Monetary policy and the output gap

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The objective of monetary policy in Norway

- The operational target of monetary policy shall be annual consumer price inflation of close to 2.5 per cent over time.

- Monetary policy shall also contribute to stabilising output and employment.

Federal Reserve Act

The Board of Governors and the Federal Open Market Committee should seek

"*to promote effectively the goals of maximum employment, stable prices, and moderate long-term interest rates*."

Dual mandate in most countries

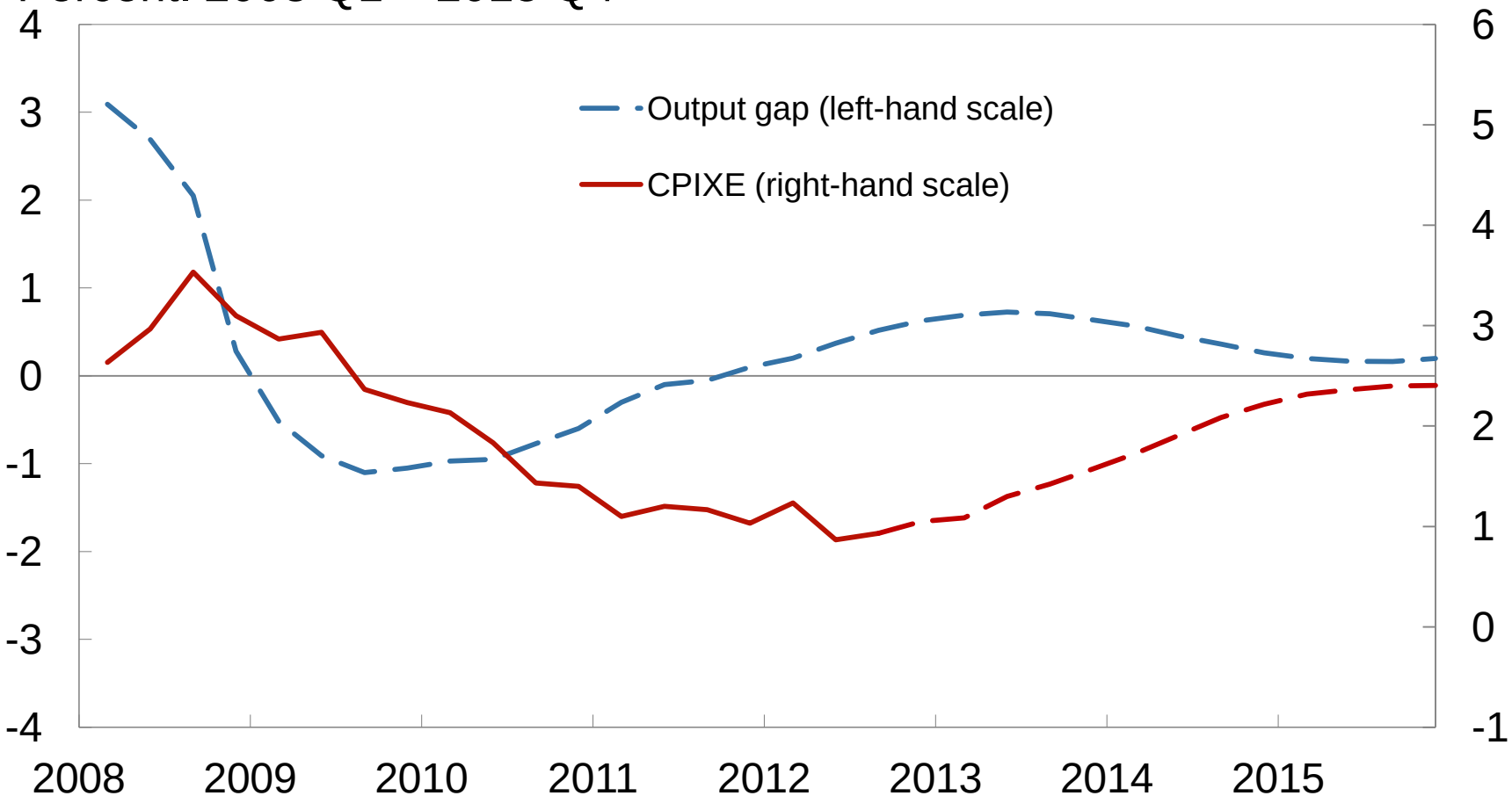
- **Price stability**
- **Stability in the real economy**

- Theoretical representation:
  - **Minimising a loss function**

$$L = E_t \sum_{k=0}^{\infty} \beta^k \left[\left(\pi_{t+k} - \pi^* \right)^2 + \lambda \left(y \right)^2 \right]$$

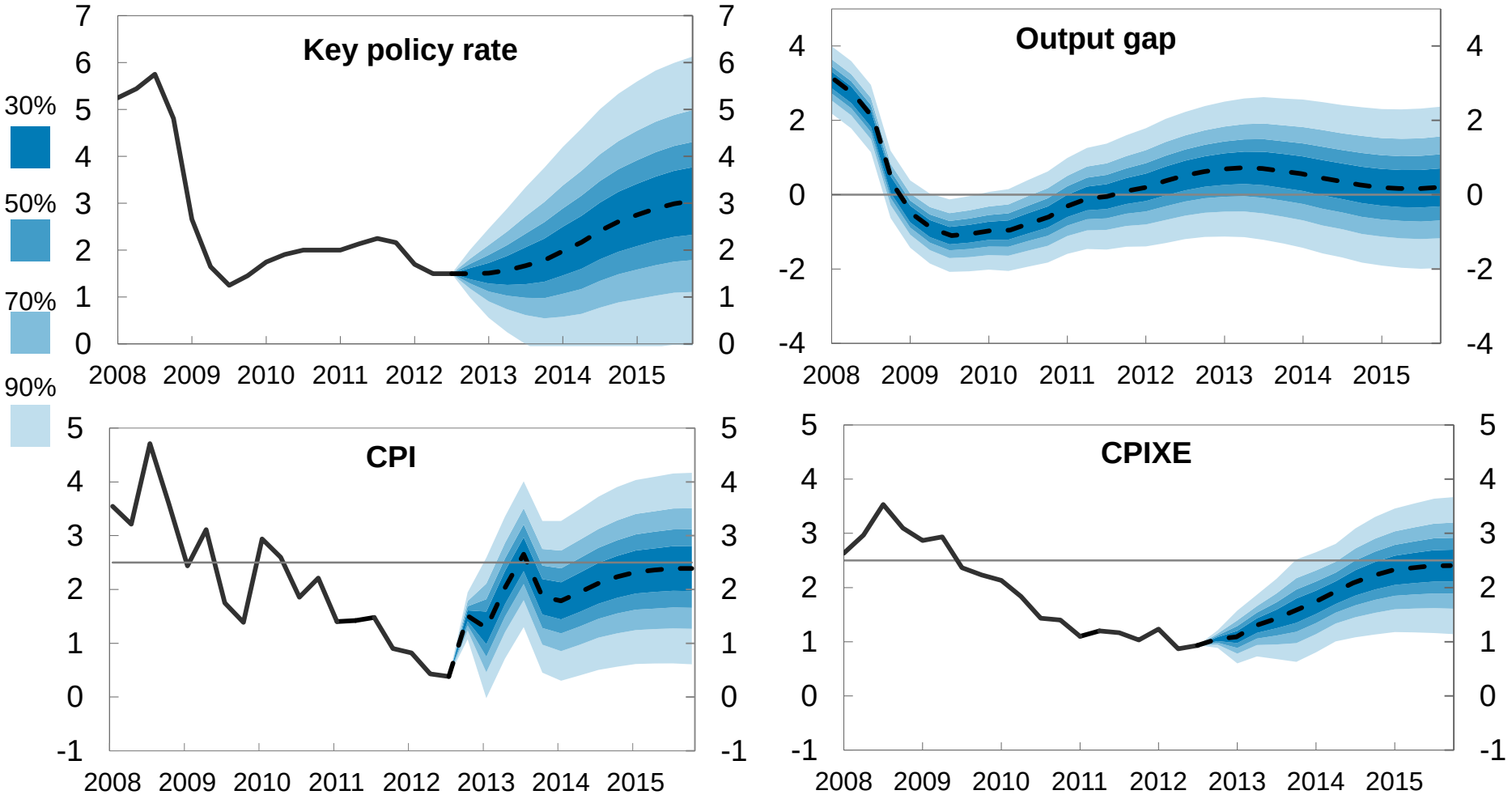
Projected inflation and output gap in the baseline scenario

Percent. 2008 Q1 – 2015 Q4



Source : Norges Bank

Baseline scenarios MPR 3/12

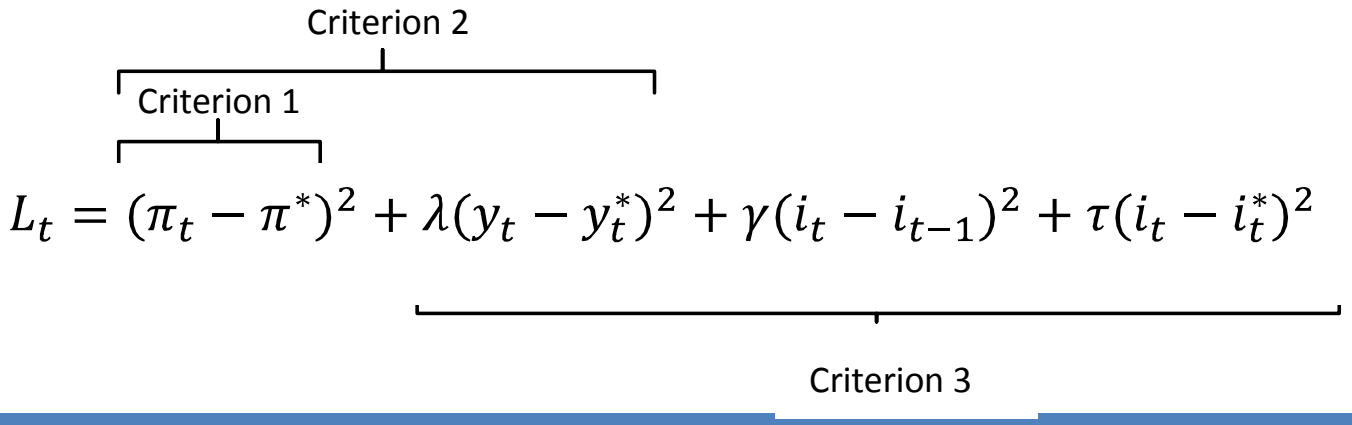


Sources: Statistics Norway and Norges Bank

Criteria for an appropriate interest rate path

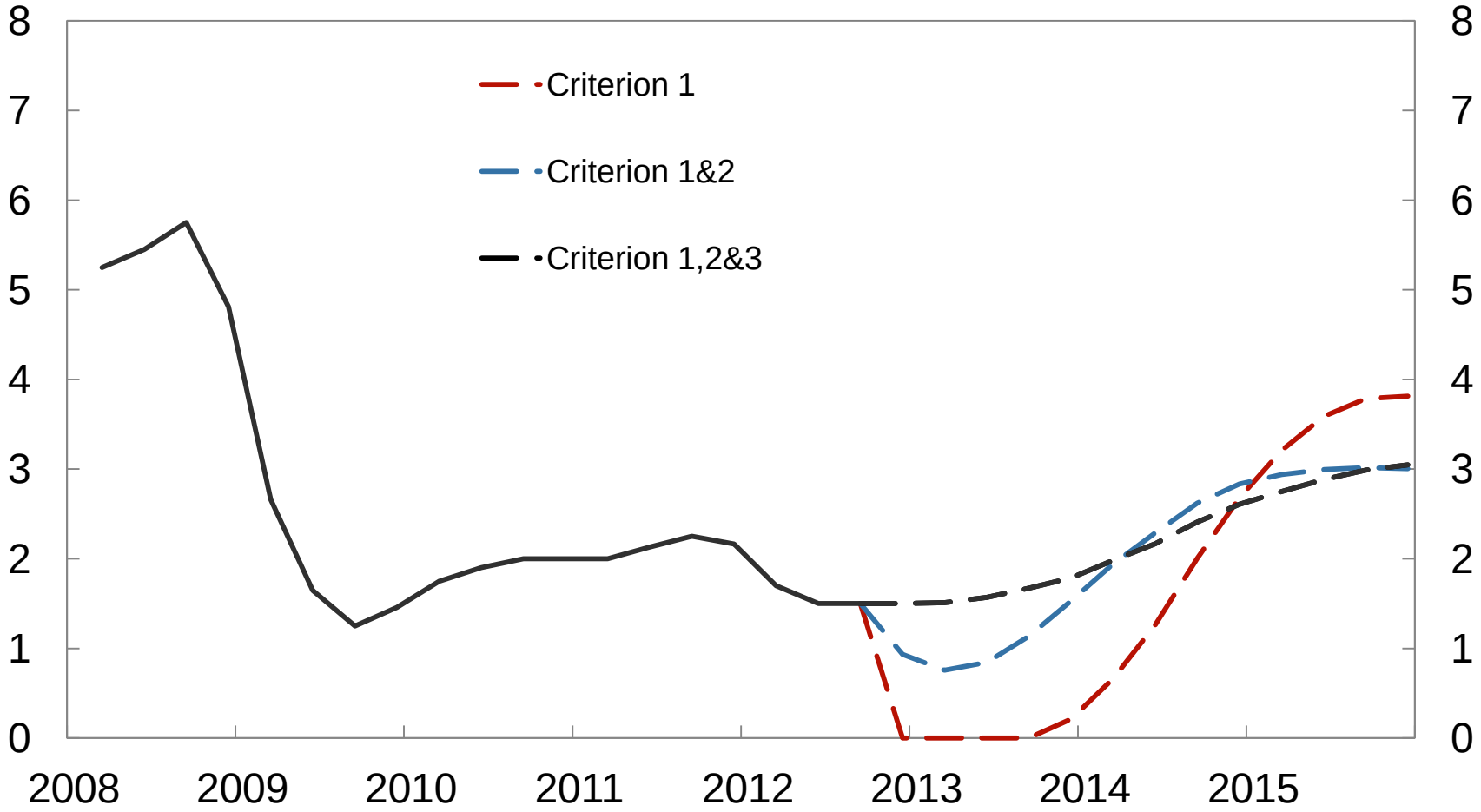
1. The inflation target is achieved
2. The inflation targeting regime is flexible
3. Monetary policy is robust

"Loss function":



Key policy rate – baseline scenario

Percent 2008 Q1 – 2015 Q4



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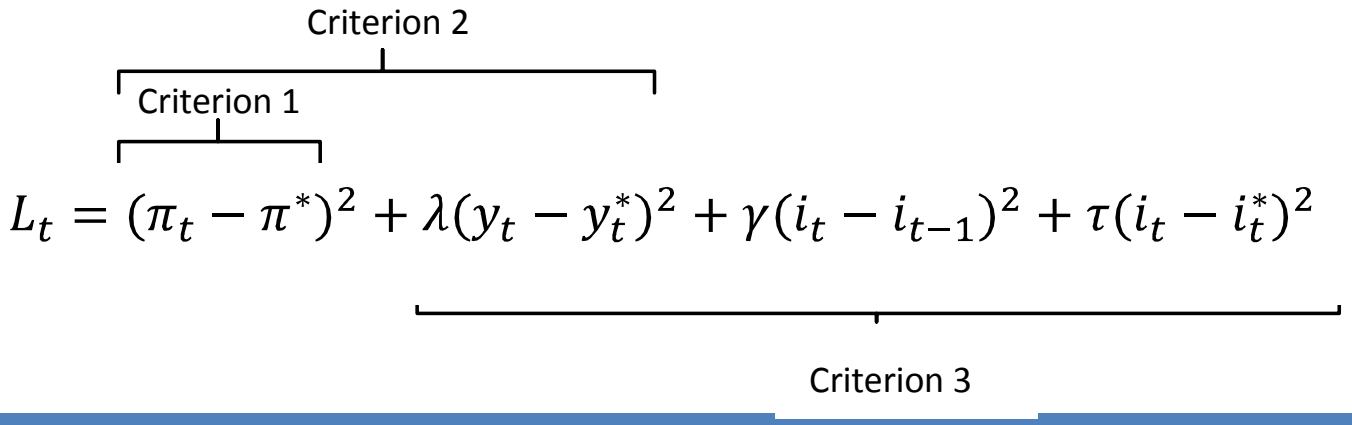

New Keynesian stylised model

- Households maximise utility (consumption and leisure)
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- Households maximise utility (consumption and leisure)
- Monopolistic competitive firms maximise profit
- Price rigidities
  - Welfare based loss function (inflation gap and output gap)
  - Relevant Y* natural (flex-price) level
  - Not smooth, vary with shocks

Why not a flex-price gap

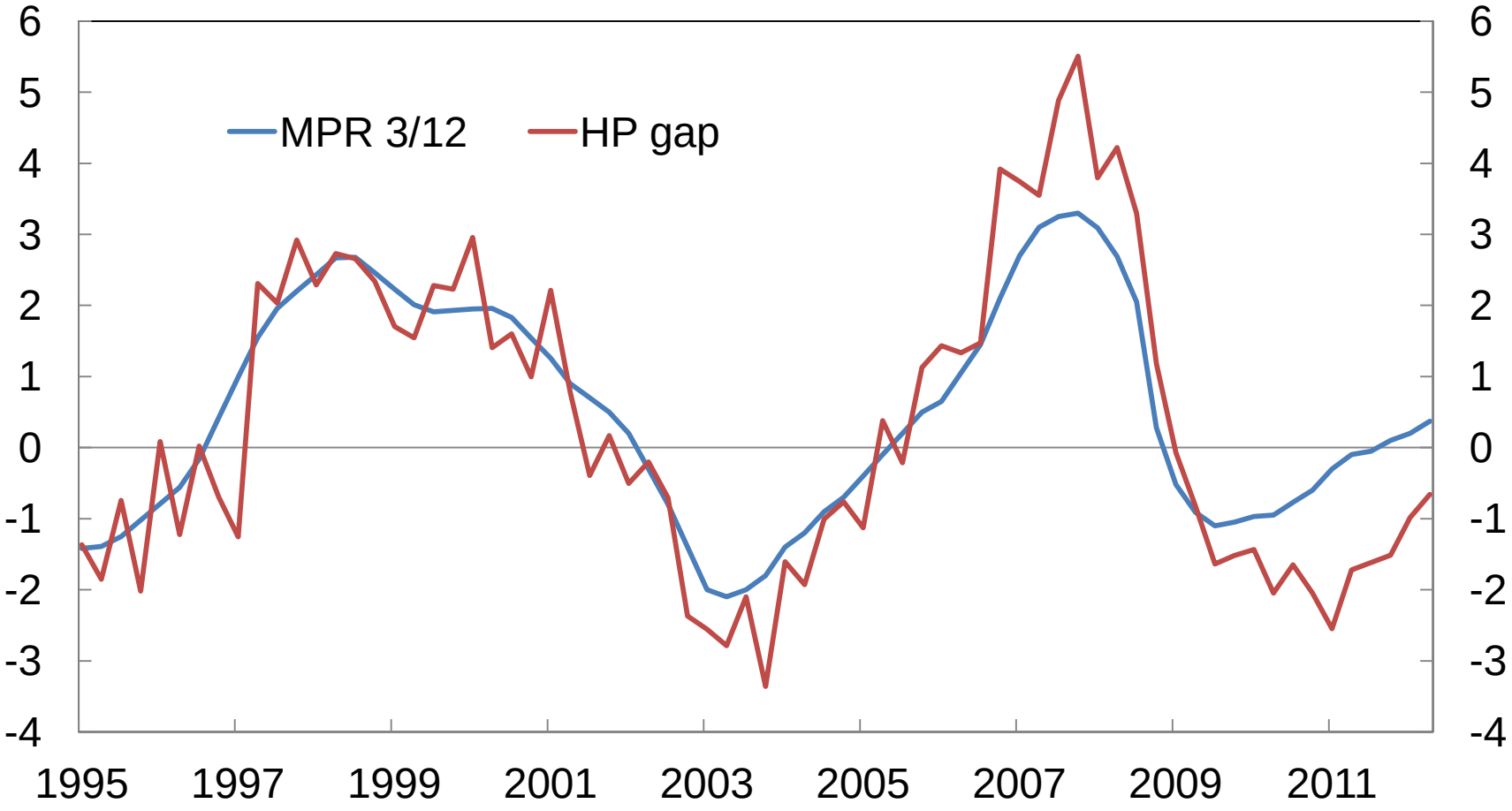
- Difficult to communicate
- Model dependent
- Highlighting nominal frictions as source of welfare loss
- We take a broader view

Stabilising around what?

- *"... the level of output that is consistent with the maximum sustainable level of employment: That is, it is the level of output at which demand and supply in the aggregate economy are balanced so that, all else being equal, inflation tends to gravitate to its long-run expected value."*

Mishkin 2007

The output gap in MPR 3/12 and the output gap using the HP-filter[1)]



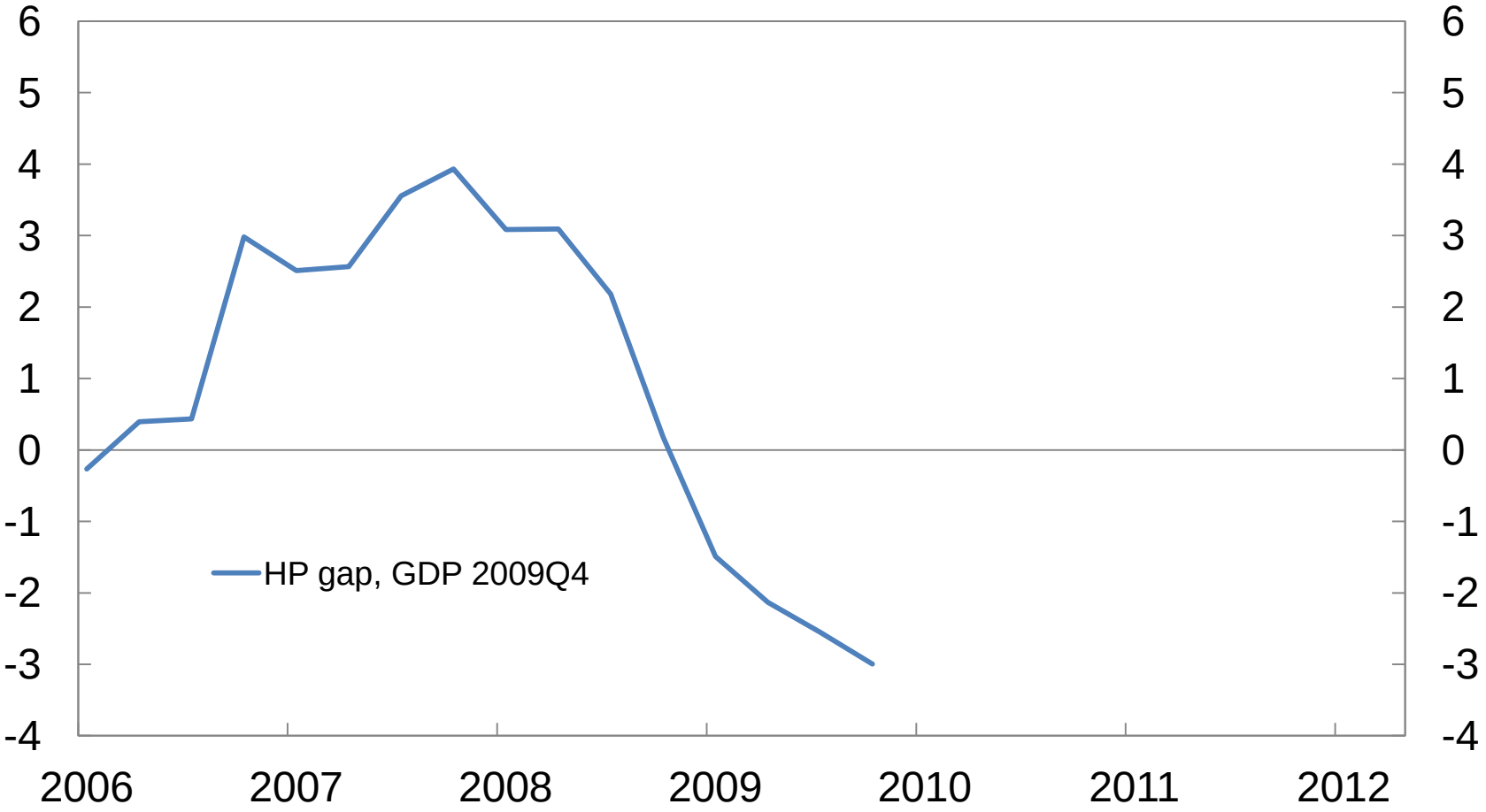
1) Lambda = 40 000

Sources: Statistics Norway and Norges Bank

Why not HP-gap based on GDP?

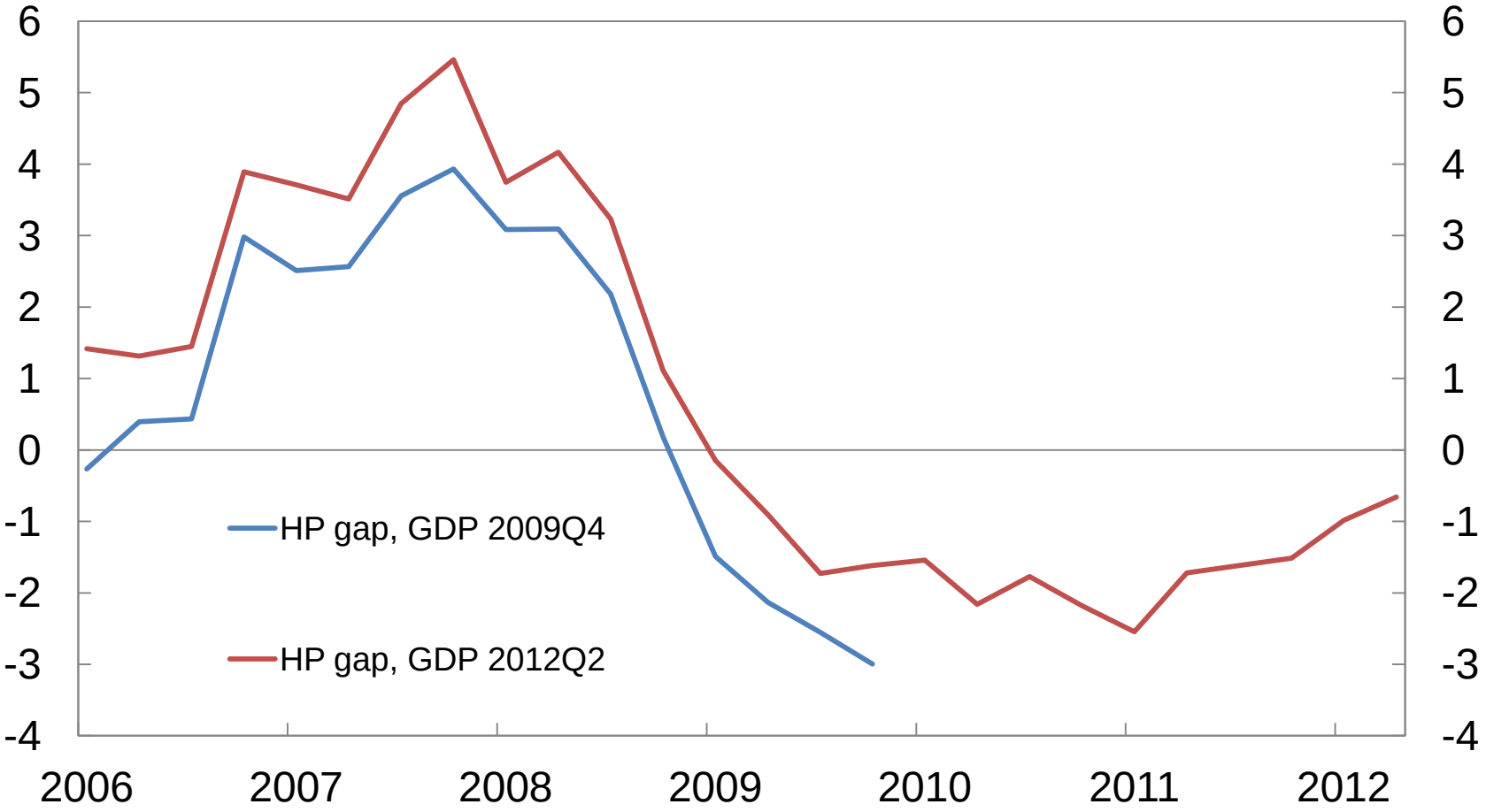
- No structure/economics
- Volatile GDP-series
- Revisions in data
- End-problems

The output gap using the HP-filter on the 2009Q4 GDP vintage



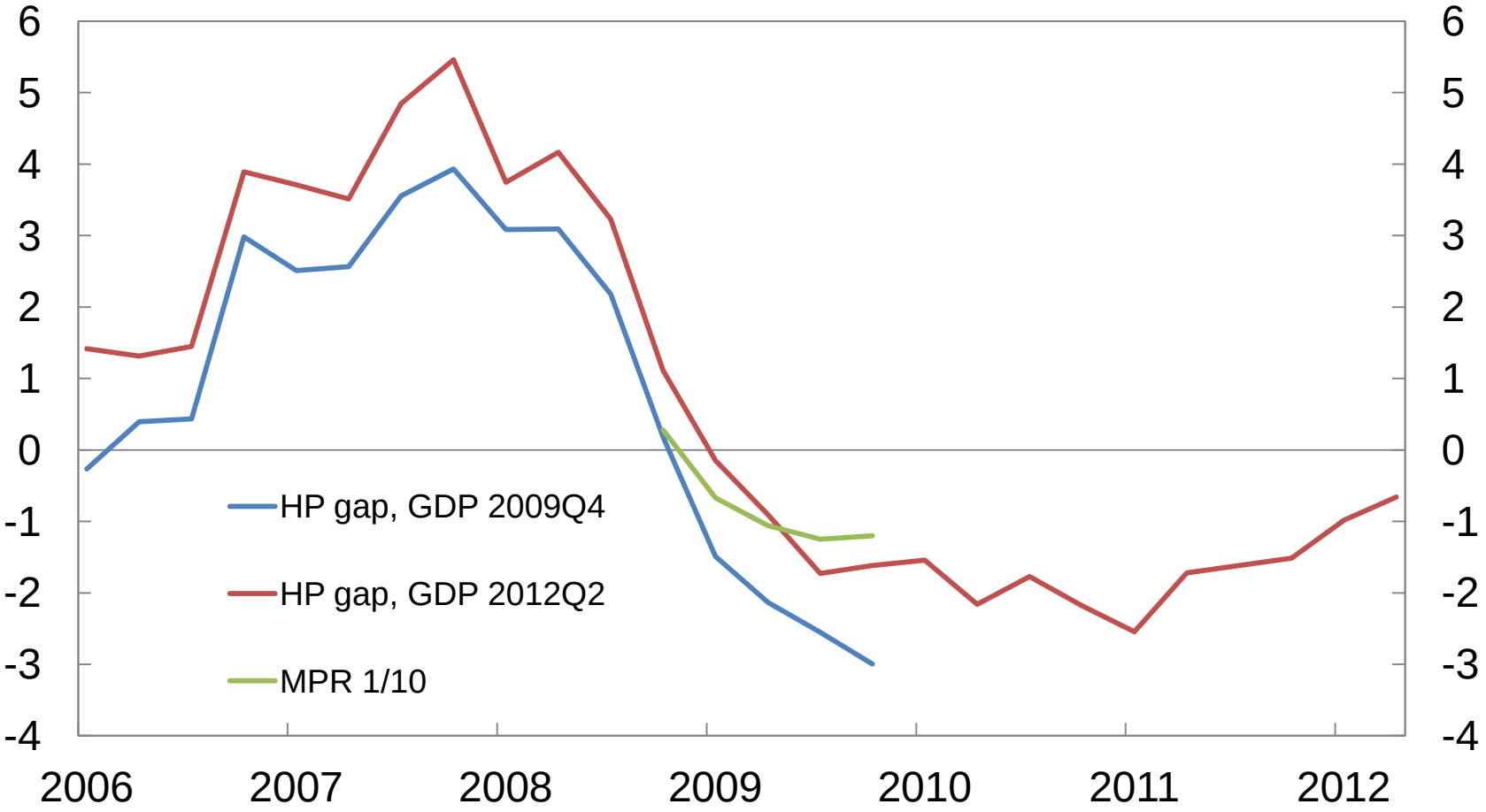
Sources: Statistics Norway and Norges Bank

The output gap using the HP-filter on the 2009Q4 GDP and 2012Q2 GDP vintages



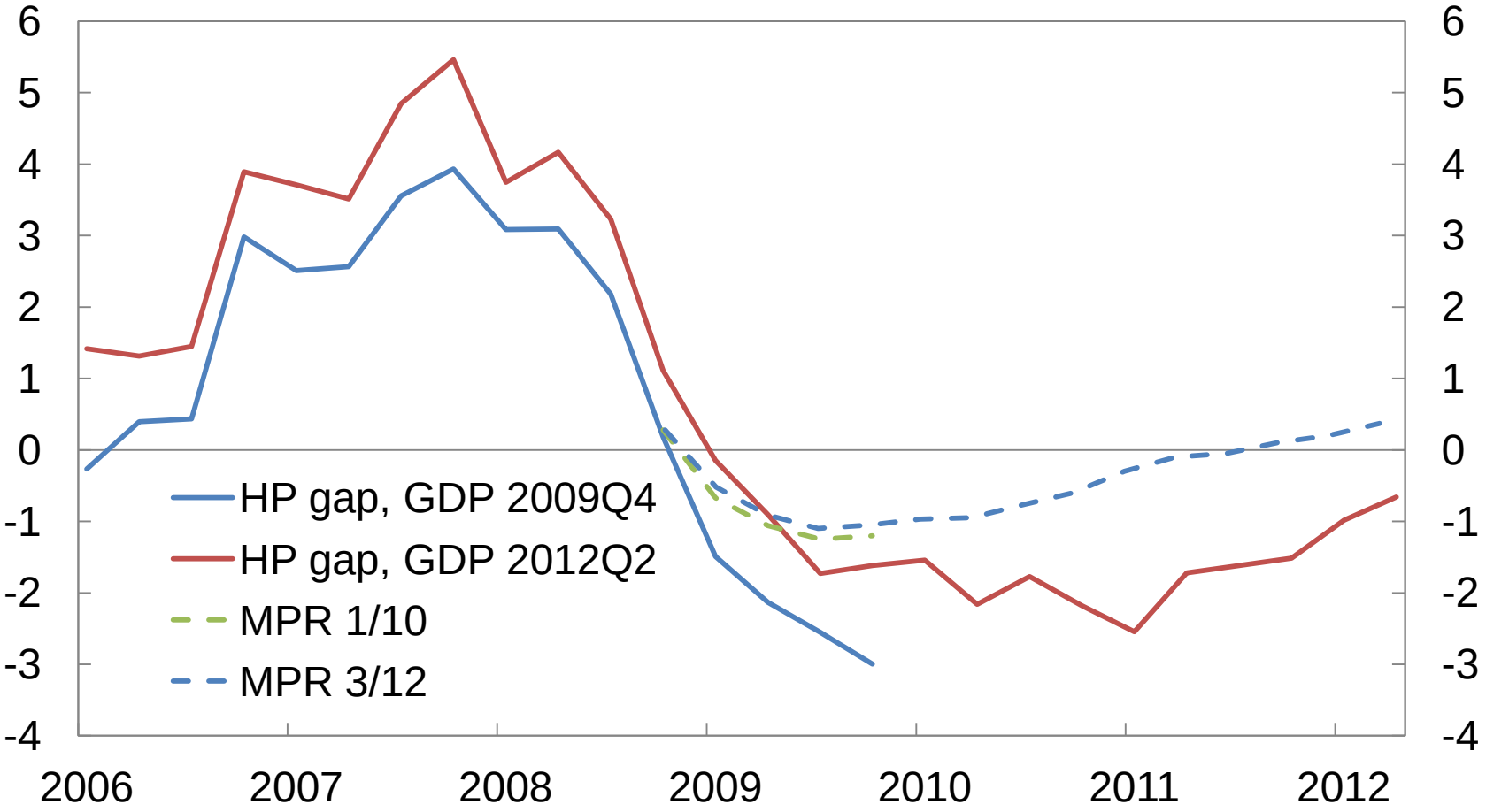
Sources: Statistics Norway and Norges Bank

The output gap using the HP-filter on different GDP vintages, and the output gap in MPR 1/10



Sources: Statistics Norway and Norges Bank

The output gap using the HP-filter on different GDP vintages, and the output gap in MPR 1/10 and MPR 3/12

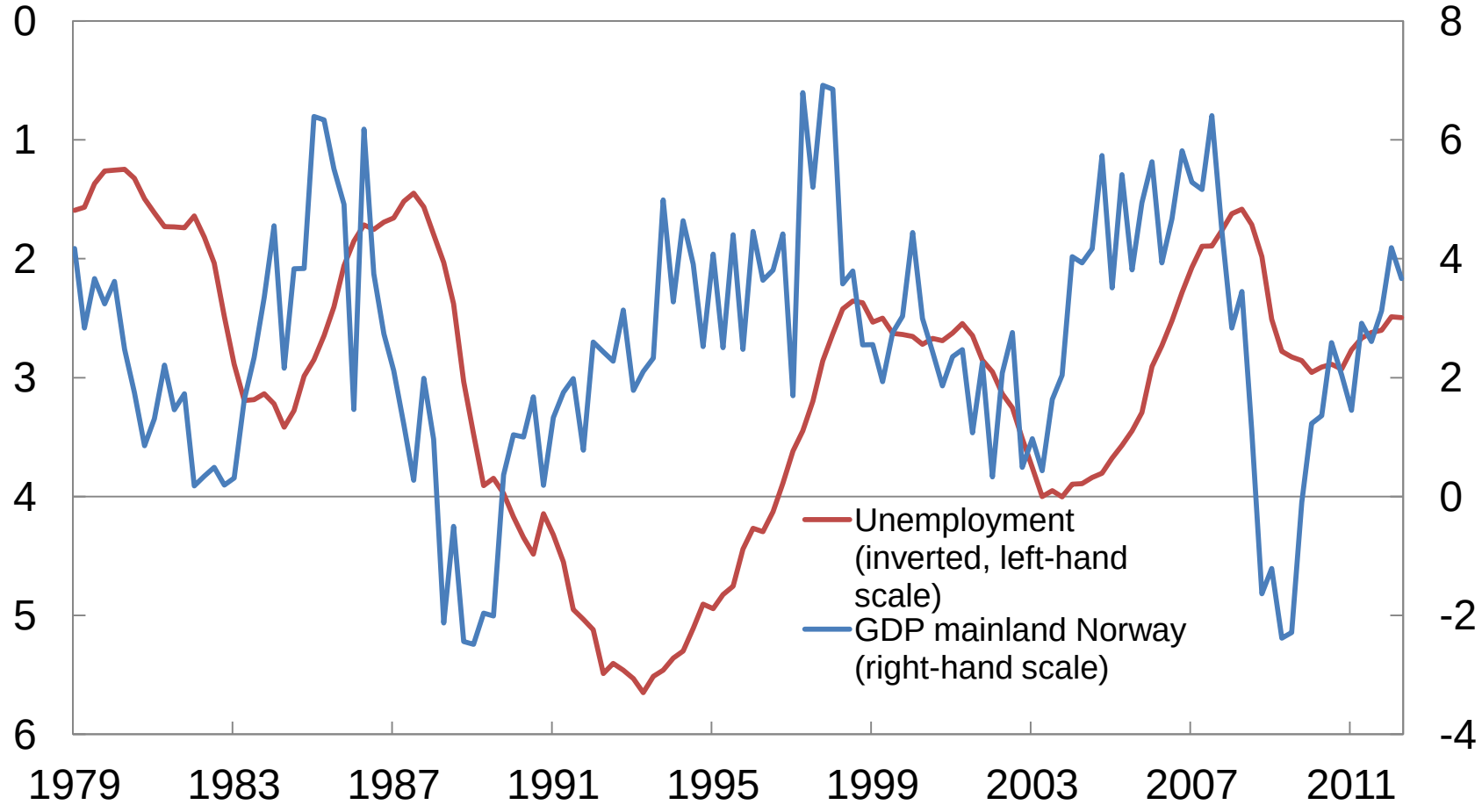


Sources: Statistics Norway and Norges Bank

How do we calculate?

- Focus on current situation
- Qualified judgment
- Based on broad information set
- Information from labor market important
- Measures of capacity utilization
- Multivariate filters

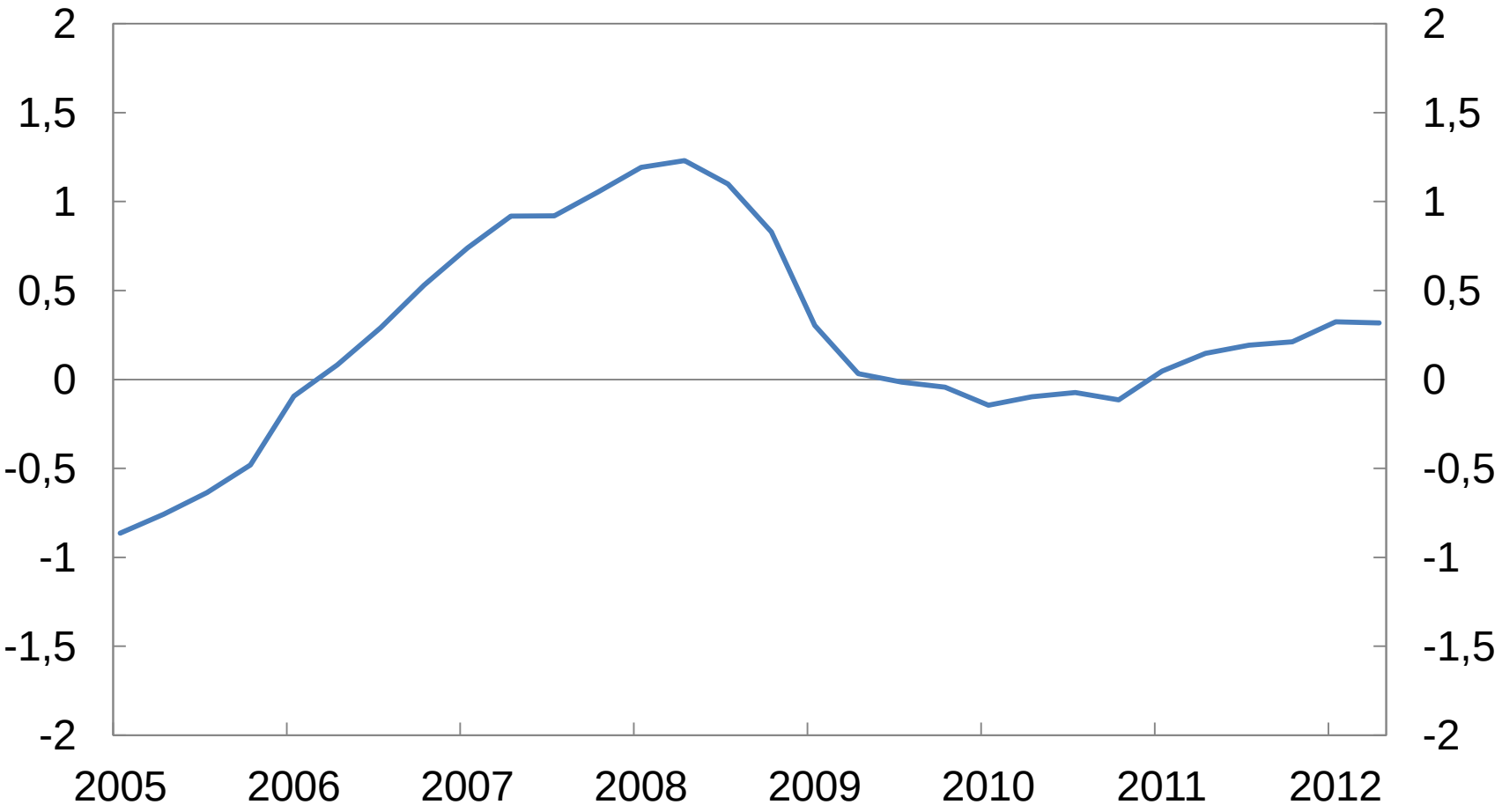
Four quarter change in GDP mainland Norway and the registered unemployment rate



Sources: The Norwegian Labour and Welfare Service (NAV) and Norges Bank

The unemployment gap

Deviation from the average unemployment rate past 15 years



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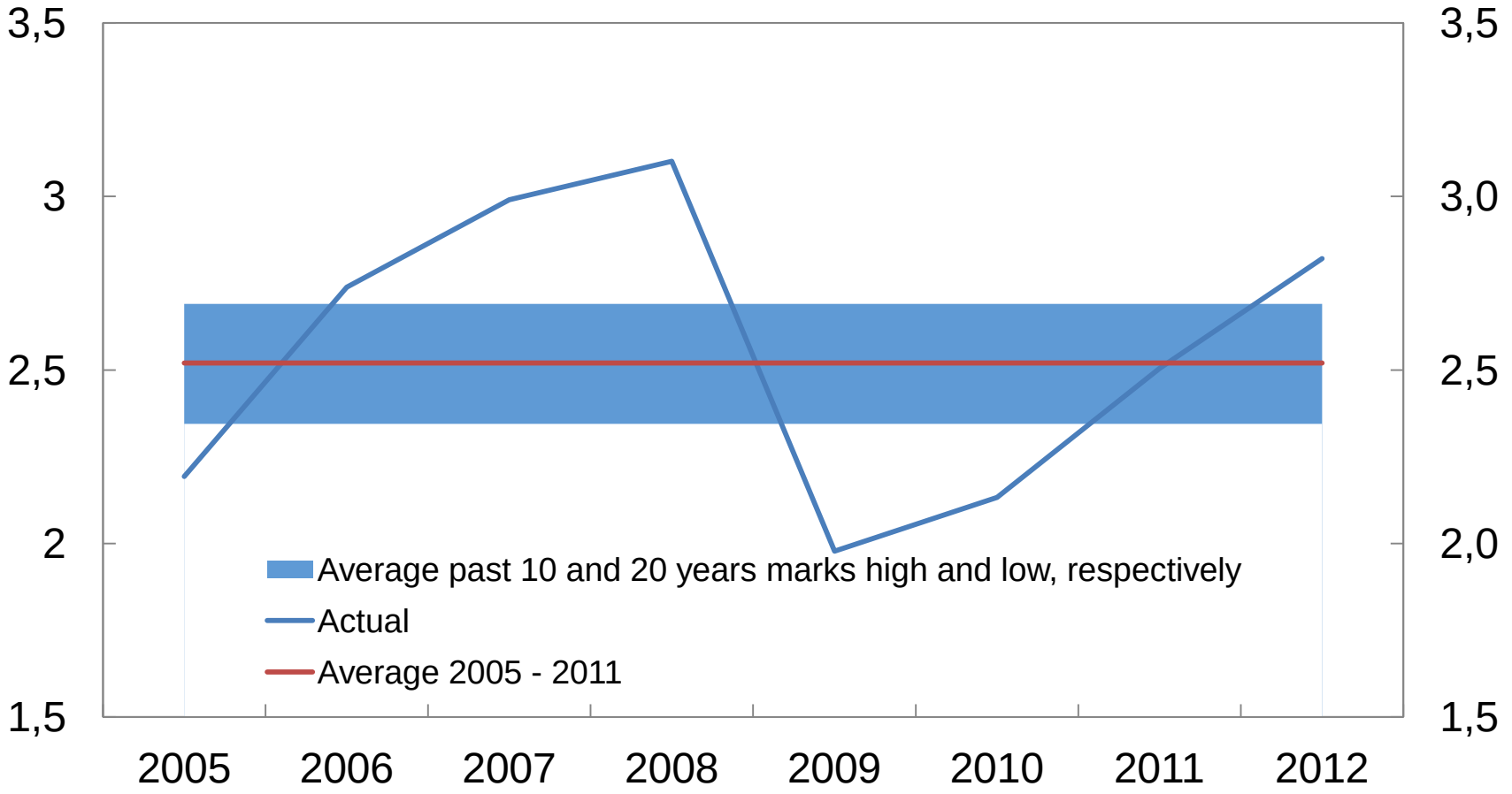
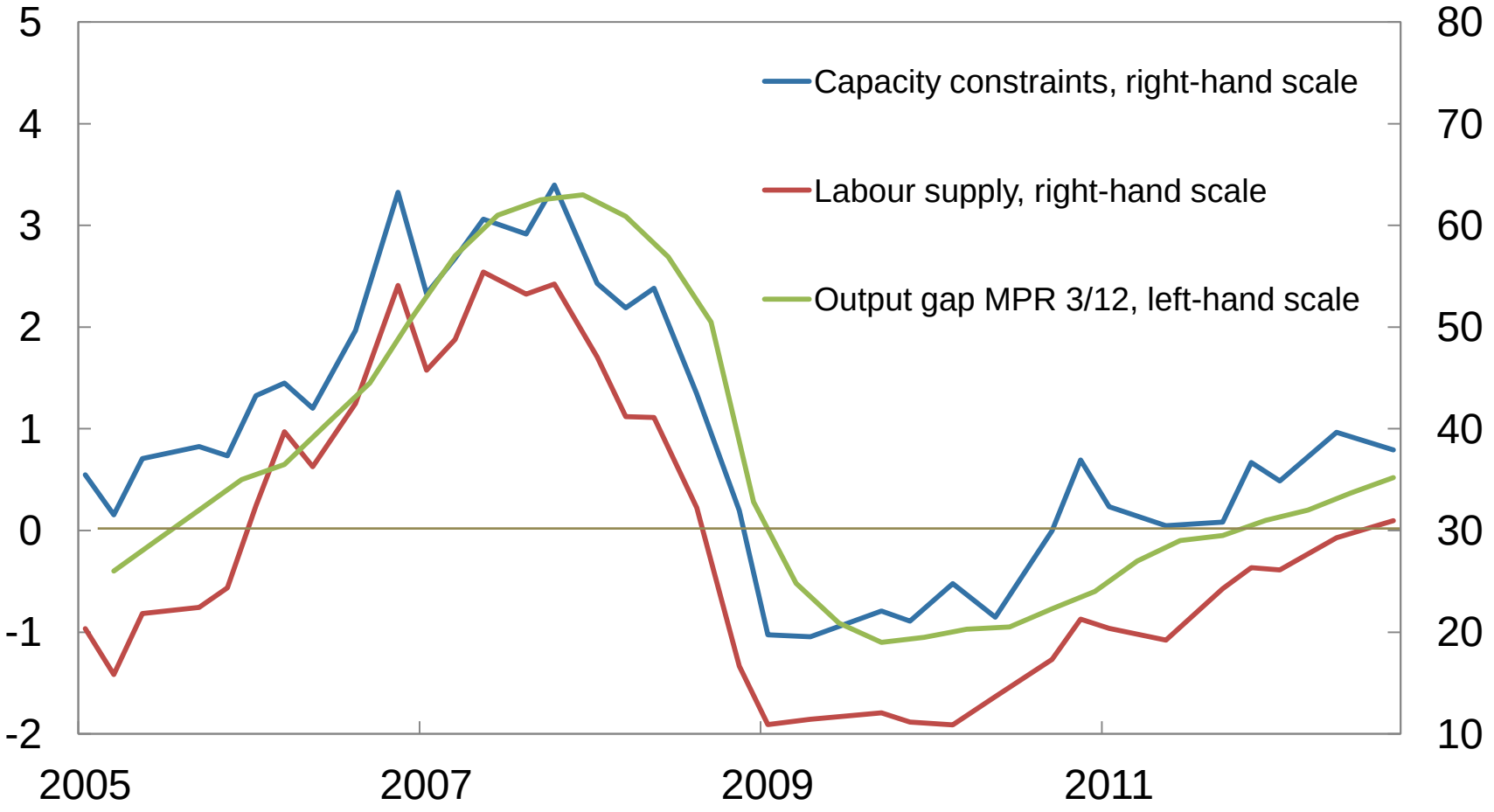
Annual real wage growth

3 year centered moving average. Percent



Sources: Statistics Norway, TBU and Norges Bank

Capacity constraints and labour supply reported by the Regional network and estimated output gap in MPR 3/12



Sources: Statistics Norway and Norges Bank

Multivariate Kalman filter

- Equations

(1) $y_t = y^T_t + y^c_t$

- $y^c_t = 2\theta_1 \cos(\theta_2) y^c_{t-1} - \theta^2_1 y^c_{t-2} + \omega_{yt}$
- $\Delta y^T_t = \gamma_y + \omega_{yt}$

(2) $\pi_t = (1 - \sum_{i \geq 1} \mu_{\pi i}) \pi^T_t + \mu_\pi(L) \pi_{t-1} + \eta_y y^c_t + \nu_{\pi t}$

- $\Delta \pi^T_t = \omega_{\pi t}$

(3) $u_t = \phi_u u_{t-1} + (1 - \phi_u) u^T_t + \phi_y(L) y^c_t + \nu_{ut}$

- $u^T_{t+1} = \beta_t + u^T_t + \eta_t$
- $\beta_{t+1} = \beta_t + \xi_t$

(4) $x_t = \beta_x x_{t-1} + (1-\beta_x) x^T_t + \beta_y(L) y^c_t + \nu_{xt}$

- $\Delta x^T_{t+1} = \omega_{xt}$

Data

Log GDP

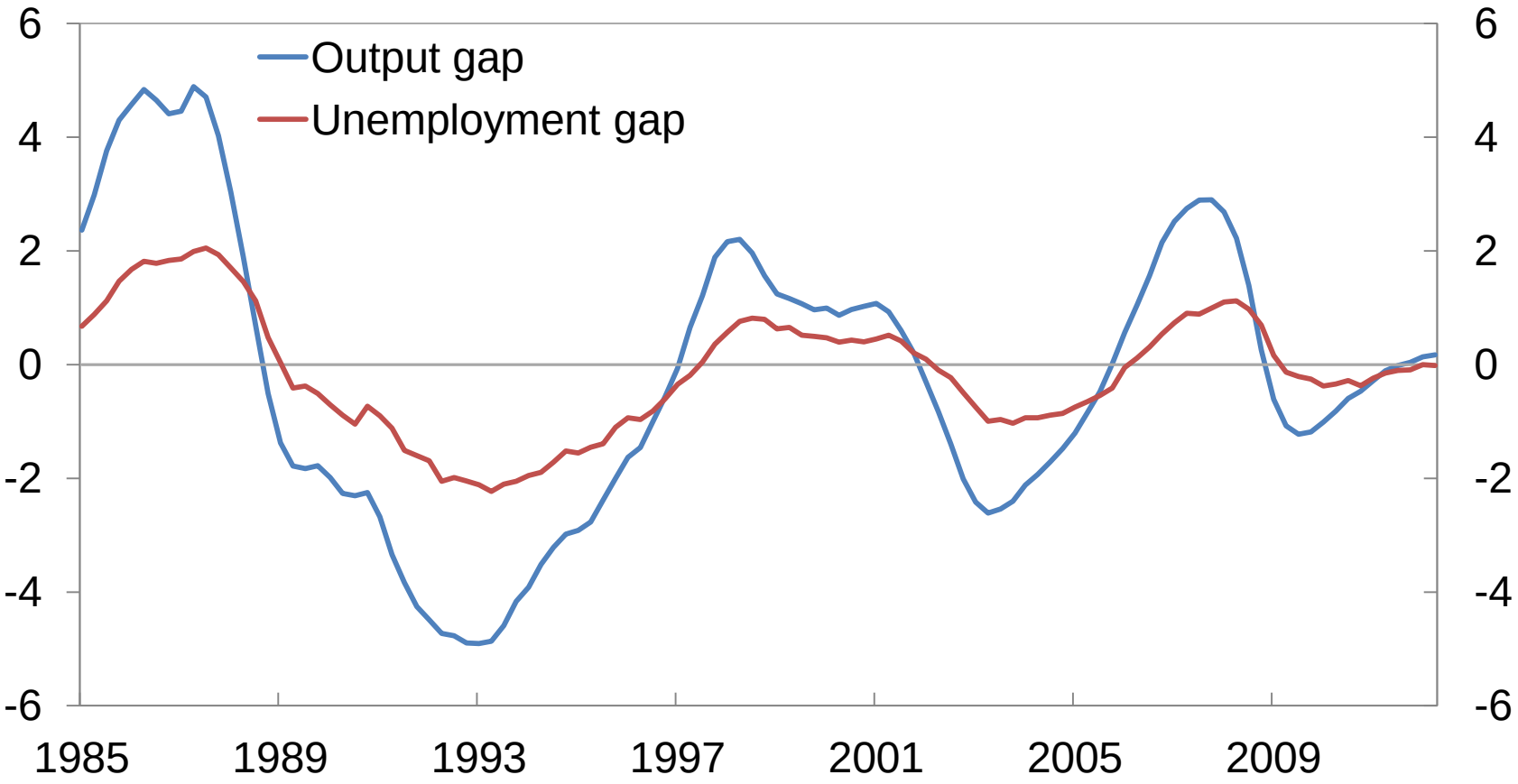
Domestic inflation, quarterly change, annualised

Registered unemployment rate

Gross capital formation, private sector, as share of GDP

Output gap and unemployment gap based on a multivariate Kalman filter

Percent. 1985Q1 –2012Q2



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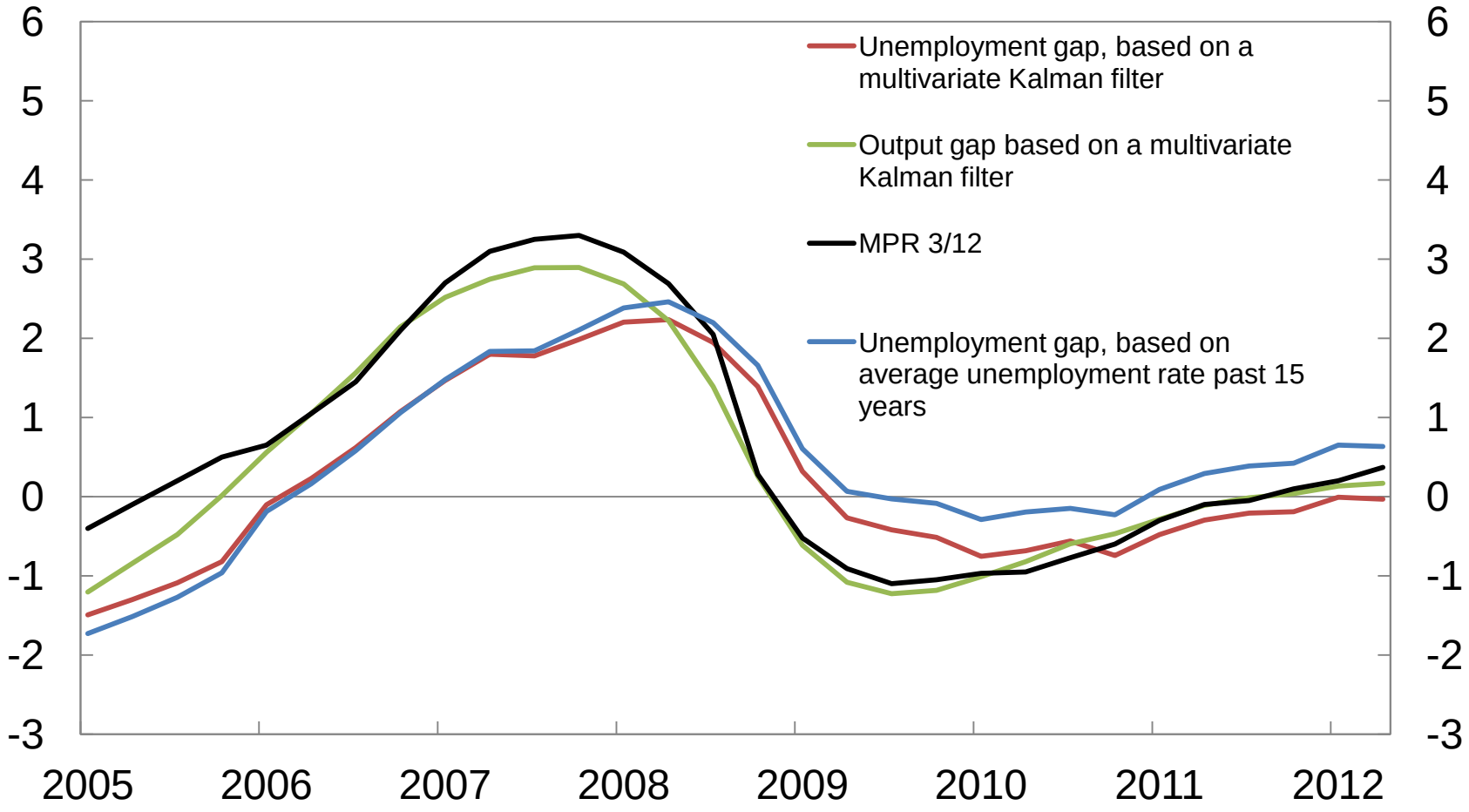
Different calculations of the output gap[1)]



1) The unemployment gaps are multiplied by factor 2

Sources: Statistics Norway, NAV and Norges Bank

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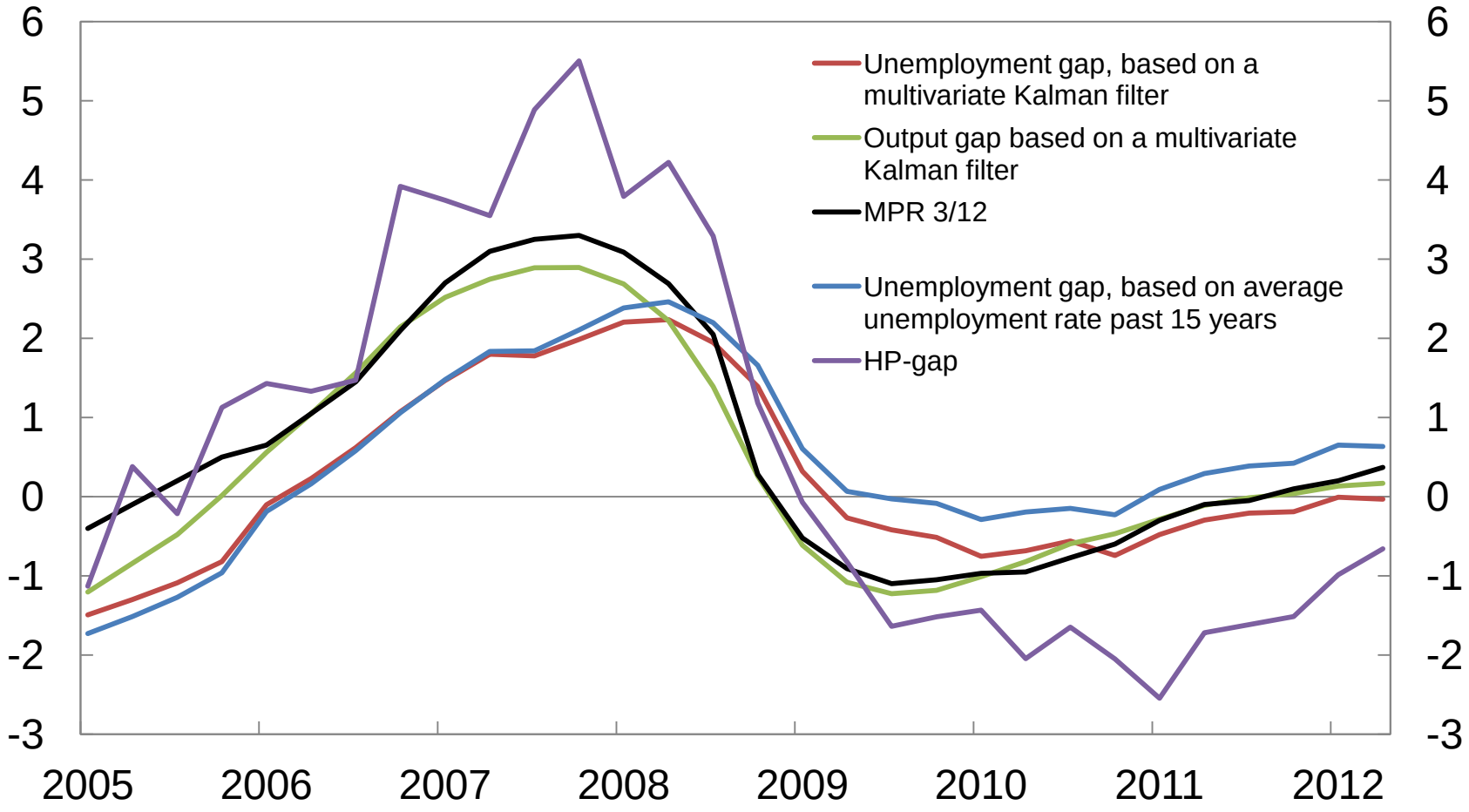

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Summing up on the output gap

- Unobservable
- Difficult
- Relying on one variable and one method not very robust
- Our approach: several methods and broader information set
- In the end: Judgmental call