

NEMO

Norwegian Economy Model

NEMO is based on the Framework of IMF's Global Economy Model (GEM)

- We work closely with the original architects
 - IMF Research Department
 - Paolo Pesenti from the Federal Reserve Board of New York.
 - Tight connections to other central banks who develop similar models
 - Sweden
 - Canada
 - England
 - ECB
 - Get help and advice from academia in Norway
 - UiO
 - NTNU
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“All models are wrong. But some are useful.”

George Box (1979)

Mission:

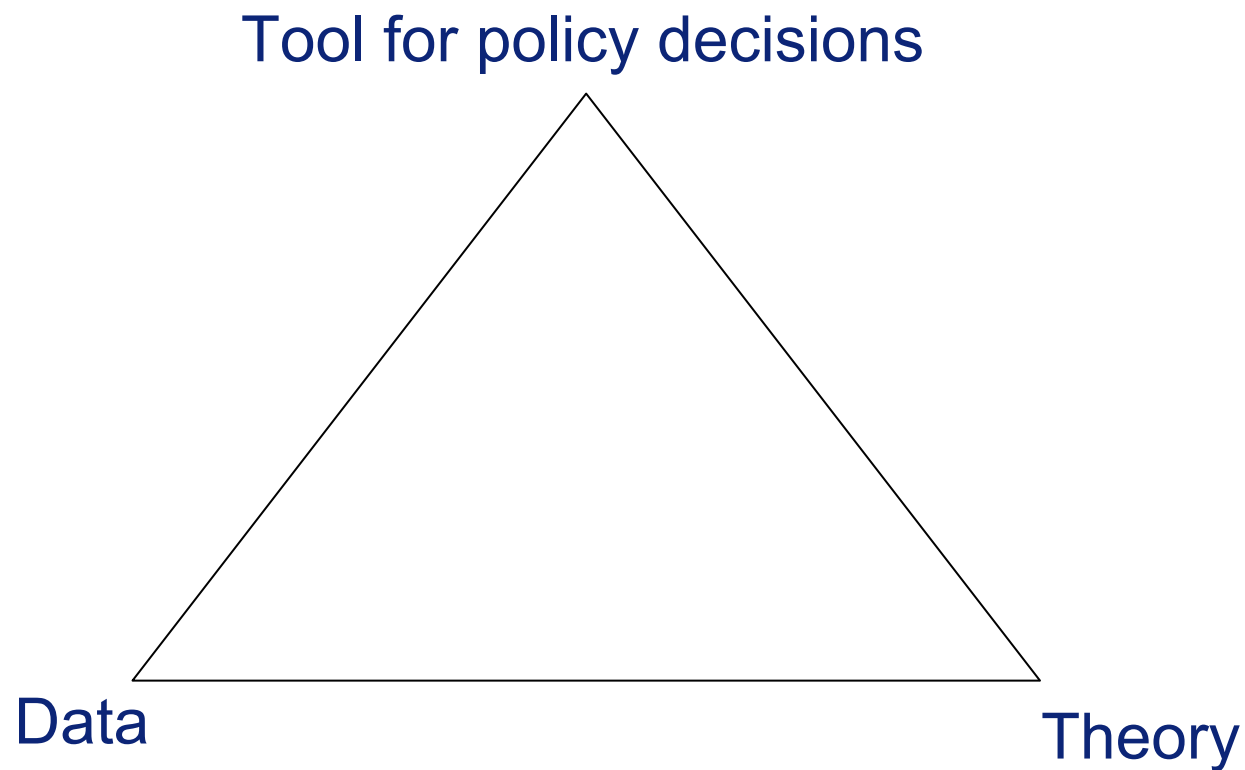
Develop a useful model for our purposes, suitable for;

- forecasts/projections
 - policy analysis and analysis of risk and uncertainty
 - communication
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General requirements for a core model

1. The model must represent consensus views
 - No trade-off between inflation and output in the long term
 - Monetary policy affects the real economy in the short to medium term
 - Monetary policy provides a nominal anchor
 2. Expectations must play an explicit role
 3. Mechanisms and disturbances must be economically interpretable in a consistent fashion
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Tensions in model building



Outline

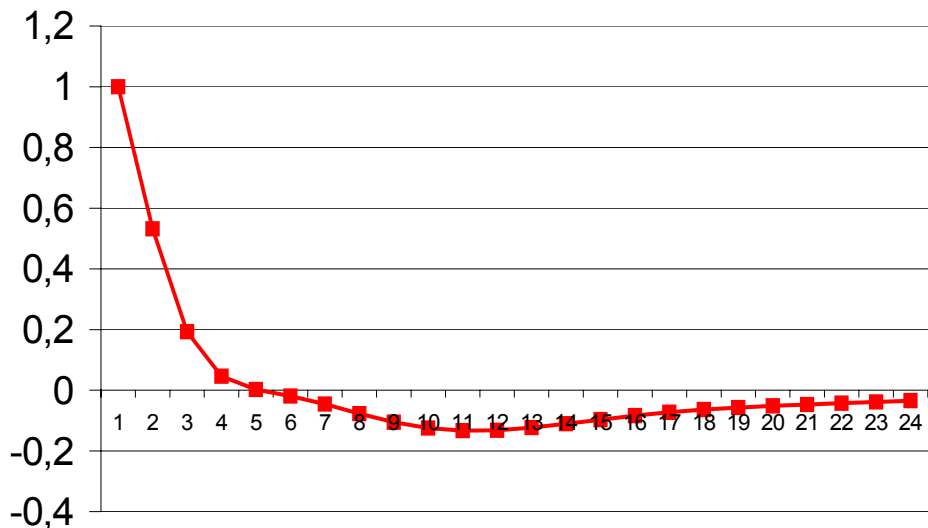
1. Key stylised facts
 2. An introduction to NEMO
 3. Some model experiments
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Key stylised facts about the monetary transmission mechanism

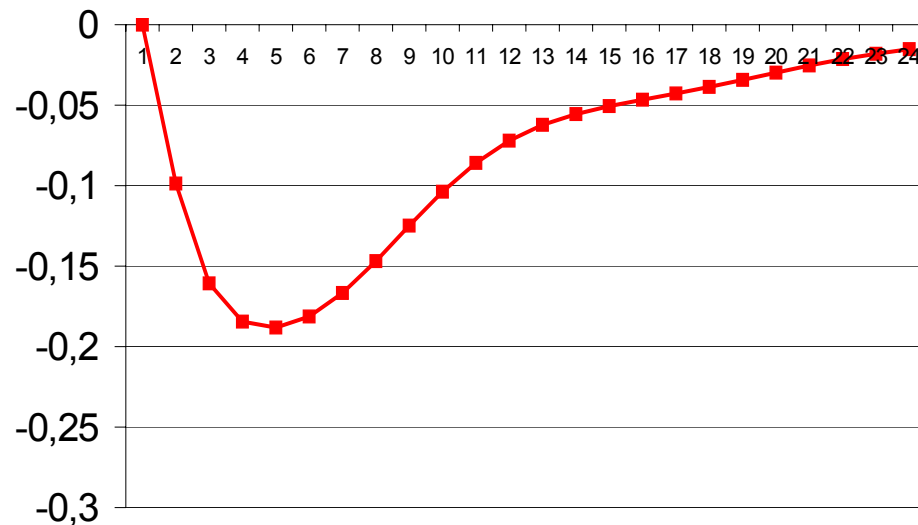
Effects of a monetary policy tightening

- Demand and output contracts
 - Real wages and inflation falls.
 - 'Hump-shaped' and persistent responses.
 - Inflation lags output
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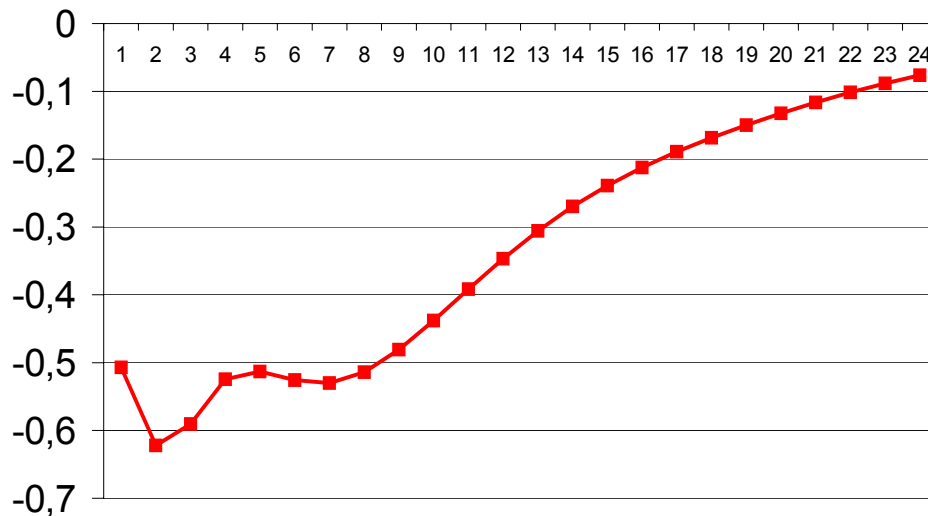
Interest rate



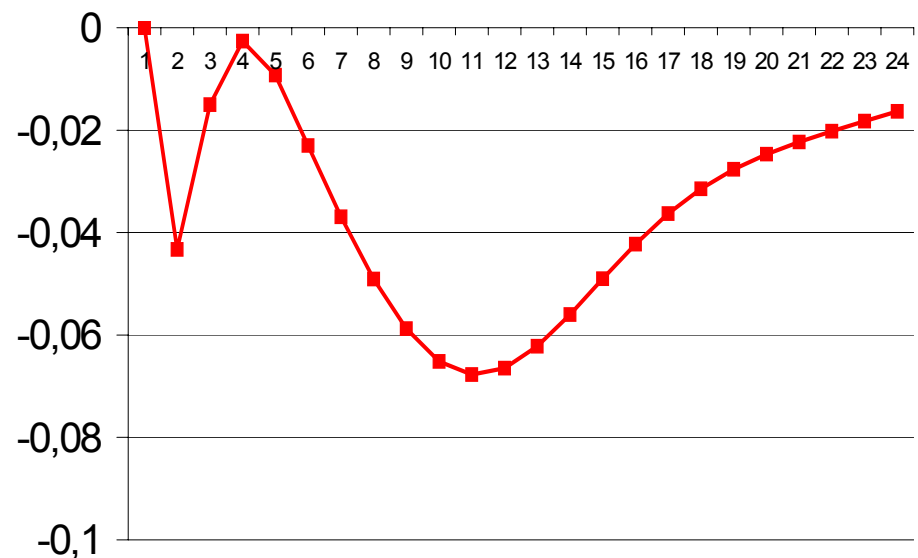
GDP



Real exchange rate



Domestic inflation



What is NEMO?

- **NEMO is a DSGE-model**
 - **D**ynamic
 - **S**tochastic
 - **G**eneral **E**quilibrium
 - Put simply, a group of equations/relations that describe the macro economy with interlinkages that **must be solved simultaneously**
 - **It is internally consistent**
 - There is a unique steady state equilibrium
 - The dynamics are stable and converge to the steady state
 - Flows (investment, current account balance) build stocks (capital stock, net foreign asset holdings)
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What is NEMO?

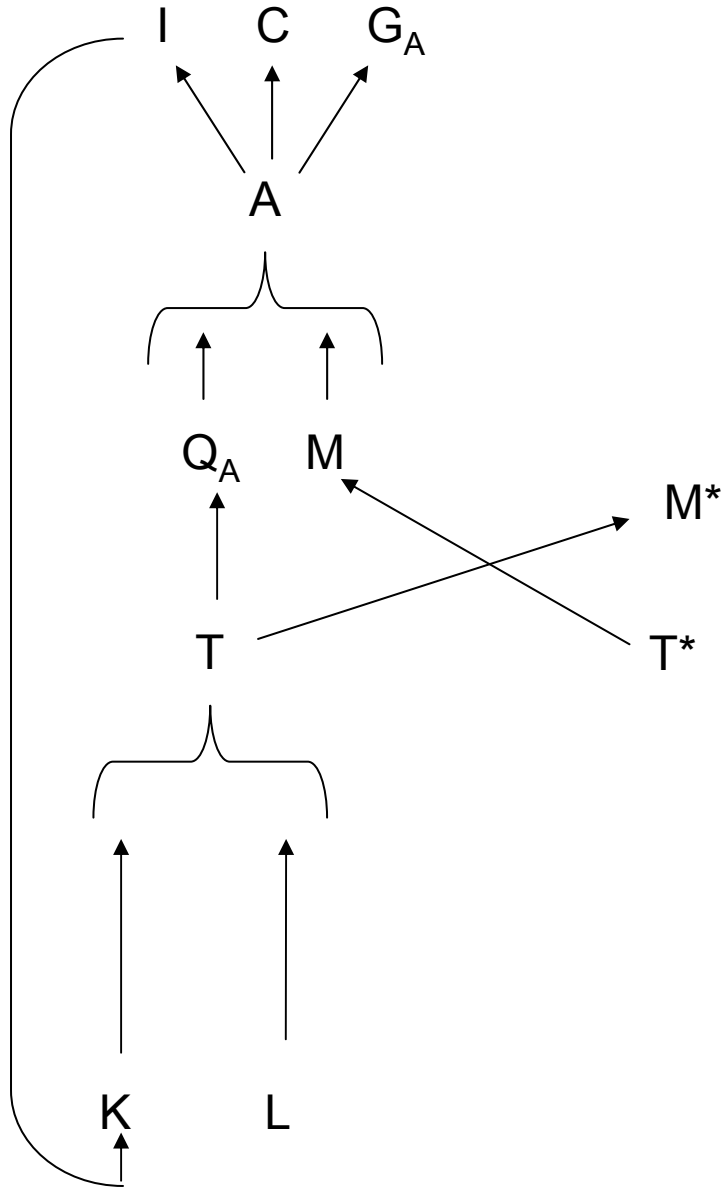
- **The behaviour of different economic agents is modelled explicitly.**
 - Households maximise expected utility
 - Firms maximise expected profits
 - Monetary policy targets inflation using the key interest rate
 - **Nominal rigidities and monopolistic competition**
 - >> **New Neo-classical Synthesis:**
 - Classical long-term properties
 - Keynesian features in the short term
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How does NEMO meet our general requirements?

1. NEMO represent consensus views
 - No trade-off between inflation and output in the long term
 - Monetary policy affects the real economy in the short to medium term
 - Monetary policy provides a nominal anchor
 2. Expectations play an explicit role in NEMO
 3. In NEMO, mechanisms and disturbances are economically interpretable in a consistent fashion
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Features of NEMO

- Its dynamics are quarterly
 - Consists of two countries - Norway and its Trading Partners
 - Balanced growth
 - One-good model
 - Monopolistic (imperfect) competition in the product market
 - Monopolistic (imperfect) competition in the labour market
 - External balance in the long run (transaction costs/endogenous risk premium)
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Features of NEMO to map stylised facts

- Real rigidities
 - Adjustment costs on capital (resembles time to build)
 - Habit formation in consumption
 - Nominal rigidities
 - Adjustment costs on prices
 - Adjustment costs on wages
 - Variable capacity utilisation of capital
 - Variable labour effort (resembles labour hoarding)
 - “Spenders” as well as “savers”
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Quantifying NEMO

We incorporate data with theory through two steps:

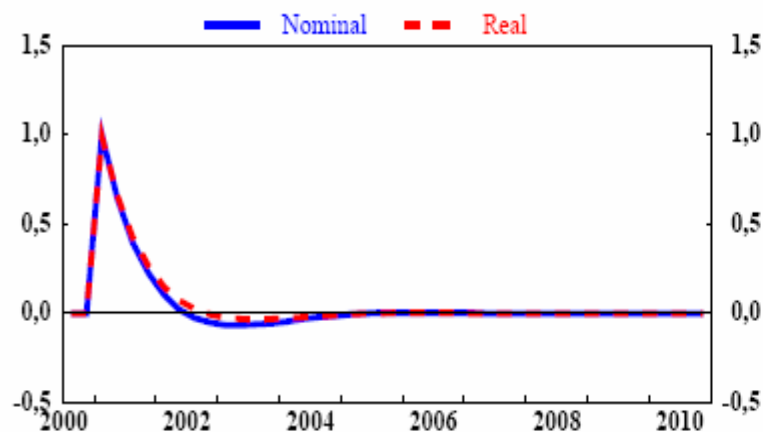
1. First step: Calibration based on a range of information:
 - Great ratios
 - Identified VARs
 - Moment-analysis/stylised facts (Stock/Watson)
 - Single equation (econometric) analysis
 - Micro evidence
 - Evidence from other countries
 - Experience and knowledge within the institution

 2. Next step: Bayesian system estimation
 - Need priors for the distribution of parameters.
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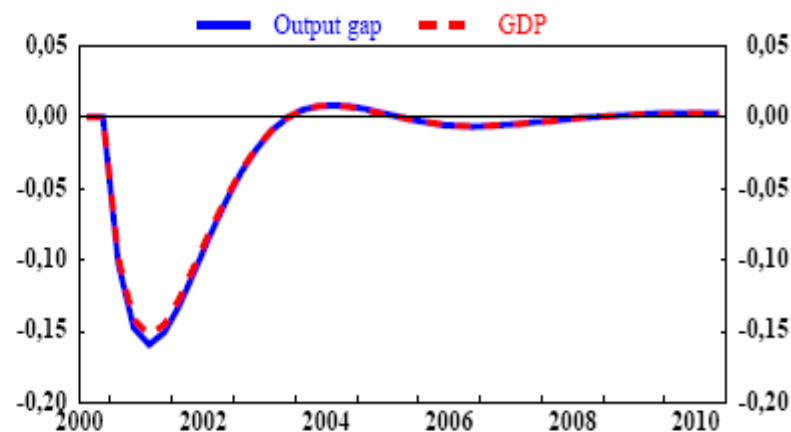
Using NEMO as a Policy Tool

- We can demonstrate individual shocks with the model as a first step for policy analysis
 - We are working on using NEMO for forecasting and projections
 - Standard
 - Monetary policy shock
 - Demand shock
 - Structural changes
 - Increased competition
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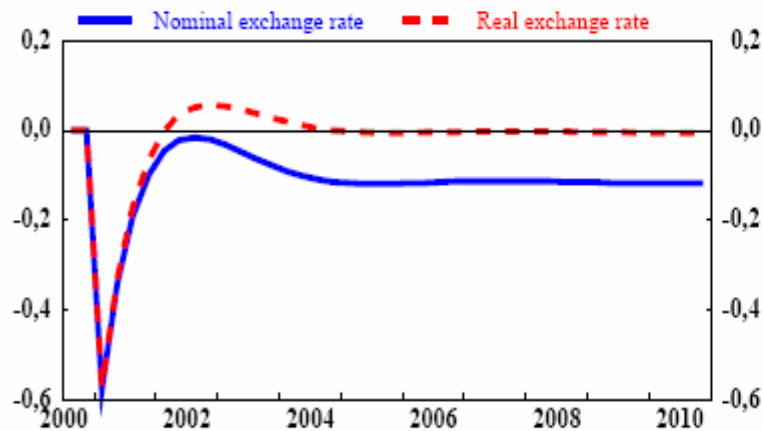
Interest Rates



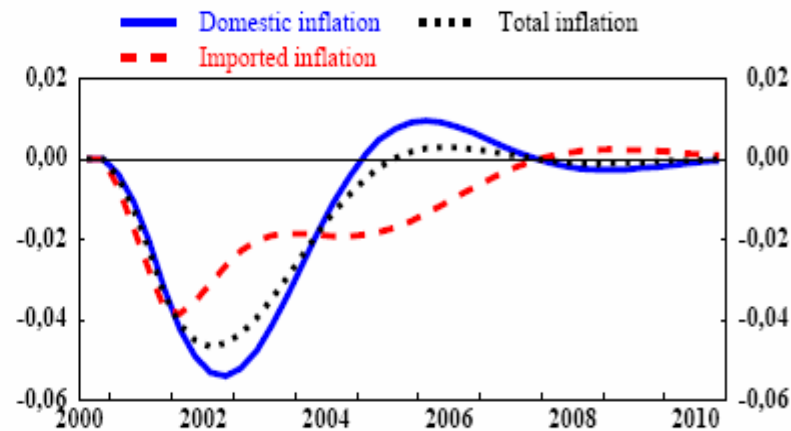
GDP and Output Gap



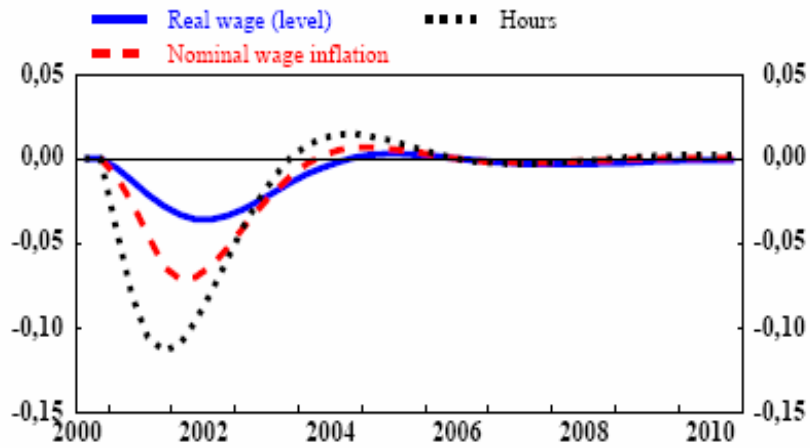
Exchange Rates (+=depreciation)



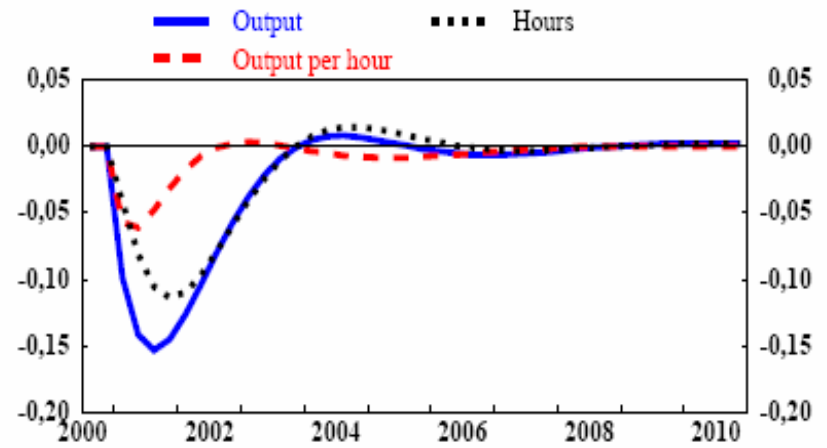
Inflation by Sector



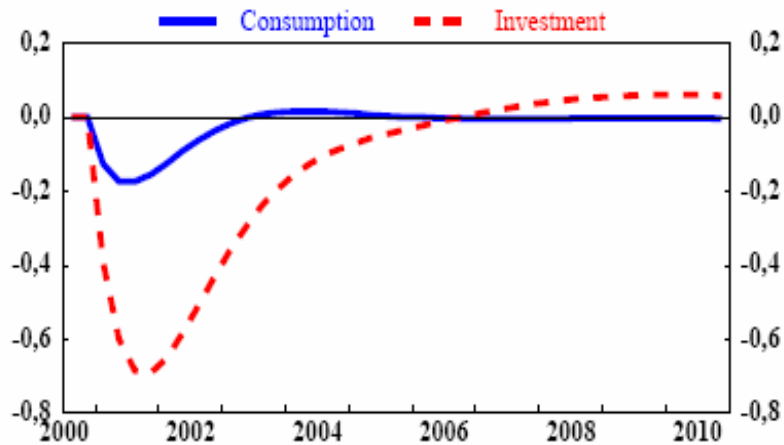
Wages and Hours



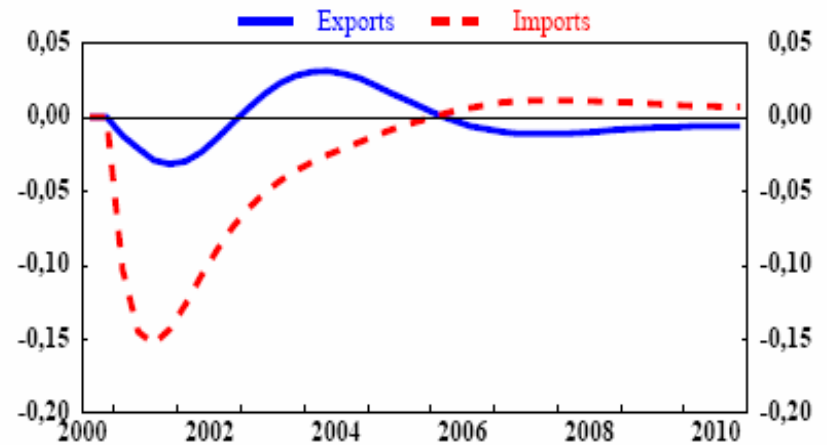
Output and Hours

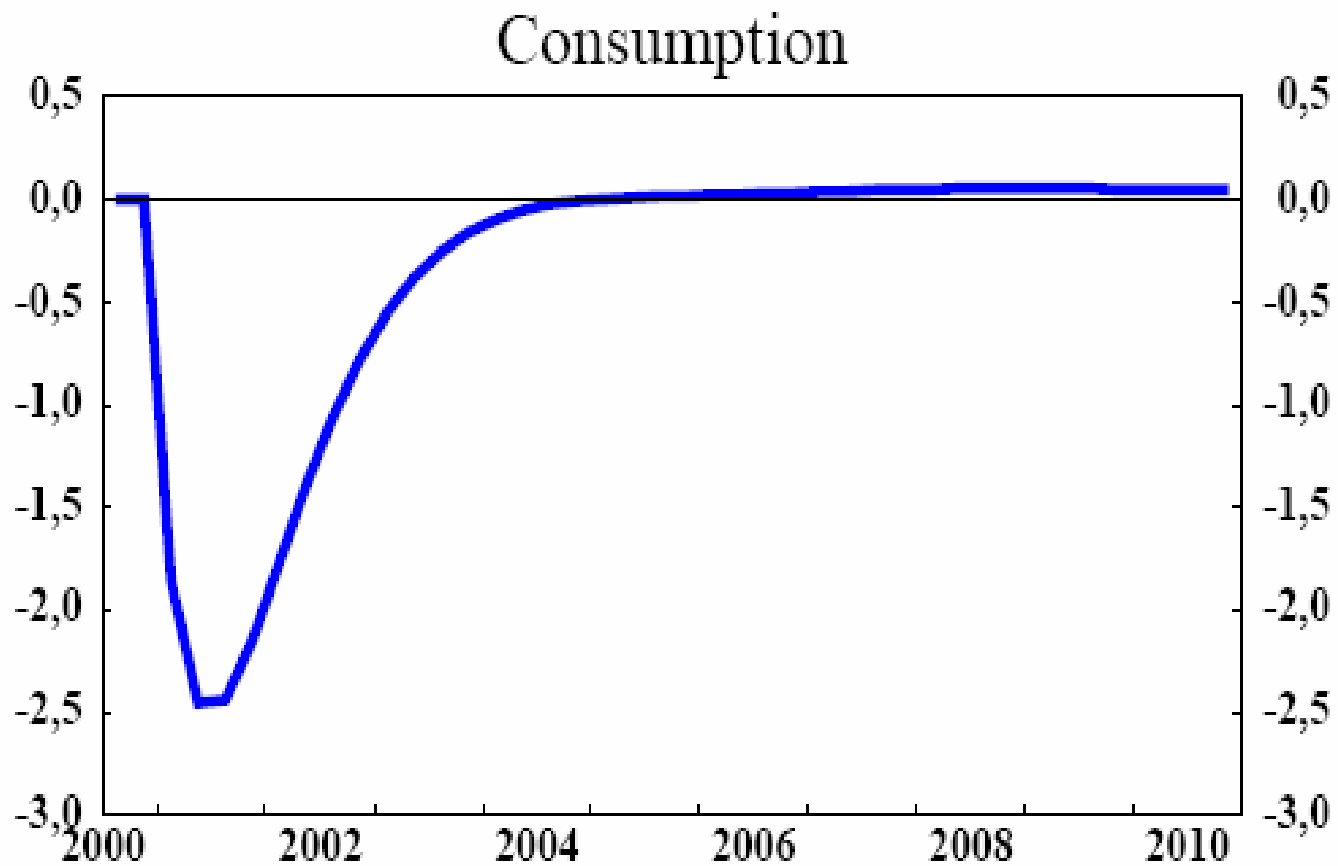


Demand components

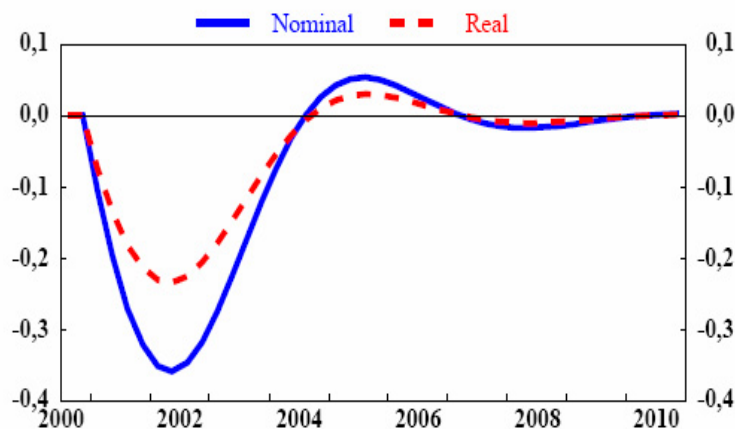


Net trade

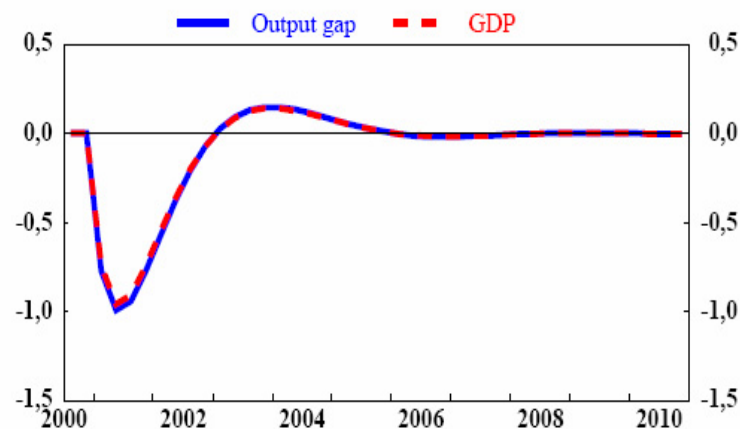




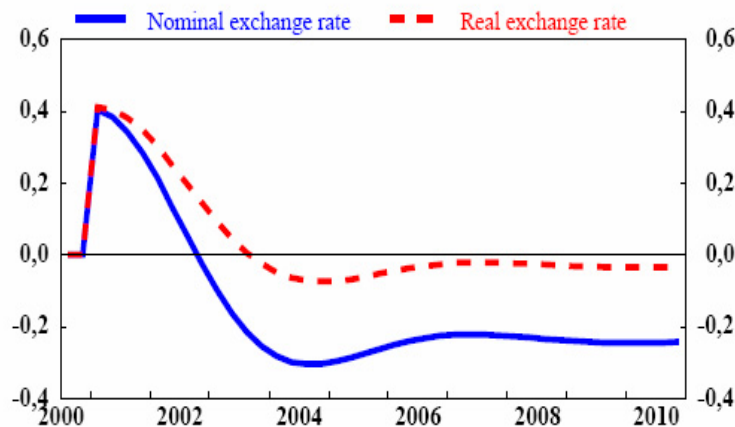
Interest Rates



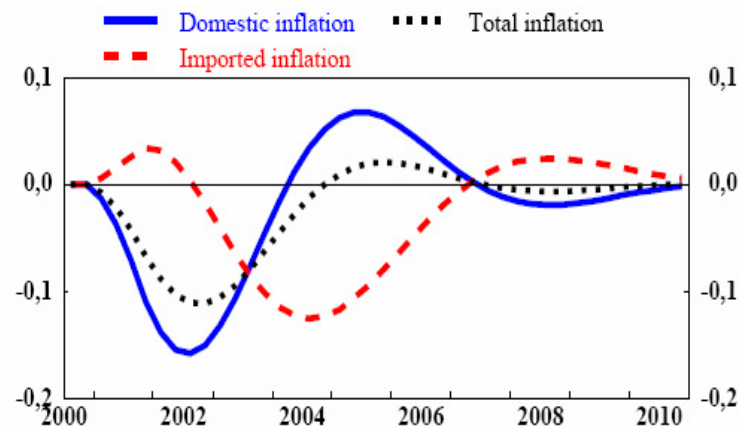
GDP and Output Gap

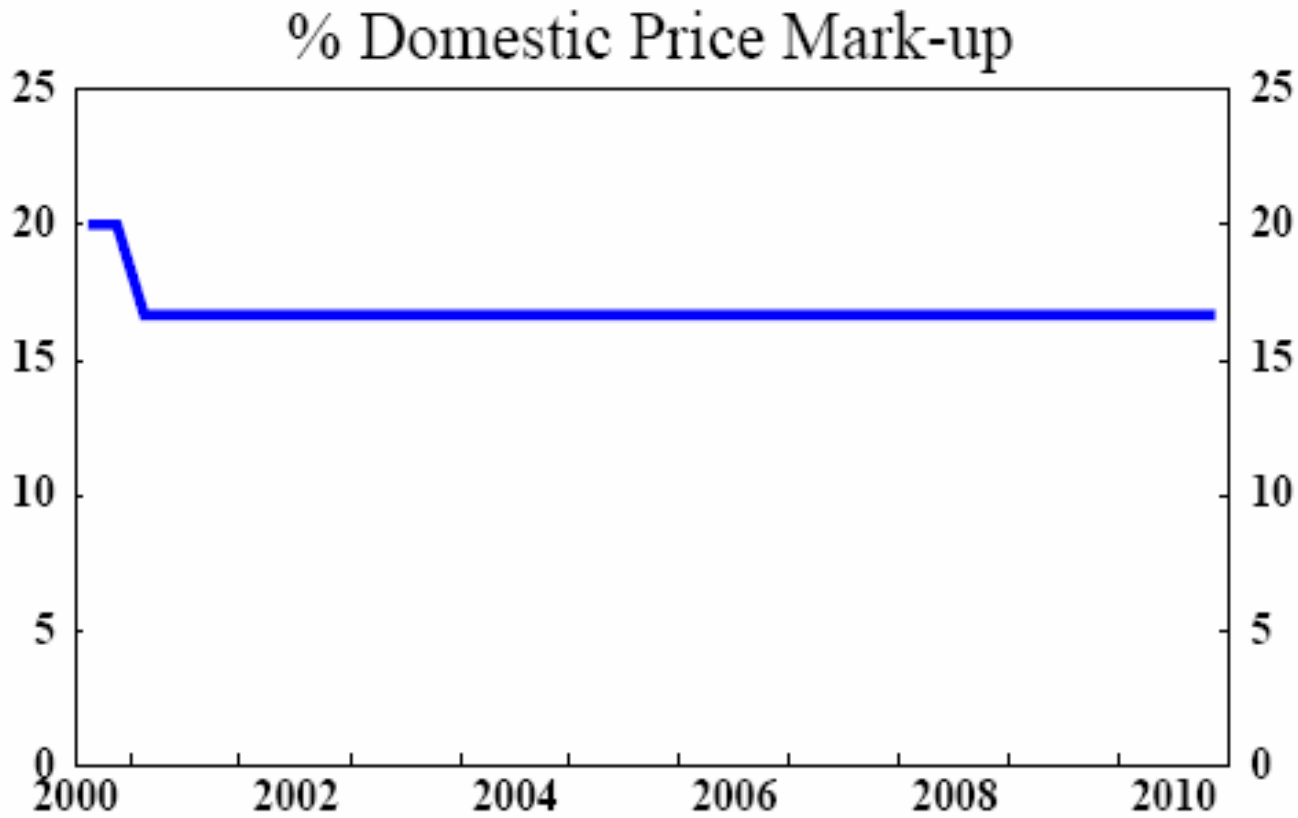


Exchange Rates (+=depreciation)

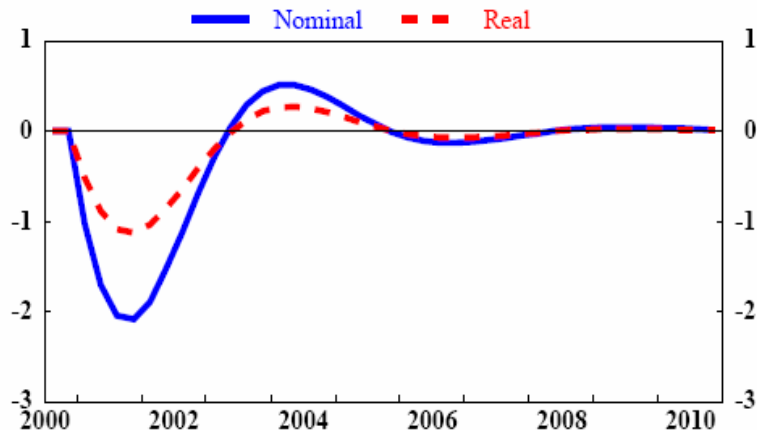


Inflation by Sector

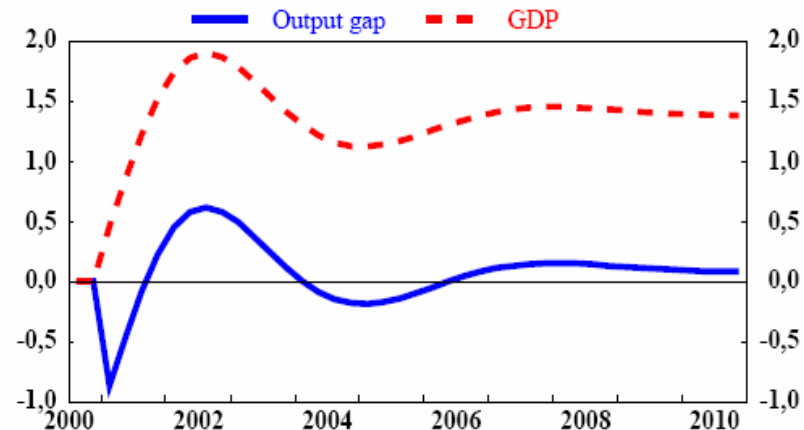




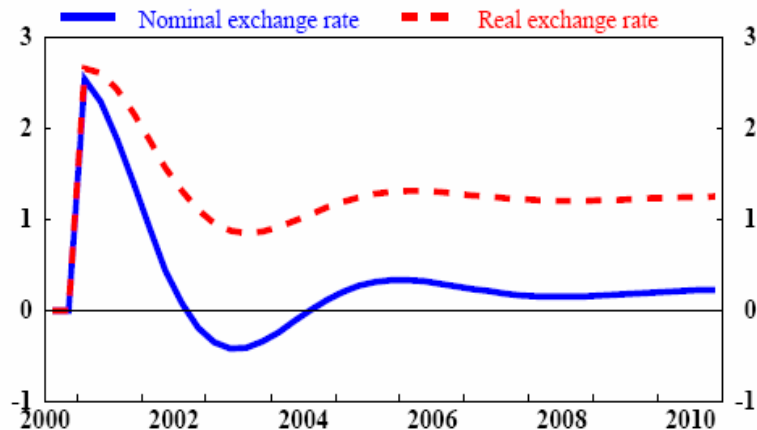
Interest Rates



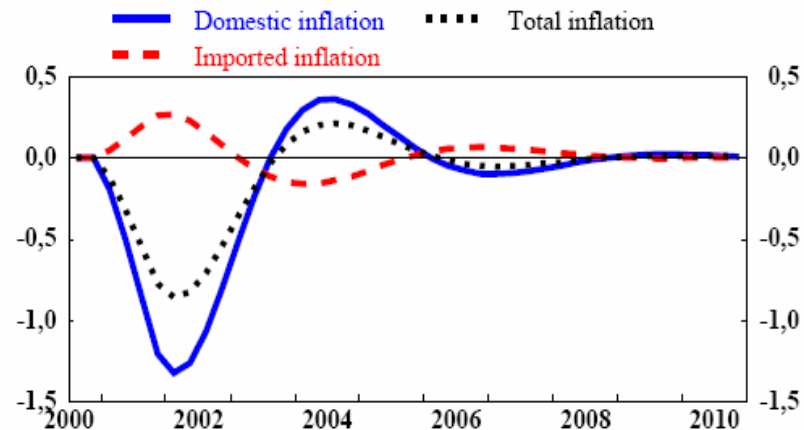
GDP and Output Gap



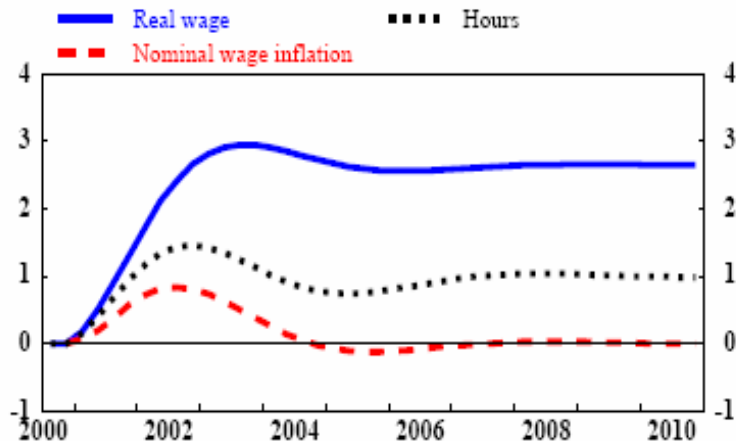
Exchange Rates (+=depreciation)



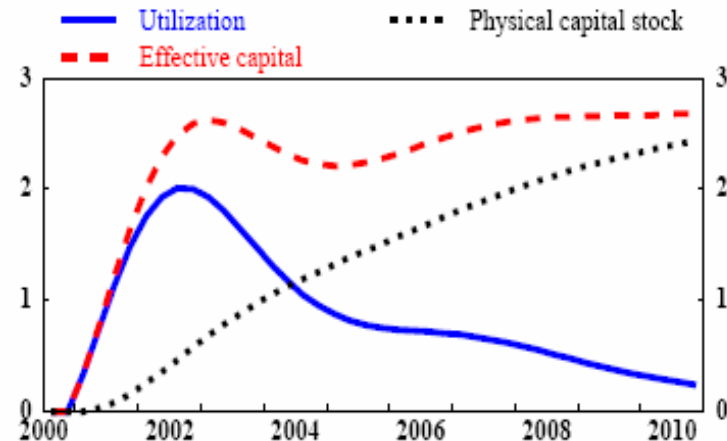
Inflation by Sector



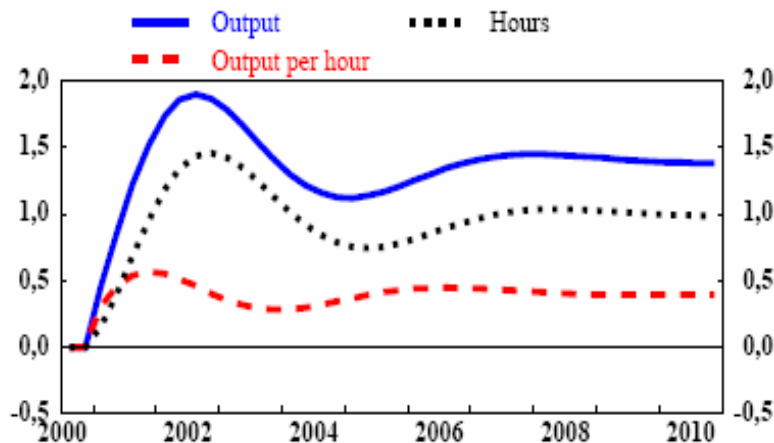
Wages and Hours



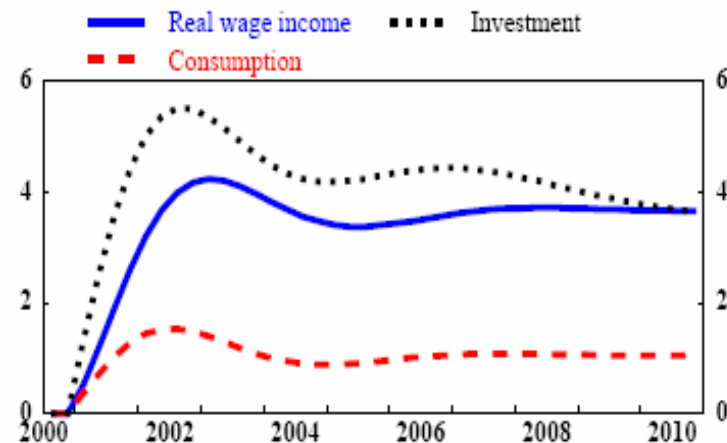
Capital and its Utilization



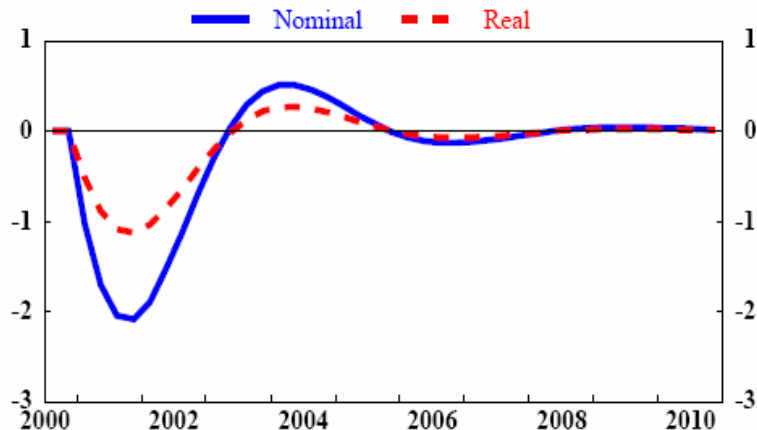
Output and Hours



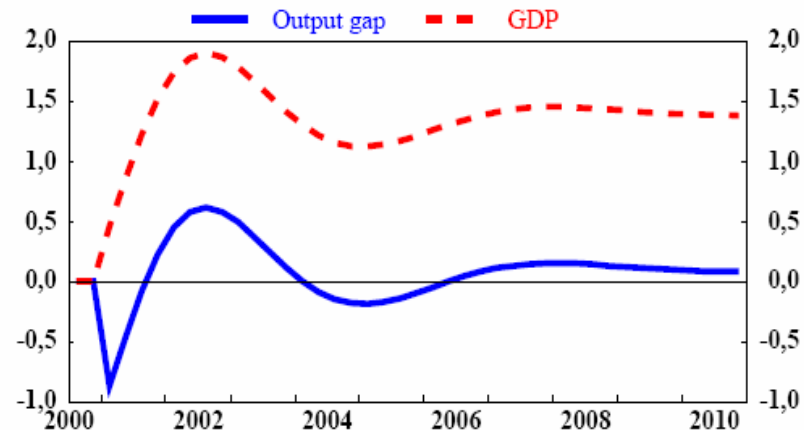
Income, Consumption and Investment



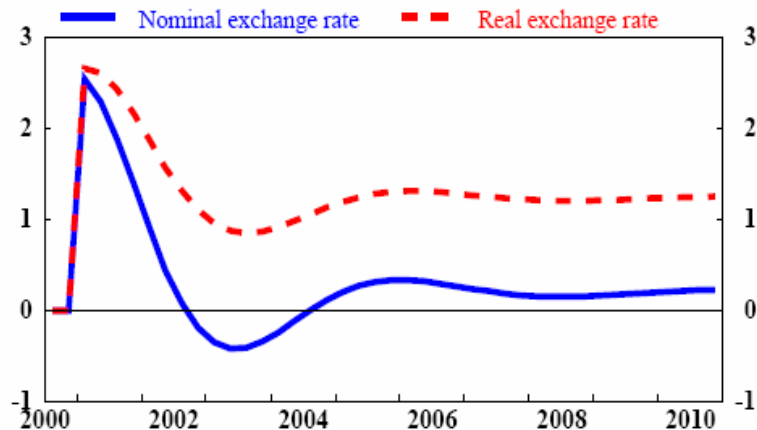
Interest Rates



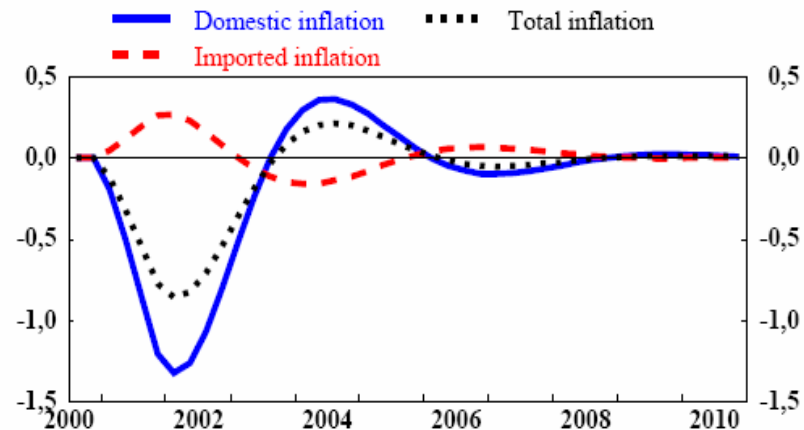
GDP and Output Gap



Exchange Rates (+=depreciation)



Inflation by Sector



NEMO is still work in progress

Completed:

- Analytical model structure
- First pass calibration

In progress:

- Integration with the forecasting system
 - Estimation
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