Bank of Thailand Macroeconometric Model (BOTMM)

Presented at the Workshop on Economic Models at the Bank of Thailand

Modelling and Forecasting Team, Monetary Policy Department
17 December 2008
Motivation
Philosophy of a macroeconometric model
Macroeconometric model at the BOT
  - Roles
  - Structure and linkages
  - Performance and simulations
  - Challenges ahead
Conclusion
Issues for discussion
Motivation

- The MPC need an economic model for
  - Assessing economic outlook in the 8 quarters ahead in order to determine the appropriate stance of monetary policy
  - Evaluating the effects of changes in economic factors and policies on the economy

- Why macroeconometric model?
  - Straightforward and easy for public communication
  - Balancing between data and economic theory
Motivation

- Macroeconometric models developed for Thailand from other institutes
  - NESDB, FPO, and TDRI
Philosophy of a macroeconometric model

- Balancing between
  - data and economic theory
  - in-sample fitting and out-of-sample forecasting

- Cointegration relationship
Based on quarterly data since 1993Q1

- Designed to capture relationships between key economic variables

- Served as a tool for MPC under the Inflation Targeting monetary policy framework
Steps in building a macroeconometric model

1. Economic theory
2. Quarterly economic data (sa or nsa)
3. Long-run equation (OLS, calibration)
4. Cointegration relationship
5. Error correction term
6. Identities
7. Short-run equation (OLS)
8. Other LR + SR equations
9. Macroeconometric Model
10. Model property testing
Over the 8 quarters ahead ...

- Baseline forecasting
  - Nowcasting and forecasting
- Policy simulation and scenario analysis
Forecasting and monetary policy decision process:

- Assumptions on World Economy and Prices
- Sector Specialists
- Economic Theory & Data
- Preliminary Economic Forecasts (Baseline)
- Probability Distribution of Forecasts (Fanchart)
- Policy Assumptions
- NAFF
- Judgment
- Scenario Analysis and Assessment of Risks
- Monetary Policy Decision
- Other Models
- Macroeconometric Model
Nowcasting and forecasting

- **Nowcasting** (Short-term forecasting for Q0)
  - judgments are imposed by modellers and sectoral experts, using available real-time economic indicators and other information that cannot be captured by the model (e.g. impact of airport closed down in Nov08)

- **Forecasting** (Longer term forecasting for Q1-Q8)
  - dynamic suggested by the model and assumptions on exogenous variables
Role in policy simulation and scenario analysis

Forecasting and monetary policy decision process:

- Assumptions on World Economy and Prices
- Economic Theory & Data
- Policy Assumptions
- Macroeconometric Model
- Preliminary Economic Forecasts (Baseline)
- NAFF
- Judgment
- Scenario Analysis and Assessment of Risks
- Probability Distribution of Forecasts (Fanchart)
- Judgment
- Monetary Policy Decision
- Other Models
- Macroeconometric Model
Types of shock

- Policy shock
  - Monetary policy
  - Fiscal expenditure
- Domestic shock
  - Minimum wage
- External shock
  - Dubai oil price
  - Trading partners’ GDP growth
  - Fed funds rate
BOTMM main structure

**Demand components**
- Durable consumption (CPR1)
- Non-durable consumption (CPR2)
- Private investment (IPR)
- Exports of goods and services (XR)
- Imports of goods and services (MR)
- Govt consumption (GCOVR)
- Public investment (IPUBR)

**Others**
- Bond and stock mkt cap (BMCAP)
- Private capital flows (CAPITAL$PRI)

**Prices**
- Core CPI / CPI energy / CPI rawfood
- Producer price index (PPI)
- Retail petroleum price index (RPPI)
- Private investment deflator (PIP)
- Govt consumption deflator (PGCON)
- Govt investment deflator (PIFX)
- Export deflator (PX) / Imports deflator (PM)
- Average wage (AVGEARN)
- Exchange rates (FX, NEER, REER)
- Interest rates (MLR)

**Government expenditure**
- Govt consumption / investment
- Govt transfer

**Domestic prices**
- Farm price / Minwage / Policy rate (RP1D)

**External demand**
- Trading partner GDP (TPGDP)

**External prices**
- Dubai / Non-fuel commodities (PWNONF)
- Trading partner CPI (TPCPI)
- Regionfx / JPY / EUR / Fed funds rate
Linkages in real GDP components

SR = Short Run Equation
LR = Long Run Equation
Linkages in external sector

\[
\text{RP1D-FEDFUND}
\text{CURRENT\$}
\text{GDPR}
\text{Expected FX}
\text{FEDFUND-RP1D}
\text{REGIONFX}
\text{CURRENTB/ GDPN}
\]

\[
\text{CAPITAL\$PRI}
\text{CAPITAL\$}
\text{FX}
\text{CURRENT\$}
\text{XR*PX\$}
\text{MR*PM\$}
\text{BP\$}
\text{RESERVE(-1)}
\text{NFA(-1)}
\text{NFA}
\text{RESERVE}
\]
Inflation

- **Producer Price Index**
  - NEER
  - PIP
  - PIFX

- **Retail petroleum price index**
- **PMG$**
- **MINWAGE**
- **AVGEARN**
- **Output Gap**
- **Core CPI_{t-1}**
- **Headline CPI**

- **CPIRFOOD** + **CPIEN** + **Core CPI** = **Headline CPI**

- **SR + LR**
- **SR**
- **LR**
- ***FX**
Performance in the in-sample forecast

**Output Growth: Historical Simulation**

**Headline Inflation: Historical Simulation**
Performance in the in-sample forecast

Consumption Growth: Historical Simulation

Investment Growth: Historical Simulation

Export Growth: Historical Simulation

Import Growth: Historical Simulation
Permanent increase in policy rate by 25 basis points

% of deviation from baseline starting from 2008Q3
1% Permanent depreciation in THB/USD exchange rate

% of deviation from baseline starting from 2008Q3

Private consumption
Private investment
Exports G&S
Imports G&S

GDP
Headline CPI
Core CPI
THB/USD
1% Permanent increase in trading partner GDP

% of deviation from baseline starting from 2008Q3

Private consumption  Private investment  Exports G&S  Imports G&S

GDP  Headline CPI  Core CPI  THB/USD
10% Permanent increase in Dubai oil price

% of deviation from baseline starting from 2008Q3

Private consumption

Private investment

Exports G&S

Imports G&S

GDP

Headline CPI

Core CPI

THB/USD

Private consumption

Private investment

Exports G&S

Imports G&S

GDP

Headline CPI

Core CPI

THB/USD
## Simulation results

### Result (%YoY difference from baseline)

<table>
<thead>
<tr>
<th>Shock (+10%)</th>
<th>GDP Growth</th>
<th>Headline inflation</th>
<th>Core inflation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Avg of first 4Qs</td>
<td>Avg of last 4Qs</td>
<td>Avg of first 4Qs</td>
</tr>
<tr>
<td>RP1D (+0.25)</td>
<td>-0.06</td>
<td>-0.05</td>
<td>-0.01</td>
</tr>
<tr>
<td>FX (+1%)</td>
<td>0.17</td>
<td>-0.07</td>
<td>0.06</td>
</tr>
<tr>
<td>TPGDP (+1%)</td>
<td>0.79</td>
<td>-0.09</td>
<td>0.00</td>
</tr>
<tr>
<td>Dubai</td>
<td>-0.19</td>
<td>-0.13</td>
<td>0.43</td>
</tr>
</tbody>
</table>
Macroeconometric model is straightforward and easy for public communication.

- Providing components of GDP forecasting and serving the MPC needs for policy making
- Balancing between data and economic theory
- For short-term, add judgment from sectoral experts, and for longer term, use model dynamics with judgment
Challenges ahead

- Consideration of other important variables that may be included in the model
  - market interest rates, e.g. bond yield
  - private credit
  - household wealth indicators
    - property price and bank deposits
  - potential GDP measured by production function
Issues for discussion

- How involved should policymakers be in the process of model building and forecast production
- How to balance between data fitting and out-of-sample forecast
  - Role of judgments in building a macroeconometric model
  - Model specification
  - Parameters in long-run equation