3 The monetary policy strategy of the ECB

The economic analysis pillar

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Outline

The New Keynesian model

The economic analysis aims at assessing short to medium-run risks to price stability. One way to illustrate this is to use the so called New Keynesian Model. Following Woodford (2008), one can specify this model using three equations:

1. Aggregate supply - Phillips curve

$$\pi_t - \pi_t^\star = \lambda(lnY_t - lnY_t^n) + \beta E_t[\pi_{t+1} - \pi_{t+1}^\star] + v_t$$

2. Aggregate expenditure (Intertemporal IS relation)

$$(lnY_t - lnY_t^n) = E_t[(lnY_{t+1} - lnY_{t+1}^n] - \sigma[i - E_t\pi_{t+1} - r_t^\star]$$

3. A monetary policy rule (for instance the Taylor rule):

$$i_t = r_t^\star + \pi_t^\star + \phi_\pi(\pi_t - \pi_t^\star) + \phi_y(lnY_t - lnY_t^n)$$

Illustrating risks to price stability using the Phillips curve

One can use the Phillips curve to illustrate risks to price stability derived from various sources:

1. **Demand pull inflation** - a higher output gap ($lnY_t - lnY_t^n$) or lower cyclical unemployment($u_t - u_t^n$) drive inflation up.
2. **Cost-push inflation** - an adverse supply shock v_t may influence inflation up (e.g. oil price shock)
3. **Expectations** - changes in expectations both regarding future inflation or the inflation target can influence inflation ($E_t[\pi_{t+1} - \pi^{\star}_{t+1}]$)

An illustration of the economic analysis pillar

In the New keynesian framework there are several components that are important

- The output or unemployment gap
- Expectations and the inflation target
- The natural rate of interest (r_t^{star})

The output gap

The **output gap** represents the percentage difference between actual output (i.e. real GDP in the national accounts) and potential output.

- Output gap$>$0 -production is higher than what is sustainable in the medium to long-run. It is a sign of an overheating economy (inflationary pressures / asset price booms)
- Output gap$<$0 - economy is not using fully all its resources or is using them inefficiently. Typical of recession periods.

Definition of potential output

- Potential output is the **level** of production in the economy that can be **sustained** in the medium to long run **given current production possibilities**
- The production possibilities are defined by the current state of **technology** and the economy's level of production factors, namely **labour** and **capital**

Estimating potential output

Potential output can be estimated using different approaches:

1. Production function approach
2. Univariate methods
3. Multivariate methods

1. Production function

- This approach implies the specification of a function relating output to technology and factor inputs.
- A commonly used function is the Cobb-Douglas one:

$$Y_t = A_t K_t^{(1-\alpha)} L_t^{\alpha} \qquad 0 < \alpha < 1$$

where

Y_t = potential output

A_t = trend in total factor productivity

K_t = stock of capital

L_t = trend component of labour supply

α = elasticity of labour with regard to output.

1. Production function

Advantages:

- Close adherence to the theoretical concept
- Allows for forecasts of potential output to be made

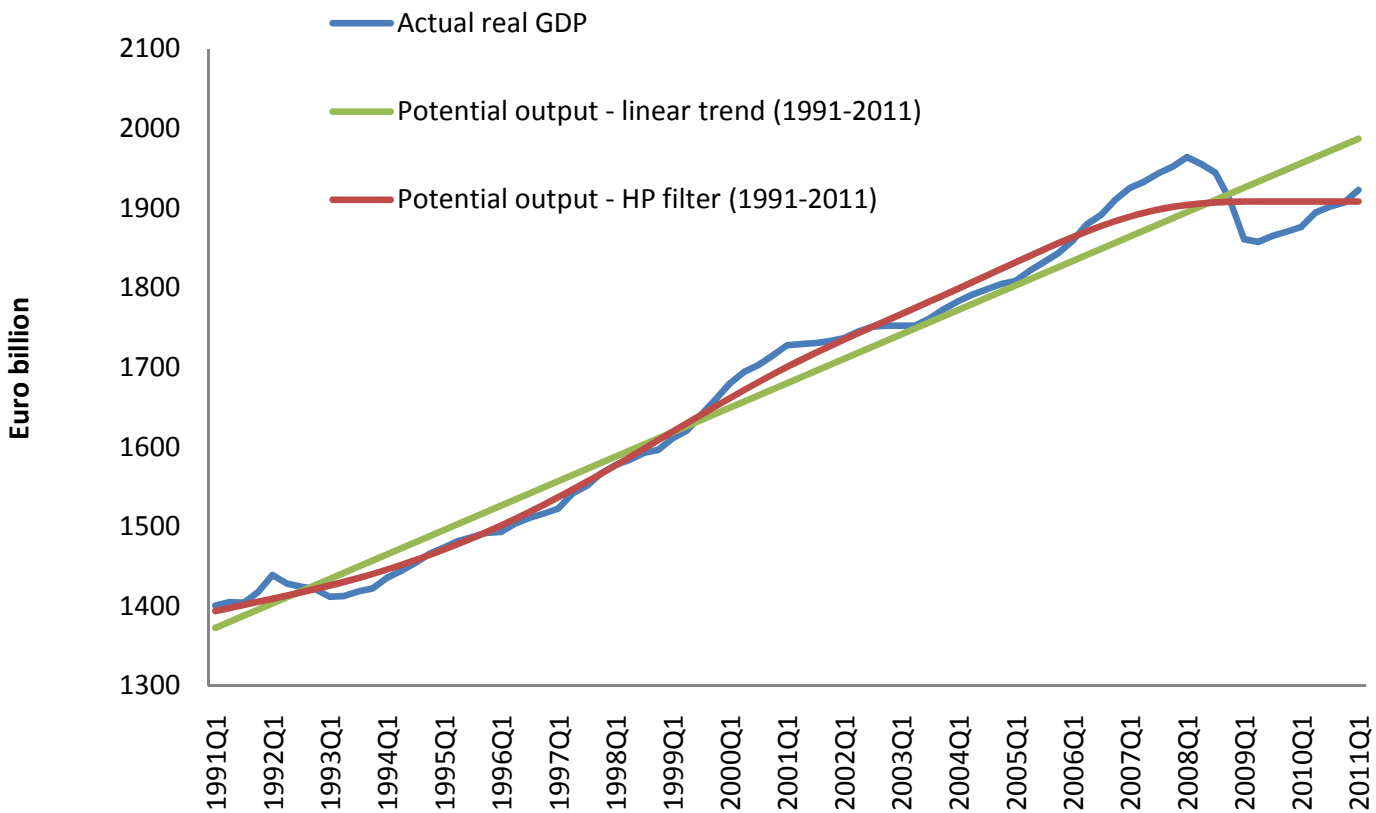
Disadvantages:

- Data problems - difficult to have good data on capital stock and even labour inputs
- It is hard to model technological progress
- α is supposed to be a constant structural parameter but in practice may change over time

2. Univariate methods

- Potential output is estimated by fitting a trend or a smooth function through the series.
  - Simplest approach: linear trend
  - Commonly used method: Hodrick-Prescott (HP) filter
- **Advantages:** simplicity, commonly used (HP)
- **Disadvantages:** discards too much information; theoretically unappealing; unstable over time

Estimates of euro area potential GDP using univariate methods (quarterly data)



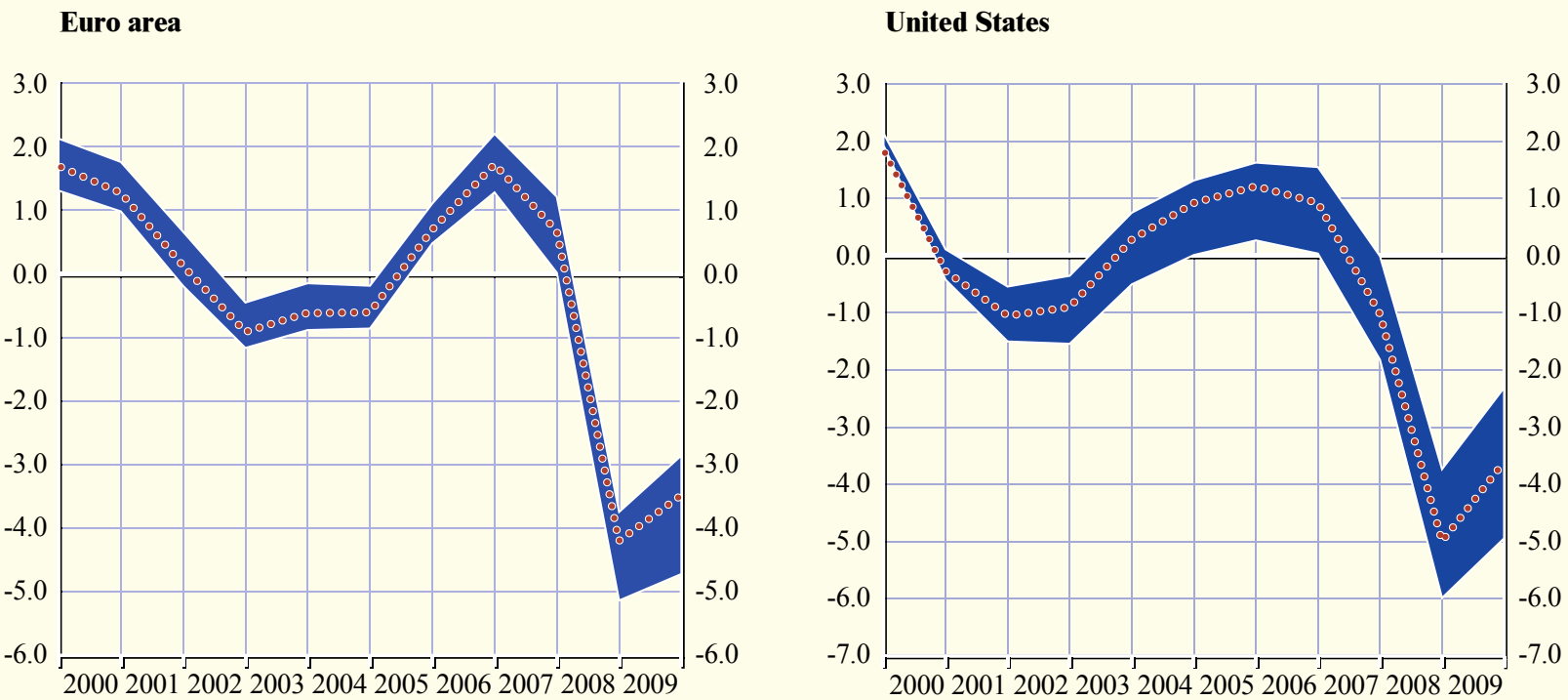
3. Multivariate methods

- The trend of GDP is derived from a model containing GDP and a number of other variables
- Commonly used variables are:
  - inflation
  - unemployment
  - survey data on capacity utilization in the manufacturing sector
- **Advantages** - takes into account potentially all relevant information
- **Disadvantages** - models may become complex as the number of variables included increases

Chart 4 Range of estimates of the output gap in the euro area and the United States

(as a percentage of GDP)

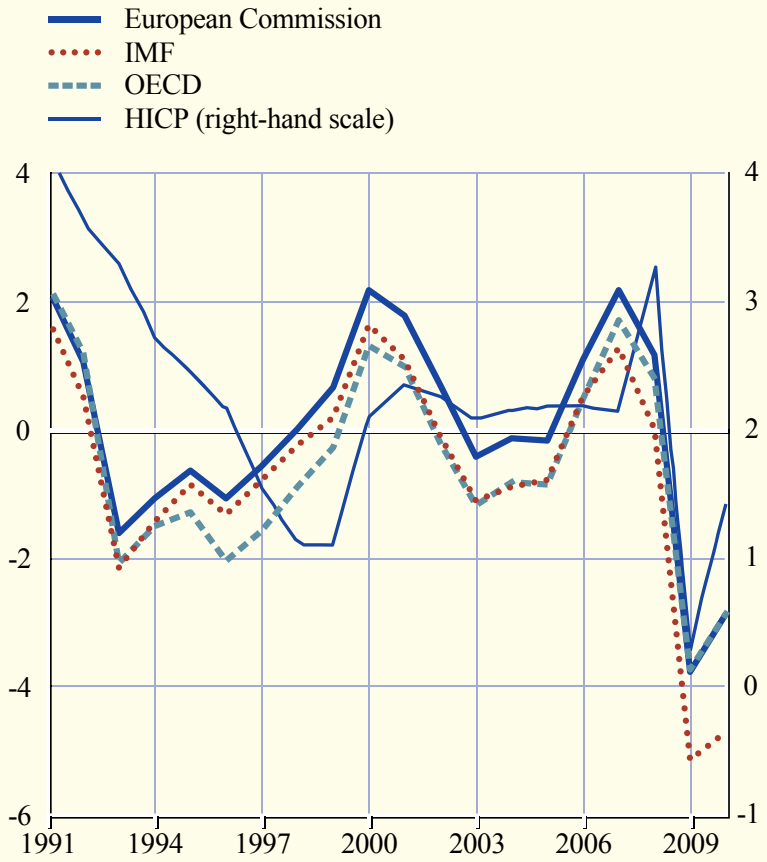
••••• average over the OECD, IMF and Commission estimates



Sources: *Economic Outlook*, OECD, December 2010; *World Economic Outlook*, IMF, October 2010; European Commission, AMECO database, autumn 2010.

Chart 5 Selected measures of the euro area output gap and annual overall HICP inflation

(annual percentage changes; percentage of GDP)



Sources: European Commission, IMF, OECD and Eurostat.
Notes: Values of all variables except the annual rate of change of the HICP are shown on the left-hand scale. Estimates of output gaps in 2010 and 2011 are projections. Data for HICP excluding energy and food in 2010 are based on available monthly observations.

The IS curve and the transmission of monetary policy

In order for policy to be effective the IS curve should be stable over time and the central bank should be able to influence the output gap ($\sigma \geq 0$). Notice that expectations are key to influencing the output gap with monetary policy:

$$(lnY_t - lnY_t^n) = E_t[(lnY_{t+1} - lnY_{t+1}^n] - \sigma[i - E_t\pi_{t+1} - r_t^\star]$$

The situation is complicated because expectations are determined in the system as a whole (there are interactions with the Phillips curve and the Taylor rule).

Economic analysis - an illustration with the Taylor rule

The Taylor rule is often used to illustrate the economic analysis pillar. Note however that:

- The ECB **does not** follow any Taylor rule in deciding policy
- The Taylor rule is at most an **indicator**
- The ECB follows the **two-pillar strategy**

The original Taylor rule

The original Taylor rule was put forward by John Taylor [1] for the US. He just noticed that in setting rates the Fed just followed the rule:

$$r_t = r^\star + 0.5(\pi_t - \pi^\star) + 0.5(y_t - y^\star) \quad (1)$$

where

- r_t - real interest rate
- $r^\star$ - equilibrium real rate
- π - inflation
- $\pi^\star$ - target inflation rate
- y - real GDP
- $y^\star$ - potential real GDP

[1] Taylor, J.B., 1993, Discretion versus Policy Rules in Practice, Carnegie-Rochester Conference Series on Public Policy, 39,195-214.

The original Taylor rule

It is more natural to show the Taylor rule in terms of the nominal interest rate (i_t) To arrive at this we use the Fisher relation (ex-post form):

$$i_t = r_t + \pi_t \Leftrightarrow r_t = i_t - \pi_t \tag{2}$$

Replacing this in equation (1) we obtain the common Taylor rule form:

$$i_t = i^\star + 1.5(\pi_t - \pi^\star) + 0.5(y_t - y^\star) \tag{3}$$

where $i^\star$ is the nominal equilibrium interest rate.

Some comments on the Taylor rule

- The presence of the **output gap** serves two purposes:
  - Is consistent with the goal of minimizing output fluctuations in addition to price stability (this is **not** in line with ECB's view)
  - The output gap is an indicator of **future inflationary pressures**
- The coefficient on π is greater than 1 (often imprecisely called the "*Taylor principle*")
- The nominal equilibrium interest rate is the sum of the equilibrium real rate and the inflation target
- One estimate of the equilibrium real rate is the historical average of real rates

Taylor rule for the euro area - example

Figure: $i^{\star} = 4, \pi^{\star} = 1.9$