

PHILLIPS CURVE CASE STUDY – ROMANIA

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***Abstract.** During modern history of economics, many have tried to find different models that are capable to emulate, and even predict various macroeconomic aspects. One of the most painful problems of the twentieth century, and probably for a long after, was control of unemployment in relation to inflation. Every country desires not to be unemployed, but at the same time, if possible, to achieve this without excessive costs. Alban W. Phillips did not tried to solve this, instead he tried to find the fundamental relationship between the two indicators, in order for governments to adjust theirs fiscal and monetary policies so they can achieve this goal.*

***Keywords:** unemployment rate, wage rate, inflation rate, trade-off, stagflation, the natural rate of unemployment, NAIRU.*

1. Introduction

One of the most painful problems of the twentieth century was control of unemployment in relation to inflation.

In order for governments to adjust their fiscal and monetary policies depending on the situation, a fundamental model was needed to be discovered.

A.W. Phillips was among others, who tried to solve this problem. He managed to find a relationship between inflation and unemployment, wide on the longrun would have been perfect for any government. Unfortunately his relationship was very much dependent on data, and more over, was not valid for any country studied.

Many economists after him tried to adjust this relationship but with very little success.

Within this paper a study case is offered, for Romania showing that, during 2007, such a relationship is possible.

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2. Generalized Phillips Curve

Alban William Phillips, an economist born in New Zealand, wrote a paper in 1958, entitled, *The Relationship between Unemployment and the Rate of Change of Money Wages in the United Kingdom 1861–1957*, which was published in the quarterly journal *Economica*.

In his paper, Phillips argues, using data series from U.K., that there is an inverse relationship between unemployment and wage rate cost roll. This relationship, according to Phillips, would hold both on long and short term. As time passed, however, other economists who were interested also in this phenomenon, have shown (empirically) that while there exists a relationship between the two components, it is unlikely to be the one that Phillips thought of.

The basic idea that stands behind the Phillips Curve is the relationship between wage growth rate and the size of unemployment. Thus, when wages increase rapidly, unemployment begins to reduce itself, and conversely, if unemployment increases wages remain constant for a short period of time, and then they begin to decline.

The line that joins representative points formed by change rate of wages (OY) and unemployment rate (OX) – is the Phillips Curve, which in fact represents the best approximation of the relationship between the two components [Best Fit] (Fig. 1).

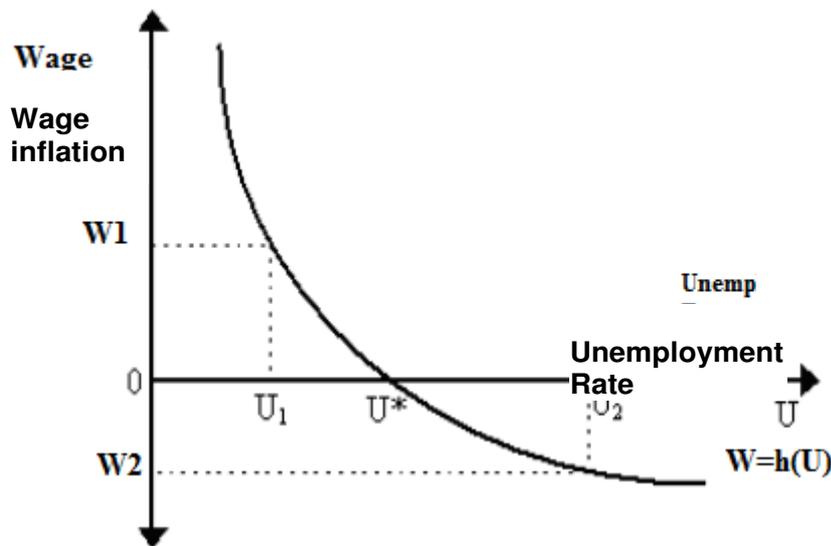


Figure 1. W function depending on unemployment rate, U.

The equation describing this relationship, based on empirical methods using data from 1861-1957, according to Phillips, is:

$$g_w + 0.9 = 9.64 U_t^{-1.39},$$

or:

$$\ln(g_w + 0.9) = \ln 9.64 - 1.39 \ln U_t$$

where g_w – is the rate of increase in nominal wages, U_t – is the level of unemployment.

In general, we set g_w as percentage rate of growth, and the relationship becomes:

$$g_w = g_w^T = f(U). \quad (1)$$

This equation suggests that the growth rate in nominal wages increases along a trend (as indicated by „ T “) and falls with the unemployment rate (U). This function is assumed increasing monotone along U , so that depreciation of nominal wages by unemployment rate, is suggested by the presence of the negative sign in the equation.

After several years, the publication of Phillips work was adapted by economists, replacing the rate of change of wages with the inflation rate. They established, also, the inverse relationship, which came to be so appreciated by the highly industrialized governments, allowing them to implement the necessary policies of control for both inflation and unemployment, along the Keynesian thinking school.

The tool at the basis of these changes, was that, when wages were changed (not necessarily increased), labor costs changed (usually, increasing). Even more, total costs changed, which draws an immediate change in prices, too (obviously, up). Along high prices inflation occurs. Thus, the link was created between inflation and unemployment.

Starting in 1970, the equation changed, introducing inflationary expectations (g_p^{ex} – expected inflation rate), transforming the Phillips Curve into a curve of expected wages:

$$g_w = g_w^T - f(U) + \lambda * g_p^{ex}; \quad (2)$$

λ (is considered constant during any period) represents the degree to which employees can receive an increase in their nominal wages, in order to keep up with the expected inflation. Usually this parameter is unitary in the long term.

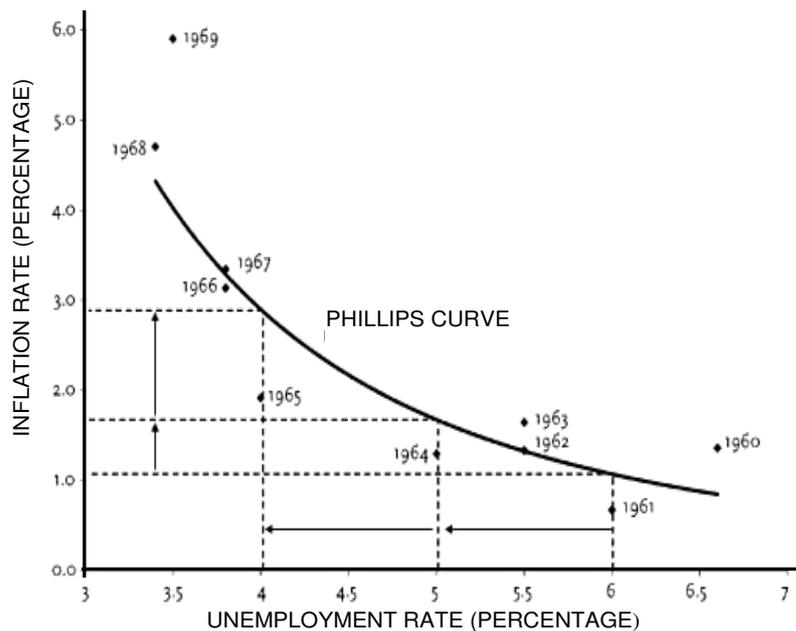


Figure 2. Phillips Curve.

Here is an example (Kevin D. Hoover – “Phillips Curve”), in order to understand the trade-off between inflation and unemployment. In the figure 2 a typical Phillips Curve derived from data, U.S.A. 1961-1969 is represented. The close correlation between the estimated curve and the empirical data pushed several economists to use the Phillips Curve as a guide for future policies. For example, for a given rate of unemployment of 6%, the government could stimulate the economy so as to obtain a value of 5%, at a cost of just over half a percentage point in inflation. If the government would want even lower rate of unemployment, the costs would suddenly become considerable: for a reduction in unemployment from 5% to 4%, that would imply an increase of more than double in the inflation rate – about 1 – 1¼ percentage points.

Between 1970-1980, U.S.A. experienced a time of crisis – the energy crisis. This fact led to an extremely unpleasant phenomenon both for U.S. and for other highly industrialized countries – that is, a strong shift in the supply curve, towards left, which meant that with higher inflation comes even higher unemployment rate (stagflation). Up to this moment, Phillips Curve only considered a motion in aggregate demand (always to its right), and the aggregate supply was neglected (it was considered almost always constant).

According to Phillips’ theory this should not have happened. This is the moment where economists started to contest Phillip, and governments

started to re-think the way policies were made – from interventionist policies to free market.

One of the contesters, Milton Friedman argued that if employees would be well informed and understand basic economic principles, then, they would negotiate their wages on a real basis not at a percentage one. This would further push the balance between supply and demand on the employment market; thus the unemployment could be maintained along a fixed line within the appreciation of real wages. Friedman along other economists have reached a conclusion: it was necessary to distinguish between various adaptations of Phillips' Curve – for long and short term.

A strong example of this is the LRAS¹ Curve. A graphical representation of long-term relationship between real output (out-put level) and price level, keeping all factors of influence for the aggregate supply, constant (*caeteris paribus*). The curve shows us, the lack of cause and effect between real output and price levels, at certain periods. First, with increasing prices, real output remains constant for maximum employment occupancy (full-employment), up to a certain point. Second, due to price flexibility, the same level of real output would be generated for any price level (i.e., constant prices). In other words, if the output would increase, we would not experience any changes in price levels (Fig. 3).

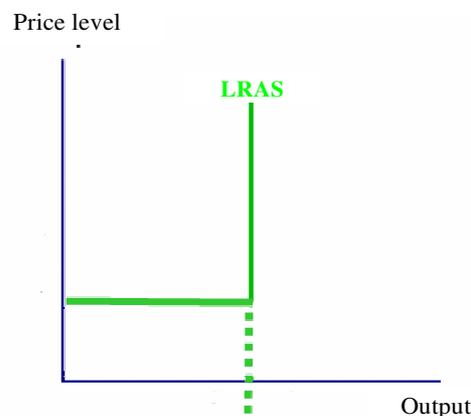


Figure 3. Long-Run Aggregate Supply Curve.

The influence of aggregate supply, will be almost nonexistent within the direct relationship to the price, until obtaining maximum production, after which, however, it will generate inflation (pay higher prices for the same amount of output) (Fig. 4).

¹ LRAS – Long-Run Aggregate Supply Curve

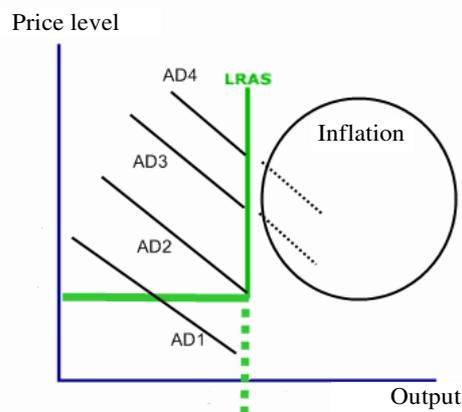


Figure 4. LRAS depending an aggregate demand.

In practice, we already know, that on the OY axis we measure price levels and on the OX axis the level of output. Thus, price levels are calculated using the GDP deflator², and the output through real GDP³.

Thus, various economists, like Friedman and Phillips, came to realize that on long term, always – on average – we will remain at a fixed level of unemployment (Fig. 5).

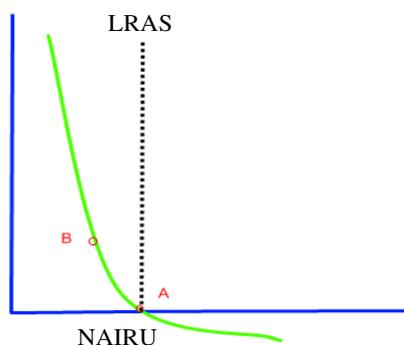


Figure 5. NAIURU – Representation.

That point, is represented in figure 5 – NAIURU –, and it stands for “Non Accelerating Inflation Rate of Unemployment”, that is, a rate of inflation which remains constant for a given rate of unemployment. The idea is that the actual rate of unemployment cannot fall below NAIURU, and

² Price index used to eliminate inflation out of GDP is the GDP deflator. This is a weighted average of prices for all goods included in GDP, the weight of each good is equal to the percentage of its importance in total GDP. $P = \text{nominal GDP} / \text{real GDP}$.

³ Real GDP eliminates price fluctuations within the nominal GDP and it represents GDP in constant prices.

that price levels will rise faster (accelerate) during favourable economic periods, when, naturally, the demand for labour is much higher.

The function f from (2), has been modified so it can contain NAIRU as well:

$$g_w = g_w^T - f(U - U^*) + \lambda * g_p^{ex} \quad (3)$$

where U^* represents NAIRU.

Thus, if $U < U^*$, inflation tends to accelerate; if $U > U^*$, inflation tends to slow down. We assume $f(0) = 0$, so, when $U = U^*$, f is no longer a part of the equation.

Within equation (3), the importance of g_w^T and g_p^{ex} seems small, but if λ is equal to one, this fact is no longer valid. If the rate of changing nominal wages is equal to zero then the fact that $U = U^*$ implies that g_w is equal with expected inflation. Thus real expected wages will remain constant.

In theory, NAIRU has some basic properties:

If U^* is NAIRU and U is the real value of actual unemployment, the theory will state the following:

- If $U < U^*$ for several years, the expected inflation will rise, thus inflation rate will accelerate;
- If $U > U^*$ for several years, the expected inflation may fall, thus the inflation rate will slow down (it can be disinflation);
- If $U = U^*$, inflation rate tends to remain constant, unless there is an exogenous shock.

3. The new form of Phillips' Curve

The equation behind the Phillips' Curve may derive from Lucas' aggregate supply functions (on short term). Rather than start from empirical data, Lucas began with a classical economic model, which follows basic economic principles.

Starting from the aggregate supply function:

$$Y = Y_n + a(P - P_e), \quad (4)$$

where Y represents the log value of actual output, Y_n is log value of the „natural” level of output, a is a positive constant, P is the log values of present price levels, and P_e is the log value of expected price levels. Lucas assumes that Y_n has an unique value.

We can rewrite the equation as:

$$P = P_e = \frac{Y - Y_n}{a} \quad (5)$$

then, we add some unexpected exogenous shocks upon the global reserves v .

$$P = P_e = \frac{Y - Y_n}{a} + v \quad (6)$$

if we subtract the level of prices from previous year P_{-1} , we get inflation rate.

We also have a negative relationship between output and unemployment (according to Okun's Law):

$$\frac{Y - Y_n}{a} = -b(U - U_n). \quad (7)$$

Where b is a positive constant, U is unemployment and U_n represent natural rate of unemployment (NAIRU). We reach, in the end at Phillips' Curve for short term:

$$\pi = \pi_e - b(U - U_n) + v.$$

4. Study Case for Romania

If we take data, on a monthly basis for 2007, we can observe that we almost have a Phillips Curve (Fig. 6).

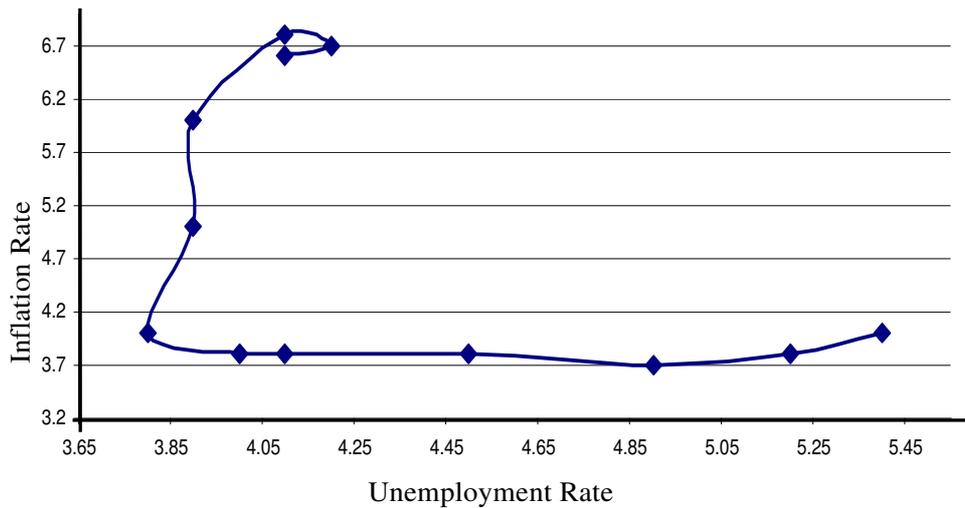
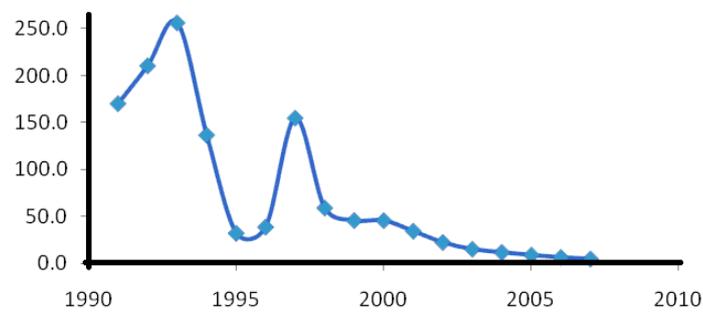


Figure 6. Phillips Curve, Romania 2007.

In Romania, after 1989, the inflation rate had an irregular evolution. During first years after the revolution (the communism was overthrown, democracy came in place), the values of inflation were way above 100%, reaching the level of 256% in 1993. Only from 1998 we can say that Romania had a normal evolution. The main reason for this stabilization was the desire of Romania to adhere to European Structures. Thus, the monetary and fiscal policies were changed for this purpose only; the final victory was registered during 2007 when Romania has finally reached a single number rate of inflation (9% – 2005). The last ten years, shows a close fight with inflation, getting from 59,1% rate in 1998 to 4,8% rate in 2007 (Fig. 7).



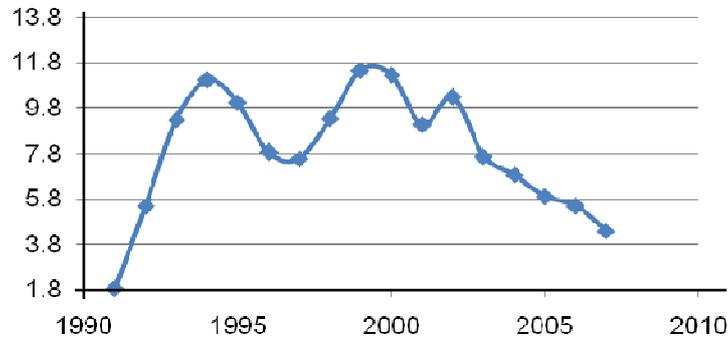
* The data were gathered from the NIS – Romania.

Figure 7. Yearly inflation rate in Romania.

Economists have agreed upon certain levels of inflation and unemployment as targets, thus for Europe they were set somewhere between under 4% for unemployment and inflation near 2-3%. The question remains, what will happen if inflation can be mentained at the desirable level, but unemployment rises above the 4% level.

The European Commission forecasted for 2009-2010 that recession will continue. The number of jobs will be reduce with at least 3,5 million reaching a 8,75% rate within EU and 9,25% within euro (exchange) zone. Inflation in 2009 was predicted by EU at 1,2%, as aginast 3,7% in 2008 and somewhere near 2% in 2010. This can only mean one thing: new methods for stimulation economy are mandatory. The first step was already made, when interested rates were lowered almost in all European countries. This should stimulate businesses, encourage credits, and last, investments. Along low interest rates, saving was the main target. The second step was made through fiscal policies. The governments can create themselves jobs, through increasing government expenditures.

For Romania, the facts are represented in figure 8.



* The data were gathered from the NIS – Romania.

Figure 8. Yearly unemployment rate in Romania.

Using Eviews program, one can see the following two line-unemployment rate in blue, inflation rate in red – the period considered was January 2006, Decembre 2008, monthly data (Fig. 9).

We can almost see the trade-off between the two components, somewhere at the end of 2006 and the beginning of 2007.

Along the drop in unemployment from 6% to 4%, the inflation rate grew from 4% to 7%, and continued over the 2008 period, up to 9%. This movement seems to suffer from lag, at almost 2 quarters of a year. This is almost natural for a country like Romania, where fiscal policies are changed on a yearly basis, and coherence and consistency of these measures can often be questioned. The only type of policy, which remains constant, is the monetary one, where National Bank of Romania has, still, some degree of freedom.

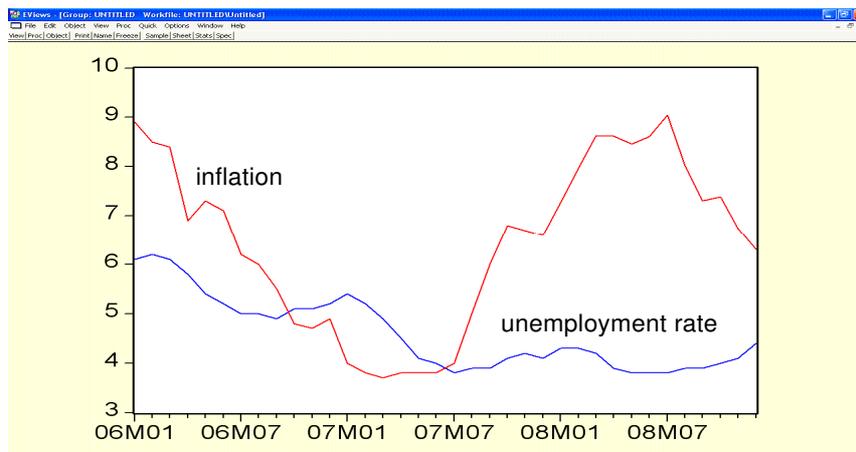


Figure 9. Unemployment rate and inflation representations.

5. Conclusions

In practice, in order to study Phillips Curve, one needs many data, preferably on a year basis, not monthly or quarterly – these can provide mix information, or even worse and no Phillips Curve will be present. This alone, unfortunately, will not guarantee, the presence of Phillips Curve, but this should not stop us. Where there might not be an inverse relationship, exactly as Phillips presented, one may find other types of relationship. The only real fact that remains is, at some level, inflation and unemployment go together.

Further study will be made in future papers, with the main goal to find specific parameters for Romania, and perhaps for other countries.

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