Output gap and financial cycles

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Concepts
- Financial cycles and their role in the analysis of business cycles
- Potential output and output gap

Measurement
- Production Function approach
- Hodrick-Prescott filter
- Finance-neutral measure

Analysis
- Estimates precision
- Real-time robustness
- Informing fiscal policy
- Informing monetary policy

Financial cycles - concept

- Interactions between perceptions of value and risk, attitude towards risk and financial constraints

- Best described by credit and property prices

- Lower frequency than business cycles

- Financial cycles amplify business cycles

Role in analyzing business cycles

- Financial booms may coincide with positive shocks on the supply side

- Economic expansions my weaken supply constraints

- Financial booms – accompanied by currency appreciation

- Misleading nature of unsustainable booms

Potential GDP – concept

- Sustainable level of GDP – full utilization of input factors

- Output gap – deviation of GDP from its potential level

- Unobservable indicators

Potential GDP - measurement

- Univariate statistical methods:
  - Hodrick-Prescott filter (1997)
  - Beveridge-Nelson decomposition (1981)
  - Unobserved components models (UC) (Watson 1986)
  - band pass filter (Baxter si King, 1999)
- Multivariate statistical methods:
  - Multivariate HP filter
  - Multivariate UC models
- Structural approaches:
  - Production function approach
  - DSGE models

Potential output – measurement approaches

> Production Function approach

> HP Filter

> Finance-neutral measure

Production function approach

- Cobb-Douglas production function

$$Y = TFP * L^{\alpha} * K^{1-\alpha} \qquad (1)$$

- Where:
  - Y   GDP level
  - TFP   total factor productivity
  - L   labor input
  - K   capital stock

Output gap – deviation of actual output from potential:

$$y - \bar{y} = \left(tfp - \overline{tfp}\right) + \propto * \left(l - \bar{l}\right) \qquad (2)$$

Capital stock

- Computed using the Perpetual Inventory Method

$$K_t = K_{t-1} * (1 - \delta) + I_t = K_0 * (1 - \delta)^t + \sum_{j=1}^{t} I_j * (1 - \delta)^{t-j} \quad (3)$$

- The equation can also be written with quarterly data:

$$K_t^Q = K_{t-1}^Q * \left(1 - \delta_Q\right) + I_t^Q \qquad (4)$$

Labor input

- $$\bar{L} = N * (1 - NAIRU) * \bar{H} \qquad (5)$$

Where:

$\bar{L}$ - potential labor

N - active population

NAIRU - non-accelerating inflation rate of unemployment

$\bar{H}$ - potential level of hours worked weekly

Total factor productivity

- Potential output – the level of output that could be obtained with a normal level of efficiency of the input factors

- Solow residuals, computed as follows:

$$tfp_t = \ln(Y_t) - [\alpha \ln(L_t) + (1 - \alpha) \ln(K_t)] \quad (6)$$

Results – Production Function approach

Potential GDP
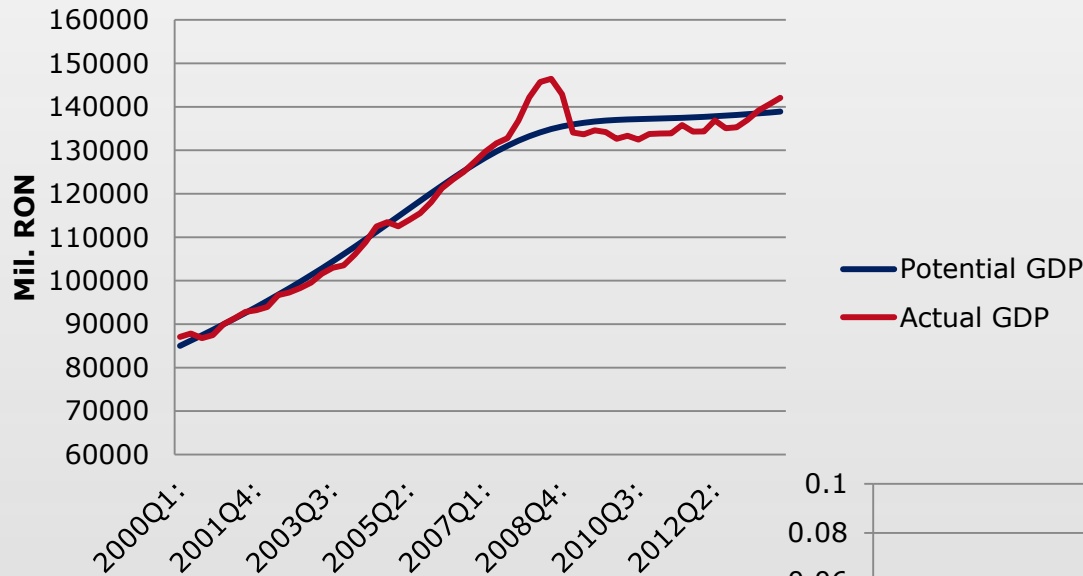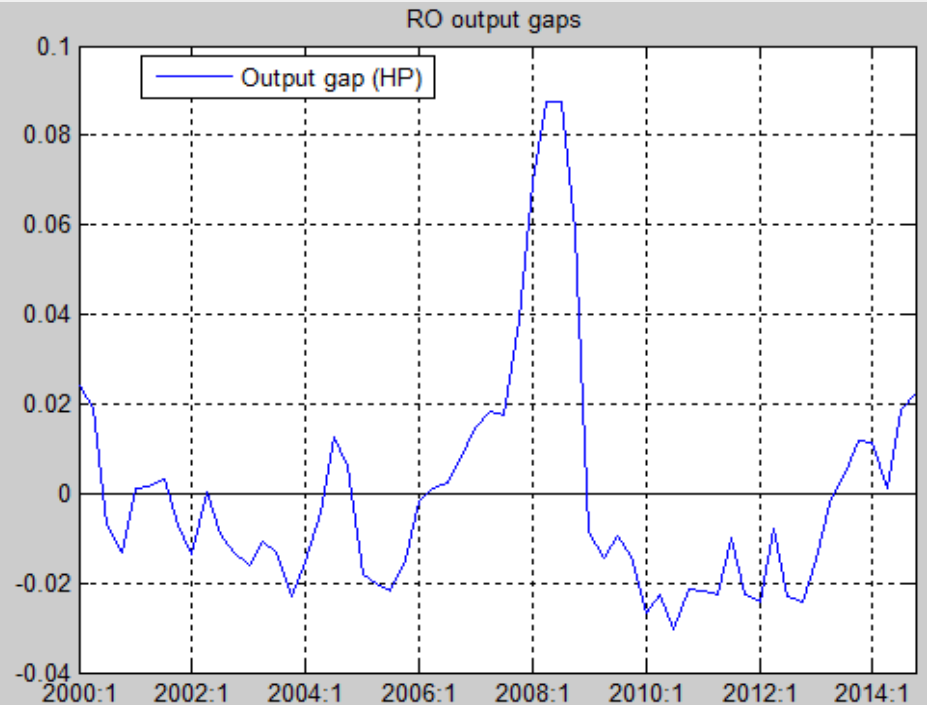

Output Gap
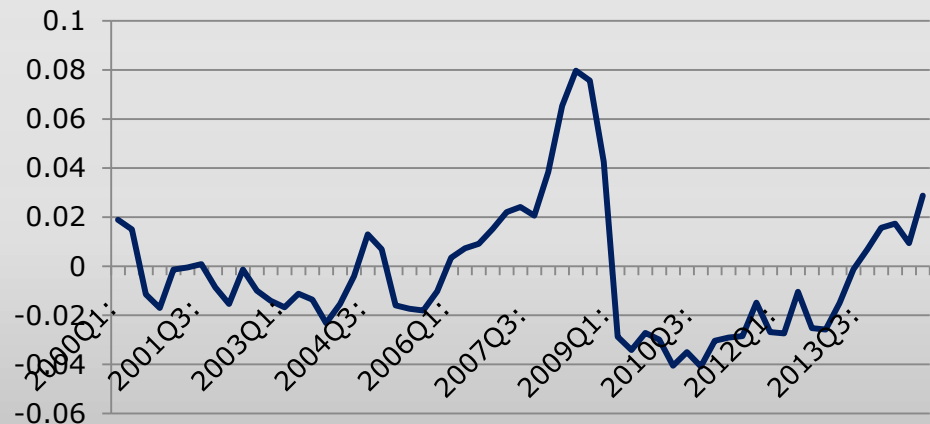
Hodrick-Prescott filter

- Statistical method:
  - Simplicity
  - Flexibility

- Minimization of the following function:

$$\text{Min} \sum_{i=0}^{T}(y_t - y_t^*)^2 + \lambda \sum_{i=2}^{T-1}[(y_{t+1}^* - y_t^*) - (y_t^* - y_{t-1}^*)]^2 \quad (7)$$

Results – HP filter
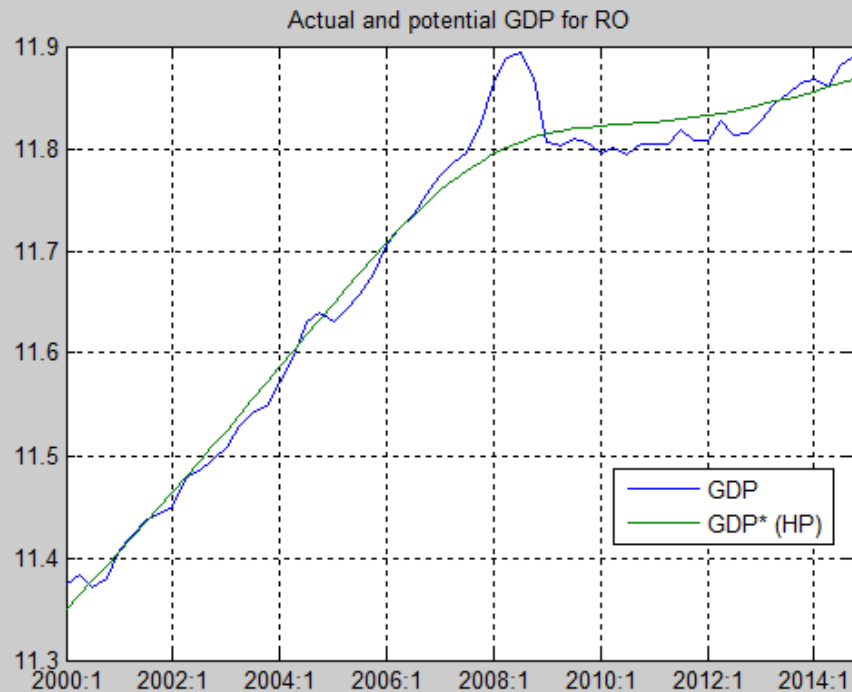
Potential output

Output gap

Finance-neutral method

- Methodology:

  ◦ State equation:
  $$\Delta y_t^* = \Delta y_{t-1}^* + \varepsilon_{0,t} \qquad (8)$$

  ◦ Measurement equation:
  $$y_t = y_t^* + \varepsilon_{1,t} \qquad (9)$$

  ◦ Incorporating financial information
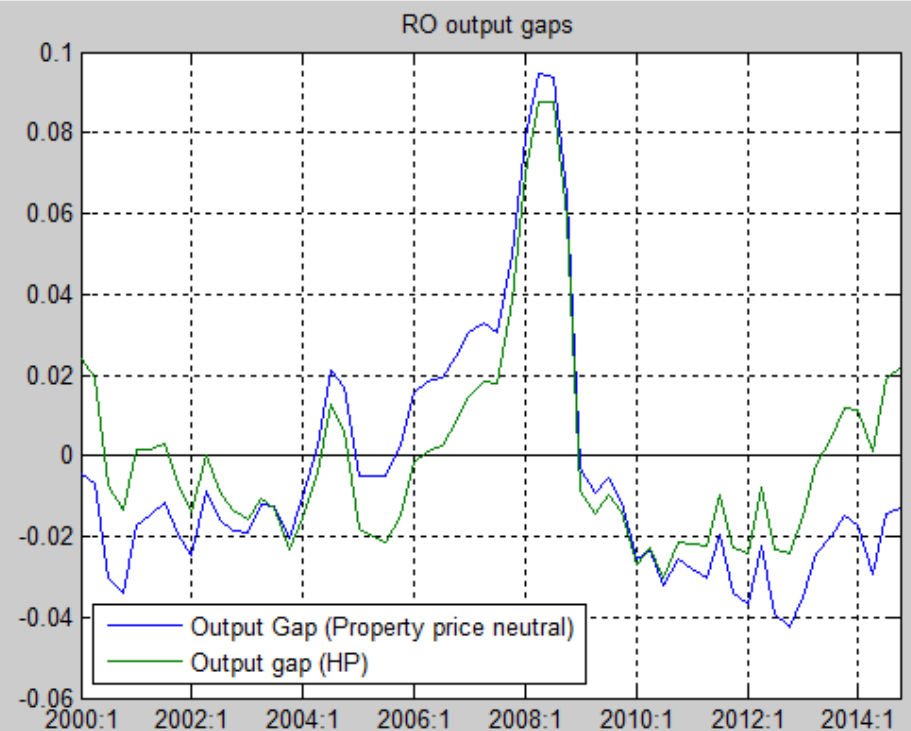 $$y_t - y_t^* = \gamma' * x_t + \varepsilon_{2,t} \qquad (10)$$

$$y_t - y_t^* = \beta * (y_{t-1} - y_{t-1}^*) + \gamma_1 * \Delta cr_{t-kcr} + \gamma_2 * \Delta ph_{t-kph} + \varepsilon_{3,t}$$
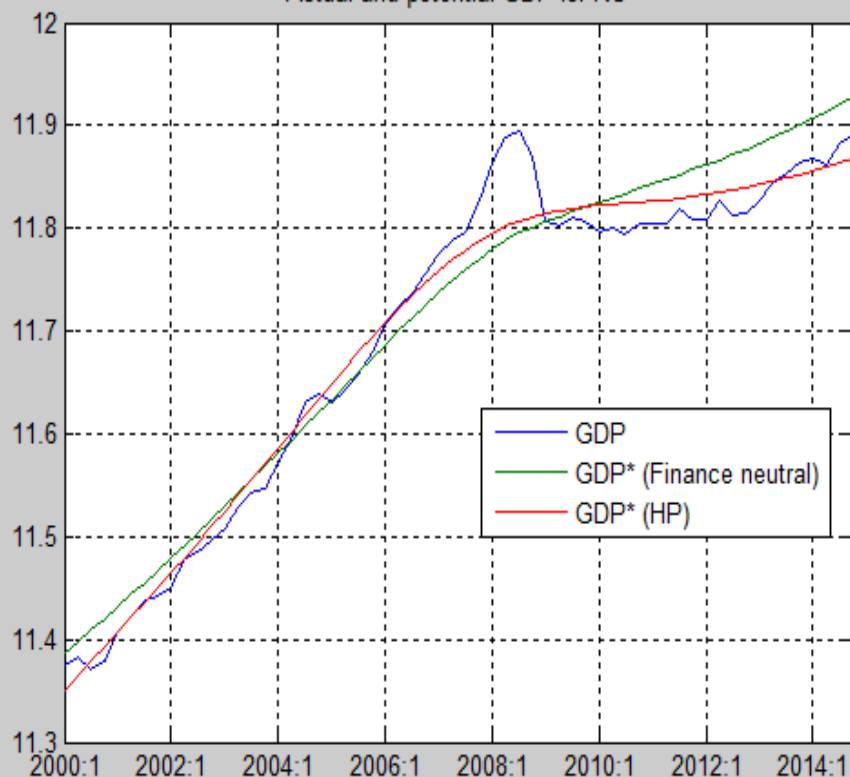(11)

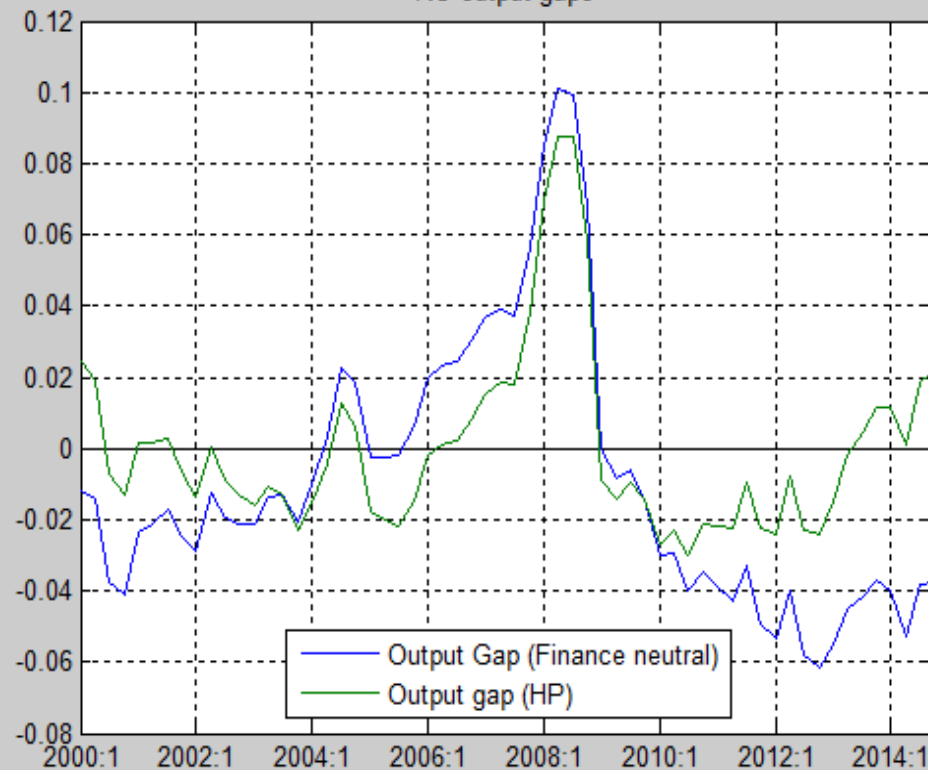# Results – individual variables
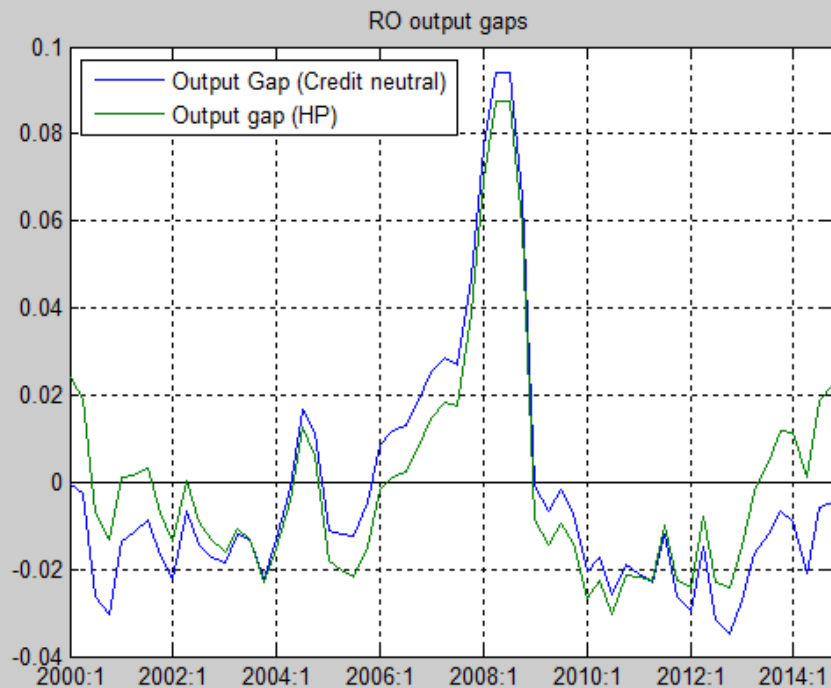
Private sector credit

Property price

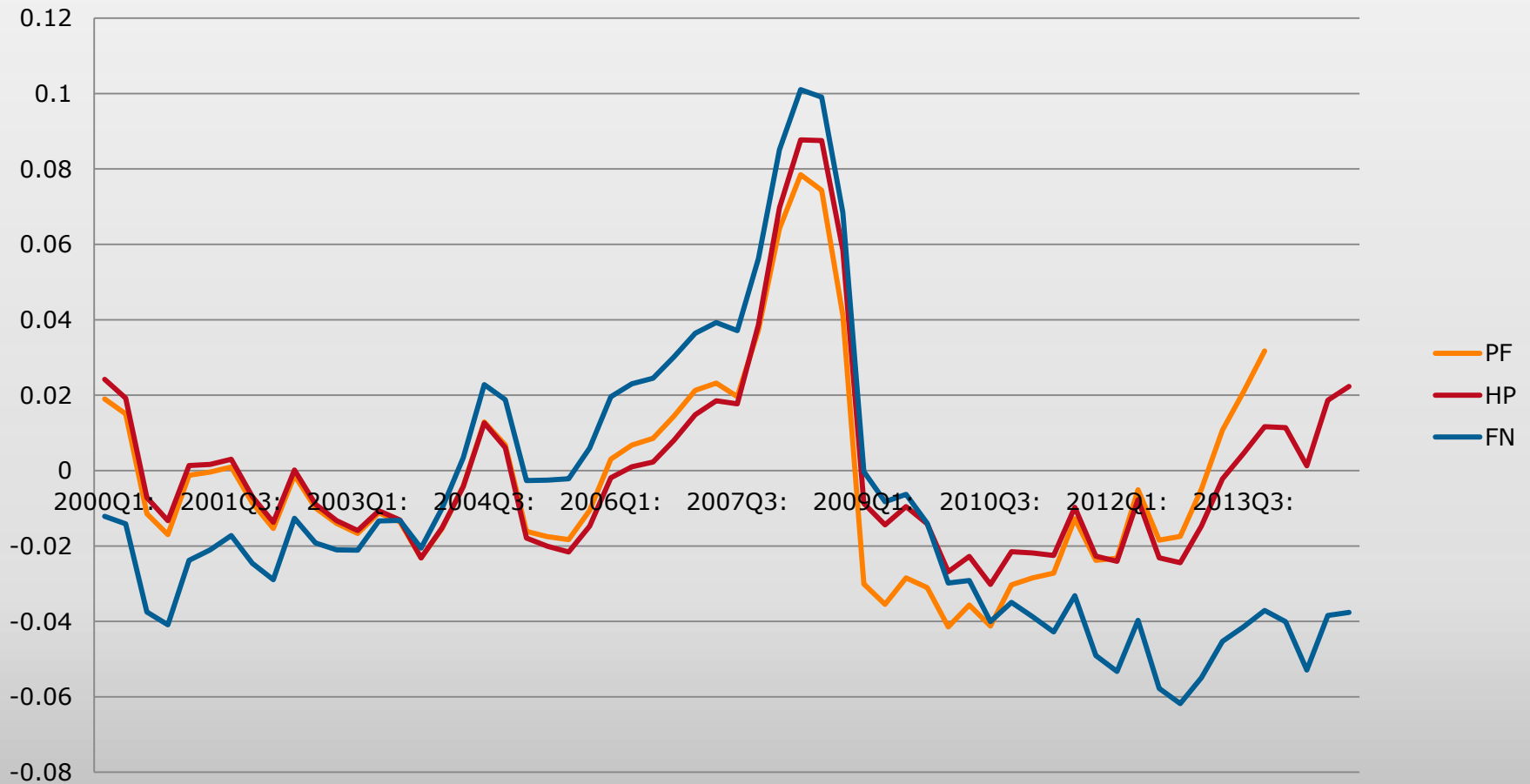# Results – finance neutral

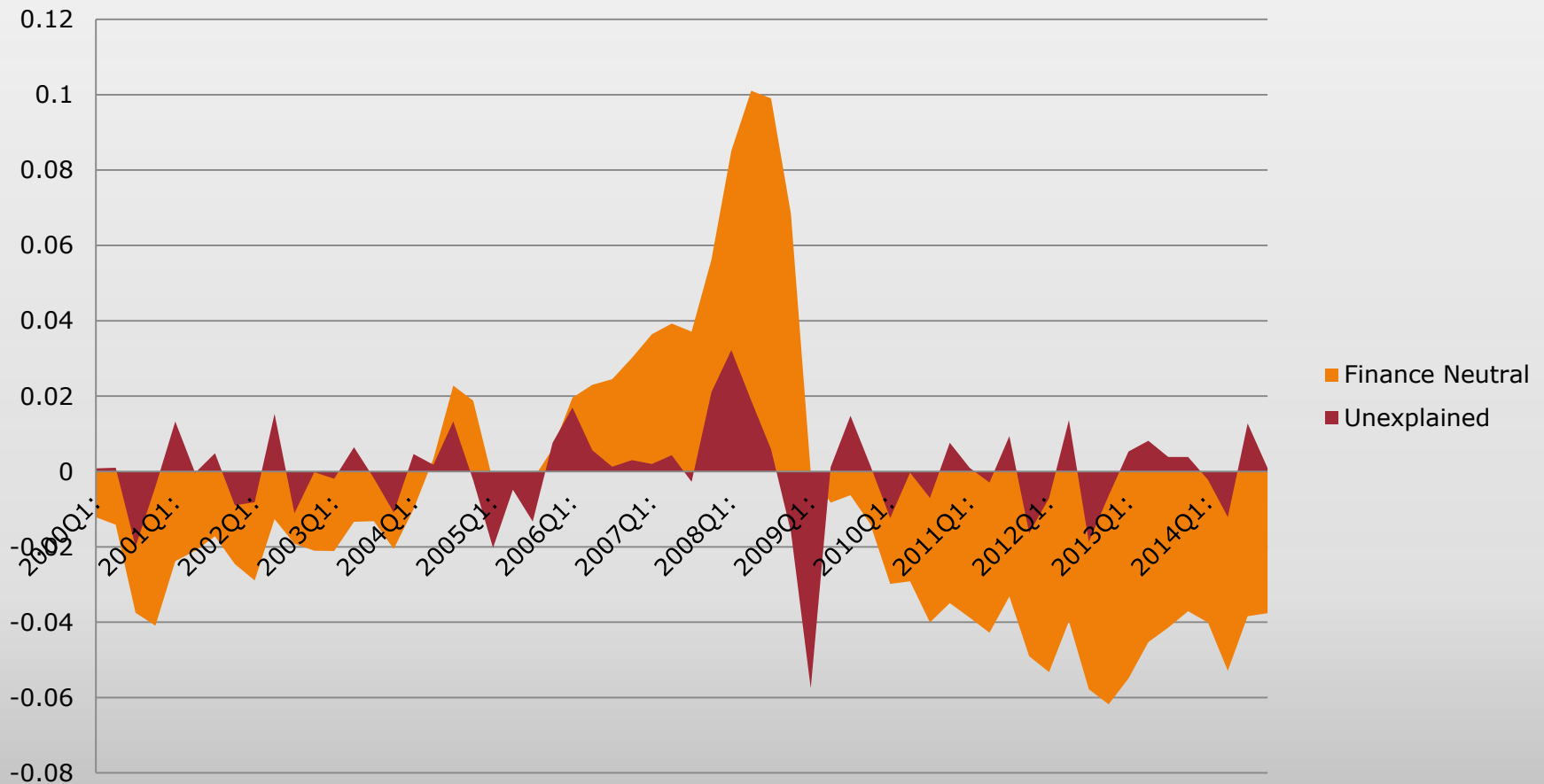Potential output

Output gap

Output gap - comparison

Output Gap

Finance-neutral measure: unexplained component

Output gap: unexplained component

Estimates analysis

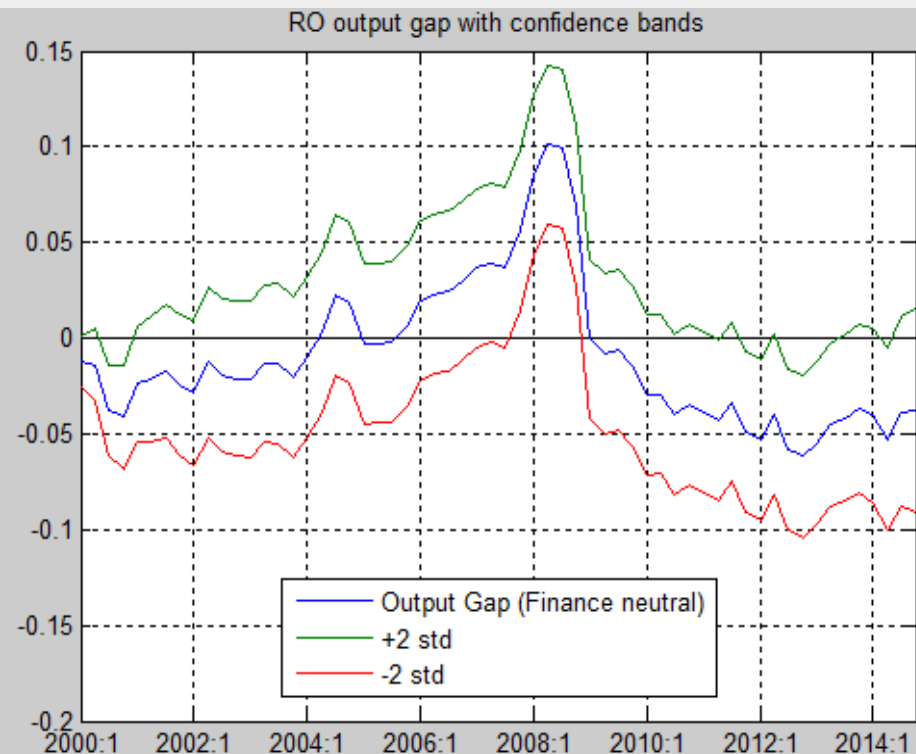Precision

Real-time robustness

Informing fiscal policy
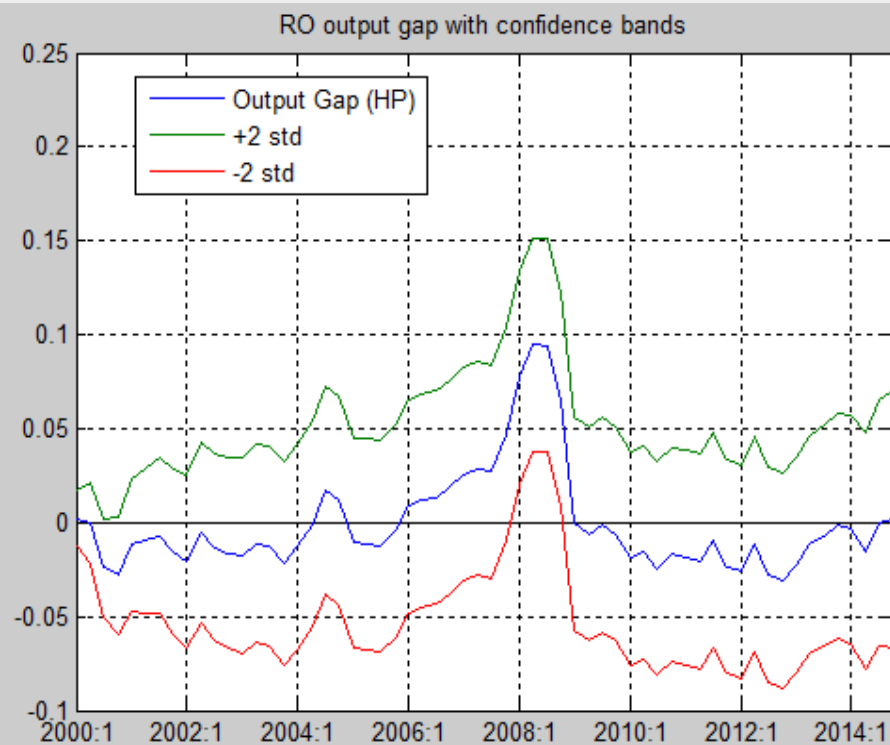
Informing monetary policy
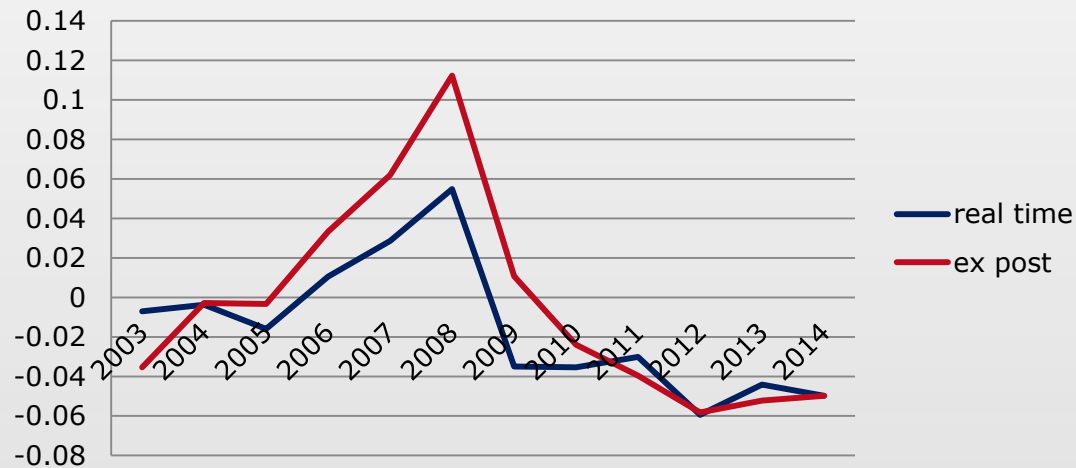
Estimates precision

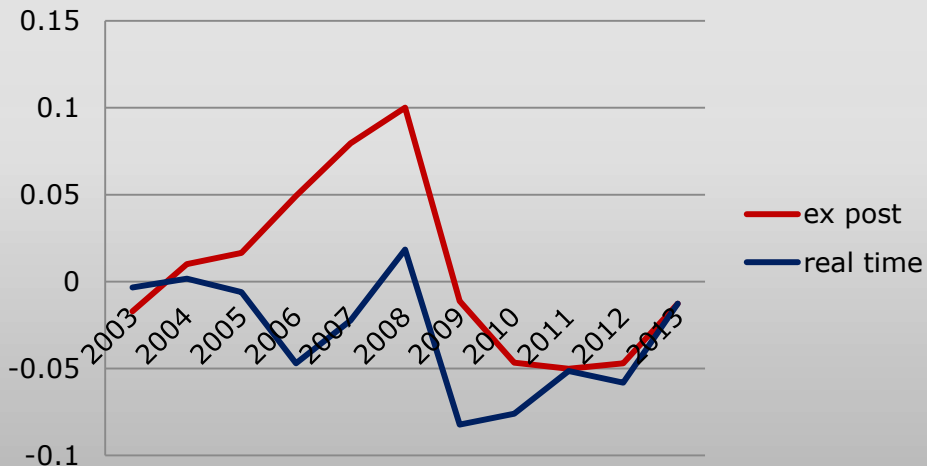Finance-neutral   HP filter

Narrower confidence bands for the finance-neutral measure!
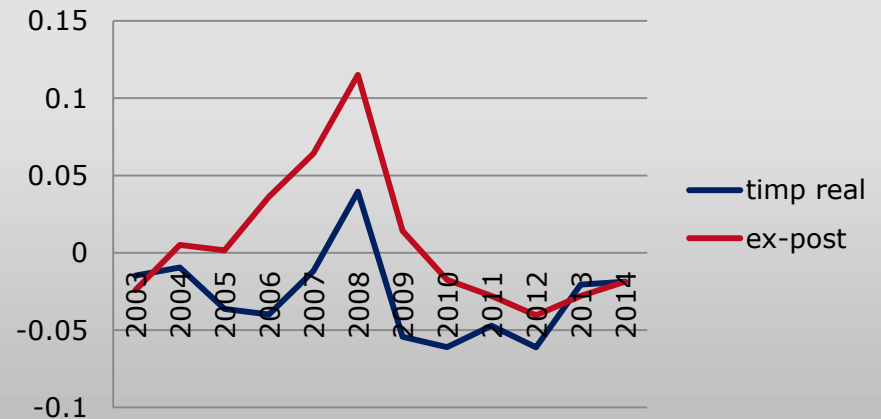
Real-time robustness

Finance-neutral
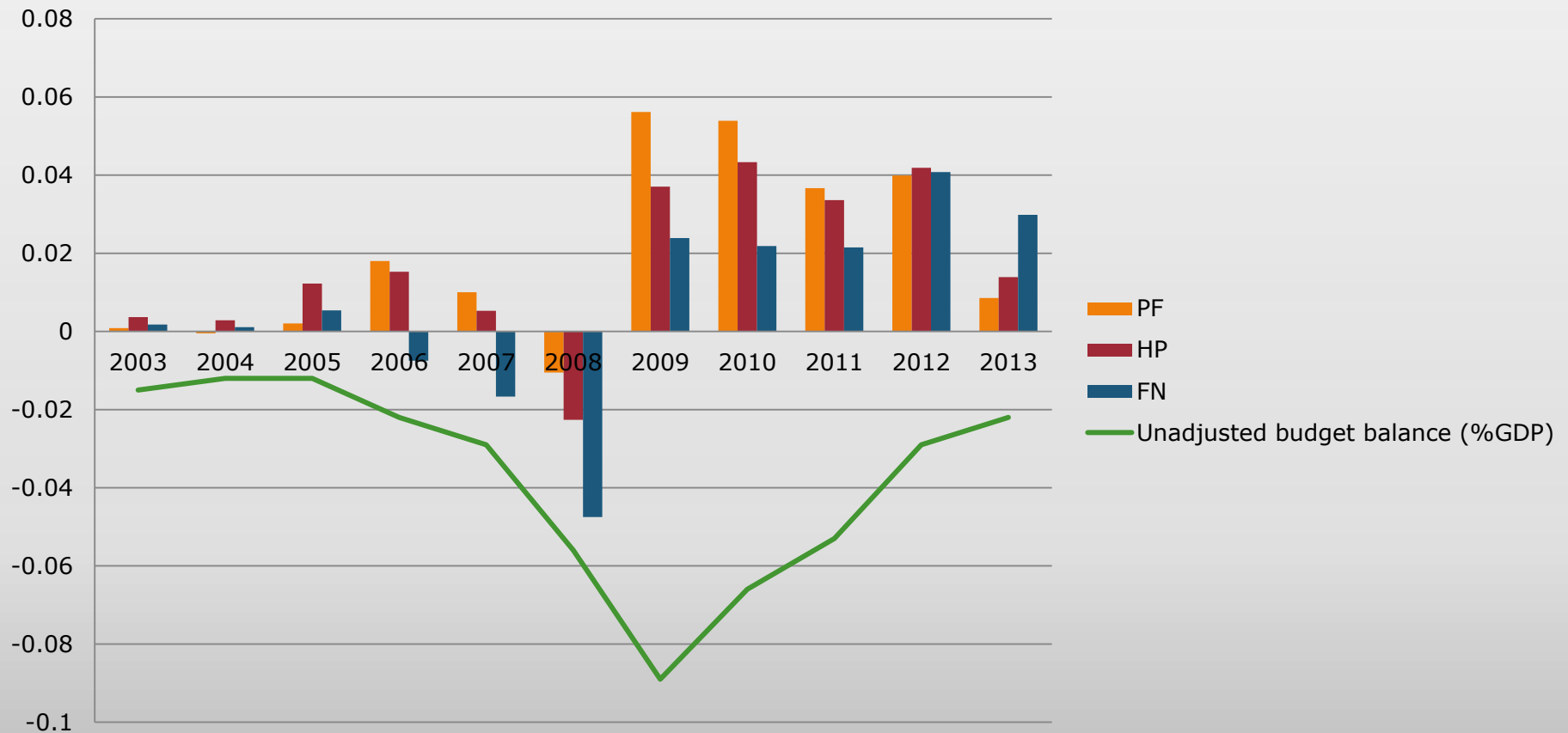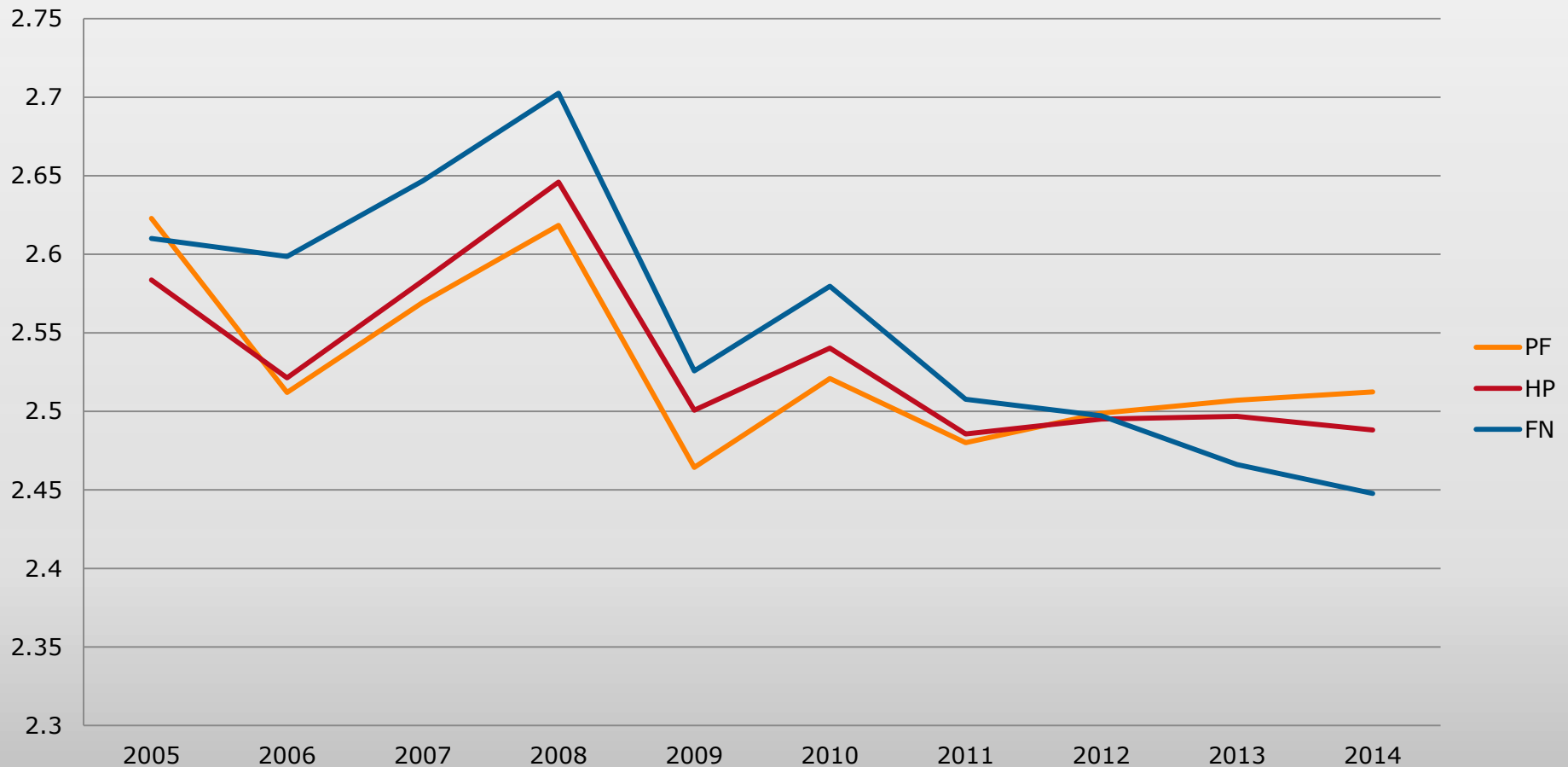
Production Function

HP

Informing fiscal policies – cyclically adjusted budget balance

Cyclical adjustments

Informing monetary policies – Taylor Rule

Policy interest rate

Conclusions

➡ Finance neutral measure – economic importance

➡ Increased precision of estimates

➡ Real-time robustness

➡ Relevance when informing policymaking

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Thank you for your consideration!