MANAGING MONETARY POLICY USING PHILLIPS CURVE

Maria-Lenuța CIUPAC-ULICI*
ulici_maria@yahoo.com
Daniela-Georgeta BEJU**
daniela.beju@econ.ubbcluj.ro
* Commercial Academy, Satu-Mare, Romania & IPAG Business School, Paris, France
** Babeș-Bolyai University, Cluj-Napoca, Romania

ABSTRACT

The Phillips curve is an important component of macroeconomics that provides a structural equation. This equation determines the rate of inflation as a function of the rate of unemployment. In fact, the Phillips curve is an inverse relation between the rate of unemployment and the rate of inflation. This equation represents an important constrain on monetary policy, because it determines the set of sustainable inflation-unemployment outcomes. For many years economists assert the existence of a negative correlation between inflation, on the one hand, and unemployment rate in the economy, on the other hand. In other words, high levels of unemployment are associated with low levels of inflation and vice versa. In this paper we propose to analyze the evolution of Phillips curve in some Eastern European countries. The evolution of inflation and unemployment in Europe brings out three features: a reduction in inflationary expectations, large falls in the structural unemployment rate that determine a flatter Phillips curve.

KEYWORDS: inflation, Philips curve, unemployment rate

1. Introduction
1.1. The Origin of Phillips Curve

The national economy is the fundamental framework for development and economical-social assertion of people. Regarding these economies a whole well defined, whose development involves the optimal economic reports, we can’t neglect monetary phenomena, because the currency is itself an important entity. Therefore phenomena are inflation and unemployment, complex and socio-economic phenomena with various aspects become persistent everywhere in the world. Basically, there is no economic mechanism that these phenomena do not affect. “There is always a temporary compromise between inflation and unemployment; there is not a permanent compromise. Temporary compromise is not from proper inflation, but from unanticipated inflation, i.e., inflation rates increases” (Milton Friedman).

Two of the most important issues facing a modern state, especially in the transition period (i.e., the transition from a centralized economy to a market economy) are represented by inflation and unemployment.
Inflation is a problem that is in attention of all countries, faced with this process – throughout history, as it was and remained the most controversial and complex contemporary issue. The inflationary process appeared before economic science, but inflation theory was shaped much later. Contemporary inflation is a monetary – real imbalance expressing money in circulation that exceeds economic needs, which trains unconverted money in gold depreciation and the unconverted in general, as sustainable growth and generalized of price. Unemployment is a macroeconomic element characterized by an excess of labor supply to the demand for labor, with different manifestations from one period to another and from one country to another. The established report between supply and demand labor determines the relationship employment-unemployment. Natural rate of unemployment ranges between 2 % and 5 %. “Unemployment inevitably accompanies economic recession and it is probably one of the main reasons for cyclical fluctuations which are generally undesirable” (Gali, 2010). “If unemployment drops below a certain rate, inflation accelerates. Sufficiently high rate of unemployment, which can avoid this, it is called unemployment which doesn’t accelerate inflation (NAIRU)”.

Phillips Law (Mankiw, 1998) has the effect of releasing an inverse relationship between inflation rate and unemployment rate: if unemployment decreases the inflation rate tends to increase and vice versa. In other words, between inflation and unemployment is a relationship of compensation. This inverse correlation is shown by the Phillips curve. The researcher Phillips revealed based on thorough research, the relationship between the growth rate of nominal wages and unemployment rate. He concluded that these two items are in negative relationship. Based on these relationships, Phillips built the curve – that took his name – where inflation has the role to arbitrate between possible actions in an economy. Inflation depends on three factors: expected inflation, cyclical unemployment, shock changes of supply.

During the existence of this curve, there are three stages:

✓ notion formation by Phillips and Lipsey that took as its starting point the assumption that there is a stable relationship between unemployment rate and inflation rate, inverse proportional;

✓ the difference between short-term and the long term Phillips curve (the difference is demonstrated by Milton Friedman and E. Phelps by using the theory of “natural rate of unemployment”, known in economics as “Friedman – Phelps Amendment”);

✓ the critique brought to Phillips curve by rational expectations school advocates, who felt that there was no systematic form of compensation between inflation and unemployment.

1.2. Friedman – Phelps Amendment

Milton Friedman and Phelps were the first economists who showed unecknowledge at Phillips curve. They questioned whether this curve is a stable relationship both on long-term and short term. Moreover Friedman criticizes the interpretation of Lipsey as regard the Phillips curve, especially because Lipsey did not take into account inflation expectations.

Phelps and Friedman show that any point on the Phillips curve determines a certain inflation rate, but if the anticipated inflation rate will change, this will lead to changes in the Phillips curve. Any current inflation rate, higher, will cause over a relatively long period of time, a higher rate of expected inflation and in this way the Phillips curve will have a tendency to climb that will prevent any offset between inflation and unemployment on long term.

In the context of the statements above, Phelps said: “If you expect a general
increase in prices of 4 % per year, why would be unemployment associated to a lower or higher rate than that which would exist if there will expect a stability of future prices and global demand would behave in a manner to determine average stable prices?"

1.3. Innovations Introduced by Samuelson and Solow to Phillips Curve

P. Samuelson and R. Solow published a paper in 1960 which brought immense publicity to Phillips curve. These two authors have tried first to demonstrate the importance of the theoretical concept of the Phillips curve for the economic policy of a country. Samuelson was inspired from the diagrams of Phillips and concludes that society is forced to decide between an usage level that is reasonably high, associated with a moderate increase, but continue of prices or reasonable stability of prices, but associated with a high unemployment rate. The society of market economy is the society of the financial strength, and this is obtained from the use of high efficiency of production factors.

The specific treatment of the Phillips curve by Samuelson and Solow derives from the following reasons: original Phillips curve was modified, so that, it became a relationship between unemployment rate and inflation rate; Samuelson and Solow turned the theoretical concept into an instrument of economic policy which allowed the realization of government programs that could alternative combine unemployment rates with inflation rates.

After the appearance of this work, this formulation of the Phillips curve (the relationship between inflation and unemployment rate) came to have priority in the debates with this issue, as in subsequent research. Meanwhile, Samuelson and Solow, wanted the transformation of the Phillips curve from an economic theory to an instrument of economic policy. Thus, in their view, each point on the Phillips curve could be interpreted as a possible alternative economic policy conducted by the government.

2. Literature Review

There is an ongoing debate in the financial literature about the importance of forward-looking behavior in the determination of Phillips curve.

Kapur (2013) forecasts inflation in India by using an augmented Philips curve framework during February 1996 – January 2011. His findings show a strong impact on non-food manufactured products inflation as regard wholesale price inflation. Lanne and Luoto (2013) estimate a method of the New Keynesian Philips curve. Their method is based on an univariate noncausal autoregressive model for US inflation rate. The analyzed period is January 1955 – March 2010. The obtained results show that inflation rate is determined by expected future inflation and lagged inflation. Also, inflation persistence seems to be intrinsic.

Paradiso and Rao (2012) analyzed the Phillips curve in USA and Australia during 1978-2010. Their Phillips curve model was augmenting with the oil price. The study’s results indicate that oil price play an important role in future inflation rate; while the coefficients of core inflation and demand pressure decreased, the coefficient of oil price was on an upward trend. In his paper, Kajuth (2012) applies a method of identification through heteroskedasticity in order to address the problems in Phillips curve estimations for the US and Euro Area during 1970-2009. The results of his research suggest a contemporaneous trade-off between unemployment and inflation gap for both areas.

Abbas and Sgro (2011) investigate the validity of the New Keynesian Phillips Curve for Australia over the period 1959-2009. They find that expected inflation is positive and statistically significant, also it is similar in magnitude in pre and post 1980s.
Their empirical findings indicate that the slope of the New Keynesian Phillips Curve is smaller and the curve is flatter in Australia. Mazumder (2011a) argues in his paper that the Phillips curve can be estimated in India. He demonstrates that the Lucas critique doesn’t apply to Indian Phillips curve by using standard econometric techniques on the sample period 1970-2008. His empirical evidences show a strong positive relationship between inflation and output (the index of industrial production). In another paper, Mazumder (2011b) argues that marginal cost is an important predictor for inflation when it has to forecast the future price activity. He computes a root mean squared errors to evaluate the performance of inflation forecasts for the period 1960-2007. His research results indicate that an aggregate measure of marginal cost has important forecasting information for the economy-wide inflation. Russell (2011) estimates short and long-run Phillips curve by using a panel data for the period 1952-2004. His paper suggests that it is correct to model inflation rate as a stationary process with shifting means. Shifts in unemployment and inflation rate appear to be important in both social and economic senses.

Tillmann (2010) analyzed how monetary policymakers think about short-run trade-off between inflation and real activity during 1992-1998. The empirical results indicate significant changes in the perceived trade-off, the Phillips curve flattens and Non-Accelerating Inflation Rate of Unemployment falls in the second half of the sample. This means that policymakers were aware of those changes in real-time. Also, Kuttner and Robinson (2010) review in their article possible explanations for flattening Phillips curve by policy-makers in the context of New Keynesian economic theory. Analyzing the Phillips curve in United States and Australia during a period of 50 years (1960-2007), they find that data problems, alternative definitions of marginal cost and globalization are not sufficient to explain the flattening of Phillips curve. Campbell (2010) studies the reduced form equations of wage-wage Phillips curve and price-price Phillips curve of firm’s optimizing behavior. His work assumes that companies pay efficiency wages and workers’ expectations of prices or wages are a mixture of adaptive and rational expectations. So, Phillips curve was determined from profit and utility maximization in this paper.

Lansing (2009) realizes a form of boundedly-rational inflation expectation in the New Keynesian Phillips curve. In order to show the volatility and time-varying persistence in US inflation date, 1871-2004, the researcher uses a panel for consumer price index inflation for the period 1871-2004 and a panel for Gross Domestic Product price inflation during 1949-2004. He finds that the New Keynesian Phillips curve is tractable and it links to microfoundations, but it is not able to account endogenously for some features of US inflation dynamics. Bentolila et al. (2008) estimate the New Keynesian Phillips curve for Spain over the period 1982-2006. They would like to demonstrate that the fall in unemployment rate would lead to an increase in inflation rate, if it hasn’t been offset by immigration. Their results confirm that the immigrant unemployment rate is statistically significant for Phillips curve: unemployment rate falls by 7 percentage points (1995-2003), while inflation rate increases by 2.5 percentage points per year. This means that the impact of immigration on inflation was good news for central banks. Matheson (2008) analyzed the Phillips curve in a small economy by using the data for New Zealand and Australia during 1992-2005. The obtained results suggest that a sectoral approach in
forecasting inflation rate with Phillips curve is preferable in an aggregate approach for a small open economy.

Bakhshi et al. (2007) derive a Phillips curve equation by using the dynamic stochastic general equilibrium model with state-dependent pricing (that was developed by Dotsey et al. (1999)). The empirical evidences suggest that the hybrid New Keynesian Phillips Curve is tracking well the intrinsic persistence in inflation rate that is founded in the data-generating model, but it fails to replicate the sensitivity of inflation rate with respect to real marginal costs. It is still considerable work to be done in order to understand the relationship between aggregate activity and inflation.

3. Research Methodology

In this paper we intend to analyze the evolution of Phillips curve in six European countries. Also, we propose to see if the theory of Phillips is respected here as regard the relationship between inflation rate and unemployment rate. So, we built the following regression in Eviews program to explain the relationship between the two variables:

\[ CPI_p = c + \beta_1 \cdot UNE_p + \varepsilon_t \]  

(1)

where:

- CPI – consumer price index
- UNE – unemployment rate
- \( p \) – the analyzed country
- \( \varepsilon_t \) – the residual value

Because the global financial crisis affected all economic fields worldwide, we introduce a dummy variable in the regression where Phillips’s theory is not respected. The dummy variable will take the value zero before the financial crisis, and one after the appearance of current crisis in the analyzed country. The regression will be:

\[ CPI_p = c + \beta_1 \cdot UNE_p + \text{dummy} + \varepsilon_t \]  

(2)

4. Data Used

The data used in this case study are monthly and are collected on the websites of the Organisation for Economic Co-operation and Development (OECD) for the consumer price index data, Eurostat database for unemployment rate data and Romanian National Institute of Statistics for Romanian consumer price index. The analyzed period is January 1998 – May 2013 and includes 6 European countries: Czech Republic, Hungary, Poland, Romania, Slovakia, and Slovenia. In Table no. 1 are the descriptive statistics of the two variables. Note that both variables show a positive average value in the analyzed period 1998-2013. Analyzing Kurtosis and asymmetry coefficients we find that the analyzed series do not follow the normal law. Thus according Skewness coefficient, we find that the consumer price index series for Poland, Slovakia and Slovenia series show an elongation to the left (the coefficient is negative), while the data series for Czech Republic, Hungary and Romania show a right tail. The unemployment rate presents a left tail only for Czech Republic and Slovakia, for the other countries the tail is elongated to right. Regarding the Kurtosis coefficient for inflation rate series, we find that all variables analysis show smaller values of 3 (except Romania), which means that the distributions are platikurtic (in the case of Romania, the distribution is leptokurtic). The distributions of unemployment rate series are platikurtic in four cases (except Czech Republic and Slovenia).
4. Empirical Results

In Figure no. 1 is presented the Phillips curve for Czech Republic. During the analyzed period the consumer price index was on an ascendant trend, while the unemployment rate presented a constant trend.

![Fig. no. 1 Phillips Curve for Czech Republic](image)

Source: OECD, Eurostat

The ascendant evolution of inflation characterized Hungary, too. The unemployment rate presents a descendent evolution during 1998-2004. During 2004-2008, we can see a little increase, but due to the appearance of global crisis it increases 57% over the period 2008-2013 (Figure no. 2).

### Table no. 1

<table>
<thead>
<tr>
<th>Consumer price index</th>
<th>Czech Republic</th>
<th>Hungary</th>
<th>Poland</th>
<th>Romania</th>
<th>Slovakia</th>
<th>Slovenia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observations</td>
<td>185</td>
<td>185</td>
<td>185</td>
<td>185</td>
<td>185</td>
<td>185</td>
</tr>
<tr>
<td>Mean</td>
<td>102.580</td>
<td>103.082</td>
<td>101.007</td>
<td>229.358</td>
<td>97.636</td>
<td>98.254</td>
</tr>
<tr>
<td>Median</td>
<td>100.3</td>
<td>100.7</td>
<td>100.2</td>
<td>151.83</td>
<td>100</td>
<td>100.6</td>
</tr>
<tr>
<td>Maximum</td>
<td>123.2</td>
<td>145.6</td>
<td>125.6</td>
<td>898.47</td>
<td>125.9</td>
<td>122.9</td>
</tr>
<tr>
<td>Minimum</td>
<td>82.7</td>
<td>59.5</td>
<td>72</td>
<td>99.67</td>
<td>59.7</td>
<td>64.3</td>
</tr>
<tr>
<td>Skewness</td>
<td>0.121</td>
<td>0.056</td>
<td>-0.067</td>
<td>1.993</td>
<td>-0.401</td>
<td>-0.451</td>
</tr>
<tr>
<td>Kurtosis</td>
<td>1.800</td>
<td>1.877</td>
<td>2.298</td>
<td>6.113</td>
<td>1.995</td>
<td>2.023</td>
</tr>
<tr>
<td>Probability</td>
<td>0.003</td>
<td>0.007</td>
<td>0.140</td>
<td>0.000</td>
<td>0.002</td>
<td>0.001</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Unemployment</th>
<th>Czech Republic</th>
<th>Hungary</th>
<th>Poland</th>
<th>Romania</th>
<th>Slovakia</th>
<th>Slovenia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median</td>
<td>7.3</td>
<td>7.4</td>
<td>12.5</td>
<td>6.9</td>
<td>14.6</td>
<td>6.7</td>
</tr>
<tr>
<td>Maximum</td>
<td>9.6</td>
<td>11.8</td>
<td>21</td>
<td>9.5</td>
<td>20.2</td>
<td>11.3</td>
</tr>
<tr>
<td>Minimum</td>
<td>4</td>
<td>5.2</td>
<td>6.3</td>
<td>4.9</td>
<td>8.5</td>
<td>4</td>
</tr>
<tr>
<td>Std. Dev.</td>
<td>1.220</td>
<td>2.050</td>
<td>4.509</td>
<td>0.844</td>
<td>3.056</td>
<td>1.384</td>
</tr>
<tr>
<td>Skewness</td>
<td>-0.688</td>
<td>0.493</td>
<td>0.204</td>
<td>0.128</td>
<td>-0.118</td>
<td>0.658</td>
</tr>
<tr>
<td>Kurtosis</td>
<td>3.117</td>
<td>1.851</td>
<td>1.528</td>
<td>2.909</td>
<td>2.002</td>
<td>4.393</td>
</tr>
<tr>
<td>Jarque-Bera</td>
<td>14.684</td>
<td>17.685</td>
<td>17.980</td>
<td>0.570</td>
<td>8.103</td>
<td>28.279</td>
</tr>
<tr>
<td>Probability</td>
<td>0.001</td>
<td>0.000</td>
<td>0.000</td>
<td>0.752</td>
<td>0.017</td>
<td>0.000</td>
</tr>
</tbody>
</table>

Source: Own processing in Eviews
Consumer price index evolution is presenting an ascendant evolution for all the analyzed period, such as Czech Republic and Hungary. Unemployment rate presents an oscillating trend. This rate increases 11% during 1998-2002. For the next period (2002-2004), the rate remains around 20%. Until the settlement of financial crisis, this rate shows a significant decrease from 21% (February 2004) to 6.3% (October 2008). During the current crisis, this rate registered a little increase; it was 10.6% in May 2013. Poland was the only country from Central and Eastern Europe that was not affected by the global financial crisis (Figure no. 3).


In the case of Romania, we can observe that consumer price index is on a descending trend for all the analyzed period. Also, the evolution of unemployment rate is different from the other countries; it was between 4.9%-9.5% during 1998-2013 (Figure no. 4).
The inflation rate in Slovakia follows the evolution of the first three countries analyzed before. Unemployment rate presents an increase of 7 % during 1998-2000. In the next four years it was around 20 %. During 2000 – October 2008, this rate decreases from 19.7 % to 8.5 %. In the time of current crisis, the rate increases 6.8 % points (Figure no. 5).

Slovenia presents an ascending evolution of consumer price index during 1998-2013, which increases from 64.3 % to 122.5 %. Unemployment rate was oscillating during the analyzed period: in the first interval (1998 – October 2005), it increases from 5.5 % to 7.5 % (a small increase); in the second interval (November 2005 – June 2008), the rate decline until 4 %; in the third interval (July 2008 – May 2013), it rises to 11.3 %.
We can see in Table no. 2 that an increase in inflation rate (represented by consumer price index) will cause a decrease in unemployment rate only for four countries from the analyzed countries: Czech Republic, Poland, Romania, and Slovakia. Statistically, the results are significant at 1 % confidence level. These four countries respect the Phillips’s theory.

**Table no. 2**

<table>
<thead>
<tr>
<th>CZECH REPUBLIC</th>
<th>HUNGARY</th>
<th>POLAND</th>
<th>ROMANIA</th>
<th>SLOVAKIA</th>
<th>SLOVENIA</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>C</strong></td>
<td>134.443* (29.2067)</td>
<td>32.438* (6.5350)</td>
<td>120.173* (40.9525)</td>
<td>901.857* (9.29275)</td>
<td>144.443* (22.7959)</td>
</tr>
<tr>
<td><strong>UNEMPLOYMENT</strong></td>
<td>-4.42842* (-7.02037)</td>
<td>8.90251* (14.696)</td>
<td>-1.4231* (-6.8859)</td>
<td>-98.1325* (-6.9814)</td>
<td>-3.0930* (-7.5355)</td>
</tr>
<tr>
<td><strong>R²</strong></td>
<td>0.212177</td>
<td>0.541332</td>
<td>0.205787</td>
<td>0.210325</td>
<td>0.236813</td>
</tr>
</tbody>
</table>

Source: Own processing in Eviews
Note: * represents the confidence level of 1 %. In parenthesis are the t-statistic values.

In the case of Hungary and Slovenia, we can see that an increase in unemployment rate will generate an increase in inflation rate. We thought that the current financial crisis can affect this relationship. That’s why, we introduce a dummy variable that indicate the appearance of the crisis. The empirical results from Table no. 3 show the inverse relationship between the two variables only before the crisis. After the installation of global crisis, we can observe a direct relation between the variables in both countries.

**Table no. 3**

<table>
<thead>
<tr>
<th>BEFORE THE FINANCIAL CRISIS</th>
<th>AFTER THE FINANCIAL CRISIS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>C</strong></td>
<td><strong>C</strong></td>
</tr>
<tr>
<td>HUNGARY</td>
<td>98.35847* (10 83817)</td>
</tr>
<tr>
<td>SLOVENIA</td>
<td>79.62747* (12.55581)</td>
</tr>
<tr>
<td><strong>UNEMPLOYMENT</strong></td>
<td><strong>UNEMPLOYMENT</strong></td>
</tr>
<tr>
<td>HUNGARY</td>
<td>-1.583188 (-1.17995)</td>
</tr>
<tr>
<td>SLOVENIA</td>
<td>5.046568* (8.217879)</td>
</tr>
<tr>
<td><strong>R²</strong></td>
<td><strong>R²</strong></td>
</tr>
<tr>
<td>HUNGARY</td>
<td>0.011161</td>
</tr>
<tr>
<td>SLOVENIA</td>
<td>0.517365</td>
</tr>
</tbody>
</table>

Source: Own processing in Eviews
Note: * represents the confidence level of 1 %. In parenthesis are the t-statistic values.
5. Conclusion

This paper draws attention to the multitude interpretation of Phillips curve. It can be seen that inflation was debated by economists and not only everywhere, to highlight the causes and effects to find the best ways to combat them or keep it to acceptable levels that do not affect the good’s economy.

Until recently, studies based on econometric methods were rare and the causes were many. The first cause was the lack of long data series. Econometric models provide relevant results only if the number of observations included in the model is large enough. Another reason was linked to the administrative control of economic variables such as prices, interest rates, exchange rate. Econometric modelling is based on the assumption that the variables of interest are random, meaning that the values they will take in the future are uncertain. A third case, relevant for econometric analysis necessary for the justification of economic policy decisions, is the “Lucas’s Critique”. Lucas has shown that when authorities undertake economic policy changes, economic agents alter their behaviour to adapt optimally changes occurred. A portion of the estimated coefficients of econometric models reflect the behaviour of agents.

All these reasons have led to performing two econometric studies whose results were:

- After analyzing the inflationary phenomenon in UE6 I noticed that the inflation rate in Romania is high at the beginning of the analyzed period and it will decrease towards the end. In contrast, in the case of Ireland, the inflation rate is very low throughout the period under review, registering even negative.
- By making the two analyzes, the inflation in the UE6 countries and the Phillips curve, we conclude that there is a link between inflation and unemployment that generate macroeconomic effects.
- The current economic crisis, with major influences on economic activity, determined an increase in the number of unemployedes. The absorption of a large number of unemployedes depends in each country on the possibilities to stimulate economic agents in capital investments growth. In Romania, the economic crisis on long-term has generated a high unemployment with little prospect of reintegration of labor.
- Unemployment can be reduced by increasing investments so they rebalance the market of goods and services, but it is necessary for the fulfillment several conditions: increase their investment and creating new structures for this sector, rational rates, increasing incomes of economic agents and population.

BIBLIOGRAPHY


