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Monetary Policy, Inflation and the Causal Relation between the Inflation Rate and Some of the Macroeconomic Variables

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Abstract

Both monetary policy and inflation are issues of great interest and importance, thus studying them and their impact on the evolution of the macroeconomic variables is a constant concern for our society. The purpose of this article is focused on identifying the existing connections between the inflation rate and some important macroeconomic indicators and also on the dynamics of inflation at a national and European level. The main objective of this study is to reveal the causal relation between the inflation rate and the interest rate of the monetary policy and also between the inflation rate and the unemployment rate, using regression methods.

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1. Introduction

The monetary area is an important component of the economic system, which has always been uncertain. The currency may be considered a measure of recording, promptly and with great accuracy, the oscillations of a country's economy. Also, the main issues are mainly expressed in monetary terms.

Economic growth, GDP or the budgetary deficit cannot be analyzed without considering governmental policies (monetary and budgetary) and their implications in promoting economic reforms. The monetary policy is a component of economic policy and can be defined as a set of actions, such as adjusting the quantity and cost of money, undertaken by the monetary authority of a country in order to influence the evolution of the national economy and to keep price

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stability. It represents an instrument of macroeconomic policy, which attempts to regulate the money supply, credit volume and interest rate in order to provide a good orientation for the economy.

Our analysis has focused on the dynamics of inflation in Romania and in the European Union. Most of the current papers that approach monetary issues have an econometric character. Both theory, as well as empirical studies indicate that the monetary policy may influence for a significant period of time not only prices, but also the employment rate, the GDP, the investments, economic growth and other important aspects of nonfinancial economic activities. Econometrics has an essential role in this area, because it represents an approach between theory and facts, thus the econometric analysis allows testing the hypothesis, verifying mathematical functions based on a variety of theories and building models to reflect reality.

Macroeconomic analyses enforces a view of the economic field as a whole, including its emergent or recession periods, with a total level of production and services of the market, without neglecting price levels and their cyclicity, of employment levels that ensure a certain level for production. The final objective of it all is to provide, in the long run, economic growth.

2. Literature review

Keynesians (1936) claimed that the monetary policy may influence the aggregate demand, by modifying the money supply, which may lead to full employment, without generating inflation. Later, at the beginning of the '80s, the Keynesian theories lose credibility and to the monetary ones, held high by economists such as Milton Friedman, Karl Brunner and Alton Meltzer, who suggest that monetary regulation can stabilize economy. The neoclassic economy brings in the rational expectations theory (Cerna, 2012, p. 59).

In Gherman and Adam's study, the monetary policy aims at guaranteeing a high employment rate, as well as price stability. This double purpose, which is known and reviewed through literature as dual mandate of the monetary policy, may oppose the declared purpose of many central banks, which aim primarily, and sometimes exclusively, at price stability (Gherman, 2010, p.90).

Gherman also considers that today few economists and businessmen, market investors or otherwise, concerned about the evolution of the economy and the business opportunities, still believe that the actions of central banks have no impact on the evolution of the GDP and other important economic variables that have been in the public's attention. The fact that monetary policies do not ensure a natural growth in employment or do not reach its correspondent GDP cannot be an excuse for lack of effort in sustaining these variables on an optimal level during business disturbances.

In a situation of dependency between global finances and high uncertainty, the ideal monetary policy should be highly comprehensive, it should be consistent, dynamic, transparent and responsible and it should avoid excessive fluctuation and flexibility (Solans, 2002).

The reduced inflation of the last years is the result of a mixture of economic policies, favorable to disinflation, followed by restrictive monetary and fiscal policies and an almost neutral budgetary policy. The monetary policy was mainly characterized by high interest rate and mandatory reserves and currency appreciation (Pop, 2011).

The economic literature highlights that, the contemporary economies, reaching a low and steady inflation creates a new economic climate, which requires a stringent reconsideration of the price stability and financial stability dependency.

3. Price stability- the main objective of a monetary policy

Price stability emerges as one of the most important objectives of the monetary policy. In pursuing the achievement of this objective there must be taken into consideration that the notion itself does not involve that all prices are stable or fixed. Pragmatically, the focus is on maintaining a steady mid-level, a relative stability and not an absolute one.

The definitions of price stability vary through literature: some authors consider inflation expectancies, while others use quantity terms to explain it. The American economist Alan Blinder (1998) stated: price stability is established when people stop debating and worrying about inflation.

Castelnuovo et.al.(2003, p.12) notice that the countries that practice inflation targeting regime do not use an explanatory definition of price stability, but this is characterized by the announcement of the inflation target. These

authors also claims that price stability is the environment where economic agents, both people and companies, may decide regarding consumption and investments without considering inflation as a decisive influence (2003, p 9).

Greenspan (1996, p.1) defines price stability as the situation in which the influence of marking price levels is low enough not to make a difference for companies and household decisions.

Bernanke (2006), when referring to price stability, declares that it is both a purpose in itself, as well as a mean for monetary policy, because it contributes to economic growth and to macroeconomic stability. We can consider that price stability has been accomplished when currency can conserve its value through time or the erosion rate for the purchasing power is very low.

In the paper “The monetary process: Essentials of money and banking”, Marshall R. and Swanson R. (1974) emphasized that price stability represents an important objective for monetary policy because price instability, manifested as inflation, can have long and intense consequences on a national economy. The unfavorable side, starting from increased inflation, resides in the reduction of economic efficiency, in an unfair and whimsical distortion regarding the income distribution and in a downgrade of the international balance of payments.

The Central European Bank considers price stability to be a yearly increase smaller than 2% of the harmonized index of consumer prices (HICP) for the euro zone. A similar definition was given by the Swiss National Bank: price stability represents an increase smaller than 2% of the index of consumer prices.

Fischer (1993) considers that, operationally speaking, price stability should represent an inflation rate between 0 and 3%. In the paper “The Role of Macroeconomic Factors in Growth” he states that macroeconomic stability, including inflation control, is a must for economic growth.

Meltzer (1997) combines quantitative and qualitative aspects, stating that price stability implies an inflation rate so close to 0 as it becomes an important factor in long-term planning, considering that a 3% inflation is too high for this objective.

The high rate of inflation of the past century required a deep reform process, during which central banks were held responsible for reaching target points of inflation. In Romania, at the beginning of the last century, the goal was to sustain monetary stability while no price increase. Starting with the 1960's, an annual increase in prices is settled to be between 3% and 4%.

4. Inflation in Romania and in the European Union

Inflation impacts in a negative way the economy, as well as the population and the companies, thus the government aims to keep it on low rate, by creating fiscal and monetary policies.

In regard to an adequate rate of inflation, before the crisis, there was the belief that a low and steady rate of inflation was crucial to the long term economic growth. At the same time, economists of all formation agreed that if there were spare production capacities, then inflation would fall. In reverse, if production was overloaded, then there would be an increase in inflation.

In Romania, any monetary policy analysis of the transition period should begin with the difficulties generated by the radical change of economic orientation, in 1990. Romania was not the only one facing difficulties in building its economy on market economy principles, the same scenario applied to most countries in Central and Eastern countries. The positive outcomes of the monetary policy form combating inflation were limited by its structural roots and by Romanian's National Bank necessity to succumb its objective in regard to price stability to the need of ensuring external equity, given the low success in supporting the outside sector.

Moreover, trying to control inflation by controlling money supply was fouled by the currency's high loss in value, the acute demonetisation crises of 1990 – 1993. In this period, because of the negative interest rate and the crash in production, there was a dramatically decrease of money demand, which resulted in high swap for the currency.

At the end of 1993 decisions were made to relaunch confidence in the national currency, while planning to remonetise, by increasing the money supply in favor of the inflation rate. By the second trimester of 1994, the increase in money supply outgrew price increase, which meant that demonetisation was no longer an issue; on the contrary, people's trust in the currency was on the rise. For example, in 1995, an increase of 71% in money supply matched a 32% rate of inflation, due to a growth of the GDP of 7% and 20% lowering in currency swap (from a yearly mark of 5.6 to a 4.5 one). In 1996 we notice that the currency swap has settled (a yearly mark of 4.9). The monetary policy succeeded, in 1997, to keep control of the interest rate, which was highly demanding, in an economy of price

liberalization and structural imbalances. Price liberalization, carried out in the beginning of 1997, was the last major step in liberating the economy which would follow in consistently low price fluctuation. But the applying the monetary policy was unequally firm, both during 1997, as for the foreseeable future. As it was the main measure for economic stability, the monetary policy had strengthen in 1997, upholding a strong restrictive way until 1997's second trimester, when it loosened, anticipating a tempered rate of inflation and assuming a constant increase of money demand. This proved to be an unthought-of decision, given that, in the context of general ease of macroeconomic policies, trust in the currency was lost, which lead to value loss.

The year 1999 was a break in inflation's decreasing trend (45.8%). Only a year before, the progress in reducing inflation was remarkable. Even though in 1997 inflation rate was at 154.7 %, it went down to 59.09% in 1998, because of the liberalisation of the exchange market and a number of previously administered prices. There is to be noticed that all of the decrease was the result of forced progress, during structural reforms. The inflation rate was steady throughout 2000, at 45.6%. Later, during 2000 – 2005, RNB managed a downgrade of 5.8% per year.

The delayed control of the inflation rate in Romania has a series of circumstantial reasons: the gradual price liberalisation, a rigid and hard structure of production, a political influence during election years, that led to hinder the achievement of economic and monetary stability.

An illustration of the inflation rate in post-1989 Romania would look as it follows:

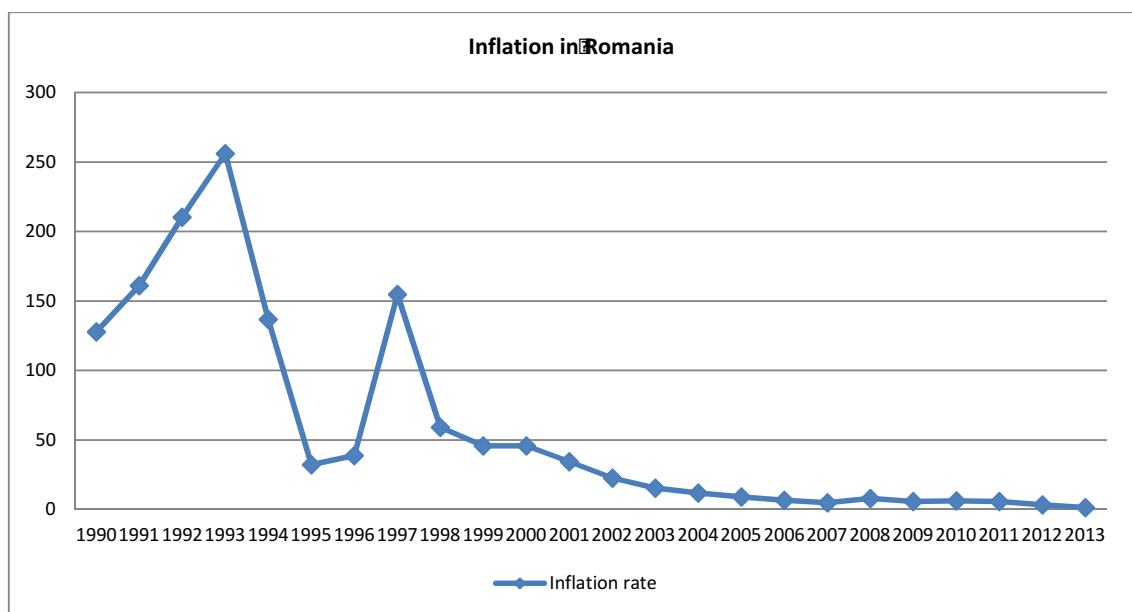


Figure 1: The dynamic of Romanian inflation during 1990 – 2013
Source: personal processing based on Romanian's National Bank data

The disinflation process continued during the last trimester of 2013, the inflation rate registered in December fell to the low point of the variation of the stationary target: 1.55 %, a minimum in the last 24 years.

The financial crisis in 2008 led to an abrupt decrease in production. In more developed countries of the European Union, the inflation rate had negative recordings for short periods, coming back at slightly lower than before 2008, but positive values. On the other hand, the employment rate has dropped significantly, which consequently provoked an increase of unemployment. This, added to inflationary pressure and the deepening of the macroeconomic imbalances, forced governments to adopt a mixture of policies in order to re-establish macroeconomic stability. Most times, macroeconomic stability is associated with monetary stability.

The outbreak of the global crisis has disrupted the order of priority on the agenda of monetary policy makers. Firstly, one of the underlying causes of the financial crisis was the ample liquidity. Secondly, credit given to customers with low reimbursing rate has proven non-performing.

The economic crisis of 2008 has slowed down the positive evolution of the European economy from 2005 – 2007, furthering it from its objectives. Generally, economies that adapted to the new economic patterns have not registered high economic growth, but were the most effective at eliminating the effects of the crisis.

Since the beginning of the 1990, a high number of central banks have targeted inflation as part of their monetary policy. Although, at first, targeting inflation was characteristic to industrial countries, recently a rising number of emergent national economies have adopted such policies, determined mostly by the success it had to obtain and maintain a low inflation rate (Tanascovici, 2010, p 505).

As it can be seen in graphic 2, inflationist shockwaves have overrun on economic recession, which lead to economic crisis. There is a lure to explain inflation as a macroeconomic cyclic imbalance or economic growth accidents in highly developed countries.

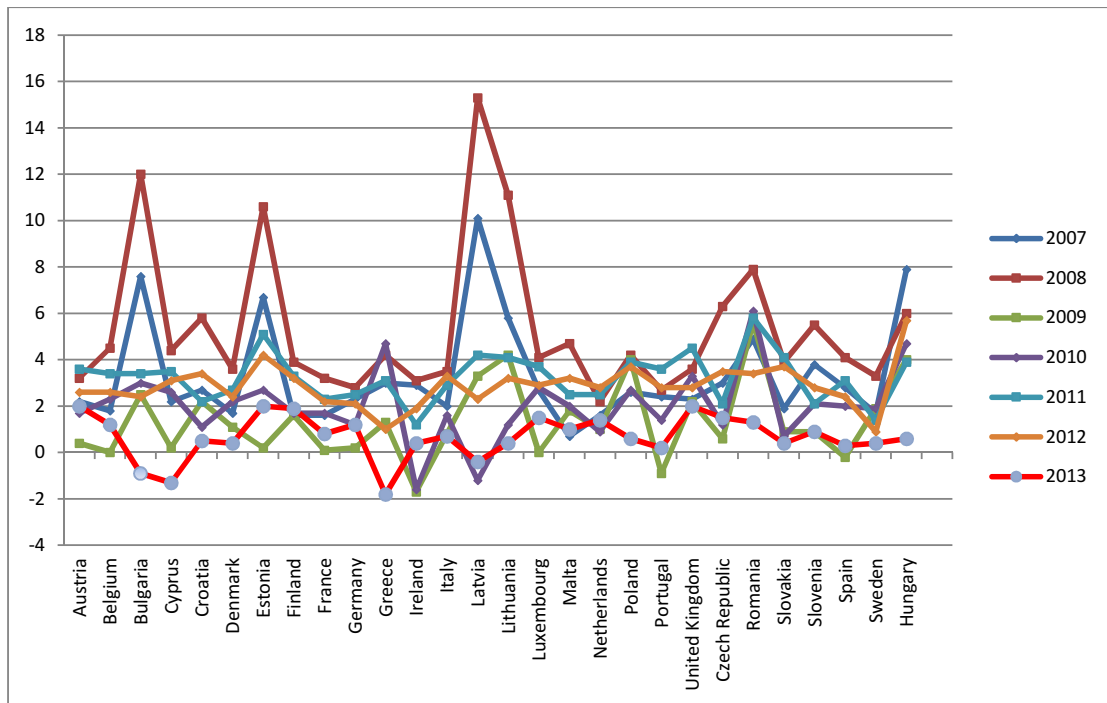


Figure 2: Inflation evolution in the European countries during 2007 – 2013
 SForce: personal processing based on Eurostat data

5. Empirical study

Lately there has been a lot of talk regarding the right level of monetary policy's interest rate. Some analysts consider that the interest rate should have been drastically reduced when production crashed, in order to mitigate the effects of the crisis. Lowering monetary policies interest rate in Romania was justified by significantly reducing the inflation rate. The RNB practiced a policy of interest rate which aimed to ensure both minimising targeted inflation deviation, as well as potential production, in order to provide inflation stability.

It has to be mentioned that, after going into recession in 2008, the Romanian National Bank sold a great amount of Euros brought before the crisis. These sales contributed to sustaining the national currency. Without them interest rate would be on the rise, to compensate for the supplementary inflation which would have been generated. The central

bank cannot influence price directly, but it can control it by managing interest rate. This may serve both as an acceleration instrument for the economy and a means for braking it.

Our objective is to demonstrate the causal relationship between inflation and monetary policy interest rate and the causal relationship between unemployment and inflation. For this purpose we use a simple linear regression model. The study is conducted on Romanian data, according to information provided by the Romanian National Bank, the National Institute for Statistics and EuroStat. The objective of this research is limited to demonstrate a causal relationship between inflation and the macroeconomic variables chosen, this being accomplished by using statistical methods to verify the following assumptions:

Hypothesis about the causal relationship between inflation rate and interest rate

I1: We assume that there is a causal relation between the independent variable of monetary policy interest rate and the dependent variable of inflation rate, between them being a direct connection. This connection and evolution is performed using annual series from 1997 to 2013.

Hypothesis regarding the causal relationship between inflation and unemployment

I2: We assume that there is a causal relation between the independent variable of inflation rate and the dependent variable of the unemployment rate, between them being an indirect connection. This connection and evolution is performed using annual series from 1997 to 2013.

The variables used in the correlation analysis are:

- Inflation rate (annual average %) R_INFL
- Unemployment rate (average %) R_SOMAJ
- Monetary policy interest rate (RNB's reference interest rate %) R_DOB

Stationary analysis of time series:

The series of interest rate and unemployment rate are non – stationar, so by applying the unit root test for series differentiated according to the tables below, we show that the series are stationary, therefore the basic series are integrated of the first order..

Hypotheses: H₀: the series has a root unit and is non-stationary

H₁: the series is stationary

Table 1: Augmented Dickey-Fuller test values for the three series

	t-statistic	Prob
ADF test statistic – R_INFL	-22.5397	0.0001
ADF test statistic – R_DOB	-4.2543	0.0058
ADF test statistic – R_SOMAJ	-5.1432	0.0012
Test critical value 1% level	-3.4653	
5% level	-2.8768	
10% level	-2.5750	

According to the Augmented Dickey-Fuller test for a materiality threshold of 0.05, the test's result is lower than the standard one. Using probability variable, H₀ is rejected for a certain relevance level or each time the probability is smaller than that relevance level. To conclude, the H₀theory is rejected due to the series being non-stationary.

5.1. The estimated pattern for relating inflation rate to interest rate

The estimated pattern for relating inflation rate to interest rate is as it follows:

$$D(R_DOB)=12.27 + 0.2933D(R_INFL)$$

Table 2: The E-views testing

Dependent Variable: R_DOB
 Method: Least Squares
 Date: 03/07/14 Time: 20:09
 Sample: 1997 2013
 Included observations: 17

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	12.27039	2.757252	4.450224	0.0005
R_INFL	0.293329	0.064633	4.538364	0.0004
R-squared	0.578613	Mean dependent var		19.10824
Adjusted R-squared	0.550521	S.D. dependent var		14.20134
S.E. of regression	9.521037	Akaike info criterion		7.455016
Sum squared resid	1359.752	Schwarz criterion		7.553041
Log likelihood	-61.36763	Hannan-Quinn criter.		7.464759
F-statistic	20.59675	Durbin-Watson stat		0.601569
Prob(F-statistic)	0.000392			

As it can be observed from Table 2, the probabilities attached to the t-statistic test are inferior to the relevance level of 5%, thus the coefficients are deemed significant from a statistic point of view.

Verifying the regression pattern hypothesis:

- Testing the homoscedasticity hypothesis:

In order to test it we have used the Breusch-Pagan-Godfrey test. It indicates a higher than 0.05% result for the Chi-Square, so the homoscedasticity hypothesis is accepted with a probability of 0.95.

Table 3: Test Breusch-Pagan-Godfrey

F-statistic	Prob.F	Prob.Chi-Square
0.0342	0.8558	0.8441

- Testing the hypothesis for error normality

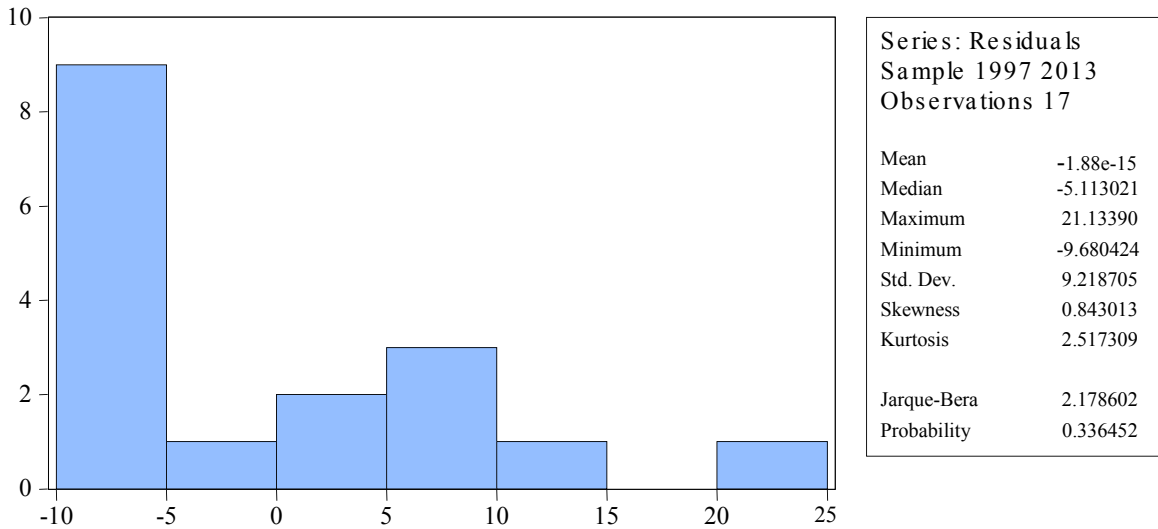


Figure 3: The distribution histogram

Testing the error normality is done both graphically (the distribution histogram) and by using the Jarque-Bera test. It resulted that the Jaque-Bera probability is 0.33 and H0 is accepted (the series is normally distributed).

- Testing the autocorrelation

Table 4: The autocorrelation

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	3.331189	Prob. F(3,12)	0.0563
Obs*R-squared	7.724561	Prob. Chi-Square(3)	0.0521

The Chi-Square is equal to 0.0521, higher that 0.05, which accepts H0 as a valid hypothesis, to which the is no autocorrelation.

5.2 The estimated pattern between inflation rate and unemployment rate

The estimated pattern between inflation rate and unemployment rate is:

$$D(R_SOMAJ) = 7.0326 - 0.0120 * D(R_INFL)$$

Table 5: the E-view testing

Dependent Variable: R_SOMAJ
 Method: Least Squares
 Date: 03/07/14 Time: 20:10
 Sample: 1997 2013
 Included observations: 17

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	7.032654	0.174561	40.28774	0.0000
R_INFL	-0.012024	0.004092	-2.938564	0.0102

R-squared	0.365352	Mean dependent var	6.752353
Adjusted R-squared	0.323042	S.D. dependent var	0.732611
S.E. of regression	0.602774	Akaike info criterion	1.935581
Sum squared resid	5.450041	Schwarz criterion	2.033606
Log likelihood	-14.45244	Hannan-Quinn criter.	1.945325
F-statistic	8.635158	Durbin-Watson stat	1.592049
Prob(F-statistic)	0.010167		

As table 5 shows the tested probabilities of the t-static test are inferior to the 5% relevance level, thus the coefficients are significant from a statistic point of view.

Verifying the regression pattern hypotheses:

- Testing the homoscedasticity hypothesis

In order to test it we have used the Breusch-Pagan-Godfrey test. It indicates a Chi-Square value higher than 0.05, thus it accepts the homoscedasticity hypothesis with a probability of 0,95.

Table 6: the Breusch-Pagan-Godfrey test

F-statistic	Prob.F	Prob.Chi-Square
0.2106	0.6528	0.6275

- Testing the hypothesis for error normality

Testing the error normality is done both graphically (the distribution histogram) and by using the Jarque-Bera test.)

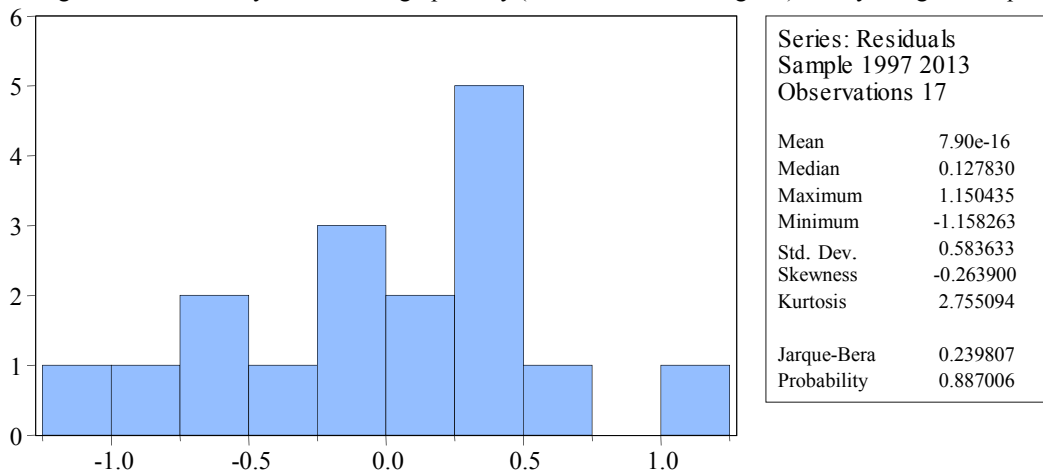


Figure 4: The distribution histogram

It resulted that the Jaque-Bera probability is 0.88 and H_0 is accepted (the series is normally distributed).

- Testing the error mismatch hypothesis

According to the error correlogram, there is no autocorrelation of series until lag 8.

Table 7: Error correlogram

	Autocorrelation	Partial Correlation	AC	PAC	Q-Stat	Prob
1			0.195	0.195	0.7686	0.381
2			0.030	-0.009	0.7878	0.674
3			-0.335	-0.352	3.3742	0.337
4			-0.225	-0.111	4.6365	0.327
5			-0.206	-0.141	5.7827	0.328
6			-0.296	-0.417	8.3544	0.213
7			0.009	-0.025	8.3569	0.302
8			-0.042	-0.258	8.4189	0.394

6. Conclusions

Our empirical results emphasize a significant direct relation between the monetary policy interest rate and inflation, which make interest rate an efficient instrument for central bank to prevent inflation. Because Romania's inflation is susceptible to unexpected changes in the interest rate, a good alternative for companies would be to make decisions based on interest rate evolution forecast. We can also state that protecting interest rate is a lever for inflation targeting strategies.

Also, there is an inverse statistically significant relation between the inflation rate and the unemployment rate. This indicates that the inflation rate is an effective instrument in preventing the increase of unemployment.

Monetary policy has demonstrated, throughout history, that its main role is to reduce inflation and to achieve price control. If this objective is accomplished, the economy gains a necessary credibility climate for healthy, efficient and durable economic growth. Monetary policy is committed to expand on the main structural variables and causal relations involved in guaranteeing a state of equilibrium, by offering to the monetary theory and practice the possibility of choosing and logically connecting macroeconomic variables.

For many analysts and businessmen, monetary policy still owes a solution to recession. In a global framework of financial interdependence and increased uncertainty, the monetary policy should ideally be characterized by commitment, consistency, dynamics, transparency, accountability, quality assessment and avoidance of excessive fluctuation and flexibility; set of attributes that inevitably involve a high degree of complexity.

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