Aging Population and Fiscal Stability
condition faced with population Aging

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Background

(Background)

• Japan entered into the aged-society
  → Japan faces the huge increases of social security.
• Japan accumulate the huge budget deficits
  → Managing the demand for government bonds are very important.

(Main Purpose)

We propose the fiscal policy rules that attain both the fiscal sustainability and the economic recovery facing with aging-society.
Objectives & Main Results

1. **Domar rule** (interest rate < economic growth)
   
   Bohn’s condition \( PB_t = PB_1 + \mu(b_{t-1} - b_0) \)

   Obtained from Government Budget Constraint

2. Supply of Government bond
   
   Demand for Government bond is neglected

   Bohn’s condition does not satisfy economic recovery

   Objective loss function focuses only on the stability of the budget and not on economic growth.

3. New Fiscal Policy Rules need to be established.
General Questions

Japan’s gross Debt/GDP ratio is around \textbf{230}\%.
Greece gross Debt/GDP ratio is \textbf{188\%}.

Why did Greece go into trouble?
Why does JGB interest rate be lowerest?

⇒ Three reasons: the demand structure for government bonds; Low Sale Tax Rate(large fiscal space); Independent Monetary Policy
### Japan’s Debt /GDP Ratio

<table>
<thead>
<tr>
<th>1995</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>95.1%</td>
<td>229.6%</td>
</tr>
</tbody>
</table>

### Greece Debt / GDP Ratio

<table>
<thead>
<tr>
<th>1995</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>101.2%</td>
<td>188.7%</td>
</tr>
</tbody>
</table>

Source: OECD Economic Outlook
Gross Debt/GDP ratio, 2014
Selected OECD Countries

Source: OECD Economic Outlook
Gross Debt/GDP ratio (2013) (Selected Countries)

Data Source: OECD Outlook
General Government Net Debt
(International Comparison)

Source: MOF

Japan: 148.7
Japan

• First we would like to show the Flow of Fund in Japan.

• Who held JGB? How much? How about Greece?

• The demand for government bond and holders create different consequences.
Recent Money Flow of Japan

Source: BOJ Flow of Funds
Bank Loans of Japan

Source: BOJ billion

Large Banks: 202 trillion yen
Regional banks: 216 trillion yen (2014, Nov)

Bank Loan (City Banks)
Bank Loans (Regional Banks I & II)
Declining Bank Loans in Japan

1. Stricter Basel Capital Requirement (Basel III)
2. Government Bonds = Zero Risk
3. Declining Domestic Demands for Bank Loans
   Shift production from Japan to other Asia
   Low expected rate of return
4. Corporations’ Surplus
   Profits from Overseas’ production
   Cash rich companies
Changes in Japan’s Money Flow

High Growth Period
Households Savings $\rightarrow$ Corporate $\rightarrow$ Capital Investment $\rightarrow$ Stock

Recent Period
Corporate Savings $\rightarrow$ Government $\rightarrow$ Elderly people

Abolish Retirement Age
Increase working population
Pension payment will start 65 or later
Wage rate be based on marginal productivity
General Account Budget for FY2014 -Breakdown of Expenditure-

General Account Total Expenditures
95,882.3 (100.0%)

Primary Expenses
72,612.1 (75.7%)

Social Security
30,517.5 (31.8%)

National Debt Service
23,270.2 (24.3%)

Redemption of the National Debt
13,138.3 (13.7%)

Others
9,656.8 (10.1%)

Food Supply
1,050.7 (1.1%)

Promotion of SMEs
185.3 (0.2%)

Energy
964.2 (1.0%)

Former Military Personal Pensions
444.3 (0.5%)

Economic Assistance
509.8 (0.5%)

Miscellaneous
6,152.6 (6.4%)

Contingency Reserves
350.0 (0.4%)

Interest Payments
10,131.9 (10.6%)

Local Allocation Tax Grants, etc.
161,424 (16.8%)

National Defense
4,884.8 (5.1%)

Public Works
5,968.5 (6.2%)

Education & Science
5,442.1 (5.7%)

General Account Budget for FY2014 -Breakdown of Expenditure-

( Note1 ) Figures may not add up to the totals due to rounding.

( Note2 ) The ratio of Social Security expenses to General Expenditures* : 54.0%

*General Expenditures equals to the Primary Expenditure minus Local Allocation Tax Grants, etc.
Total Account (Initial General and Special Account, 2014)

Total 234.7

Unit: trillion Yen
Budget Allocation of Central Government (Japan, 1985-2011)

Source: MOF
Billion yen
Trends in Interest Payments and Interest Rate

Source: MOF

Government Bond Outstanding
Interest Rate
Interest Payment

Source: MOF
Trends in General Account Tax Revenues, Total Expenditures and Government Bond Issues

Source: MOF

Crocodile’s Mouth
Population Aging of Japan

Forecast (2012)

10 of Thousands

Peak of the Population 2004, 127.8 million

Source: Ministry of Internal Affairs and Communication
Total Fertility Rate (TFP) of Major Countries (1980-2015)

Source: UN
Aged Dependency Ratio of Major Countries (1980-2040)

Source: UN
Aged Population of Major Countries (1980-2040)

Source: UN
Effects on Population Aging and Declining Birthrate

(1) GDP Growth Rate $\downarrow$ (Working Population Declining) $\rightarrow$ Debt/GDP Ratio $\uparrow$

(2) Life Cycle Saving
Households’ Saving Rate $\downarrow$ $\rightarrow$ Demand of Government Bond $\downarrow$

(3) Pay-as-you-go System (Pension) $\rightarrow$ Broadening the generation disparity $\rightarrow$ It will be burdened
Generational Inequality

Aged People have strong VOICE→Voting Right
Young generation do not have any Voting Right.
Young people do not go for Voting.
Aged People wants to receive benefits.
Japanese Pension Scheme -- Pay as you go system

In 1950s, Retirement Age 55, Life expectancy 59
In 2010, Retirement Age 60,65, Life expectancy 88

We proposed to start pension payments from
60->65->70 by allowing old people to work

Japanese Survey shows many people want to work
MOF’s JGB management policy

(1) Dialogue between MOF and market participants (esp, Institutional investors)
(2) Diversification the JGB holders and it’s variety
(3) Improvement of Liquidity in JGB
(4) Sophistication of Debt Management
Issues of Various Government Bond

Short term  1 to 5 years (Banks, Postal Saving)
10 years (Trust Banks, Insurance)
Inflation indexed bond
15 year (floating bond)
20 year (Insurance, Pension Funds, Kampo)
30 year (Insurance, Pension funds)
40 year (Pension fund, Insurance)
# Market Issuance Plan by JGB Types

<table>
<thead>
<tr>
<th></th>
<th>FY 2014 (initial)</th>
<th>FY 2014 (Supplymentary Budget)</th>
<th>FY 2015 (initial)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(per time)</td>
<td>(total, a)</td>
<td>(per time)</td>
</tr>
<tr>
<td>40-years</td>
<td>0.4 × 4 times</td>
<td>1.6</td>
<td>0.4 × 4 times</td>
</tr>
<tr>
<td>30-years</td>
<td>0.4 × 4 times</td>
<td>8</td>
<td>0.4 × 4 times</td>
</tr>
<tr>
<td></td>
<td>0.7 × 8 times</td>
<td>8</td>
<td>0.7 × 8 times</td>
</tr>
<tr>
<td>20-years</td>
<td>1.2 × 12 times</td>
<td>14.4</td>
<td>1.2 × 12 times</td>
</tr>
<tr>
<td>10-years</td>
<td>2.4 × 12 times</td>
<td>28.8</td>
<td>2.4 × 12 times</td>
</tr>
<tr>
<td>5-years</td>
<td>2.7 × 12 times</td>
<td>32.4</td>
<td>2.7 × 12 times</td>
</tr>
<tr>
<td>2-years</td>
<td>2.7 × 12 times</td>
<td>32.4</td>
<td>2.7 × 12 times</td>
</tr>
<tr>
<td>TBs (1-year)</td>
<td>2.2 × 1 times</td>
<td>27.5</td>
<td>1.9 × 2 times</td>
</tr>
<tr>
<td></td>
<td>2.3 × 11 times</td>
<td>27.5</td>
<td>2.2 × 1 times</td>
</tr>
<tr>
<td>10-Year Inflation-Indexed</td>
<td>0.4 × 4 times</td>
<td>1.6</td>
<td>0.4 × 2 times</td>
</tr>
<tr>
<td></td>
<td>0.5 × 2 times</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Auctions for Enhanced-Liquidity</td>
<td>0.7 × 12 months</td>
<td>8.4</td>
<td>0.7 × 12 months</td>
</tr>
<tr>
<td>Total</td>
<td>155.1</td>
<td>154.5</td>
<td>▲0.6</td>
</tr>
</tbody>
</table>
# Japanese Debt (2012)

<table>
<thead>
<tr>
<th>HOLDERS</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Banks and Postal Savings</td>
<td>45%</td>
</tr>
<tr>
<td>Life and Non-life Insurances</td>
<td>20%</td>
</tr>
<tr>
<td>Public Pension funds</td>
<td>10%</td>
</tr>
<tr>
<td>Private Pension Funds</td>
<td>4%</td>
</tr>
<tr>
<td><strong>Central Bank of Japan</strong></td>
<td>8%</td>
</tr>
<tr>
<td>Overseas’ Investors</td>
<td>8%</td>
</tr>
<tr>
<td>Households</td>
<td>5%</td>
</tr>
<tr>
<td>Others</td>
<td>3%</td>
</tr>
</tbody>
</table>

Source: BOJ
Japanese Debt, 92% are held by Domestic Investors (2014)

<table>
<thead>
<tr>
<th>HOLDERS</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Banks and Postal Savings</td>
<td>27.8%</td>
</tr>
<tr>
<td><strong>Central Bank of Japan</strong></td>
<td><strong>21.2%</strong></td>
</tr>
<tr>
<td>Life and Non-life Insurances</td>
<td>19.3%</td>
</tr>
<tr>
<td>Overseas’ Investors</td>
<td>8.5%</td>
</tr>
<tr>
<td>Public Pension funds</td>
<td>6.4%</td>
</tr>
<tr>
<td>Private Pension Funds</td>
<td>3.4%</td>
</tr>
<tr>
<td>General Government</td>
<td>2.6%</td>
</tr>
<tr>
<td>Households</td>
<td>2%</td>
</tr>
<tr>
<td>Others</td>
<td>1.5%</td>
</tr>
</tbody>
</table>
Abenomics

"Three arrows" agenda

Bold monetary policy  Flexible fiscal spending  Growth strategies to stimulate private-sector investment

Rise in expected inflation rate → Yen depreciation

Demand ↑ ← Household income ↑

Production ↑ → Corporate earnings ↑

Positively reinforcing cycle in real economy

Rise in real inflation rate ↑  GDP growth ↑
BS of BOJ

Total Asset: 158
- Long term JGB 89
- Banknotes 87
- Others
- Current deposit 47

ETF etc. 6.6

FY2012

Total Asset: 224
- Long term JGB 142
- Banknotes 90
- Current deposit 107
- Others

ETF etc. 8

FY2013

Total Asset: 297
- Long term JGB 200
- Banknotes 87
- Current deposit 177
- Others

ETF etc. 9.3

FY2014

Data Source: BOJ

Unit: Trillion Yen
Monetary Base (Seasonally Adjusted / Average amounts outstanding)

Unit: 100 million yen

Source: BOJ
Greece, 72% of their debts are held by overseas’ Investors (2011)

<table>
<thead>
<tr>
<th>HOLDERS</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eurozone</td>
<td>15%</td>
</tr>
<tr>
<td>ECB</td>
<td>15%</td>
</tr>
<tr>
<td>IMF</td>
<td>6%</td>
</tr>
<tr>
<td>Greek banks &amp; non-banks</td>
<td>23%</td>
</tr>
<tr>
<td>Other European Banks</td>
<td>10%</td>
</tr>
<tr>
<td>Non European Banks</td>
<td>8%</td>
</tr>
<tr>
<td>Non-Greek non-Banks</td>
<td>23%</td>
</tr>
</tbody>
</table>

Source: Financial Times
Domar Condition

\[ b_t - b_{t-1} = (r_t - \eta_t) b_{t-1} + g_t - t_t \]

\( r_t = \text{Interest Rate} \)
\( \eta_t = \text{Growth rate} \)

where

\[ b_t = \frac{B_t}{Y_t}, \quad b_{t-1} = \frac{B_{t-1}}{Y_{t-1}}, \quad g_t = \frac{G_t}{Y_t}, \quad t_t = \frac{T_t}{Y_t} \]
Interest rate and Economic growth rate (1995-2013)

Domar Condition does not hold in Japan

Source: MOF and Ministry Cabinet
Bohn’s Condition

- $PB_t = g_t - t_t$  Primary Balance (PB)
- $PB_t = PB_1 + \mu(b_{t-1} - b_0)$  Bohn’s Rule: Primary Balance improvement Rule at $t$

$$\sum_{t=1}^{\infty} \frac{PB_t}{(\lambda)_t} = b_0$$

- Bohn’s Rule satisfied with “transvesarity condition”.

Implication of Bohn’s condition

- Bohn’s condition only gives that the budget balance is retained in the long run.

→ **Bohn’s condition attains the fiscal sustainability. However, it cannot exclude the economic contraction equilibrium where people’s income will decrease and government expenditure will be cut.**

→ That is the reason why we propose the fiscal policy rule with both economic recovery and fiscal sustainability.
Japanese Government Bond Yields

Source: MOF
Interest rate in selected OECD countries

Source: Monthly Monetary and Financial Statistics (MEI), OECD statistics
Japan’s Supply and Demand for Bonds

$E_1 \rightarrow E_2 \rightarrow E_3 \rightarrow E_4$
Greece Supply and Demand for Government bonds

\[ r_t \]

\[ \Delta B_t^S \]

\[ \Delta B_t^D \]

\[ E_1 \rightarrow E_2 \rightarrow E_3 \rightarrow E_4 \]
Greek Case and Japanese Case

- **Greek Case**
  - Foreign fund $\rightarrow$ large
  - Domestic Deposits $\rightarrow$ Small
  - In GGB market, Foreign funds flow out
  - Interest Rate goes up

- **Japanese Case**
  - Foreign fund $\rightarrow$ Small
  - Domestic Deposits $\rightarrow$ Large
  - In JGB market, Domestic deposits flow into the JGB market $\rightarrow$ interest rate deflates, whereas the supply of JGB is sufficiently large.
Macroeconomic Model
(Supply and Demand for Gov. Bonds)

\[ G_t + r_t B_{t-1} = \Delta B_t + T_t \]  Government Budget
Constraint

\[ Y_t - T_t + r_t B_{t-1} + \theta G_t = C_t + S_t \]  where

\[ S_t = \Delta B_t + \Delta W_t^D - \Delta W_t^F \]  and \( \theta G_t \): Public
Investment for elder people

\[ YD_t = Y_t + \theta G_t + r_t B_{t-1} - T_t = C_t + S_t \]  Disposable Income

\[ C_t = c_0 + c_1 YD_t \]  Consumption Equation

\[ W_t = d_0 + d_1 YD_t + d_2 r_t \]  Deposit Equation
The long-run interest rate and the long run equilibrium level of debt

\[ \bar{r}_t \]

\[ = \frac{(c_0 + d_0) + (1 - \theta)(1 - c_1 - d_1)\bar{G} - (1 - c_1 - d_1)Y_t^f - \bar{W}^D - \bar{W}^F}{d_2} \]

\[ \bar{B}_t = \frac{d_2(\bar{G} - \bar{T})}{(1-c_1-d_1)(Y_t^f - (1-\theta)\bar{G}) + \bar{W}^D + \bar{W}^F - (c_0 + d_0)} \]
Minimize the following loss function:

\[
L(B_t, Y_t, G_t, T_t, \Delta B_t) = \frac{1}{2} w_1 (B_t - B_t^*)^2 + \frac{1}{2} w_2 (Y_t - Y_t^f)^2 \\
+ \frac{1}{2} w_3 (G_t - G_{t-1})^2 + \frac{1}{2} w_4 (T_t - T_{t-1})^2 \\
+ \frac{1}{2} w_5 (\Delta B_t - \Delta B_t^*)^2
\]

\(w_i \ (i = 1, \cdots, 5)\) are the policy weights where government can set up.
Objective Loss Function of the Government

(i) Sustainable Debt /GDP ratio
(ii) Stable Economic Growth
(iii) Smooth Government Spending
(iv) Smooth Tax Revenue
(v) Smooth change of flow of bonds
Fiscal Policy Rule to stabilize Government Budget Deficits

Our Proposed Government Spending Rule is

\[ G_t - G_{t-1} = \alpha_1 (B_t - B_t^*) + \alpha_2 (\Delta B_t - \Delta B_t^*) + \alpha_3 (Y_t - Y_t^f) \]

where

\[ \alpha_1 = \frac{w_1}{w_3} \left( \frac{d_2 - (1 - \theta)(1 - c_1 - d_1)B_{t-1}}{d_2 - (c_1 + d_1)B_{t-1}} \right), \quad \alpha_2 = \frac{w_5}{w_3} \left( \frac{d_2 - (1 - \theta)(1 - c_1 - d_1)B_{t-1}}{d_2 - (c_1 + d_1)B_{t-1}} \right), \quad \alpha_3 = -\frac{w_2}{w_3} \theta \]
Optimal Taxation Rule

Our Proposed Government taxation Rule is

\[ T_t - T_{t-1} = \beta_1 (B_t - B_t^*) + \beta_2 (\Delta B_t - \Delta B_t^*) + \beta_3 (Y_t - Y_t^f) \]

where \( \beta_1 = \frac{w_1}{w_4} \left( \frac{d_2}{d_2 - (c_1 + d_1)B_{t-1}} \right), \beta_2 = \frac{w_5}{w_4} \left( \frac{d_2}{d_2 - (c_1 + d_1)B_{t-1}} \right), \beta_3 = \frac{w_2}{w_4} \)
Fiscal Policy Rule to stabilize Government Budget Deficits

(i) Current Debt – Desired Debt
(ii) GDP-gap
(iii) Smooth change of government spending
(iv) Smooth change of taxation
(v) Affordability of Financial Wealth which can be allocated to hold Government Bonds $B_t^*$
Augmented Bohn’s Rule

• From our proposed Government spending rule and taxation rule, we have the following augmented Bohn’s Rule:

\[ PB_t - PB_{t-1} = (\alpha_1 - \beta_1)(B_t - B^*_t) + (\alpha_2 - \beta_2)(\Delta B_t - \Delta B^*_t) + (\alpha_3 - \beta_3)(Y_t - Y^f_t) \]

• This is the version of considering both Economic recovery and fiscal sustainability.
Policy Implications from the rule

• Bohn’s condition does not satisfy economic recovery. It only gives a condition that the budget balance is retained.

• The fiscal policy rule has to watch how the government debt diverges from the desired level and the GDP gap.
Empirical Survey

Demand of government Bond

\[ \Delta(B_t) = 8444390 + 1336455(r_t) \]

Investment function,

\[ \Delta(I_t) = 85153 - 2125[\Delta(r_t)] \]

Consumption Equation

\[ C_t = 9445 + 0.53(YD_t) \]

Deposit Equation

\[ \Delta(W_t^D) = -10828237 + 0.22(YD_t) - 675616(r_t) \]
Theoretical equilibrium GDP and the actual real GDP of Japan
(2003Q4 – 2013Q4)

Noted: Y* (constant line) is the obtained income in the short-run equilibrium. Y_r (dashed line) is the real income seasonally adjusted.
Theoretical equilibrium interest rate and the actual interest rate on bond (2003Q4 – 2013Q4)

Noted: r* (constant line) is the obtained interest rate in the short-run equilibrium. r (dashed line) is the long-run JGB interest rate.
Conclusion

1. We must consider the fiscal policy rules that attain both fiscal sustainability and economic recovery facing with aging & declining birthrate society.

2. From flow of funds, we observed that the private sector’s money flow finances the government debt. However these private sector’s money flow should go not to the government debt finance but to the private economic activity in order to attain the economic growth for fiscal sustainability.
Conclusion

3. Because Japan will enter the aged-society, we should postpone the retirement age in order to increase the working-age section and reduce the top portion. And to base wage rates on productivity rather than seniority, as is traditionally the case in most Japanese firms.

4. Using the hometown investment trust fund (Yoshino 2013). The goal of the fund is to connect investors with their hometowns. Since the bank lending still be low, the hometown investment trust fund will be another way to finance SMEs which are needed the funding.
References


Thank you very much for your attention.