The Fiscal Impact of Population Aging in the United States
by Henry J. Aaron

Comments by Naoyuki Yoshino
Professor of Economics, Keio University, Japan

Yoshino@econ.keio.ac.jp
Trends in General Account Tax Revenues, Total Expenditures and Government Bond Issues

(Unit: trillion yen)

<table>
<thead>
<tr>
<th>Flow</th>
<th>FY2014 (trillion yen)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bond Dependency Ratio</td>
<td>43.0%</td>
</tr>
<tr>
<td>General Account Primary Balance</td>
<td>-18.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stock</th>
<th>As of end-FY2014 (Percentage of GDP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Government Bonds Outstanding (General Bonds Outstanding)</td>
<td>780 (156%)</td>
</tr>
<tr>
<td>Long-Term Debt Outstanding of Central and Local Governments</td>
<td>1,010 (202%)</td>
</tr>
</tbody>
</table>

Graph showing trends in tax revenues, special deficit financing bond issues, construction bond issues, and total expenditures over the years FY75 to FY14.
Transition of Major Expenditure Items in the General Account

(FY1960) 1.7 trillion yen
(breakdown)
- Social Security related Expenditures 0.2
- Local Allocation Tax Grants, etc. 0.3
- Public Works

(FY1970) 8.2 trillion yen
(breakdown)
- Social Security related Expenditures 1.2
- Local Allocation Tax Grants, etc. 1.8
- Public Works

(unit: trillion yen)
- National Debt Service
- Others
  - Education & Science
  - National Defense,
- Public Works related
- Local Allocation Tax Grants, etc.
- Social Security related Expenditures
### General Government Gross Debt (International Comparison)

<table>
<thead>
<tr>
<th>CY</th>
<th>1999</th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
</tr>
</thead>
<tbody>
<tr>
<td>Japan</td>
<td>129.0</td>
<td>137.6</td>
<td>144.7</td>
<td>153.5</td>
<td>158.3</td>
<td>166.3</td>
<td>169.5</td>
<td>166.8</td>
</tr>
<tr>
<td>U.S.</td>
<td>58.6</td>
<td>52.7</td>
<td>52.7</td>
<td>55.1</td>
<td>58.3</td>
<td>65.2</td>
<td>64.6</td>
<td>63.4</td>
</tr>
<tr>
<td>U.K.</td>
<td>46.7</td>
<td>44.6</td>
<td>39.9</td>
<td>40.5</td>
<td>41.1</td>
<td>43.2</td>
<td>45.5</td>
<td>45.3</td>
</tr>
<tr>
<td>Germany</td>
<td>61.8</td>
<td>60.8</td>
<td>60.1</td>
<td>62.5</td>
<td>65.9</td>
<td>69.3</td>
<td>71.8</td>
<td>69.8</td>
</tr>
<tr>
<td>France</td>
<td>66.8</td>
<td>65.7</td>
<td>64.3</td>
<td>67.5</td>
<td>71.7</td>
<td>74.1</td>
<td>76.1</td>
<td>71.2</td>
</tr>
<tr>
<td>Italy</td>
<td>125.7</td>
<td>120.8</td>
<td>120.1</td>
<td>118.8</td>
<td>116.3</td>
<td>116.8</td>
<td>119.4</td>
<td>121.2</td>
</tr>
<tr>
<td>Canada</td>
<td>92.2</td>
<td>84.2</td>
<td>85.7</td>
<td>84.8</td>
<td>80.3</td>
<td>76.5</td>
<td>75.8</td>
<td>74.9</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Japan</td>
<td>162.4</td>
<td>171.1</td>
<td>188.7</td>
<td>193.3</td>
<td>210.6</td>
<td>218.8</td>
<td>227.2</td>
<td>231.9</td>
</tr>
<tr>
<td>U.S.</td>
<td>63.8</td>
<td>72.6</td>
<td>85.8</td>
<td>94.6</td>
<td>98.8</td>
<td>102.1</td>
<td>104.1</td>
<td>106.3</td>
</tr>
<tr>
<td>U.K.</td>
<td>46.4</td>
<td>56.7</td>
<td>71.3</td>
<td>84.5</td>
<td>99.0</td>
<td>102.4</td>
<td>107.0</td>
<td>110.0</td>
</tr>
<tr>
<td>Germany</td>
<td>65.6</td>
<td>69.9</td>
<td>77.5</td>
<td>86.3</td>
<td>85.8</td>
<td>88.3</td>
<td>86.1</td>
<td>83.4</td>
</tr>
<tr>
<td>France</td>
<td>73.0</td>
<td>79.3</td>
<td>91.4</td>
<td>95.7</td>
<td>99.3</td>
<td>109.3</td>
<td>113.0</td>
<td>115.8</td>
</tr>
<tr>
<td>Italy</td>
<td>116.5</td>
<td>118.9</td>
<td>132.4</td>
<td>131.1</td>
<td>124.0</td>
<td>142.2</td>
<td>145.7</td>
<td>146.7</td>
</tr>
<tr>
<td>Canada</td>
<td>70.4</td>
<td>74.7</td>
<td>87.4</td>
<td>89.5</td>
<td>93.6</td>
<td>96.1</td>
<td>97.0</td>
<td>97.1</td>
</tr>
</tbody>
</table>

(Source) OECD "Economic Outlook 94" (November, 2013)
(Note1) Figures represent the general government-based data.
(Note2) FY2014 draft budget is not reflected in the above data.
(10) Government Bonds Outstanding and Tax Revenue - to - GDP ratio (based on initial budget)
Fig. c3-5 Government Bonds holders of Each Countries (Home and Abroad)

Japan (Dec. 2012)
- Foreign Investors: 9%
- Domestic Investors: 91%
- Total: 960.4 trillion yen

- Foreign Investors: 48%
- Domestic Investors: 52%
- Total: 11.6 trillion dollars

- Foreign Investors: 32%
- Domestic Investors: 68%
- Total: 1.4 trillion pounds

Germany (Dec. 2012)
- Foreign Investors: 59%
- Domestic Investors: 41%

France (Dec. 2012)
- Foreign Investors: 38%
- Domestic Investors: 62%
Fig.1-11 Breakdown by JGB and T-Bill Holders (1~4) (March 2013, QE)

(Unit: trillion yen)

- Total 969.1 trillion yen
- Banks, etc. 411.1 42.4%
- Life and NonLife Insurance 193.3 19.9%
- Public Pensions 63.0 6.5%
- Pension Funds 31.0 3.2%
- Foreigners 81.5 8.4%
- Households 24.2 2.5%
- Others 17.6 1.8%
- General Government (ex Public Pensions) 15.1 1.6%
- Fiscal Loan Fund 4.4 0.5%

(Source: Bank of Japan)
Bond Market – Japan and Greece
# Holdings of Greece Debt

<table>
<thead>
<tr>
<th>HOLDERS</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overseas’ Investors</td>
<td>33%</td>
</tr>
<tr>
<td>Greek Domestic Investors</td>
<td>21%</td>
</tr>
<tr>
<td>ECB</td>
<td>18%</td>
</tr>
<tr>
<td>Bilateral Loans</td>
<td>14%</td>
</tr>
<tr>
<td>Social Pension Funds</td>
<td>6%</td>
</tr>
<tr>
<td>IMF</td>
<td>5%</td>
</tr>
<tr>
<td>Greek Domestic Funds</td>
<td>3%</td>
</tr>
</tbody>
</table>

Source: Financial Times
Fig. 1-9 10-year Principal Countries Government Bond Yield

(Source: Bloomberg)
The Domar condition is obtained from government budget constraints as follows.

- \( G_t + r_t B_{t-1} = \Delta B_t + T_t \) Government budget constraint (1)
- Equation (1) states that government spending \( (G_t) \) + interest payments \( (= r_t B_{t-1}) \)
- = new issue of government bonds \( (\Delta B_t) \) + tax revenue \( (T_t) \)
- Divide Equation (1) by GDP \( (Y_t) \) and rewrite Equation (1)
- \( b_t - b_{t-1} = \frac{(r_t-\eta_t)}{1+\eta_t} b_{t-1} + g_t - t_t \) The Domar Condition (2)
- where \( b_t = B_t / Y_t \), \( \eta_t = \Delta Y_t / Y_t \), \( g_t = G_t / Y_t \), and \( t_t = T_t / Y_t \)
- We also mention that we can derive the Domar condition from our government objective function (Equation (?)). From this equation,
\[
\frac{\partial L}{\partial b_{t-1}} = 2w_5 \frac{\partial \Delta b_t}{\partial b_{t-1}} = \frac{r_t-\eta_t}{1+\eta_t}
\]
setting up other policy weights as zero, i.e., \( w_i = 0, i = 1, ..., 4 \).
\( G_t + r_t B_{t-1} = \Delta B_t + T_t \)  
Government Budget Constraint=Supply of government bonds (3)

A simple macro model which includes the demand side of the government bond can be constructed as follows.

Equation (3) is the disposable income where wage income, transfer payment from the government and interest receipt from the government bonds minus tax payments. The disposable income is distributed consumption and savings. Savings are allocated to purchase of government bonds, increase in domestic deposits and investment into foreign countries. For simplicity, the foreign assets holdings is regarded as exogenous.

The disposable income is defined as income \( (Y_t) \) plus government transfer to households \( (\theta G_t) \) plus interest receipt of government bond \( (r_t B_{t-1}) \) by households minus tax payment \( (T_t) \) as follows. The disposable income is divided into consumption \( (C_t) \) and savings \( (S_t) \)

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

where \( S_t = \Delta B_t + \Delta W_t^D - \Delta W_t^F \) (4)

Savings \( S_t \)=Government bonds \( \Delta B_t \)+Domestic Deposits \( \Delta W_t^D \)–Foreign assets \( \Delta W_t^F \)

\( \Delta W_t^F = \Delta \bar{W}^F \)  
Foreign assets are assumed to be constant (5)

\( C_t = c_0 + c_1 YD_t \)  
Consumption Equation (6)

\( W_t^D = d_0 + d_1 YD_t + d_2 \Delta r_t \) where \( \Delta r_t = r_t - r_{t-1} \)  
Deposit Equation (7)
**Fiscal Policy Rule**

\[
\frac{\partial B_t}{\partial G_t} = -\left[\frac{(1-\theta)(1-c_1-d_1)B_{t-1}+d_2}{(c_1+d_1)B_{t-1}-d_2}\right], \quad \frac{\partial Y_t}{\partial G_t} = \theta, \quad \frac{\partial \Delta B_t}{\partial G_t} = -\left[\frac{(1-\theta)(1-c_1-d_1)B_{t-1}+d_2}{(c_1+d_1)B_{t-1}-d_2}\right]
\]

\[
G_t = G_{t-1} + \frac{w_1}{w_3} (B_t - B_t^*) \left(\frac{(1+(c_1+d_1-1)\theta)B_{t-1}}{(c_1+d_1)B_{t-1}-d_2}\right) - \frac{w_2}{w_3} \theta (Y_t - Y_t^f) + \frac{w_5}{w_3} (\Delta B_t - \Delta B_t^*) \left(\frac{(1+(c_1+d_1-1)\theta)B_{t-1}-d_2}{(c_1+d_1)B_{t-1}-d_2}\right)
\]

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

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

\[
\frac{\partial L}{\partial T_t} = w_1 (B_t - B_t^*) \left(\frac{\partial B_t}{\partial T_t}\right) + w_2 \frac{\partial Y_t}{\partial T_t} (Y_t - Y_t^f) + w_4 (T_t - T_{t-1}) + w_5 (\Delta B_t - \Delta B_t^*) \left(\frac{\partial \Delta B_t}{\partial T_t}\right) = 0
\]

\[
\text{where } \frac{\partial B_t}{\partial T_t} = \frac{d_2}{(c_1+d_1)B_{t-1}-d_2}, \quad \frac{\partial Y_t}{\partial T_t} = -1, \quad \frac{\partial \Delta B_t}{\partial T_t} = \frac{d_2}{(c_1+d_1)B_{t-1}-d_2}
\]

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

\[
\text{where } \beta_1 = -\frac{w_1}{w_4} \left(\frac{d_2}{(c_1+d_1)B_{t-1}-d_2}\right), \quad \beta_2 = -\frac{w_5}{w_4} \left(\frac{d_2}{(c_1+d_1)B_{t-1}-d_2}\right), \quad \beta_3 = \frac{w_2}{w_4}
\]
DSGE Model – McNelis and Yoshino

1. Fiscal Policy Rule
   Government Spending and Tax Revenue

2. Increase working labor
   Old people to work, retirement age
   Female participation in labor force
   (child care facilities etc.)

3. Wage rate should be determined by market
   Seniority wage rate should be abolished

4. Medical care for elderly people
   Huge medical costs for terminal care
References


