

The Phillips curve

The economy in the medium run

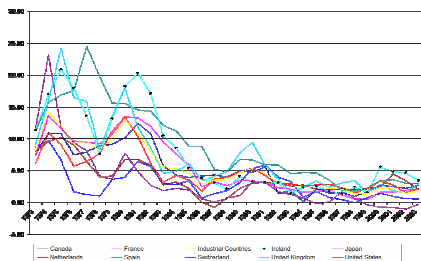
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Preliminary remarks

- The AS-AD model provides for an adequate construction to explain fluctuations in economic activity around a long-run trend. It also allows for an analysis of possible policy responses to various types of shocks.
- However, it is limited in the sense that inflation is always zero, except during the process of adjustment of the economy in the medium run.
- Empirically, inflation is almost always strictly positive.

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Inflation rates



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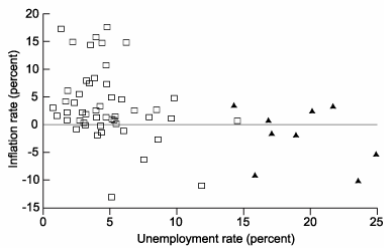
The Phillips curve

- The Phillips curve is a negative statistical relationship between inflation and unemployment.
- Early evidence for the UK (Phillips), and for the United States (Samuelson and Solow).
- When unemployment is low, inflation is high. When unemployment is high, inflation is low.

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The Phillips curve



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The aggregate supply curve

- The aggregate supply relation can be rewritten in terms of inflation:

$$P = P^e (1 + \mu) F(u, z)$$

$$P_t = P_t^e (1 + \mu)(1 - \alpha u_t + z)$$

$$\pi_t = \pi_t^e + (\mu + z) - \alpha u_t$$

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Interpretation

- When prices are expected to rise faster, workers ask for higher wage compensation and prices will increase faster as a result. Higher expected inflation leads to higher actual inflation.
- Higher values of μ and z lead to higher inflation.
- A higher level of unemployment leads to lower wages and slower price variations, so inflation is lower.

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The original Phillips curve

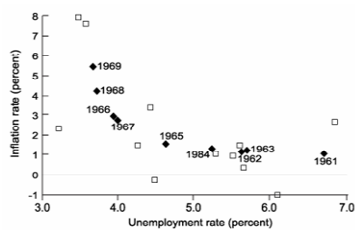
- Suppose that workers expect that inflation will be roughly zero on average over time. Then the Phillips curve is given by

$$\pi_t = (\mu + z) - \alpha u_t$$

- Lower unemployment increase the bargaining power of workers, leading to higher nominal wages and higher prices. This mechanism develops into a wage-price spiral!

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The early Phillips curve



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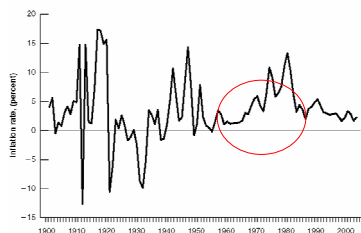
The modified Phillips curve

- The Phillips curve breaks down in the 1970s. There is no apparent relation between inflation and unemployment anymore!
- Oil shocks.
- A change in the behaviour of inflation (positive and persistent) changes the way in which inflation expectations are formed. Economic agents do not make systematic mistakes.

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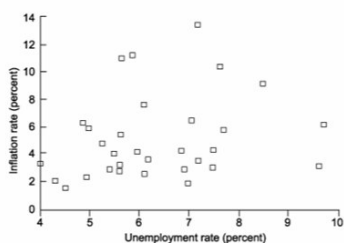
The behaviour of inflation



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The modified Phillips curve



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The modified Phillips curve

- When inflation became consistently positive and persistent, people changed the way they made expectations.
- One way to model such a change in the formation of expectations:

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

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The modified Phillips curve

- As long as inflation remains close to zero on average, workers will ignore past inflation and $\theta = 0$. So, expected inflation was zero and the Phillips curve was written as

$$\pi_t = (\mu + z) - \alpha u_t$$

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The modified Phillips curve

- When workers changed the formation of expectations, then $\theta = 1$. In this case,

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

- The modified Phillips curve becomes

$$\pi_t = \pi_{t-1} + (\mu + z) - \alpha u_t$$

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The modified Phillips curve

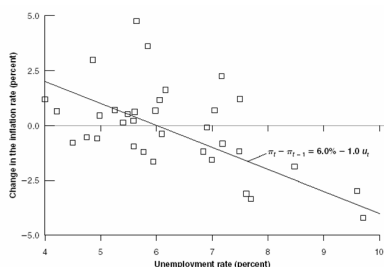
- The modified Phillips curve provides a relation between changes in the rate of inflation and the rate of unemployment. Hence,

$$\pi_t - \pi_{t-1} = (\mu + z) - \alpha u_t$$

- High unemployment leads to decreasing inflation, low unemployment leads to increasing inflation.

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The modified Phillips curve



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The natural rate of unemployment revisited

- By definition, the natural rate of unemployment is the rate of unemployment such that the actual price level and the expected price level are equal, or such that the inflation rate equals the expected rate of inflation:

$$\pi_t - \pi_t^e = 0 = (\mu + z) - \alpha u_n \Rightarrow u_n = \frac{\mu + z}{\alpha}$$

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The natural rate of unemployment revisited

- The Phillips curve can be written as

$$\pi_t - \pi_t^e = -\alpha \left(u_t - \frac{\mu + z}{\alpha} \right)$$

$$\pi_t - \pi_{t-1} = -\alpha (u_t - u_n)$$

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The natural rate of unemployment revisited

- This equation provides a relation between inflation, the rate of unemployment, and the natural rate of unemployment.
- The natural rate of unemployment is the rate of unemployment required to keep inflation constant. It is sometimes called the NonAccelerating Inflation Rate of Unemployment (NAIRU).

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Further issues

- Graphical determination of u_n ?
- Differences across countries.
- Differences over time.
- Wage indexation.

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