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Impact of Crisis Coverage on the Financial Market of Russia

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ABSTRACT

The article examines the impact of informational messages characterizing the crisis in the economy on the financial market indicators. The aim of the article is to build an index that allows assessing the crisis situation in the country based on text analysis of informational messages. Due to the literature review, the factors determining the crisis in the economy were identified. The empirical base of the study included more than 10 million news texts from various sources accredited by Thomson Reuters. For the first time, the authors compiled a “bag of words” (dictionary) to determine the crisis situation in the country; and by means of the text analysis, they developed the author’s crisis index calculated on the basis of news reports in foreign media about Russia. They conducted the analysis of the relations between the crisis index and the stock index MOEX. According to the results of the study, it has been established that an increase in the number of news reports determining the crisis situation in the economy has a negative effect on the financial market: it leads to a drop in stock prices. Thus, not only objective economic factors, but also the information component influencing the mood of investors and the behavior of economic entities, affects the key indicators of the financial market. The proposed author’s crisis index can also be used to assess other relations, for example, the effect of the crisis on the exchange rate.

Keywords: text analysis; crisis; crisis index; financial market; stock index

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INTRODUCTION

The Russian economy is in a protracted crisis. The drop in the value of the country's currency, the economy contraction, the decline in real incomes of the population are the primary signs of a crisis in the economy. At the same time, the sentiment of the news context has an increasing influence on the financial market. Depending on the news reports carrying various emotional tints, investors' mood change. One of the factors for a negative media coverage is information about a crisis in a country or the world. Such reports indicate an increase in investment risks and, accordingly, affect the behavior of financial market participants. In economics, to identify a crisis situation, they use index construction that reflects appearing crisis situations in a country's economy.

LITERATURE REVIEW AND RESEARCH HYPOTHESES

Most studies construct crisis indices based on macroeconomic indicators. Among foreign studies, work [1] can be mentioned where the factors determining currency crises are revealed. According to the research results, the most significant crisis indices are: low level of gold and foreign exchange reserves, inability of short covering by the central bank reserves, high external and internal debts of the public sector to GDP. In work [2], the authors use such indicators as trade and regional integration to construct a crisis index. The authors conclude that the globalization and expansion of international trade contribute to the spread of economic crises from one country to another. In research [3], a crisis index of economic liberalization is constructed. The research results show that rising unemployment has a significant impact on a crisis emerging in the economy.

One of the most common crisis indices is the EMP (exchange market pressure). This index is a weighted average of the depreciation rate of the national currency (usu-

ally compared with the US dollar in nominal or real terms), a monthly change in the value of foreign reserves of foreign currency (in percentage terms) and a monthly change in interest rate [4, p. 115]. This index is used to determine a financial crisis period, as well as to study the dependencies of economies of different countries from each other. Based on this index, the fluctuations were investigated during the crisis period of the currency of Fiji [5], Russia and the CIS countries [6].

Among domestic studies, work [7] should be noted where the authors determine crisis periods via the construction of various indices of economic security. The main indicators used to construct the indices are: GDP, industrial output, investment in fixed assets, unemployment, ratio of per capita income to the subsistence minimum, ratio of the average pension to the average wage, total amount of foreign exchange reserves, etc.

In work [8], the most common groups of the stock market crisis indices were investigated: stock indices, rates of return, yield spreads. The authors identified the outrun features of the P/E and P/BV indicators for the Russian stock market.

In research [9], the authors construct an integral index of the crisis origin by means of the following variables: GDP dynamics, crisis duration and recession (the number of years when negative GDP growth rates were observed), rising unemployment, and budget deficit.

By means of text analysis techniques, the Bank of Russia constructed a high-frequency index calculated on the basis of daily news to assess the dynamics of economic activity in the country. Based on the analysis of the news data for the period from January 2014 to August 2017, the influence of the news on the economic activity in the country is determined. The resulting factor is the PMI (Purchasing Managers Index) published by Bloomberg. A wide range of indices makes it possible to comprehensively evaluate crisis phenomena highlighting the key

risks inherent in each crisis period. Based on the data, it is possible to forecast crises in the short and long term.

The aim of the study is to construct an index allowing to assess the crisis situation in the country based on text analysis. The authors believe that there is a relationship between the situation in the financial market and the news describing the crisis situation in the country. Spreading news reports containing information on various manifestations of the crisis influences investors' mood. Detecting the economic crisis leads to a fall in stock prices on the stock market.

INDEX CONSTRUCTION METHODOLOGY

To identify the relationship between the financial market situation and the news covering various manifestations of the crisis, this work uses the so-called sentiment analysis extracting positive or negative emotions from texts [10]. Such an automatic analysis allows to determine whether the text under review is positive or negative to the object in question.

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First publications on sentiment analysis appeared in the late 1990s — early 2000s [11–13]. Since then, quite a lot has been done in this area: lexicons of sentiment-related words have been compiled and algorithms have been developed [14–16].

In modern text analysis systems, the most common assessments are: *positive sentiment*, *negative sentiment*, and *neutral sentiment*. Neutral sentiment means that the text does

not have emotional coloring. Successful cases of using multidimensional spaces are also known [10].

To determine the sentiment of the text, methods based on dictionaries (lexicon-based methods) are widely used. These methods imply that words in a dictionary correspond to a certain emotional scale and are the markers for the overall sentiment of the text.

Among the direct methods of compiling lexicons of sentiment-related words the following directions can be defined:

1. Compiling lists of sentiment-related words manually [17]. This approach is particularly effective in addressing the specific task to extract the sentiment from texts of specific topics.

2. Using ready-made dictionaries and lists. There are special thesauruses where the emotional component of the vocabulary is marked up. For English, this is SenticNet, SentiWordNet and WordNet-Affect. For example, SenticNet [18] is a semantic thesaurus, which reflects not only the sentiment of the vocabulary, but also cognitive information.

In this work, the lexicon of sentiment-related words was compiled manually, since the sentiment-related words were extracted in the subject area “crisis and crisis situation”; there are no ready-made dictionaries and lists for this area yet.

The content of the lexicon of sentiment-related words and the classification of its vocabulary are largely determined by a specific task. Therefore, only negative sentiment is of interest for the subject area “crisis — crisis situation”. This aim significantly reduces the lexicon of sentiment-related words.

Thus, the lexicon of negative sentiment-related words of the subject area “crisis — crisis situation” was compiled manually. For this purpose, scientific articles about economic crisis written in English by foreign authors were used [19–23]. These authors consider the economic crisis as financial, while highlighting its currency, debt and banking subaspects. When analysing these texts, special atten-

tion was paid to the lexical units describing the causes of a crisis situation, as well as the forms of each crisis type.

At the first stage, negative sentiment-related words of the semantic field “crisis” were manually identified by an expert linguist from the texts (about 100 thousand words). The expert judged by the highest frequency of lexical units in the above works. Besides the sentiment-related words of the subject area “crisis — crisis situation”, the so-called intensifiers were also included in the lexicon. They changed (increased or decreased) the significance of the following words.

According to the semantic features, these words were then divided into groups. The classification of the vocabulary and the groups are given below.

1. Words related to the semantic field “crisis” with a negative connotation.
2. Words related to the semantic field “anxiety” with a negative connotation.
3. Words related to the semantic field “deterioration”.
4. Adjectives and adverbs-intensifiers denoting an excessive degree.

The following words were assigned to the first group — the semantic field “crisis”: “asset price bust”, “asset price bubble”, “bailout”, “bank liquidation”, “bankrupt”, “bankruptcy”, “boom”, “borrow”, “borrower”, “borrowing”, “burden”, “corrupt”, “corruption”, “credit crunch”, “currency”, “currency attack”, “current account deficit”, “debt”, “deficit”, “deflation”, “derivative speculation”, “devalue”, “devaluation”, “disruption in foreign exchange markets”, “downgrade”, “downgraded”, “excessive consumption”, “exchange rate”, “external deficit”, “financial innovation”, “fluctuate”, “fluctuation”, “foreign debt”, “hedge funds”, “high inflation rate”, “high public sector debt”, “high unemployment”, “housing bubble”, “housing market”, “imbalance”, “interest rates”, “job loss”, “layoff”, “leverage”, “loan”, “loose financial conditions”, “low ranking”, “mortgage”, “mortgage lending”, “non-performing loans”, “oil prices”, “over-

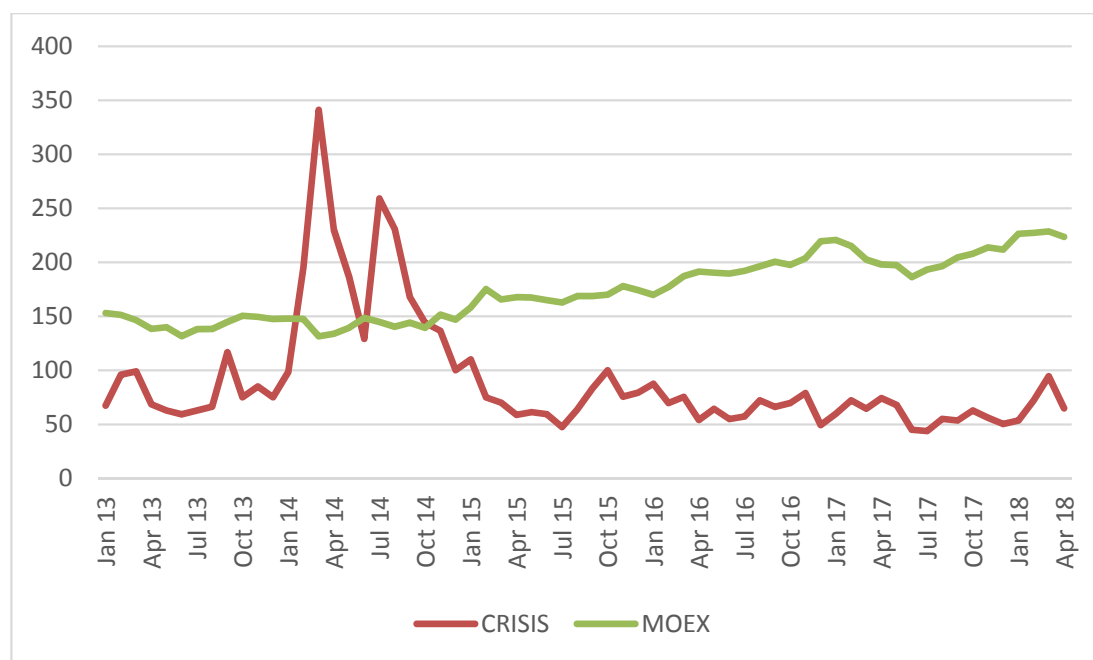
valued currency”, “pressure”, “rating”, “rating agency”, “real estate boom”, “redundancy”, “redundant”, “regulatory weakness”, “risk”, “risky”, “securitization”, “securitize”, “securitized”, “shadow banking”, “sovereign debt”, “speculative attack”, “speculative investment”, “subprime”, “subprime loans”, “subprime mortgage”, “trade deficit”, “trading loss”, “unemployed”, “unemployment”, “unregulated”, “volatile”, “volatility”, “weak competitiveness”, “weak regulation”.

The negative effects of the crisis and the sanctions against Russia not only directly affect the economic indicators of the country's development, but also have a negative indirect effect on the economy by creating a negative media coverage that brings discredit to Russia to investors.

The following words were assigned to the second group — the semantic field “anxiety”: “concern”, “doubt”, “doubtful”, “fear”, “gloomy”, “insecurity”, “loss of confidence”, “panic”, “tension”, “threat”, “threaten”, “turbulence”, “turbulent”, “turmoil”, “uncertain”, “uncertainty”, “unprecedented”.

The following words were assigned to the third group — the semantic field “deterioration”: “decline”, “declining”, “depreciate”, “depreciation”, “deteriorate”, “deterioration”, “diminish”, “diminishing”, “downturn”, “drop”, “fail”, “failure”, “fall”, “gap”, “go down”, “inefficient”, “instability”, “lack”, “laggard”, “loose”, “loosen”, “loss”, “low”, “lower”, “melt-down”, “plunge”, “recession”, “reduce”, “reduction”, “slowing”, “slow”, “growth”, “slow-down”, “slump”, “tight”, “tighten”, “tightening”, “unstable”, “vulnerable”, “weak”, “weaken”.

The following words were assigned to the fourth group: “abundance”, “abundant”, “exces-



Crisis index and Moscow Exchange index

Source: calculated by the authors.

sive”, “rapid”, “rapidly”, “significant”, “significantly”.

The lexicon included not only separate parts of speech, but also collocations, both negative and emphatic, for example: rising unemployment, face bankruptcy, weak competitiveness, low ranking, overvalued currency.

Thus, the manually compiled lexicon of negative sentiment-related words of the subject area “crisis” includes 171 units.

In addition, two indices were developed regarding the sanctions:

1) SAN 0 is an index showing the number of references in the media to the words “sanctions” and “economic sanctions”;

2) SAN 1 is an extended index calculated on the basis of the words: “sanctions”, “economic sanctions”, “restriction”, “prohibition”, “blockade”, “block”, “barrier”, “ban on import”.

DATA ANALYSIS

Thomson Reuters news reports are used as an empirical base, since their content was proved to meet the requirements of the text consistency for sentiment analysis and studying the influence of the news on the financial

market. The news for the period from 2006 to 2018 was selected as a source; the test period was January 2013 — May 2018. The news was selected by the keywords “Russia, Russian, Moscow, Kremlin” during the test period. To test thematic modeling and sentiment analysis, a total sample of more than 10 million news texts from various sources from various sources accredited by Thomson Reuters was used. The main sources of information were: The New York Post, CNN, Breitbart, Reuters, Fox, Atlantic, The Washington Post, BuzzFeed.

As part of the study, the interdependence between the calculated author’s crisis index (crisis) and the Moscow Exchange index (MOEX) was studied (see *figure*). Monthly data for the period of January 2013 — May 2018 were analyzed. The sample size is 64 observations (the exchange rate and the Moscow exchange index are considered as a monthly average).

To identify the relationship between the variables under review, a correlation analysis was first carried out (*Table 1*). The analysis results show that the crisis has the greatest impact on the stock index and has the opposite effect.

Table 1

Correlation analysis of the considered variables

	MOEX	CRISIS	SAN 0	SAN 1
MOEX	1.000000	-0.522382	-0.346004	-0.379796
CRISIS	-0.522382	1.000000	0.910611	0.935603
SAN 0	-0.346004	0.910611	1.000000	0.995201
SAN 1	-0.379796	0.935603	0.995201	1.000000

Source: calculated by the authors.

As it is seen from *table 1*, the indices on the crisis and the sanctions have a very close relationship. Consequently, at present for Russia, the imposed sanctions are the main factor in the manifestation of the crisis. The impact of the crisis index on the stock market is negative. Thus, not only the economic crisis itself, but even a mention of crisis signs in the news leads to a drop in prices on the Moscow stock exchange.

The GARH-model was used to analyse the impact of the crisis on the stock index (*Table 2*).

Table 2 shows that the crisis has a negative effect on the change in the stock index: the higher the crisis index is, the lower the value of the MOEX index is. The coefficient of determination (R-squared) is 96% which means a high explanatory power of the selected variables; there is no autocorrelation in the residuals.

The final equation for calculating the MOEX index is as follows:

$$\text{MOEX} = 127.65 - 0.038 \times \text{CRISIS} + 0.73 \times \text{MOEX}_{-1}.$$

Given that the sanctions were defined as the main factor of the crisis in the current period of time, the initial data set was divided

into the period up to March 2014, i.e. before the first sanctions against Russia, and after. The reanalysis revealed that the influence and dependencies of variables during the sanction period increase (*Table 3*).

As it is seen from *Table 3*, the values of the coefficients increased according to the data presented in *Table 1*. The value of the correlation coefficient between the developed crisis index (CRISIS) and the Moscow Exchange index (MOEX) increased from -0.52 to -0.68. Similarly, the relationship between the stock index (MOEX) and the sanction indices (SAN 0, SAN 1) increased from -0.34 to -0.61 and from -0.38 to -0.61 respectively. Thus, the sanctions, as well as coverage of this topic in the news have the most negative impact on the Russian economy today. Increasing correlation coefficient values between the variables under review also indicates the increasing media coverage influence on the financial market indicators on the whole. Thus, the negative effects of the crisis and the sanctions against Russia not only directly affect the economic indicators of the country's development, but also have a negative indirect effect on the economy by creating a negative media coverage that brings discredit to Russia to investors.

Table 2

Impact of the crisis on the stock index (MOEX)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
CRISIS	−0.037885	0.018923	−2.002038	0.0453
@TREND	1.537348	0.155297	9.899403	0.0000
Const	127.6524	6.909549	18.47478	0.0000
AR(1)	0.726824	0.067346	10.79241	0.0000
	Variance Equation			
C	2.018538	1.611175	1.252836	0.2103
ARCH(1)	−0.124038	0.096184	−1.289590	0.1972
GARCH(1)	1.063141	0.091077	11.67295	0.0000
R-squared	0.959633	Mean dependent var		174.3964
Adjusted R-squared	0.955308	S.D. dependent var		29.08690
S.E. of regression	6.149094	Akaike info criterion		6.436995
Sum squared resid	2117.436	Schwarz criterion		6.675121
Log likelihood	−195.7653	F-statistic		221.8801
Durbin-Watson stat	1.816403	Prob(F-statistic)		0.000000
Inverted AR Roots	.73			

Source: calculated by the authors.

CONCLUSIONS

Thus, we proved that the manifestations of a crisis in a country, possible to be determined not only traditionally by the values of the main economic indicators, but also by the content of news reports, can influence the key economic indicators and the activities of economic entities in the country. In particular, mentioning a crisis in Russia provokes a decline in the Moscow Exchange stock index,

thereby reflecting the economic sentiment of investors.

The paper suggests a tool for the quantitative analysis of the qualitative factor — the content of informational news reports. This analysis allows to study the relationship between various economic indicators and the news. The consistency of the developed crisis indicator is proved by the example of the most obvious relationship — the impact of the crisis on the stock mar-

Table 3

Correlation analysis for March 2014 – April 2018 (the period of sanctions against Russia)

	CRISIS	MOEX	SAN 0	SAN 1
CRISIS	1.000000	-0.687177	0.958541	0.964155
MOEX	-0.687177	1.000000	-0.614648	-0.608722
SAN 0	0.958541	-0.614648	1.000000	0.998526
SAN 1	0.964155	-0.608722	0.998526	1.000000

Source: calculated by the authors.

ket. In the future, the proposed author's index can be used to assess other relationships, such as the impact of the crisis on the performance of Russian companies.

A negative media coverage about Russia can be used as an additional measure of economic impact by the countries that imposed the sanctions. To a greater extent news reports influence the stock market and reduce

the attractiveness of Russian companies as a source of investment. Thus, it can be stated that the external negative factors aimed at destabilizing the Russian economy are reflected in the financial market indicators. To improve the economic situation in Russia, it is necessary to resolve political conflicts and disagreements leading to information pressure and sanctions against Russia.

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Fedorov F.Yu. — calculation of the crisis indicator.

Vinogradova L.V. — compiling a “bag of words”.

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