THE IMPACT OF MONETARY INSTRUMENTS FOR THE EVOLUTION OF ECONOMIC GROWTH AND PRICE STABILITY OF ROMANIAN MARKET

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***Abstract**:*

Our approach to the research – the results of which are presented in this paper – is based on the assumption that the relation berween the money base and inflation was severely uncorrelated due to the development of technology and the creation of esoteric financial instruments. Since inflation is the key objective of the strategy pursued by the National Bank of Romania, we intend to find out if the monetisation level of tanhe economy still is one of the factors causing inflation. Moreover, we consider the correlation between economic growth and inflation, a question endlessly discussed by academic circles after the crises. By means of an econometric analysis we define some relations of causality among variables to see whether monetary variables influence the evolution of the GDP or vice versa.

***Keywords**:* VAR, inflation, monetary base, central bank

***JEL Classification**:* E17, E31, E52, E58

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1. Introduction

In the present context of rescheduling Romania's accession to the European Monetary Union – which is likely to be postponed at least two years beyond 2015 – the initial target - a quickly resuming economic growth is of great importance for preventing that Romania lags behind in fulfilling European standards. Understanding the conditions and the mechanism of economic growth to ensure its sustenability is a priority of economic research. Moreover, a faster accession to the Euro Monetary Union would benefit our country since it may speed up reforms for closing the gap in productivity.

Given the capital account and exchange rate liberalization, National Bank of Romania gave up monetary targeting strategy (monetary base could not be controlled any longer) – a strategy pursued for about two decades and half – and adopted the inflation target strategy in august 2005. Isarescu (2007) said that the development of financial institutions and markets had led to a difficult and, later, impossible control of monetary aggregates due to increasingly unstable velocity of money circulation.

Therefore, the main objective of the monetary policy followed by the National Bank of Romania was the inflation target. The inflation target strategy – which compels the Central Bank to keep a low inflation – played a leading role in maintaining price stability in industrialized countries. Similarly to the developing countries, the former communist countries adopted and implemented this strategy able to improve the transparency of the monetary policy and to determine the authorities to carry out necessary reforms for a transition from the planned economy to a market economy.

According to Mugur Isărescu (2009), the inflation target strategy cannot be successfully implemented unless a coherent assembly of economic policies is promoted. As regards the particular case of the emerging economies in Central and Eastern Europe, for formulating and coordinating macroeconomic policies it is required to pay special attention to the specific features of the real and nominal convergence processes. The only valid solution on medium and long terms implies development and implementation of a coherent mix of macroeconomic policies able to support economic growth and, at the same time, to limit the economy's vulnerability.

The present crisis showed that the main target of the monetary policy – inflation – was not enough to stabilize prices at a low level and this should

have been accompanied by financial stability; more exactly, a combination of monetary policies to obtain a balanced mix of policies. In the 2012 Annual Report, the National Bank of Romania reveals that Romania made progress in macroeconomic stabilization in 2011 by promoting a mix of economic policies for starting economic growth on a sustainable basis. While the monetary policy was countercyclical in 2011, because of the monetary area created in the previous years, the size of the imbalanced caused before the crisis and the need to eliminate the severe deficit by the end of 2012 forced the fiscal policy to be further procyclical.

2. Evolution of the monetary supply in relation with inflation and GDP

In our analysis we used monthly, quarterly and annual data for the GDP, the CPI, and the M1, M2 and M3 monetary aggregates for January 2005 – December 2012 period. The primary data were found at www.bnro.ro and www.insse.ro.

Table 1: The evolution of the monetary indicators during the period under analysis

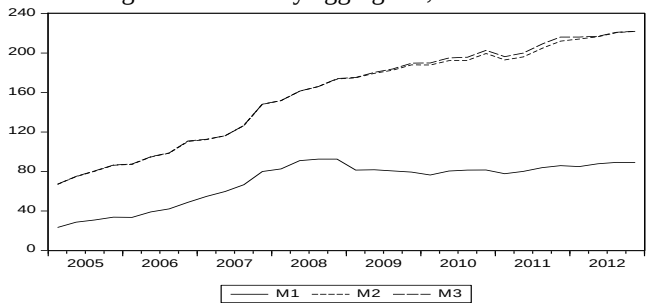
Year	2005	2006	2007	2008	2009	2010	2011	2012
M3	86,525	110,821	148,116	174,028	189,630	202,773	216,208	222,017
M2	86,230	110,442	148,044	173,629	188,013	199,572	212,059	221,829
M3 (% of GDP)	30.16	32.44	35.93	34.04	38.75	39.07	37.69	37.80
M1	33,760	48,726	79,914	92,549	79,362	81,592	85,834	89,020
Cash in circulation	11,386	15,130	21,441	25,287	23,968	26,794	30,610	31,477
Demand deposits	22,374	33,596	58,473	67,262	55,394	54,798	55,224	57,543

The M1 monetary aggregate (the money supply in a narrow sense) includes sight deposits and cash in circulation. The M2 monetary aggregate (intermediate money supply) consists of the M1 monetary aggregate and

deposits to be reimbursed on notice of the most three months inclusively as well as deposits for an initial period up to two years inclusively. The M3 monetary aggregate (the money supply in a broad sense) includes the M2 monetary aggregate and loans from repo operations, shares/units of monetary market funds (issued) and issued tradable securities with maturity up to two years inclusively.

The money supply in a narrow sense (M1) began to decrease with the start of the global financial crisis, from 92,549 million lei in 2008 (the reference level of the best economic year as regards the GDP level) to 79,362 million lei in 2009, and then slightly increased, but not reaching the level of economic growth in the reference year.

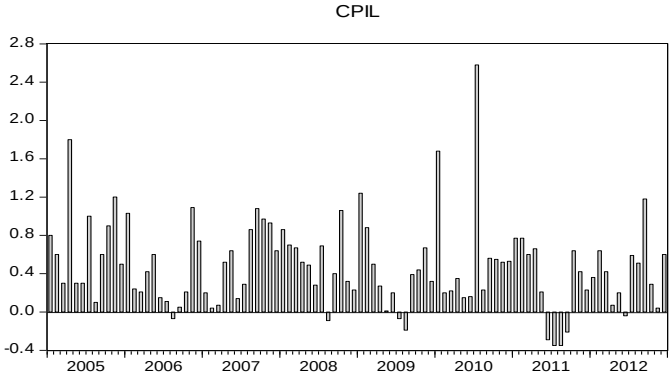
Figure 1. Monetary aggregates, 2005-2012



Source: Eviews processing based on data available at www.bnro.ro

Figure 2: Evoluţia inflaţiei în perioada 2005-2012

CPIL



Source: Eviews processing based on data available at www.bnro.ro

Table 2: The evolution of inflation during the period under analysis

Year	2005	2006	2007	2008	2009	2010	2011	2012
M3	86,525	110,821	148,116	174,028	189,630	202,773	216,208	222,017
M1	33,760	48,726	79,914	92,549	79,362	81,592	85,834	89,020
Cash in circulation	11,386	15,130	21,441	25,287	23,968	26,794	30,610	31,477
Demand deposits	22,374	33,596	58,473	67,262	55,394	54,798	55,224	57,543
Annual inflation	8.40	4.78	6.14	6.13	4.34	7.73	3.10	4.86

The relation between the money supply and inflation was severely uncorrelated due to the development of technology and the changing velocity of money circulation.Although the annual rate of inflation was only 1.79% in May 2012 (historical minimum level) and then it reached 5.33% in September 2012, the money supply in a broad sense stayed at about the same level (220.6 billion lei in May 2012 and 220.7 billion lei in September 2012, respectively). Official data show that the rising trend was determined by same factors such as the rising trend of oil quotation in the world, the nominal depreciation of the leu as against the euro, the shock caused by the agricultural supply in Romania and in the world, the unfavourable basic effect on the volatile price side as well as adjustments of volatile prices.

In our study, the assessing of the intensity of shocks to system variables is based on the VAR determination, which is a model enabling us to analyse the effects of economic policy measures. VAR analysis has been used in macroeconomic studies since the 1970s, with Cristopher Sims as a leading promoter, as VAR is , in fact, a system-type analysis with all included variables endogenous and, there before, modelled together.

The VAR method is very common for analysing time series, especially due to its flexibility and easy utilisation. It may be considered a generalisation of both the univariate autoregressive (AR) model, because the dependent variables are lags of explanatory variables and also of simultaneous equations. All variables in the VAR model are treated symmetrically, as each variable has an equation that explains the evolution on the basis of own lags and the lags of other variables of the model.

Ito and Sato (2006) use VAR analysis to measure the effects of exchange rate pass-through on national prices in East-Asian countries. They conclude that the level of the exchange rate pass-through in relation to import

prices is very high, but low in relation to inflation, with one exception: Indonesia, whose accommodating monetary policy and high CPI sensitivity to exchange rate changes are important factors that lead to spiral effects of the national price inflation and sharp nominal exchange rate depreciation in the post-crisis period.

Cezar Boţel (2002) explains the utilisation of this method, considering that only system-type analyses (simultaneous equations) can reveal the interconnections between macroeconomic variables.

VAR models are based on the analysis of shocks to the variables studied. The shocks or 'innovations' form that part of a variable level that cannnot be explained by the history (passed values) of that variable or other system variables.

The main purpose of the VAR analysis is assesing the effects of various shocks to system variables. The VAR analysis has three types of results: impulse response, forecast error variance decomposition, or variance decomposition and Granger causality.

Bogdan Moinescu and Adrian Codirlaşu (2012) partly use the VAR method to show that as regards services providers a shock to the rate of interest on lei credits affects the non-performing crediting rate beginning in the fourth quarter and is highly persistent and as regards the construction companies the impact of a shock to the euro interest margin is significant statistically after one quarter in correlation with default rates.

C. Sims, the initiator of the model, describes by VAR the evolution of a set of variables k (called endogenous variables) over the same period of the sample (t=1,2,…2000) as a linear function only in relation to their past evolution.

The variables are gathered into a vector k × Vector (y) by observing variable i at moment t. For example, if variable i is the exchange rate, then y(i,t) has the value of the exchange rate at moment t.

An autoregressive vector of p order (reduced), denoted by VAR (p), takes the following form:

$$y_t = c + A_1 y_{t-1} + A_2 y_{t-2} + ... + A_p y_{t-p} + e_t$$

where: c is a vector of constants k × 1 (intercept), Ai is a matrix k × k (for every i = 1,..., p) and et is a vector k × 1 of error terms that meet the following requirement: each error term has zero significance, the contemporary covariance matrix of error termi is Ω (semidefined positive

matrix k × k); and for any non-zero k – there is no correlation over time; especially, there is no serial correlation between individual error terms. See Hatemi-J.A. (2004) for multivariate tests for autocorrelation in VAR models.

A fundamental requirement to be fulfilled before analysing the shocks to the studied variables is checking the stationary character of the time series, because using them in a non-stationary form might cause illusory regressions. A VAR is stationary when the effects of the shocks to system variables diminish to null in a certain time. If VAR is not stable, then the confidence intervals for impulse response functions cannot be built since the standard errors cannot be computed by common methods.

We used the Phillips – Perron test for stationarity.

Table 3: The stationarity of the series

	Null hypothesis likelihood (unit root)			**Nature of the series**
	Level + ct	**Level+ct+trend**	**First difference**	
Series	**Prob.**	**Prob.**	**Prob.**	
GDP	0.2721	0.9691	0.0147	I(1)
M1	0.0015	0.0381	0.0000	I(0)
M2	0.0586	0.1516	0.0000	I(0)
M3	0.0598	0.1678	0.0000	I(0)
CPI	0.0002	0.0006	0.0000	I(0)

First, we tested for the existence of a VAR representation between the GDP and the M1 and M2 monetary aggregates, and the CPI and the M1 and M3 monetary aggregates. For the GDP we considered the difference series according to the above table (series I(1)), and for the other ones we used the level series. The results of the VAR model tests are not conclusive for the 2005 – 2012 period, i.e. the regression coefficients related to the explanatory variables are mostly statistically insignificant, which – if correlated with high coefficients of determination – leads to the conclusion that the space of entered elements would be strongly correlated.

Under these circumstances we checked up the existence of some causality relation among those variables using Granger Causality Tests to see exactly if monetary variables influenced the GDP evolution or vice versa.

The basic ideea of Granger Causality Test is that X is 'Granger Causality' for Y , if X contains information allowing for a better prediction of

Y than when we use only information from the past of the series Y (and possibly from the past of other explanatory variables Z). The most usual form of Granger Causality Test is the VAR method, which allows both for determining the statistical significance of the regression coefficients of Y in relation to X and for directly estimating the causality (likelihood that X is/is not Granger-Cause for Y).

The definition of Granger Causality is the following: let us have three time series Xt, Yt and Zt. We forecast Yt+1 on the basis of the past values of variables Yt and Zt. Then we forecast Yt+1 on the basis of the past values of series Xt, Yt and Zt. If the second estimation is better than the first one (according to the usual tests), then the past values of series Xt contain information helping to forecast (improving) Yt+1, which information cannnot be found in the history of series Yt and Zt. We say that Xt does Granger-Cause Yt+1 if: (a) Xt precedes Yt+1 (the cause precedes the effects) and, (b) Xt contains useful information to forecast Yt+1, which information cannot be found in the other variables. The conclusion is stronger if variables Zt are more adequate and better selected. If better selected. If X and Z are not correlated, then Xt contains unique information useful for forecasting Yt+1.

Xt might Granger-Cause Yt+1 and Yt might not Granger-Cause Xt+1 . In this case the relation between X and Y is interconditional (stochastic system with feedback). Usually, the test regarding the absence of Granger causality is carried out by estimating the following VAR model:

$$Y_t = a_0 + a_1Y_{t-1} + ... + a_pY_{t-p} + b_1X_{t-1} + ... + b_pX_{t-p} + e_t \quad (1)$$

$$X_t = c_0 + c_1X_{t-1} + ... + c_pX_{t-p} + d_1Y_{t-1} + ... + d_pY_{t-p} + \varepsilon_t \quad (2)$$

The H0 test: b1 = b2 = ... = bp = 0, against HA: 'No H0', is a test according to which X does not Granger cause Y.

Similarly, the H0 test: d1 = d2 = ... = dp = 0, against 'No H0' is a test according to which Y does not Granger-Cause X.

In both cases, the rejection of the null hypothesis implies the existence of a Granger causality relation. If there is at least one (or a few) value i for which the coefficients bi¬ are econometrically significant and the coefficients dk are not significant, whatever k (i and k between 1 and p) is, then X does Granger – cause Y. Otherwise, if there are no econometrically significant coefficients bi but there is one econometrically significant (or a group of) coefficient dk, then Y does Granger – cause X. If there are both significant coefficients bi and dk , then the causality relation both ways.

Since not all variables are stationary, we used Toda–Yamamoto

version of Granger Test. Toda-Yamamoto version is applied when series are not stationary (Jula 2013).

Testing a causality relation between inflation and monetary aggregates.

We tested the causality relation between CPI and M3 for quarterly data. The results do not show a causality between those variables.

VAR Granger Causality/Block Exogeneity Wald Tests
Date: 03/21/13 Time: 13:38
Sample: 2005Q1 2012Q4
Included observations: 30

Dependent variable: CPI

Excluded	Chi-sq	df	Prob.
M3	1.197907	1	0.2737
All	1.197907	1	0.2737

Dependent variable: M3

Excluded	Chi-sq	df	Prob.
CPI	0.201928	1	0.6532
All	0.201928	1	0.6532

The null hypothesis: M3 does not Granger-cause CPI (Toda Yamamoto version) and the likelihood of 0.2737 is higher than the standard threshold of 0.05, so we accept this hypothesis.
The null hypothesis: CPI does not Granger-cause CPI (Toda Yamamoto version) and the likelihood of 0.6532 is higher than the standard threshold of 0.05, so we accept this hypothesis, too.

In conclusion, the hypothesis regarding a relation between the quarterly values of CPI and M3 is not econometrically verified. Under these

circumstances, we test for the existence of some causality relations among monthly values of those variables.

VAR Granger Causality/Block Exogeneity Wald Tests
Date: 03/21/13 Time: 13:18
Sample: 2005M01 2012M12
Included observations: 94

Dependent variable: CPIL

Excluded	Chi-sq	df	Prob.
M3L	4.895786	1	0.0269
All	4.895786	1	0.0269

Dependent variable: M3L

Excluded	Chi-sq	df	Prob.
CPIL	0.004698	1	0.9454
All	0.004698	1	0.9454

The money supply in a broad sense (M3) does not Granger-cause CPIL (Toda-Yamamoto version) and the likelihood is 0.0269, below the standard threshold of 0.05, so the hypothesis is rejected; therefore we accept the alternative hypothesis that M3 is a cause for CPIL.

CPIL does not Granger-cause M3 (Toda-Yamamoto version) and the likelihood is 0.9454, higher than the standard threshold of 0.05; therefore, we accept the hypothesis that CPIL is not a cause of the M3 dynamics.

We also tested the quarterly relation between the GDP and M1 and between the GDP and M3.

VAR Granger Causality/Block Exogeneity Wald Tests
Date: 03/21/13 Time: 12:51
Sample: 2005Q1 2012Q4
Included observations: 30

Dependent variable: M1

Excluded	Chi-sq	df	Prob.
PIB	0.722892	1	0.3952
All	0.722892	1	0.3952

Dependent variable: PIB

Excluded	Chi-sq	df	Prob.
M1	1.383073	1	0.2396
All	1.383073	1	0.2396

VAR Granger Causality/Block Exogeneity Wald Tests
Date: 03/21/13 Time: 12:41
Sample: 2005Q1 2012Q4
Included observations: 30

Dependent variable: PIB

Excluded	Chi-sq	df	Prob.
M3	0.570287	1	0.4501
All	0.570287	1	0.4501

Dependent variable: M3

Excluded	Chi-sq	df	Prob.
PIB	1.242044	1	0.2651
All	1.242044	1	0.2651

M3 does not Granger-cause GDP (Toda Yamamoto version) and the likelihood of 0.45 is higher than the standard threshold of 0.05, so the hypothesis is accepted.

GDP does not Granger-cause M3 (Toda Yamamoto version) and the likelihood of 0.265 is higher than the standard threshold of 0.05, so the hypothesis is accepted.

3. Conclusions

After more than five years since the global financial crisis started, is still has a major impact on all domains influencing the GDP. In Romania, the crisis interrupted the economic growth that had lasted for more than one decade. If the National Bank of Romania had not adopted the inflation target strategy Romania might have not grown economically between 2000 and 2008, by giving up the monetary aggregate target; the national economy underwent a strong monetisation, so the maximum level of monetisation expressed as a ratio of the money supply in a broad sense (M3) to the GDP was attained in 2009.

The econometric analysis shows that in the period in view there are no causality relations according to Granger test between the money supply and inflation and between the money supply and the GDP, and the analysis based on the autoregressive vector reveals that the macroeconomic variable variation cannot be explained by means of the past values. The decorrelation of the monetary aggregates and inflation, and the GDP, respectively, was caused by the development financial institutions and markets, and the emergence of esoteric financial instruments, respectively.

Considering the proposal of Milton Friedman, the faather of monetarism, who said that the monetary policy had to ensure the equilibrium of the market economy by constantly increasing the money supply in

circulation by 5-6% annualy, the question is whether we have to adopt a monetary policy able to ensure the monetary supply expansion by a percentage that constantly stimulates constant growth of the Nominal Gross Domestic Product. There are some economists who support this policy, called the strategy of Nominal Gross Domestic Product target, but for our country this could be a difficult target because of the very low rate of sustainable economic growth. Belonging to the Monetary Union Zone could be another structural constraint of our economy as regards the monetary policy target, called the Nominal Gross Domestic Product Target.

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