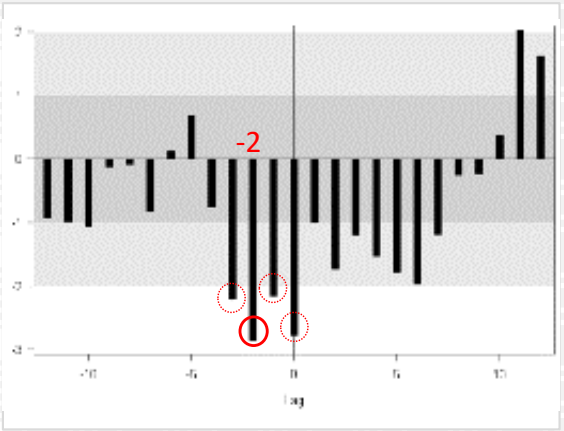


Note:

Chart shows that changes in exchange rate's dynamics correlate negatively with changes in TSOI's 2nd lead.

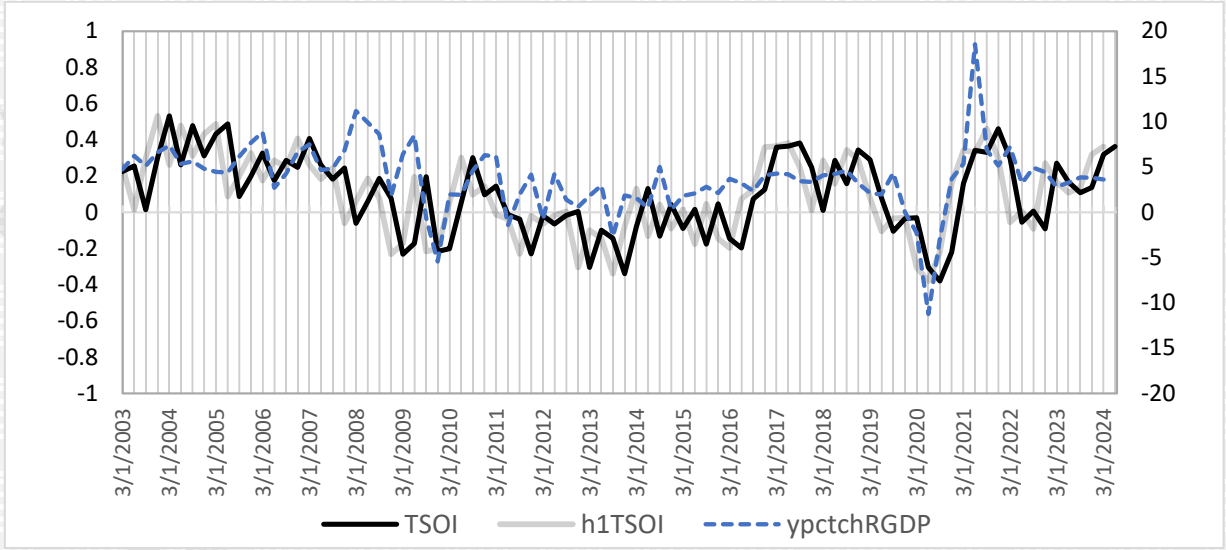
Correlation stats for:
[1] Exchange rate (EURO) [quarterly growth], and
[2] TSOI.

- Realizations:		**59**
- Strongest correlation:	**(TSOI)**	**2 leads**
- Pearson coefficient:		**-0.382**
- P-value:		**0.0028 *****



FINDINGS

Comparison of progression over time, between TSOI and economic growth.

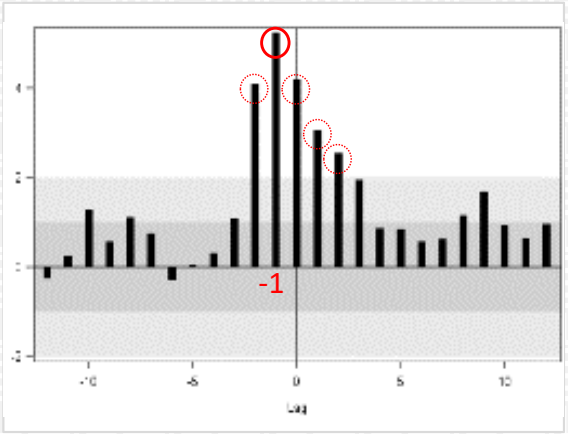


Note:

Chart shows that changes in economic growth's dynamics correlate positively with changes in TSOI's 1st lead.

Correlation stats for:
[1] real (yearly) economic growth, and [2] TSOI.

- Realizations:		**84**
- Strongest correlation:	**(IOST)**	**1 leads**
- Pearson coefficient:		**0.569**
- P-value:		**<0.0001 *****



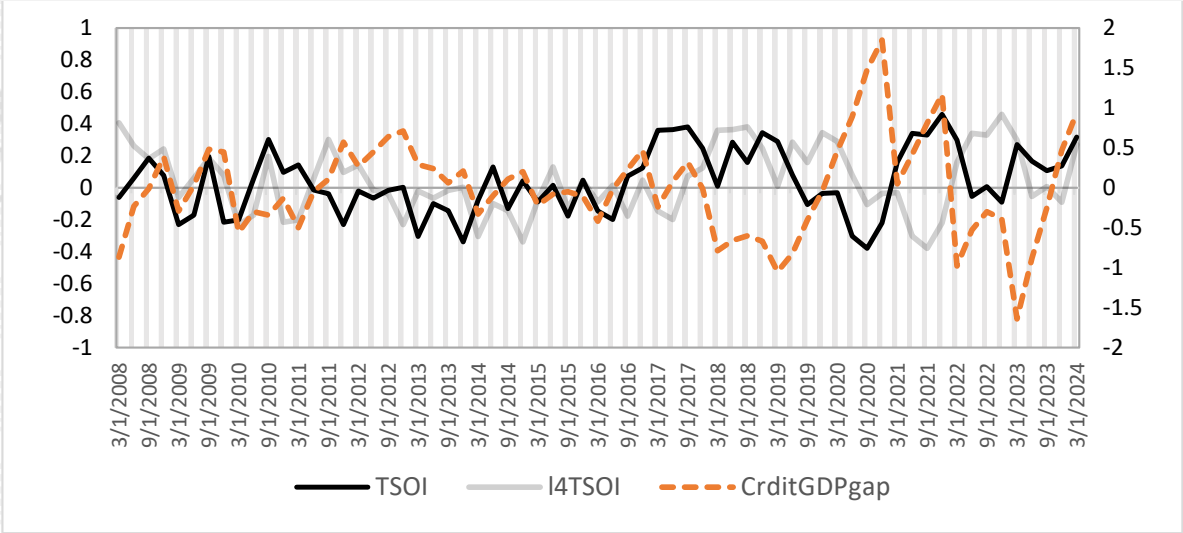
FINDINGS

Comparison of progression over time, between TSOI and Credit – GDP gap:

- Levels of non-financial short-term credit, in ALL.

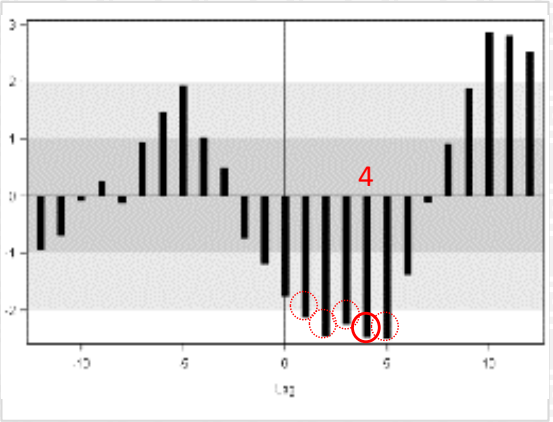
Note:

Chart shows that changes in Credit – GDP gap's dynamics correlate negatively with changes in TSOI's 4rth lag.



Correlation stats for:
[1] credit to GDP gap, and
[2] TSOI.

- Realizations:		**65**
- Strongest correlation:	**(TSOI)**	**4 lags**
- Pearson coefficient:		**-0.337**
- P-value:		**0.0061 *****



CONCLUDING REMARKS

This research project's purpose was a quantitative assessment of the communication tones present in the English version of the Bank of Albania's quarterly monetary policy reports.

- The data consisted of identifying – in reports' text contents – terms with positive and negative connotations, and the methods of their collection included the Python environment and programming language.
- The product of this research is an index of the semantic orientation of terminology used in monetary policy reports (TSOI), spanning 86 quarters (2003Q1 – 2024Q2).
- The correlations between the TSOI and the main economic indicators, such as: gross domestic product, interest rates, exchange rate, and loans, in most cases come up as statistically significant.
- TSOI results a forward guiding indicator: 3 quarters to 1 year for: interest rates, rates of government bonds, and REPO, as well as; 1 year: for annual inflation and the Credit - GDP gap.
- Based on the results of statistical tests, TSOI is deemed a valid and suitable series for use in econometric analyzes and estimations with a focus on central bank decision-making, as well as research in the economic field.

FUTURE RESEARCH

This research project aimed to perform a quantitative assessment of one of the Bank of Albania's means of mass communication and information: the monetary policy report.

In this context, quantitative assessment projects of this nature can also be undertaken for:

- press releases, conferences, speeches, articles and interviews published by Bank of Albania's press center:
  - extracting the data according to publication relevant dates;
- financial stability reports and statements (which have a 6-month publication frequency).

Also, the product of this research (TSOI index) can be used for more in-depth econometric analyses, such as:

- a vector autoregression analysis for economic growth, TSOI, inflation, and exchange rate.

Thank you!

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