The Inflation and Economic Growth: Evidence from Romania

Mircea Asandului[1], Dan Lupu[2]

Abstract: The main purpose of this study is to establish the existence (or not) of a relationship between inflation and economic growth in Romania, the study lasting from 1970 to 2013. The methodology used in this study is the one specific to time series: structural break test using Zivot-Andrews test, the stationarity test using Augmented Dickey-Fuller (ADF), and then Granger causality testing. Test results showed that for the analyzed period, there was a cointegrating relationship between inflation and economic growth for Romania. Finally, to establish the econometric model of the two variables, it has been developed an ARDL model with two different periods of lag.

Keywords: inflation; economic growth; granger causality; ARDL

JEL Classification: F10; F11; F31

1. Introduction

Any macroeconomic problem has both a positive side, balanced, and a negative side, imbalanced. As regards inflation, as the negative side for a monetary economy, it interferes with all the negative aspects of the contemporary economy: recession crisis, unemployment, and budget deficits, external deficits (trade and payment).

Economic theory characterizes monetary indicators as key factors in influencing both inflation and economic growth. The classic example of this approach lies in Fisher's equation; the money is directly proportional to the price and volume of transactions, reflecting the output. However, empirical data, especially for emerging economies and those in transition, shows deviations from this principle. If, between money and output is kept interrelated relationship, then inflation is determined mainly by other factors, such as: lack of competitive environment, low

[1] Assistant, PhD, Alexandru Ioan Cuza University of Iasi, Faculty of Economics and Business Administration, Romania, Address: 22 Carol II Str, Iasi, Romania, Tel.: +40232201450, Fax: +40232201070, E-mail: asmircea@yahoo.com.

[2] Assistant, Phd, Alexandru Ioan Cuza University of Iasi, Faculty of Economics and Business Administration, Romania, Address: 22 Carol II Str, Iasi, Romania, Tel.: +40232201450, Fax: +40232201070, Corresponding author: danlupu20052000@yahoo.com.

productivity, exchange rate movements and import prices. However, these records do not constitute an argument for excessive easing of monetary policy. In terms of economies with a non-functional structure, the monetary policy should be directed to avoid inflationary risks that can arise from excessive growth of the money supply. Correlation between inflation and economic growth turns out empirically to be inversely related: high rates of inflation are usually accompanied by negative rates of growth.

A first stage of inflation falls to Revolution of 1989, the stage mainly characterized by contradictory consequences of keeping prices under control. The second stage of inflation is until the onset of action of price liberalization. This stage was characterized by a relatively constant price level of goods and services but by the explosive growth of consumer income, which emphasized the gap between the supply of goods (steadily declining) and money (increasing). The third stage of inflation is marked by the transition to a liberalized price system. But price liberalization before the abolition of monopoly situations of most industrial enterprises and the establishment competitive system on the market principles, the rapid growth of imports over exports, rigorous inefficient management of the national currency by the central bank, outside pressures, led to sustainable event galloping inflation.
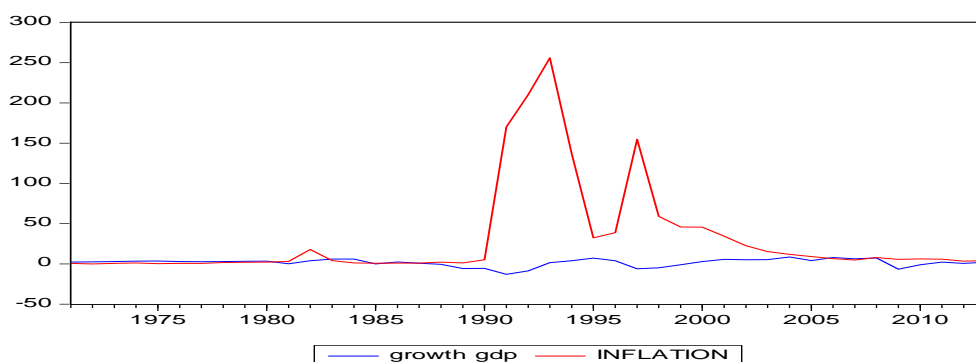

Figure 1. Evolution of inflation and economic growth in the period 1970-2013

Source: own calculations using INSSE data

In Romania, after a period when high rates of inflation have coincided with the economic downturn in 1995-1996, there has been a certain growth. This unhealthy increase was driven, due to its structural weaknesses, to violent inflationary pressures. The fight against inflation has been accompanied, in the following years, by a significant decline in gross domestic product. Currently, we are dealing with a certain increase in gross domestic product, economic growth accompanied by

medium rates of inflation, with a particular increase in unhealthy, bad sectors, wage distortion and low efficiency.

Extensive theoretical and empirical research examined the relationship between inflation and economic growth, both in developed countries and in developing countries. This section provides a brief overview of the main studies in this field.

Barro (1995), Bruno and Easterly (1998) explored the relationship between inflation and increasing economic growth, using an extensive sample of 100 countries for the period 1960-1990. Their empirical findings show that there is a negative relationship in terms of statistically significant between inflation and economic growth, in sense of reduction of economic growth with 0.2-0.3% in case of inflation increasing with 10%.

Sarel (1995), Khan and Senhadji (2001), Burdekin et.al (2004) reexamine the question of the existence of threshold values in the relationship between inflation and growth, using new econometric techniques. Inflation reaches a threshold level, different for developed (inflation less than 5%) and developing countries (less than 15%). The authors found a significant negative relationship between inflation and growth, for inflation rates above the threshold level.

Kremer, Bick, and Nautz (2013) use a dynamic threshold model to highlight the impact of inflation on economic growth in the long term. The empirical analysis is based on an extensive data set panel, made up of 124 countries for the period 1950-2004. For industrialized countries, the authors' results confirm the inflation targets of 2% set by many central banks. For non-industrialized countries, it is estimated that inflation impedes economic growth if it exceeds 17%; for values below this threshold, however, the impact of inflation on growth remain insignificant. Therefore, the results contradict the authors' assertion that inflation stimulates economic growth in developing countries.

This study aims, by keeping interdependence aspects investigated, to analyze the following dimensions: the evolution of the inflationary process in our country, the influence of inflation on GDP growth and the correlation between economic growth and inflation.

2. Econometric Methodology

The study uses a series of econometric methods to obtain empirical results. In a first phase, we use Zivot-Andrews test for structural breaks in the series analyzed. Subsequently, ADF methods are used to establish stationarity issue, and Granger to establish correlations. Finally, ARDL method is used to determine an econometric model for the influence of inflation on economic growth in our country.

Looking at Figure 1, it is easy to see that in the period 1990-2000; inflation rates were abnormally high, implying the possible existence of structural breaks in time series analysis. In these conditions it is mandatory the use of the method Zivot and Andrews.

The work of Zivot and Andrews (1992) provides the methods that can detect the occurrence of structural breaks in the time series. By using Zivot and Andrews's model, we arrive at the results shown in Figure 2; values sets as the structural breaks will be removed from the time series to not distort the results.
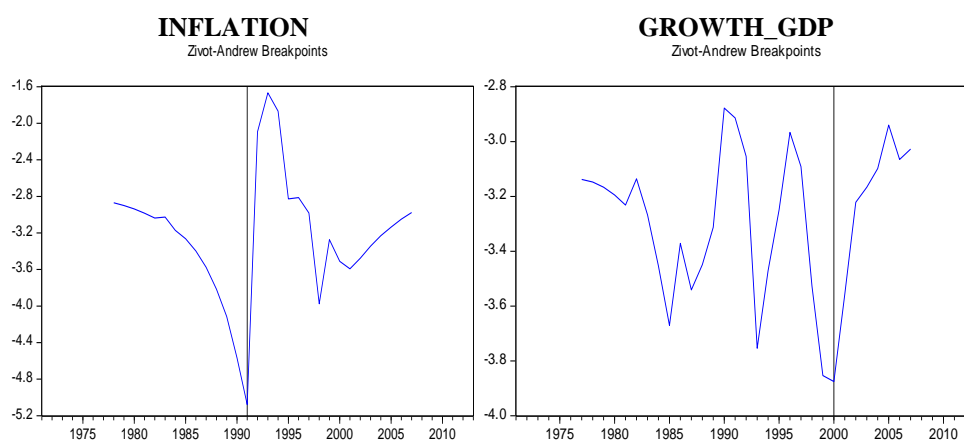

Figure 2 Zivot-Andrews Unit Root Test

Source: own calculations using INSSE data

In order to analyze the two indicators (inflation and economic growth), we perform a series of descriptive statistics on them. Table 1 illustrates the changes in the period 1970-2013 for the two indicators.

Table 1. Basic Statistic about inflation and economic growth during 1970-2013 in Romania

	GROWTH_GDP	INFLATION
Mean	2.421500	10.67447
Median	2.907500	4.040000
Maximum	8.490000	59.10000
Minimum	-6.576000	0.150000
Std. Dev.	3.708141	15.33467
Skewness	-0.796990	1.755676
Kurtosis	3.325130	4.955210

Source: own calculations using INSSE data

As can be seen from the table above, the average economic growth in Romania was only 2.42, with a maximum of 8.49 and a minimum of -6.57. For inflation, the average is quite high of 10.67 to a maximum of 59% and a minimum of 0.15%.

We will use the Augmented Dickey-Fuller test for the series included in the regression to test the inflation-growth relationship. ADF test has the null hypothesis that the series has a unit root (not stationary). As shown in the figure below, the probability associated with this test is <0.05, then the null hypothesis is rejected and we can say that the series are stationary.

Table 2. The results of Augmented Dickey-Fuller test

	t-Statistic	Prob.*
GROWTH_GDP	-4.163460	0.0294
D(INFLATION)	-5.461060	0.0021

Source: own calculations using Eviews 7

In order to verify the hypothesis mentioned above, we used ARDL model, an auto-regression vector. This approach is widely used in international practice to determine the implications of monetary policy. We use the ARDL model in order to study the effects of various shocks on the variables in the system. Thus, it can answer questions extremely important from the point of view of economic policy authorities, for example: "How reacts growth to an increase in inflation?" and the reversed question.

ARDL model selected is the (2,3), with the F statistic = 4.674304. As can be seen the value obtained is higher than indicated by Pesaran, so between inflation and growth occurs cointegration relationships. On the other hand, we see a negative correlation between GDP growth and inflation (coefficients are negative -0.303158, -0.007804, -0.009371).

Table 3 The results of ARDL model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.156393	1.011390	0.154632	0.0081
GROWTH_GDP(-1)	-0.303158	0.237487	-1.276525	0.0113
INFLATION(-1)	-0.007804	0.015758	0.495214	0.0239
D(GROWTH_GDP(-1))	-0.067304	0.238516	-0.282176	0.0097
D(GROWTH_GDP(-2))	0.100501	0.197275	0.509448	0.0140
D(INFLATION(-1))	-0.009371	0.017504	-0.535357	0.0062
D(INFLATION(-2))	0.029974	0.016998	1.763377	0.0077
D(INFLATION(-3))	0.015675	0.017073	0.918150	0.0356

Source: own calculations using Eviews 7

To determine whether monetary variables influence GDP growth, or vice versa, Granger test was used. Granger Causality indicates whether a variable "causes" another variable statistically. This method not expressly indicate whether a variable causes another variable, the test only reflects the predictive capabilities of the variables, but this allows us to make assumptions regarding the existence of causality. Granger test shows better predictive power of monetary variables in relation to GDP. For this reason, the regressions monetary indicators appear as independent variables.

It is observed that the probability associated to the option - GDP does not Granger cause inflation (YT does not Granger cause ...) is high (0.1433 and 0.2245, both greater than 0.05), which makes us accept this hypothesis. On the other hand, we must reject the hypothesis that inflation does not cause GDP statistics, the probability associated with being close to 0, therefore we must accept reverse assumption. It follows that both variables taken into account, inflation and GDP growth are mutually interrelated Granger.

Table 4. Results of Granger causality test

Null Hypothesis:	Obs	F-Statistic	Prob.
D(INFLATION) does not Granger Cause GROWTH_GDP	40	2.05440	0.1433
GROWTH_GDP does not Granger Cause D(INFLATION)		1.55946	0.2245

Source: own calculations using Eviews 7

In this context, a plausible hypothesis is that inflation was caused by economic growth, and that in turn inflation influenced the growth.

A VAR analysis result is shock response function (impulse - response function). The shock response (IRF) shows how a variable reacts at a shock provided by another variable in the system. IRF follows the trajectory of this effect over time, at different horizons. In our study we treated the shock as a change in one unit of the residual value. As we see, the change of economic growth has little influence on inflation, which varies around 0. Such a situation is typical for transition economies or emerging, relevant in this case are numerous studies that show a low level of correlation between monetary variables and inflation for countries in Eastern Europe. Instead, inflation shows a major influence on economic growth.

However, initially need to identify which component of the relationship is established as "momentum": either increase inflation contributes to GDP growth or conversely increased economic activity increases the monetary variables. This approach on the one hand, it is desirable, but on the other hand has a relative character, because changes in output and inflation influence each other.
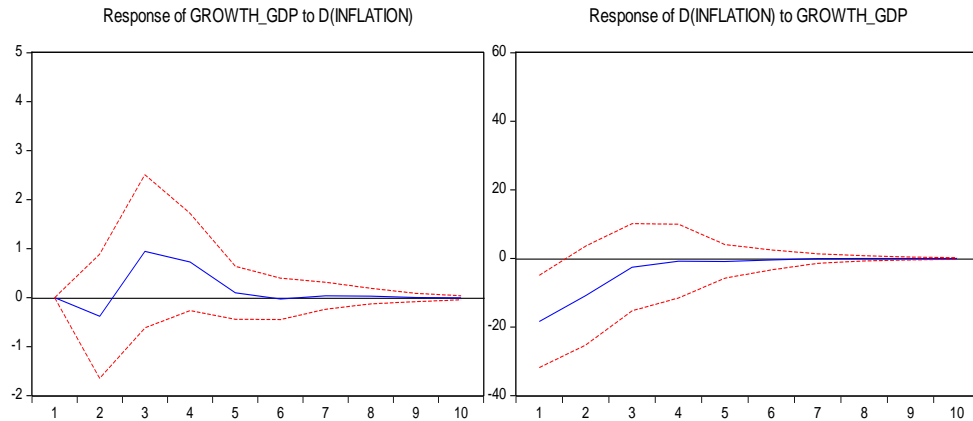
Figure 3. Impulse response function

3. Conclusions

Inflation has a negative influence on economic growth, on the population, but also on business. High rates of inflation affect negatively the economic growth, hyperinflation generates recession and strong long-term declines, and moderate level of this indicator could generate, in some cases, benefits. But most often, it causes negative effects and therefore specialists formulated certain policies to control and stop the inflationary phenomenon. Due to the negative consequences on economic and social organism, inflation is a major objective of macroeconomic policies of all countries with a market economy. Therefore current policies to combat inflation have been developed so as to curb inflation and at the same time, enable growth and limiting unemployment.

4. Acknowledgement

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