PHILLIPS CURVE IN ROMANIA IN CONDITIONS OF NEAR RATIONALITY

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Abstract

In a period of mainstream economic models failing to explain macroeconomic processes and individual economic behaviors, is necessary to reconsider dominant economic models by approaching with a higher accuracy the economic reality.

The paper is proposing to contribute to Homo Oeconomicus updating process by analyzing one of its fundamental pillars: Phillips Curve, to observe potential latent influences that can be attributed to limited rationality or non-rationality and verify the precision of the model.

The argument of the article takes form of the necessity of a deep evaluation of the concepts and paradigms of classical economics for adjustments with the purpose of a better representation of the reality and for an exact prediction of economic phenomena and their relations.

Keywords: Phillips Curve, Inflation, Unemployment, Romania, Near Rationality

JEL classification: C01 Econometrics, E24 Unemployment, E31 Inflation

Introduction

Phillips Curve is one of the fundamental pillars of Homo Oeconomicus paradigm based on the concepts of selfishness, perfect rationality, static preferences, utility-profit maximization and complete information.

Since its conceptualization, Phillips Curve has intensively influenced important aspects of macroeconomics based on the fictional compromise between Unemployment and Inflation based on the theory of mainstream economics which stipulates that people are rational economic actors, who take decisions only in their own-interest and unconscious and irrational behavior are out of the equation.

In contemporary period there is an emphasis on researching the validity of classical economic models which are not correlated with the latest findings in the field of psychology, sociology, physics and other domains for a more comprehensive approach.

Description of the problem

There is a need of a complete and profound update of mainstream economic theory and its fundamental pillars. Thus, concept and sub-theories that are not credible and correlated with the economic reality should be removed and replaced with valid concepts.

Phillips Curve in the form initially proposed is no longer a valid concept and the latest proposed adjusted Philips Curve models are still incomplete and weak correlated with the economic reality.

The problem rests on the lack of validity of the theoretical models in relation with the economic reality. In the same time, Homo Oeconomicus paradigm needs to be updated to the latest findings in economics, psychology, sociology and other areas. Rationality in its perfect state is no longer seen as a valid concept, so there is a need of replacing it with a more complex and accurate model.

Phillips Curve concept is having its origins in Alban W. Phillips article from 1958 named “The Relation Between Unemployment and the Rate of Change of Money Wage Rates in the United Kingdom, 1861 –1957” showing a direct negative correlation between Wages rates and Unemployment rates and a relation between the simple change of Unemployment and salaries, through the following graphic representation:

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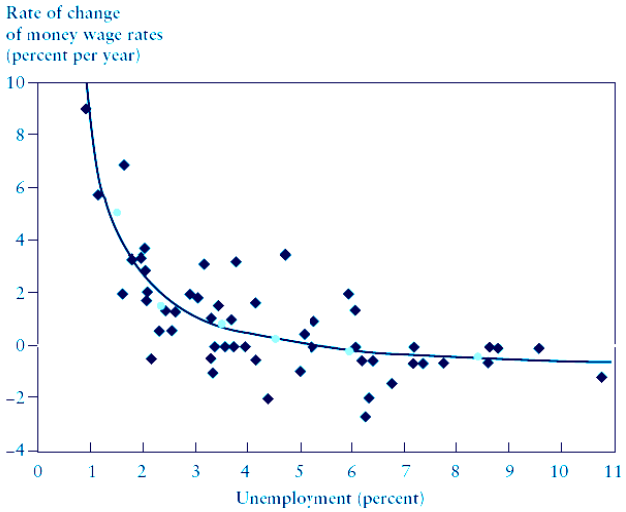

Figure 1. Phillips Curve in UK between1861 and 1957

The presence of a solid correlation between Unemployment and the level of nominal wages and prices had put into discussion the existence of a trade-off between Unemployment and Inflation, which can be exploited by governments for a desirable social result.

In 1967, Milton Friedman started a series of initiatives on establishing a correlation between Unemployment and Inflation after he argued that the salaries are rising once the demand on the labor market overcomes the offer and the salaries are decreasing when the offer overcomes the demand. He stated that the possibility of influencing Unemployment through monetary expansion is just temporary, on the long run, Unemployment returning to its "natural rate". Milton Friedman agreed that there is a temporary trade-off between Unemployment and Inflation but not a permanent one. (Milton Friedman, 1968)

Edmund Phelps affirmed that the equilibrium rate of long-run Unemployment is independent of the rate of Inflation, introducing two innovations in Phillips Curve Model: the first innovation is referring to the substantiation of Accelerating Phillips Curve Model in which the price acceleration is correlated with Unemployment and there is no trade-off between long-run Unemployment and Inflation and the second innovation is about the importance of expectations in the process of price setting. Phelps considered long-run Accelerating Phillips Curve Model defined by the following equation (Edmund Phelps, 1968):

$$\pi_t = \pi_t^e - aU^t = \pi_{t-1} - aU_t$$

$$\Delta\pi_t \equiv \pi_t - \pi_{t-1} = -aU_t$$

While both Friedman and Phelps are referring to the long-run Unemployment or the NRU (Natural Rate of Unemployment) as the rate the Unemployment is at equilibrium, independently of Inflation rate, later researches are concentrating on the concept of NAIRU (Non Accelerating Inflation Rate of Unemployment), altering Phelps equation as follows:

$$\Delta\pi_t \equiv \pi_t - \pi_{t-1} = -a\left(U_t - U^n\right)$$

The equation states that when the Unemployment reach NAIRU (which is by default 0 in initial Phelps equation) noted in the above equation with U^n, the change in the inflation rate is 0, with other words when the Unemployment reaches NAIRU, the inflation reaches the expected inflation, named by Phelps "lagging Inflation" (Edmund Phelps, 1968).

While the concepts of NRU (Natural Rate of Unemployment) and NAIRU (Non-Accelerating Inflation Rate of Unemployment) are used interchangeable in some formulations, those different concepts: while NRU is a microeconomic concept, with an unique state of equilibrium, based on rational behavior of people, being the equilibrium rate of long-run Unemployment, NAIRU is an macroeconomic concept, involving multiple states of equilibrium, being the rate of Unemployment when the Inflation tends to be stable.

Robert Lucas in 1973 and Thomas Sargent - Neil Wallace in 1975 offered a high importance to expectations, integrating the false perceptions of people who are not capable of making the

distinction between a real change of prices caused by demand and a change caused by monetary intervention. The authors argue that there is a correlation between Unemployment and Inflation if the monetary authority is able to produce unanticipated changes in price setting.

In 2000, George Perry estimates Phillips Curve by a model in which the parameters are allowed to vary over time. The author identified that the coefficient of expected Inflation was at low levels between 1950 and 1960, raised up to 1970 and decreased up to present.

George Akerlof, William Dickens and George Perry are proposing in 2006 a model which takes in consideration in the correlation between Inflation and Unemployment not how people forms expectations but how they use them.

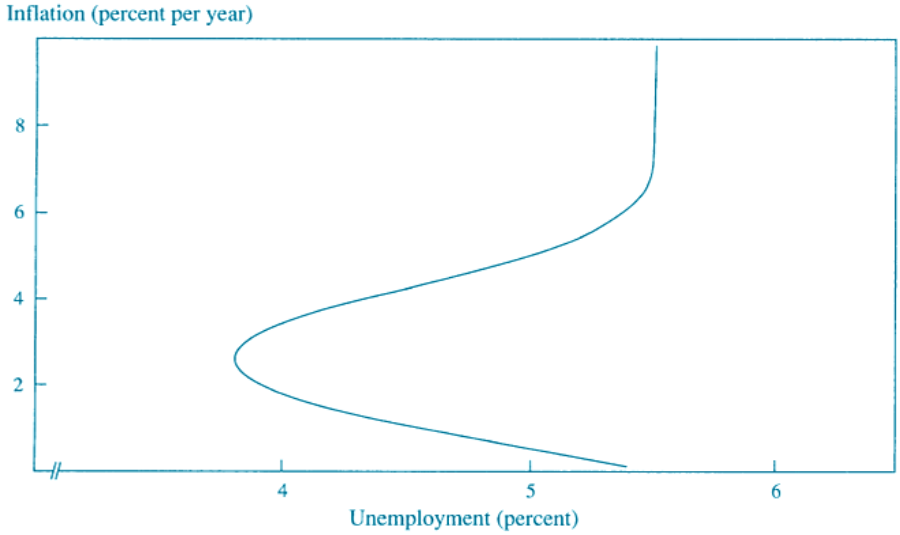

Figure 2. Phillips Curve proposed by Akerlof, Dickens and Perry in 2006

Authors suggests that there are 3 causes that contributes to the unconformity between econometrics models and economic reality:

* When the Inflation is at low levels, a significant number of people will not take it in consideration when setting prices or salaries.

* When the Inflation is taken in consideration, people are not using it as economists are supposing. The informal use of Inflation conducts to an incomplete representation of the expectations, affecting the aggregate relation between Inflation and Unemployment.

* The employees are perceiving the Inflation as an increase of prices and a reduction of their salaries rather than an increase of the nominal demand for their services so they will not take in consideration alternative opportunities as much as is supposed.

At low rates of Inflation, this has actually a positive effect in maintaining the Unemployment at low rates as due to the fact that the benefits are significant compared to the high objective or subjective costs with a complete rational behavior. When the Inflation raises, the risks with not using a rational behavior are increasing so people are more likely to take in consideration Inflation.

Daniel Kahneman and Amos Tversky argue that people are using a mechanism of decision editing by which they are taking in consideration only few factors they consider as having high importance, literally ignoring the other factors, considered irrelevant. Thus, when Inflation is at low rates, this is considered an unimportant factor to pay attention to consequences due to the fact that people have heuristic approaches in making decisions and they are not acting accordingly to a purely rational econometric model.

Robert Schiller, argued, based on researches, that there are high discrepancies between how economists believe people react and how people actually react. Two groups of people have been questioned, first group formed by economists and the second formed by people with no economics knowledge, challenging their behavior regarding the correlation between Inflation and Unemployment.

* 61% of the economists and 11% of the non-economists were agreeing with the affirmation: “the competition between employers will have as effect raising my salary. I could receive offers from outside the company and my current employer will raise my salary to keep me.” (Robert Schiller, 1997)

* 4% of economists and 26% of non-economists were agreeing with the affirmation: “high prices will creates extra profit for my employer who will be able to sell the products for more. This will not affect my salary.”

* 12% of economists and 77% of non-economists were agreeing with the affirmation: “Inflation is affecting my purchasing power. It makes me poorer”

Those results reveals that people are not perceiving macroeconomic processes as economists expects, existing numerous inconsistencies between economic theory and economic reality. In the same time, the inconsistency of Phillips Curve Model and economic reality is suggested to be caused by the “Unemployment hysteresis ” (Lucian Liviu Albu, 2004) referring to the fact that Unemployment is influenced by the past evolution and the changes are lasting, being difficult to return to anterior values, even when the factors causing the change are not acting anymore on Unemployment.

Phillips Curve has known numerous conceptual adjustments from its origins to present, being one of the main pillars of Homo Oeconomicus paradigm. Phillips Curve model has been adjusted, as if initially was suggested a negative correlation between Inflation and Unemployment, over time have included aspects such as NRU, NAIRU, expectations or incomplete rationality.

The problem rests on the incompleteness and inaccuracy of Phillips Curve model which needs to be adjusted so it could match the economic reality. The accuracy of the model will be tested so new perspective of development and improvement could arise for an enhanced precision.

Methodology and data sources

Objective

The objective of the study is to analyze the Phillips Curve Model in Romania for the period between January 1992 and December 2013 for observing the accuracy of the theoretic model with the economic reality and how bounded or incomplete rationality affects some economic processes and results.

Hypotheses

1. Homo Oeconomicus Model is not an accurate paradigm.

2. Phillips Curve is less representative to express the correlation between Inflation and Unemployment.

3. NAIRU is decreasing in contemporary period.

Limitations

There are limitations of the research which can influence the validity of hypothesizes demonstration:

1. Errors related with measuring Inflation and Unemployment. Those two variables can`t be quantified with maximum accuracy due to several factors such as: the difficulty to take in consideration all the goods and services for a complete aggregation of Inflation, the results are not obtained in real time, there are discrepancy between real economy and official statements provided by the existence of underground economy.

2. The transition period in Romania after 1989 has affected the optimum functionality of the market, at least in the first years, being registered high fluctuations regarding Unemployment and Inflation.

3. Unpredictability of human behavior, which in real economy is not aligned with a trend but varies, depending on endogenous and exogenous motivations, constraints, preferences and values.

Methodology

To observe the correlation between Inflation and Unemployment and to test the hypothesis has been conducted an econometric modelling of two series of data:

-Monthly Unemployment Rate and Monthly

-Inflation Rate in Romania for the period of January 1992 – December 2013. The source of the data is Romanian National Institute of Statistics.

Thus, the series have been analyzed to identify existent correlations, trends, cyclicity, skewness, kurtosis, seasonality, values distribution, stationarity, etc. In the same time, an econometric modelling has been conducted to observe the influence of independent variable on dependent variable by analyzing the regression and residuals through Hodrick-Prescott filter for NAIRU calculation and it has been achieved a state-space model through the application of Kalman filter to minimize the errors.

Series of data

It can be observed a transition from a very high Inflation in the first half of the period to a lower Inflation Rate with less inflections, in the second half of the period.

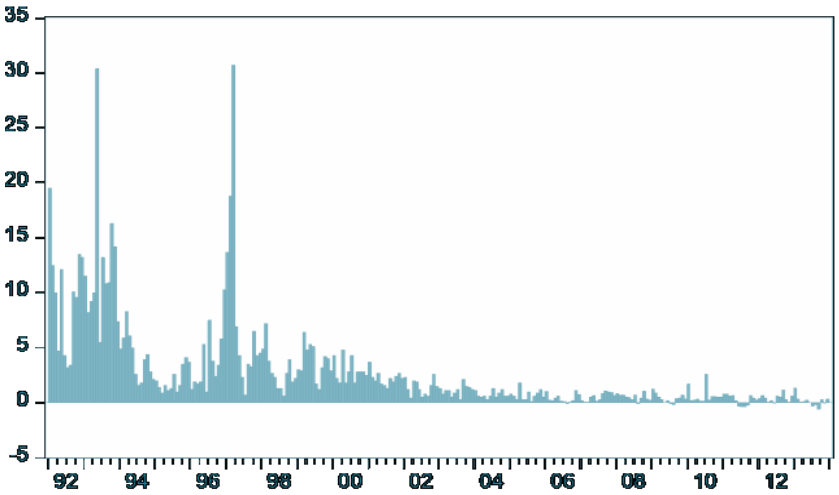

Figure 3. Inflation Rates in Romania between January 1992 and December 2013

As it can be observed from the Descriptive Statistics Results, the Mean is 2,692841 and the Standard Deviation is 4,181416. In the same time Skewness and Kurtosis results suggests a right skewness and a sharper distribution than Gaussian.

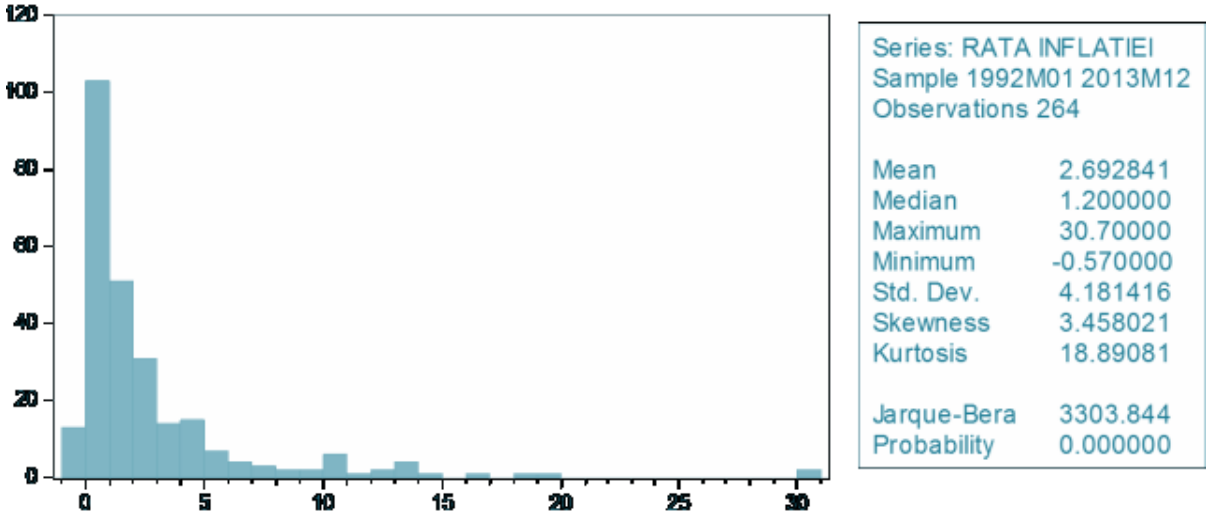

Figure 4. Inflation Rates Histogram and Descriptive Statistics Results

Regarding the second data series, Unemployment, it can be observed a transition from a very high Unemployment in the first half of the period to a lower Unemployment Rate in the period of economic grow, followed by increased values determined by economic crisis and a stabilization in the later period.

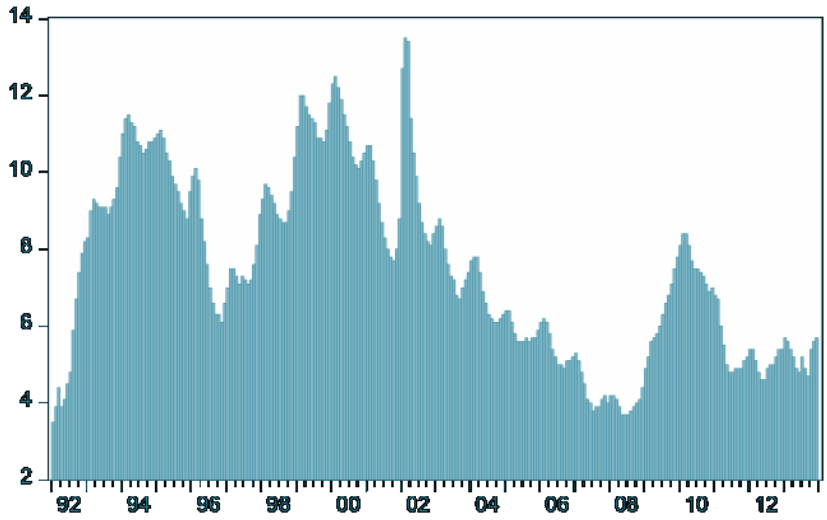

Figure 5. Unemployment Rates in Romania between January 1992 and December 2013

The Mean is 7.515530 and the Standard Deviation is 2,424641. In the same time Skewness and Kurtosis results suggests a light right skewness and a sharper distribution than Gaussian.

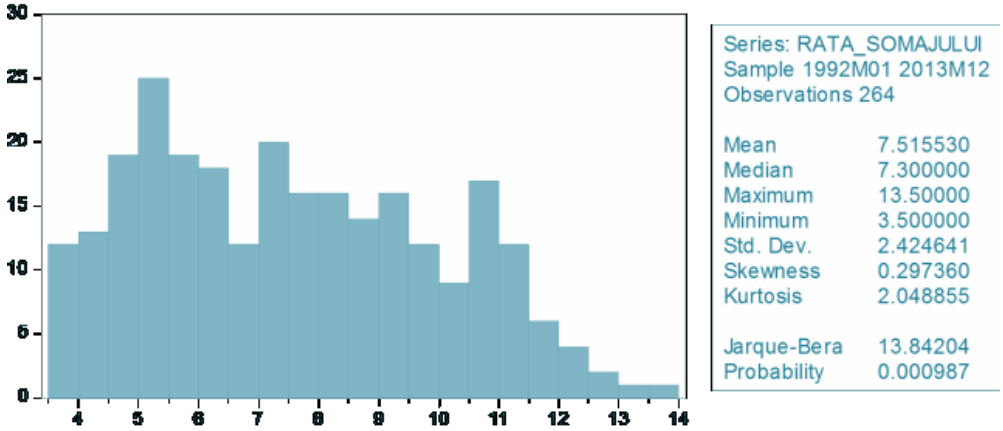

Figure 6. Unemployment Rates Histogram and Descriptive Statistics Results

Economic Modelling

The series has been interfered into a Scatter diagram for emphasizing the potential correlation between data.

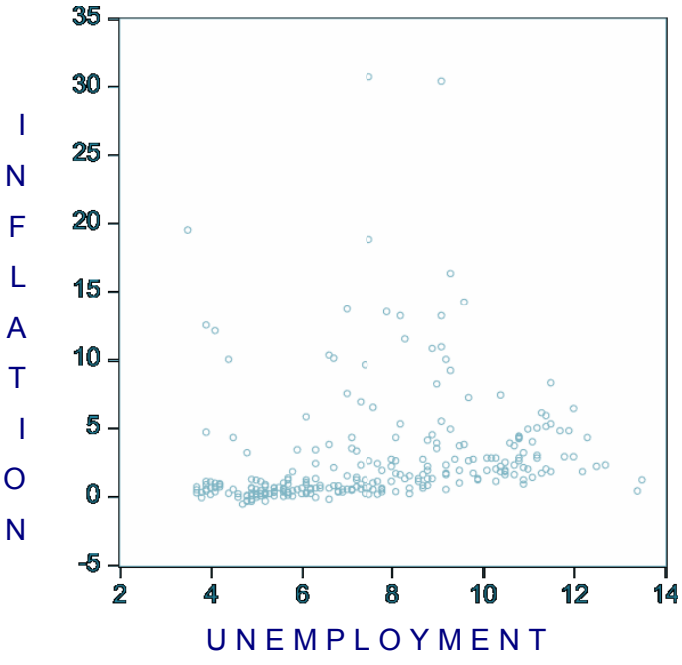

Figure 7. Scatter Diagram between Unemployment and Inflation

In order to test the link between the variables, it has been used the Phillips model proposed by Friedman and Phelps in an adjusted form. Thus, the Phillips Curve regression equation has the following form:

$$\pi_t = a + b\pi_{t-1} - c(U_t - U^n) + \varepsilon_t, t = 1,2,3...n$$

where π_t is the inflation at moment t, π_{t-1} is the expected inflation with the mention that in the hypotheses of the model is stipulating that the expectations on inflation are based on anterior inflation values, U_t is unemployment rate, U^n is NAIRU (Non Accelerating Inflation Rate of Unemployment), and a, b, c are the coefficients.

This model tries to estimate the influence Unemployment at moment t and expected Inflation (an anchor in moment t-1) have on Inflation at moment t. In the same time, there will be made an estimation of NAIRU for Romania in the period January 1992 and December 2013 to emphasize the level of Unemployment so the pressure from the labor market on Inflation to be null for the period of observation.

The hypotheses of the Regression model are the following:

H1: The regression model is linear in relation with coefficients

H2: The exogenous variables π_{t-1} and $U_t - U^n$ have nonzero finite dispersion

H3: The exogenous variables π_{t-1} and $U_t - U^n$ are not random

H4: The errors ε_t are random variables with null mean

H5: The errors are not heteroscedastic

H6: The errors are independent (the lack of error autocorrelation)

H7: The errors are normal distributed

For testing the hypothesis it has been used the “estimated output” results in Eviews software and it has been included the consistency with White test heteroscedasticity for an enhanced accuracy.

Results obtained

By running Hodrick Prescott Filter in Eviews on Unemployment, the cyclicity has been removed, being obtained the estimated values of NAIRU and the trend of its representation.

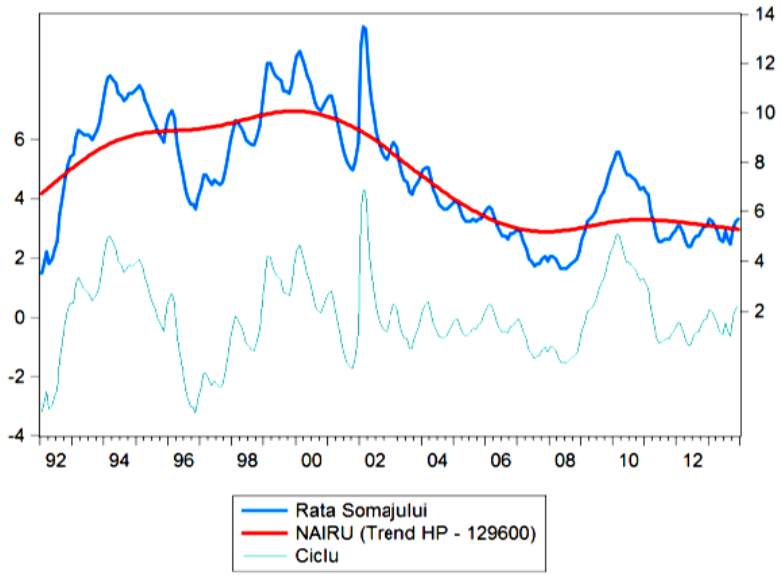

Figure 8. NAIRU Values in Romania between January 1992 and December 2013

It can be observed how NAIRU has been fluctuating in the analyzed period, being on a slope of decreasing.

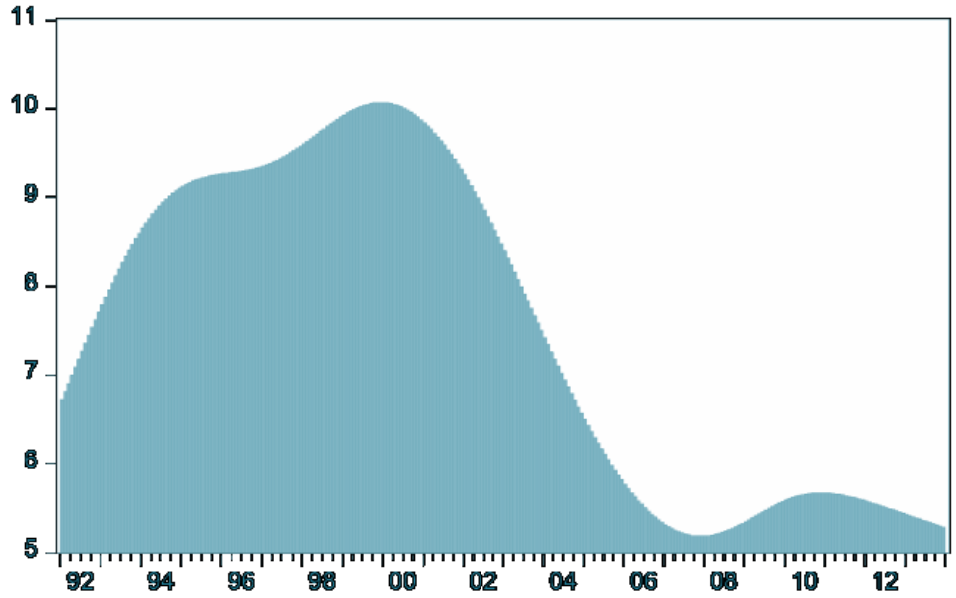

Figure 9. NAIRU decreasing in Romania between January 1992 and December 2013

As a result of running the regression equation on the series of Inflation, Unemployment and NAIRU, it is obtained the following estimated equation:

$$\pi_t = 0{,}765096057877 + 0{,}69005133286\ \pi_{t-1} - 0{,}0455545241596\ (U_t - U^n)$$

Thus, by interpreting the coefficients, taking in consideration the presented model, when unemployment = NAIRU, inflation is influenced by 0.765096057877 + 0.69005133286 of anterior inflation. With other words, in the absence of unemployment, inflation is influenced by 0.69005133286 of anterior inflation in addition to 0.765096057877.

For the estimated Inflation it has been made a residual analysis by running the specific function in Eviews, obtaining the below graph:

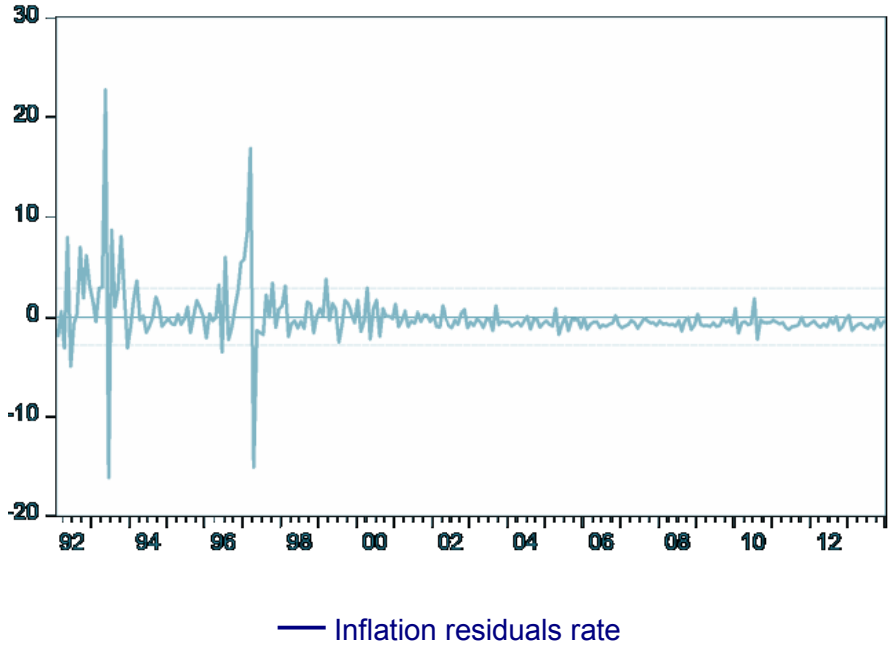

Figure 10. Residual Analysis of Estimated Inflation

In the same time, it has been a Scatter Diagram between the Difference between Unemployment and NAIRU and the Adjusted Inflation with Hodrick Prescott Filter, emphasizing a correlation similar to the one proposed by Akerlof, Dickens and Perry.

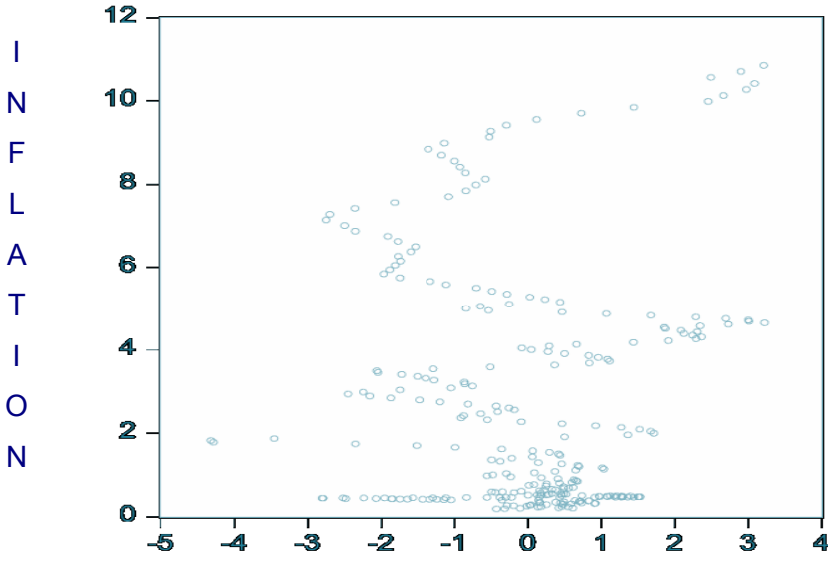

Figure 11. Scatter Diagram on the correlation between Unemployment, NAIRU and Adjusted Inflation

It has been achieved a Kalman state-space model to describe the relation between the measured values and the unobserved variables to minimize the errors through residual elimination. The equation of Eviews function was the next:

@signal Inflation_Rate = c(1) + c(2)*Inflation_Rate_lag1 + [var = exp(c(3))]

@signal Unemployment_NAIRU = - (Unemployment_rate – NAIRU) + [var = exp(c(4))]

@state NAIRU = NAIRU(-1) + [var = exp(c(5))]

param c(1) .0 c(2) .0 c(3) .0 c(4).0 c(5).0

obtaining the following result:

@SIGNAL Inflation_Rate = 0.762347880069 + 0.690852229057*Inflation_Rate_LAG1+ [VAR = EXP(2.08453788017)]

@SIGNAL Unemployment_NAIRU = Unemployment Rate - NAIRU + [VAR = EXP(-34.4975405202)]

@STATE NAIRU = NAIRU(-1) + [VAR = EXP(-0.326229760322)]

One-step-ahead inflation rate

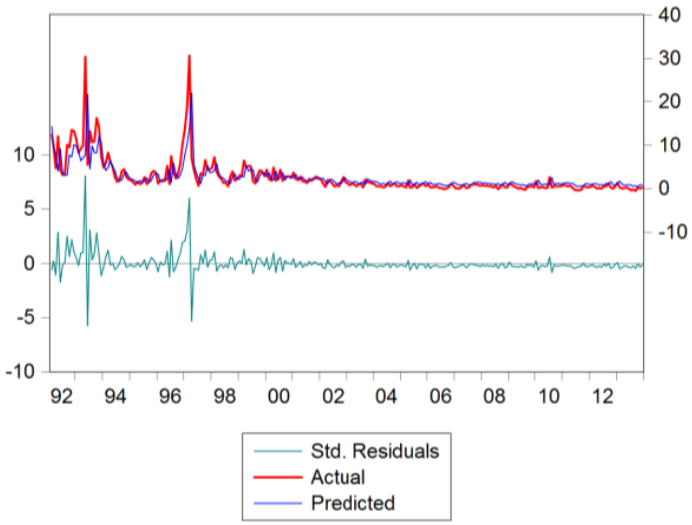

Figure 12. Kalman Filter Signal 1

One-step-ahead unemploymed rate

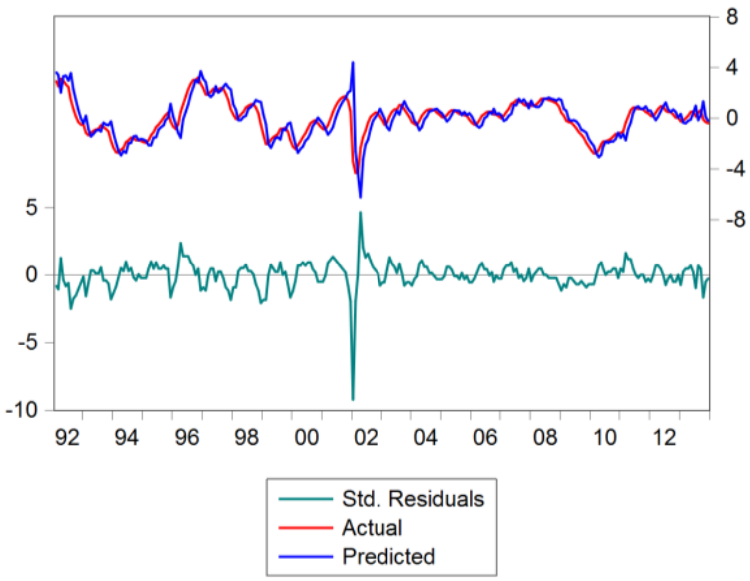

Figure 13. Kalman Filter Signal 2

Conclusions

Phillips Curve in its classical form is no longer representative due to transformations of the economic mechanisms, the relation between Inflation and Unemployment not being an inverse one from multiple causes such as Inflation expectations, Unemployment hysteresis but also the alterations of preferences and human economic behavior over time, later models being more accurate.

Due to the economic modelling it has been identified some correlations between Inflation, Unemployment and NAIRU which can be used in further research for predictions. It has been also observed a decrease of NAIRU for the analyzed period, confirming the initial hypothesizes.

Even if Phillips Curve classical model uses some Homo Oeconomicus characteristics to simplify the econometric modelling, this construction is not enough representative compared with the economic reality by not taking in consideration various unobservable variables that could explain the econometric errors of the model in predicting the correlation between Inflation and Unemployment.

Homo Oeconomicus paradigm in its current state is not a valid concept, being based on a series of elements such as perfect rationality, complete information and other presuppositions which are proved not to be just or in compliance with reality just in very few cases. Researches shows that the human mechanism of thinking and taking decisions is different from what economists assume, for example, the latter are not taking in consideration important aspects such as the preference of people for using mental shortcuts and decisional patterns, the importance of unconscious mind in dictating to conscious rational behavior, etc.

Inflation and Unemployment are interfering through a correlation but current econometric models are not taking yet in consideration all the unobservable and latent factors that influences the relation between those two indicators, existing a need of a more interdisciplinary approach.

Research Perspectives

As a result of the results, there could be taken in consideration the following research perspectives:

- An in depth analysis of Homo Oeconomicus fundamental pillars to observe their validity and to identify new approaches to explain the current economic phenomena.

- Researching and investigation of the concept of Unemployment hysteresis for analyzing the process and implications for explaining the economic aggregates and mechanisms.

- An in depth investigation of identifying and quantifying latent and unobservable variables which influence the economic processesand integrate into an econometric model by applying the Kalman filter for an enhanced prediction.

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