The JGB Mystery

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International comparison (1)

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Government debt-to-GDP ratio for selected countries, 2010

Euro Area	85.8	Australia	20.5	Malaysia	54.2
Austria	72.2	Canada	84.0	Maldives	[illegible]
Belgium	96.7	Czech Republic	38.5	Myanmar	42.8
Cyprus	60.8	Denmark	43.7	Nepal	35.9
Finland	48.4	Iceland	92.4	Pakistan	56.8
France	82.3	Japan	220.0	Solomon Islands	25.7
Germany	84.0	Korea	33.4	Thailand	44.1
Greece	142.8	New Zealand	32.0	Bulgaria	17.4
Ireland	94.9	Norway	55.4	Hungary	80.2
Italy	119.0	Singapore	96.3	Latvia	39.9
Luxembourg	18.4	Sweden	39.7	Lithuania	38.7
Malta	67.1	Switzerland	54.5	Poland	55.0
Netherlands	63.7	United Kingdom	75.5	Romania	31.7
Portugal	92.9	United States	94.4	Armenia	39.2
Slovak Republic	41.8			Russia	11.7
Slovenia	37.3			Morocco	51.1
Spain	60.1			Botswana	13.2
				Seychelles	83.1
				South Africa	33.8
				Mexico	42.9
				Venezuela	38.4

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Source: Nomura, based on IMF

International comparison (2)

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Government bond yields, 2010

Euro Area	3.78	Australia	5.37	Malaysia	3.52
Austria	3.23	Canada	3.66	Maldives	8.00
Belgium	3.46	Czech Republic	3.89	Myanmar	12.00
Cyprus	4.60	Denmark	2.93	Nepal	6.00
Estonia	5.97	Iceland	6.36	Pakistan	13.05
Finland	3.01	Japan	1.15	Papua New Guinea	10.86
France	3.12	Korea	4.59	Solomon Islands	3.24
Germany	2.74	New Zealand	4.86	Thailand	3.60
Greece	9.09	Norway	2.77	Bulgaria	6.00
Ireland	5.74	Singapore	2.37	Hungary	7.28
Italy	4.04	Sweden	2.89	Latvia	10.34
Luxembourg	3.17	Switzerland	1.67	Lithuania	5.57
Malta	4.19	United Kingdom	3.61	Poland	5.78
Netherlands	2.99	United States	3.21	Romania	7.34
Portugal	5.40			Armenia	13.88
Slovak Republic	3.87			Russia	7.57
Slovenia	3.83			Morocco	4.34
Spain	4.25			Botswana	7.69
				Seychelles	8.75
				South Africa	8.62
				Mexico	7.11
				Venezuela	15.53

Source: Nomura, based on IMF

Hamilton and Flavin (1986)

$$B_t = (1 + r_t)B_{t-1} - (R_t - G_t)$$

$$= E_t\left[\sum_{i=1}^{n}\left\{\prod_{j=1}^{i}\frac{1}{1+r_{t+j}}\right\}(R_{t+j} - G_{t+j})\right] + E_t\left[\left(\prod_{i=1}^{n}\frac{1}{1+r_{t+j}}\right)B_{t+n}\right]$$

Government debt is sustainable if

$$\lim_{n\to\infty} E_t\left[\left(\prod_{i=1}^{n}\frac{1}{1+r_{t+j}}\right)B_{t+n}\right] = 0$$

Cointegration test

$$\Delta B_t = G_t - R_t + r_t B_{t-1}$$

$$= E_t \left[\sum_{i=0}^{\infty} \Delta \left\{ \prod_{j=0}^{i} \frac{1}{1 + r_{t+j+1}} \right\} S_{t+j+1} \right]$$

$$+ \lim_{i \to \infty} E_t \left[\left(\prod_{j=0}^{i} \frac{1}{1 + r_{t+j+1}} \right) B_{t+i+1} \right]$$

$$- \lim_{i \to \infty} E_t \left[\left(\prod_{j=0}^{i} \frac{1}{1 + r_{t+j}} \right) B_{t+i} \right]$$

Government debt is sustainable if G_t, R_t, $r_t B_{t-1}$ are cointegrated.

Bohn (1998)

$$b_{t+1} = x_{t+1}(b_t - s_t)$$

$$s_t = \rho b_t + \mu_t$$

$$\Delta b_{t+1} = -\{1 - x_t(1-\rho)\}b_t - x_{t+1}\mu_t$$

Government debt is sustainable if $0<x(1-\rho)<1$.

Broda and Weinstein (2004)

$$b_n = \sum_{t=1}^{n} \left(\frac{1+r}{1+\eta}\right)^{n-t} (g_t + h_t - \tau_t - \lambda_t m_t) + \left(\frac{1+r}{1+\eta}\right)^{n} b_0$$

Government debt is sustainable if current policy can be applied indefinitely with a stable government debt-to-GDP ratio (Blanchard 1990).

Set $b_n = b_0$.

$$b_0 + \left\{1 - \left(\frac{1+\eta}{1+r}\right)^{n}\right\}^{-1} \sum_{t=1}^{n} \left(\frac{1+\eta}{1+r}\right)^{t} (g_t + h_t - \tau_t - \lambda_t m_t) = 0$$

Sustainable tax rate solves the equation above.

$$\tau^{*} = \frac{i-\eta}{1+\eta}\left[b_0 + \left\{1 - \left(\frac{1+\eta}{1+i}\right)^{n}\right\}^{-1} \sum_{t=1}^{n} \left(\frac{1+\eta}{1+i}\right)^{t} (g_t + h_t - \lambda_t m_t)\right]$$

Asako et al. (1993)

Doi and Nakazato (1998)

could not reject sustainability.

However,

Kato (1997)

Ihori et al. (2000)

Ihori, Nakazato and Kawade (2003)

Broda and Weinstein (2004)

Doi (2006)

Doi, Hoshi and Okimoto (2011)

rejected sustainability.

Hypothesis: CA surplus, household financial assets (1)

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Foreign holdings ratio of government bond

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Austria	58.9	64.1	68.6	70.6	75.1	75.1	76.2	78.6	80.8	78.1	78.0
Canada	20.8	17.7	19.1	14.9	14.0	12.4	13.5	12.4	11.5	14.6	21.1
Czech Republic	3.8	3.7	3.9	5.4	17.6	23.4	23.5	23.9	24.2	25.9	29.2
Denmark	41.8	40.9	40.7	35.9	37.1	38.2	35.1	41.8	44.5	43.4	42.9
Estonia	0.0	0.0	87.0	89.4	96.8	100.0	100.0	0.0	76.2	82.7	0.0
Finland	61.8	68.2	83.8	83.5	89.3	89.8	91.4	91.5	91.6	96.0	99.0
France	33.7	38.4	40.7	42.4	49.0	56.5	60.1	61.2	65.3	68.2	68.1
Hungary	31.3	35.9	38.6	42.0	45.6	47.3	48.7	49.0	45.5	46.7	48.7
Iceland	61.8	67.2	65.6	64.1	62.8	59.4	77.2	78.0	80.9	61.6	41.0
Ireland	55.3	66.7	70.3	73.8	79.4	84.3	85.6				
Israel	26.7	25.8	24.1	23.7	24.7	24.9	26.1	22.9	18.4	16.6	15.5
Italy	41.8	40.0	39.0	43.7	41.3	46.2	47.9	46.6	48.7	51.8	
Korea	5.5	4.1	3.0	2.4							
Mexico	43.9	37.5	36.2	34.7	37.8	35.1	26.6	27.7	28.7	27.2	35.6
Netherlands	40.2	47.5									
New Zealand	48.2	45.3	50.6	53.9	55.1	54.0	55.4	56.4	56.4	44.0	42.3
Norway	35.0	32.0	32.0	30.5	23.0	31.0	36.8	51.0	45.2	44.4	47.9
Poland	27.3	22.7	25.8	29.4	34.4	39.5	36.6	34.5	31.5	35.4	41.8
Slovak Republic	43.5	22.6	21.5	18.2	19.5	12.6	39.6	37.0	37.4	33.7	36.4
Slovenia				43.7	38.4	34.3	35.6	51.4	49.6	55.6	64.8
Spain	41.4	44.3	45.4	40.3	45.1	46.9	50.5	47.1	46.3	46.6	44.8
Sweden	36.2	42.6	45.2	42.3	40.1	45.3	36.0	37.6	37.2	40.1	45.7
Turkey						19.2	22.9	21.3	19.9	16.8	19.7
United Kingdom	17.7	19.3	18.1	19.5	22.2	25.9	29.9	32.0	35.1	28.3	31.1
United States	34.3	34.5	38.5	42.0	46.8	47.4	47.3	50.4	53.7	51.0	50.9
Japan	6.0	4.9	3.4	3.1	4.1	4.5	5.5	7.7	6.9	6.1	6.5
Germany					40.2	43.9	45.8	49.5	51.3	53.2	59.2

Note: Amount held by non-residents/total marketable central government debt. Figures for Germany include local government debts.
Source: Nomura, based on OECD, Bank of Japan and Deutsche Bundesbank

Takada (2011)

"Credibility of JGBs has been largely maintained by the existence of a current account surplus."

Shukan Toyo Keizai **"Avoiding a JGB Crash" (April 2, 2011)**

"Currently, Japanese households are supporting JGB prices. . . [I]f we lose household purchases, our choices will be either finding foreign investors or direct purchases by the Bank of Japan."

“It doesn’t make sense to explain stable JGB prices by the mere existence of a current account surplus or a large accumulation of household financial assets. We cannot say ‘company A’s stock price does not fall because shareholders are all Japanese.’ Similarly, we cannot say ‘JGB prices do not fall because they are mostly held by Japanese.”

(A professor at the University of Tokyo)

Expectation of deflation

>Expectation of currency appreciation

>Domestic interest rates must be lower than foreign interest rates (interest rate parity).

ex. Kono (2011)

But why do investors still expect deflation?

Japanese households are extremely risk-averse.

>They don’t like to take equity risk or currency risk.

>They only hold safe assets = JGBs.

ex. Doi (2007)

But why do Japanese households still think JGBs are safe?

Shukan Toyo Keizai "Avoiding a JGB Crash" (April 2, 2011)

"If they are told by their bosses to invest in JGBs and make profits, they cannot say no."

Nomura's bond analyst

"Bond investors are worried about Japan's fiscal problem. They think fiscal crisis may come in five years or ten years, but not right now. If the fiscal crisis does not come so soon, they have to invest their excess liquidity in JGBs.

But why do they think a fiscal crisis NOT an immediate threat?

Hypothesis: Future policy change (1)

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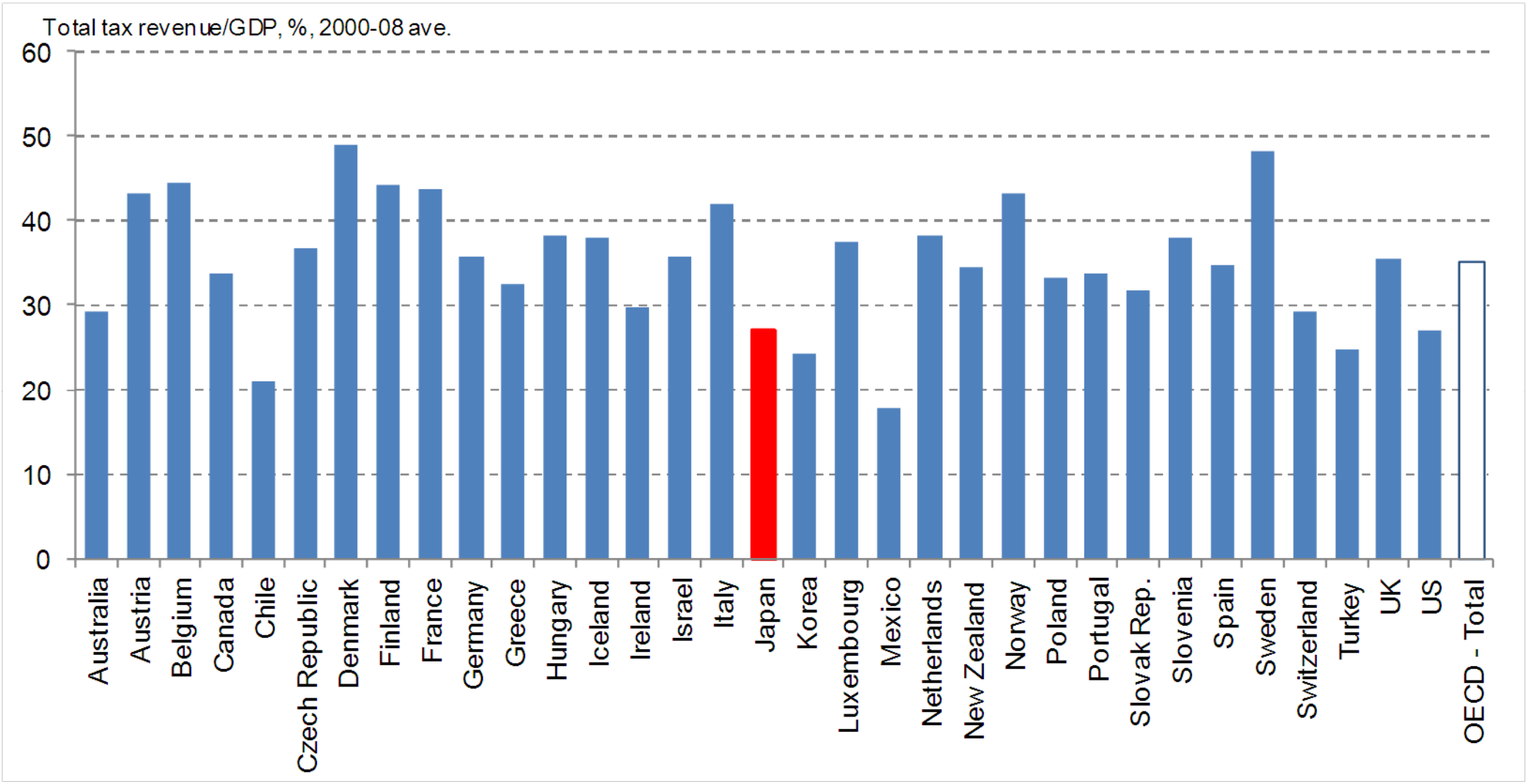
Total tax revenue-to-GDP ratio, 2000-08 ave.



Source: Nomura, based on OECD

Ihori (2000)

"The reason why public bonds of our country are purchased at low interest rates despite the primary balance deficit is that investors are optimistic about the future fiscal system of Japan, thinking that the primary balance will return to surplus in the long run. They think so because Japan can tolerate higher tax rates as the current tax rate is still low."

"If you want to explain low interest rates on JGBs, you must appeal to the fact that we still have room for further tax hike."

(A professor at the University of Tokyo)

Ito, Watanabe and Yabu (2010)

$$b_t = \begin{cases} \mu_0 + \alpha_0 b_{t-1} + u_{0t}, & \text{if } S_t = 0 \\ \mu_1 + \alpha_1 b_{t-1} + u_{1t}, & \text{if } S_t = 1 \end{cases}$$

Fiscal policy switches between state 1 and 2 with some transition probabilities.
α<1: Ricardian regime
α>1: non-Ricardian

Simulation with estimated parameters suggest that debt-to-GDP ratio is likely to rise over the next 20 years, but will start declining after that and finally converge to zero.

Shukan Economisto

“A Countdown to JGB Crash” (October 11, 2011)

Shukan Diamondo

“Rich Japanese Abandoning Japan” (October 8, 2011)

Are investors really positive about future policy change?

A Nomura JGB salesperson

“Domestic banks and life insurers are assuming that there won’t be an immediate fiscal crisis. They know the JGB market is a closed market in the sense that most of the participants are domestic investors. There is a kind of tacit agreement among investors; we can hold JGBs domestically if everyone participates. So, you know what you do.”

Keynes (1936)

"In practice we have tacitly agreed, as a rule, to fall back on what is, in truth, a convention. The essence of this convention . . . lies in assuming that the existing state of affairs will continue indefinitely, except in so far as we have specific reasons to expect a change. This does not mean that we really believe that the existing state of affairs will continue indefinitely. We know from extensive experience that this is most unlikely. . . . Nevertheless the above conventional method of calculation will be compatible with a considerable measure of continuity and stability in our affairs, *so long as we can rely on the maintenance of the convention*."

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My guess:

- Investors are following a tacitly agreed convention that JGBs are safe.
- Investors assume the current state to continue until there is good enough reason to expect otherwise.
- Admittedly, debt-to-GDP ratio is very high. But no one knows the upper limit. Also, there are hypotheses that justify low rates on JGBs.

- **Justifications of low JGB yields include; CA surplus, household financial assets, deflation, risk-averseness, behavior of banks, future policy change. . . .**

Nomura's bond analyst

"The reason why we have not had a fiscal crisis is that we still have a current account surplus and a large amount of household assets. Investors do not care why or how the current account surplus or the accumulation of household financial assets can sustain JGB prices. These benchmarks are used just as excuses to purchase JGBs."

Kodama (2011)

"There would be no wonder even if the market starts to price in the risk of fiscal crisis, given the current level of fiscal deterioration. It is difficult to predict when that will happen . . . [T]he market is focusing on the timing when the current account balance turns to deficit and when government debt exceeds household net asset."

Noguchi (1989)

Interest rate *declines* with aging in a closed economy.
Current account increases with aging in a small open economy.

Household max $U = C_y^{1-\beta} C_o^{\beta}$ s.t. $w = C_y + \frac{C_o}{1+r}$

Firm's production function

$$Y = L^{\alpha} K^{1-\alpha} = Lk^{1-\alpha}$$

Closed economy: $r = (1+n)\frac{1-\alpha}{\alpha\beta}$

Small open economy: $CA = n(K^* - K) = nY\left(\frac{1}{1+n}\alpha\beta - \frac{1-\alpha}{i}\right)$

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Oguro (2010)

Government debt level exceeds the amount of household financial assets in 2022.

My own calculation: