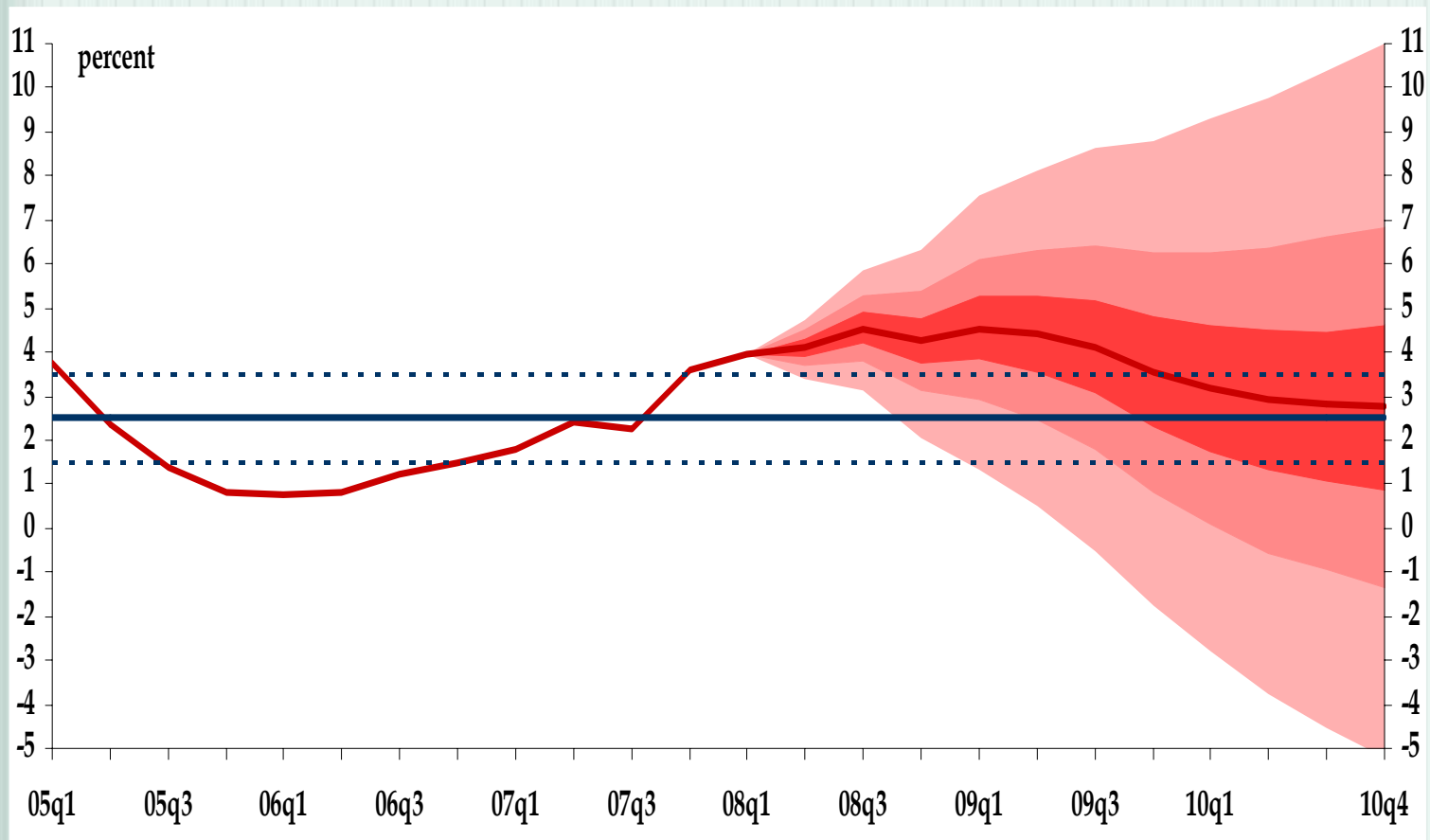


**Inflation projection
of the National Bank of Poland
based on NECMOD model**

June 2008

Inflation projection – June 2008



Source: Economic Institute

Presentation plan

- **Forecasting model**
 - **Main changes in the forecasting model**

- **Central projection**
 - **Starting point compared to February projection**
 - **Projection for 2008-2010**
 - **Accounting for deviations from the previous projection**
 - **Expert adjustments**

- **Uncertainty of inflation projection**
 - **Factors accounted for in the model – fan charts**
 - **Factors unaccounted for in the model**

Forecasting model

Main changes in the forecasting model

Forecasting model

Main changes in the forecasting model (1)

- **Extension of the supply side:**
 - disaggregation of investments into public investments, corporate investments and housing investments,
 - endogenisation of economic activity rate within 3 age groups framework.
- **Introduction of the housing market**
- **Introduction of explicitly modelled expectations consistent with the model's structure:**
 - equations of core inflation and value added deflator,
 - Taylor's rule,
 - real interest rates.

Main changes in the forecasting model (2)

- **Increased transmission of world prices on domestic prices due to:**
 - changed decomposition of CPI (division into 3 components: 1) food prices, 2) prices of fuels, electricity and natural gas, 3) core inflation),
 - food and energy prices forecast on the basis of world prices of agricultural and energy commodities,
 - changed decomposition of import prices (exclusion of oil and natural gas prices from import prices).
- **More accurate modelling of the impact of EU funds on the economy:**
 - more detailed accounting for EU funds - currently 3 groups of funds are distinguished: 1) current transfers, 2) capital transfers to the general government sector, 3) investment transfers for enterprises,
 - diversification of channels through which different types of EU funds affect the economy.

Main changes in the forecasting model (3)

- **Adjustment of LFS data**
- **Disposable income**
 - own estimate (partially based on GUS data) of disposable income,
 - remittances from Poles living abroad and transfers from the EU explicitly accounted for in a disposable income estimate.
- **Introduction of the fundamental equilibrium exchange rate**
 - introduction of a model-consistent equation for the fundamental equilibrium exchange rate, so that a model-consistent shift in the equilibrium exchange rate can be defined in forecasting and simulation exercises.
- **Inclusion of ESA 95 data**

Central projection

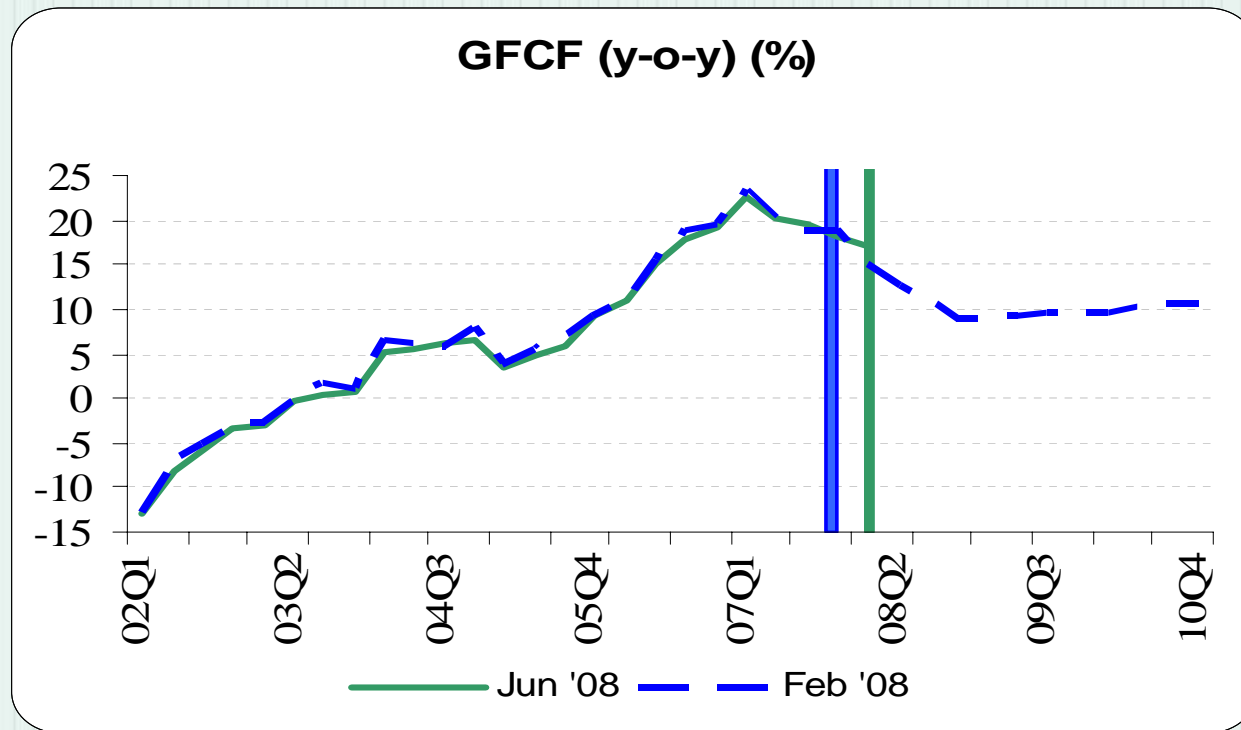
Starting point of June projection as compared to February projection

- **GDP and its components**
- **Labour market**
- **Inflation**

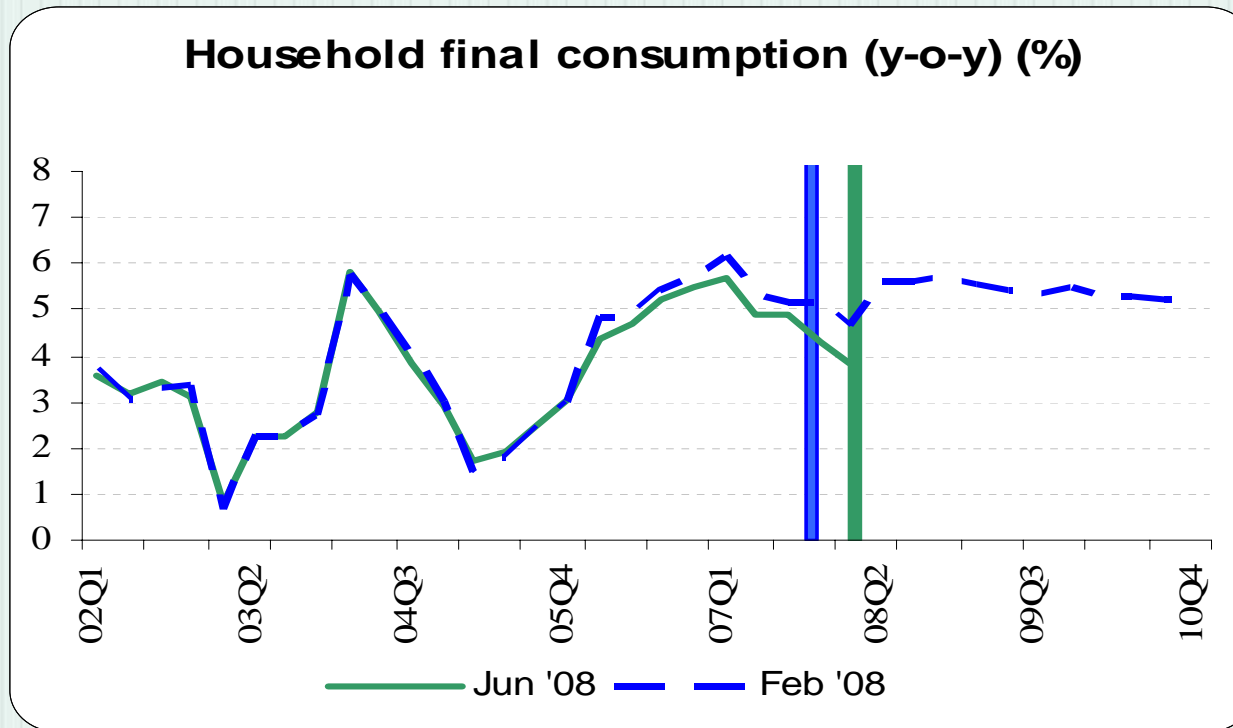
GDP and its components

Starting point

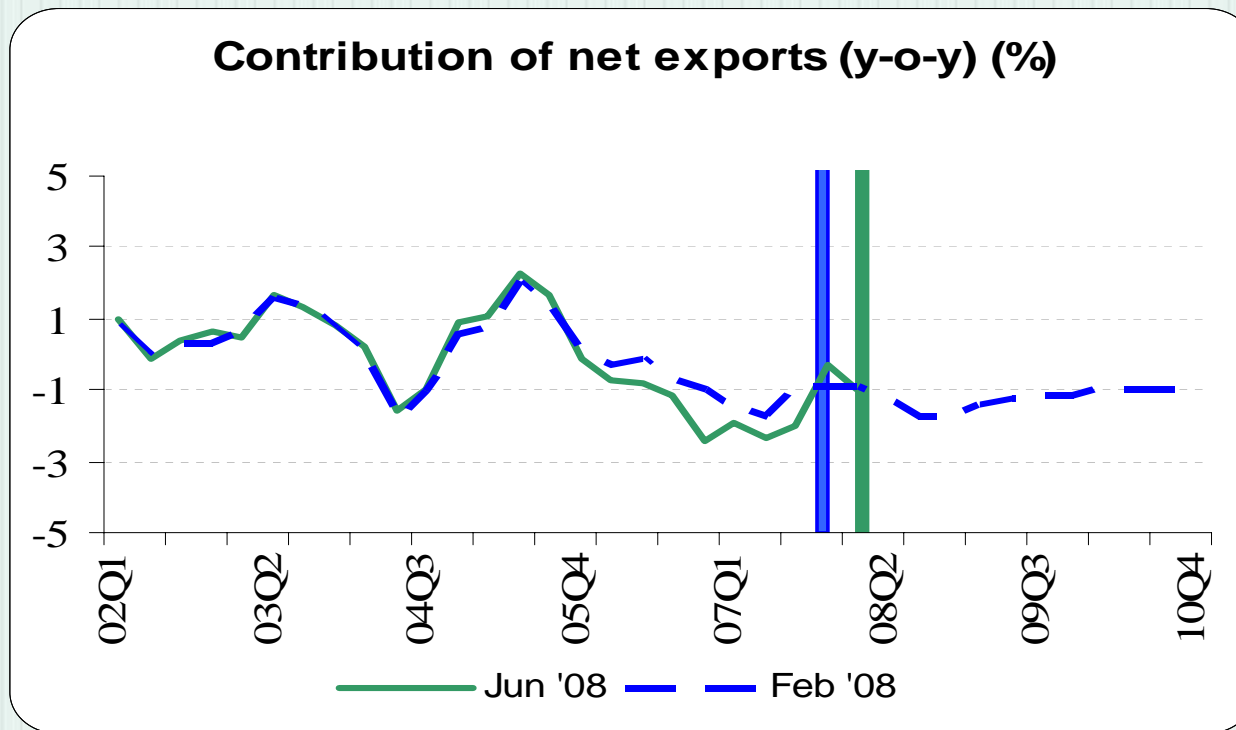
Fixed capital formation: similar growth rate



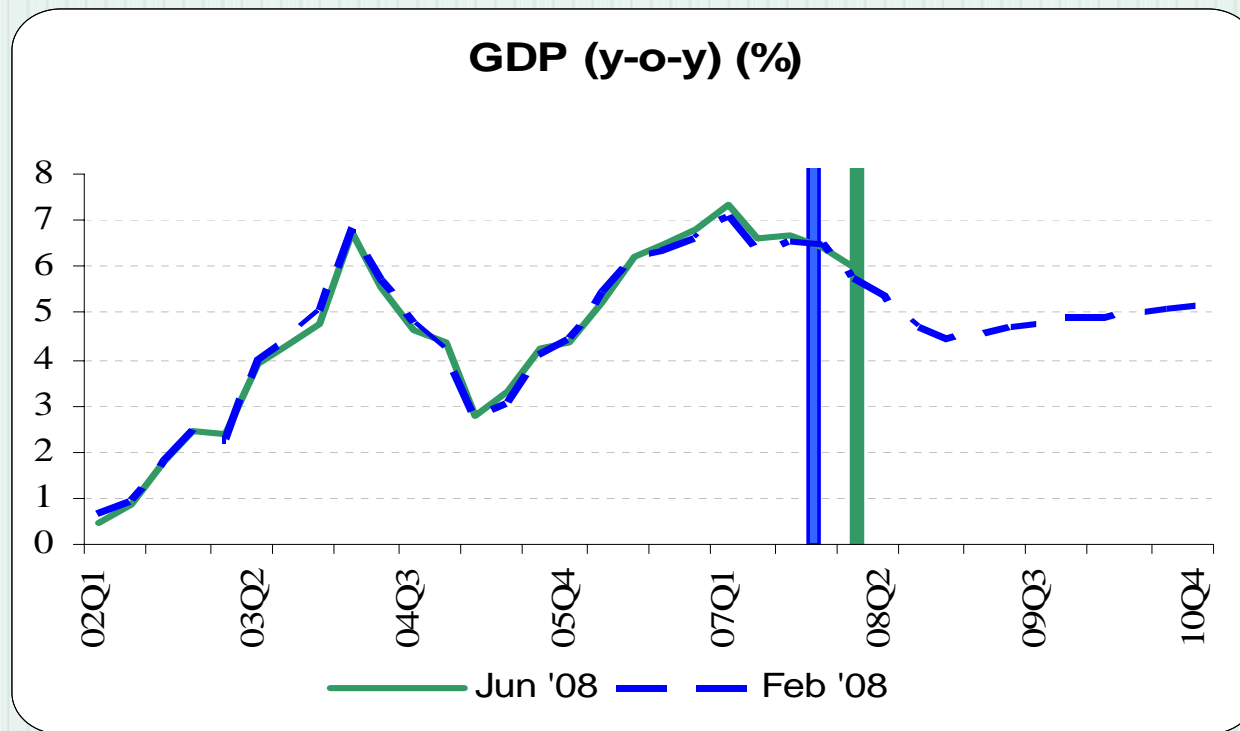
Private consumption: slower growth rate



Contribution of net exports: similar



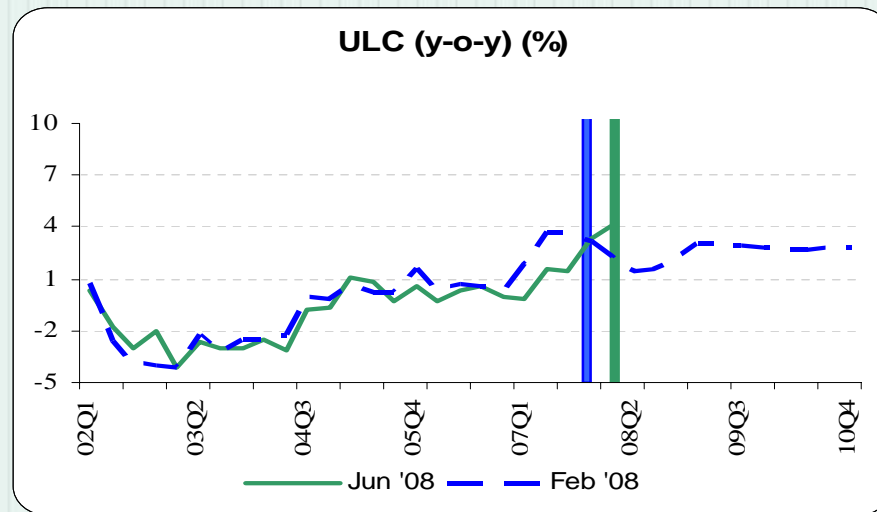
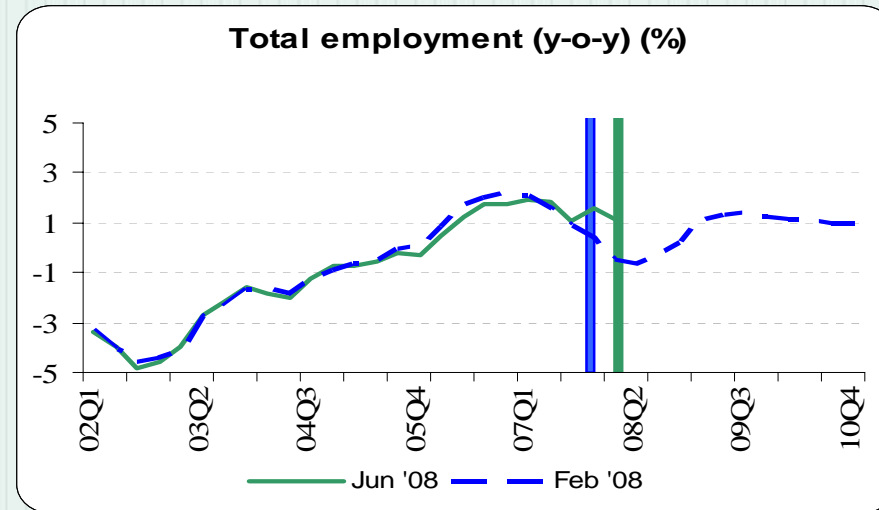
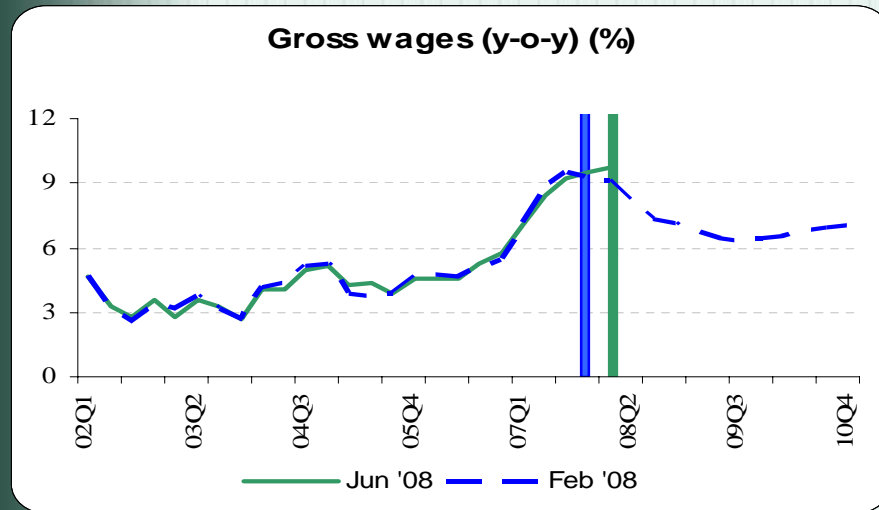
GDP: similar growth rate



Labour market

Starting point

ULC: higher growth rate*

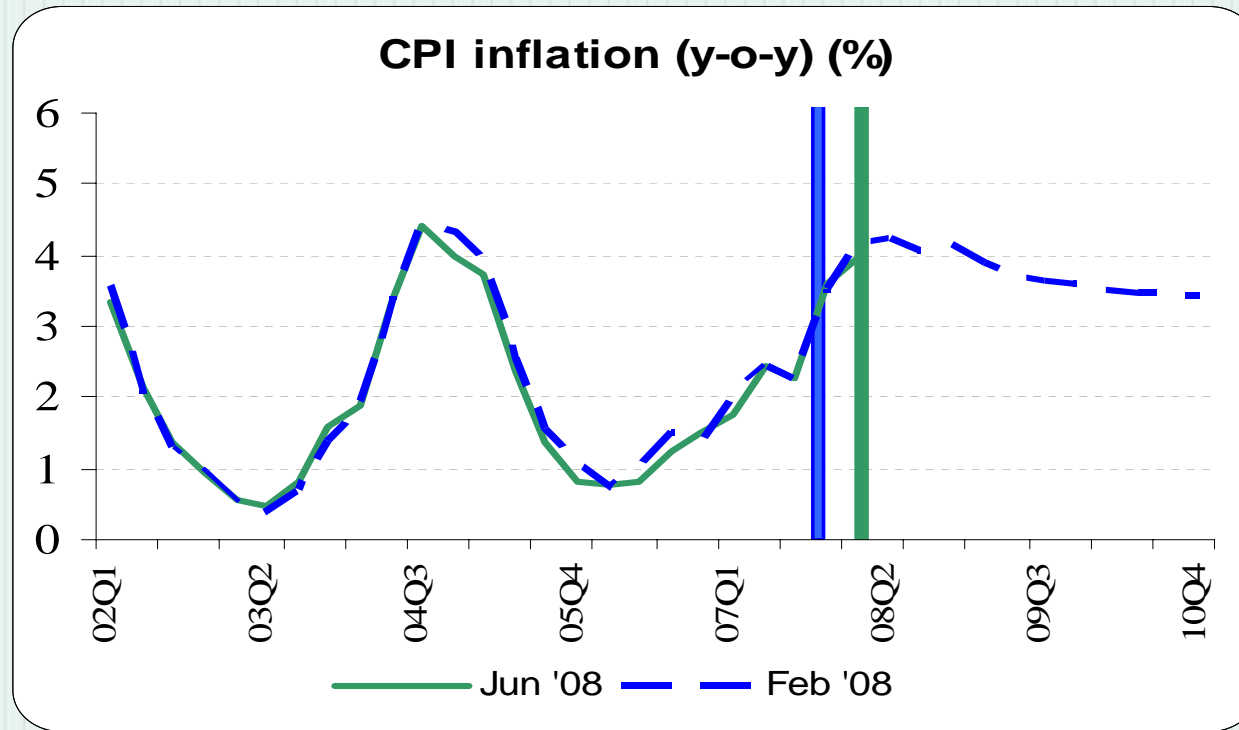


* Growth rate of the number of working persons and ULC presented in comparable terms

Inflation

Starting point

Inflation: similar



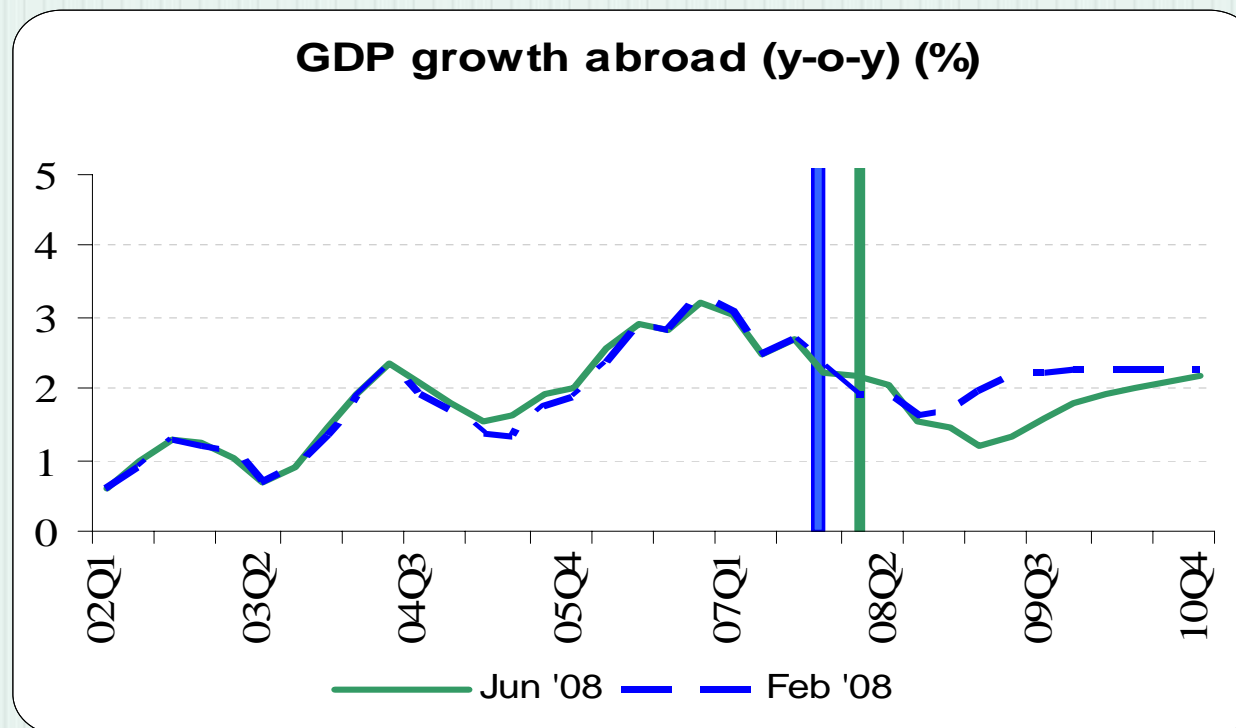
**Macroeconomic projection
for 2008-2010**

Constant interest rates

Assumptions

Macroeconomic projection

Growth abroad: lower from 2008 Q3



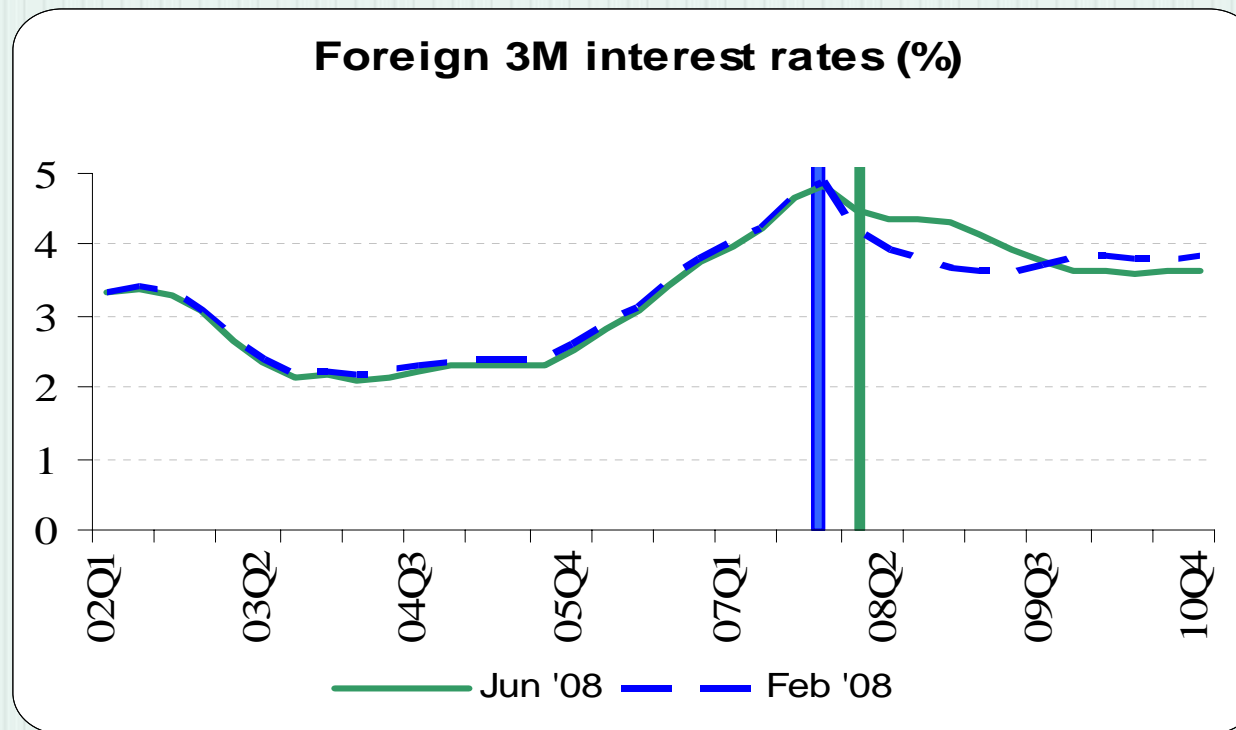
In NECMOD model, the foreign sector is represented by three economies (with weights, respectively):

- euro area (87.8%)
- United Kingdom (7.2%)
- United States (5.0%)

Lower economic growth abroad in comparison to February projection:

- in the United States throughout the projection horizon.
- in the euro area in 2009 and 2010
- in the United Kingdom in 2009

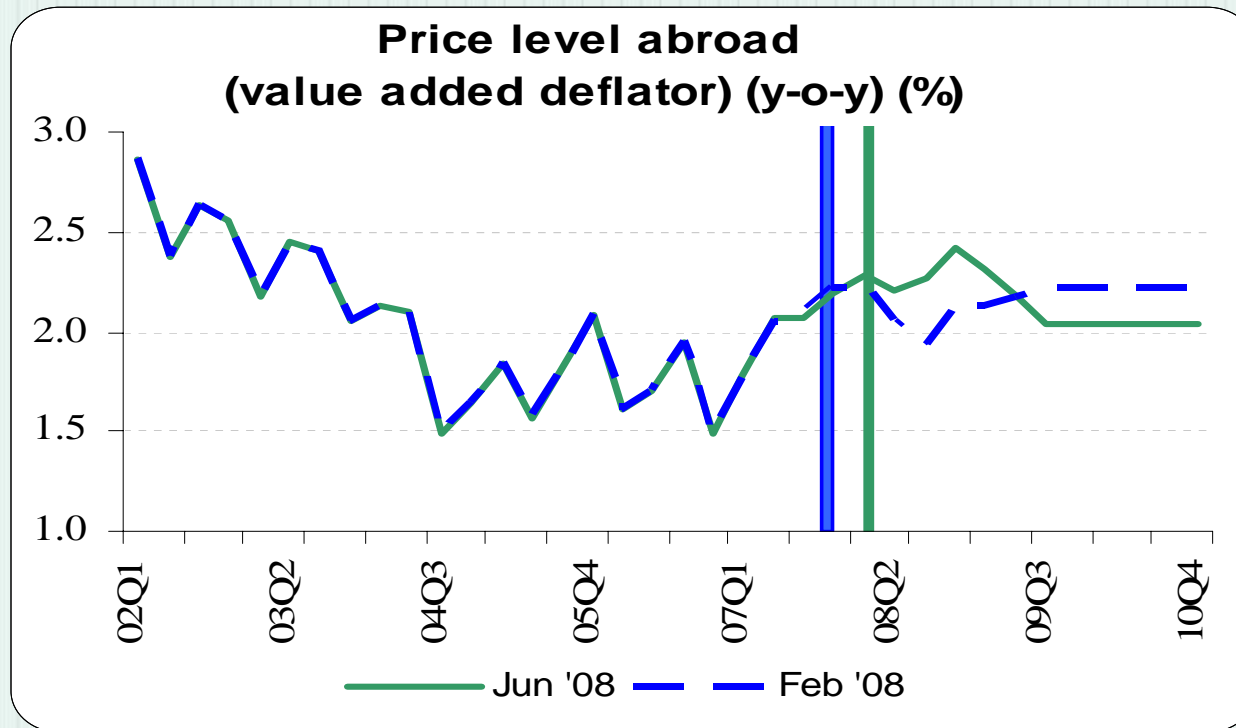
Interest rates abroad: lower from 2009 Q3



In comparison to February projection, **higher** market interest rates abroad:

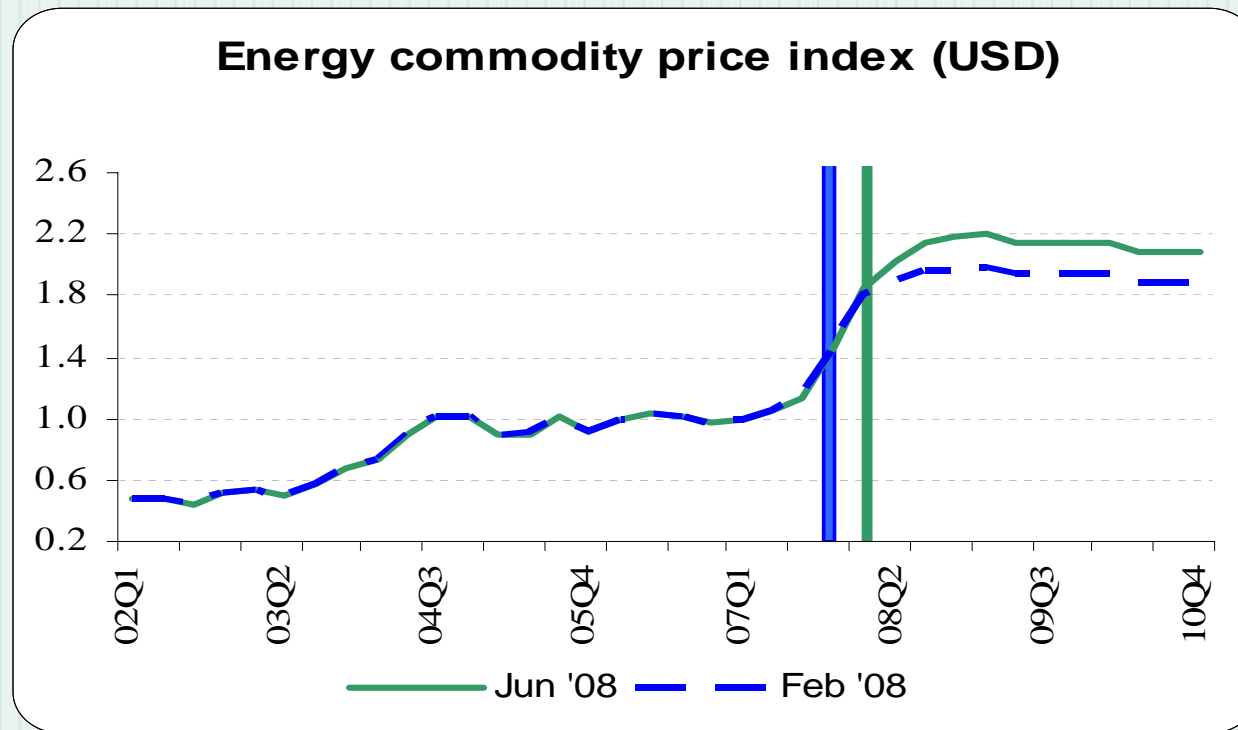
- in the United States throughout the projection horizon
- in the euro area throughout the projection horizon, except for 2008 Q2
- in the United Kingdom till 2009 Q2

Price level abroad*



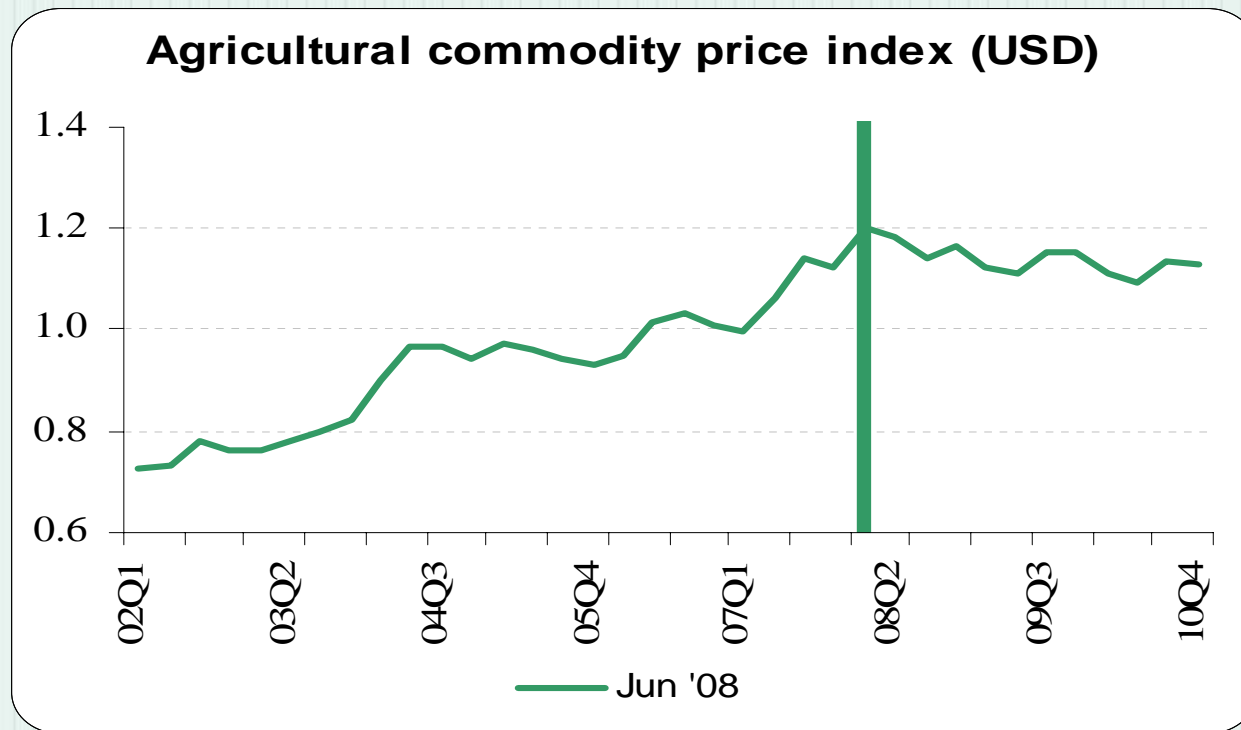
* February path of value added deflator abroad estimated based on February forecast of GDP deflator abroad.

Energy commodity price index*



* Global index of energy commodity prices includes prices of: hard coal, crude oil, natural gas. February forecast of the index is an estimate based on the change of forecast of oil price paths between the projections.

Global prices of agricultural commodities*

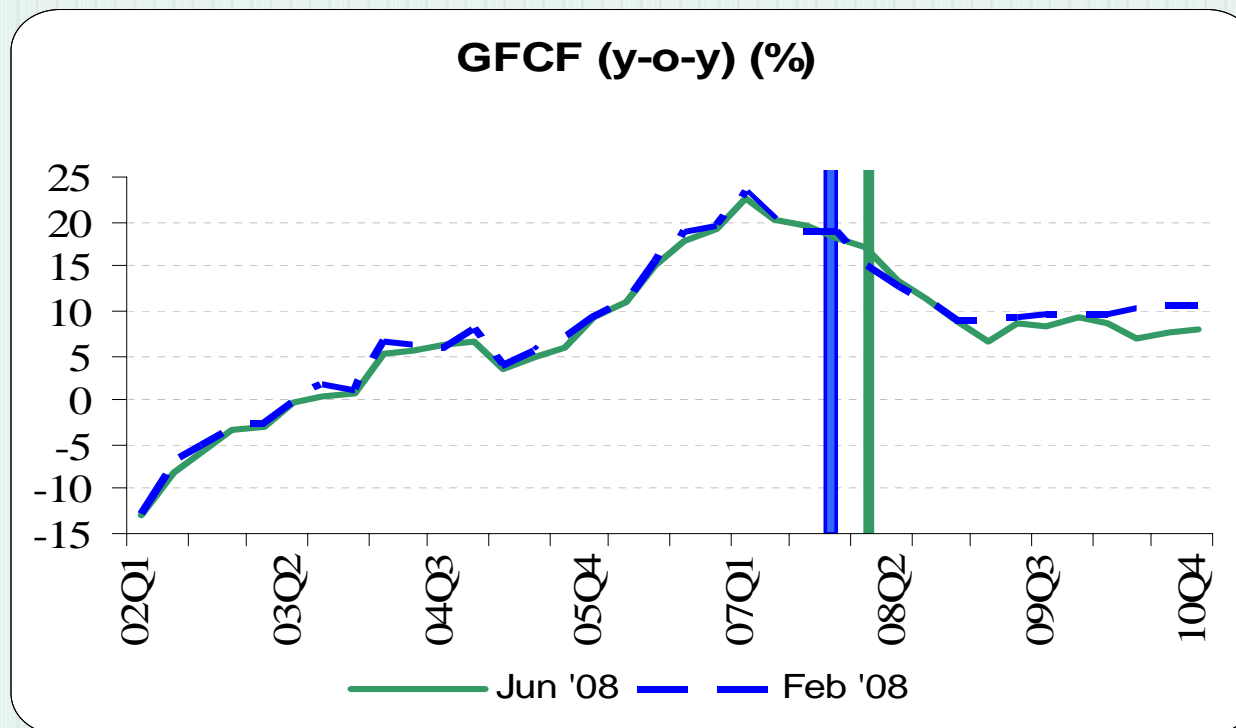


*Global index of agricultural commodity prices consists of prices of: wheat, pork, beef, poultry, fish, olive oil, sugar, oranges and bananas. Index weights represent the structure of consumer consumption (CPI basket).

GDP and its components

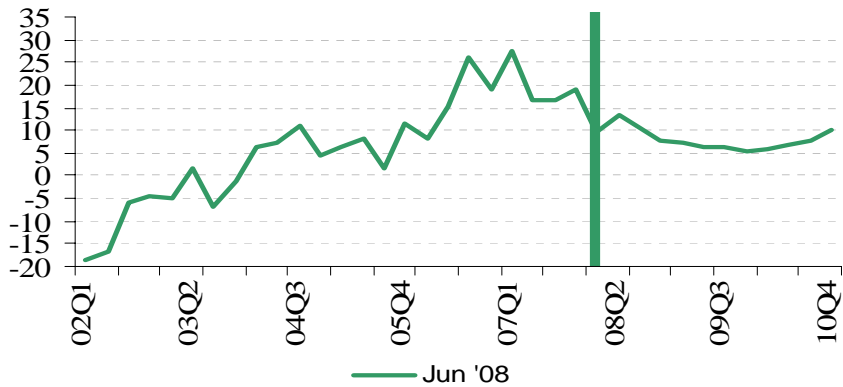
Macroeconomic projection

Investment outlays:
slightly higher growth rate in 2008,
then lower in the longer projection horizon

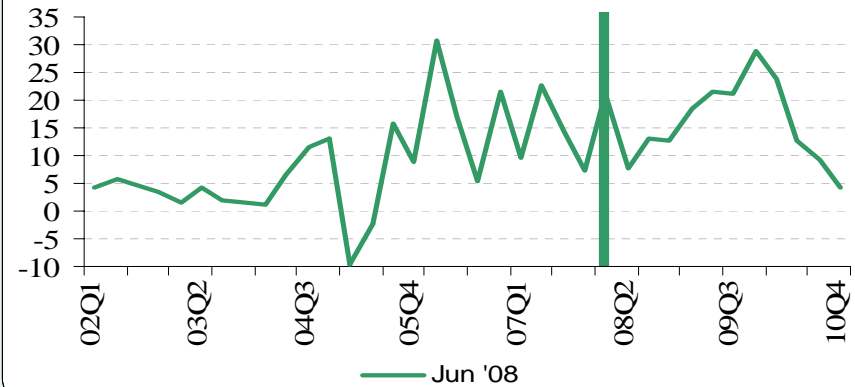


Fixed capital formation: decomposition

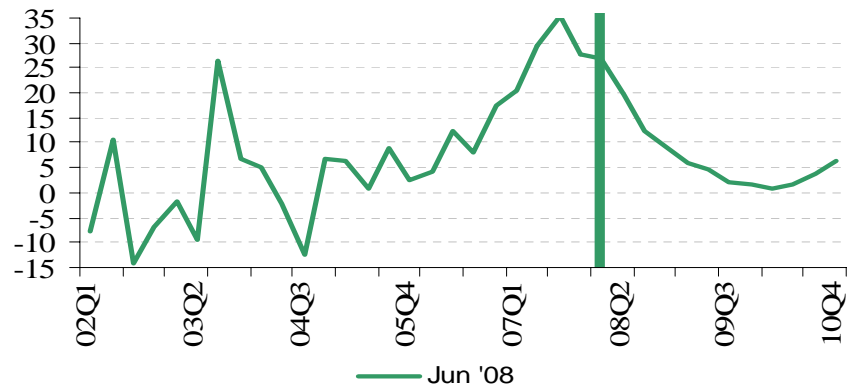
GFCF enterprises (y-o-y) (%)



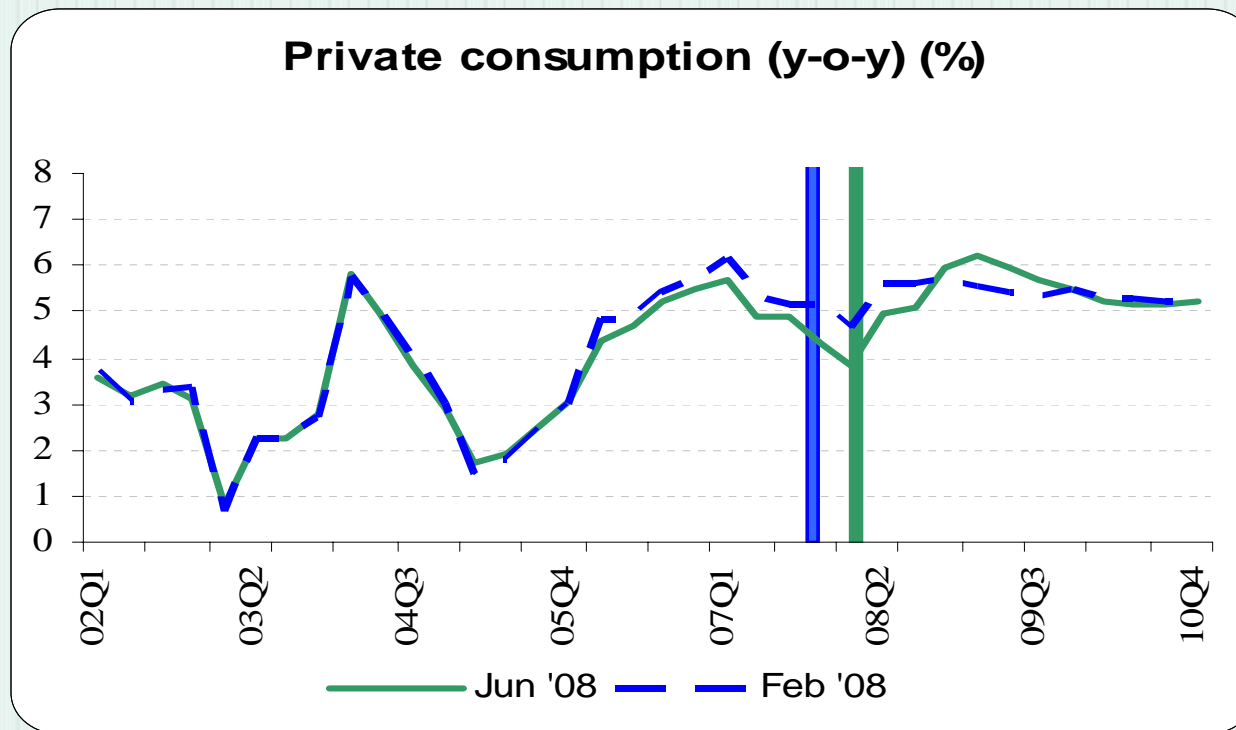
GFCF public sector (y-o-y) (%)



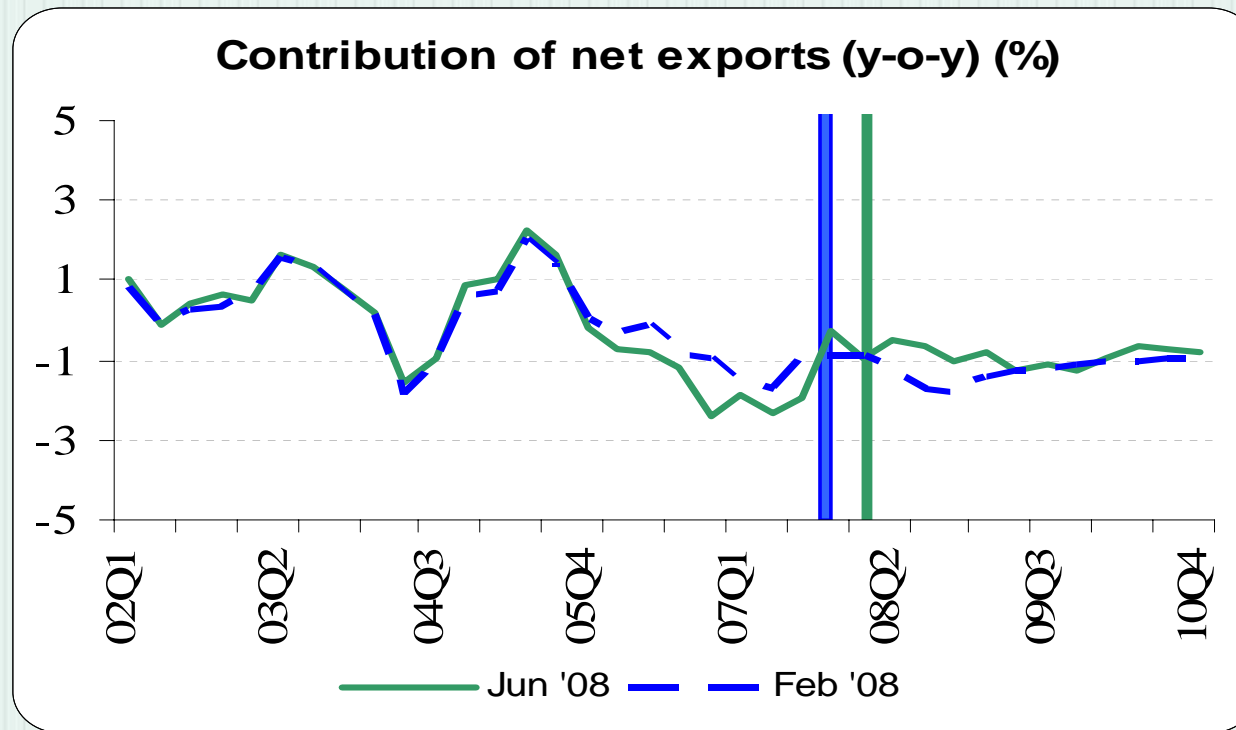
GFCF housing (y-o-y) (%)



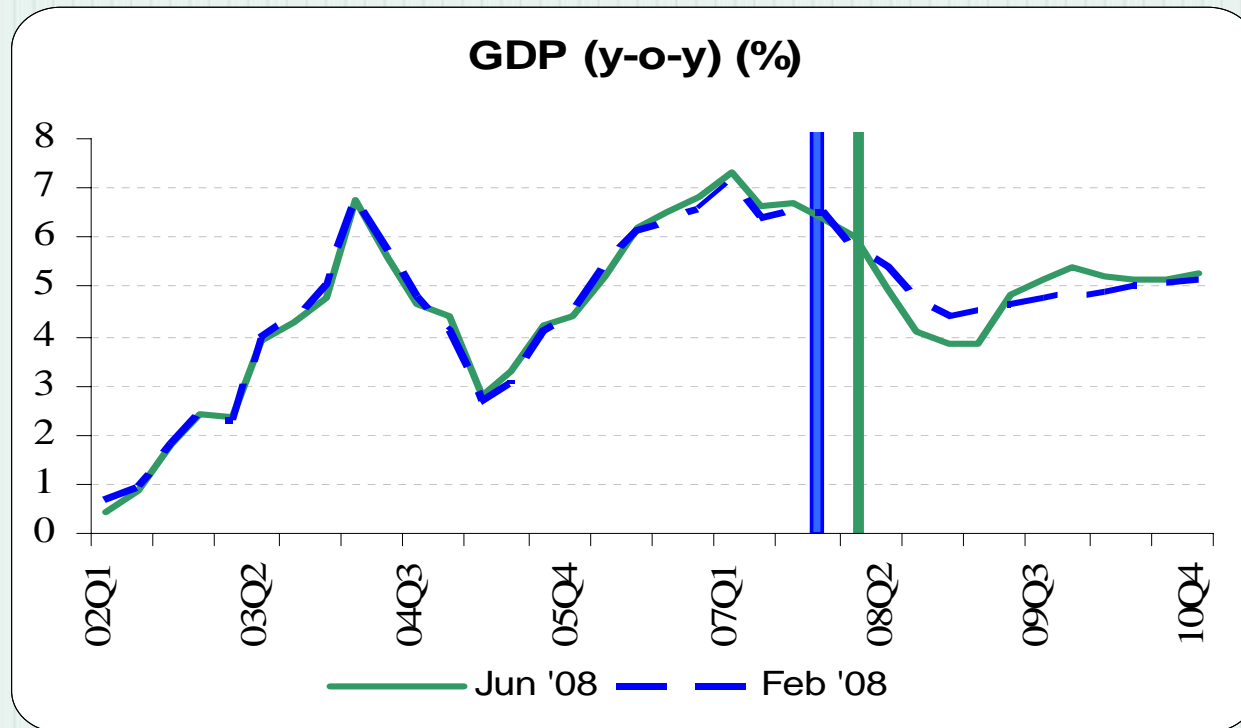
Private consumption: higher in 2009



Contribution of net exports: slightly higher



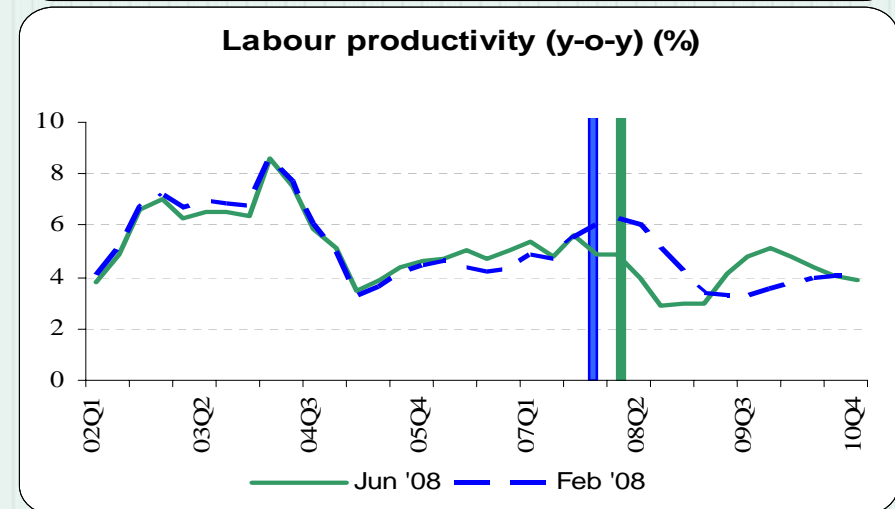
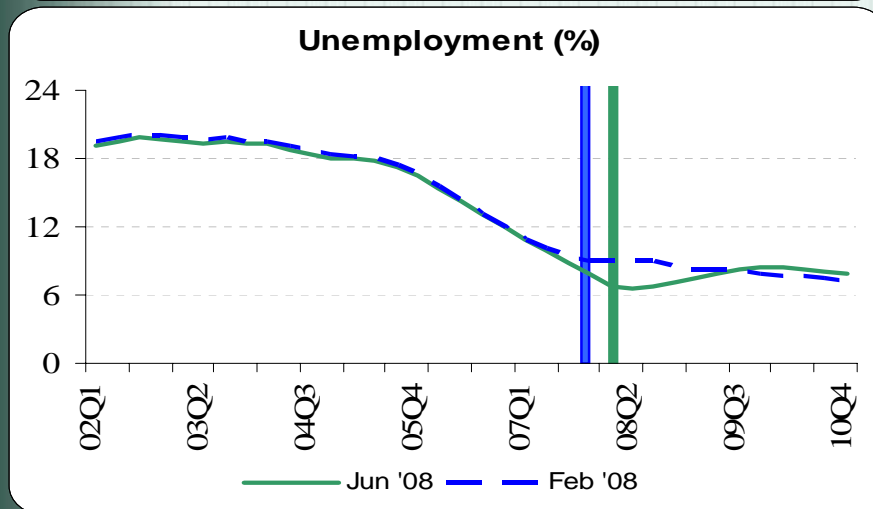
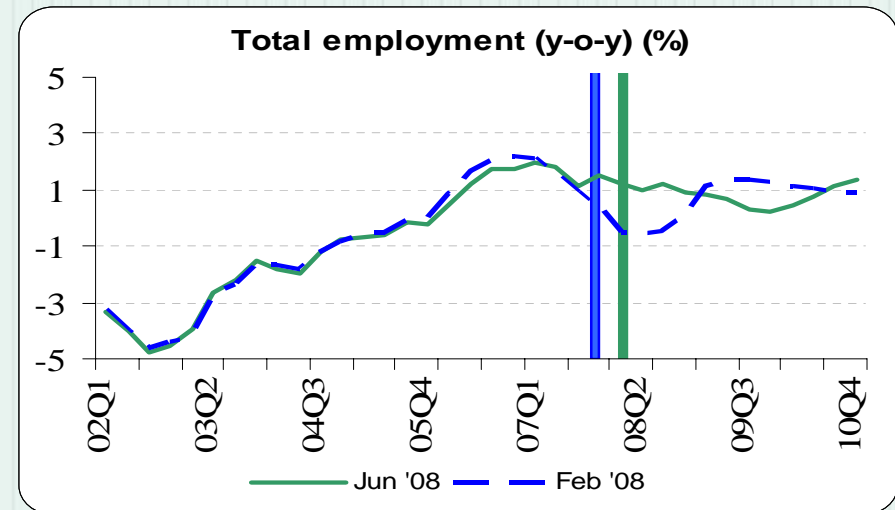
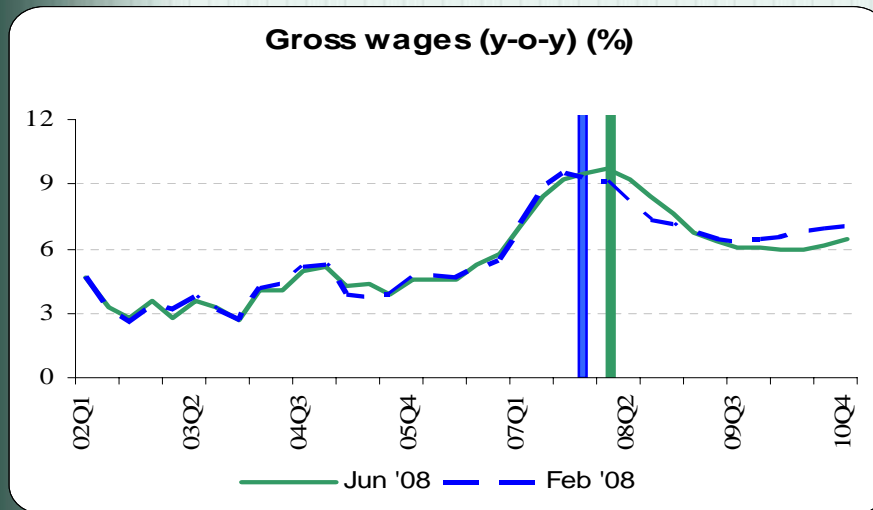
GDP: lower growth rate till 2009 Q1, then above February path



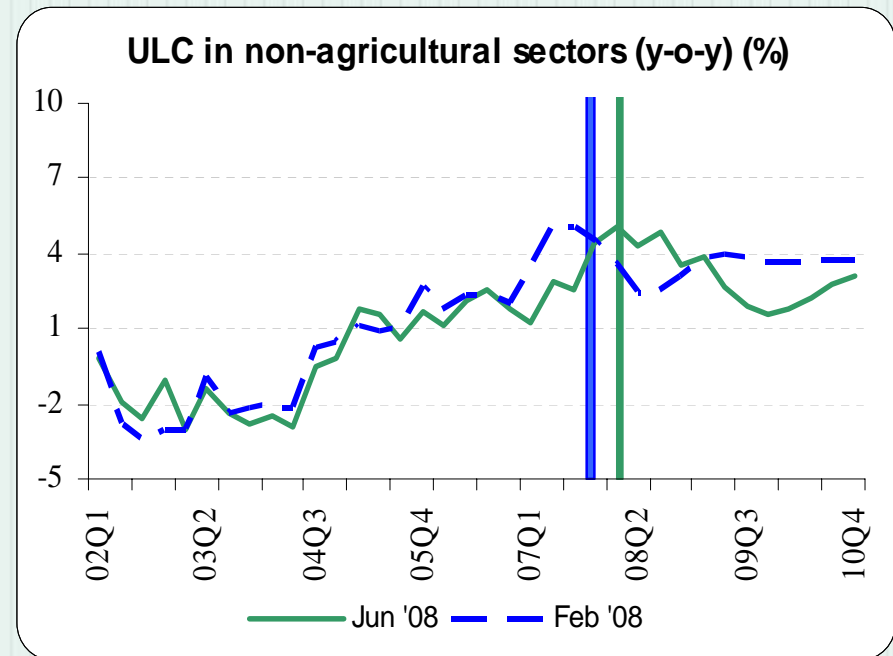
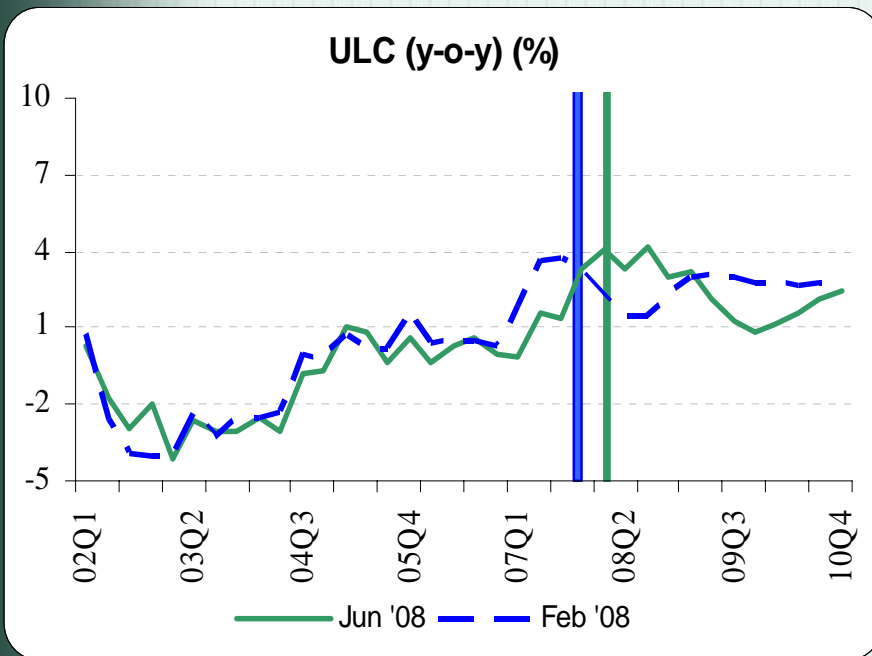
Labour market

Macroeconomic projection

Labour market: faster productivity growth and slower growth of wages in the long projection horizon



ULC: initially higher, then lower growth rate*

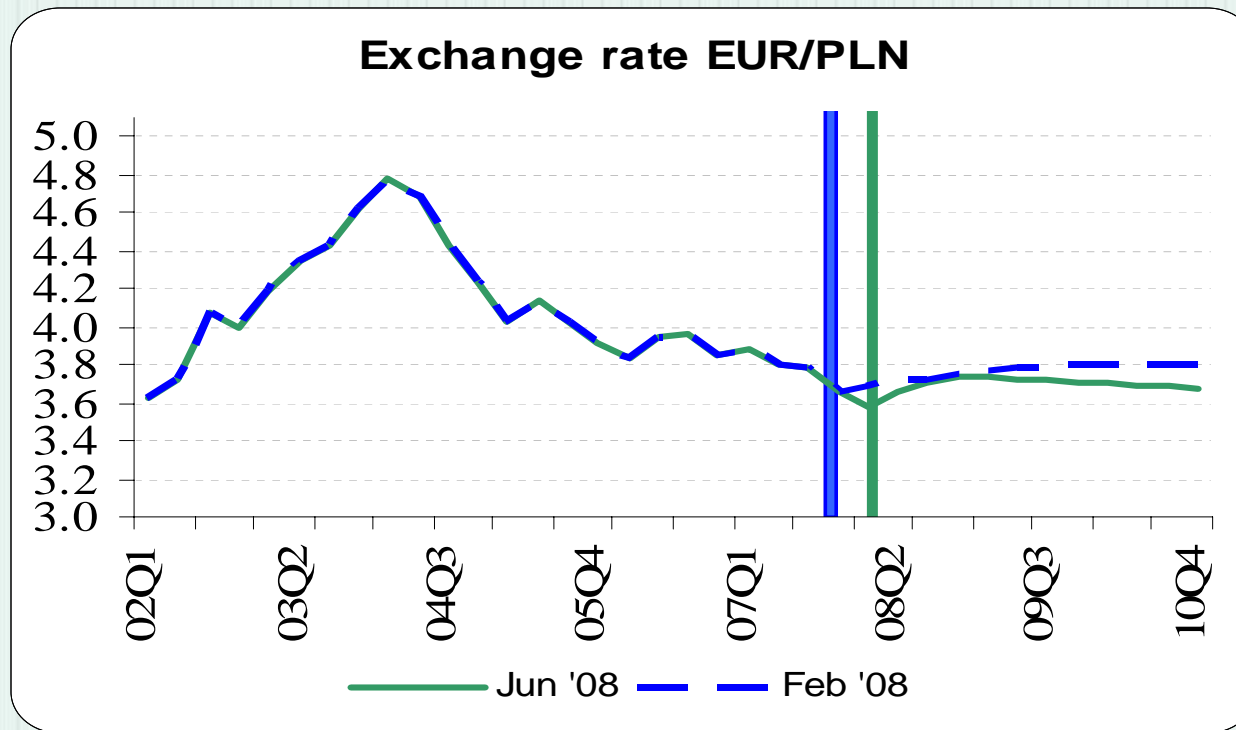


* Growth rate of ULC presented in comparable terms

Exchange rate

Macroeconomic projection

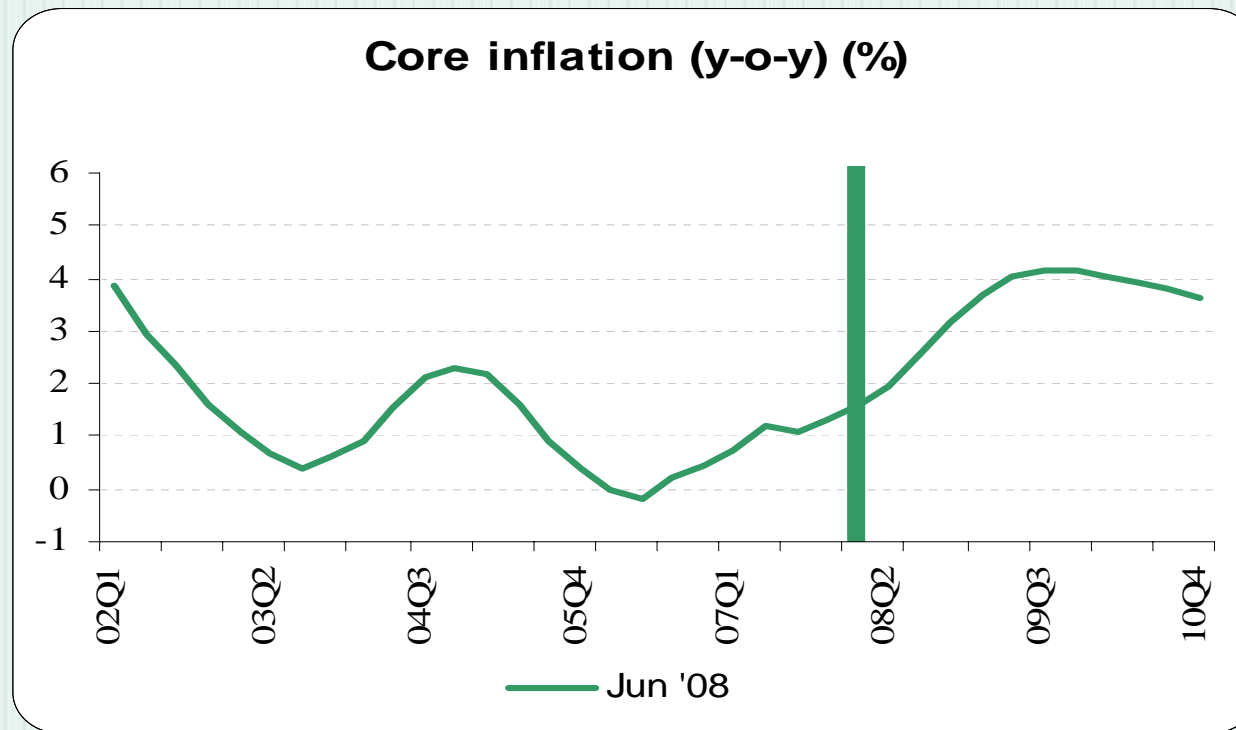
Exchange rate: slightly below February path



Inflation

Macroeconomic projection

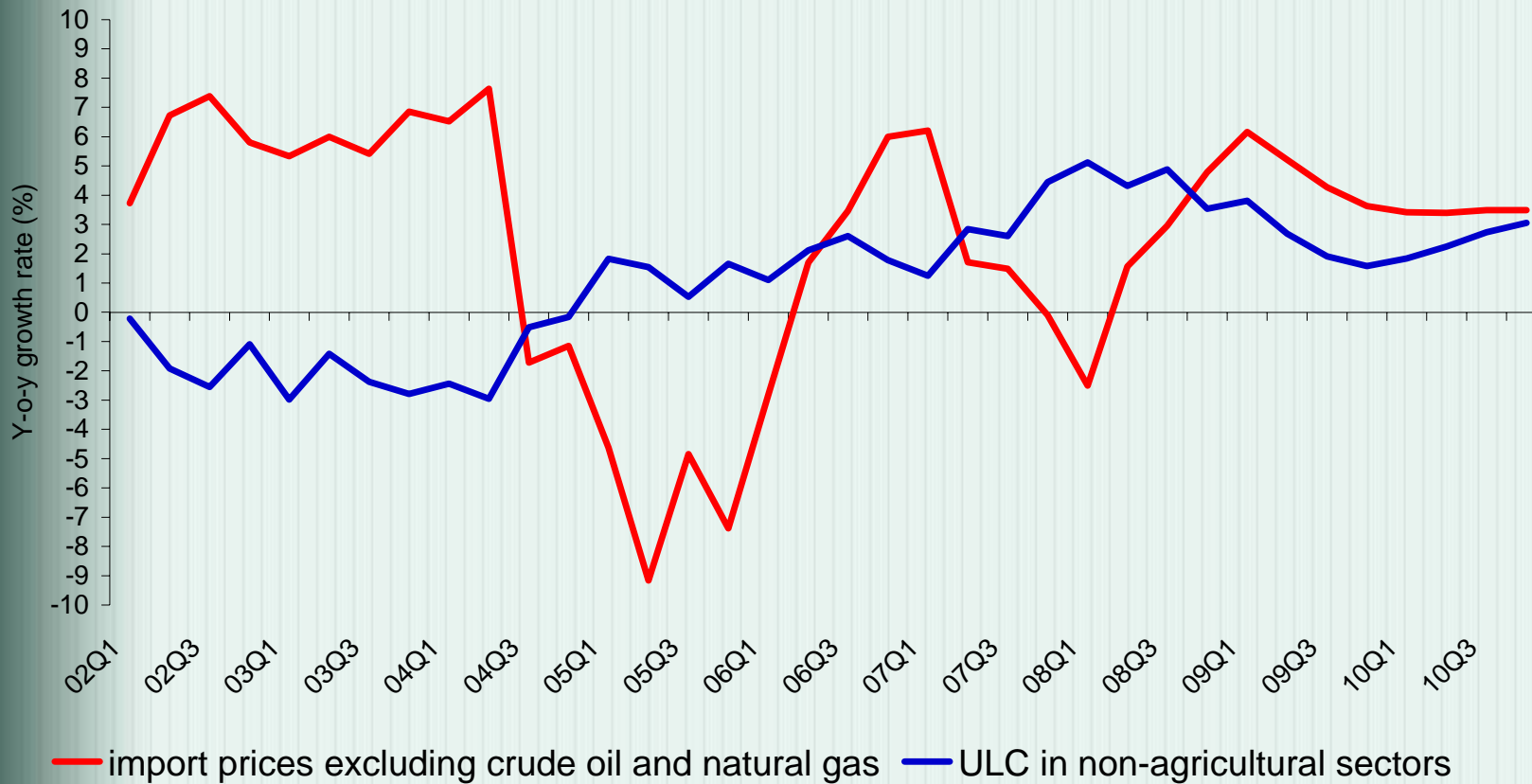
Core inflation*



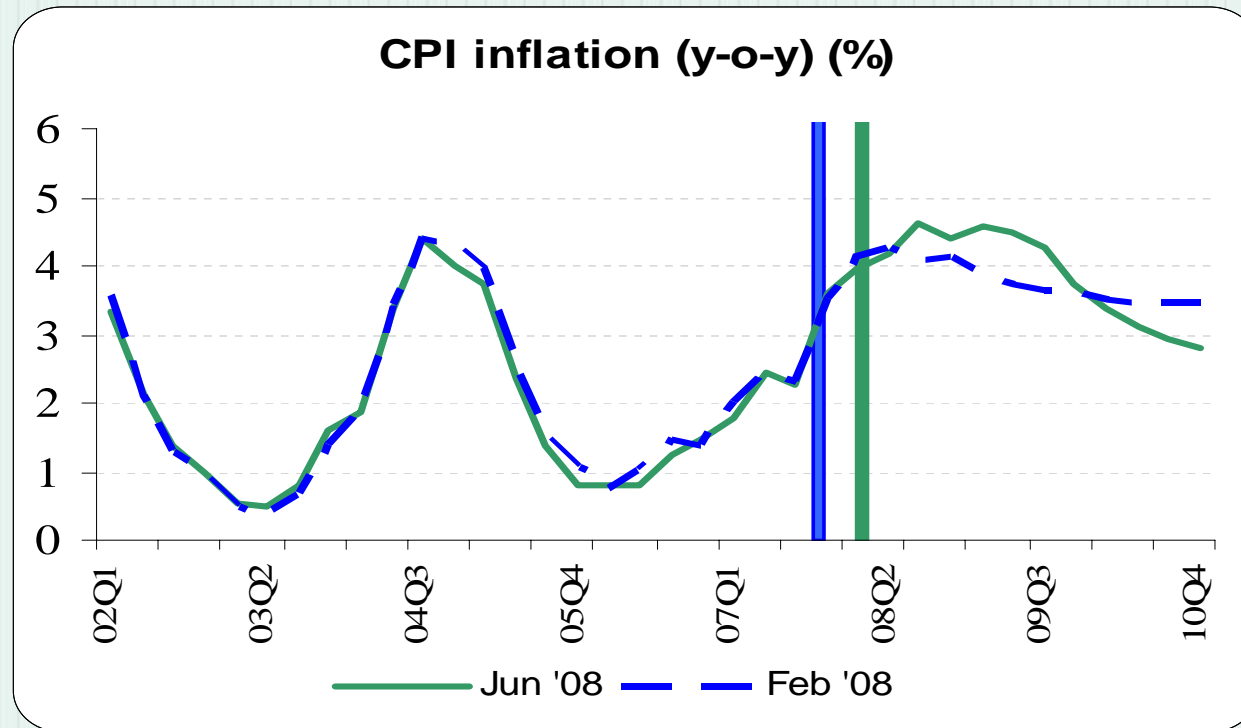
* Core inflation does not include prices of food and non-alcoholic beverages and prices of energy carriers.

Core inflation determinants

Determinants of y-o-y core inflation (%)



CPI inflation: clearly higher till mid-2009 but lower in long projection horizon



**June projection compared to
February projection**

Macroeconomic projection

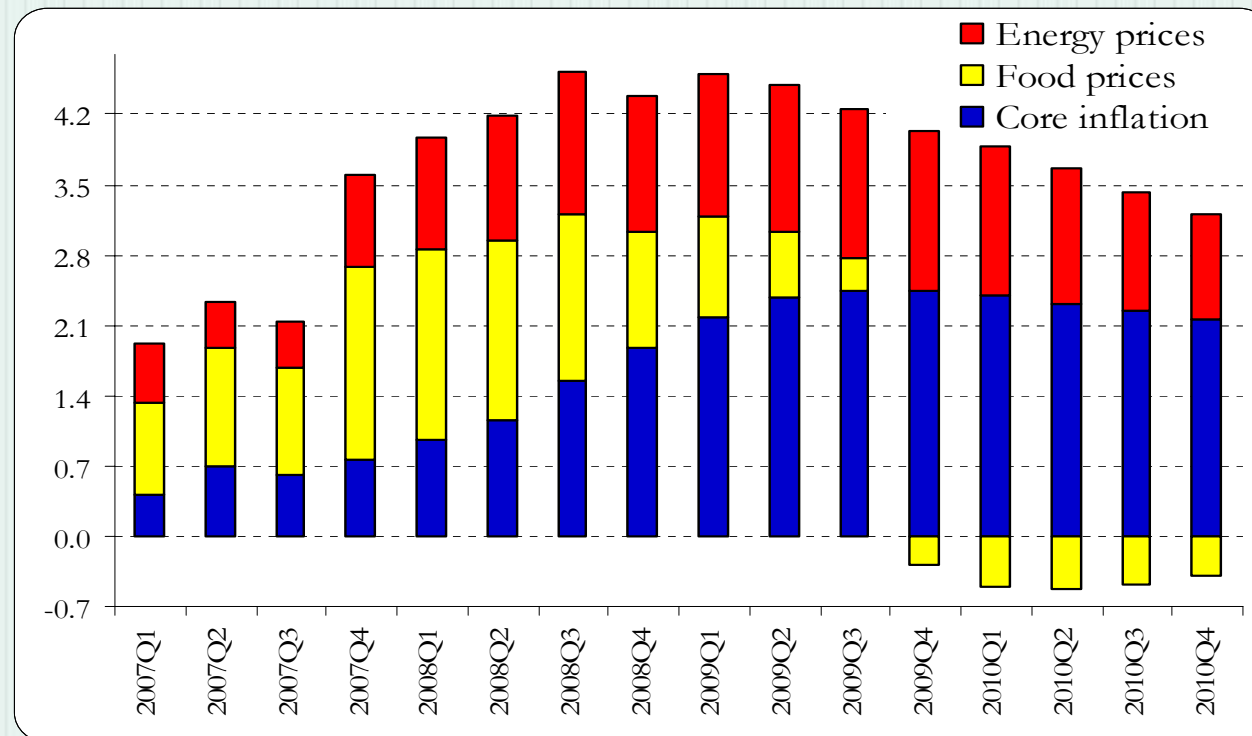
June projection compared to February projection: CPI inflation

- CPI inflation remains clearly above its path in February projection till the end of 2009 .
- In 2010 inflation runs below its path in February projection.

Accounting for CPI inflation

Macroeconomic projection

Decomposition of CPI inflation

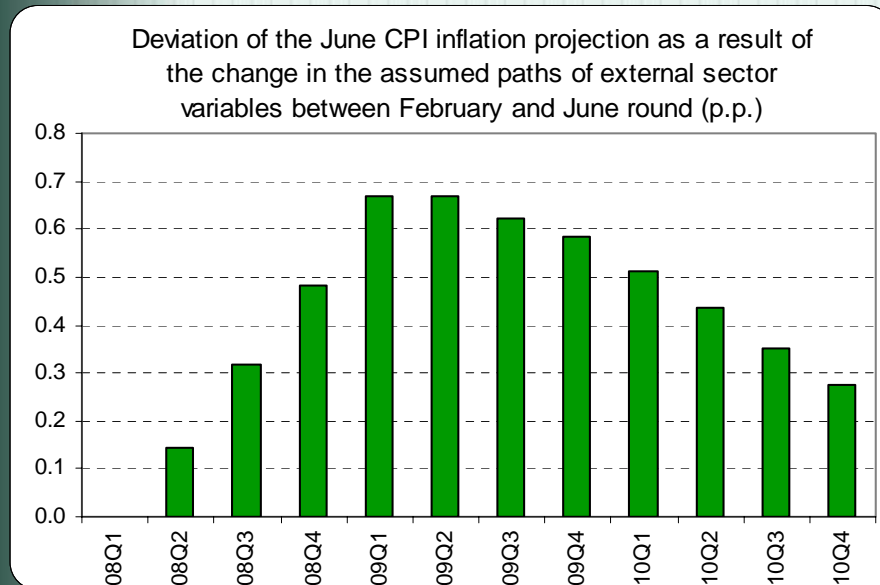


- In the short-term horizon the greatest contribution is made by food prices
- In the long-term horizon the greatest contribution is made by core inflation (net of food and energy prices)

Analysis of deviations between June and February inflation projection

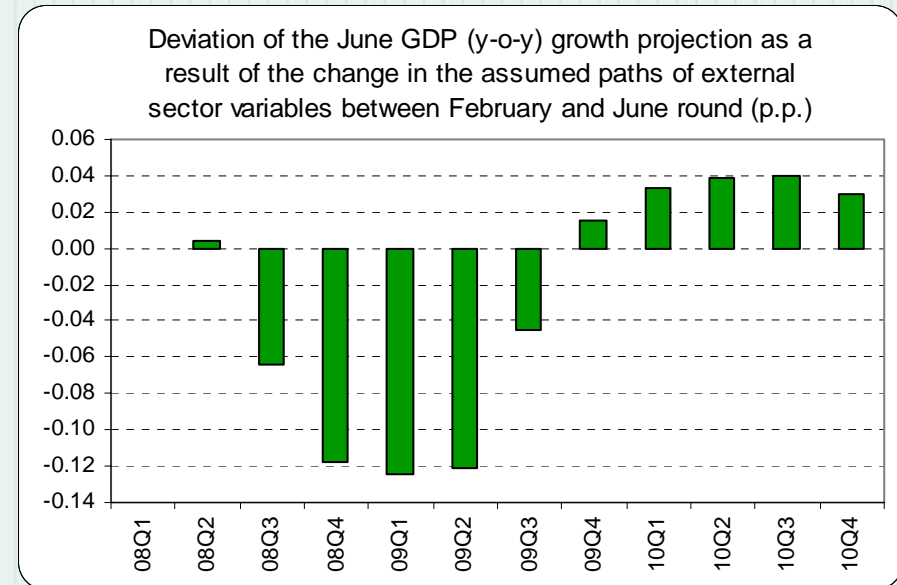
Macroeconomic projection

Difference in the assessment of worldwide economic situation



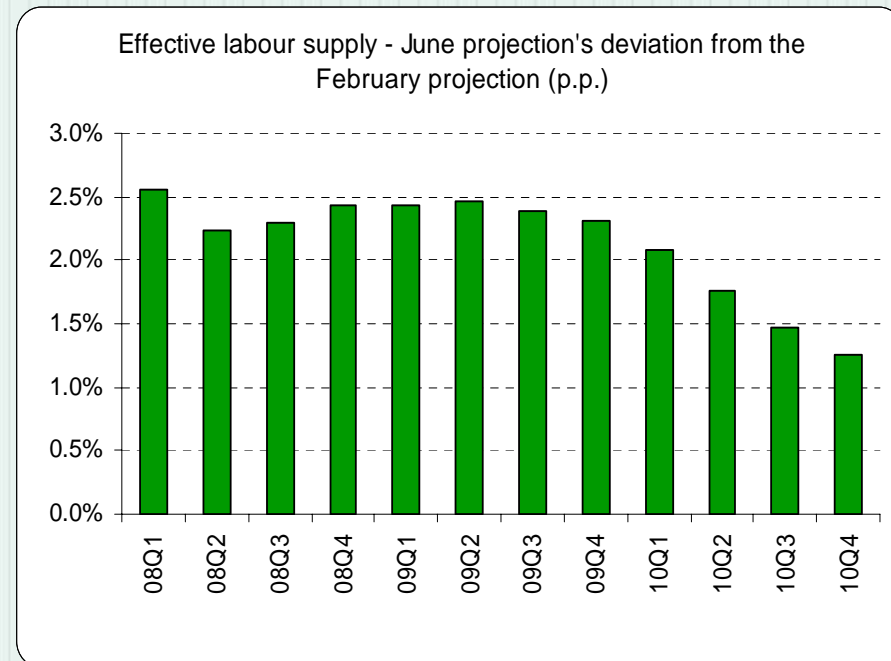
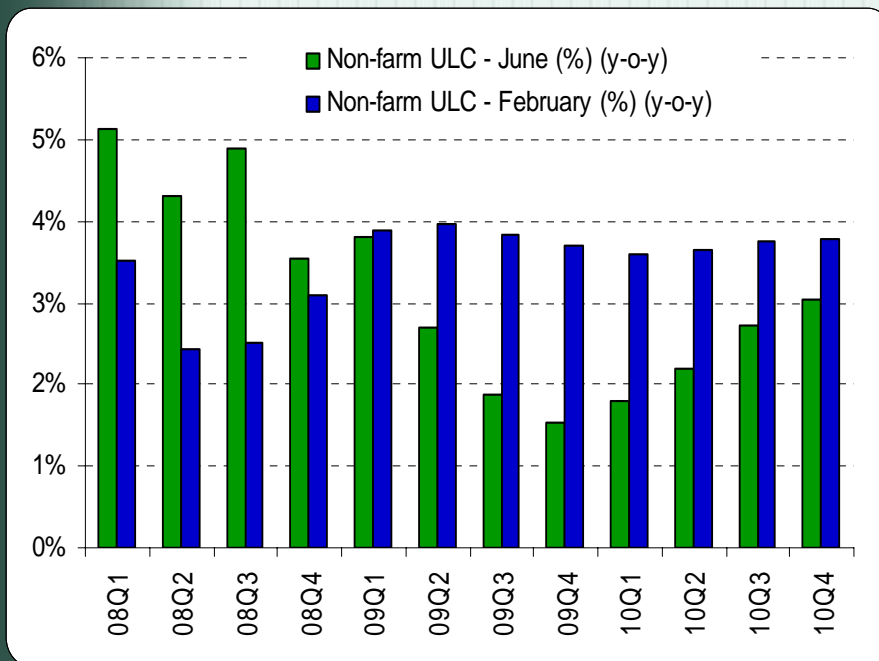
Changed assumptions resulted in inflation higher of:

- 0.24 pp in 2008
- 0.62 pp in 2009
- 0.38 pp in 2010



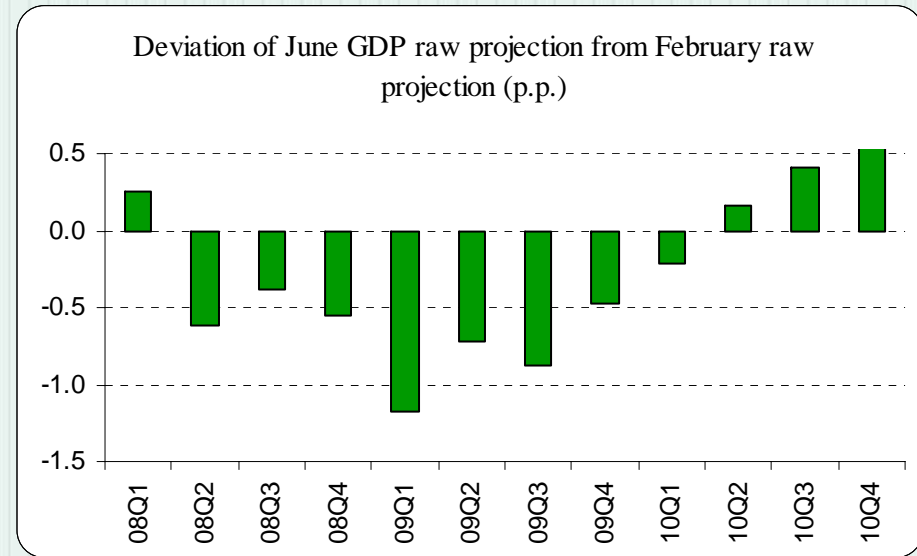
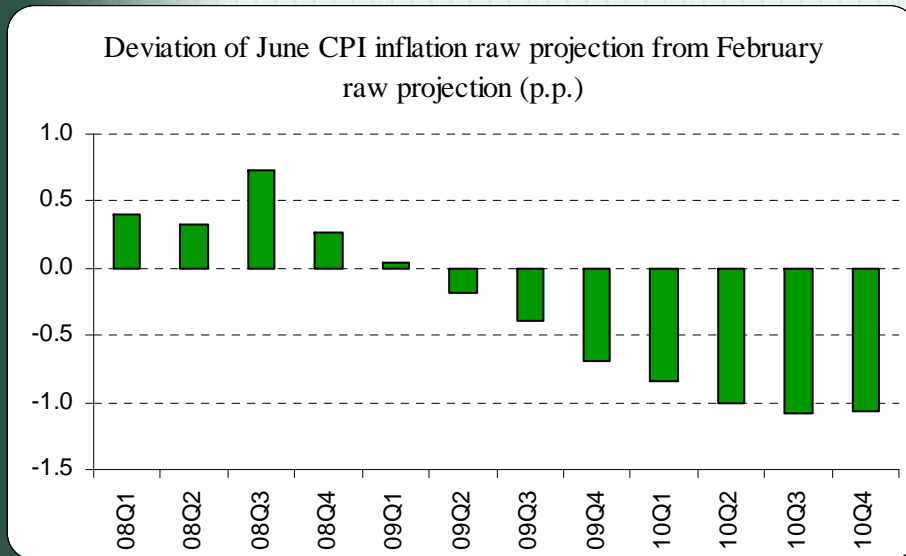
Lower GDP growth in the short-term follows from the weakening of investment demand caused by dynamic growth of commodity prices.

Difference in assessment of labour market situation*



* ULC series from February and June projections are presented in comparable terms

Accounting for projection on ECMOD model (raw June projection vs. February projection)



- Rise in inflationary pressure in the short-term and its significant drop in 2010
- Lower rise in GDP growth rate till the beginning of 2010

Expert adjustments

Macroeconomic projection

Expert adjustments

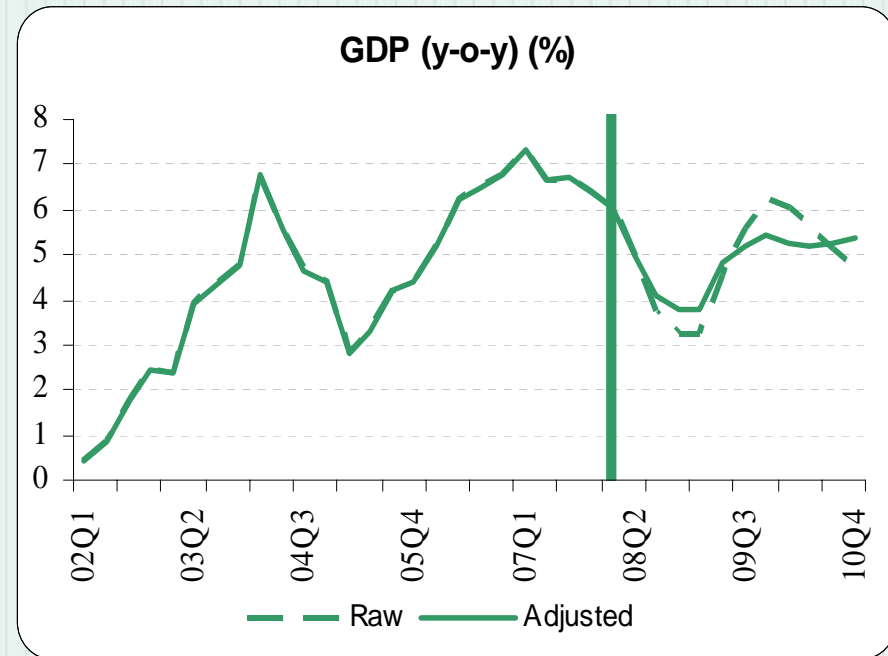
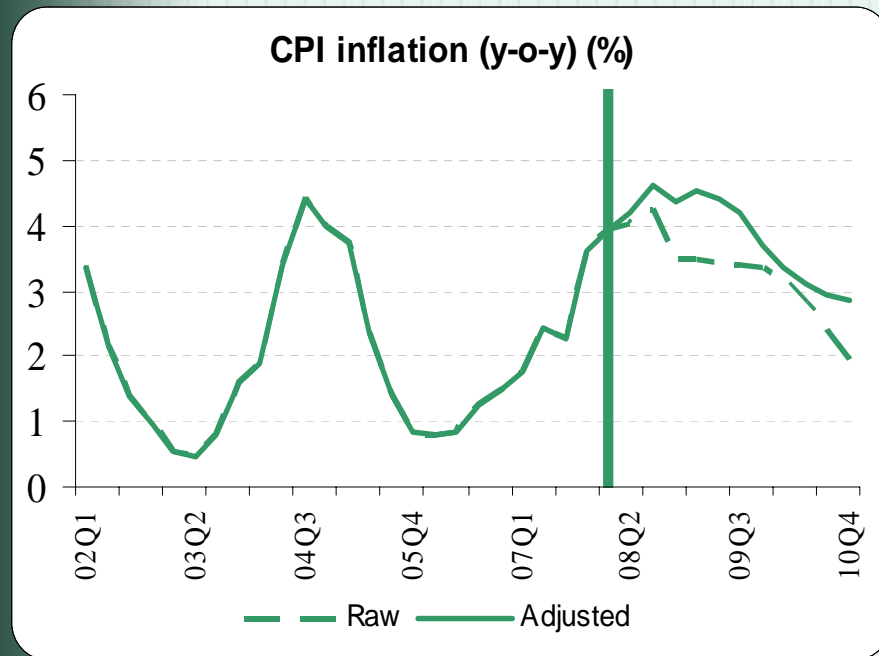
- **Adjustment of main macroeconomic scenario:**
 - labour market
 - export deflator
 - operating surplus of the household sector
 - gross fixed capital formation of enterprises
 - gross fixed housing capital formation and housing investment deflator
 - inventories

Expert adjustments

- **Coherence adjustments :**
 - energy prices
 - food prices
 - fiscal sector

The following slides present the paths of variables before adjustments (so-called raw projection) and after introducing all expert adjustments to the model (June projection)

Joint effect of adjustments on inflation and GDP

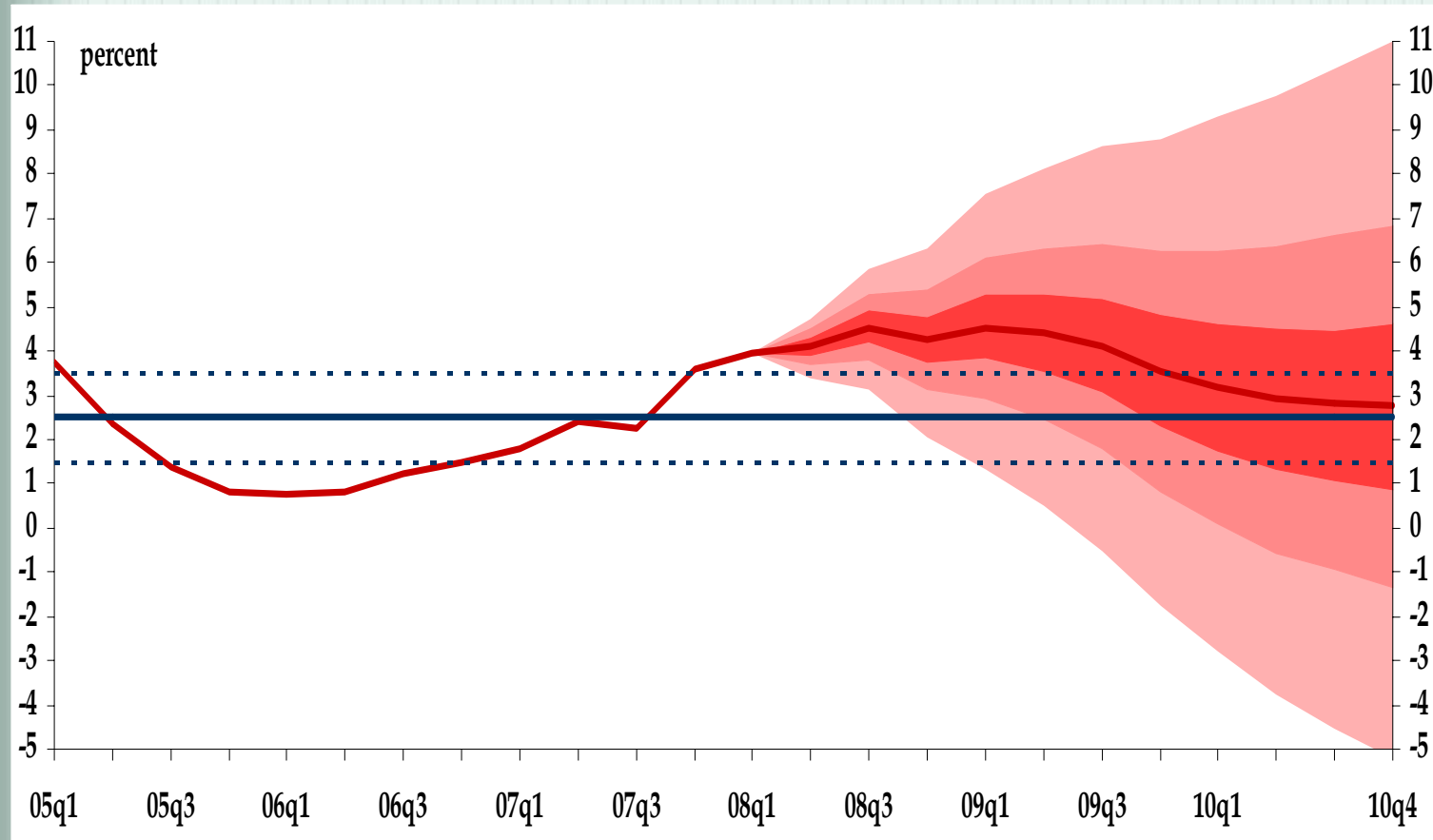


Uncertainty of inflation projection

**Uncertainty factors accounted for
in the model – fan chart**

Uncertainty of projection

Inflation projection – June 2008

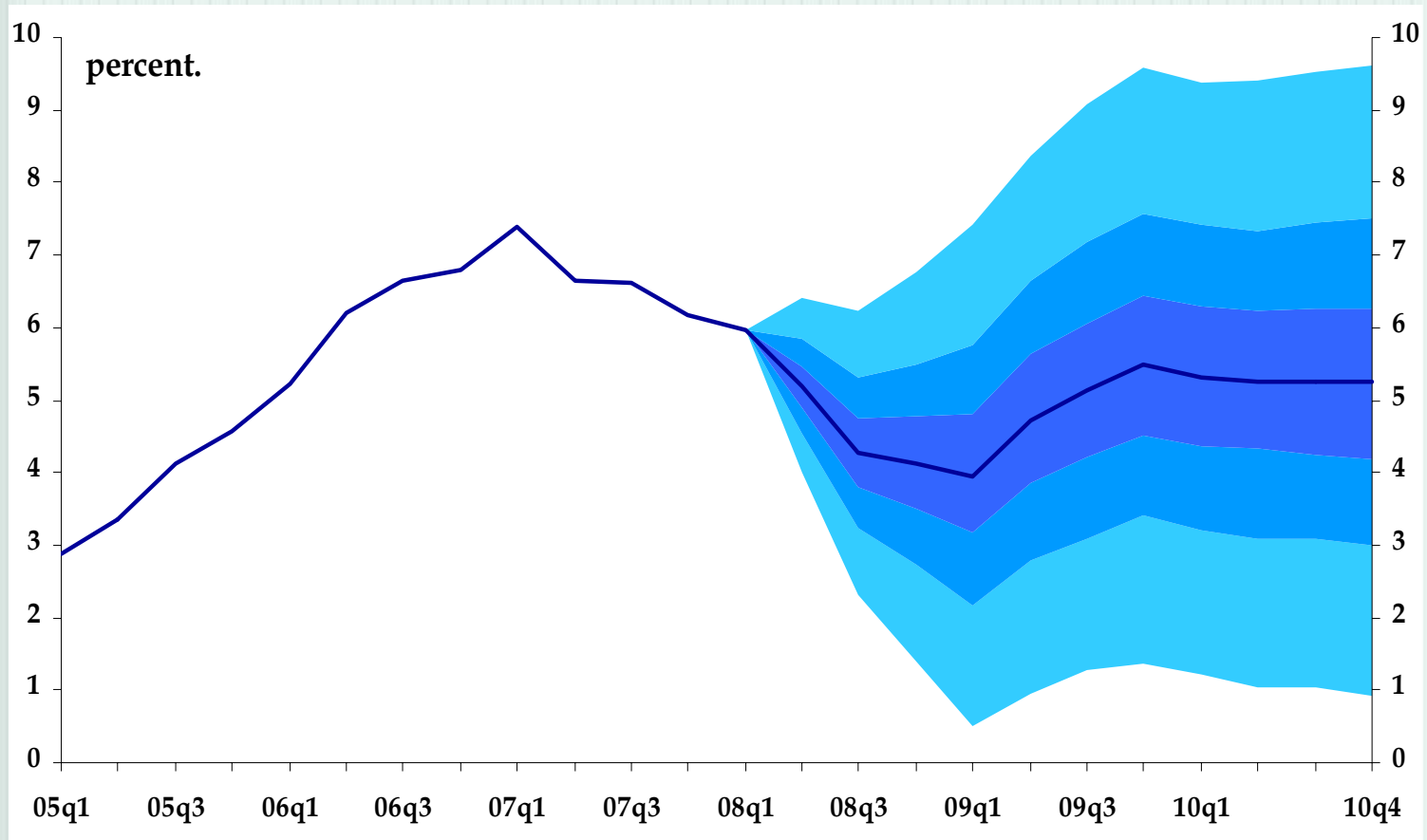


Source: Economic Institute

Overview of probabilities for inflation

Probability of inflation running:					
	below 1.5%	below 2.5%	below 3.5%	below the central path	in the range (1.5%; 3.5%)
2008 Q2	0.000	0.000	0.112	0.495	0.112
2008 Q3	0.000	0.006	0.123	0.486	0.123
2008 Q4	0.020	0.095	0.286	0.484	0.266
2009 Q1	0.059	0.146	0.291	0.487	0.232
2009 Q2	0.108	0.204	0.341	0.492	0.233
2009 Q3	0.172	0.279	0.405	0.492	0.232
2009 Q4	0.261	0.369	0.492	0.500	0.231
2010 Q1	0.326	0.425	0.533	0.498	0.207
2010 Q2	0.365	0.459	0.559	0.503	0.194
2010 Q3	0.387	0.477	0.565	0.505	0.178
2010 Q4	0.402	0.479	0.563	0.505	0.160

Projection of GDP growth– June 2008



Source: Economic Institute

Decomposition of central path uncertainty (decomposition of the fan)

- **Short term (below 1 year)**
 - endogenous variables: uncertainty of the random component in equations of food, energy, core inflation, exchange rate.
 - exogenous variables: small though growing significance in the case of crude oil, natural gas and food prices
- **Long term (above 1 year)**
 - endogenous variables: uncertainty of the random component in equations of total number of working people, wages, exchange rate and import volume
 - exogenous variables: index of agricultural commodity prices, oil prices, natural gas prices, prices abroad (value added deflator abroad)

Uncertainty factors unaccounted for in the model

Uncertainty of projection

1. Intensification in labour market tensions (Inflation ↑)

- perspectives of sustaining high demand for labour
- impact of economic recovery on the rise of effective labour supply
- impact of changes in fiscal and regulatory policies on labour market
- intensity and nature of migration flows

2. Stronger slowdown in the global economy (Inflation ↓)

- deeper global economy slowdown than that accounted for in June projection

3. Market regulations and implementation of European standards (Inflation ↑)

- weakness of the market mechanism on regulated market and uncertainty connected with the pace of deregulation process increase the uncertainty of future energy prices
 - unknown term of implementation the standard VAT rates
 - difficulties with assessment the scale of the impact of new regulation on carbon dioxide emissions and possible further tightening of environmental protection requirements on the economic activity
-

4. Continuation of rising trend of worldwide prices of energy and agricultural commodities (Inflation ↑)

- no sufficient adjustments in supply of commodities in response to growing demand
- no international coordination in terms of bio-fuel market regulation
- persisting uncertainty in financial markets resulting in increased interest in commodity market on the part of investors
- high sensibility of commodity prices to unpredictable weather and political factors

5. Propensity of enterprises to pass increased labour cost onto their prices in globalisation conditions (Inflation ↓)

- limited possibility of passing rising production costs on prices due to heightened competitive pressure
- increased possibility of reducing non-labour production costs

6. Exchange rate (Inflation ↔)

- problems in forecasting zloty exchange rate translate into a high risk of significant deviations of its future realisations from the projected path
-

6. Data released after the cut-off date

- **External environment:**
 - data available after the cut-off date confirm better than anticipated economic situation in main global economies
 - expected interest rate rises in the United States and euro area
 - **After the publication of GUS national accounts data for 2008 Q1 :**
 - implications for the starting point of the projection: stronger rise in private consumption, lower growth rate of gross fixed capital formation, higher contribution of exports
 - increased probability of slower than projected closing of the supply gap in the coming quarters and a slower growth rate of external imbalance
 - **Labour market**
 - better labour market situation than accounted for in the projection: higher number of working persons, higher economic activity ratios
 - smaller than accounted for in the projection reduction of unemployment rate between 2007 Q4 and 2008 Q1
 - increased probability of faster realisation of projection scenario: rise in the supply of labour amid concurrent slowdown in unemployment rate decline
 - **CPI**
 - CPI inflation data in May indicate that in the short projection horizon food and energy price may be running above projection level
-

Uncertainty factors – summary

Uncertainty of projection

Having considered non-model uncertainty factors it can be assessed that the projection risk is symmetrical both for **economic growth** and for **inflation**.

Uncertainty of projection