

The Influence of Inflation rate on Robor in the Romanian Banking System - Case Study

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Abstract

In this paper, the author analyzes the evolution of inflation, the evolution of ROBOR 3M, and, respectively, ROBOR 6M, for the 2007-2018 period. It also analyzes the correlation between the inflation rate and ROBOR 3M/6M in the Romanian Banking system using the Pearson index. The result of the correlation based on Pearson correlation coefficient between the inflation rate and ROBOR 3M, respectively ROBOR 6M, was 0.76 for the first correlation, indicating a very good correlation, and 0.78 for the second correlation, indicating a better correlation than the first one.

According to the results based on theory and practice, there is a connection, a strong relation and a correlation from good to very good between the inflation rate and ROBOR 3M, and respectively ROBOR 6M. Starting with May 2019, for credit variable interest rate contracted after May 2, 2019, will have the formula for slightly modified interest rates.

Key words: inflation rate, Robor, Pearson coefficient, correlation

J.E.L. classification: E31, E43, C58

1. Introduction

Inflation is defined as the rate at which the general price for goods and services increases over a period. Thus, the deflation is defined as the rate to which the general price for goods and services decreases. In case of inflation, the currency loses its buying power in time, while in case of deflation, the currency gains buying power. A high or unpredictable inflation can have a negative impact on the economy.

Inflation distorts the long-term plans of the companies. The incertitude related to the real value of the currency can discourage significantly the investment decisions. The retirement funds, the insurance companies and other financial companies follow attentively the inflation in order to ensure a real positive profitability of the investments.

The clear expectations related to inflation are important for the allocation of the investment portfolio, preventing the loss of real value in cases when the profitability is inferior to the inflation.

Inflation is best described as an increase in price as general, where inflation decreases purchasing power from a currency (McConnel and Brue, 2008). There are some causes for the inflation, when the aggregated demand increases more rapid than the aggregated supply, also increasing the price of goods and services. The imbalance between the demand and the supply is connected to the government deficit, the expansion of the bank interest and the growth of the external demand (Haberler, 1960).

The interest rates are part of the monetary policy; the currency supply is reflected on the market also as a way to neutralise the inflation (Asghapur et al., 2014). Asghapur, Kohnehshahri and Karami (2014) agreed that the interest rates have a negative relation with the inflation. This opinion is supported by Kandel, Ofer and Sarig (1996), affirming that the interest rates are negatively correlated with the inflation. Fisher Hypothesis (1930) stated that the interest rates reflect the fluctuations of the inflation. On the other hand, the interest rates can be in a positive relation with the inflation, as expressed by Mishkin (1984) and Gibson (1982). Ghazali (2003) stated that there is no significant relation between the interest rates and the inflation.

2. Literature review

Bilan & Roman (2016) studied the relationship between inflation rate and non-performing loans and concluded: "On the one hand, a high inflation rate can reduce the real value of outstanding loans, which makes it easier for borrowers to service their debts. On the other hand, a high inflation rate leads to a fall in real incomes, so the ability of borrowers to service their debts deteriorates".

The high rhythm of the inflation during the last century required a profound process of reform, where the central banks were kept responsible for reaching the objectives of the inflation. In Romania, at the end of the last century, the objective was represented by the maintenance of the monetary stability without increasing the prices (Cioran, 2014).

The stability of the prices is one of the most important objectives of the monetary policy. In order to reach this objective, we must consider the fact the notion itself does not involve the fact that all the prices are stable or fix. Pragmatically, the emphasis is on the maintenance of a constant medium level, to a relative stability and not to an absolute value. Castelnuovo et al. (2003, p.12) show the fact that the countries practicing a regime of aiming to the inflation do not use an explicit definition of the price stability; instead, this is characterised by the announcement of the inflation aim.

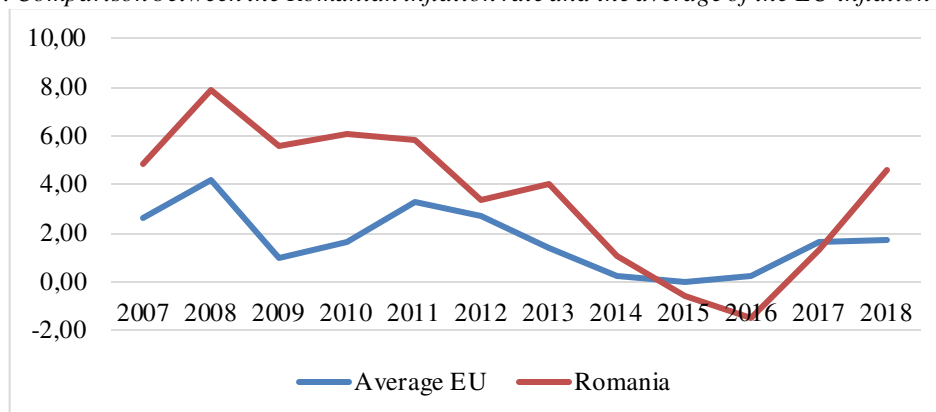
The European Central Bank considers as price stability a yearly increase lower than 2% from the Harmonised Index of Consumer Prices in the euro area.

Using a model of segmented markets, Alvarez et al. (2001) showed that a policy for the increase of the interests on short term for the reduction of the inflation can be rationalized, in essence, with essential models of monetary balance. John H. Cochrane (2016) stated that: "The observation that inflation has been stable or gently declining at the zero bound, suggests that an interest rate peg can lead to stable inflation. If that is true, then raising the interest rate peg should raise inflation". De Grauwe and Schnabl (2008) analyse the impact of the exchange rate on the inflation and the production from the South-East and Central Europe. Related to the entire period of analysis, the estimations show a significant impact of the stability of the exchange rate on the low inflation and a significant positive impact of the exchange rate on the real growth.

3. Comparison between the Romanian inflation rate and the EU inflation rate

The study period is the time interval 2007 – 2018, years. As observed in Chart no.1, the Romanian inflation rate had almost the same fluctuation as the EU inflation rate. When the inflation rate in the European Union increased, the inflation rate increased also in Romania. The situation was slightly different in 2016, when a negative inflation rate of -1.53% was registered in Romania, while in EU there was a positive inflation rate of 0.21 %. The highest inflation rate in the European Union and in Romania as well was registered in 2008: 4.20% in the European Union and 7.86% in Romania, a remarkable high rate.

Figure no.1. Comparison between the Romanian inflation rate and the average of the EU inflation rate



Source: own processing of data collected from: <http://www.insse.ro>, <http://www.bnr.ro>; <http://databank.worldbank.org/>

The deflation process continued in the last quarter of 2013. The inflation rate registered in December decreased until the low point of the variation of the stationary target: 1.55%, a minimum value for the last 24 years.

The financial crisis from 2008 led to an abrupt decrease of the production. The inflation rate in the more developed EU countries registered negative values for short periods, returning to a slightly lower level compared to 2008, but with positive values. On the other hand, the employment rate decreased significantly, leading to an increase of the unemployment. This aspect, together with the inflationist pressure and the deepening of the macroeconomic imbalance, forced the governments to adopt policies for the recovery of the macroeconomic stability. Many times, the macroeconomic stability is associated with the monetary stability.

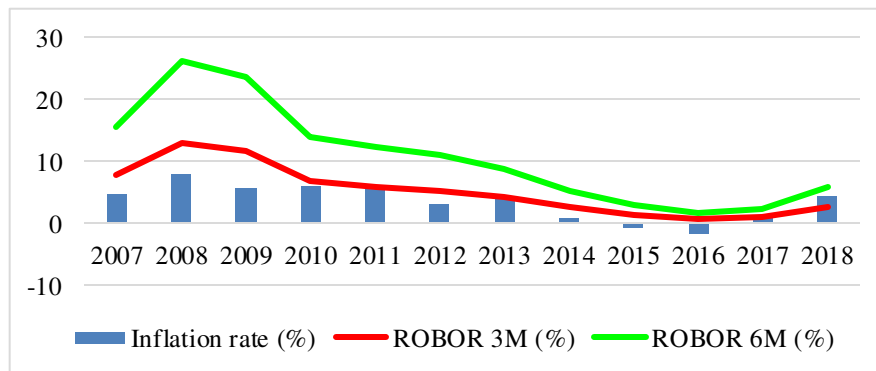
The reduced inflation from the period 2014-2016 is the result of a combination of economic policies favouring the deflation, followed by restrictive monetary and fiscal policies and by an almost neutral budgetary policy. The monetary policy was mainly characterised by the high rate of the interests, the mandatory reserves and the appreciation of the currency (Pop, 2011).

The European Union registered a negative inflation rate -0.05%, only in 2015, when the inflation rate in Romania was -0.59%. If the difference between the EU and Romania was high enough in 2007, with an inflation rate of 2.63% for the EU and an inflation rate of 4.83% for Romania, a difference of 2.2%, the situation was reversed in 2017, when Romania had an inflation rate lower than the rate in the EU. That year, Romania registered an inflation rate of 1.34%, while the EU inflation rate was 1.60%, a difference of only 0.26%. In 2009, the difference between the EU average and the Romanian inflation rate was 2.9%.

4. Case study

As observed in Chart no.2, there is a close connection between the inflation rate and ROBOR 3M and ROBOR 6M. When the inflation grows, ROBOR grows, too, and when the inflation rate decreases, ROBOR also decreases.

Figure no. 2. The inflation rate and ROBOR 3M/6M



Source: own processing of data collected from <http://www.bnro.ro/>

The highest inflation rate was registered in Romania in 2008, a level 7.86%. In the same year, the highest ROBOR was also registered in Romania: ROBOR 3M was 13.00% and ROBOR 6M was 13.07%.

From 2015, the inflation rate and also ROBOR began to decrease, reaching that year the negative inflation rate of -0.59%. The rate was even lower in 2016, when it reached the value of -1.53%. ROBOR 3M was 1.33% in 2015 and ROBOR 6M was 1.58% in 2015, while, for 2016, ROBOR 3M was 0.78% and ROBOR 6M was 1.03%. The inflation rate also ROBOR increased in 2017 compared to 2016, with an inflation rate changing from -1.53% to 1.34%, ROBOR 3M from 0.78% to 1.15%, and ROBOR 6M from 1.03% to 1.34%. The inflation rate and ROBOR 3M and 6M increased with 0.25% in 2017 compared to 2016.

5. The Pearson coefficient

We use Pearson coefficient to calculate correlation between the inflation rate and ROBOR 3M/6M. The period we analysed is January 2007 - December 2018. Discussing a maximum or a minimum registered by the inflation rate and ROBOR, we may say that the highest inflation rate was in 2008, a level of 9.04%. ROBOR 3M reached a maximum of 22.15% in October 2008, while ROBOR 6M reached the maximum of 22.33% also in October 2008.

The lowest inflation rate was registered in Romania in May 2016, with a level of -3.46%, while ROBOR 3M was at the lowest level in October 2016, with a level of 0.69%. ROBOR 6M registered at the same time a minimum of 0.93%.

In conclusion, the Romanian inflation rate passed from a maximum of 9.04% to a minimum of -3.46, ROBOR 3M from 22.15% to 0.69%, and ROBOR 6M from 22.33% to 0.93%. The inflation rate was of 4.01% in January 2007 and increased to 4.95% in 2018. ROBOR 3M was 7.93% in January and reached to 2.09% in March 2018, while ROBOR 6M had a value of 8.05% in January 2007 and 2.38% in March 2018.

The Pearson correlation coefficient can be defined as a numerical index measuring the relation between two continue or discrete quantitative variables (x; y). It has a value between +1 and -1, where 1 is the total positive linear correlation, 0 is not a linear correlation and -1 is the total negative linear correlation. **The calculation formula** for the **R** correlation coefficient:

$$R = \frac{\sum_i (X_i - \bar{X})(y_i - \bar{y})}{\sqrt{\sum_i (X_i - \bar{X})^2} \sqrt{\sum_i (y_i - \bar{y})^2}}$$

A correlation coefficient from **-0.25 to 0.25** indicates a **weak or a void** correlation. A correlation coefficient from **0.25 to 0.50** (or from **-0.25 to -0.50**) indicates an **acceptable** degree of association. A correlation coefficient from **0.5 to 0.75** (or from **-0.5 to -0.75**) indicates a **moderate to good** correlation. A correlation coefficient higher **0.75** (or **less than -0.75**) indicates a **very strong association or correlation**.

The coefficient of determination is the square of the **correlation coefficient R**, meaning **D=R²**. The value of the coefficient of determination expresses an intensity of the linear relation between the two variables. It answers to the question: what percentage from the variation of **Y** can explain the linear relation with **X**?

An idea on the relation between the two characteristics may be obtained by dividing the dispersion diagram in four quadrants through two perpendicular lines passing through the point (X, Y) and presenting coordinates which are equal to the averages of the two variables.

II	I
III	IV

If there is a linear relation between the two variables, then the points of the diagram will be distributed especially in certain quadrants (II and IV or I and III). If the points are distributed in the quadrants I and III, then the dispersion diagram has an increasing trend (the regression line will have an upwards trend). If the points are distributed in the quadrants II and IV, then the dispersion diagram will have a decreasing trend (the regression line will have a downwards trend). If the points are equally distributed in all the four quadrants, then the dispersion diagram indicates a void correlation.

The calculation formula for the coefficient **R²** :

$$R^2 = \frac{n(\sum xy) - (\sum x)(\sum y)}{\sqrt{[n \sum x^2 - (\sum x)^2][n \sum y^2 - (\sum y)^2]}} \quad (1)$$

Table no. 1. The correlation between the inflation rate and ROBOR 3M/6M

Inflation rate– ROBOR 3M	Inflation rate– ROBOR 6M
0,76	0,78

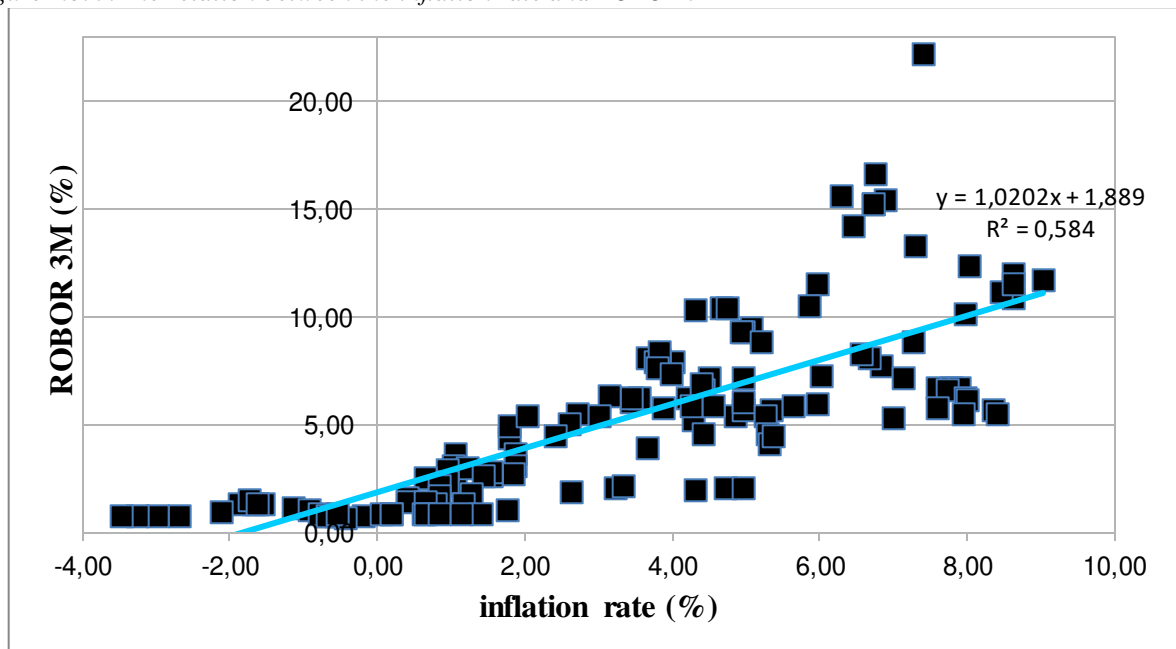
Source: own processing of data collected from the Romanian National Bank web site

Based on the correlation between the inflation rate and ROBOR 3M, we obtained the result of **0.76**. Based on the theory, there is a very good correlation for a correlation coefficient higher than 0.75. In the same time, also based on the correlation between the inflation rate and ROBOR 6M we obtained a result of **0.78**, representing a better correlation than the previous one.

In conclusion, according to the results based on theory and practice, there is a connection, a strong association and a good to very good correlation between the inflation rate and ROBOR 3M, respectively ROBOR 6M.

The Charts 3 and 4 present with more details the relation between the inflation rate and ROBOR 3M, respectively ROBOR 6M for the period 2007-2018, which was our study period.

Figure no. 3. The relation between the inflation rate and ROBOR 3M



Source: own processing of data collected from the Romanian National Bank web site

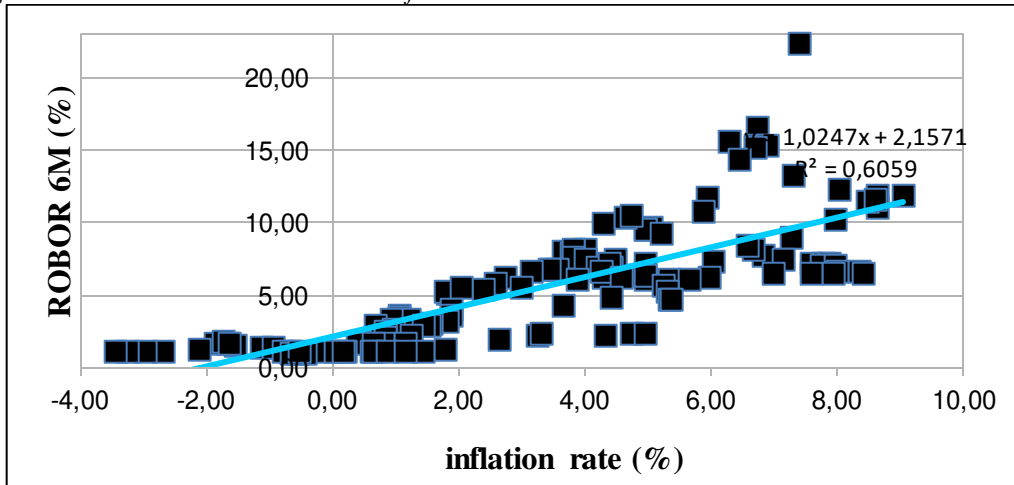
The diagram points are distributed mostly in the quadrants I and III. The dependence between ROBOR 3M and the interpretation rate is positive, an increase of the inflation rate implying a growth of ROBOR 3M. The regression line has an ascending trend, while the dispersion diagram indicates an upward trend.

For the formula: $f(x) = ax + b$, we have: $f(x)$ – ROBOR 3M and x – inflation rate.

$$y = 1.0202x + 1.889; \quad R^2 = 0.584.$$

This result means that approximately 58% from the variation of ROBOR 3M is explained by the linear relation with the inflation rate. For each growth of the inflation rate (x) with 1%, ROBOR 3M (y) increases with 1.02%. If the inflation rate would be 0, ROBOR 3M would equal 1.89%.

Figure no. 4. The relation between the inflation rate and ROBOR 6M



Source: own processing of data collected from the Romanian National Bank web site

The diagram points related to the relation between the inflation rate and ROBOR 6M are mostly distributed in the quadrants I and III. The dependence between ROBOR 6M and the inflation rate is positive, an increase of the inflation rate implying a growth of ROBOR 6M. The regression line has an ascending trend, while the dispersion diagram indicates an upward trend.

For the formula: $f(x) = ax + b$, we have: $f(x)$ – ROBOR 6M and x – inflation rate.

$$y = 1.0247x + 2.1571; \quad R^2 = 0.6059$$

Approximately 61% from the variation of ROBOR 6M is explained by the linear relation with the inflation rate, for each growth of the inflation rate (x) with 1 %, ROBOR 6M (y) will grow with 1.02%. If the inflation rate would be 0, ROBOR 6M would be 2.16%.

6. Conclusions

In conclusion, based on theoretical and practice data, we may conclude that there is a quite strong relation between the inflation rate and ROBOR. The aimed level of inflation was around 7.5% in 2005. Starting in 2013, The Romanian National Bank has proposed an inflation rate under or around 2.5%, as aim and engagement, even if, in 2008, Romania registered the highest inflation rate, a level 7.86%. In the same year, Romania registered the highest ROBOR: 13.00% for ROBOR 3M and 13.07% for ROBOR 6M.

Starting in 2015, the inflation rate and ROBOR have started to decrease, with a negative inflation rate of -0.59% in 2015 and -1.53% in 2016. ROBOR 3M was 1.33% while ROBOR 6M was 1.58% in 2015. ROBOR 3M was 0.78%, while ROBOR 6M was 1.03% in 2016. Both the inflation rate and ROBOR increased in 2017 compared to 2016. The inflation rate changed from -1.53% to 1.34%. ROBOR 3M changed from 0.78% to 1.15%, while ROBOR 6M increased from 1.03% to 1.34%. The inflation rate and also ROBOR 3M and 6M increased with approximately 0.25% in 2017 compared 2016.

July 2008 presented the highest inflation rate, a level of 9.04%. In October 2008, ROBOR 3M reached the maximum of 22.15%, while ROBOR 6M reached the maximum of 22.33% in the same month. The lowest inflation rate in Romania was registered in May 2016, a level of -3.46%. ROBOR 3M presented the lowest value of 0.69% in October 2016, while ROBOR 6M had the lowest level of 0.93% at the same time.

Finally, the result of the correlation based on Pearson correlation coefficient between the inflation rate and ROBOR 3M, respectively ROBOR 6M, was 0.76 for the first correlation, indicating a very good correlation, and 0.78 for the second correlation, indicating a better correlation than the first one.

In conclusion, according to the results based on theory and practice, there is a connection, a strong relation and a correlation from good to very good between the inflation rate and ROBOR 3M, and respectively ROBOR 6M. Approximately 58% from the variation of ROBOR 3M is

explained by the relation with the inflation rate, while approximately 61% from the variation of ROBOR 6M is explained in the same way, meaning that ROBOR 3M increases with 1.02% for 1% growth in the inflation rate. The situation and the values are similar for ROBOR 6M. If the inflation rate would have been 0, ROBOR 3M would have been 1.89% and ROBOR 6M would have been 2.16%.

Starting with May 2019, for credit variable interest rate contracted after May 2, 2019, will have the formula for slightly modified interest rates. ROBOR will be replaced with an index. The new index represents the interest rate calculated as the weighted average of interest rates with the interbank market volumes. Index change occurs automatically only for new loans after May 2 or refinanced after that date. However, the new index may also be used for ongoing loans if the bank and the client come to an agreement in this regard, initialed "by an addendum to the credit agreement".

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