

THE RATIONAL ANTICIPATIONS REGARDING "INFLATION - UNEMPLOYMENT" TRADE-OFF

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Abstract

The paper starts from the premise that rational expectations theory invalidates the Philips Curve by demonstrating that monetary policy is long-term ineffective in terms of unemployment. The argument of the paper is the need to evaluate the trade-off inflation unemployment in the literature and how it verifies the precision of the Philips Curve model for better prediction of inflation and unemployment and their relationship. Identifying the Philips Curve is important when designing macroeconomic policy strategies on inflation, unemployment, economic growth, the shape of the curve being crucial to the direction of economic policy. Inflation and unemployment are structural components of market economy, each of them constitute dangerous macroeconomic dis-equilibriums, and in the Romanian economic evolution, in certain periods, we can consider that each of them exhibited major threats for development and progress. Some conclusions are presented regarding the data which verify the short term Philips Curve model precision in order to show the signification of the relationship between inflation and unemployment on 1990 – 2017 period for Romania and the possible consequences on the strategic macroeconomic policies.

Keywords: Rational expectations Theory, Philips Curve Model, inflation, unemployment, Romania

JEL Classification: C01, E 24, E 31

Introduction

Unemployment is one of the chronic and incurable "diseases" of the modern and contemporary economy caused by the evolution of economic disequilibrium, the cyclicity of economic activity, the emergence of new factors of influence, the incidence of technical and technological innovation. Because it is present more or less, in all countries, almost naturally, unemployment is characterized, globally and structurally, by causes, durations, by forms and types, in several respects, by operating a categorically accepted system.

Inflation, defined by the decline in the purchasing power of a monetary unit, is also present in any one of the economies and may be a serious impediment to the implementation of a growth policy. A good rational anticipation of inflation can help eliminate resource deficit and reduce mistrust in public policies.

The Dilemma of Inflation-Unemployment has so far gone through three stages of theoretical and empirical history.

The first theory developed in 1958, based on the observations of a 90-year period, beginning in 1861, in the UK through the contribution of Alban William Philips. Its famous curve highlighted a reversed relationship between inflation and unemployment, concluding that unemployment is caused by lack of inflation, and governments have to choose between having inflation and using it to fight unemployment or to accept unemployment and reduce inflation. According to Samuelson, in the modern market economy, not "labour" but "man is the commodity", and the state has a role in elaborating and supporting economic policy that ensures the full use of the labour force in accordance with the principles of "welfare for all" and "social peace" in the country as well as internationally. Samuelson and Solow have heavily popularized the negative inflation-unemployment correlation.

The second stage between 1960 and 1975 belongs to Milton Friedman, Edmund Phelps, and after 1975 the contributions of Robert Lucas and Thomas Sargent are noted. Milton Friedman introduced the concept of the Natural Rate of Unemployment (NRU), designating that corresponding level of unemployment as stable inflation, and highlighted the long-term Philips curve as a vertical line. Friedman and Phelps introduced the idea of an erroneous inflation expectations at the economic agent level, which influences salaries and prices and, obviously, the level of unemployment.

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Lucas and Sargent, they have demonstrated a positive correlation between inflation and unemployment on the basis of statistical records, stating that there is a huge econometric failure in the Philips curve.

In a third step, a different approach consistent with the Keynesian mainstream is that of Robert J. Gordon who argues that the past inflation rate is not limited to the formation of inflationary expectations but also includes an effect of pure persistence caused by salary and price fixed in terms contracts as well as specific price differences for raw materials and finished products. The Gordon model in an econometric approach is known as the triangular model.

While theoretically, the debates continue and the empirical knowledge in Romania kept pace with the theoretical evolutions, being signaled in another paper a series of analyzes and studies on the inflation-unemployment relationship.

In this paper, a Philips Curve for Romania 1990-2017 is constructed econometrically by a multifactorial linear regression model, and the final is dedicated to several conclusions about the results obtained.

The nature of the research is applicative, aiming on a theoretical basis, based on empirical data, to identify a form of the Philips curve in Romania that allows a better prediction of the phenomena of unemployment, inflation and their interdependence.

Purpose and objectives

The paper aims to build and verify the Philips Curve model in Romania during 1990-2017 and to provide an insight into how it can contribute to strategic growth policies.

In this sense, a first objective is to establish the theoretical foundation of the concepts of unemployment, inflation, the Philips curve, the theory of rational expectations, which by their understanding and analysis are the support for the decision makers of wage, fiscal, budgetary, monetary policy.

The second objective is to build and verify the Philips Curve for Romania, the period 1990-2017.

Methodology

The methodology used is in agreement with the subject being focused on econometric analysis and statistical-mathematical analysis. The statistical and mathematical analysis allowed to identify the main trends of the inflation and unemployment rates, the interpretation of the statistical situations to clarify the economic reality.

The econometric analysis used linear regression, the multifactorial linear model. In building the model we used the Eviews 9.5 program.

The data used were annual, 1990-2017.

Data Source: EUSF (EU Labor Force Survey) at European level EUROSTAT.

The results of the analyzes led to the formulation of conclusions regarding the anticipation of the inflationary phenomenon, the evolution of unemployment and recommendations for use in a practical purpose for strategic directions of economic policy or in the development of this research.

Phillips curve - trade-off inflation-unemployment

Keynes believes that the unemployment is due to insufficient aggregate demand. The Keynesian concept starts from the analysis of the classic and neoclassical scheme. It highlights the limits of previous approaches to the fact that the labour market is not independent of the commodities market. The equilibrium of the goods market implies that economies and investments are balanced, but this balance is not necessarily compliant with the full use of available labour, because the level of investment (high or low) is generated by the financial options of the capital holders and can generate the under-utilization of the labour force.

In the context of globalization and the growth of the capital market's role, an economic model has been imposed that includes the third market, respective the capital market, wich determines new types of non-Walrasian equilibrium that underlie new mechanisms of unemployment influenced distinctly by each factor in the mobilizing or restrictive sense.¹⁶ [2] The indicator with the minimum value is defined as a restrictive

¹⁶ Pavelescu, F.M., " Methodological implications of the extension of the number of considered markets in a non-Walrasian equilibrium model ", 2011, p.8-9. The model was tested by the author on the case of Romania,

factor, while the maximum value indicator is considered a mobilizing factor of the economic activity. Two types of Keynesian unemployment were identified, namely:

- pure Keynesian unemployment, capital being the mobilizing factor.
- relative Keynesian unemployment, with the labor force being the mobilizing factor.

For repressed inflation, as with Keynesian unemployment, two types are identified. In this model the mobilizing factor is the demand for goods and services and the factor of restrictive factor is the factor of production, as follows:

- repressed inflation resulting from lack of capital (relative or absolute),
- the suppressed inflation caused by the labour deficit (relative or absolute).

The classic unemployment in the model with three markets it is there characterized as non-Walrasian equilibrium in which labour is mobilizing factor and the limiting factor is capital. This model may be considered appropriate for the analysis of short-term economic activity and the forecast of unemployment types with an influence on macroeconomic policy.

After Keynes, the analysis of inflation was the focus of the debate with the contribution of Alban William Phillips to the so-called Phillips curve. Its famous curve highlighted a reversed relationship between inflation and unemployment, concluding that unemployment is caused by lack of inflation, and governments have to choose between having inflation and using it to fight against the unemployment or to accept unemployment and reduce inflation. Samuelson and Solow have heavily popularized the negative inflation-unemployment correlation.

The theory of rational expectations is the core of the new classical macroeconomics.

The theory of rational expectations is fundamented on 2 ideas:

- People know and use all the information and economic theories on which economic policy measures are based, which mean that a particular economic agent uses all the information to which he has access to formulate his forecasts; the decisions of economic agents depend not only on the objective characteristics of the economic and social environment in which they operate, but also on their expectations about the future
- prices and wages are flexible (it is adapting quickly to the market changes, has establishing an equilibrium).

State economic policy can only succeed if the government has better information than trade unions or would influence the inflation by measures and methods that trade unions can not anticipate.

The following considerations must be mentioned:

- inflation is identified in dynamics and its measurement is based on the general price level, that is expresses the relative price variation;
- unemployment may be measured both in absolute value as unemployment mass, relative size and the unemployment rate, and if it is considered the duration of unemployment can be measured their dynamics in the same relative or absolute sizes.

When the state intervenes in reducing unemployment, a change in inflation occurs, the price of this inflation is called the Sacrifice Rate.

Mathematical expression:

$$u - u^* = (-1/\beta) * P_t - P_{t-1}; 2 < \beta < 3$$

where:

P_t = price in the current period

P_{t-1} = price in the previous period;

u = unemployment rate;

u^* = natural unemployment rate.

determining the types of unemployment he faced between 1991 and 2004, being a useful tool in designing and implementing macroeconomic policies.

The economic interpretation: every percent decline in the inflation requires an increase in the unemployment by $1/\beta$ percent compared to its natural level.

The theory of rational expectations invalidates the curve of Philips by demonstrating that monetary policy is inefficient in the long run regarding to the unemployment rate.

Philips Curve as type as New Keynesian Phillips Curve (NKPC) do not replied to inflation inertia, although it is actually noticed in reality of economy. Thus, a hybrid version of the Phillips curve, proposed by Jordi Gali and Mark Gertler (1999), takes into account that expectations are not purely anticipatory, but may have an adaptive component. In fact, they developed a particular case of the NKPC, which measures marginal cost as a determinant of inflation instead of an ad hoc exit gap.

Gali (2003) defines the output gap as: "deviation of output from the equilibrium level in the absence of nominal rigidities." This definition suggests a "forward-looking" Phillips curve: current inflation depends on future inflation expectations and the current output gap.

Various economic and econometric models have been developed in the literature, which are actually versions of the Phillips curve. These are distinguished by the measure proposed by the authors to assess the influence of economic activity on prices, the forms of expectation of the economic agent, as well as on the indicators chosen for assessing the impact of supply shocks.

Gordon himself (2013) proposes to use a specification within his own triangular model with adaptive anticipations, the short-term unemployment gap (responsible for the economy's demand gap) and a range of variables such as import prices, productivity trend dynamics and product price fluctuations in the food and energy industries to incorporate supply shocks.

Aleksandra Halka and Jacek Kotlowski (2013) through a study by National Bank Poland estimates a Phillips curve for the prices of each consumer basket component based on an adaptive anticipation model but which includes the GDP deviation versus potential as a factor to illustrate the influence of demand, namely the nominal effective exchange rate, external inflation and the price of food and oil for the supply. Jaromir Baxa, Miroslav Plasil and Borek Vasicek (2013) Czech National Bank estimates various forms of the Phillips curve, testing a multitude of relevant indicators for assessing inflationary demand, including the GDP gap, the unemployment gap (including the short one), real labor cost and survey data on the degree of utilization of production capacities and factors limiting output from the perspective of the deficit of labour force.

However, all these studies reveal that the results of the Phillips curve estimate are sensitive to model specifications, so that the magnitude of the impact of economic activity on the inflation differs according to the measure used to quantify the demand deficit. None of these measures succeeds to systematically capture the evolution of prices in the economy. Under these circumstances, it seems that there is currently no one single Phillips curve concept, so that the use of a single specification is proving to be insufficient to substantiate monetary policy decisions, and a more comprehensive analysis is needed, a fact that has been recognized and the European Central Bank ECB (2014, 2015).

US economist N. Gregory Mankiw, a professor at Harvard University, defines the natural rate of unemployment as the average unemployment rate around which economic fluctuations are taking place. He calculates this indicator as an average of the annual unemployment rates over a period of 10 years prior to and 10 years after the time (year) for which the analysis is performed. Using this calculation, he determined a natural unemployment rate for the US economy of between 4% and 7% for a period of 45 years between 1945 and 1990.

In recent years, the debates about linearity in the Phillips curve have been raised.

Since the outbreak of the international financial crisis, most economies have been characterized by relative price stability, which has led economists to declare a weakening of the negative inflation-unemployment relationship.

We can conclude that the inflation-unemployment relationship may be positive or negative depending on the source of the shocks and the policy response as well as the length of the delayed responses.

Economic research is geared towards exploring aspects of process dynamics, expectations-building, or policy adequacy.

A convex Phillips curve assumes that inflation may not drop in response to an excess deficit on the demand side. An extreme shape of convexity is represented by an asymmetric curve, in which case inflation reacts to an excess demand only if the latter is above a certain level.

In the US, there are studies and researchers suggesting that the shape specific to the Phillips Curve is convex, while Gordon (1997) advocates a linear curve, and Joseph Stiglitz (1997) he is even in favor of a concave shape.

In 2000, George Perry estimates the Philips Curve through a model in which the parameters can be changed over time. The author identified the anticipated inflation rate at a low level between 1950 and 1960, raised until 1970 and then lowered to the present. George Akerlof, William Dickens and George Perry propose in 2006 a model that takes into account the correlation between inflation and unemployment not how people shape their antcipations, but also how they use it.

In Romania, studies on the functional form of the Phillips curve are reduced, partly because of the challenges associated with the collection of a long time series and on the other side by the necessity corresponding harmonization for the specific economy.

There have been constant concerns in Romania about the relationship of inflation - unemployment and influences in public policies, some of which have been presented in the paper "Inflation-unemployment relationship - Empirical investigation on 1990-2017 period on Romania"¹⁷.

Checking the philips curve for Romania in the period 1990-2017

In order to highlight the relationship between inflation and unemployment, annual data from the EUROSTAT database and the National Statistics Institute (INS) database were used.

A multifactorial regression was used as a model in which the variable was the inflation rate (r_{infl}), and as an independent variable the inflation rate of the previous period was used as the expression of the anticipation inflation rate, the inflation rate in the national definition (rs), the number of unemployed in the ILO definition (SB) and real GDP growth rate (r_{GDP}).

In modeling a multifactorial regression of the form was used:

$$R_{INFL}=C(1)*RS(-1)+C(2)*D(R_{GDP})+C(3)*D(SB(-1))+C(4)$$

It is worth noting that the chosen model does not have the classical shape of the Philips curve, the GDP gap has been replaced by the GDP growth acceleration variable (R_{GDP}) to highlight the extent to which an acceleration of growth could influence the inflation rate . Furthermore, it was chosen to include the number of unemployed in the ILO definition given the need to capture the extent to which they affect the inflation rate.

Running the model led to the following coefficients:

$$R_{IPC}=8.147145229*RS(-1)-2.110692074*D(R_{GDP})-0.0002014553594*D(SB(-1))$$

There is a positive correlation between inflation and the unemployment rate, but negative with the GDP acceleration and the number of ILO unemployed.

Granger's tests have shown that the hypothesis that the inflation rate causes Granger's unemployment rate to a lag of 1, as can be seen from Table no.1.

¹⁷ Dutcas, M. presentation at the conference INTERNATIONAL SCIENTIFIC CONFERENCE "ACCOUNTING AND FINANCE - UNIVERSAL LANGUAGES OF BUSINESS" Third Edition - March 2018, Pitesti, Romania. Also, parts of this paper were taken up in the chapter "A Causal Analysis of Sustainable Unemployment", published in the book "GROWTH, DEVELOPMENT AND ECONOMIC SUSTAINABILITY IN ROMANIA (2007-2017)", Editor Romanian Academy, Bucharest, 2018

Tabel 1. Granger test for inflation rate and unemployment rate

Pairwise Granger Causality Tests Sample: 1995 2017 Lags: 1			
Null Hypothesis:	Obs.	F-Statistic	Probability
RS does not Granger Cause R_INFL	21	1.15325	0.29706
R_INFL does not Granger Cause RS		7.63308	0.01282

Source: author's work

Testing the stationarity of the series with the Augmented Dickey-Fuller test (ADF) indicates that the series are not all stationary in the level, but only the unemployment rate series and the inflation rate, while the real growth rate of GDP and SB (the number of BIM unemployed) in order of difference 1. Table no. 2 shows the results of the ADF tests for the series used in the model.

Table 2. Stationarity test for the series used in the model

INDICATOR	T statistic	Critical value	T statistic	Critical value	T statistic	Critical value
	none	none	constant	constant	Constant and trend	Constant and trend
Inflation rate (r_infl)	-28.813400	-2.692300*	-20.993800	-2.650000***	-10.872600	-3.270000
D (r_infl)	-3.719800	- 2.708000	-2.966917	-2.666593	-0.983845	-4.667883
DD (r_infl)	-1.572336	-2.728252	-1.211595	-3.959148	-5.303013	-4.667883
Unemployment rate (rs)	-1.239900	- 2.679700***	-1.562990	-2.646119	-2.210822	-3.261452
D (RS)	-4.376183	-2.685718	-4.295567	-2.650413	-4.167450	-3.268973
DD (RS)	-5.182546	-2.699769	-5.005745	-2.660551	-4.811756	-3.286909
Number of unemployed BIM (SB)	-0.925830	-2.685718	-1.980120	-2.650413	-8.333016	-3.261452
D (SB)	-8.176113	-2.685718	-8.022544	-2.650413	-7.326395	-4.498307
DD (SB)	-6.137599	-2.699769	-5.796642	-2.660551	-5.427266	-3.286909
Real GDP Growth Rhythm (r_GDP)	3.014303	-2.679735	0.315628	-2.646119	-1.870554	-3.261452
D (r_GDP)	-2.418974	-2.685718	-3.121744	-2.650413	-3.178809	-3.268973
DD (r_GDP)	-6.769296	-2.692358	-6.637287	-2.655194	-6.430265	-3.277364

Source: author's work

* with the probability of 1%
 ** with the probability of 5%
 *** with the probability of 10%

Adjustment errors or residues are also important for validation of the model and the test subject its correlation, distribution, indicating heteroscedasticity qualitative study of the equation.

According to the statistical results, the coefficients of the equation are stable.

All coefficients and tests are presented in the next, Table no 3.

Table 3. The multifactorial model used

Variable	coefficient	Std. error	t-Statistic	Prob.
RS (-1)	8.147145	1.577851	5.163444	0.000100
D (R_GDP)	-2.110692	0.929460	-2.270879	0.037300
D (SB (-1))	-0.000201	0.000027	-7.327396	0.000000
C	-36.114020	12.15594	-2.970894	0.009000
R-squared	0.849489	Mean dependent var		22.085000
Adjusted R-squared	0.821269	SD dependent var		35.763970
SE of regression	15.119800	Akaike info criterion		8.446744
Sum squared resid	3657.733000	Schwarz criterion		8.645890
Log likelihood	-80.467440	F-statistic		30.101610
Durbin-Watson State	2.267889	Prob (F-statistic)		0.000001

Source: author's work

Note that adjusted R^2 and R^2 have a level of 0.8495 and 0.82127 respectively, indicating that the chosen factors explain the pattern well enough. Also, the Durbin-Watson statistic is around 2, or 2.26788, indicating that the residues are not correlated.

Conclusions

We presented in the paper a model that does not theoretically follow the classical form of the Phillips curve because we have replaced the GDP gap with the GDP growth acceleration variable D (R_GDP) to highlight the extent to which an acceleration of growth could influence the inflation rate and we noticed a negative correlation. We have opted to include the number of the unemployed in the ILO definition to capture the extent to which they influence the inflation rate and we also have a negative correlation.

Analyzing the validity of the models, it is noted that they do not pass all the tests requiring different adjustments.

It is certain that in an economy, unemployment and inflation are a serious problem, and identifying the impact of each of the components of the model is important for designing macroeconomic policy strategies on inflation, unemployment and growth. Empirical research can continue to test the linearity of the Phillips cube thus obtained, its form being essential to the direction of monetary policy.

With information on ILO unemployment, the unemployed who are actively seeking jobs, it may continue this research with verification of the vacancies - unemployment, it means a Beveridge's curve, that seems it is also change itself with the time, which suggests the possibility of identifying a link between the two curves.

Policy measures can be set and targeted by type of unemployment or the type of inflation, but given the emergence of behaviors, action must be taken to considered all of this is strongly influenced by the behavior of economic actors, which is based on their own economic rationality models, based on their own value system.

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