I. THE MONETARY CAUSES OF INFLATION IN ROMANIA[1]

Cristian PĂUN[2]
Vladimir TOPAN[3]

Abstract

Inflation is considered one of the most sensitive macroeconomic phenomena in modern economies (inducing significant distorsions in the productive structure of the economy and social injustice in the market). Three of the most important theories that explain the nature and the causes of inflation are: the Keynesian approach that considers inflation as an effect of higher costs or as one of the demand side (an increase in money supply, according to Keynes, will lead to an increase in the volume of transactions due to an extra demand that will push the economy closer to full employment); the monetarist approach (starting with Fisher) that approximates inflation through an index of prices and considers it a result of changes in the velocity of money, transactions volume and the money supply (M x V = p x T); and the Austrian approach that defines inflation exclusively as a monetary phenomenon and a result of expansionary monetary policies of the Central Banks. Based on these main theories, the present paper analyzes the relationship between broad money dynamics and CPI, in order to ilustrate the monetary causes of inflation in Romania.

Keywords: inflation, monetary policy, central bank, broad money

JEL Classification: E31, E41, E58

I. Introduction

Inflation is commonly associated with an increase in the level of prices (usually assessed by means of index numbers) for goods and services as compared to a previous moment. The reduction in the purchasing power of money and the social injustice (redistribution) induced in the economy are the standard simple negative effects of inflation. On the other side, the monetary interventionists wrongly associate a “positive” effect with inflation in terms of the possibility of central banks to reduce the

[1] This paper is supported by Research Project CNCSIS TE_340 No. 38/03.08.2010: “Contagion Effect of Financial Crises in Case of Eastern European Countries”.
[2] Academy of Economic Studies, E-mail: cpaun@ase.ro.
[3] Academy of Economic Studies, E-mail:topan_vlad@yahoo.com.

interest rate, in order to facilitate more investments in the economy and an increase in employment. Nevertheless, any anticipated increase in broad money will have a direct impact on the individual cash balance, time preference and consumption that will diminish the interest of investors in the money and capital market financial instruments. The nominal interest rate will increase (due to lower investment and saving rate, lower liquidity, higher risk) and will restrain the investment efforts of the private sector. Moreover, any *un*anticipated inflation (especially by means of credit expansion above genuine savings) will have the unfortunate consequences described by the theory of the business cycle: artificial lowering of interest rates below their market level, illusorily enhanced profitability of more capitalistic ("longer term") investment projects (which are, therefore, initiated/launched) – the boom phase; and, as these are unsustainable (malinvestments), the necessary subsequent liquidation phase – the crisis phase – throughout which a veritable cluster of entrepreneurial errors is discovered (with widespread banckrupcy, layoffs, cost-cutting, activity downsizing – a generally depressed business environment). Inflation has become more problematic in modern times due to the higher role assumed by central banks in the global economy (paper money or computer digits that are easily introduced in the economy). The correct understanding of price dynamics is important not only at private individuals' or entrepreneurs' level. Public institutions (central banks), too much obsessed with achieving price stability, confuse the possible causes of (price) inflation and, apart from usually failing to reach this goal, induce additional instability in the markets. Business cycles have become more and more accelerated and profound and the standard solutions seem to be limited to a single perspective: a higher money supply to reduce the interest rate, to increase investments and to support the private and public consumption in order to spur optimism and change market behavior accordingly.

II. Main Theories on the Monetary Causes of Inflation

Inflation is still a very controversial concept and in economic theory there are different fundamental approaches to this macroeconomic phenomenon. Classical economists and a few after them (D. Hume, 1752) identified the direct link between the money supply and inflation, and also accepted the possibility of "beneficial inflation"; R. Cantillon (1755) elucidated the redistributive impact of changes in the money supply and credit on relative prices known as the "Cantillon effect"; A. Smith (1776) pointed out the distinction between nominal and real prices in terms of labor and money and explained the inflation not as an ongoing process but as a result of demand and supply of gold; D. Ricardo (1810), who is considered by some as first and foremost a monetary economist, elaborated the standard version of the more crude and mechanicist quantity theory of money (in which the money supply is neutral to everything but the "level" of prices); J. S. Mill (1848) formulated for the first time an equation of exchange that defined the quantitative relationship between the supply of money and the value of money transactions; S. Jevons (1875) mathematically elaborated the theory of exchange; S. Newcomb (1885) proposed an explicit formula for the equation of exchange as a relationship between the nominal amount of money, velocity of money, price level and an index of real expenditures including the newly produced goods and services; C. Menger (1892) explained the origins of money as a market social institution for the facilitation of exchange) explained inflation from a quantitative perspective: a higher money supply will generate, *ceteris paribus*, higher prices in the economy. In classical economics, price inflation is mainly a monetary phenomenon, its main cause being a greater money supply in the economy.

The Keynesian approach (J. M. Keynes, 1930, 1936; A. Pigou, 1949; F. Modigliani, 1989; A. Lerner, 1944, 1952; J. Tobin, 1987; J. Stiglitz, 1988; P. Krugman, 1982, 1985; and others) is derived from the classical equation of exchange. The difference consists in the focus on money demand instead of the money supply. In this case, the equation of exchange was modified, the price level being dependent upon the demand for money (Md), an index of real expenditures (Q) and a portion of nominal income that is held in cash (k). Keynesians argue that fiscal policy is more important than monetary policy (inflation was considered by Keynes a method of taxation). They consider that prices in the economy are less sensitive to changes in supply and demand (especially the price of labor). The Keynesian approach points out that prices are somewhat rigid and, if the government will increase public expenditures on different public projects, the output of the economy will increase. This position served moreover as an argument for public intervention in free markets and for extensive and regular use of government intervention tools such as spending, taxes and the manipulation of the money supply as a fine-tuning policy that could stabilize the economy. The New Keynesians provided other non-monetary perspectives on inflation: inflationary gap or demand-pull inflation, the Philips Curve, cost-push inflation, asymmetry of information and its impact on price level.

The monetarist approach to inflation was initially developed by I. Fisher (1911, 1912) from the classical theory (Jevons, Newcomb). Fisher proposed an adjusted equation of exchange: the stock of money (M) multiplied by the velocity of money (V) is equal to the total volume of transactions (T) multiplied by the price level (P). From this relationship one may see that, in Fisher's view, the price level is positively influenced by the stock of money and its velocity and negatively influenced by the total volume of transactions (higher transactions meaning lower prices). He argued that an increase in the stock of money would not produce a significant effect on the velocity of money and volume of transactions, the price level being the most affected in this case (the argument is related to the expansionary effect on newly printed money exercised by banks that issue money instruments, such as payment instruments or time deposits). Another contribution of Fisher was his proposal to create and to use an index of prices as a basis for monetary intervention in the market (he was the first who approximated inflation based on a consumer prices index). Fisher (1933) claimed to be a developer of a crisis theory that is based on the concept of debt deflation effect. The difference between monetarists and Keynesists consists in a higher importance associated with monetary policies than fiscal policies and public expenditures. In fact, monetarists developed a whole theory of centralized monetary policy and its "virtues" to stabilize the real economy (especially the representatives of the Chicago School). The main followers of monetarist vision on inflation are: (1) M. Friedman, the founder of Chicago School (1952, 1972), who considered inflation as a tax on individual cash balance, was interested to identify the factors that could influence the rate of inflation so as to maximize economic growth and to propose an optimum monetary policy in that respect (he was also a critic of the Philips Curve (1977), analyzed the strengths and weaknesses of monetary policies (1968, 1982), and generally tried to define the best way to implement the monetary policy and to establish its role within the economic system). Friedman remained a strong supporter of monetary intervention in the economy believing “that monetary policy can prevent money itself from being a major source of economic disturbance” (1968) and considered that monetary intervention to stabilize the market prices as beneficial (in fact, the natural state of prices on the market is not to be stable). The higher importance of monetary policies (than fiscal policies or public deficits) is based on the following argument: “a budget deficit is inflationary if, and only if, it is financed in considerable part by printing money”. Friedman rejected the Keynesian incomes policy (control of wages and prices in the economy) as an efficient tool that could be used in combitation with the monetary policy to combat inflation; (2) K. Brunner criticized the Keynesian IS-LM diagram considering it “not well suited to cope with important aspects of monetary mechanisms” (1961, 1976). Brunner defined money as a “social device” that reduces information and transaction costs (1971), criticized the positive correlation between money and income growth and analyzed the limits and errors of the idea that monetary growth can be tightly controlled and managed (1983) and (3) R. Lucas explained the relationship between inflation and welfare (2000), introduced a theory of rational expectations (the private economic decisions made by individuals according to their past experiences and anticipations will change the projected results of monetary and fiscal policies) (1972) and criticized the use of econometrics as a tool for public macroeconomic policies (1976), also known as “Lucas Critique”.

The Austrian School provided one of the most consistent views on inflation in the spirit of the classical theory (Mill, Cantillon, Menger and Böhm-Bawerk). In the Austrian paradigm, inflation is defined exclusively as a monetary phenomenon consisting in an increase in the money supply (in a *fiat* money setting), or an increase in money substitutes unbacked by money proper (in a private commodity money setting). L. v. Mises (1924, 1966) argued that any additional quantity of money introduced in the economy would produce direct effects both on the price level in general and the structure of production together with the built-in web of relative prices (the theory of the non-neutrality money, that is, an approach different than the Keynesian one). Because it is difficult to say which will be affected more (price level or structure of production), it is difficult to appreciate exactly the impact of additional money on the price level (a double quantity of money printed and injected into the economy will not double all prices and will not raise them at the same moment and to the same extent). F. Hayek (1937) agreed on this non-neutrality of money and he considered that the monetary policy should “neutralize” the effect of the money supply on the price level. He considered that an increase in the money supply would be “unnecessary” and “disruptive” from the point of view of the structure of production. The sound monetary policy that could neutralize the inflationary effect of the money supply is a “100 percent reserve gold standard under the supervision of a central bank” (Hayek believed for a long time that the central banks should keep their monopoly on money production, but later (1978) he concluded that monetary stability could be achieved only if there was a separation between public authorities and money). Haberler (1932) and F. Machlup

(1935), who in their early work shared the Austrian view, explained the origin of (price) inflation from two different sides: money side and goods side. Haberler identified three factors from the "goods side" (non-monetary factors) that could increase the price level in the economy:

(1) changes in the technologies that increase the production level that, in turn, reduces the price level;

(2) lengthening of the production process by adding new phases (or intermediaries of unfinished goods) that reduce the production volume and generate an increase in the price level;

(3) an increase in population that increases the demand for goods and services with a direct effect on the price level.

The first factor was considered by Haberler to be a positive one that did not require any monetary intervention. Haberler pointed out that only the second and the third factors implied a monetary accommodation. Haberler failed to explain if an adjustment of the money supply made to reduce the impact of an increase in population would not reduce an improvement of technology. It is not clear why an increase in population will not accelerate an improvement of technology without any additional monetary accommodation (even Hayek, Haberler and Machlup finally agreed that a monetary intervention will induce more distortions in the real economy). On the other side, A. Mahr (1933) has a different position arguing that a monetary policy intended to establish neutral money could reduce economic growth (only products with a higher elasticity of demand will absorb a higher share of the consumers' purchasing power). Mises and Rothbard took a totally different position, considering the idea of neutral money as an endorsement for maintaining legal tender laws and the state monopoly of money production. Mises assumes for the following:

(1) the purchasing power of money should be free of the control and influence of public authorities;

(2) additional money supply (especially in the form of credit expansion) increases the confusion between money and capital and induces a non-natural decrease in interest rates and a subsequent cluster of entrepreneurial errors;

(3) full employment could not be achieved by manipulating the purchasing power of money, as any additional money will finally generate an economic situation in which the available means will exceed the ends they could serve.

Money is viewed by Mises as "an element that bound the market into a web of exchanges" (R. Ebeling, 1992). An increase in prices induced from the goods side is not considered inflation, but rather a natural evolution of the market. Prices are naturally unstable and cannot be all fixed or their changes neutralized by a monetary intervention. When the government supplies the market with additional money or encourages credit expansion in order to reduce the interest rate, it is not clear where this additional money produced from nothing will go: to buy securities on the capital market (in this case, the interest rate will be lower on short term), to buy capital goods, to be spent on consumption or to be kept in the cash balance of the individuals. All these three different markets will compete for this additional printed money. For this reason, Mises defined inflation only as that increase in prices generated by additionally printed or fiat money. Price inflation generated by natural disasters, depletion of natural resources, increases in consumers' preference for leisure or reduction in time preference is considered to have a positive impact on the economic system (Salerno, 2010). Inflation is not so much a tax (as Keynes tried to suggest) but an alternative to taxation, with similar effects (but with lower political costs for the government and less predictable incidence on the general public). Sound money is not the money manipulated by the public authorities to be neutral to the economy and to respond to the natural increase in population, technological improvements in production or higher complexity of production processes. It is commodity money, independent of any state intervention and manipulation (only this kind of money could ensure sustained economic growth). Inflation in a gold standard (that uses gold as means of exchange) will be generated only by unbacked monetary substitutes – such as banknotes, token coins, checks etc. – issued by banks (if permited by law, this could be easily discovered and sanctioned by bank clients). Continuing and improving the classical theory, the Austrian approach clearly theorizes with strong arguments *the direct connection between the money supply and the price level, together with the negative impact on economic growth*.

In conclusion, the Keynesian approach (including some versions of the general equilibrium theory) considers prices as rigid and not sensitive to increases in the money supply. Most of the other theories argued that inflation has *a strong monetary dimension*. In the spirit of these theories, there are a lot of recent studies that illustrate the monetary causes of inflation: M. R. Pakko (1994) found a positive relationship between money growth (currency plus bank deposits) and inflation (CPI) for 13 former Soviet republics; W. Poole (1994) searched for monetary causes of inflation in all members of World Bank and found *a strong positive evidence*; G. T. McCandless and W. E. Weber correlated the monetary aggregates (M_0, M_1 and M_2) with inflation (CPI) and *discovered a very strong positive correlation* in a sample of 110 countries reported in IMF IFS; G. P. Dwyer and R. W. Hafer (1999) correlated money growth with GDP deflator for 79 countries reported in IMF IFS and discovered *a strong and stable positive correlation between this two variables*; C. Dabus and F. Tohmé (2004) found *a significant non-linear relationship between money supply and inflation* in the case of Argentina; P. De Grawe and M. Polan (2005) tested the monetary causes of inflation using a sample of 160 countries over 30 years and found that for countries with high inflation "*an increase in the growth of money stock leads to an increase in both inflation and velocity*"; H. Berger and P. Österholm (2008) used a BVAR Granger to test if *money growth is relevant for explaining and forecasting EU inflation*; B. Roffia and A. Zachini (2008) found *a strong relationship between excess money growth and inflation in the case of 15 industrialized countries*.

Romania, as an emerging market, experienced problems with inflation during the transition period. There are a few relevant studies about the Romanian inflation and its determinants that could be mentioned: L. Donath and B. Dima (2003) studied structural inflation (monetary and non-monetary components) in the case of Romania between 1993 and 2000; E. Pelinescu and C. Scutaru (2002) studied the determinants of Romanian inflation, E. Pelinescu and P. Caraiani (2006) analyzed whether the monetary regime of inflation targeting that Romania chose was favorable to inflation convergence with the EU; A.S. Dospinescu (2010) studied the persistent and nonpersistent changes in relative prices and their relation with the volatility of the aggregated price index; the persistence of inflation in the Romanian ecomomy was observed by P. Caraiani (2009).

III. Data Used in the Model

The data used in this study refers only to the Romanian economy and covers the period between 01 January 1997 and 31 December 2010 (monthly data). For the empirical test/ilustration we selected the following variables:

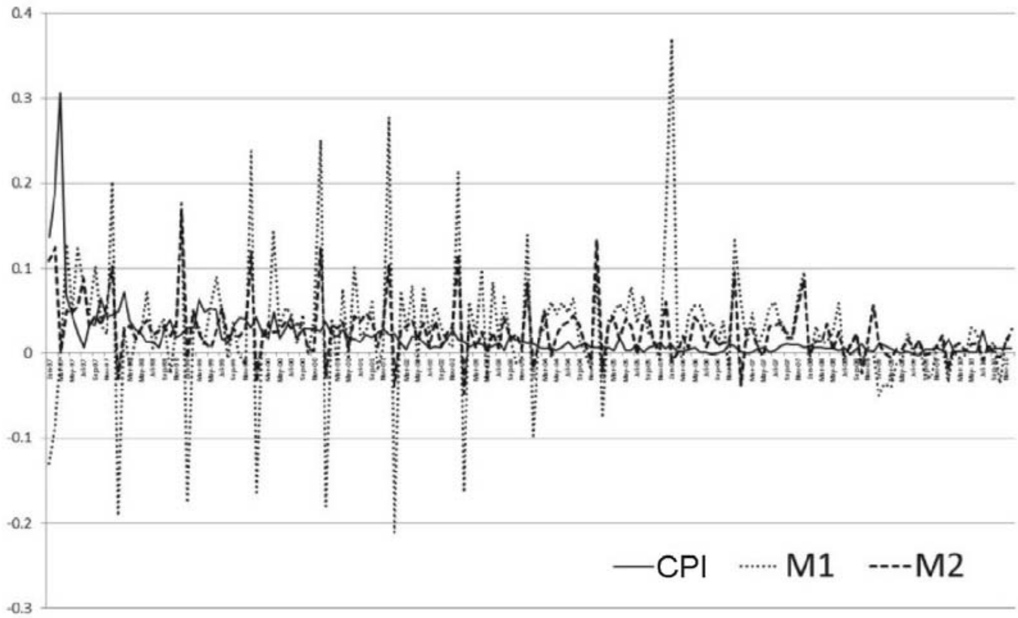
(1) Monthly inflation measured by monthly CPI variation; and

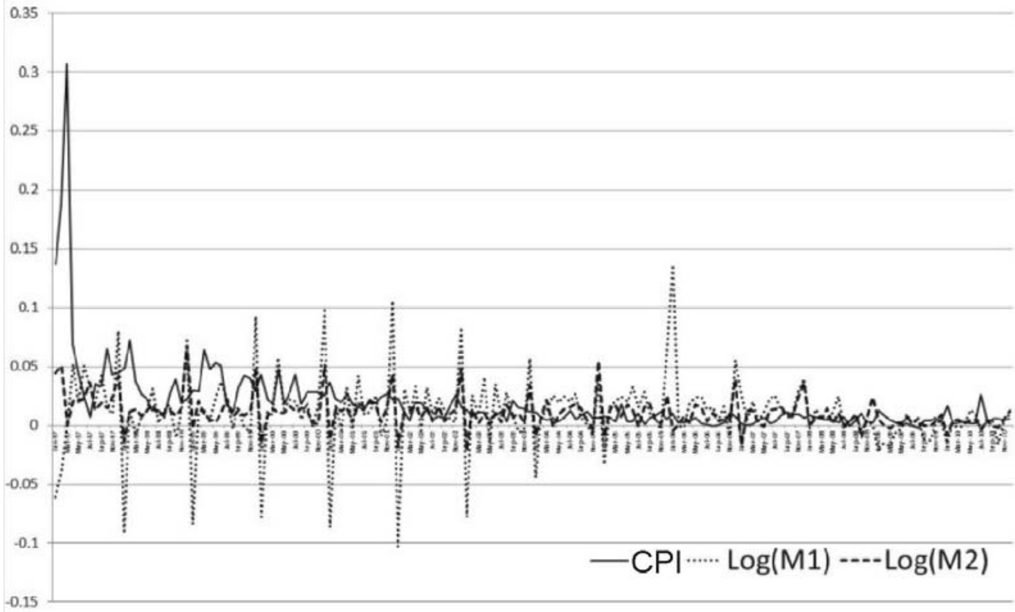
(2) Money supply change: we used both M1 and M2 monthly simple variation, log variation - $\log(M1_1/M1_0)$ and log natural variation $Ln(M1_1/M1_0)$. M1 is the monetary aggregate that includes cash printed by the central bank and M2 is a monetary aggregate that includes M1 and a significant part of non-cash money created by commercial banks (according to the fractional reserves requirements imposed by the central bank on demand deposits in Lei and Euro).

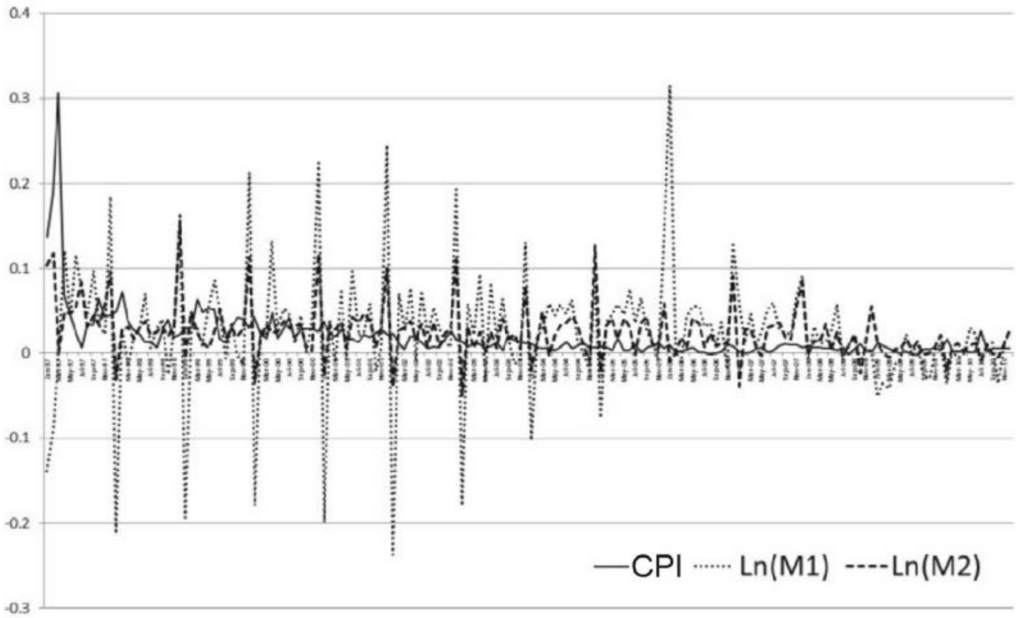
In this test, we used 168 observations of specified variables (monthly CPI, M1 and M2). The chart that plots the dynamics of these three variables (Figure 1) shows that when the Romanian monetary system operated with a high growth rate of M1 and M2, CPI was higher and when the monetary policy was more restrictive in terms of producing more money.

Figure 1

Time Series Used in the Model (CPI, M1 and M2)







The first step in our analysis was to test the unit-root hypothesis on the time series used in the regressions (we used a unit-root test with intercept and lag 0):

- CPI time series (see Table 1 in Annexes): ADF Test Statistics is **-6.105736** lower than critical values (for 1% critical value is - 3.4706, for 5% critical value is -2.8788 and for 10% critical value is -2.5759). Durbin-Watson is **2.151057** (higher than the critical value for 168 observations, 4 regressors);
- rM1 time series (see Table 2 in Annexes): ADF Test Statistics is **-17.01734** lower than critical values (for 1% critical value is - 3.4706, for 5% critical value is -2.8788 and for 10% critical value is -2.5759). Durbin-Watson test is **2.036901** (higher than the critical value for 168 observations, 4 regressors);
- rM2 time series (see Table 3 in Annexes): ADF Test Statistics is **-15.64817** lower than critical values (for 1% critical value is - 3.4706, for 5% critical value is -2.8788 and for 10% critical value is -2.5759). Durbin-Watson test is **2.034157** (higher than the critical value for 168 observations, 4 regressors);.

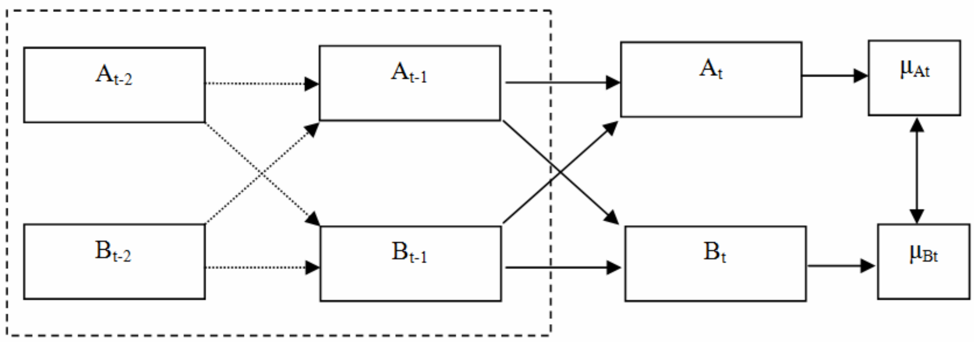
The results of the unit-root test performed on all the three time series rejected the null-hypothesis that there is a unit-root problem (all time series are stationary). Because all time series have Durbin-Watson test higher than critical value (for 168 observations, 4 regressors and 5% significance), there is no autocorrelation problem.

III. Research Methodology

To test the connection between monetary expansion and CPI we used a basic VAR model with no exogenous variable. We test two basic VAR models with and without intercept in the regressions (see Figure 2 for the graphic representation of interdependence between endogenous variables).

Figure 2

Basic VAR and the Interdependence between Variables, k=2



Source: I. G. N. Agung, 2009, p. 322.

The two sets of equations involved in the basic VAR model are the following:

$$\begin{cases} A_t = \alpha_1 + \sum_{j=1}^{k} \beta_{A,j} \times A_{t-j} + \sum_{j=1}^{k} \lambda_{A,j} \times B_{t-j} + \mu_{A,t} \\ B_t = \alpha_1 + \sum_{j=1}^{k} \beta_{B,j} \times A_{t-j} + \sum_{j=1}^{k} \lambda_{B,j} \times B_{t-j} + \mu_{B,t} \end{cases} \quad \text{Set 1}$$

$$\begin{cases} A_t = \sum_{j=1}^{k} \beta_{A,j} \times A_{t-j} + \sum_{j=1}^{k} \lambda_{A,j} \times B_{t-j} + \mu_{A,t} \\ B_t = \sum_{j=1}^{k} \beta_{B,j} \times A_{t-j} + \sum_{j=1}^{k} \lambda_{B,j} \times B_{t-j} + \mu_{B,t} \end{cases} \quad \text{Set 2}$$

According to the Basic VAR methodology without exogenous variables, we may have the following situations:

1. *Unidirectional causality* from variable B to variable A if $\lambda_{A,1}+\lambda_{A,2}$ from the regression $A_t = f(A_{t-1}, A_{t-2}, B_{t-1}, B_{t-2}, \alpha_{A,t})$ or from $A_t = f(A_{t-1}, A_{t-2}, B_{t-1}, B_{t-2})$ is *statistically* different from 0 and $\beta_{A,1}+\beta_{A,2}$ is *not statistically* different from 0;
2. *Unidirectional causality* from variable A to variable B if $\beta_{B,1}+\beta_{B,2}$ from the regression $B_t = f(A_{t-1}, A_{t-2}, B_{t-1}, B_{t-2}, \alpha_{B,t})$ or from $B_t = f(A_{t-1}, A_{t-2}, B_{t-1}, B_{t-2})$ is *statistically* different from 0 and $\lambda_{B,1}+\lambda_{B,2}$ is *not statistically* different from 0;
3. *Bilateral causality* between A and B when $\beta_{A,1}+\beta_{A,2}$, $\beta_{B,1}+\beta_{B,2}$, $\lambda_{A,1}+\lambda_{A,2}$ and $\lambda_{B,1}+\lambda_{B,2}$ are statistically different from 0;
4. *Independence* between A and B if coefficients in both regressions are not statistically relevant.

The statistical relevance is measured by t-stat, the critical value being -2 or 2 (t-stat should be lower than -2 or higher than 2 for 5% significance). In our test, the variable A is CPI and variables B are log M1 and log M2 (2 sets of equations for each of them).

IV. Results and Conclusions

For a better result, we tested three different growth rates for M1 and M2 (simple, log and natural log). The ADF test performed for all three types of rates indicated that all time series were stationary (have no unit-root problem) and there was no significant autocorrelation problem (see Table 4).

Table 4

Augmented Dickey-Fuller Test for rM1, rM2, log M1, log M2, lnM1 and lnM2

Time series	ADF Test result	Durbin-Watson Test
rM1	-17.01734	2.036901
rM2	-15.64817	2.034157
Log M1	-17.27618	2.040116
Log M2	-15.74501	2.033445
Ln M1	-17.27613	2.040117
Ln M2	-15.74509	2.033443

Critical values for ADF test are: for 1% critical value is - 3.4706, for 5% critical value is -2.8788 and for 10% critical value is -2.5759 (the ADF test result should be lower than this critical value in order to have no problem with non-stationary of your time series).

Table 5

Basic VAR Using Simple Growth Rates for M1 and M2 (with Intercept)

	CPI	rM1		CPI	rM2
CPI(-1)	0.533422	-0.036146	CPI(-1)	0.496154	0.046476
	(0.07482)	(0.26069)		(0.07382)	(0.11748)
	(7.12934)	(-0.13866)		(6.72084)	(0.39562)
CPI(-2)	0.087109	0.284701	CPI(-2)	0.050554	0.199521
	(0.07101)	(0.24741)		(0.06677)	(0.10626)
	(1.22675)	(1.15073)		(0.75711)	(1.87774)
RM1(-1)	-0.020262	-0.298141	RM2(-1)	0.236927	-0.284572
	(0.02248)	(0.07832)		(0.04749)	(0.07557)
	(-0.90144)	(-3.80686)		**[4.98887]**	(-3.76550)
RM1(-2)	-0.023882	-0.009697	RM2(-2)	0.113900	-0.061410
	(0.02210)	(0.07701)		(0.04995)	(0.07948)
	(-1.08055)	(-0.12593)		**[2.28046**	(-0.77265)
C	0.007039	0.034443	C	-0.001780	0.028754
	(0.00220)	(0.00765)		(0.00234)	(0.00373)
	(3.20626)	(4.50283)		(-0.75990)	(7.71437)

Note: Standard errors in ( ) & t-statistics in ( ), │t-statistics│ should be higher than critical value 2.

The critical value for the Durbin-Watson test for 5% significance of 168 observations and 4 regressors (we use 4 regressors because in the Basic VAR model we have two lags for both endogenous variables) is 1.809. Because all time series have a D-W value higher than this critical value, this indicates that we have no autocorrelation problems in all time series included in the test.

Interpretation: In the case of CPI and rM1 we have no statistically unidirectional or bilateral dependence. In the case of CPI and rM2 we have a *clear unidirectional* causality, CPI being determined by M2 dynamics (the coefficients of rM2 in the equation of CPI are statistically different from 0 and coefficients of CPI are not statistically different from 0). R squared for this equation is 0.538317 and F statistics is 46.93094. The same results (with a higher statistical relevance) are obtained if we exclude intercept (Table 6).

Table 6

Basic VAR Using Simple Growth Rates for M1 and M2 (without Intercept)

	CPI	RM1		CPI	RM2
CPI(-1)	0.598868	0.284095	CPI(-1)	0.498314	0.011587
	(0.07402)	(0.26531)		(0.07367)	(0.13696)
	(8.09111)	(1.07082)		(6.76393)	(0.08460)
CPI(-2)	0.115356	0.422920	CPI(-2)	0.043037	0.320952
	(0.07245)	(0.25969)		(0.06595)	(0.12260)
	(1.59223)	(1.62854)		(0.65258)	(2.61786)
RM1(-1)	0.008790	-0.155984	RM2(-1)	0.217670	0.026516
	(0.02115)	(0.07582)		(0.04011)	(0.07457)
	(0.41557)	(-2.05741)		**[5.42648]**	(0.35559)

	CPI	RM1		CPI	RM2
RM1(-2)	0.007150	0.142146	RM2(-2)	0.094366	0.254158
	(0.02043)	(0.07323)		(0.04277)	(0.07950)
	(0.34994)	(1.94099)		**[2.20650]**	(3.19677)

Table 7

Basic VAR Using Log M1 and Log M2 (with Intercept)

	CPI	LOGM1		CPI	LOGM2
CPI(-1)	0.529617	-0.024449	CPI(-1)	0.496943	0.019271
	(0.07494)	(0.10951)		(0.07375)	(0.04871)
	(7.06741)	(-0.22326)		(6.73790)	(0.39563)
CPI(-2)	0.088103	0.116475	CPI(-2)	0.050390	0.083347
	(0.07090)	(0.10361)		(0.06683)	(0.04414)
	(1.24265)	(1.12422)		(0.75397)	(1.88831)
LOGM1(-1)	-0.055858	-0.313146	LOGM2(-1)	0.567797	-0.289859
	(0.05362)	(0.07836)		(0.11454)	(0.07564)
	(-1.04169)	(-3.99626)		**[4.95723]**	(-3.83188)
LOGM1(-2)	-0.063386	-0.008128	LOGM2(-2)	0.279050	-0.061627
	(0.05272)	(0.07704)		(0.12027)	(0.07943)
	(-1.20237)	(-0.10550)		**[2.32022]**	(-0.77589)
C	0.007158	0.013751	C	-0.001929	0.012182
	(0.00217)	(0.00317)		(0.00237)	(0.00156)
	(3.29684)	(4.33397)		(-0.81535)	(7.79559)

Note: Standard errors in ( ) & t-statistics in ( ), │t-statistics│ should be higher than critical value 2.

Interpretation: In the case of CPI and Log M1 we have no statistically unidirectional or bilateral dependence. In the case of CPI and Log M2 we have a *clear unidirectional* causality, CPI being determined by M2 dynamics (the coefficients of Log M2 in the equation of CPI are statistically different from 0 and coefficients of CPI are not statistically different from 0). R squared for this equation is 0.537700 and F statistics is 46.81459. The same results (with a higher statistical relevance) are obtained if we exclude intercept (Table 8).

Table 8

Basic VAR Using Log M1 and Log M2 (without Intercept)

	CPI	LOGM1		CPI	LOGM2
CPI(-1)	0.598496	0.107869	CPI(-1)	0.499266	0.004600
	(0.07413)	(0.11079)		(0.07362)	(0.05695)
	(8.07399)	(0.97365)		(6.78148)	(0.08077)
CPI(-2)	0.118147	0.174192	CPI(-2)	0.042468	0.133369
	(0.07242)	(0.10824)		(0.06605)	(0.05109)
	(1.63140)	(1.60932)		(0.64293)	(2.61025)
LOGM1(-1)	0.013782	-0.179366	LOGM2(-1)	0.517354	0.028650
	(0.05077)	(0.07587)		(0.09629)	(0.07448)
	(0.27148)	(-2.36400)		**[5.37264]**	(0.38464)
LOGM1(-2)	0.011352	0.135445	LOGM2(-2)	0.227853	0.261647
	(0.04902)	(0.07327)		(0.10247)	(0.07926)
	(0.23157)	(1.84863)		**[2.22361]**	(3.30104)

Table 9

Basic VAR Using Ln M1 and Ln M2 (with Intercept)

	CPI	LNM1		CPI	LNM2
CPI(-1)	0.529613	-0.056296	CPI(-1)	0.496948	0.044358
	(0.07494)	(0.25216)		(0.07375)	(0.11216)
	(7.06735)	(-0.22326)		(6.73797)	(0.39550)
CPI(-2)	0.088104	0.268185	CPI(-2)	0.050390	0.191921
	(0.07090)	(0.23856)		(0.06683)	(0.10163)
	(1.24267)	(1.12416)		(0.75397)	(1.88839)
LNM1(-1)	-0.024262	-0.313143	LNM2(-1)	0.246586	-0.289863
	(0.02329)	(0.07836)		(0.04974)	(0.07564)
	(-1.04184)	(-3.99623)		**[4.95713]**	(-3.83193)
LNM1(-2)	-0.027530	-0.008122	LNM2(-2)	0.121184	-0.061623
	(0.02289)	(0.07704)		(0.05223)	(0.07943)
	(-1.20248)	(-0.10542)		**[2.32010]**	(-0.77584)
C	0.007158	0.031662	C	-0.001929	0.028050
	(0.00217)	(0.00731)		(0.00237)	(0.00360)
	(3.29693)	(4.33387)		(-0.81526)	(7.79558)

Note: Standard errors in ( ) & t-statistics in ( ), │t-statistics│ should be higher than critical value 2.

Interpretation: In the case of CPI and Ln M1 we have no statistically unidirectional or bilateral dependence. In the case of CPI and Ln M2 we have a *clear unidirectional* causality, CPI being determined by M2 dynamics (the coefficients of Ln M2 in the equation of CPI are statistically different from 0 and coefficients of CPI are not statistically different from 0). R squared for this equation is 0.537696 and F statistics is 46.81399. The same results (with a higher statistical relevance) are obtained if we exclude intercept (Table 10).

Table 10

Basic VAR Using Ln M1 and Ln M2 (without Intercept)

	CPI	LNM1		CPI	LNM2
CPI(-1)	0.598495	0.248382	CPI(-1)	0.499271	0.010582
	(0.07413)	(0.25510)		(0.07362)	(0.13113)
	(8.07398)	(0.97366)		(6.78154)	(0.08070)
CPI(-2)	0.118150	0.401081	CPI(-2)	0.042469	0.307102
	(0.07242)	(0.24923)		(0.06605)	(0.11765)
	(1.63143)	(1.60927)		(0.64294)	(2.61033)
LNM1(-1)	0.005982	-0.179367	LNM2(-1)	0.224681	0.028645
	(0.02205)	(0.07587)		(0.04182)	(0.07448)
	(0.27134)	(-2.36402)		**[5.37258]**	(0.38458)
LNM1(-2)	0.004928	0.135447	LNM2(-2)	0.098952	0.261649
	(0.02129)	(0.07327)		(0.04450)	(0.07926)
	(0.23149)	(1.84867)		**[2.22353]**	(3.30108)

In conclusion:

- Inflation is considered by the main economic theories as a monetary phenomenon with structural monetary causes.
- Inflation in Romania has a monetary cause, as the Basic VAR model performed on endogenous variables shows a unidirectional causality between M2 dynamics and CPI dynamics (all three methods used for estimating the growth rate being statistically significant at 5%).
- We obtained no statistical relevance for M1 dynamics, as this result suggests that credit expansion (that is included in M2) has high relevance for Romanian inflation during the past years.
- We obtained a higher statistical relevance if we excluded the intercept, this suggesting that the dynamics of M2 explains alone much better the dynamics of CPI (there are no other significant non-monetary factors that should be added to this relationship);
- The highest statistical relevance is obtained when we use LogM2 = $Log(M2_1/M2_0)$ for estimating monthly growth rate instead of simple growth rate=$(M2_1/M2_0-1)$ or Ln M2 = $Ln(M2_1/M2_0)$.

This study revealed the non-neutral characteristics of money and the direct impact of newly created money (by the central bank and commercial banks operating within the limits set by minimum reserve requirements). A better result could be obtained if CPI (that is a partial expression of price inflation) is replaced with a composite index that includes not only consumption goods as they are defined by the Keynesian or the monetary theory. If this index included prices of real estate assets, prices of gold and a capital market index, the connection between ”inflation” and broad money would most probably be higher. During the current crisis, the non-neutrality of money became naturally much more visible. In the ”boom” phase, the additional money was rapidly consumed by increased prices outside the CPI (real estate assets, financial assets, gold), while any additional money produced by the banking system was directed (and previously created money was *re*directed) more toward consumption. If Romania becomes closer to the Euro Area and the markets are more liberalized (a lower part of CPI is administered by the public authorities), the non-neutrality of money will be much less hidden behind statistical makeshifts and more money produced by the central bank will much sooner be captured by the official reports as higher price inflation.

To end in a rather pessimistic note, it is sad that we have to employ sophisticated tools to convey simple ideas that were once (and should be again) common knowledge among respectable economists. Namely, here, inflation has first and foremost something to do – in the fiat money contemporary setting – with increases in the money supply orchestrated by central banks.

References

Agung, I. G. N., 2009. *Time series analysis using Eviews*, John Wiley&Sons (Asia) Pte Ltd, pp. 319 – 380.

Berger, Helge and Österholm, Pär, 2008. Does money growth Granger-cause inflation in the Euro Area? Evidence from output-of-sample forecasts using Bayesian VARs. *Discussion Papers* 2008/10, Free University Berlin, School of Business&Economics.

Brunner, K., 1961. A schema for the supply theory of money. *International Economic Review*, pp. 79-109.

Brunner, K. and A.H. Meltzer, 1971. A Monetarist Framework for Aggregative Analysis. *Konstanzer Symposium on Monetary Theory and Monetary Policy*, Vol. 1.

Brunner, K. and A.H. Meltzer, 1976. An Aggregative Theory for a Closed Economy. In J. Stein (editor), *Monetarism*. Amsterdam: North-Holland. Reprinted in Brunner and Meltzer, 1989.

Brunner, K. and A.H. Meltzer, 1983.Strategies and Tactics for Monetary Control. *Carnegie-Rochester Conference Series on Public Policy*, 18, pp.59-104.

Cantillon, R., 1755. *An Essay on Economic Theory*, translated by Chantal Saucier. Edited by Mark Thornton, Available at: <http://mises.org/books/Essay_on_economic _theory_cantillon.pdf>. [Accessed in May 2011].

Caraiani P., 2009. Inflation Persistence and DSGE Models. An Application on Romanian Economy. *Journal of Economic Computation and Economic Cybernetics Studies And Research*, 3, pp.179–188.

Dabus C. and F. Tohmé, 2004. Non-Linearities in the Relation Between Inflation and Money Supply in Argentina: A SOC Approach. Departamento de Economia, Universidad Nacional del Sur 12 de Octubre y San Juan, 8000 Bahia Blanca, Argentina.

DeGraw, P. and M. Polan, 2005. Is Inflation Always and Everywhere a Monetary Phenomenon? *Scandinavian Journal of Economics*, 107(2), pp.239–259.

Donath L. and B. Dima, 2003. The structural inflation in Romania. Institut für Finanzwissenschaft und Infrastrukturpolitik der Technischen Universität Wien, Editor: Wolfgang Blaas, pp. 77 – 98, Available on: <http://www.ifip.tuwien.ac.at/publ/oes/oes_pdf/oes_2003_2_ 3.pdf>. [Accessed on May 2011].

Dospinescu A.S., 2010. Measuring Core Inflation in Romania Using the Dobrescu Method – A Comparative Approach. *Romanian Journal of Economic Forecasting*, 13(2), pp.308-319.

Dwyer, G. P. Jr. and Hafer, R. W., 1999. Are Money Growth and Inflation Still Related? *Federal Reserve Bank of Atlanta Economic Review,* 84, pp.32–43.

Ebeling, R., 1992. Ludwig von Mises and the Gold Standard. In: *The Gold Standard: Perspectives in the Austrian School*, Edited by L. Rockwell, pp. 35 – 59, Available at: <http://mises.org/books/goldstandard.pdf>.

Fisher, I., 1911. Recent changes in price levels and their causes. *The American Economic Review*, 1(2), Available at Jstor: <http://www.jstor.org/pss/1814913>.
Fisher, I., 1912. The theory of exchange for 1911 and forecast. *The American Economic Review*, 2(2), June 1912, Available at Jstor: <http://www.jstor.org/pss/1827581>
Fisher, I., 1933. The Debt-Deflation Theory of Great Depressions. *Econometrica*, 1(4), pp. 337-357, <http://www.jstor.org /stable/1907327>. [Accessed in May 2011].
Friedman, M., 1963. *Inflation: Causes and Consequences*, Asia Publishing House, New York.
Friedman, M., 1968. The Role of Monetary Policy. *The American Economic Review*, 58(1), pp. 1-17, Available at Jstor: <http://www.jstor.org/stable/1831652>.
Friedman, M., 1972. Have Monetary Policies Failed?. *The American Economic Review*, 62(1/2), pp.11-18, Available at Jstor: <http://www.jstor.org/stable/1821518>.
Friedman, M., 1977. Nobel Lecture: Inflation and Unemployment. *The Journal of Political Economy*, 85(3), pp.451-472, Available at Jstor: <http://www.jstor.org/stable/1830192>.
Friedman, M., 1982. Monetary Policy: Theory and Practice. *Journal of Money, Credit and Banking*, 14(1), pp.98-118, Available at Jstor: <http://www.jstor.org/stable/1991496>.
Haberler, G., 1932. *The Theory of International Trade.* London: William Hodges, p. 47.
Hayek, F. A., 1937. *Prices and Production.* Augustus M. Kelly, Publishers New York, First Edition 1941, pp.105-28; Available at: <http://mises.org/books/pricesproduction.pdf>.
Hayek, F. A., 1978. *Denationalization of Money: The Argument Refined*, London: Institute of Economic Affairs, Republished in 1990, Available at: <http://mises.org/books/denationalisation.pdf>.
Hume, D., 1752. Essays, Moral, Political, and Literary. Part II.III *Of money*, Available at Econlib: <http://www.econlib.org/library/LFBooks/ Hume/hmMPL26.html#Part II, Essay III, OF MONEY>. [Accessed in May 2011].
James E., 1956. "Rotwein (Eugénie) - David Hume: Writings in Economics", *Revue Économique*, Programme National Persée, 7(4), pp.674-674.
Jevons, S., 1875. Money and the Mechanism of Exchange. available at <http://www.econlib.org/library/YPDBooks/Jevons/jvnMME.html>.
Keynes, J.M., 1930. *A Treatise on Money*, vols. I-II. New York: Harcourt, Brace and Co.; also in D.E. Moggridge (ed.), *The Collected Writings of John Maynard Keynes*, volumes. 5-6, London: Macmillan, 1971.
Keynes, J.M., 1936. *The General Theory of Employment, Interest and Money.* London: Macmillan and Co.; also in D.E. Moggridge (ed.), *The Collected Writings of John Maynard Keynes*, vol. 7, London: Macmillan, 1973.
Krugman, P. R. & Torsten Persson and Lars E.O. Svensson, 1982. Inflation, Interest Rates, and Welfare. *The Quarterly Journal of Economics*, 100(3), pp.677-95.

Krugman, P. R. and Torsten Persson and Lars E.O. Svensson, 1982. Inflation, Monetary Velocity, and Welfare. *NBER Working Papers* 0987, National Bureau of Economic Research, Inc.

Lerner, A., 1944. Interest theory – Supply and demand for loans or supply and demand for cash. *The Review of Economics and Statistics*, 26(2), May 1944, Available on Jstor: <http://www.jstor.org/pss/1927696>.

Lerner, A., 1951. The essential properties of interest and money. *The Quarterly Journal of Economics*, 66(2), May 1952, Available on Jstor: <http://www.jstor.org/pss/1882941>.

Lucas, R.E., 1972. Expectations and the Neutrality of Money. *Journal of Economic Theory*, 4(2), pp.103-24. Reprinted in Lucas, 1981.

Lucas, R.E., 1976. Econometric Policy Evaluation: A critique. *Carnegie-Rochester Conference Series on Public Policy*, Vol. 1, p.19-46. Reprinted in Lucas, 1981.

Lucas, R.E., 2000. Some Macroeconomics for the 21st Century. Robert E. Lucas, Jr.; *The Journal of Economic Perspectives*, 14(1), pp. 159-68.

Machlup, F., 1935. The Stock Market, Credit and Capital Formation. New York: Columbia University Press, pp. 174-201.

Mahr, A., 1933. Monetary Stability, and How to Achieve It. *Public Policy Pamphlets*, no. 9, Chicago: University of Chicago Press.

McCandless, G. T. Jr. and Weber, W. E., 1995. Some Monetary Facts. *Federal Reserve Bank of Minneapolis Quarterly Review*, 19, pp.2–11.

Menger, C, 1892. On the Origins of Money. *Economic Journal*, 2, pp.239-255.

Mill, J. S., 1848. Principles of Political Economy with some of their Applications to Social Philosophy", Part III.VII – *Of money*, Part III.VIII *Of the value of money as dependent on demand and supply*, Available at Econlib: ,http://www.econlib.org/library/Mill/mlP.html>. [Accessed in May 2011].

Mises, L. v., 1924. *The Theory of Money and Credit*, Indianapolis: Liberty Classics 1952, reprinted 1981, Available at: <http://mises.org/books/tmc.pdf>.

Mises, L. v., 1966. *Human Action, A Treatise on Economics*, 3rd ed., Chicago: Henry Regnery, pp.408-16. Available at: <http://mises.org/Books/HumanActionScholars.pdf>.

Modigliani, F., 1989. The Collected Papers of Franco Modigliani. Volume 4: *Monetary Theory and Stabilization Policies*, Editors: Andrew Abel & Simon Johnson, The MIT Press, MIT Press Books.

Pakko, M. R., 1994. Inflation and Money Growth in the Former Soviet Union. *International Economic Contributions*, Federal Reserve Bank of St. Louis.

Pelinescu, E. and Caraiani P., 2006. Does the inflation targeting have a positive role upon the convergence of the inflation rate?. *Romanian Journal of Economic Forecasting*, 7(3), pp.39–50.

Pelinescu, E. and Scutaru, C., 2002. Determinants of Inflation in Romania. *Oeconomica*, nr.2, Societatea Română de Economie, Institutul Român Pentru Libera Inițiativă, pp.65-86.

Pigou, A. C., 1949. *The veil of money*, London: Macmillan, Available at: <http: //www.questia.com/library/book/the-veil-of-money-by-a-c-pigou.jsp>. [Accessed in May 2011].

Poole, W., 1994. Keep the M in Monetary Policy, Jobs & Capital. Milken Institute for Job & Capital Formation, Santa Monica, CA.

Ricardo, D., 1810. The High Price of Bullion, a Proof of the Depreciation of Banknotes. Available at: <http://socserv.mcmaster.ca/econ/ugcm/3ll3/ricardo/bullion>.

Salerno, J.T., 2009. Money: Sound and Unsound. Ludwig von Mises Institute, Available at: <http://mises.org/books/sound_money_salerno.pdf>.

Samuelson, P. A. and al., 1952. Monetary Policy to Combat Inflation", *The American Economic Review*, 42(3), pp.384-391, Available at Jstor: <http://www.jstor.org/stable/1810390>.

Smith, A., 1776. *An Inquiry into the Nature and Causes of the Wealth of Nations*. Edwin Cannan, ed. 1904. Library of Economics and Liberty, <http://www.econlib.org/library/Smith/smWN1.html>. [Accessed in May 2011].

Stiglitz, J., 1988. Imperfect Information, Credit Markets and Unemployment. *NBER Working Papers* 2093, National Bureau of Economic Research, Inc.

Tobin, J., 1987. *Essays in Economics, Vol. 1: Macroeconomics*, First MIT Press Edition, Originally published by North-Holland Publishing Company, 1971, Available at: <http://books.google.com/books?id=ar4-mvqsDpgC &printsec=frontcover&hl=ro#v=onepage&q&f=false>.

Annexes

Table 1

Unit Root Test for CPI

ADF Test Statistics	**-6.105736**	1% Critical Value*		-3.4706
		5% Critical Value		-2.8788
		10% Critical Value		-2.5759
Variable	Coefficient	Std. Error	t-Statistic	Prob.
CPI(-1)	-0.320425	0.052479	-6.105736	0.0000
C	0.005289	0.001928	2.743026	0.0068
R-squared	0.184299	Mean dependent var		-0.000789
S.E. of regression	0.021340	Akaike info criterion		-4.844574
Sum squared resid	0.075139	Schwarz criterion		-4.807232
Log likelihood	406.5219	F-statistic		37.28001
Durbin-Watson stat	**2.151057**	Prob(F-statistic)		0.000000

Table 2

Unit Root Test for rM1

ADF Test Statistics	**-17.01734**	1% Critical Value*		-3.4706
		5% Critical Value		-2.8788
		10% Critical Value		-2.5759
Variable	Coefficient	Std. Error	t-Statistic	Prob.
RM1(-1)	-1.260193	0.074053	-17.01734	0.0000
C	0.036875	0.005874	6.277974	0.0000
R-squared	0.637035	Mean dependent var		0.000903
S.E. of regression	0.070819	Akaike info criterion		-2.445486
Sum squared resid	0.827521	Schwarz criterion		-2.408145
Log likelihood	206.1981	F-statistic		289.5898
Durbin-Watson stat	**2.036901**	Prob(F-statistic)		0.000000

Table 3

Unit Root Test for rM2

ADF Test Statistics	**-15.64817**	1% Critical Value*		-3.4706
		5% Critical Value		-2.8788
		10% Critical Value		-2.5759
Variable	Coefficient	Std. Error	t-Statistic	Prob.
RM2(-1)	-1.175132	0.075097	-15.64817	0.0000
C	0.029743	0.003117	9.543619	0.0000
R-squared	0.597429	Mean dependent var		-0.000483
S.E. of regression	0.031606	Akaike info criterion		-4.059030
Sum squared resid	0.164826	Schwarz criterion		-4.021688
Log likelihood	340.9290	F-statistic		244.8652
Durbin-Watson stat	**2.034157**	Prob(F-statistic)		0.000000