Macroeconomic Forecasting and Policy Analysis

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Outline

• Overview
• Background of the analytical work at the NBG
• Forecasting and Policy analysis System
• Application of the forecast
• Future avenue
• Potential role of the international effort
Overview

• Main objective of NBG – maintain price stability
  – Constitution
  – Organic law of Georgia

• Georgia has moved to Inflation Targeting since 2009

• Under Inflation Targeting monetary policy is designed based on the inflation forecasts so that the inflation target is met in the medium term

• The main instrument of monetary policy is policy interest rate

• The interest rate decision at each MPC meeting is based on forward-looking analysis

• Endogenous short-term interest rate path in the forecast is essential for efficient implementation of inflation targeting
Overview Cont.

- Weak but improving monetary policy transmission mechanism
- Stable financial system
- Developing financial markets
- Organizational structure
  - MPC
  - Liquidity forecasting group
- Communication policy improving
Overview Cont.

- The inflation target is set by the National Bank of Georgia
  - It is written in “The Main Directions of Monetary and Exchange Rate Policies”
  - The parliament of Georgia approves the target annually for the next 3 years.
  - If Parliament does not approve the target. NBG will still follow its policy

- **NBG gradually reduces inflation target toward its long term value of 3 percent.** For 2016 inflation target is set at 5 percent level, for 2017 - at 4 percent. From 2018 inflation target is set at 3 percent.
Overview Cont.

- **Monetary policy is designed based on the inflation forecasts so that the inflation target is met in the medium term**

- Monetary policy formulation and the implementation measures are discussed by the Monetary Policy Committee

- The committee consists of 12 members: the Governor, two Vice Governors, and the heads of relevant departments and divisions

- MPC meets 8 times in a year

- New forecast is produced once a quarter before every second MPC meeting when Inflation Report is released

- **The monetary policy committee (makes decision on monetary policy instruments);**
  - The most important is the monetary policy rate (determined by monetary policy reaction function)
    \[ i_t = \gamma_1 i_{t-1} + (1 - \gamma_1) [i^N_t + \gamma_2 (\pi_{t+3} - \pi_{tar}^t) + \gamma_3 \hat{Y}_t] \]
  - Operational target is stabilization of interbank short-term rates around monetary policy rate

- Financial markets division (enforces decisions)
Forecasting and policy analysis system (FPAS)

• The interest rate decision at each MPC meeting is based on forward-looking analysis

• Endogenous short-term interest rate path in the forecast is essential for efficient implementation of inflation targeting

• In this regard, macroeconomic models represent an effective tool for forecasting, taking into account the endogeneity of monetary policy

• The NBG relies on forecasting and policy analysis system that has been developed by its staff in cooperating with international counterparties
FPAS functions in general

• **A model-based, macroeconomic forecast** – to provide information for policy decisions and support it by structuring and systemizing the analysis

• **Risk assessments** – this includes risk assessments to the baseline forecast, alternative scenarios for specific assumed shocks, and options for the policy rule

• **Measures of uncertainty** - The model-based forecast should be presented with model-consistent confidence intervals for key variables (bands or fan charts)
Forecasting and policy analysis system (FPAS)

• Incorporates several analytical tools classified in three categories
• Short term forecasts (one-two quarters) of main macroeconomic variables are based on the output of these models
  – Nowcasting
    • Judgement is used mostly - GDP current quarter forecast, inflation forecast
  – Near term forecasting
    • ECM - quarterly inflation equation
    • Principal Components - quarterly GDP forecast
    • BVAR - quarterly GDP and inflation forecast model
• Medium term forecasting tool (core model)
  – Semi structural model based on the new Keynesian approach. Its balanced by empirical qualities and dynamic stochastic general equilibrium approach (DSGE)
• Additional satellite models
• Fiscal impulse is incorporated exogenously
Components of FPAS

• Full-time team of staff
• Streamlined set-up
• Core macro model
• A reporting database
• A near-term (current and next quarter) forecasting system
• Information sharing
## Forecasting staff

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<th>Monetary Policy Division</th>
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<td>ECM - quarterly inflation equation</td>
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<td>Principal Components - quarterly GDP forecast</td>
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<td>BVAR - quarterly GDP and inflation forecast mode</td>
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<td>Inflation forecast by components</td>
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<td><strong>Medium term forecasting</strong></td>
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<td>Core Model</td>
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<td><strong>Additional inputs to the forecast</strong></td>
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<td>Projection of fiscal impulse</td>
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<td>BoP forecast</td>
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<td><strong>Total</strong></td>
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### Organization of forecasting process

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<td>Setting initial conditions</td>
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<td>MPC Meeting</td>
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<td>Presentation of inflation report to analysts</td>
<td>Sixth week</td>
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<tr>
<td>Publishing Inflation Report</td>
<td>Sixth week</td>
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Core macro model

- **The NBG uses a “gap” model for monetary policy analysis and forecasting** - It is a semi-structural open-economy model with an endogenous central bank reaction function.

- The model is calibrated to reflect characteristics of the Georgian economy and to have standard macroeconomic properties.

- **Key behavioral equations**
  - Aggregate demand or IS curve
  - Price Setting or Phillips curve
  - Uncovered Interest rate parity condition for the exchange rate
  - Monetary policy rule for setting interest rate

- Two part - ROW and Georgia
- The model allows projections for GDP, inflation, interest rates and exchange rates.
The QPM Phillips curve splits inflation into domestic and imported components. Headline inflation is composed of domestic, $\pi_t^D$, and imported, $\pi_t^M$, prices:

$$\pi_t = (1 - \beta_1)\pi_t^D + \beta_1 \pi_t^M$$

Domestic inflation captures the cyclical impact of the output gap, and direct and indirect exchange-rate pass through import prices and real exchange rate gap:

$$\pi_t^D = \beta_2 \pi_t^M + (1 - \beta_2)[\beta_3 \pi_{t-1}^D + (1 - \beta_3)\pi_t^e] + \beta \left(\beta_4 \tilde{D}_t + \beta_5 \hat{Z}_t\right) + \varepsilon_{t}^D,$$

Where $\tilde{D}_t$ is the output gap, $\hat{Z}_t$ is the deviation of the real exchange rate from its equilibrium trend, and $\pi_t^e$ is expected domestic inflation. Imported inflation is approximated by the product of changes in the exchange rate times the foreign inflation rate, i.e.

$$\pi_t^M = \beta_6 \pi_{t-1}^M + (1 - \beta_6)[\Delta S_t + \pi_t^* - \Delta \tilde{Z}_t] + \varepsilon_{t}^M,$$

Where $\Delta S_t$ is the change in the nominal effective exchange rate, $\Delta \tilde{Z}_t$ is the trend in the real exchange rate, and $\pi_t^*$ is foreign inflation. Both the exchange rate and the foreign inflation rate are measured as trade-weighted averages of 5 trading partners (the United States, the euro area, Turkey, Ukraine, and Russia).
Core macro model cont.

- **Aggregate demand** is modeled with separate equations for domestic demand and **net exports**. The gap between equilibrium and actual GDP is decomposed into the domestic-demand gap and net-trade gap, i.e.:

\[
\hat{Y}_t = \eta_1 \hat{D}_t + \eta_2 \hat{X}_t.
\]

**Domestic demand** is affected by the real interest rate gap and the risk premium, and by the effect of net trade and real exchange rate (balance-sheet effect) on consumption, i.e.

\[
\hat{D}_t = \alpha_1 \hat{D}_{t-1} + \alpha_2 \hat{D}_t^e - \alpha_3 (r_t^{eff} + \alpha_4 prem_t) + \alpha_5 (\hat{Y}_t - \hat{D}_t - \alpha_6 \hat{Z}_t) + \alpha_7 \hat{G}_t + \epsilon_t^D
\]

- **Net exports are a function of the exchange rate and foreign demand.**

The net export gap, \( \hat{X}_t \), responds to the foreign demand gap, \( \hat{Y}_t^* \), the real exchange rate, \( \hat{Z}_t \), and domestic demand, \( \hat{D}_t \):

\[
\hat{X}_t = \xi_1 \hat{X}_{t-1} - \xi_2 \hat{D}_t + \xi_3 \hat{Z}_t - \xi_4 \hat{Y}_t^* + \epsilon_t^Z.
\]
Core macro model cont.

• **Exchange rate determination**
  Exchange rate determination follows a modified version of the uncovered interest parity (UIP) condition, i.e.
  \[ i_t = i^*_t + 4(S^GEL_{USD,e} - S^GEL_{USD}) + prem_t + \varepsilon^S_t, \]

• **A central bank policy reaction function sets the short-term interest rate.**
  The function is forward-looking in that it responds to the model’s own forecast for year-on-year headline inflation, \( \pi 4_{t+4} \). Policy also responds to the output gap, \( \hat{Y}_t \). Reflecting the actual behavior of central banks, the reaction function smooths the interest rate response:
  \[ i_t = \gamma_1 i_{t-1} + (1 - \gamma_1)(i_N^t + \gamma_2(\pi 4_{t+4} - \pi_{tar}) + \gamma_3 \hat{Y}_t) + \varepsilon^i_t \]
Inflation forecast

Source: NBG
Development of the model

• Technical assistance mission from IMF in 2009
  – Human capacity development
  – Training of the staff

• NBG Staff visit to IMF for training in 2011

• Cooperation with the international consulting company OG Research to develop the model in 2012-2013 financed by EBRD
  – On-site visits
  – Training of the staff

• On going technical assistance from IMF aiming at improving the QPM and streamlining the FPAS
Data challenges

• Short time series and structural breaks
  – macroeconomic data useful for modeling purposes begin in 2004
• Real GDP by expenditures does not exist (although NBG does rough estimation of it)
• Labor statistics suffer from methodological inaccuracies over the history
• Absence of Inflation expectations and consensus forecasts
SDG

- Sustain GDP per capita growth
- Inclusive growth
- Productivity growth
- Diversification
- Renewable Energy

- Macroeconomic stability
- Low and predictable inflation
- Stable and developed financial sector
- Improved access to finance
Questions ?
Monetary policy efficiency

Source: NBG

* Interest rate volatility is measured as 3 day standard deviation
Money market rates hover around the policy rate...

Activation of Monetary Policy Instruments

Source: NBG
Need for NBG interventions have decreased

Introduction of FX Auctions

Source: NBG