

Vashchyents Daniel
Bachelor Student, LNU
 Kyrlych Volodymyr
Professor, LNU

SYSTEM DYNAMIC MODELING OF EXPECTED INFLATION AND OUTPUT BEHAVIOR

The Phillips curve illustrates the relationship between inflation and unemployment in the economy. This model shows that when unemployment is low, inflation tends to be higher, while when unemployment is high, inflation tends to be lower. These two interconnected indicators create a curve that demonstrates the trade-off between these two factors.

The Phillips curve can be seen as an indicator of how changes in the level of unemployment lead to changes in the level of inflation in the economy, or as the reason for the shifting of this curve. Both approaches to understanding the model are interchangeable and show how high unemployment can affect the level of inflation, and vice versa.

The Phillips curve demonstrates how the economy responds to changes in the level of unemployment and affects the level of inflation. This interaction between unemployment and inflation can be represented as a curve indicating the tendencies of changes in these two indicators in the economy.

$$y(t + 1) = k(\lambda - \pi(t)) + p\pi^e(t + 1) \quad k > 0, \quad p > 0$$

$$\pi(t) = \xi(\lambda(t) - y_n) - \pi^e(t) \quad \xi > 0$$

$$\Delta \pi^e(t + 1) = \tau(\pi(t) - \pi^e(t)) \quad \tau > 0$$

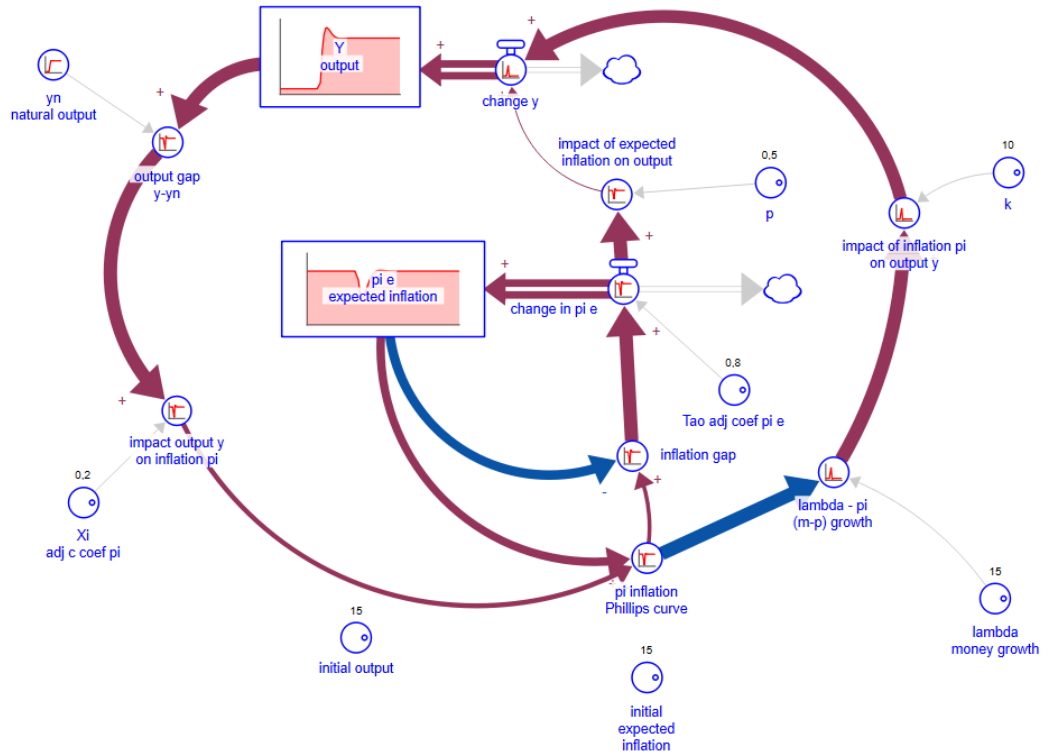


Figure 1. System Dynamic Inflation –Unemployment Model

Let’s analyze what will happen to the expected inflation and output in the event of changes in the inflation and output.

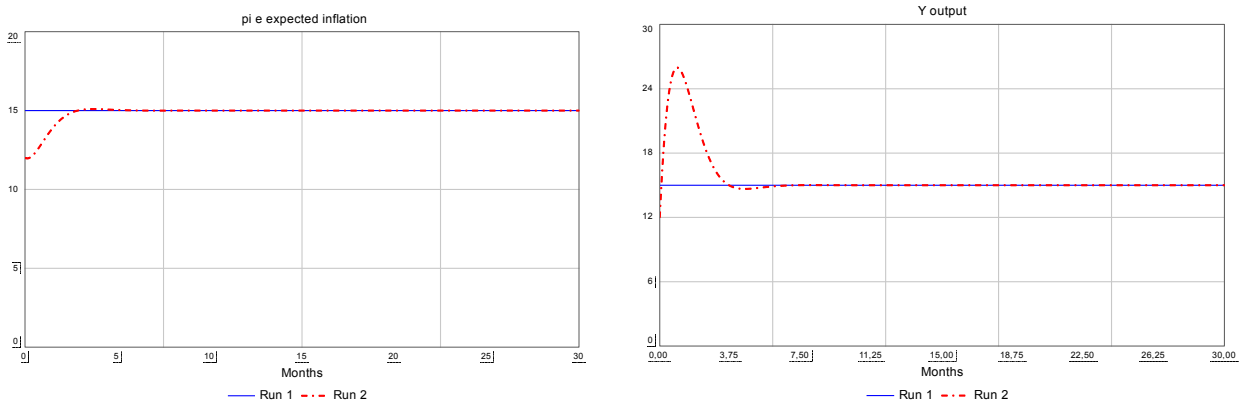


Figure 2. Scenario 1 – change in initial levels of expected inflation and output

Clearly, inflation surged rapidly, and the output level experienced a significant spike. However, over time, both metrics returned to their previous levels. In case x, the initial values will be 35 for the output level and 7 for inflation.

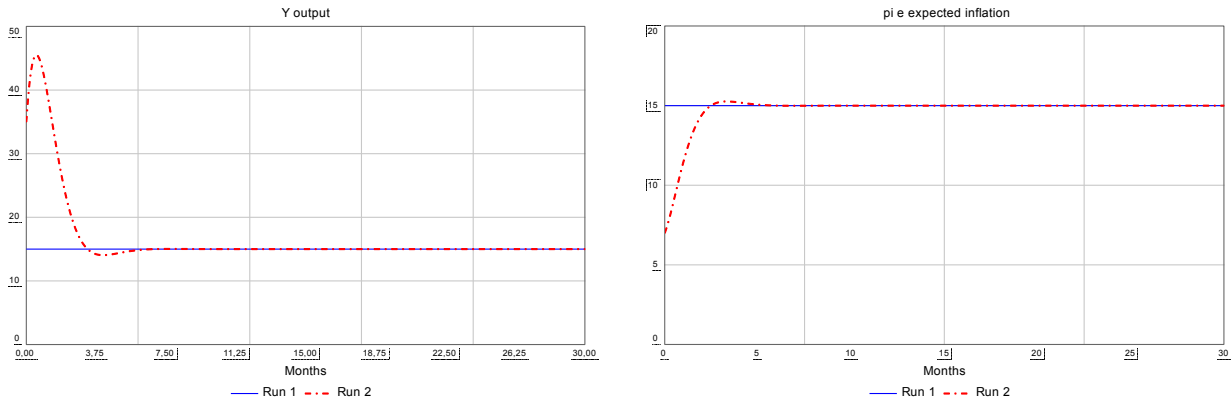


Figure 3. Scenario 2 – change in initial levels of expected inflation and output

Inflation undergoes a stabilization period, decreasing from 15 to 3 over three months, while output surges to 45 within 0.6 months, then returns to a stable state.

For the third case, it's established that the natural output level by the 10th month will be 135, the initiated output level will be 25, and the inflation rate will be 7.

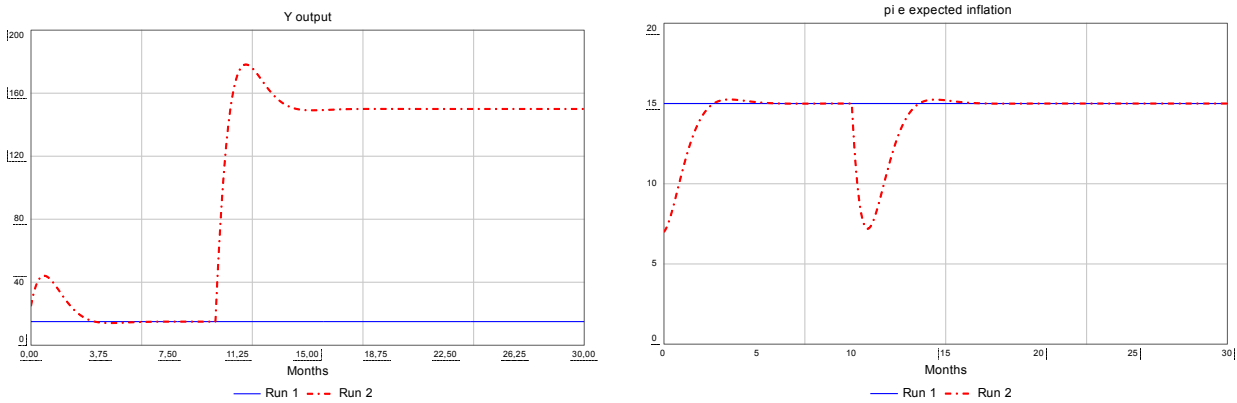


Figure 4. Scenario 3 – change in initial levels of expected inflation and output

Here, the output undergoes changes but eventually settles back to stability, as seen in previous cases. However, after adjustments in the natural output level, the output experiences rapid shifts, altering its stable level. On the other hand, inflation encounters short-term fluctuations, yet its stable level remains unchanged.

From all these investigations, it appears that inflation consistently converges to one level, regardless of the initial levels of output. However, the stable output level depends on the natural output level.

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