Low inflation, a high net savings surplus and institutional restrictions keep the Japanese long-term interest rate low

Pieter W. Jansen [§]

24 April 2006

Abstract

This paper explains that the interest rate on long-term Japanese government bonds is low in comparison with other industrialised countries for four main reasons: lower inflation, net savings surplus, institutional restrictions and home bias. Monetary policy and institutionalised purchases of government bonds by semi-government agencies keep the market demand for bonds high. We find that since the 1970s Japanese interest rate movements are better explained by the current account balance than in other industrialised countries. This is caused by sizeable net oversavings and institutional reasons increased the impact of oversavings as such on the long-term interest rate for Japan. Hence, the institutional reasons increase the coefficient value of the savings-investment balance. A reason for the existence of the high national net savings surplus could be that unsustainable budgetary deficits in Japan called for a Ricardian response. We doubt whether Ricardian equivalence is here the driving factor: household savings have actually fallen over the nineties. Corporate savings, in response to overcapacity and poor investment outlook, have risen more strongly. This has kept the private and national savings balance positive. There is also some indication that ageing has contributed to the structural current account surplus for Japan.

Keywords: long-term interest rate, current account balance, Japan, Ricardian equivalence, ageing.

Jel-code: E43

[§] Research officer at the Free University of Amsterdam and investment strategist at AEGON Investment Management and and Research officer at the Free University of Amsterdam, email: pjansen@aegon.nl.

Low inflation, a high net savings surplus and institutional restrictions keep the Japanese long-term interest rate low

Pieter W. Jansen §

Abstract

This paper explains that the interest rate on long-term Japanese government bonds is low in comparison with other industrialised countries for four main reasons: lower inflation, net savings surplus, institutional restrictions and home bias. Monetary policy and institutionalised purchases of government bonds by semi-government agencies keep the market demand for bonds high. We find that since the 1970s Japanese interest rate movements are better explained by the current account balance than in other industrialised countries. This is caused by sizeable net oversavings and institutional reasons increased the impact of oversavings as such on the long-term interest rate for Japan. Hence, the institutional reasons increase the coefficient value of the savings-investment balance. A reason for the existence of the high national net savings surplus could be that unsustainable budgetary deficits in Japan called for a Ricardian response. We doubt whether Ricardian equivalence is here the driving factor: household savings have actually fallen over the nineties. Corporate savings, in response to overcapacity and poor investment outlook, have risen more strongly. This has kept the private and national savings balance positive. There is also some indication that ageing has contributed to the structural current account surplus for Japan.

I Introduction

When we observe the nominal interest rate, it seems that the Japanese long-term interest rate deviates from the Uncovered Interest rate Parity (UIP). For instance, the nominal interest rate differential with the United States was 343 basis points on average from early 2000 till the end of 2004. When we correct these differences for inflation differences over this period, the interest rate differential is reduced significantly to 15 basis points, but - apart from the United States – real inflation differences with other industrialised countries are still quite substantial (see table 1). Although inflation developments explain an important part of nominal interest rate differentials, there is still a large gap in real terms. In this paper we try to answer the question how it is possible that the Japanese interest rate is so low in comparison with other large industrialised economies.

Table 1: Long-term interest rate differentials (foreign rate -/- Japanese) (in basispoints)

	Germany	United Kingdom	France	Canada	United States
Nominal terms	+463	+493	+474	+526	+343

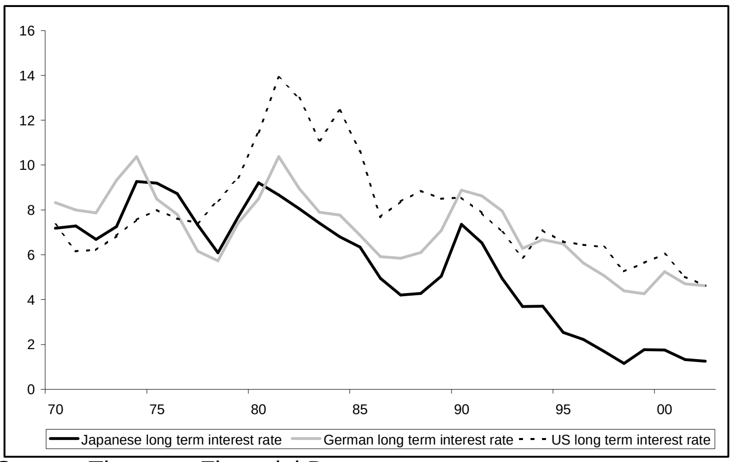
§ Research officer at the Free University of Amsterdam, email: pjansen000@wanadoo.nl.

Real terms	+101	+161	+73	+69	+15

Source: Thomson Financial Datastream

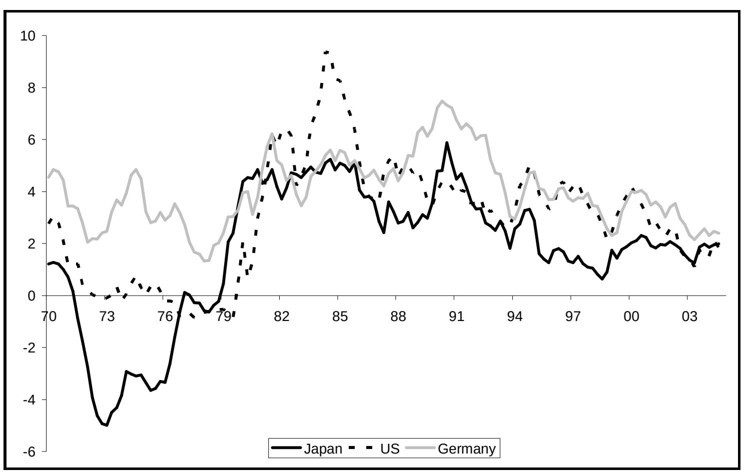
Charts 1 and 2 show respectively the long-term interest rate developments in Japan, Germany and the United States in nominal and real terms. The Japanese nominal long-term interest rate has been slightly lower than the German and US 10 years rate during the 1980's and the gap expanded in the nineties. Chart 2 shows that the gap is substantially smaller in real terms. [1]

Chart 1: Nominal Japanese, US and German long-term interest rates



Source: Thomson Financial Datastream

Chart 2: Real Japanese, US and German long-term interest rates



Source: Thomson Financial Datastream

[1] We calculated the real long-term interest rate by deflating the nominal rate by the 5 year average consumer price index annual percentage changes as a proxy for long-term inflation expectations.

At first glance it seems odd that for a country that is fully integrated in the international capital market the assumption of portfolio theory, which implies that the yield on a specific bond instrument is related to the risk of the borrower, does not seem to hold for the Japanese government bonds.[2] The Japanese budgetary position deteriorated substantially during the nineties and has been on an unsustainable path for some years.[3] Moody's and Standard and Poor's have lowered the Japanese sovereign bond rating to below the US Treasuries rating in 2003.[4] It does not seem likely that the difference is explained by a liquidity premium either. Currently the US government bond market and the Japanese are the largest worldwide.[5]

To investigate whether other factors, besides the difference in inflation rates, explain why the Japanese interest rate is lower, we analyse the Japanese interest rate formation in section 2 in a broad model. An interesting outcome of the model is that savings-investment balances seem to be a more important factor in explaining Japanese long-term interest rate movements in comparison with other industrialised countries. We discuss the relation between the savings-investment balance and the long-term interest rate in section 3. Fukao and Okuba (1984) found a statistical significant relationship between the Japanese interest rate and the current account surplus, which relation gained significance since capital market liberalisation took place in the seventies in Japan. In section 4 (demographic changes) and section 5 (Ricardian equivalence) we discuss possible reasons for the savings-investment surplus. In section 6 we argue that institutional factors and home bias might cause the coefficient value for the savings-investment balance to be higher in Japan than elsewhere. Section 7 concludes.

II Japanese long-term interest rate determined in a broad defined interest rate model

This section presents an error correction model for the Japanese long-term interest rate.[6] We confront the outcomes for Japan with other industrialised countries. The model incorporates a number of interest rate theories. Through encompassing these theories, a range of variables are included. The model consist of interest rate variables such as the foreign long-term interest rate and the domestic short-term interest rate and it consists of non-interest rate variables such as savings, investment, business cycle, equity return and exchange rates. This broad interest rate model is based on the model discussed by Den Butter and Jansen (2004). The ERM is specified as follows:

---

[2] See for instance Mishkin and Eakins (1998) or Fabozzi (2000)
[3] See for instance recent country reports of the IMF (2003) and the OECD (2003A)
[4] See for instance www.standardandpoors.com or www.moodys.com.
[5] See for instance BIS Quarterly review December (2004)
[6] The augmented Dickey-Fuller test pointed out that the Japanese long-term interest rates interest rate and the explanatory variables taken into consideration showed to be integrated of order I(1), we decided to specify the equation with an error correction mechanism.

$$(1)\quad \begin{aligned} \Delta R_l &= C + \beta_1 \Delta Cycle + \beta_2 \Delta R_S + \beta_3 \Delta NEE + \beta_4 \Delta R_l^f + \beta 5 \Delta INF + \beta_6 \Delta CA + \beta_7 \Delta EQR \\ &- \beta_8 \left(R_{l_{-1}} - \gamma_1 Cycle_{-1} - \gamma_2 R_{S_{-1}} - \gamma_3 NEE_{-1} - \gamma_4 R_{l\,-1}^f - \gamma_5 INF_{-1} - \gamma_6 CA_{-1} - \gamma_7 EQR_{-1} - C \right) \end{aligned}$$

Where Cycle is a business climate indicator, R_S is the short-term interest rate, NEE is the nominal effective exchange rate, R_L^F is the foreign long-term interest rate, INF is inflation, CA is current account balance and EQR is expected equity return (inverse price/earnings ratio). For the calculation of the foreign long-term interest rate we divided the world in three large interest rate blocks: US, Japan, Euro. For the euro area we used the German interest rate as the central long-term interest rate. If a country is not located in any of these regions (such as Canada, Australia, Switzerland and the UK) the foreign rate is an unweighted of these three. For the others the foreign rate is calculated as an average of the two other region (US: average German and Japanese rate). Insignificant variables have been removed from the estimated equation to reduce noise in the model. Table 10 shows empty spaces for these insignificant variables.

Table 10: Estimation results of the annually specified long-term interest rate model (period: 1970-2003)

	Japan	France	US	UK	Germany	Italy	Neth	Belg	Can	Spain	Aus
Business cycle											
Short int rate		0.250 (4.57)	0.374 (5.72)	0.161 (3.72)	0.368 (4.32)	0.483 (6.16)	0.198 (5.32)	0.138 (3.59)	0.962 (4.10)	0.395 (6.43)	0.322 (6.73)
N.E.E.	-0.031 (-2.26)			-0.048 (-3.74)					-0.033 (-2.30)		
Foreign int rate	0.407 (3.73)	0.723 (5.98)		0.896 (7.04)	0.644 (6.17)	0.415 (1.68)	0.717 (7.69)	0.733 (6.82)	0.962 (7.30)	0.951 (5.68)	0.454 (2.76)
CPI inflation											
CA balance	-0.294 (-2.85)										
Expected equity return		0.154 (2.28)		0.200 (4.66)							
Constant	-0.055 (-0.61)	-0.021 (-0.24)	0.048 (0.36)	-0.074 (-0.89)	0.006 (0.08)	0.014 (0.08)	0.018 (0.26)	0.013 (0.20)	-0.002 (-0.02)	0.140 (0.99)	0.049 (0.44)
LT relation	-0.323 (-2.52)	-0.413 (-2.64)	-0.399 (-3.68)	-0.348 (2.55)	-0.410 (-3.41)	-0.472 (-3.34)	-0.331 (-2.71)	-0.448 (-3.45)	-0.676 (-4.12)	-0.351 (-2.61)	-0.348 (-3.11)
Adj R-squared	0.590	0.857	0.623	0.856	0.764	0.664	0.831	0.866	0.875	0.799	0.723
DW Statistic	1.56	1.67	1.94	2.05	1.75	1.40	1.65	1.70	1.91	1.88	1.71

Akaike inf crit	1.56	1.45	2.24	1.41	1.30	2.99	1.04	0.89	1.22	2.21	2.04
F-statistic	12.50	44.60	24.98	38.90	35.62	21.40	53.28	70.14	56.94	34.09	28.90
S.D. dep var	0.77	1.23	1.15	1.19	0.90	1.76	0.93	0.97	1.17	1.52	1.21

In the ECM we estimated with annual data since 1970, the Current account balance is statistically significant for Japan, but did not add to explaining interest rate movements for other countries. Nevertheless, the current account balance is not the variable in the Japanese model with the highest t-value. Just as for other countries, the foreign long-term interest rate has the highest t-value. The short-term interest rate is not significant in the annual model for Japan (unlike for the other countries). Although in a single variable model the short-term interest rate does explain long-term interest rates in Japan, it is not significant in the broader defined model. Because correlations between the independent variables are relatively low (between –0.44 and +0.31 for Japan), this has not likely been caused by multicolinearity. Additionally, omitting any of the other variables in the model does not lead to statistical significance of the short-term interest rate. The business cycle indicator is not statistically significant for any of the countries.[7]

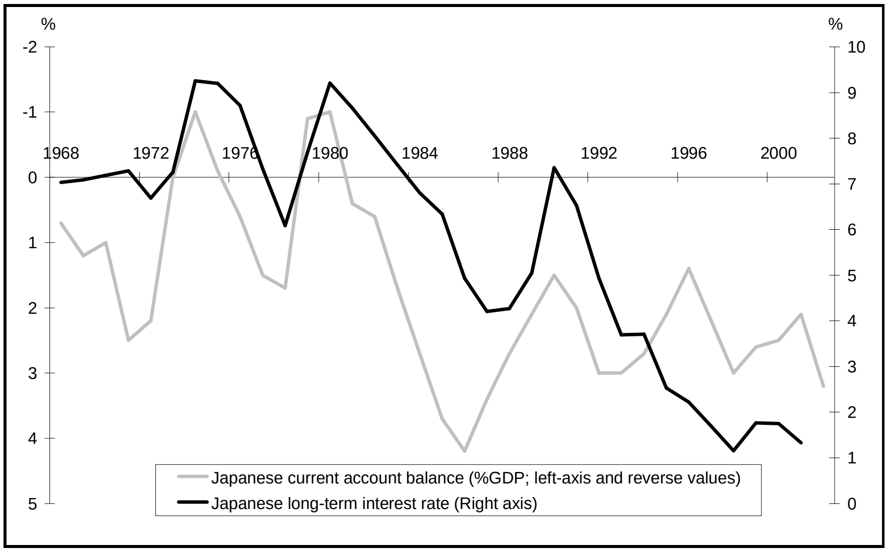
The strong relevance of the current account balance for the Japanese long-term interest rate determination in comparison with other countries, will be analysed in the remainder of this paper. In section 3 we look further into the empirical relation between savings-investments balance and the long-term interest rate and the savings behaviour itself. Then we discuss two specific possible causes for oversavings in section 4 (demographic change) and section 5 (Ricardian equivalence). Section 6 discusses that institutional factors likely cause a higher coefficient value for Japan. Section 7 concludes.

III Savings-investment balance and the long-term interest rate

In chart 3 we show the relation between the current account balance and the nominal long-term interest rate. We see a historical negative relation between the two variables (the current account figures are shown on the left axis in *reverse order*). Nevertheless, in the nineties this relation had not been as strong. For instance, in the period 1992 to 1996 both the long-term interest rate and the current account balance decreased (in the chart they move in opposite direction).

Chart 3: Japanese current account balance and the long-term interest rate

[7] Although not presented here, in a model with a quarterly frequency the business cycle, measured through a business confidence indicator, is statistically significant for the three largest countries in the panel: United States, Japan and Germany.



For the theoretical determination of the long-term interest rate, we can apply the standard life cycle framework. First, we assume that the (real) long-term interest rate (r) is negatively influenced by saving and positively by investment. Hence, the CA (current account balance) is an indication of tension on the capital market. With a CA deficit it is relatively difficult to finance investments domestically, putting upward pressure on r.

(2) $r = f\left(S^{-}, I^{+}\right)$

(3) $r = f\left(-CA\right)$

Where the current account balance is determined by national saving minus national investment:

(4) $CA = S^{n} - I^{n}$

Section 2 showed that only for Japan the current account balance explained long-term interest rate movements in a broad model. In this section we estimate ERM equations for the group of countries using the current account balance as the singular variable. The purpose of this is to isolate the current account balance and remove possible disturbance of the other independent variables.

Both the nominal long-term interest rate and the current account balance (% GDP) are integrated at the first order when we apply the Augmented Dickey Fuller test. We estimate an error correction model with the following specification:

(5) $\Delta R_{l} = C + \beta_{1}\Delta CA + \beta_{2}\left(R_{l_{-1}} - \gamma_{1}CA_{-1}\right)$

The model is estimated with annual data over the period 1971 to 2003 (for France the estimate period starts since 1976 because of limited data availability). We initially estimated the model for 11 industrialised countries, but found a statistical relationship for the four countries which are presented in table 3. We did not find a statistical significant relationship for the US, Germany, Italy, Canada, Netherlands, Belgium and Spain.

Table 3: Estimation results ERM CA model

	Coefficient CA*	LT-correction	Constant	Adj R-squared	DW-statistic	Akaike	SD dependent variable	F-stat
Japan	-0.46 (-3.82)	-0.07 (-1.26)	-0.14 (-1.27)	0.304	1.56	2.04	0.77	8.00
France	-0.74 (-2.88)	-0.07 (-0.68)	-0.21 (-1.01)	0.192	1.56	3.08	1.20	4.22
UK	-0.29 (-1.59)	0.01 (0.11)	-0.15 (-0.75)	0.021	1.54	3.25	1.19	1.34
Australia	-0.37 (-2.81)	-0.02 (-0.31)	-0.07 (-0.38)	0.156	1.35	3.13	1.21	3.97

* T value in brackets

For Japan, the current account balance is statistically significant at the 1% confidence level with a t-value of –3.82. The adjusted R-squared is 30.4%. Also for France and Australia the current account balance is significant on the 1% level, but the adjusted R-squared is somewhat lower. For the UK, current account movements have very limited significance in explaining long-term interest rate movements.

Additionally, we have analysed the relation between the dependent variable and the independent variables through a VAR analysis. We note that because of limited data availability we are careful with drawing conclusion from the outcome of this model. In the estimated model, both the CA balance and the long-term interest rate itself are used as endogenous variables in the VAR equation. We have used two lags which has given the model the following specification[8]:

(6) $Y_{1_t} = Y_{1_{t-1}} + Y_{2_t} + Y_{2_{t-1}} + \ldots Y_{n_t} + Y_{n_{t-1}}$

Where $Y_{2_t} = Y_{2_{t-1}} + Y_{1_t} + Y_{1_{t-1}} + \ldots Y_{n_t} + Y_{n_{t-1}}$

The VAR-equation for Japan has an adjusted R-squared of 91.9% and a standard deviation of 2.6 (in interest rate %-points). The standard deviation is substantially larger than in the ECM (0.8). The table is sorted by explanatory power (adjusted R-squared). The strongest relation is

[8] At two lags, both the Akaike and Schwartz criteria are minimised while the residual of the VAR estimate shows no unit root according to the Augmented Dickey Fuller test.

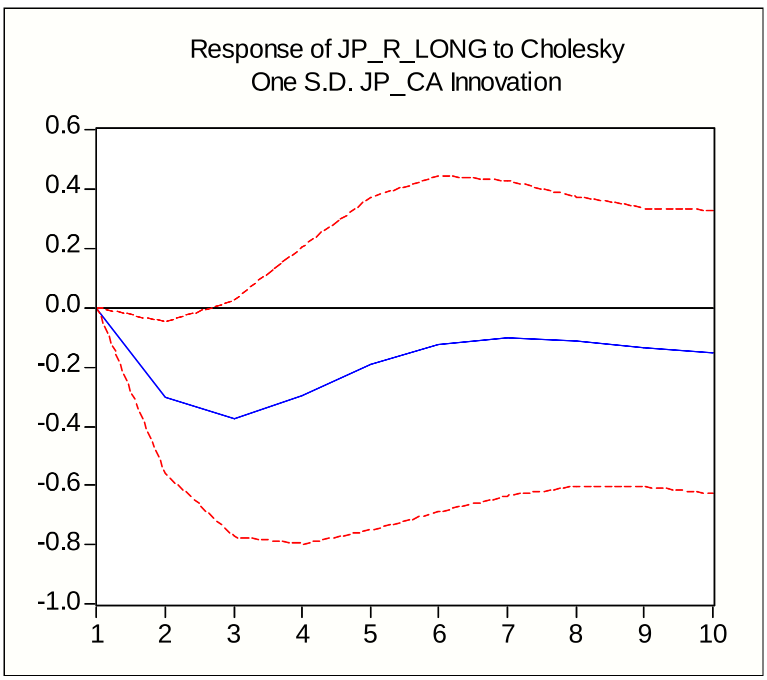
found for Japan, followed by Belgium and France. Only for Japan, Belgium, Canada, Italy and The Netherlands we find the theoretically expected long-term negative effect of a change of the CA balance on the long-term interest rate.

Table 4: estimation results VAR CA model

	R(-1)	R(-2)	CA(-1)	CA(-2)	Constant	Adj R-squared	F-stat	Akaike	S-dev dependent variable
Japan	0.773	0.221	-0.510	0.421	-0.007	0.919	89.1	2.4	2.58
Belgium	0.857	-0.121	-0.322	0.044	2.819	0.894	56.0	2.8	2.73
France	1.253	-0.192	-0.063	0.479	-0.915	0.891	54.2	3.3	3.57
Australia	1.150	-0.156	0.087	0.293	1.388	0.876	55.8	3.2	3.10
Italy	1.312	-0.411	-0.266	0.217	1.055	0.863	48.3	3.9	4.32
Spain	1.224	-0.268	-0.070	0.128	0.395	0.857	39.9	3.9	4.08
UK	1.160	-0.227	-0.188	0.279	0.949	0.849	44.6	3.3	3.06
Canada	1.080	-0.241	-0.311	0.134	1.059	0.815	35.2	3.2	2.58
US	1.017	-0.171	0.217	0.024	1.511	0.795	31.1	3.2	2.43
Netherlands	1.040	-0.243	-0.057	-0.139	2.034	0.745	23.6	2.8	1.81
Germany	1.099	-0.300	-0.066	0.161	1.295	0.712	19.5	2.8	1.70

The chart below shows the propagation of one standard deviation innovations of the current account balance and its affect on the long-term interest rate in the estimated VAR model for Japan.

Chart 4



Has Japan oversaved?

The strong negative relation between the long-term interest rate in Japan and the savings-investment balance questions whether this is due to a strong imbalance in net national savings. In other words: is oversaving the reason for the low interest rate in Japan? In a number of OECD countries the gross national saving rate decreased during the 1970s and 1980s and stabilised or rose marginally during the 1990s. In Japan the gross national saving rate decreased slightly during the 1990s, but remained higher (26.4% in 2001; see table below) than in other OECD countries, except for Korea, Norway and Finland (OECD (2003b)). According to the OECD (2001) government savings are the main indicator of the direction of movement of the saving rate in the 1990s for the OECD countries. However, in Japan government savings decreased in the period 1995-1999 by 4%-points of GDP, while private savings rose with 2%-points of GDP (OECD (2001)). In other OECD countries there was a tendency towards fiscal consolidation in the nineties, causing the government savings to increase, while private savings decreased.

Table 2: Gross national savings as a percentage of nominal GDP

period	Japan	United States	Germany	France	United Kingdom	Italy
1985	32.0	17.2	---	18.1	18.2	22.6
1990	33.6	15.9	---	21.5	16.2	20.7
1995	29.4	16.4	21.8	19.5	15.7	21.6
2001	26.4	16.1	19.8	21.4	15.4	20.0

Source: OECD (2003b)

Does this indicate that Japan is oversaving? Oyama and Yoshida (1999) tested, using the modified golden rule approach, whether the Japanese are oversaving in relation to other major industrialised countries. According to Oyama and Yoshida the capital to GDP ratio in Japan is not different than in other industrialised countries (approximately 30-35%), while the saving rate is clearly higher in Japan than in some other industrial countries.

In the Modified golden rule approach the optimal saving rate is determined through the share of capital to GDP, social time preference and the natural growth rate. It appears in Oyama and Yoshida's study that at a time preference rate of zero Japan's saving is optimal. Other industrialised countries are on the optimal saving rate, when the time preference rate equals the real interest rate. A small time preference rate for Japan is defended by Miranda (1995). Miranda calculated a time preference rate of below 2% and concluded that Japan did not oversave. Assuming that the actual saving rate is the optimal, Oyama and Yoshida calculate the implicit time preference. They find a stable time preference rate for Japan and Germany at respectively 0% and 2%, while in other industrialised countries the time preference rate varies with the real interest rate.

Two main reasons for high net savings could be identified: demographic influences and Ricardian equivalence which we discuss in section 4 and 5.

IV Demographic influences caused high net savings?

Ageing effects could have kept the national net savings high while government net savings deteriorated. As countries are getting closer to the eve of retirement of the baby boom generation, and individual savings are peaking according to the life cycle savings model, this would theoretically lead to the expectation of large current account surpluses just before retirement of the baby boomers. The lifecycle savings-investments framework which we introduced in section 3 can be used for such an analysis. In a two period model, economic agents smooth their consumption equally over their expected lifetime. There is no bequest motive in this model, contrary to the Ricardian assumption. In this model there are two types of agents: young (Y) and old (O). We assume that only generation Y works. In this period generation Y saves for retirement, these savings are dissaved in the next generation (O), which is the only income to O. Consumption in period t is determined as follows:

(7) $C_t = C_t^y + C_t^o$

The present value of an individual lifetime consumption at t:

(8) $PV\ C_t = C_t^y + \frac{\left(C_{+1}^o\right)}{(1+r)}$

How much an individual consumes at each stage of his/her life depends on time preference (ρ). When ρ equals r, than consumption at both stages are equal. ρ and r theoretically do not necessarily have to be equal in an open economy. Individuals then attempt to smooth their consumption perfectly over their lifetime. Consumption of an individual at the two stages in life are related according to the presentation in equation 9.

(9) $C_{+1}^o = (1-\rho)(1+r)C_t^y$

Or rewritten:

(10) $C_{+1}^o = \frac{(1+r)}{(1+\rho)}C_t^y$

In period +1 *O* sells its savings of which a part may be invested abroad when savings accedes domestic investment demand, but because *Y* saves the exact amount as old initially did at t, the current account balance remains unchanged:

(11) $S^p_{+1} = S^p_t$

(12) $CA_{+1} = CA_t$

Demographic shocks lead to a mismatch between savings of the working population and dissavings of the retired generation. Equation 11 and 12 will not balance when a similar shock does not occur with trading partners. Ageing is a phenomenon which is observed in all industrialised countries. Because the ageing countries cannot have a significant current account surplus as a whole. The non-ageing world is relatively small in economic terms. This means that ageing will have to be absorbed domestically. For instance through a lower interest rate and an increase of investment. With a positive birth rate shock to a country, by the time this generation reaches working age, there will (theoretically) be a savings surplus when this generation reaches working age (Y in the model). In this simple example we define that the economy consists of only two generations at a certain time, where agents in the first generation works and save. When the demographic shock is temporary, the next generation will be smaller. Therefore, when the "baby boom" generation retires and starts dissaving, the dissaving will be larger than the saving of the working population.

Still, the effect on the current account is ambiguous. There are two other effects that are relevant: government savings and private investments. According to Higgins (1998) investments peak earlier in the life cycle than savings. Investments keep capital/labor ratios constant early in the working life. This means that by adding more periods to our theoretical model there is likely to be a current account deficit early in working life of the baby boom generation, a surplus later during working life and a deficit at the end of the working life. Government savings, which is mainly effected through pension payments and health care payments, is likely to show the same pattern as private savings, if this is not met by compensation measures on the government revenue side. If larger expenditures are met by enhanced revenues (tax hikes) there is no effect on net government savings.

For a detailed analysis of ageing influences on gross and net savings see for instance McMorrow and Roeger (2003), Turner et al (2003) or Higgins (1998). The positive influence on net savings in Japan is confirmed by OECD (2001) estimations. These estimates show that the weakening of the government budgetary balance in Japan caused the (net) private saving rate to rise by 2.3%-points, but this was mainly offset by dissaving related to population ageing (-2.2%-point) in the period 1995 to 1999.

V Ricardian equivalence a cause for high net savings?

Ricardian equivalence could be a second reason for higher net savings. Upper and Worms (2003) found that fiscal policy plays an important role in the determination of long-term real interest rates. But the authors state that only in Japan low real rates coincided with high debt and government borrowing. The Japanese government budget balance has decreased from +2.0% of GDP in 1990 to -7.1% in 2002.[9] Despite a worsened government budget, the current account remained in surplus while the long-term interest rate fell over the years. A low real GDP growth and continuing presence of deflation (GDP deflator measure) since 1998, have resulted in a sharp rise of the government debt to GDP ratio. The unsustainability of the fiscal situation in Japan has been analysed by both the IMF (2003) and the OECD (2003a). This unsustainability seems to justify a Ricardian response by the private sector. We first discuss theoretically the impact of unsustainable government deficit in a neoclassical model. Further on, we will analyse sector savings developments in Japan to see what caused rising oversaving of the private sector and whether this can be reasonably expected to be due to Ricardian equivalence.

If we interpret current unsustainable deficit as temporary deficits (which they are by definition), we can once again use the Neoclassical saving-investment model. Government borrowing will have to be compensated through higher taxes during the current economic planning horizon of economic agents. Hence, the outcome of the Ricardian dynasty savings model is the same as the outcome in the Neoclassical life cycle model: current taxpayer will end up with the bill of the fiscal stimulus. While the government debt is at an unsustainable path, it is likely that any further deterioration is met by an enhancement of private saving, keeping net national savings relatively constant.

Net national saving is the sum of private net saving (S^P-I^P) and government net saving. Government net saving is equal to net borrowing/net lending balance (B^G). The current account balance, as stated by equation 13, shows that the current account balance is the difference of foreign assets (A) held at period t-1 and t.

(13) $$S_t^n - I_t^n = S_t^p + B_t^g - I_t^p$$

(14) $$CA_t = A_{+1} - A_t = \left(A_{+1}^p - A_t^p\right) + \left(A_{+1}^g - A_{+1}^g\right)$$

Equation 15 and 16 show how private gross saving and government net saving are determined. Hence, if there would be a government debt, the first term on the right hand side of equation 15 would be negative. T is total tax receipts/payment, C private consumption, Y labour income and G equals government consumption.

(15) $$S_t^p = rA_t^p + Y_t - T_t - C_t$$

[9] OECD (2003b)

(16) $B_t^g = rA_t^g + T_t - G_t$

We use the model to theoretically simulate unsustainable fiscal policy, which we interpret in the model as a temporary budget deficit. The temporary deficit is compensated in the next period. We start with fiscal stimulance of D, a change in government savings of –D, which will be fully paid back in period +1 through a lump sum tax of D(1+r). In our two generations model this doesn't impact generation *O*. To this generation the fiscal deficit is permanent, so, in the absence of a bequest motive, generation *O* will consume it's share of the stimulance. It does change consumption smoothing decisions of *Y*. If the population is balanced between *Y* and *O*, this will lead to a rise in consumption of ½(D). *Y* consumers at t will keep their consumption unchanged. At +1 *Y* will have to pay ½(D)(1+r) in taxes. *Y* responds in a full Ricardian way, by investing its share at r to be able to pay ½(D)(1+r) at +1. The result is that the current account balance will fall by ½(D), because government saving (S^G_t) declines by D and private saving (S^P_t) rises by ½(D).

In period +1 the government will pay off its debt of D through higher taxes in period +1 of $(1+r)D_t$. Generation *Y* in period t has become to O in period +1. It dissaves ½(D) in assets which it kept to pay for the extra tax which accumulated including interest to ½(D)(1+r). Generation *Y* in +1 is confronted with a one period extra tax expenditure of ½(D)(1+r). *Y* in +1 will try to smooth consumption over both periods, so *Y* decreases its savings by half of its share in this incidental tax. In period +1 the current account balance increases by ¼ (D)(1+r); see equation 18.

At time +2 *Y* is not confronted with tax consequences of the fiscal stimulance of t. Generation *O* dissaves less than generation *Y* saves. The difference is ¼ (D)(1+r). From period +3 the current account balance is back to zero.

The developments of the current account balance from t to +3 is shown in the below shown four equations:

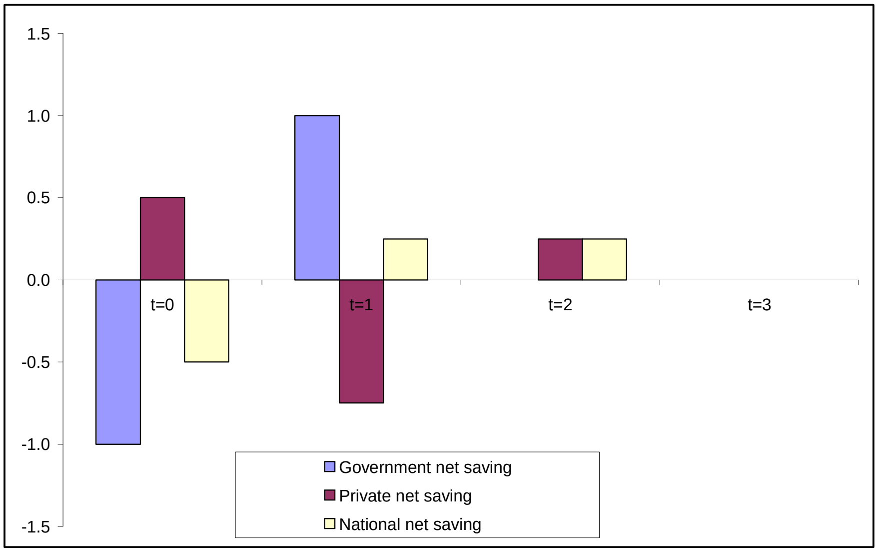
(17) $CA_t = -D + \frac{1}{2}D = -\frac{1}{2}D$

(18) $CA_{+1} = D(1+r) - \frac{3}{4}(1+r) = \frac{1}{4}D(1+r)$

(19) $CA_{+2} = 0 + \frac{1}{4}D = \frac{1}{4}D$

(20) $CA_{+3} = 0 + 0 = 0$

Chart 5: Change in savings of a 1 period 1D fall in the government balance (for simplicity r is not taken into account here but would be of influence in t=1)

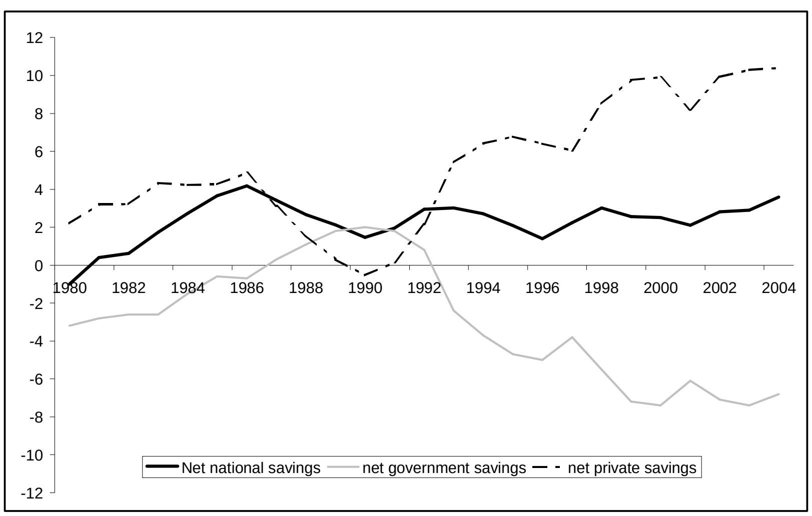


The above presented model analysis shows that temporary deficits have less effect on the current account balance than permanent deficits, and through this on the interest rate. We assumed a fiscal imbalance which leads to a temporary average deficit for a full generation which is corrected in the next generation. In this case one of the two generations responds through higher savings (young) and one generation does not (old). There is a partial Ricardian response. When we tune into the Japanese budgetary situation, the unsustainability and high future ageing costs, a case can be made for a short-term or medium term budgetary correction. Hence, a correction *within* the generation in which the budgetary expansion was initiated, implying a full Ricardian effect. This would encourage savings and keep the interest rate low, maybe even when the government credit rating deteriorates further. The urgency of the situation (a quick response is required) would mean that most of the Ricardian assumptions, which are often argued to be irrealistic will not be tested (see for explanation of the assumption for instance Barro (1989) and Bernheim (1989)). Any additional fiscal stimulance will likely be corrected within the current living generations, without the need for a bequest motive.

Is there currently evidence of Ricardian equivalence in Japan? Some studies addressed this issue previously, but unfortunately some date back to before the unsustainability of the government finance got apparent. Horioka (1993) finds that the Neoclassical lifecycle theory is more applicable to Japan than the Ricardian Dynasty theory. According to Horioka bequests are however prevalent because of risk aversion (timing of death and medical costs). Even in the Japanese case there could be liquidity constraint consumers and even myopic consumers. Kimura on quote in Oyama and Yoshida (1999), finds that 60-80% of the residents respond in a Ricardian equivalence way, while 20-40% responds in a Keynesian way. Also Kuttner and Posen (2001) find, in a more recent study, that Ricardian equivalence is perhaps in evidence but does not perfectly neutralise fiscal policy. So even in the Japanese situation, there is some evidence of a Keynesian reaction. Both Ricardian and Neoclassical theories neglect liquidity constraintness of the Keynesian framework. Campbell and Mankiw (1989) claim that liquidity constraintness of consumers is substantial in the industrialised countries. Campbell and Mankiw (1989) estimate this effect at 50% and Masson, Bayoumi and Samiei (1996) estimate that 60% of a change in government saving is compensated by private savings in a number of industrialised countries. These numbers are lower than the previous mentioned studies point out for Japan, even at times of government financial stability in Japan.

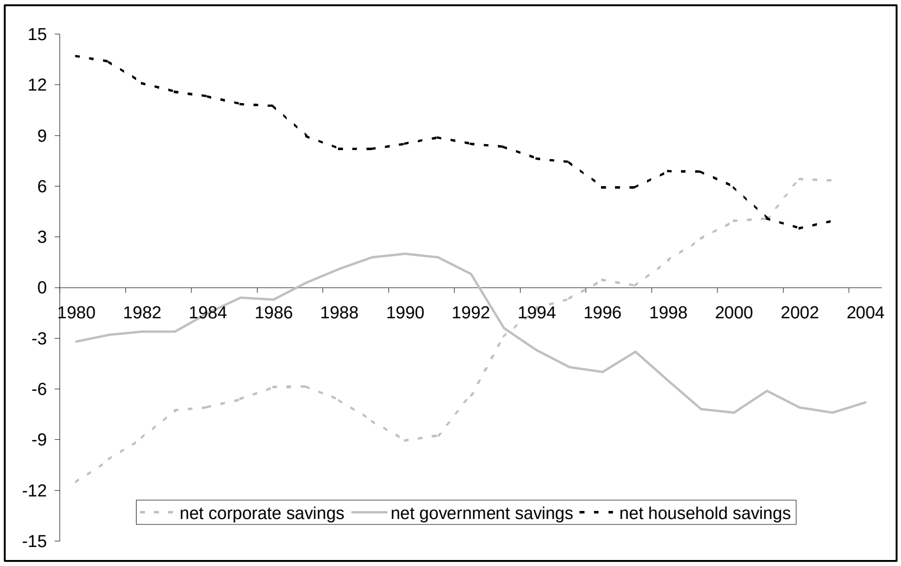
While there is a theoretical case for the private sector to respond to further fiscal deterioration by increasing savings, we evaluate how private entities have responded in the eighties and nineties. Chart 6 shows net national savings, net private savings and net government savings in Japan since 1980. The chart shows that despite a deterioration in government savings, national net savings remained quite stable, even a minor rise over the nineties can be detected. Especially the private response to fiscal stimulus since the early nineties is striking in the chart. Masson, Kremers and Horne (1994) find a statistical significant relationship between net Japanese foreign assets and government debt (negative relationship) in the period 1950-1990, but this relation is not confirmed by chart 6 for the nineties.

Chart 6: Public and private savings



As chart 7 shows, the private response to deteriorating government finances does not find its cause in a rise of net household savings which has slowly fallen since the eighties (from 15% GDP to 6%). The corporate net savings have offset the government financial deterioration.

Chart 7: Private savings components



But is this rise in corporate savings really a Ricardian response where we would expect this behaviour to take place mainly with households? The rise in corporate savings is more likely to be caused by other factors such a lack of investment opportunities through a fall of potential growth and the need for debt restructuring. In the nineties a further slowdown in economic growth and large corporate losses as a result of the collapse of the asset bubble, which led to overcapacity and a rise of nonperforming loans, have most likely stimulated corporate savings. As long as overcapacity is a problem, corporate savings are likely to remain high. Liquidity abundance through a broad monetary policy in absence of investment opportunities could have led to savings enhancement by companies. The relationship between corporate savings and government savings seem likely to be related through the business cycle and is not a direct Ricardian type response to expected enhanced future corporate taxation.

The correlation matrix below shows that in all countries there is a strong negative correlation between first differences of government net savings (S_g) and private net savings (S_p) (between -0.72 and -0.92). Almost in all countries the relation is stronger between government and corporate savings (S_c) than between government and household savings (S_h). Household savings has a positive sign (see correlation matrix) in relation to the interest rate in most countries. How savings respond to a change in r depends on the net effect of two factors. First, the income effect predicts that a rise in r implies that less savings is required. The rise in r will lead to higher consumption in the future. This enables higher consumption in the current period. Second, the substitution effect, implies that the price of current consumption rises. A higher interest rate than the time preference would enhance savings.

The substitution effect tends to dominate in most countries. The correlation for Japan is almost zero.

Investigating the causality is another way of looking whether government savings influences private savings. Using the Granger causality technique we found that the causality runs from corporate savings to government savings and not vice versa. Overall (see appendix) not much causality can be found between sectoral savings for a set of 11 industrialised countries. Only statistically significant causality from government savings to corporate savings in Germany and the Netherlands and from corporate to government savings in Japan and Belgium can be found.

Table 5: Correlation matrix (first differences; annual data; 1970-2003)

	R-Sg	R-Sp	R-Sc	R-Sh	Sg-Sp	Sg-Sc	Sg-Sh	Sc-Sh
United Kingdom	0.01	0.01	-0.11	0.25	-0.92	-0.82	-0.49	0.11
Spain	0.14	-0.22	-0.35	0.16	-0.89	-0.67	-0.54	-0.08
United States	0.38	-0.32	-0.47	0.33	-0.88	-0.75	-0.18	-0.34
Japan	0.16	-0.37	-0.42	0.01	-0.88	-0.81	-0.31	-0.04
Belgium	0.33	-0.45	-0.48	-0.08	-0.83	-0.70	-0.44	-0.02
Australia	0.19	-0.37	-0.50	0.35	-0.83	-0.74	-0.12	-0.32
Canada	0.22	0.10	-0.04	0.30	-0.81	-0.74	-0.60	0.42
France	0.15	0.43	-0.62	0.29	-0.77	-0.64	-0.35	-0.16
Netherlands	-0.07	-0.02	-0.16	0.18	-0.76	-0.35	-0.77	-0.04
Italy	0.04	-0.19	-0.37	0.17	-0.75	-0.51	-0.53	-0.06
Germany	0.01	-0.25	-0.35	0.34	-0.72	-0.66	-0.44	0.16

We estimate a model in which we test how components of private savings explain changes in government savings, and further, how all savings components explain long-term interest rate movements.

The first equation is the following:

$$(21) \quad \Delta S_g = C + \beta_1 S^h + \beta_2 S^c + \beta_3 \left(R_{l_{-1}} - \gamma_1 S^h_{-1} - \gamma_2 S^c_{-1} + C_{-1} \right)$$

where, S^g is net government savings, S^h net households savings and S^c net corporate savings.

Table 6 below shows that for all countries household savings and corporate savings are statistically significant and explain changes in government net savings in the period 1970-2003. All have the theoretically expected negative sign. The correlation between corporate savings and household savings is usually quite low (see table 5). Therefore, multicolinearity is not a problem here. It is most likely that private savings responds to government savings, but as mentioned earlier, it could be coincidental through the economic situation. Government savings usually deteriorate through automatic stabilizers when the economy turns into a recession. The recession induces savings of private entities. This response indicates risk aversion and does not indicate consumption smoothing. From a neoclassical perspective, it could also indicate a previous overestimation of permanent income, for instance by overestimating job security until the downturn came. Table 6 shows that the statistical relation is stronger for corporate savings than for household savings. This supports the argument made earlier: especially for corporations, with limited investment opportunities, savings are likely to respond stronger to an economic downturn. Table 6 also shows that the results for Japan are not that different in an international context. The equations for eight out of eleven countries show a higher t-value for corporate savings than for household savings. In case of a Ricardian response by households in Japan due to unsustainable Japanese government finances, the results would clearly have to be different for Japan compared to others with much more solid government finances. The adjusted R-squared for the Japanese equation ranks roughly in the middle. Adjusted R-squared for all countries are significant. They range from 53.4% for Australia to 83.3% for the United States. The adjusted R-squared for Japan is 77.0%. Overall, a slightly stronger relation is found between government net savings and the private savings component than found by Masson, Bayoumi and Samiei (1996), possibly because we tested the savings components individually.

Table 6: Regression results of first difference government savings model (period 1980-2003)

Country	Household savings	Corporate savings	Long-term relation	Constant	Adj R2	DW-stat	F-stat	Aikake
US	-0.68 (-4.76)	-0.79 (-12.23)	-0.08 (-0.72)	-0.12 (-1.13)	0.833	1.55	54.03	1.88
Belgium	-0.67 (-3.43)	-0.90 (-8.01)	-0.14 (-1.52)	0.32 (1.79)	0.809	1.65	32.07	2.69
Spain	-0.74 (-5.81)	-0.53 (-7.08)	-0.22 (-1.01)	0.04 (0.27)	0.791	1.48	28.72	2.05
Japan	-0.68 (-3.76)	-0.82 (-8.18)	-0.29 (-2.39)	0.17 (1.05)	0.770	0.90	25.62	1.86
UK	-0.89 (-6.20)	-0.58 (-7.98)	-0.31 (-2.64)	-0.12 (-0.84)	0.763	1.48	35.26	2.57
Italy	-0.87 (-5.94)	-0.54 (-3.99)	-0.26 (-1.57)	-0.04 (-0.21)	0.689	1.52	17.28	2.67
Canada	-0.67 (-3.04)	-0.47 (-3.55)	-0.29 (-2.29)	0.12 (0.48)	0.685	1.28	16.25	2.94
Germany	-1.12 (-3.72)	-0.51 (-5.13)	-0.19 (-1.30)	-0.06 (-0.37)	0.646	1.726	19.88	2.79
France	-0.70 (-3.77)	-0.66 (-5.61)	-0.25 (-1.66)	-0.05 (-0.41)	0.646	1.34	15.61	1.93
Netherl.	-0.74 (-6.48)	-0.45 (-4.60)	-0.27 (-1.94)	0.01 (0.08)	0.627	1.49	15.03	2.59
Australia	-0.41 (-2.68)	-0.47 (-6.21)	-0.23 (-1.98)	-0.03 (-0.17)	0.534	1.49	13.25	2.65

* coefficient value and t-value in brackets

We additionally tested how, and which, savings components explain the interest rate formation (equation 22). The savings components explain on an adjusted basis 26.6% of the movements in the long-term interest rate in Japan (see table 7). Government savings and household savings are not statistically significant.

$$(22)\quad \Delta R_l = C + \beta_1 \Delta S^h + \beta_2 \Delta S^c + \beta_3 \Delta S^g + \beta_4 \left(R_{l_{-1}} - \gamma_1 S_{-1}^h - \gamma_2 S_{-1}^c - \gamma_3 S_{-1}^g - C_{-1} \right)$$

It appears that a model estimated with savings components does not explain interest rate movements better for Japan than for other industrialised countries. The net government balance does not lead statistically significant explanatory power for any industrialised country.

Table 7: Estimation results of the ERM long-term interest rate model (period 1980-2003)

Country	Government savings	Household savings	Corporate savings	Long-term relation	Constant	Adj R-Squared
Canada		0.69 (4.27)		-0.54 (-3.20)	-0.03 (-0.19)	0.385
Germany		0.68 (2.87)		-0.44 (-2.68)	-0.06 (-0.40)	0.232
United States		0.68 (3.00)		-0.19 (-1.83)	0.01 (0.06)	0.226
Australia			-0.25 (-2.86)	-0.08 (-1.23)	-0.01 (-0.05)	0.223
France			-0.52 (-2.56)		-0.16 (-0.70)	0.188
United Kingdom		0.41 (2.01)		-0.02 (-0.30)	-0.12 (-0.60)	0.062
Japan			-0.21 (2.16)	-0.30 (-2.14)	-0.18 (-1.24)	0.266
Italy		0.90 (3.10)		-0.36 (-1.94)	-0.01 (-0.04)	0.261
Netherlands		0.27 (2.57)		-0.12 (-1.20)	-0.19 (-1.13)	0.161
Spain						
Belgium						

VI Institutional factors and home bias cause a higher coefficient value

We found that the savings and investments balance explains the Japanese long-term interest rate movements better than for other countries. For a country integrated in international financial markets the savings-investment balance should not have a significant impact on domestic long-term interest rate formation, because the mismatch can be financed internationally. But institutional factors could have increased the importance of net savings on domestic long-term interest rate formation in Japan.

The bond market is almost fully domestically financed in Japan: 96% of Japanese government bonds are held by Japanese citizens.[10] If a high savings surplus is strongly home biased, the interest rate could still remain low. A strong home bias can also indicate that the explanation of the savings balance is predominant in explaning the interest rate movements, which turns an economy with open capital markets through low capital mobility effectively into a closed economy.

[10] OECD, 2005, p69

The amount of government bonds held by the government itself is substantial in comparison with other countries. Table 8 reports on bonds held by the domestic citizens and bonds held by central bank and government. The rate of bonds held domestically in Japan was at the end of the nineties higher than in the US and the UK. The much lower percentage of US government bonds held by US citizens than British bonds by UK citizens can be explained from the dollar’s international currency position. The relative amount of bonds held by central bank and government is much higher in Japan than in both other countries.

Table 8: holdings of government bonds

	Held domestically	Held by Central bank/government
Japan	90.0%	46.3%
United States	63.1%	13.1%
United Kingdom	85.6%	3.6%

Source: Rhee (2001)

Since the late 90’s these numbers have risen for Japan. Since March 2001, the Bank of Japan started buying government bonds as part of its monetary policy framework. OECD (2005) gives some insight in the distribution of government bond holdings. According to the OECD study the Bank of Japan bought since March 2001 till the end of 2004 one third of new government bond issues. The total amount in government bonds that the Bank holds valued 60 trillion yen in government bonds (12% GDP) by the end of 2004. By September 2003 the Bank of Japan held 14.6% of outstanding government bonds. In total, the government held 50.4% of the outstanding bond in 2003. Including besides the Bank of Japan the postal saving (15.4%), postal insurance (9.6%), fiscal loan fund (10.7%). The banks are holding 20.3% of the total outstanding government debt. Because of these large government holdings and given that commercial banks’ holdings are kept for a long-term to improve solvency ratio’s after substantial profit loss through nonperforming loans, the liquidity of Japanese government bonds is much lower than would be expected by the size of outstanding government debt. The large government demand, and especially the purchases of the Bank of Japan since 2001, are likely to have kept the long-term interest rate much lower.

Home bias might also be voluntarily. The exchange rate risk, which is for a large net creditor such as Japan difficult to hedge, can be an important reason for Japanese investors to be home biased in their investment decisions. Jorion (1996) shows that investing abroad, in a situation that the home country has a structural current account surplus, like Japan had in the eighties and nineties, hedging the currency risk would be expensive. Since 1970 the yen appreciated in real effective terms 80% and 90% since 1990.[11] Large exchange rate losses in the past might also have had a psychological effect. This home bias may up to now have been more important than worries over the governments solvency ratio.

VII Conclusions

In relation to other industrialised countries the Japanese government pays a low interest on its government debt, especially when we take into account the relative low rating on government bonds. We found that the current account balance significantly explains movements in the Japanese interest rate. Much better for Japan than for other industrialised countries. For most countries there is no statistically significant relation at all.

We investigated two possible causes for the existence of oversavings: ageing and Ricardian equivalence. Some evidence indicates that ageing has contributed to the net savings surplus. Although a theoretical case can easily be made for Ricardian equivalence in Japan we do not find evidence. The strong response of private saving to government deficits is not caused by household saving but by corporate saving. In our view, the rise in corporate saving is more likely to be a response to losses and the worsened investment outlook than it is Ricardian in nature. We found a statistical significant Granger causality running from corporate savings to government savings in Japan, but not vice versa.

Although Japan has a higher savings surplus than elsewhere, we think that the higher coefficient value is cause by institutional factors and a strong home bias. Institutional factors such as a substantial domestic holdings of government bonds by international standards and especially more recently the Bank of Japan purchases of government bonds keep demand for Japanese government bonds higher. This has likely increased the downward pressure on the long-term interest rate compared to foreign long-term interest rates of recent.

References

Barro, Robert, 1989, The Ricardian approach to budget deficits. In: Journal of Economic Perspectives. Vol 3, number 2, spring 1989, pp 37-54.

Bernheim, B.D., 1989, A neoclassical perspective on budget deficits. In: Journal of Economic Perspectives, vol 3, no 2, spring 1989, pp 55-72

Bank for International Settlements, 2004, Quarterly Review December, table A92 Domestic debt securities by sector and residence of issuer, Basel.

Butter, F.A.G den, and P.W. Jansen, 2004, An empirical analysis of the German long-term interest rate. In: Applied Financial Economics, vol 14 no 10, pp 731-741.

[11] Source: OECD

Campbell, J.Y. and G.N.Mankiw, 1989, consumption, Income and Interest Rates: Reinterpreting the Time Series Evidence. In: NBER Macroeconomics Annual pp 185-216, The MIT Press, MA.

Fabozzi, F., 2000, Fixed Income Analysis for the Chartered Financial Analyst Program. Frank J. Fabozzi Associates, New Hope, PA.

Fukao, M. and T.Okubo, 1984, International linkage of interest rates: the case of Japan and the United States. In: International Economic Review. Vol 25, no 1, pp 193-207.

Higgins, M., 1998, Demography, national savings, and international capital flows. In: International Economic Review, vol 39, no 2, pp 343-369.

Horioka, C.Y., Saving in Japan, 1993 In: A.Heertje, World Savings: an International Survey. Blackwell, Oxford and Cambridge. Pp 238-278.

IMF, 2003, Article IV consultation Japan, Washington D.C..

Jorion, P, 1996, Returns to Japanese investors from US investments. In: Japan and the World Economy, vol 8, pp 229-241.

Kuttner, K.N and A.S.Posen, 2001, The great recession: lessons for macroeconomic policy from Japan. In: Brookings Papers on Economic Activity, vol 2, pp 93-185.

Masson, P.R., J.Kremers and J.Horne, 1994, Net foreign assets and international adjustments: The United States, Japan and Germany. In: Journal of International Money and Finance, vol 13, pp 27-40.

Masson, P.R, T.Bayoumi and H.Samiei, 1996, International Evidence on the Determinants of Private Saving, CEPR Discussion Paper no 1368, London.

McMorrow, K. and W.Roeger, 2003, Economic and Financial Market Consequences of Ageing Populations. European Economy. Economic Papers no 182. European Commission, Brussels.

Miranda, K, 1995, Does Japan save too much? In: U.Baumgartner and G.Meredith, Saving Behaviour and Asset Price "Bubble" in Japan. Occasional paper 124, IMF, Washington D.C..

Mishkin, F.S. and S.G.Eakins, 1998, Financial Markets and Institutions. Addison-Wesley Longman. Second edition, New York.

OECD, 2001, Economic Outlook no 70; chapter 4, Saving and investment: determinants and policy implication, Paris.

OECD, 2003a, Economic review Japan 2002, Paris.

OECD, 2003b, Economic Outlook no 73, Paris.

OECD, 2005, Economic review Japan 2004, Paris.

Oyama, T. and K.Yoshida, 1999, Does Japan Save Too Much? Or Do Other Major Countries Save Too Little? International Comparison of Savings Rates From the Modified Golden Rule Approach. Working paper 99-5. Bank of Japan, Tokyo.

Rhee, S.G, 2001, Chapter 3 Japan. In: Y.Kim (ed), Government Bond Market Development in Asia. Asian Development Bank, Philippines.

Turner, D., C.Giorno, A. De Serres, A.Vourc'h and P.Richardson, 2003, The Macroeconomic Implications of Ageing in a Global Context. OECD Economics Department Working Papers No 193, Paris.

Upper.C and A.Worms, 2003, Real Long-term Interest Rates and Monetary Policy: a Cross-Country Perspective. BIS Papers No 19. pp 234-257, Basel.

APPENDIX

The table below shows the results of the Granger causality test. The H_0 represents that the first mentioned variable does not Granger cause changes in the second mentioned variable. Only in three cases, highlighted in the table, is there a causal relationship.

Table: Granger causality test results on savings component relations

	Government savings to household savings		Household savings to government savings		Government savings to corporate savings		Corporate savings to government savings	
	F-stat	*P-value*	*F-stat*	*P-value*	*F-stat*	*P-value*	*F-stat*	*P-value*
Canada	1.08	0.52	7.37	0.06	3.12	0.19	0.72	0.67
Germany	0.99	0.51	0.27	0.96	4.91	0.02	0.84	0.59
United States	0.94	0.53	0.78	0.63	0.63	0.73	0.63	0.73
Australia	0.32	0.94	0.44	0.87	1.60	0.26	2.10	0.16
France	2.48	0.24	1.60	0.38	0.14	0.99	0.06	1.00
United Kingdom	0.62	0.74	3.09	0.07	0.93	0.54	0.96	0.52
Japan	0.87	0.68	107.50	0.07	40.50	0.12	4243.00	0.01
Italy	10.26	0.24	0.76	0.71	26.50	0.15	0.33	0.87
The Netherlands	1.29	0.60	0.33	0.88	483.60	0.04	1.35	0.59
Spain	6.08	0.30	0.17	0.95	7.40	0.28	0.21	0.93
Belgium	0.82	0.69	0.61	0.76	1.07	0.63	288.40	0.05