Development and Application of the Bank of Japan's Version of the Global Economy Model (BoJ-GEM)

"An Interim Report"

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Outline

Background / Motivation

- The international department conducts research on global economic and financial conditions to support monetary policy-making.
  - Needs for both qualitative and quantitative assessment of propagation of shocks in one country to the other countries.

- In view of the ongoing trend of globalization in the economy and financial services, economic interdependence with other Asian countries will continue to deepen.
  - In particular, China has become an economic powerhouse in the world.

1. High GDP growth and huge population
   - Driven by a growth strategy that has relied on high savings, high investment, and high external demand.
   - Due to societal ageing, the demographics structure will be altered.

2. Growing openness
   - After the "Reform and Opening-up" policy was enacted in 1978, the trade volume to GDP ratio increased roughly from 0.1 to 0.4.
   - A growing number of debate on trade imbalance and foreign exchange rate regime.

Characteristics of the BoJ-GEM

- We are modifying Global Economy Model (GEM) developed by IMF.
  - GEM aims to provide an fully optimizing framework capable of addressing basic policy questions involving international transmission of policy and structural shocks, reproducing key elements of economic interdependence among countries.
  - A variety of real and nominal rigidities enable the model to reproduce the persistent dynamics observed in the data.

- We focus more on Chinese Economy.
  - The model comprises five regional blocks: China, Japan, United States, European Union, and the rest of the world.
  - The foreign exchange rate regime in China is approximated by fixed exchange rate regime.

Basically the same as the prototypical GEM.

- Monopolistically competitive firms produce tradable and nontradable goods using Labor and Capital.
  - At the current stage, we do not include commodity or oil sector.

- Forward-looking households consume final goods, provide labor, and invest to capital stock and internationally traded bond, while consumption of liquidity-constrained households depends solely on their current labor income.

- The monetary authority adjust the nominal interest rate in response to inflation, except for China.

- Consumption Habit formation, sticky price, sticky wage, and real adjustment costs in capital investment, labor and imports are introduced to reproduce realistic dynamics.

- Risk-Adjusted Uncovered Interest Rate Parity (UIRP) holds for the exchange rates.

Calibration Strategies

- In calibrating the parameters, we for the most part follow "The Bank of Canada's Version of the Global Economy Model (BoC-GEM).

- The Trade matrix and the shares of government expenditure are re-calculated from actual data since our GEM consists of different countries from BoC-GEM.
  - Some goods are difficult to categorize into consumption or investment goods.

- Calibration for China is basically the same as the Asian Block in BoC-GEM.
  - However, we should consider the deep parameters that can be specific to Chinese economy.

Simulation Example

- A variety of simulations is possible since a lot of structural shocks are pre-installed in the GEM.

- As an Example, we consider the case where the U.S. consumption unexpectedly decrease.

- Bottom line: We can investigate the effect on the U.S. and the propagation to other countries.

- How and to what extent will the effect on China change under alternative exchange rate regimes?
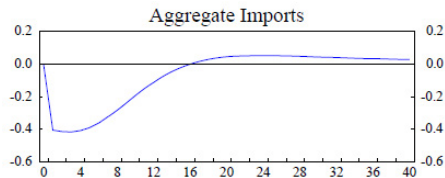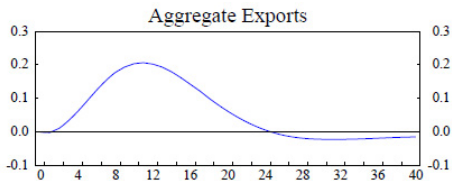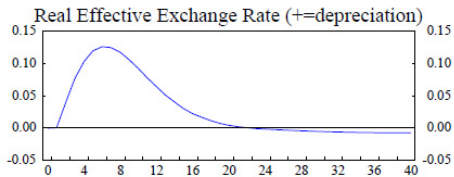 - Fixed vs. flexible exchange rate regime.

Simulation Example
The effects on the U.S.

Real Effective Exchange Rate (+=depreciation)

Aggregate Exports
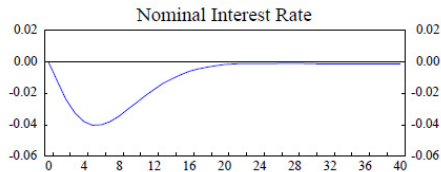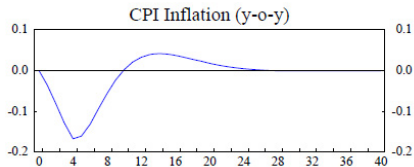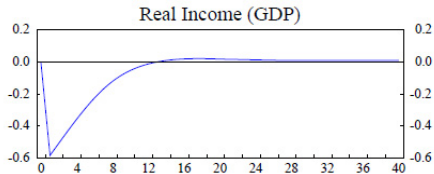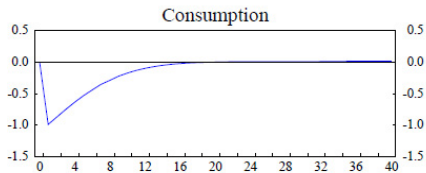
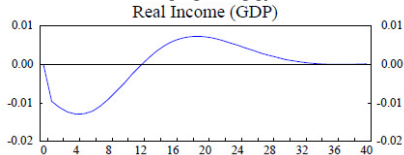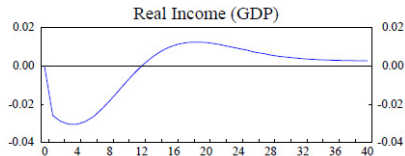Aggregate Imports

Simulation Example
The effects on other countries

Japan
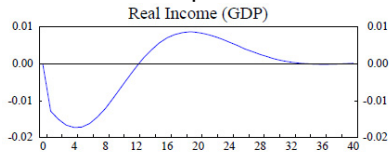
Euro Area

Rest of the World

Simulation Example
The effects on China

Under Fixed Exchange Rate Regime

Real Income (GDP)
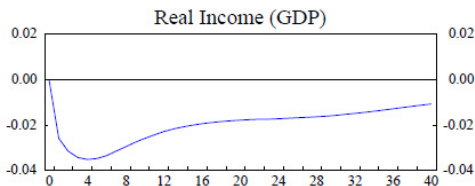
Under Flexible Exchange Rate Regime

Real Income (GDP)
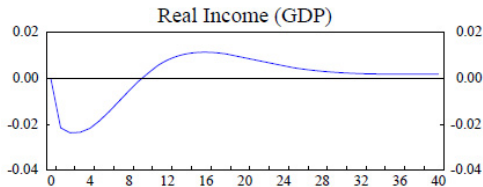
- Consider the plausibility of steady-state values in Chinese economy.

- Conduct Macro- and Microeconometric studies on Chinese economy for calibration.

- Compare the impulse responses with VAR studies.
  - Limited Availability of the data.

- Add commodity and oil sectors.

- Extend the model to investigate financial markets.