Investigation on the Potential Manipulation of ROBOR Interest Rates

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Abstract: Recently observers have expressed concerns that the ROBOR benchmark interest rates may not accurately reflect the costs of interbank lending. ROBOR rates are reference indices for variable interest loans granted to both individuals and corporate clients in Romania, but also for derivative financial contracts that has ROBOR as the underlying asset. Therefore, the impact of ROBOR's relevance is reflected in a much wider range of financial products addressed to the population, which will bear all the changes related to its volatility. This paper examines a possible manipulation of the prices of interbank deposits. In order to evaluate the evolution of the relevant ROBOR rates from the perspective of the existence of a market manipulation behavior, for the period July 2, 2018 - April 4, 2022, two scenarios were analyzed. Firstly, the collusion between two or more participants to obtain additional financial income related to the loan portfolio indexed to ROBOR. Secondly, the collusion between two or more participants to use inside information regarding the monetary policy decisions of the National Bank of Romania (NBR). Analyzing the hypotheses of the two scenarios, we conclude that there are no indications of a possible manipulation of ROBOR interest rates by tacit agreements between participants in the Fixing or by using inside information on monetary policy decisions of the NBR.

Key words: Romanian Interbank Offer Rate (ROBOR), benchmark interest rates, market abuse, market manipulation, inside information, Cartel

JEL codes: E4, E43

1. Introduction

This research paper aims to investigate a possible manipulation of the prices of interbank Romanian loans (ROBOR) through collusion among Fixing participants.

To answer the main question, this study is divided into two parts. The first one is devoted to empirical research on a possible cartel agreement between two or more participants in order to obtain an additional profit gain related to the portfolio of loans indexed to ROBOR. The second one is dedicated to empirical research on the scenario of a cartel agreement between two or more participants to use privileged information about the NBR's monetary policy decisions.

Generally, market abuse includes insider dealing, unauthorized disclosure of inside information and

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manipulation of the market. According to the provisions of *Regulation (EU) 2016/1011 on indices used as benchmarks in financial instruments and financial contracts or to measure the performance of investment funds and amending Directives 2008/48/CE and 2014/17/EU and Regulation (EU) No. 596/2014* (Benchmark Regulation), the ROBID/ROBOR interest rates are included in the category of significant benchmarks and the credit institutions participating in the establishment of these reference rates are called, for the purposes of the Benchmark Regulation, contributors.

2. ROBOR — Romanian Interbank Money Market Interest Rate

ROBID and ROBOR represent the Romanian interbank money market interest rates, as defined in *National Bank of Romania* (*NBR*) *Norm No. 4/1995 on the functioning of the interbank money market*, with subsequent amendments and additions (hereinafter referred to as NBR Norm No. 4/1995). The rates are established according to the provisions of the *Rules on determining the ROBID and ROBOR* (operational starting November 11, 2019).

The quotations supplied to the Agent by the reference banks in the Fixing are the basis for setting up the reference rates corresponding to deposit operations (ROBID) and loan operations (ROBOR), respectively. The latter is a reference index for loans granted with variable interest to both individuals and corporate clients, at the level of the entire national banking system (not only of the 10 contributors), as well as for derivative financial contracts that have ROBOR as an underlying asset. Therefore, the impact of ROBOR's relevance is reflected on a much wider area of financial products addressed to retail and corporate clients, which will bear all the costs related to its volatility. The calculation formula of the variable interest rate, established contractually by the banks, together with the loan granted to these categories of customers is influenced by the variation of the ROBOR reference rate (for loans granted before the entry into force of Government Emergency Ordinance No. 19/2019). The value of the reference rates mentioned above directly reflects the price at which the Romanian LEU (RON) is bought and sold on the interbank money market at a given time. Therefore, the importance of the evolution and variations recorded by this index is indisputable from the perspective of the final consumers of banking products.

Taking into account the existing data at the national level, in March 2022, out of a total of 2,124,258 debtors, 350,192 have mortgages, of which 32% are indexed to ROBOR, 226,767 have "First Home Mortgages" of which 71% are indexed to ROBOR and of the total number of borrowers who contracted a consumer loan, namely 1,547,299 borrowers, only 14% have loans indexed to ROBOR.

The practices analyzed in this paper aim to identify a possible manipulation of the prices of interbank Romanian loans (ROBOR) through collusion among Fixing participants, which would cause an increase in ROBOR and implicitly an increase in the monthly fees charged by banks for loans with floating rates.

3. Regulatory Framework

- Law No. 24/2017 on issuers of financial instruments and market operations;
- GEO No. 19/2019 for the modification and completion of some normative acts;
- NBR Regulation No. 1/2000 on open market operations performed by the NBR and standing facilities granted to eligible participants;
- NBR Norms No. 4/1995 on the operation of the inter-bank money market;
- NBR Norm No. 12/2008 for completing the NBR Norm no. 4/1995 on the operation of the inter-bank money market;

- Rules for determining the ROBID and ROBOR reference rates (Operational starting 11 November 2019).

Pursuant to the aforementioned legislation, the interbank money market is defined as a continuous market in which operations are carried out for the collection and placement of deposits and operations with money market instruments (government securities in the case of access to the standing facilities offered by the NBR), spot or forward, in the national currency at an interest rate level freely determined by the participating credit institutions.

4. Principles and Rules That Ensure the Market Discipline of the Indices

The activities related to the operations carried out by the participants of the interbank money market are carried out in accordance with a set of restrictive principles and rules as regulated in the normative acts mentioned earlier. These include the following principles and rules that ensure the market discipline of the indices.

Thomson Reuters calculates the ROBID and ROBOR rates daily as the arithmetic average of the interest rates displayed by a set of 10 commercial banks selected by the NBR according to their importance in the national banking system. These 10 banks were selected according to established performance criteria: i) activity in the interbank money market; ii) the limits on deposits in RON that the rated credit institution grants to other participants; iii) the limits of other credit institutions on deposits in RON that are granted to the rated credit institution. The status of a Fixing participant can only be obtained and maintained if the rules are followed.

The ROBID/ROBOR rates for each term are calculated by the proxy as the arithmetic average of the last rates reported by each participant for deposits attracted/placed in a 15-minute interval prior to the Fixing, after removing extreme values (outliers), thereby ensuring the integrity of the indices (an individual participant cannot engage in manipulative behavior in the sense of increasing the index, as the fixed value it reported in the ROBOR calculation would be removed from the calculation);

The maximum spread between the interest rate for withdrawal transactions and the interest rate for placement transactions shall be freely determined in the market, but shall ensure the fulfillment of the following conditions set forth in the Rules:

a) the spread between ROBID and ROBOR rates published by each Fixing participant for a given term deposit shall not exceed: i) 0.30 percentage points for O/N (one day), T/N (one day, with settlement on the business day following the transaction date), 1W (one week), 1M (one month) deposits; ii) 0.35 percentage points for 3M (3 months) deposits; iii) 0.40 percentage points for 6M (6 months) and 12M (12 months) deposits;

b) notwithstanding the provisions of subparagraph (a), in the event that interest rates in the interbank money market increase significantly, the following allowable spreads between the demand and supply rates referred to in subparagraph (a) shall apply: (i) twice the value if the quoted interest rate on the deposits placed exceeds the NBR monetary policy rate by more than 30%; (ii) three times the value if the quoted interest rate on the deposits placed exceeds the interest rate on the credit facility; (iii) unlimited if the quoted interest rate on the deposits placed exceeds 1.5 times the interest rate on the credit facility;

c) pursuant to Standard No. 12/2008 completing the Standard of the NBR No. 4/1995 on the operation of the inter-bank money market, the Central Bank may temporarily suspend the publication of the ROBOR/ROBID indices calculated on the basis of the quotations of the participating banks, if the participants' quotations for the deposits placed exceed the interest rate level for the NBR credit facility by more than 25%. In this situation, NBR will publish ROBID/ROBOR indices determined as follows: ROBID for all maturities, equal to the interest rate

on the central bank deposit facility; ROBOR for all maturities, equal to the interest rate on the central bank credit facility.

Credit institutions participating in the Fixing are required to quote fixed rates through information dissemination systems for the following maturities: i) O/N, T/N, 1W, 1M for a transaction value of up to 20 million RON; ii) 3M for a transaction value not exceeding 10 million RON; iii) 6M and 12M for a transaction value not exceeding 5 million RON. If the binding quotation published by one bank is accepted by another bank (counterparty), the transaction shall be deemed concluded and executed without reservation.

The mechanism for determining the ROBID/ROBOR indices results in the published fixed value for the ROBOR rate being dependent on the value of the quoted ROBID rate. Therefore, the conclusion of cartel-like agreements between two or more Fixing participants with the aim of manipulation in terms of increasing the ROBOR index results in significant economic losses for the manipulating participants due to the attraction of the other participants' deposits at ROBID rates higher than the rates established on the interbank market (deposits of 5 to 20 million LEI placed by each Fixing participant for each maturity for which the manipulating participant published fixed quotations).

In addition, the fluctuation margins of the indices do not allow for significant deviations of the interest rates published by the participants from the effective interest rates on the interbank money market.

The managements of the credit institutions participating in the Fixing are responsible for controlling the activities of the personnel involved in the Fixing by dividing the money market activities into different departments (front office, back office, cipher, and bank correspondence) in accordance with international practices and taking into account the necessary training of all persons employed by the institution in legal aspects (including asset relations) in each concluded transaction. Each Fixing participant develops its own rules for regulating the activity in question, which must be approved by the NBR.

In case of non-compliance with the provisions of the law, the NBR sanctions the financial institution concerned with a written warning, a fine, a partial or full suspension of the issued license for a period of up to 90 days and, in case of repeated or particularly serious violations, with the withdrawal of the license. In addition, if a case of market abuse/manipulation of the interbank money market is detected, the NBR will impose the penalty of imprisonment from one year to 5 years in accordance with the provisions of Article 134 paragraph (5) of Law No. 24/2017. Thus, the legal consequences of market manipulation/market abuse are likely to deter such behavior.

Asset portfolios indexed to ROBOR may be an incentive for banks to provide manipulated quotes. Moreover, nothing prevents participating banks from increasing or decreasing their own exposure to the benchmark, which they themselves can influence. Systematically favorable ROBOR rates for banks may lead to maintaining or increasing exposures, while unfavorable fixings provide incentives to reduce them.

Since the way ROBID/ROBOR indexes are formed is subject to the restrictive rules mentioned above, they ensure market discipline and index efficiency.

It is important to note that the evolution of the monetary policy interest rate (the main instrument used by the central bank to implement monetary policy) is highly correlated with the change in the reference index. According to Article 7, paragraph (1), letter a) of Regulation (EU) No. 596/2014, privileged information is precise information that has not been made public that relates directly or indirectly to one or more issuers or to one or more financial instruments and that, if it were made public, could significantly affect the price of the financial instruments concerned or of the derivative financial instruments linked to them. The possession and use of inside information about future monetary policy decisions before they are publicly announced constitutes market abuse.

5. Analysis of the Determination of ROBOR Reference Rates: Evaluation of the Hypothesis of the Existence of Manipulative Behavior in the Interbank Money Market

Analyzing the existing public information on the websites of the main banks in Romania regarding the portfolio of variable rate loans granted to both individuals and legal entities (prior to the entry into force of GEO No. 19/2019 amending and completing some normative acts), depending on the contractual terms established between the bank and the debtor, it is noted that in this analysis the ROBOR reference rates are relevant for maturities of 3M, 6M and 12M.

In order to evaluate the evolution of ROBOR rates from the point of view of the presence of market manipulation, two scenarios were considered:

5.1 Scenario 1: Collusion Between Two or More Participants to Obtain Additional Financial Gains Related to the Portfolio of Loans Indexed to ROBOR

From a mathematical and statistical point of view, historical data can reveal the existence of market manipulation behavior in the situation where the value of the 3M, 6M and 12M ROBOR index is recorded in:

- The first working day of the month under analysis (R_i) is higher than the value of the ROBOR index recorded on the last working day of the previous month ($R_{(i-1)}$) and than the value of the ROBOR index recorded on the second working day of the month under analysis ($R_{(i+1)}$);

$$R_i > R_{(i+1)} \text{ și } R_i > R_{(i-1)} \tag{1}$$

- The last working day of the month under analysis ($R_{(i-1)}$) is higher than the value of the ROBOR index recorded on the penultimate working day of the month under analysis ($R_{(i-2)}$) and than the value of the ROBOR index recorded on the first working day of the following month ($R_{i)}$).

$$R_{(i-1)} > R_{(i)} \text{ și } R_{(i-1)} > R_{(i-2)} \tag{2}$$

Table 1 The Dates on Which There Is A "Spike" of the ROBOR Index on the Last Working Day of the Month or on the First Working Day of the Month

Date	Change in the ROBOR rate recorded on the analyzed day compared to the ROBOR rate recorded the day before ($\Delta R_i/R_{i-1}$). respectively or the day after ($\Delta R_i/R_{i+1}$) (percentage points)						Observations
	ROBOR 3M		ROBOR 6M		ROBOR 12M		
	$\Delta R_i/R_{i-1}$	$\Delta R_i/R_{i+1}$	$\Delta R_i/R_{i-1}$	$\Delta R_i/R_{i+1}$	$\Delta R_i/R_{i-1}$	$\Delta R_i/R_{i+1}$	
03.01.2022	0.01	0.01			0.01	0.01	
31.05.2021					0.01	0.01	
31.03.2021	0.01	0.01					
30.09.2020	0.02	0.01	0.01	0.01			
31.03.2020					0.01	0.02	
02.03.2020					0.01	0.02	Variations that are statistically insignificant (the sample standard deviation is 0.09).
03.02.2020			0.01	0.01			
03.01.2020	0.01	0.01	0.02	0.01			
30.04.2019					0.01	0.04	
01.03.2019	0.02	0.02	0.01	0.02			
03.12.2018	0.02	0.02					
01.08.2018					0.01	0.01	

Source: Author's calculations based on data available on the website www.bnro.ro

5.2 Scenario 2: Collusion Between Two or More Participants[1] to Use Privileged Information About the NBR's Monetary Policy Decisions

The NBR's press releases on the NBR Board's decisions on monetary policy issues are usually issued after the Fixing. Therefore, a significant change (0.03 percentage point[2]) in ROBOR rates recorded on the day of the press release or in the preceding days could indicate market abuse.

From a mathematical and statistical point of view, historical data can reveal the existence of market manipulation behavior in the situation where the value of the ROBOR 3M/6M/12M index shows changes, namely:

- The ROBOR index on the day of issuing the press release regarding the decision to change the monetary policy interest rate (R_i) is higher than the value of the ROBOR index on the previous day ($R_{(i-1)}$):

$$R_{i} > R_{(i-1)} \tag{3}$$

- The ROBOR index on the day of publication of the press release on the decision to change the monetary policy rate (R_i) is higher than the value of the ROBOR index measured one week before the publication of the press release, i.e., 5 working days ($R_{(i-5)}$):

$$R_{i} > R_{(i-5)} \tag{4}$$

- The ROBOR index calculated in the week preceding the press release on the decision to change the monetary policy rate ($R_{(i-6)}$) is higher than the value of the ROBOR index calculated two weeks before the press release (or 10 working days) ($R_{(i-10)}$):

$$R_{(i-6)} > R_{(i-10)} \tag{5}$$

Table 2 The Dates on Which the Press Releases on the NBR's Monetary Policy Decisions and the Changes in the ROBOR Index Related to Scenario 2 Were Published (One or Two Weeks Before the Release).

Press release date[3]	$R_i > R_{i-1}$; $R_i > R_{(i-5)}$; $R_{(i-6)} > R_{(i-10)}$ (percentage points)			Observations
	3M	6M	12M	
08.01.2018	0.01 0.08 -0.01	0.03 0.04 -0.03	0.01 0.01 0.00	Press release on the increase in the monetary policy interest rate from 1.75% to 2%
09.01.2018	0.04 0.04 0.04	0.02 0.02 0.02	0.03 0.03 0.03	The evolution of ROBOR is not reflected in the same proportion as the increase in the monetary policy interest rate (0.25%)
07.02.2018	0.02 0.02 0.00	0.01 0.02 0.04	0.01 0.02 0.00	Press release on the increase in the monetary policy interest rate from 2% to 2.25%
08.02.2018	0.04 0.04 0.04	0.06 0.06 0.06	0.04 0.04 0.04	The evolution of ROBOR is not reflected in the same proportion as the increase in the monetary policy interest rate (0.25%)

(Table 2 to be continued)

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[1] A possible abusive use of privileged information by a single Fixing participant would not be reflected in the ROBOR quotation, as extreme values are excluded from the calculation of the reference index.

[2] If the privileged information is held and used by only one participant, his attempt to artificially increase the ROBOR rates will fail because the ROBOR Rules will cause that rate to be removed from the ROBOR rate calculation (as it is an outlier). Therefore, in this scenario, market abuse is only possible if at least two Fixing participants have inside information and use it. If the two participants hypothetically increased the ROBOR prices published at the Fixing by 0.25 percentage points, the ROBOR rate published by BNR would increase by 0.03 percentage points.

[3] Regarding the change in the monetary policy interest rate or the date of the entry into force of the change in the monetary policy interest rate.

(Table 2 continued)

07.05.2018	0.00 0.09 0.33	0.02 0.05 0.11	0.02 0.06 0.09	Press release on the increase in the monetary policy interest rate from 2.25% to 2.5%
08.05.2018	0.14 0.14 0.14	0.17 0.17 0.17	0.13 0.13 0.13	There could be a possible leak of information two weeks before the release. See the 0.33% rise two weeks before the release. It is also possible that the participants anticipated the BNR's decision to increase by 0.25%
20.03.2020	0.00 0.27 0.03	0.01 0.21 0.00	0.01 0.19 0.00	Press release on the decrease in the monetary policy interest rate from 2.5% to 2%
23.03.2020	-0.63 -0.63 -0.63	-0.61 -0.61 -0.61	-0.63 -0.63 -0.63	The evolution of ROBOR is closely related to the decrease in the monetary policy interest rate; the two variables are strongly correlated
29.05.2020	0.00 -0.03 -0.01	0.00 -0.04 -0.01	0.01 -0.02 -0.01	Press release on the decrease in the monetary policy interest rate from 2% to 1.75%
02.06.2020	-0.11 -0.11 -0.11	-0.10 -0.10 -0.10	-0.11 -0.11 -0.11	The evolution of ROBOR is not reflected in the same proportion as the increase in the monetary policy interest rate (0.25%)
05.08.2020	0.00 0.02 0.01	0.00 0.00 0.00	0.00 0.00 0.00	Press release on the decrease in the monetary policy interest rate from 1.75% to 1.5%
06.08.2020	-0.10 -0.10 -0.10	-0.11 -0.11 -0.11	-0.15 -0.15 -0.15	The evolution of ROBOR is not reflected in the same proportion as the increase in the monetary policy interest rate (0.25%)
15.01.2021	0.00 -0.01 -0.23	0.00 -0.01 -0.14	0.01 -0.01 -0.12	Press release on the decrease in the monetary policy interest rate from 1.5% to 1.25%
18.01.2021	-0.19 -0.19 -0.19	-0.22 -0.22 -0.22	-0.19 -0.19 -0.19	The evolution of ROBOR is closely related to the decrease in the monetary policy interest rate.
05.10.2021	0.00 0.12 0.06	0.02 0.10 0.03	0.01 0.10 0.03	Press release on the increase in the monetary policy interest rate from 1.25% to 1.5%
06.10.2021	0.26 0.26 0.26	0.27 0.27 0.27	0.24 0.24 0.24	The evolution of ROBOR is closely related to the increase in the monetary policy interest rate; the two variables are strongly correlated
09.11.2021	0.03 0.12 0.03	0.02 0.10 0.03	0.03 0.12 0.04	Press release on the increase in the monetary policy interest rate from 1.5% to 1.75%
10.11.2021	0.07 0.07 0.07	0.09 0.09 0.09	0.10 0.10 0.10	There could be a possible leak of information two weeks before the release. See the increase of 0.15%, 0.13% or 0.16% (two weeks before the announcement). It is also possible that the participants anticipated the BNR's decision to increase by 0.25%
10.01.2022	0.00 0.03 0.04	0.01 0.04 0.01	0.00 0.02 0.03	Press release on the increase in the monetary policy interest rate from 1.75% to 2%
11.01.2022	0.02 0.02 0.02	0.02 0.02 0.02	0.02 0.02 0.02	The evolution of ROBOR is not reflected in the same proportion as the increase in the monetary policy interest rate (0.25%)
09.02.2022	0.07 0.24 -0.01	0.06 0.22 0.01	0.08 0.25 0.01	Press release on the increase in the monetary policy interest rate from 2% to 2.5%
10.02.2022	0.24 0.24 0.24	0.28 0.28 0.28	0.31 0.31 0.31	A possible leak of privileged information is highlighted by the evolution of ROBOR one week before the announcement of the increase in the monetary policy interest rate by the Board of Directors, with the ROBOR index evolving in accordance with the increase in the reference interest rate (0.50%), in conjunction with the day after the announcement.

(Table 2 to be continued)

(Table 2 continued)

05.04.2022	0.01 0.06 0.04	0.00 0.04 0.03	0.00 0.01 0.03	Press release on the increase in the monetary policy interest rate from 2.5% to 3%
06.04.2022	0.06 0.06 0.06	0.08 0.08 0.08	0.10 0.10 0.10	The evolution of ROBOR is not reflected in the same proportion as the increase in the monetary policy interest rate (0.50%)
10.05.2022	0.01 0.14 0.25	0.01 0.11 0.21	0.01 0.14 0.18	Press release on the increase in the monetary policy interest rate from 3% to 3.75%
11.05.2022	0.16 0.16 0.16	0.18 0.18 0.18	0.28 0.28 0.28	It can also be seen, from the evolution of ROBOR two weeks before the announcement, a fairly sharp increase (0.39%-3M, 0.32%-6M or 0.32%-12M) in conjunction with its evolution following the announcement of the press. There is a possibility of a leak of privileged information.

Source: Author's calculations based on data available on the website www.bnro.ro.

From the data presented in the table above, it follows that there are no significant movements of the ROBOR index value on the day of issuing the press release, compared to the previous dates. Therefore, we conclude that there was no possible information leakage.

5. Conclusion

The purpose of the national legislative framework is to ensure the premises for the creation of safe, reliable benchmarks that reflect the real level of interest rates at which transactions with deposits in RON are carried out on the Romanian interbank money market.

Analyzing the economic-financial context related to the period July 2, 2018 - April 4, 2022, it was found that there were no events/turbulences of a nature to affect the normal functionality of the interbank market as a whole and, correlatively, the market from the time of the Fixing, with an impact on the interest rates related to the withdrawal/placement operations of deposits in RON.

Analyzing the data presented in the tables above, we note that no significant movements in the value of the ROBOR index are highlighted. Therefore, we conclude that there is no evidence of possible manipulation of the ROBOR indices through tacit collusion between participants in the Fixing or using privileged information about the NBR's monetary policy decisions.

However, in certain periods (May 2022, February 2022, November 2021, and May 2018), fluctuations in the ROBOR index are observed to be directly proportional to fluctuations in the monetary policy rate, which may indicate, on the one hand, a possible leak of privileged information a week or two before the NBR issues the press release or possible anticipations of the banks regarding the future monetary policy decisions of the NBR.

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