Growing sovereign risk may boost JGB yields to 10%, with foreign holdings seen rising to 20% -30% sometime between '18 and '28

Hideaki Matsuoka¹ and Shohei Terada²

<Abstract>

Japan is saddled with the world's largest public debt, but so far shows no signs of a sovereign debt crisis, with long-term interest rates remaining stable at low levels. This is because Japan's debt has long been financed mostly by the nation's abundant household assets deposited at financial institutions which use them to buy government bonds. This makes Japan very different from Greece and Spain which are also debt-ridden but not flush enough to buy up their own national debt. But if Japan's national debt is to continue to balloon, it will eventually exceed domestic investors' capacity to absorb additional debt and Japan may follow in the footsteps of the Southern European countries. The question then turns to what extent the government bond yield will go up.

We use an indicator called "domestic assets surplus" to measure the domestic market's capacity to buy government bonds. The surplus shows how much outstanding financial wealth held by the household and private sectors surpass the government debt. Based on the assumption that investors will begin demanding sovereign debt risk premium when the indicator's reading falls below a certain level, we estimated coefficients correlated with long-term interest rates, using a methodology called threshold regression with panel data covering 25 countries.

Our studies show that when the surplus dips below 105% of GDP, the coefficients of long-term interest rates to public debt become significantly larger (, meaning that debt will have a far greater impact on yields). Given Japan's sizable debt, the 10-year yields will reach 10% once investors become aware of sovereign default risk. At that time, 20% to 30% of Japan's debt will be owned by overseas investors.

The surplus is expected to fall below 105% of GDP in 2018 in a pessimistic scenario, and in 2028 in an optimistic scenario. The optimistic scenario represents the government's cautious scenario. Fiscal outlook built on the premises that Japan will achieve high nominal GDP growth rate will blunt our crisis mentality. Even if the pessimistic scenario prevails, Japan will be able to dodge fiscal crisis by raising consumption tax rate 2 % every year between fiscal 2016 and 2020, because that will enable Japan's market to maintain its ability to finance national debt.

The government has decided to double the tax rate to 10% in 2015. We now need to discuss further steps we can take after that year to ward off a sovereign debt crisis.

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1. Japan versus Greece: The difference is in the government bond buying structure

Japan is saddled with the world's largest public debt, but has yet to show any signs of a sovereign debt crisis, with the country's long-term interest rates remaining stable at low levels, a persistent trend made possible by domestic financial institutions continuing to remain majors buyers of Japanese government bonds. This shows that the bulk of the government's 900 trillion-yen debt (Figure 1-1) has been financed by such domestic financial institutions, which rely for funding on the nation's abundant household and corporate assets that are deposited as savings at banks and used to pay insurance premiums to insurance companies.

**Figure 1-1  Japan's Flow of Funds Accounts (End of December 2011)**

On the other hand, while sovereign debt crises broke out in Greece and Spain, nations whose government debt is smaller than that of Japan (on a GDP percentage basis), Japan has so far been able to avoid such a disaster. What separates Japan from Greece and Spain is their difference in terms of the underlying mechanism of government bond buying. Figure 1-2 compares these three countries in terms of government debt and domestic private-sector financial assets, i.e. the sum of household (and nonprofit organization) financial assets less equity holdings and the cash and deposits held by corporations. This comparison reveals that, on a GDP percentage basis, Greece's domestic private-sector financial assets are smaller than its government debt, requiring the nation to rely heavily on overseas financing. The challenge facing Spain is not as serious as that for Greece with the former's domestic private-sector financial assets
continuing to remain somewhat greater than its government debt. In recent years, however, there has been a narrowing of the gap between Spain's domestic private-sector financial assets and its government debt.

As for Japan, while the country's government debt as a percentage of its GDP is greater than that of both Greece and Spain, the level of Japan's domestic private-sector financial assets is much higher compared with the two European nations. In addition to the abundance of domestic private-sector financial assets in Japan, the country's economic slump in recent years has been contributing to aggressive government bond buying by financial institutions, a phenomenon in which the sluggish economy causes corporate funding demand to weaken, promoting domestic banks to buy Japanese government bonds as an alternative fund use vehicle to lending. For all these developments, if Japan's government debt continues to inflate, there will come a day when even its huge domestic private-sector financial assets will not be sufficient to finance the enormous government debt as they do now, making Japan follow in the footsteps of Greece and Spain. In this scenario, Japan in turn will find itself having no alternative but to rely on foreign investors as the sizable buyers of Japanese government bonds, which will result in a jump in the proportion of non-resident holdings of government bonds from the current low level (Figure 1-3).

**Figure 1-2 Government debt and Private sector financial assets:**

<table>
<thead>
<tr>
<th>Japan</th>
<th>Greece</th>
<th>Spain</th>
</tr>
</thead>
</table>

Note: Private Sector Financial Assets = The sum of household (and Nonprofit organizations) financial assets less equity holdings and cash and deposits held by corporations.

Sources: OECD, IMF
2. A potential process of a once-calm market facing a crisis

Although the bulk of Japan's government debt is now financed by domestic financial institutions, the country starting to rely on foreign investors as the significant holders of Japanese government bonds in future will likely result in the nation's long-term interests tending to rise. As for Japanese domestic investors, they generally have a so-called "home country bias," a factor causing them to make inefficient portfolio management decisions. "Home country bias" refers to a condition that makes a country's investors give priority to domestic assets in constructing an investment portfolio even when they are inefficient owing to the existence of various factors involved in overseas investment, namely, foreign exchange fluctuation risks, high transaction costs (language barrier and information acquisition cost as well as the tax regime, regulation, fees and commissions for holding foreign assets in portfolio) and information asymmetry. In the case of Japan, home country bias is thus serving as the major contributing factor for the nation's domestic investors to remain major buyers of Japanese government bonds in spite of their low yield levels.

One point to note here is the fact that, even in the event of a country's government debt balance continuing to rise, the nation's institutional investors have only a weak incentive to recognize the need for risk premium (the term risk premium as used in this context refers to higher government bond coupons and/or sufficiently favorable government bond issuance pricing, and is referred to as "Sovereign Debt Risk Premium" hereafter) for the potential of the government running into a sovereign debt crisis. This is because demanding such risk premium will bring about a growing risk of these investors suffering substantial valuation losses on their government bonds, assets held on their balance sheets, given their high portfolio exposure to the country's government bonds, a situation currently facing Japanese financial institutions.

Note: The figures for Spain are based on all securities other than shares.
Sources: FRB "Flow of Funds", Bank of Japan "Flow of Funds", Haver Analytics

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investors) that hold huge levels of Japanese government bonds on their balance sheets. Consequently, even when the nation's government debt continues to grow, that will cause interest rates to increase only marginally.

On the other hand, however, interest rates may potentially rise if foreign investors holding the country's government bonds begin to find it necessary to sell their holdings in response to the nation's government debt coming to exceed its domestic financial assets in value, a scenario in which such foreign investors without any home country bias on Japan start to demand a high sovereign debt risk premium that is commensurate with the country's government debt level. An econometric analysis by Tokuoka, K. (2010) using Japanese data shows that Japan's long-term interest rates will rise as the proportion of non-resident holdings of Japanese government bonds increases. Such a situation could potentially prompt Japanese domestic financial institutions into selling their Japanese government bond holdings in a hurried manner due to the fear that the posting of "valuation losses" will result in downgrading of their credit ratings. If this scenario materializes, Japanese interest rates may continue to rise further.

3. How far will long-term interest rates rise? To 10% under a fiscal crisis scenario

3.1 A sovereign debt risk premium estimation based on a threshold regression approach

This section makes an estimation to determine to what extent the sovereign debt risk premium level differs from one country to another according to each nation's government bond buying mechanism, i.e. the degree of a country's domestic assets surplus shortage-induced reliance on non-resident holders of its government bonds. This estimation uses panel data on 25 nations (a total of 392 observations for the period whose data is available during the years from 1981 to 2011). Included in these data are long-term interest data for different foreign countries that already have a high non-resident holding ratio and thus are watched with caution by investors in the global government bond market due to the presence of their perceived fiscal disaster risk. Therefore, this set of data allows one to estimate the potential interest rate levels that may occur if Japan becomes required to rely on foreign investors as the sizable buyers of Japanese government bonds.

This estimation process utilizes the threshold regression methodology devised by Hansen (2000). Threshold regression refers to a methodology by which one estimates coefficients differing from one sample group to another among those groups that are divided, thereby determining at what time points the samples are divided in a statistical

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4 Meanwhile, Andritzky (2012) proved, using a panel data-based estimation of different nations' long-term interest rates, that an increase in the proportion of non-resident holdings of a country's government bonds causes the nation's long-term interest to decline. What separates Tokuoka, K. (2010) from Andritzky (2012) in research conclusion is the question of whether a gain in non-resident government bond holdings is interpreted to mean an increase in sovereign debt risk premium or a rise in incoming fund supply. The conclusion of the estimation by Andritzky (2012) can be considered to reflect a mechanism in which interest rates decline as incoming fund supply grows owing to an increased number of foreign funding channels.

5 Austria, Belgium, Canada, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Korea, Netherlands, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, United Kingdom, and United States
criteria. This specific process uses formula (a) and formula (b) below to estimate how government debt coefficients (the effect of government debt on long-term interest rates) change according to the type of the country’s government bond buying structure.

\[
R_{i,t} = \beta_1 D_{i,t} I_1 \{\gamma \geq \lambda\} + \beta_2 D_{i,t} I_2 \{\gamma < \lambda\} + \beta_3 A_{i,t} + \beta_4 S_{i,t} + \beta_5 P_{i,t} + c_i + e_{i,t} \quad \ldots (a)
\]

\[
R_{i,t} = \beta_1 D_{i,t} I_1 \{\gamma \geq \lambda\} + \beta_2 D_{i,t} I_2 \{\gamma < \lambda\} + \beta_3 A_{i,t} + \beta_4 S_{i,t} + \beta_5 P_{i,t} + \beta_6 I_2 \{\gamma < \lambda\} + c_i + e_{i,t} \quad \ldots (b)
\]

< Notation>

(1) \(R_{i,t}\): Long-term interest rate for each country (dependent variable) \((i\) is country index, \(t\) is time index)

(2) \(D_{i,t}\): General Government Gross Debt(% of GDP)

(3) \(A_{i,t}\): Private sector financial assets(% of GDP): The sum of household(and nonprofit organizations) financial assets less equity holdings and cash and deposits held by corporations

(4) \(S_{i,t}\): Short-term interest rate(policy interest rate)

(5) \(P_{i,t}\): Consumer Price Index (percent change from previous year)

(6) \(c_i\): Fixed Effects

(7) \(e_{i,t}\): Error terms

(8) \(\gamma\): Domestic Assets Surplus (the difference between Private Sector Financial Assets and General Government Gross Debt (% of GDP): \(A_{i,t} - D_{i,t}\))

(9) \(\lambda\): Threshold Value

(10) \(I_1\): indicator function: \(1(\gamma \geq \lambda)\) or \(0(\gamma < \lambda)\)

(11) \(I_2\): indicator function: \(1(\gamma < \lambda)\) or \(0(\gamma \geq \lambda)\)

(12) \(\beta_k\): The coefficients of the independent variables for item \(k\) in the series \((k = 1\) to \(5\) in equation ((a), \(k = 1\) to \(6\) in equation (b)).

The panel data shown in items (1) to (7) above are used to perform a fixed effects modeling process (an Ordinary Least Square process using different dummy variables for different countries). In performing a threshold regression analysis, items (8) to (11) are additionally used. This process assumes that the effect of general government gross debt (as a percentage of GDP) ("(2)"%) on long-term interest rates changes according to the scope of "\(\gamma\)". Here, it is thought that if "\(\gamma\)" is greater than the threshold value of "\(\lambda\)", the effect on interest rates is small and that, conversely, if "\(\gamma\)" is smaller than the threshold value of "\(\lambda\)", then the effect on interest rates is large.

Specifically, this process starts with an estimation of a large "\(\gamma\)" value. The estimation formula (a) is used to estimate the regression coefficients for item "(2)" with the coefficient slope dummy of item (10) as 1 in the case of a sample whose "\(\gamma\)" is greater than its "\(\lambda\)", and with the coefficient slope dummy of item (11) as 1 in the case of a sample whose "\(\gamma\)" is smaller than its "\(\lambda\)". Then, this estimation process is repeated to identify, within the estimation formula, the level of "\(\lambda\)" that minimizes the sum of squared residuals. The level of "\(\lambda\)" is estimated as a threshold value that shows the level at which the domestic assets surplus exists, and if a value falls below this threshold

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6 The data on (1), (3) and (4) were obtained from “Source OECD” while the data on (2) and (5) are those from IMF “World Economic Outlook”
value, the parameter for government debt as a percentage of GDP for the estimation "(a)" shifts from $\beta_1$ to $\beta_2$. In such instance, due to the risk premium size profile, the state of $\beta_1 < \beta_2$ is expected to materialize. The estimation "(a)" seeks to determine to what extent the interest rate fluctuates in response to 1% point increase that has occurred in government debt as a percentage of GDP, namely, the status of the $\beta_1$ and $\beta_2$ profile that shows the steepness of interest rate fluctuation. Moreover, the estimation "(b)" seeks to determine the same profile, based on the assumption that a threshold value exists for the level (constant) according to the level of domestic assets surplus.

In the case of the estimation formula "(a)", the threshold regression analysis identifies 104.73% to be the value $\lambda$ for a threshold value that minimizes the sum of squared residuals (this value represents domestic assets surplus as a percentage of GDP). (Figure 3-1-1) Meanwhile, the estimation "(a)" shown in Figure 3-1-2 presents the estimation results based on the dividing of different coefficients according to the size profile for the value $\lambda$ (threshold value). Figure 3-1-2 reveals that the estimated coefficients are statistically significant while meeting the sign condition as well. Highlighted in Figure 3-1-3 is a graph of the estimates for 25 countries using the estimation formula "(a)" and of the actual values.

**Figure 3-1-1 Likelihood ratio in Threshold Regression and Threshold Value**

The coefficient for total government debt as a percentage of GDP is identified as 0.027 by the estimation performed with the use of all the samples (Figure 3-1-2 [reference]), meaning that each 1% point increase in government debt as a percentage of GDP causes long-term interests to rise by 2.7 basis points. On the other hand, the estimation "(a)" reveals that, if the domestic assets surplus is greater than 104.73% of GDP, the coefficient is 0.011 and that, if the surplus is smaller than 104.73% of GDP, the coefficient is 0.043%, showing that the latter case has an effect about four times larger than that of the former case. This is interpreted to mean that, if a nation's domestic assets surplus is less than 104.73% of its GDP, the country will end up facing overseas investors' demand for sovereign debt risk premium for its government debt, and the size of such risk premium will be four times as large as that for the risk premium demanded by domestic investors. Contained in the list of the sample names whose domestic assets surplus is smaller than 104.73% (Figure 3-1-3) are the names of many European nations.
that ran into sovereign debt crises in the past.

The estimation "(b)" shows \( \beta_1 \beta_2 = 1.6 \) with the coefficient of constant dummy ending up being negative. This suggests that, although intercept becomes small if the domestic assets surplus falls below the threshold, the extent of interest rate increase tends to be greater according to the level of government debt as a percentage of GDP, compared with the estimation "(a)". Nevertheless, the following section continues the examination by using the estimation "(a)" whose adjusted R-squared is even greater.

In the past, the actual outbreak of sovereign debt crisis has been triggered by individual nations' political factors such as skepticism about state government's governance, key business community leader's statements and taxpayers' opposition to fiscal reform programs. These kinds of factors were accompanied by a jump in long-term interest rates in the crisis-hit nations (Figure 3-1-4). As for Ireland and Portugal, these countries incidentally ran into sovereign debt crises respectively in the years in which their domestic assets surplus fell below the 104.73% mark ("Sovereign Debt Risk Premium Ceiling"), namely, 2010 for Ireland and 2011 for Portugal (Figure 3-1-5). Meanwhile, in the case of nations like Greece whose domestic assets surplus continued to remain constantly below the 104.73% mark, it was political incidents like fiscal statistics falsification that triggered the occurrence of a sovereign debt crisis. These observations indicate a country that needs to rely for securing funding on overseas investors as the major buyers of its government bonds, as it has only a small domestic assets surplus, is structurally vulnerable to a shock encountered in relation to fiscal management.

**Figure 3-1-2 Regression Estimation: Dependent variable; Long-term interest rate**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Estimation(a)</th>
<th>Estimation(b)</th>
<th>Estimation(reference)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Government Debt(% of GDP)</td>
<td>Coefficient</td>
<td>Std Error</td>
<td>Coefficient</td>
</tr>
<tr>
<td>( D_{t,t} )</td>
<td>0.011</td>
<td>0.002 ***</td>
<td>0.011</td>
</tr>
<tr>
<td>( D_{t,t} )</td>
<td>0.043</td>
<td>0.004 ***</td>
<td>0.066</td>
</tr>
<tr>
<td>Private Sector Financial Assets (% of GDP)</td>
<td>Coefficient</td>
<td>Std Error</td>
<td>Coefficient</td>
</tr>
<tr>
<td>( A_{t,t} )</td>
<td>-0.034</td>
<td>0.003 ***</td>
<td>-0.033</td>
</tr>
<tr>
<td>CPI(change from previous year)</td>
<td>Coefficient</td>
<td>Std Error</td>
<td>Coefficient</td>
</tr>
<tr>
<td>( P_{t,t} )</td>
<td>0.125</td>
<td>0.049 ***</td>
<td>0.148</td>
</tr>
<tr>
<td>Constant dummy</td>
<td>Coefficient</td>
<td>Std Error</td>
<td>Coefficient</td>
</tr>
<tr>
<td>( I_{t} )</td>
<td>-2.052</td>
<td>0.839 ***</td>
<td></td>
</tr>
<tr>
<td>Fixed Effects(country)</td>
<td>Coefficient</td>
<td>Std Error</td>
<td>Coefficient</td>
</tr>
<tr>
<td>( \varepsilon_{t,t} )</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>

Threshold Value: \( \lambda = 104.73 \) and 101.27

Number of observations: 393
Adjusted R-squared: 0.901
S.E.of regression: 0.989
Bootstrap: P value: 0.000 ***

Note1: Standard errors are White's heteroscedasticity consistent standard errors.

**Note2:** Private Sector Financial Assets = The sum of household(and Nonprofit organizations) financial assets less equity holdings and cash and deposits held by corporations.
Judging from the analysis discussed above and the experiences of sovereign debt crisis-hit European nations, it is possible to argue that Japan, a nation saddled with political instability, may well end up in a situation where Japanese government bonds get sold off and long-term interest rates jump in response to the country's domestic assets surplus falling below the threshold value, or to the releasing of any trigger (e.g. bribery scandal-induced damage to the government's credibility and events like policymakers' failure to have their proposed tax system reform bill passed by the Diet). Still, it would be possible to argue conversely that, to date, such trigger for a sovereign debt crisis has been non-existent in Japan, despite policymakers' aggravating credibility erosion in the past, because of the lack of presence, among Japanese government bond markets, of foreign investors who normally recognize the need for sovereign debt risk premium.7

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Figure 3-1-3 The proportion of country samples with below-threshold value domestic assets surplus

<table>
<thead>
<tr>
<th>Country</th>
<th>The percentage of Domestic Assets Surplus &lt; 104.73 (%)</th>
<th>Sample period</th>
<th>The year in sovereign debt crisis</th>
<th>Number of observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>100</td>
<td>1995 - 2010</td>
<td></td>
<td>16</td>
</tr>
<tr>
<td>Finland</td>
<td>100</td>
<td>1995 - 2010</td>
<td></td>
<td>16</td>
</tr>
<tr>
<td>Greece</td>
<td>100</td>
<td>1998 - 2011</td>
<td>2009</td>
<td>14</td>
</tr>
<tr>
<td>Hungary</td>
<td>100</td>
<td>2000 - 2010</td>
<td>2010</td>
<td>11</td>
</tr>
<tr>
<td>Italy</td>
<td>100</td>
<td>1995 - 2010</td>
<td>1992 (*)</td>
<td>16</td>
</tr>
<tr>
<td>Norway</td>
<td>100</td>
<td>1994 - 2010</td>
<td></td>
<td>17</td>
</tr>
<tr>
<td>Poland</td>
<td>100</td>
<td>2001 - 2010</td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>Slovak Republic</td>
<td>100</td>
<td>2001 - 2010</td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>Slovenia</td>
<td>100</td>
<td>2004 - 2010</td>
<td></td>
<td>7</td>
</tr>
<tr>
<td>Czech Republic</td>
<td>100</td>
<td>2001 - 2010</td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>France</td>
<td>100</td>
<td>1995 - 2010</td>
<td></td>
<td>16</td>
</tr>
<tr>
<td>Germany</td>
<td>100</td>
<td>1994 - 2010</td>
<td></td>
<td>17</td>
</tr>
<tr>
<td>Spain</td>
<td>89</td>
<td>1994 - 2011</td>
<td>2012 (*)</td>
<td>18</td>
</tr>
<tr>
<td>Canada</td>
<td>74</td>
<td>1981 - 2011</td>
<td></td>
<td>31</td>
</tr>
<tr>
<td>Sweden</td>
<td>71</td>
<td>1995 - 2011</td>
<td>1994 (*)</td>
<td>17</td>
</tr>
<tr>
<td>Ireland</td>
<td>40</td>
<td>2001 - 2010</td>
<td>2010</td>
<td>10</td>
</tr>
<tr>
<td>Denmark</td>
<td>20</td>
<td>2001 - 2010</td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>Portugal</td>
<td>18</td>
<td>2001 - 2010</td>
<td>2011</td>
<td>10</td>
</tr>
<tr>
<td>United States</td>
<td>16</td>
<td>1981 - 2011</td>
<td></td>
<td>31</td>
</tr>
<tr>
<td>Belgium</td>
<td>0</td>
<td>2000 - 2011</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>Japan</td>
<td>0</td>
<td>1989 - 2011</td>
<td></td>
<td>23</td>
</tr>
<tr>
<td>Korea</td>
<td>0</td>
<td>2002 - 2011</td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>Netherlands</td>
<td>0</td>
<td>1995 - 2011</td>
<td></td>
<td>17</td>
</tr>
<tr>
<td>Switzerland</td>
<td>0</td>
<td>1999 - 2009</td>
<td></td>
<td>11</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>0</td>
<td>1987 - 2011</td>
<td></td>
<td>25</td>
</tr>
</tbody>
</table>

Note: Although the sovereign debt crises of Italy, Sweden and Spain occurred outside of the sample period, these nations' data are shown in the table above in consideration of the occurrences' proximity to the period.

7 The estimation program for the threshold regression analysis was prepared by drawing on the research by Yamada, Obayashi (2006).
Figure 3-1-4 Long-term interest rate in Sovereign Debt Crisis

Source: IMF
Figure 3-1-5  The total government debt and domestic private-sector financial assets of sovereign debt crisis-hit European nations

Note: Private Sector Financial Assets = The sum of household (and Nonprofit organization) financial assets less equity holdings and cash and deposits held by corporations.
Source: OECD, IMF

Sweden (year)

<Spain>

Note: Private Sector Financial Assets = The sum of household (and Nonprofit organization) financial assets less equity holdings and cash and deposits held by corporations.
Source: OECD, IMF

Greece (year)

Ireland (year)
3.2 Sovereign debt crisis and the proportion of non-resident holdings of government securities

As the threshold at which the sovereign debt risk premium begins to pick up, what would be the approximate percentage of the non-resident holding of government bonds that is equivalent to the "domestic assets surplus to GDP ratio of 104.73%," the level discovered through the analysis of the preceding section? Looking at the relationship between “the proportion of non-resident holdings of government securities” and “domestic assets surplus” (Figure 3-2-1), one can identify a tendency for the non-resident holding of governments securities to rise as the domestic private-sector financial assets to government debt ratio lowers. Such clear correlation, however, is not observable in the case of euro zone nations since, due to the continuous promotion of government securities cross-holding among different European countries, their proportion of non-resident holdings of government securities has continued to rise without any change to the domestic financial assets surplus. By making thus an approximate estimation on the basis of the data on the non-euro zone nations of the U.S. and Sweden, it is possible to conclude that the domestic assets surplus to GDP ratio of 104.73% is equivalent to about 20% to 30% in the proportion of non-resident holdings of government securities. This means that, once this proportion exceeds the 20% to 30% mark, foreign investors begin to affect the country's overall interest rates.

Figure 3-2-1 The proportion of non-resident holdings of government securities and domestic assets surplus

The proportion of non-resident holdings of government securities(%)

Threshold Value=104.73

Note: The proportion of non-resident holdings of government securities in some countries includes all securities other than shares.

Sources: Country authorities, SourceOECD, IMF "World Economic Outlook", Haver Analytics
3.3 Projection of long-term interest rates

3-3-1 The assumptions for simulation

○ Government Debt (% of GDP) Nominal GDP growth rate and primary balance (PB) are exogenously assumed and interest payments are endogenously decided by previous long-term interest rate function. As for the nominal GDP growth rate and PB, both optimistic and pessimistic scenarios are assumed. The optimistic scenario uses the nominal GDP growth rate of approx. 2%, based on the Japanese government's "prudent scenario," while the pessimistic scenario assumes a nominal GDP growth rate and PB based on private-sector research institutes' average forecasts (Figure 3-3-1).

○ Consumer Price Index Forecasts corresponding to optimistic and pessimistic scenarios, respectively, are used.

○ Policy interest rate Real interest rate deflated by consumer price index is used.

○ Private sector financial assets It is assumed that Japanese private sector financial assets as a percentage of GDP will continue to remain flat compared with the end-calendar 2011 level. Amid a further aging of the nation's population, a growing number of age groups will tap their savings for living expenses, potentially causing Japan's household financial asset holdings to start declining. The increasing population aging trend in recent years has resulted in a rising number of age groups that show lower household savings rates, a factor curbing the growth of the country's household financial assets. On the other hand, households' demand for financial assets may potentially grow even further, driven by senior citizens who are motivated to accumulate financial assets for bequeathing purposes. As for the corporate sector, enterprises' cash position has continued to pick up owing to the sector's depressed capital spending, which has been causing domestic private-sector financial assets to increase moderately. Given the existence of both positive and negative factors as well as the trend observed in recent years, Japanese private sector financial assets are assumed to remain flat in coming years.

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8 The government debt data used for the panel data analysis are general government data covering the central and local governments as well as social security. The primary balance data published by individual institutions cover the central and local governments. Thus, firstly, the central and local government primary balance forecasts made by individual institutions were used for forecasting the debt balance for the central and local governments. Secondly, these forecasts were incorporated in the general government debt balance values.

9 Hoshi, T. and Ito, T. (2012) forecasted a macroeconomic savings rate on the basis of savings rates for different age groups and Japan’s future demographics.
3-3-2 The result of simulation

Under the pessimistic scenario (persistent low GDP growth rates and the absence of additional tax hikes), it is in 2018 that Japan is expected to face a high possibility of interest rates starting to increase (Figure 3-3-2). Starting from around the time when the total general government debt (as a percentage of GDP) exceeds the 250% mark (Figure 3-3-3), Japan will have no alternative but to rely on overseas investors as the significant buyers of Japanese government bonds, according to this pessimistic scenario, and such situation will result in the country's long-term interest rates trending up. On the other hand, under the optimistic scenario, it is in 2028 that Japan will enter a period of rising interest rates.

### Figure 3-3-2  The assumptions of Pessimistic scenario and Optimistic scenario and the year in sovereign debt crisis

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Year</th>
<th>Long-term interest rate in sovereign debt crisis (%)</th>
<th>Nominal GDP growth rate (average annual growth rate, %)</th>
<th>Primary Balance (% of GDP, average)</th>
<th>Consumer Price Index (average annual growth rate, %)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pessimistic</td>
<td>2018</td>
<td>9.9</td>
<td>0.7</td>
<td>-4.5</td>
<td>0.8</td>
</tr>
<tr>
<td>Optimistic</td>
<td>2028</td>
<td>10.1</td>
<td>1.7</td>
<td>-3.4</td>
<td>0.9</td>
</tr>
</tbody>
</table>

Note: The annual average of nominal GDP growth rate, that of primary balance and that of Consumer Price Index are the average from 2012 to the financial crisis.
As for the effects on the county's economy, according to an estimation by the Bank of Japan (2012)\(^\text{10}\), every 100 basis-point interest rate increase will cause major Japanese banks to collectively suffer bond valuation losses of 3.4 trillion yen whereas, in the case of the nation's regional banks, such valuation losses will come to 3.0 trillion yen. If we assume a 900 basis-point yield gain for bonds of all maturities and simply multiply the above-mentioned figures by nine times on the basis of the Bank of Japan estimation results, the bond evaluation losses will amount to approx. 31 trillion yen for major banks and approx. 27 trillion yen for regional banks, although it is necessary to allow for certain levels of variance. This can be interpreted to mean that the outbreak of a sovereign debt crisis will likely be accompanied by a financial crisis with the rising lending interest rates serving to choke the nation's housing investment and capital spending, thereby plunging the Japanese economy into a serious recession. Meanwhile, it may be possible to expect Japan to emulate, by leveraging the weakened Japanese currency, when the export-driven economic recovery of countries hit by sovereign debt crises. However, given that Japanese manufacturers have been actively shifting their production bases to overseas locations amid signs of industry hollowing-out, the weakening of the Japanese yen may not be enough for the country's exporters to make a comeback.

Then, in order to avert a sovereign debt crisis, to what extent does Japan need to raise its tax rate? Here, we used, realistically, the pessimistic scenario-based assumption that low economic growth will continue to persist. For the purpose of avoiding a fiscal disaster in the latter half of the 2010s, Japan must not only hike its consumption tax rate in fiscal 2014 and 2015 but also in the latter half of the decade and thereafter. If the nation's consumption tax rate is raised by 2 percentage points each year from fiscal

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\(^{10}\) Please refer to Bank of Japan (2012) p.56.
2016 to fiscal 2020, sending the tax rate to 20%, Japan's domestic assets surplus will remain above the threshold value until fiscal 2025, which should allow the country to continue to rely only on domestic investors as the major buyers of Japanese government bonds, as it has been doing in the past (Figure 3-3-4).

Figure 3-3-4  To Preventing Sovereign Debt Crisis
(the consumption tax rate is raised to 20% by raising the tax rate 2% every year between fiscal 2016 and 2020)

Note: The primary balance data reflects the impact of factors such as transfers from the fiscal investments and loans special account. Outstanding government debts is the total of ordinary Japanese government bonds(JGBs), local government bonds and the outstanding balance of local accounts and transfers. This forecast is based on the pessimistic scenario. The impact of the Consumption Tax rate hike is calculated by a table for the multiplier effect of Cabinet Office "Economic and Fiscal Model (ver.2010)". 
Sources: Ministry of Finance, Cabinet Office
4. Discuss the post-10% consumption tax rate outlook

This report estimated how far the yields on long-term Japanese government bonds will rise if a sovereign debt crisis strikes Japan. This crisis scenario depends on the nation's domestic assets surplus, the key determining factor, becoming less than sufficient. Specifically, using a methodology called threshold regression with panel data covering 25 countries, we estimated long-term interest rate function. This function showed that the sovereign debt risk premium varies due to the difference in the government bond buying structure. Our analysis thus revealed that if Japan's government debt exceeds its domestic financial assets in value, requiring the nation to rely on foreign investors as the major buyers of Japanese government bonds, such investors will demand a high fiscal disaster risk premium that is commensurate with the level of the country's government debt. According to this analysis, such a situation will cause Japan's long-term interest rates to rise to 10% at a time when an estimated approx. 20% to 30% of Japanese government bonds will be held by non-resident investors. Moreover, we concluded that, judging from the sovereign debt crises experienced by certain European nations in the last few years, it will most probably be political factors that will serve as a trigger for a jump in interest rates. (e.g. bribery scandal-induced damage to the government's credibility and events like policymakers' failure to have their proposed tax system reform bill passed by the Diet).

Our simulated calculation showed that Japan will run into a sovereign debt crisis in fiscal 2018, based on the average GDP growth rate and fiscal balance forecasts by private sector research institutes (pessimistic scenario). If, however, the fairly high GDP growth rates materialize as forecast by the Japanese government, the arrival of such sovereign debt crisis will be postponed until fiscal 2028 (optimistic scenario). On the other hand, even when assuming a protracted period of low GDP growth rates (pessimistic scenario), such a disaster will be avoidable if Japan continues to raise its consumption tax rate by 2 percentage points each year from fiscal 2016 to fiscal 2020, increasing it to 20%. Implementing this consumption tax policy will allow Japan to rely only on domestic investors as the major buyers of Japanese government bonds, as it has been doing in the past, and avert a sovereign debt crisis that would result in a spike in interest rates.

One potential policy option for Japan to avoid a sovereign debt crisis will be to sell the government's foreign bond holdings, but this will be nothing more than a temporary measure to postpone the arrival of a crisis. Essentially, Japanese policymakers have no alternative but to strive rigorously to restore fiscal health. While forecasting a nominal GDP growth rate is important as a means of estimating when a sovereign debt crisis will occur, using a high nominal GDP growth rate-based fiscal projection amid the persisting deflation in Japan will only serve to mitigate policymakers' worries about the risk of a potential future fiscal disaster. Although pursuing both growth strategy and fiscal health restoration efforts is undoubtedly important, the current environment makes it extremely difficult for Japanese policymakers to do so. In this respect, it is necessary to distinguish between a high growth rate "target" as part of a growth strategy and a growth rate "assumption" used as part of the endeavor to steadily restore fiscal health to Japan. We argue that, in examining the nation's challenge of fiscal health restoration on the basis of
a low GDP growth rate assumption, experts must discuss their outlook on Japan for the years from fiscal 2015, the year in which the consumption tax rate will be raised to 10%, and onwards.

REFFERENCES


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