

The Correlation between Inflation and Money Supply

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Abstract

Inflation is a macroeconomic disequilibrium that affects all households and firms. The aim of our study is to investigate inflation in Romania, the causes that determine it and the relationship between money supply and inflation. There is evidence that inflation in many countries is of monetary origin. We used the data provided by the World Bank and the National Bank of Romania on inflation and broad money as a percentage of GDP. For the period 2005-2021, in Romania the data shows that inflation values do not exceed 10% and do not deviate significantly from the inflation target, while the money supply increases by an average of 11.63% per year. Our paper employs VAR model and endorses the thesis that there is a long-run relationship between inflation and money supply in Romania at a 5% significance level.

Key words: inflation, money supply, monetary aggregates, monetarism

J.E.L. classification: E31, E 51, E52

1. Introduction

“Inflation is caused by too much money chasing after too few goods” – Milton Friedman

It is widely accepted that low inflation promotes long-term stability which, in turn, provides grounds for steady economic growth and development. Therefore, controlling the inflation level has been a high priority of many countries. Hence, in order to control inflation, the policymakers should understand what determines the respective phenomenon.

Many interpretations are given but still on the question of what causes the rise in inflation there is a lack of consensus. Our paper overviews the determinants of inflation and places its main focus on the monetarist theoretical perspective.

Further, the paper investigates the significance of the effects from the changes in the monetary aggregates (i.e. M1, M2, M3) in rising/adjusting the levels of inflation. Aiming to provide empirical evidence, the purpose of this study is to depict the relationship between inflation and money supply in Romania.

For the above-mentioned purposes, monetary aggregates have been defined in compliance with the methodology of the European Central Bank. (***, NBR, June 2022)

M1 is calculated as the sum of currency in circulation and overnight deposits. M2 is calculated as M1 plus deposits with an agreed maturity of up to two years and deposits redeemable at notice of up to three months. M3, also referred to as broad money, is calculated on the basis of M2 plus other marketable instruments, including repurchase agreements, marketable securities with a maturity of up to and including two years or money market fund shares and units.

2. Theoretical background

A vast literature has been written on the causes of inflation. There are usually presented four main drivers behind it. Part of the theories are formulated on the basis of the (aggregate) demand-pull and cost-push arguments. The two other causes of inflation refer to money supply and demand for money.

Our paper focuses on the monetarist perspective. According to monetarists the monetary policy works as the so-called equation of exchange is showing: $MV = PQ$, where M refers to the total supply of money in circulation on average in a given economy, V is the velocity of circulation, P is the average price level of goods and services, and Q is the quantity of goods and services exchanged in the chosen period of time. (Schiller, 1997, p.332)

This quantitative identity reveals the relationship between money supply and macro performance. One key assumption of this model is that the velocity of money is stable. In the 70's this condition of velocity of money predictability was met. During that time, there was the rise of monetarism. The rate of growth in money supply was linked to the dynamic of nominal GDP. Some monetarists also assert that if V and Q both are stable, then money supply influences directly the prices (P). In the 80's and 90's the velocity of money became unstable, and the above-mentioned link was not confirmed anymore. Consequently, the Keynesian view has gained ground again. The followers of the Keynesian theory emphasize that money supply affects macro performance primarily through changes in interest rates. (Jahan, 2014)

Having the two competing views that diverge in major aspects, the monetary policy is to be drafted differently. The prescription made by monetarists is for the monetary authorities to act on the side of money supply without manipulating interest rates. The concept behind it is self-explanatory. The interest rate being the price of the money depending on both demand for money and money supply. However, the monetary authorities can have control only over the money supply. Therefore, engaging an expansionary monetary policy when condition of V stability is met would lead to nominal GDP growth. In the tradition of Keynes thinking, between the money supply and GDP there is an indirect link. More money being supplied would decrease interest rates which, in turn, stimulates increased total spending on investment causing real GDP to grow.

Nowadays, the great debate between monetarists and Keynesians is still vivid. Monetary authorities around the world tend to combine the two views and fight against inflation in eclectic ways.

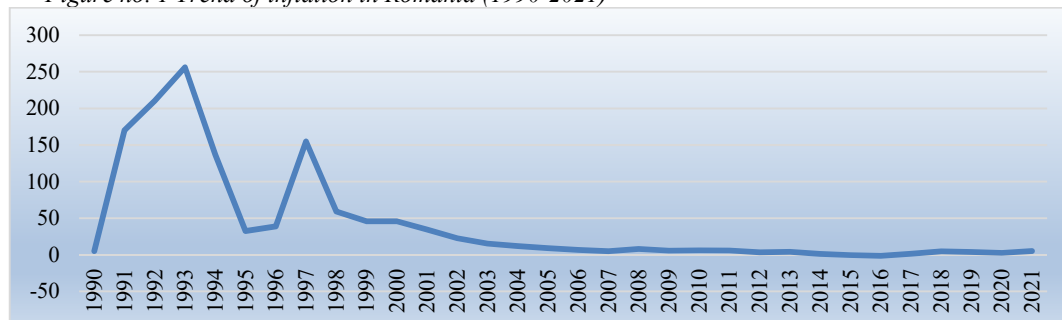
3. Data on inflation in Romania

There is a clear trend of steady rise of inflation in the last year worldwide. In fact, the large opinion states that the trend has been steadily fuelled over the past decade by the monetary policies of powerful central banks.

Accelerated by the current energy crisis and post-Covid-19 pandemic record consumption, inflation has already caused drastic changes in the monetary policies of major economies. Analysts warn that these new conditions mark the end of the era in which the global financial system will continue to operate under the logic of quantitative easing and low monetary policy interest rates. Romania is already taking steps in this direction: the National Bank of Romania has raised its key interest rate several times in the last months.

Going back in time, in the case of Romania, the period of transition to a market economy was characterized by high and fluctuating inflation rates, causing economic and social instability. After 2000, inflation decreased gradually and since 2005 the inflation rate has fallen below 10 percentage points.

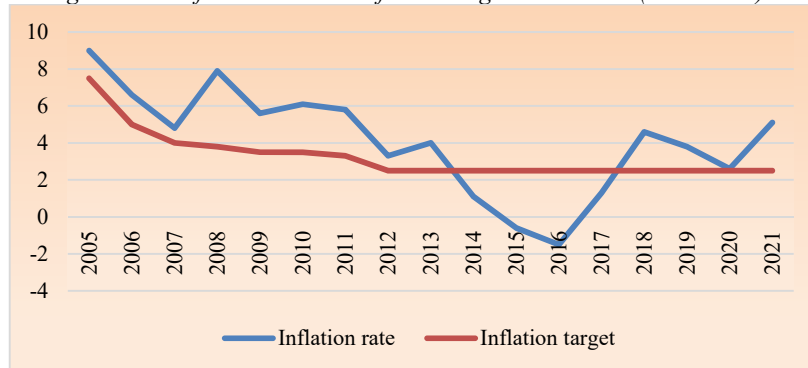
Figure no. 1 Trend of inflation in Romania (1990-2021)



Source: Romanian National Institute of Statistics, <https://insse.ro/cms/ro/content/ipc%E2%80%93serie-de-date-anuala>

We mention that since 2005 Romania has denominated the national currency and adopted the Inflation Targeting Strategy, a commitment undertaken by the National Bank to ensure price stability and better coordination between fiscal and monetary policy. Figure 2 shows that for the period 2005-2021 there are no significant deviations between the inflation rate and the inflation target.

Figure no. 2 Inflation rate and inflation target in Romania (2005-2021)



Source: Romanian National Institute of Statistics and National Bank of Romania

Low inflation rates have been maintained for a long period of time, Romania even recorded a short episode of deflation in 2015 and 2016. The most recent data shows that for 2021 inflation was 5.1%, and the National Institute of Statistics reported for July 2022 an inflation rate of 15.05% and a forecast inflation rate for the fourth quarter of the year at 12.5%.

It is well-known that the spectacular economic recovery from Covid-19 pandemic crisis is due to the stimulus packages being adopted with unprecedented speed. In the attempt of avoiding lasting recessions, the Romanian government (as most governments in the world did) supported a consistent financial response to counter the economic effects of the pandemic.

At present, facing ‘second-round’ effects of the previous expansionary policy, there is a call for changed approaches. The National Bank of Romania published in June 2022 the key measures chosen in the fight against the 2-figure inflation. [***, NBR, June 2022.]

4. Research methodology

Our research provides a dynamic analysis of the long-term inflation rate in Romania starting from the consideration that price stability is essential for long-term growth and development and for preserving macroeconomic stability. The scope of the study is to explain the relationship between the inflation rate and money supply in Romania and also to check on the relevance of monetarist theory in the present context.

Measurement and Definition of Variables

The annual inflation rate is determined by subtracting 100 percentage points from the annual consumer price index (CPI). The CPI is a time series which is calculated as a Laspeyres-type index with a fixed base. It results from the determination of weighted averages of market prices for certain goods and services purchased by consumers.

For the purpose of our study, we have used the M3 values and the broad money as percentage in GDP. As we mentioned in the introductory part of the paper, The National Bank of Romania calculates monetary aggregates in agreement with the European Central Bank.

The indicators used are time series for the period 2005-2021 and the data source is the World Bank and the National Bank of Romania.

Descriptive statistics

A first analysis of the data to be used in the regression analysis was based on descriptive statistics. Therefore, we analysed the mean dispersion, standard deviation, minimum and maximum values recorded by the variables.

The analysis of the annual data series for the period 2005-2021 using EViews shows that broad money, GDP and broad money as a percentage of GDP have close mean and median values, meaning that the variables are normally distributed, which is also confirmed by the Jarque-Bera test. The probabilities associated with this test for the three series of data are higher than the significance level $p=0.1$, which means that we can accept the null hypothesis and that the series are normally distributed.

Positive values for skewness indicate skewness to the right for broad money, GDP and broad money as percentage in GDP. The Kurtosis values close to 3 for all variables show that the series is normally distributed from this approach.

Also, the analysis of the data series representing broad money shows a steady increase in the supply of money in the economy for the period analysed, with a minimum of 97 billion LCU for 2007 and a maximum of 564.42 billion LCU for 2021. The average annual absolute growth for the period analysed is 29.18 billion LCU and the average annual percentage growth is 11.63%. If we refer to broad money as a percentage in GDP we observe that the indicator has been growing steadily, that it recorded a minimum of 32.24 percentage points in 2008 and a maximum of 47.75 percentage points in 2021, the average being 38.61 percentage points.

Table no. 1 Descriptive statistics for indicators

	<i>INF</i>	<i>M3</i>	<i>GDP</i>	<i>M3 GDP</i>
<i>Mean</i>	4.088235	274.6745	687.9378	38.61199
<i>Median</i>	4.600000	241.5500	634.9678	38.62409
<i>Maximum</i>	9.000000	564.4230	1181.918	47.75484
<i>Minimum</i>	-1.500000	97.00600	286.8619	32.24836
<i>Std. Dev.</i>	2.837887	130.9110	259.0757	4.210999
<i>Skewness</i>	-0.343484	0.702055	0.401400	0.437846
<i>Kurtosis</i>	2.527119	2.693620	2.211859	2.981072
<i>Jarque-Bera</i>	0.492675	1.462986	0.896505	0.543430
<i>Probability</i>	0.781658	0.481190	0.638743	0.762071
<i>Sum</i>	69.50000	4669.467	11694.94	656.4038
<i>Sum Sq. Dev.</i>	128.8576	274203.1	1073924.	283.7202
<i>Observations</i>	17	17	17	17

Source: Own computation using EViews 10.1

5. Findings

The paper aims at the investigation on the relationship between inflation and money supply. We share the Monetarist perspective according to which the change in inflation rate is determined by the change in broad money when the V (and Q) are stable.

First, we tested the stationarity of the time series. For this purpose, we used the Augmented Dickey - Fuller (ADF) Test. The results obtained showed that the series representing GDP is integrated of order 1, $I(1)$ the unit root is performed using models with intercept for p -value=0.0485. For broad money we obtained that the series is integrated of order 2, $I(2)$ the unit root is performed using models with none for p -value=0.0018. For broad money as percentage of GDP we obtained that the series is integrated of order 1, $I(1)$ the unit root is performed using models with none for p -value=0.0014. The inflation rate is a series integrated of order 1, $I(1)$ and the unit root is performed using models with none for p -value=0.0004.

Noticing that the data series are non-stationary, but are first-order integrated, becoming stationary by calculating the first difference, to verify the relevance of the model we used the Engle-Granger cointegration test used for single-equation models. The application of cointegration tests examines whether there is a long-run relationship between the observed variables.

Table no. 2 Engle-Granger Cointegration Test

Series: INF M3 GDP				
Sample: 2005 2021				
Included observations: 17				
Null hypothesis: Series are not cointegrated				
Cointegrating equation deterministic: C				
Automatic lags specification based on Schwarz criterion (maxlag=3)				
Dependent	tau-statistic	Prob.*	z-statistic	Prob.*
INF	-1.692867	0.6856	-5.864347	0.6007
M3_GDP	0.271391	0.9954	0.997254	0.9972

Source: Own computation using EViews 10.1

The results obtained after employing the cointegration test show that there is no cointegrating relationship between the observed variables, which may be due to the insufficient length of the data series. If there is no cointegration we can only estimate the short-run model, i.e. the VAR model.

The Vector Autoregression Estimates show that if we consider the inflation rate as a dependent variable the significance level is 5% with F-statistic of 3.757397. So, we conclude that there is a long-run relationship between inflation and money supply in Romania at a 5% significance level, we reject the null hypothesis that there is no relationship between inflation and money supply in Romania and accept the alternative hypothesis.

The VAR models are:

$$INF = 11.08596 + 0.828721 * INF(-1) - 0.348809 * INF(-2) + 0,407597 * M3_{GDP}(-1) - 0.659486 * M3_{GDP}(-2)$$

$$M3_{GDP} = -11.63014 + 0.045506 * INF(-1) + 0.382810 * INF(-2) + 0,862450 * M3_{GDP}(-1) + 0.430543 * M3_{GDP}(-2)$$

The results favour the idea that inflation rate is positively correlated with the inflation rate in the previous year and with broad money as a percentage of GDP in year t-1. The variable broad money as a percentage of GDP is positively correlated with the inflation rate in year t-1, with the inflation rate in year t-2, with broad money as a percentage in GDP in year t-1 and with broad money as a percentage in GDP in year t-2.

Inflation is 60% explained (R-squared = 0.600473) by inflation in previous years and money supply in previous years. This means that there are other factors driving variations in inflation that we aim to identify in future studies.

6. Conclusions

Inflation is a macroeconomic phenomenon with multiple causes. For the period under review, Romania has experienced monetary expansion, but at the same time a real GDP growth that did not fully cover the money supply growth. Also, for Romania there has been a significant increase in broad money as a percentage of GDP, which means that money supply has grown faster than value added, with the highest values of the indicator recorded for 2020 and 2021.

Our study showed that inflation is both cause and effect. With a significant budget deficit, macroeconomic imbalances are widening. That is why it is not a solution to live on credit; on the contrary, consumption on credit needs to be discouraged, but the monetary policy of the Central Bank is not sufficient to temper inflation. Policy makers must consider solving the structural problems that the country's economy is facing.

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