Marichka Natalia
*Bachelor student, LNU*
Kozytskyi Valerii
*Associate Professor, LNU*

# SYSTEM DYNAMIC MODELING OF INFLATION AND UNEMPLOYMENT

The English economist Alban Phillips developed a model that determined the reverse relationship between changes in wage rates and unemployment. Since then, this curve in economic theory is called the Phillips curve. The theory states that inflation causes some income growth, which, in turn, should lead to an increase in the number of jobs and reducing unemployment. The Phillips curve is a useful way to express aggregate supply because inflation and unemployment are such important measures of economic performance.

A lot of disputes about inflation start with the Phillips curve and my reflections are not a special case. We are going to focus on such features that are principal for the changing of inflation and unemployment. Talking about Phillips curve, two basic instructions are singled out: the original one, which links inflation to unemployment, and the expectations-augmented Phillips curve, which links inflation to unemployment and expected inflation.

Modeling inflation in the context of the macroeconomic model, it is usually accepted to design a model as linear in logarithms, except for inflation and interest rates. All variables in logarithms are denoted by lowercase letters.

***Table 1. Macroeconomic model of inflation***

| Goods market | Definitions of variables |
|---|---|
| c=a+b1-txy | y = real income |
| i=i0-h(r-e) | c = real consumption |
| y=c+i+g | i = real investment |
| | g =real government spending |
| | e = expected inflation |
| **Money market** | |
| md=ky-ur | r = nominal interest rate |
| ms=m-p | md = real money demand |
| md=ms | ms = real money supply |
| | m = nominal money stock |
| | p= price level |

The equilibrium condition is maintained and real income equals the sum of real expenditure. Paying attention to the money market, the money demand equation is not changed. Although there is an exception to its interpretation as real money demand which is positively connected to real income and negatively connected to the nominal interest rate. Therefore *ms=ln MP=ln M -ln P=m-p*

Inflation should be equal to zero to see how this model works. The assumption can be made only about actual inflation in the long run and then it will equal expected inflation. To see whether the long-run result of this model satisfies this condition, we make the following calculations:

$$y(t) = 9 + 0.2(m - p(t)),$$
$$\pi(t+1) = p(t+1) - p(t) = 1.2(y(t) - y_n),$$
$$m = 5\, y_n = 6.$$

As the price is defined in logarithms, we get a recursive linear equation for the

$$p(t+1) = p(t) + 1.2(y(t) - 6) = p(t) + 1.2(9 + 0.2(5 - p(t)) - 6),$$
$$p(t+1) = 4.8 + 0.76p(t),$$

setting $p(t+1) = p(t) = p^*$, which leads to an equilibrium price of

$$p^* = 20, \quad \pi^* = 0.$$

price level

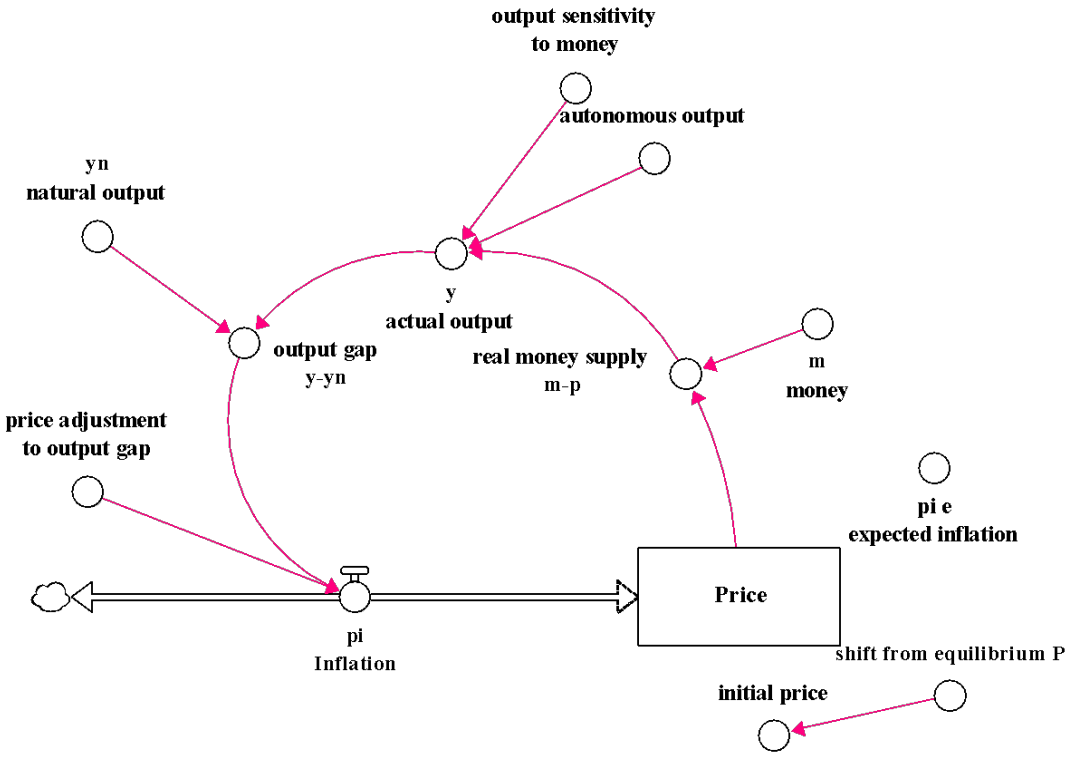


***Figure 1. System Dynamic Model of Phillips Curve***

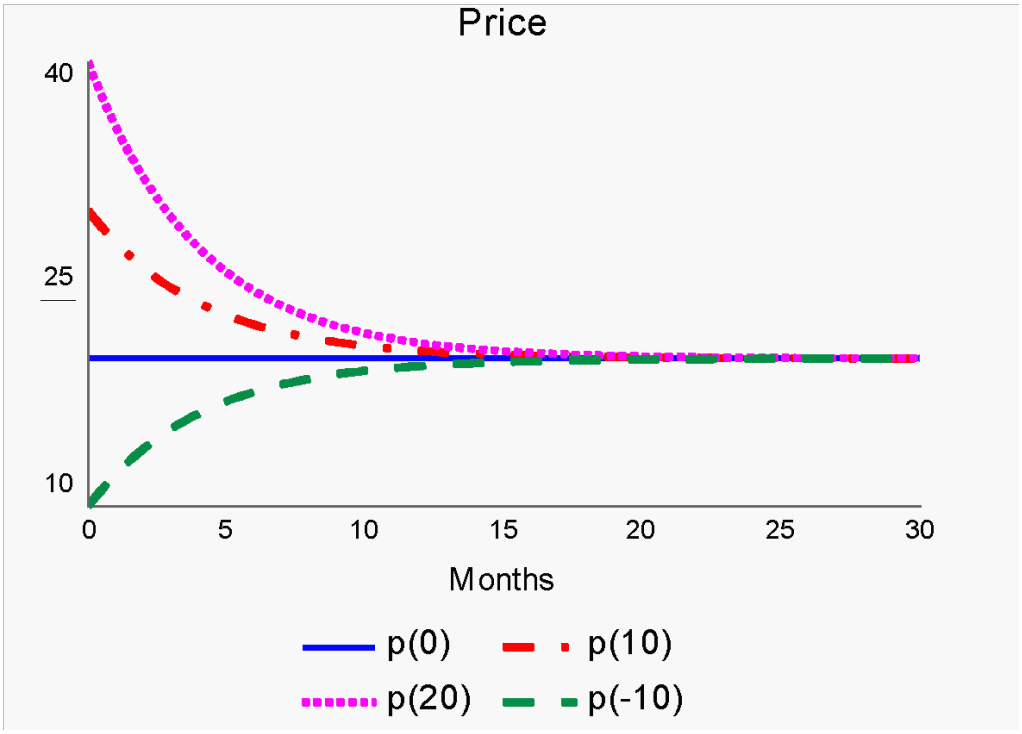


***Figure 2. Dynamic of Price***

Based on Fig. 2, the following conclusions can be drawn. If the price is higher than the equilibrium at the beginning, then it decreases and, of course, vice versa. No matter what deviation to equilibrium is, we come to equilibrium in ten periods.
Inflation constantly falls and still reaches zero, which is exact to the expected rate of inflation. The price level remains in equilibrium at the value p*=20 only if actual and expected inflation will be zero

## *References*

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