What About Japan?

YiLi Chien
St-Louis Fed

Hal Cole
UPenn

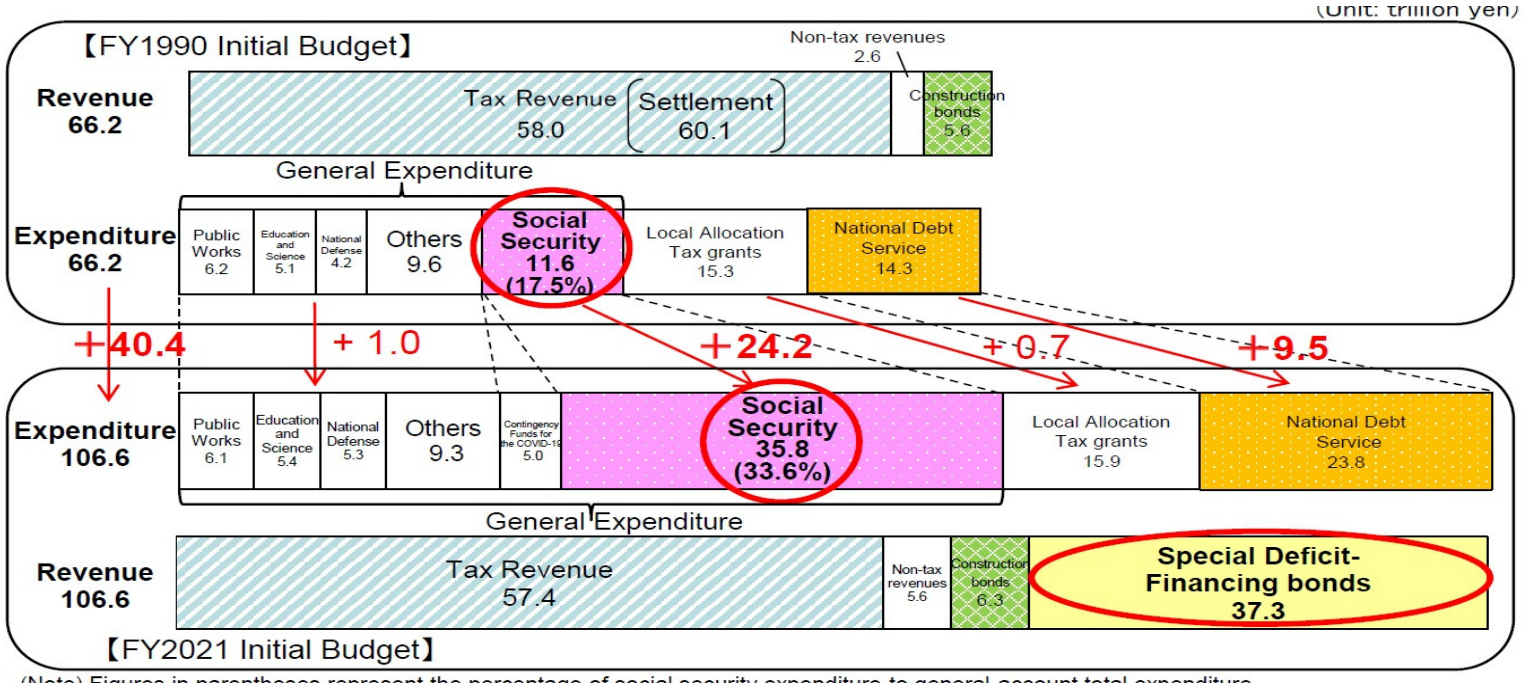
Hanno Lustig
Stanford

Roadmap

1. Looking Backwards: Debt Dynamics
2. Net Debt Dynamics for Japanese Public Sector
3. Quantifying Financial Repression
4. Tax on Foreign Investments
5. Gov't Duration Mismatch and Fiscal Capacity
6. HH Duration Mismatch and Welfare Losses

Demographic Transition

Japan: Central Government Budget



Source: Japan Ministry of Finance

- Over past 20 years Japan's social security payments have increased from 17 to 35% of government expenditures.
- JP's gov't running large deficits and highest debt/GDP ratio among advanced economies (sofar) without fiscal crisis. How? JP is not in $r < g$ region.

Japanese Gov't: SWF with Borrowed Money

- Our paper: Consolidate JP's public sector (including BoJ and pension funds).
- **Carry trade**: Gov't earns an additional 2–3% of GDP from its risky investments.
  - Risky maturity transformation on a large scale (more than 1 GDP) by
    1. Borrowing at floating rates (by issuing reserves through BOJ).
    2. Investing in long-duration assets (including bonds and stocks through pension funds).
  - Taking on foreign currency risk (more than 1/2 of GDP).

- **Duration mismatch** on JP's consolidated government balance sheet.
  - A decrease in real rates increases government's spending possibility set, because
    1. Weighted duration of liabilities minus assets is negative.
    2. But its future government surpluses are in the distant future.

- Lots of extra fiscal capacity created (destroyed) when rates decline (increase).

Japanese HH Balance Sheet

- **Duration mismatch** on JP stand-in HH balance sheet.
- Mismatch especially pronounced for young JP households who hold mainly deposits.
  - A decrease in real rates shrinks consumption possibility set, because
    1. Young have little duration in their portfolio (e.g., mainly deposits.)
    2. But young need to finance future consumption out of savings (excess consumption has high duration). (Greenwald et al., 2022)
- Large welfare losses for young non-participants.
- Financial Repression is a tax on young non-participants.

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Government Debt Dynamics

- Let G_t denote nominal government spending before interest, T_t denote nominal government tax revenue.
- Start from the static government budget constraint,

$$G_t - T_t + D_{t-1} R_t = D_t,$$

  where R_t denotes the gross return on the entire portfolio of marketable debt D_t.
- By iterating *backwards*, we obtain the following expression for the debt/output ratio:

$$\frac{D_t}{Y_t} = \sum_{j=0}^{t} \left(\frac{G_{t-j} - T_{t-j}}{Y_{t-j}} \right) \frac{R_{t-j,t}}{X_{t-j,t}} + R_{0,t} \frac{D_{-1}}{Y_{-1}},$$

  where $R_{t-j,t} = \prod_{k=1}^{j} R_{t-j+k}$ and $X_{t-j,t} = \prod_{k=1}^{j} X_{t-j+k}$.

$r > x$

$$\frac{D_t}{Y_t} = \sum_{j=0}^{t} \left(\frac{G_{t-j} - T_{t-j}}{Y_{t-j}} \right) \frac{R_{t-j,t}}{X_{t-j,t}} + R_{0,t} \frac{D_{-1}}{Y_{-1}},$$

- Consider the steady-state in a deterministic environment:

$$\frac{D}{Y} = \frac{\frac{G-T}{Y}}{\frac{x-r}{1+x}},$$

  where lowercase denotes logs.
- When $r < x$, the government can roll over its debt in perpetuity and run steady-state deficits ($G > T$) with a constant debt/GDP ratio. (Blanchard (2019), Mehrotra et al (2021))

- Japan not in the Blanchard goldilocks region.

	x	π	r
1997-2023	0.07%	0.20%	1.54%
			$r - x$
1997-2023			1.47%

Debt Dynamics

- Assume $r = x$. Then debt/output increase is:

$$\Delta \frac{D}{Y} \approx 26 \times \underbrace{\frac{G - T}{Y}}_{5.1\%}.$$

- The average annual primary deficit is around 5.1% of GDP in the last 26 years. (133% of GDP in cumulative deficits.)
- Hard to make sense of these debt dynamics only looking at central government.

Public sector

- Consolidate the Japanese public sector's balance sheet:
  1. Central and local government.
  2. Public pension funds.
  3. BoJ.
  4. Publicly-owned financial institutions.
- Analyze the budget constraint consolidated public sector.
- Analyze asset and liabilities of the consolidated public sector.
- Derive an equation for the net debt dynamics of the public sector.

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Cheap Funding

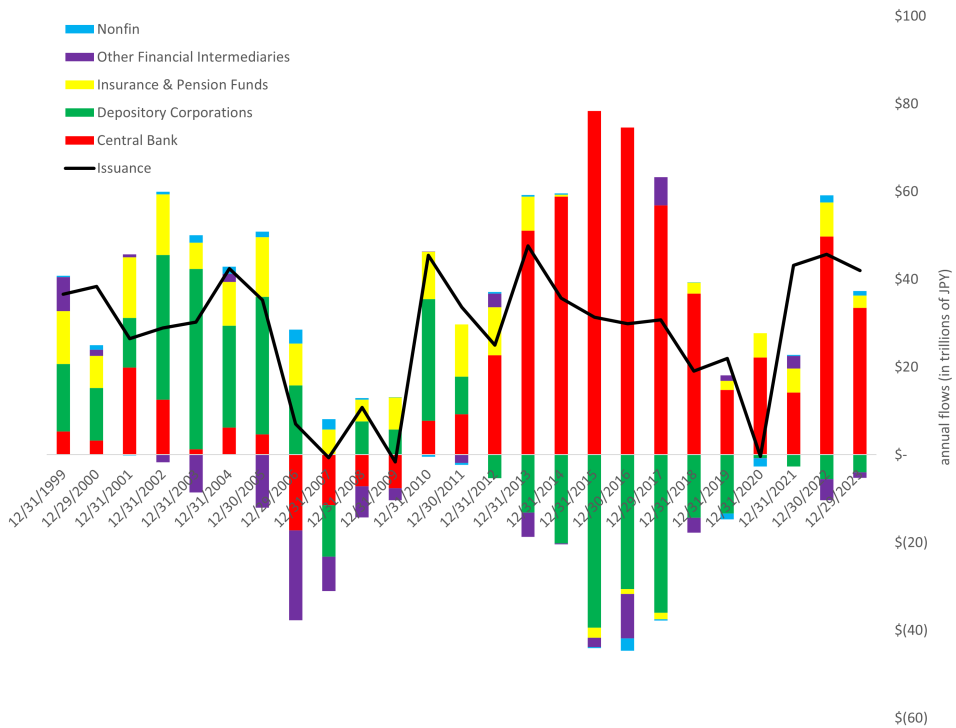
- Prior to 2001: Cheap funding for government.
  - Participation by HH in capital markets was expensive (Kashyap et al (1999))
  - HH trapped in low-yielding deposits:
    - Interest rate ceilings on deposits.
    - HH deposits at Japan Post and pension fund reserves required to fund FILF.

- Post-2001 liberalization: Alternative sources of cheap funding.
  - 2001: BoJ starts large scale asset purchases; Replacing FILF deposits with bank reserves at BoJ. .
  - 2016: BoJ starts YCC .

BOJ Balance Sheet 1997

December 1997			
Assets		Liabilities	
Currency and Deposits	0.00%	Currency	10.91%
Domestic Loans	4.20%	Bank Reserves	0.65%
Bonds & T-Bills	9.70%	Government Deposits	0.09%

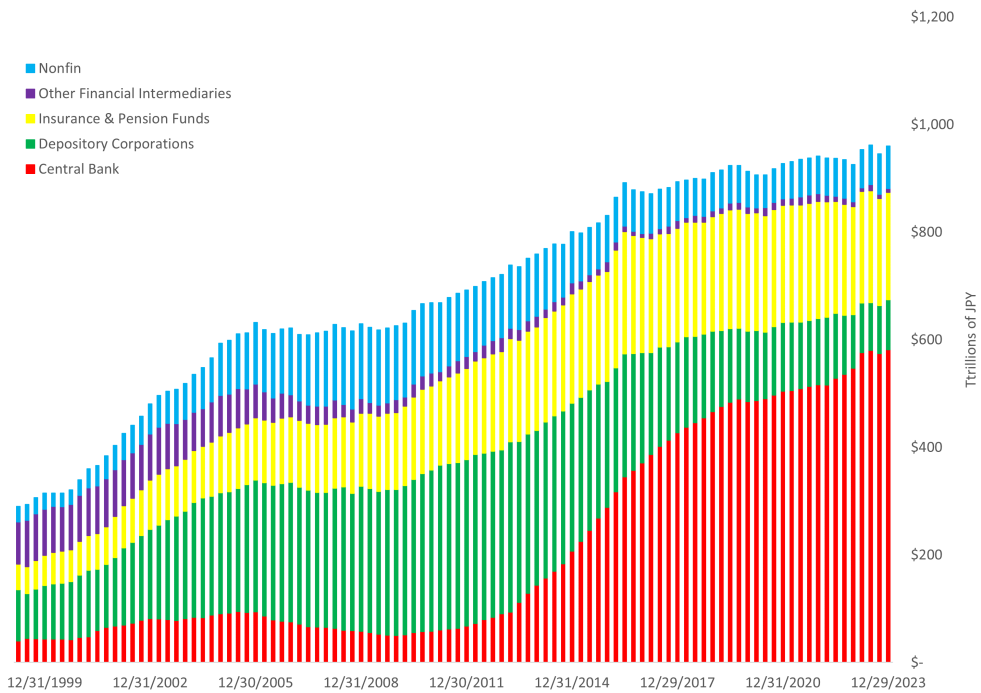
BOJ Balance Sheet (% of GDP) End of 1997.



BOJ Balance Sheet 2021

December 2021			
Assets		Liabilities	
Currency and Deposits	0.51%	Currency	23.43%
Domestic Loans	27.16%	Bank Reserves	100.19%
Bonds & T-Bills	99.77%	Government Deposits	3.26%

BOJ Balance Sheet (% of GDP) End of 2021.



Consolidated BOJ + General Gov't Balance Sheet

- Gov't replaced FILF deposits with Bank Reserves.

December 1997			
Assets		Liabilities	
Currency and Deposits	5.75%	Currency	10.91%
Domestic Loans	6.55%	Bank Reserves	0.65%
Other Domestic Securities	5.77%	Bonds & T-Bills	58.97%
Domestic Equities	11.79%	Loans	25.54%
Foreign Securities	6.83%	Deposits FILF	76.40%
B.O.J. Loans	4.20%		

December 2021			
Assets		Liabilities	
Currency and Deposits	17.27%	Currency	23.43%
Domestic Loans	3.45%	Bank Reserves	100.19%
Other Domestic Securities	13.74%	Bonds & T-Bills	139.61%
Domestic Equities	31.92%	Loans	27.58%
Foreign Securities	54.65%	Deposits FILF	4.69%
B.O.J. Loans	27.16%		

$rx > 0$

- Start from static budget constraint for consolidated gov't.

$$G_t - T_t + D_{t-1}R_t^D - A_{t-1}R_t^A = D_t - A_t \equiv ND_t$$

where R_t^A denotes the gross return on the portfolio of assets, A_{t-1}.

- The net debt/output ratio dynamics:

$$\frac{ND_t}{Y_t} = \sum_{j=0}^{t} \left[\frac{G_{t-j} - T_{t-j}}{Y_{t-j}} - \frac{A_{t-j-1}}{Y_{t-j-1}} \frac{R_{t-j}^A - R_{t-j}^D}{X_{t-j}} \right] \frac{R_{t-j,t}^D}{X_{t-j,t}} + \frac{R_{0,t}^D}{X_{0,t}} \frac{ND_0}{Y_0}.$$

- Consider the steady-state in a deterministic environment. When $r^f > x$, the government can run steady-state deficits ($G > T$) with a constant ND/Y provided that $rx\frac{A}{Y} = (r^A - r^f)\frac{A}{Y}$ is large enough:

$$\frac{ND}{Y} = \frac{\frac{T-G}{Y}}{\frac{r^f - x}{1+x}} + \frac{\frac{rx}{1+x}\frac{A}{Y}}{\frac{r^f - x}{1+x}}.$$

Backing out $rx > 0$

- The net debt/output ratio dynamics:

$$\frac{ND_t}{Y_t} = \sum_{j=0}^{t} \left[\frac{G_{t-j} - T_{t-j}}{Y_{t-j}} - \frac{A_{t-j-1}}{Y_{t-j-1}} \frac{R^A_{t-j} - R^D_{t-j}}{X_{t-j}} \right] \frac{R^D_{t-j,t}}{X_{t-j,t}} + \frac{R^D_{0,t}}{X_{0,t}} \frac{ND_0}{Y_0}.$$

- Assume $r^D = x$, constant $rx\frac{A}{Y}$, and constant primary deficits of 5.1%.
- The net debt/output ratio change over 26 years is only 70%, down from 133%:

$$70\% = \Delta \frac{ND}{Y} \approx \underbrace{26 \times \overbrace{\left(\frac{G-T}{Y} \right)}^{5\%}}_{133\%} - \underbrace{26 \times \frac{rx}{1+x} \left(\frac{A}{Y} \right)}_{2.42\%}.$$

- Implied excess return of around 2.42% of GDP.
- $\rightarrow$Shrinks net debt by 63% of GDP.

Computing rx

- What's the actual number?
- Japanese Gov't earns an additional 2.28% of GDP on its risky asset position $rx\frac{A}{Y}$: compensation for equity risk, interest rate risk, and currency risk (does not hedge currency risk).
  - Japanese Gov't earns rx of 1.90% per annum above its cost of funding.
  - The size of the SWF A/Y in 2021 is 148% of GDP.
  - The spreads really started to increase after the GFC.

	r^L	r^A	$r^A - r^L$	$(r^A A - r^L L)$
1998-2023	0.69%	2.59%	1.90%	2.28%
1998-2012	0.92%	0.89%	−0.04%	−0.63%
2013-2023	0.38%	5.04%	4.66%	6.25%

$(r^A A - r^L L)$ as % of GDP.

SWF with Borrowed Money

% of GDP, Year End	1997	2012	2023	97 to 23 Diff
Assets				
Deposits	5.9%	8.5%	18.0%	12.1%
Loans	102.8%	63.1%	60.8%	-42.1%
Domestic Equities	10.7%	20.9%	38.7%	28.0%
Foreign Securities	7.5%	29.7%	56.6%	49.1%
Other Assets	8.4%	7.9%	7.2%	-1.1%
Sum	**135.2%**	**130.1%**	**181.3%**	46.1%
Liabilities				
Currency	10.8%	18.3%	21.7%	10.9%
Bank Reserves	0.6%	9.5%	91.1%	90.4%
Bonds & T-Bills	41.8%	162.3%	107.7%	65.9%
Loans	55.1%	48.5%	36.0%	-19.1%
Deposits FILF	46.4%	1.1%	1.6%	-44.9%
BoJ External Debt	0.0%	0.1%	7.5%	7.5%
Other Liabilities	5.2%	8.7%	10.1%	4.9%
Sum	**159.9%**	**248.5%**	**275.6%**	115.7%
Net Liabilities	**24.7%**	**118.4%**	**94.3%**	69.6%

Spread

- Asset side: Growing allocations to risky asset classes (including 0.5 GDP in foreign securities).
- Liability side: Increasing shift to funding at low, floating rates.

- Currency carry trade: borrowing in low rate funding currency, investing in high rate currencies.

- Japanese Gov't earns an additional 2.28% of GDP on its risky asset position.
  - Japanese Gov't earns rx of 1.90% per annum above its cost of funding.
  - The size of the SWF A/Y in 2023 is 180% of GDP.
  - The spreads really started to increase after the GFC.

	r^L	r^A	$r^A - r^L$	$(r^A A - r^L L)$
1998-2023	0.69%	2.59%	1.90%	2.28%

No QE Counterfactual

- **Assumption**: Returns on JGBs after 2012 would have been 2% higher than the actual returns.

	r^L	r^A	$r^A - r^L$	$(r^A A - r^L L)$
1998-2023	0.69%	2.59%	1.90%	2.28%
1998-2012	0.92%	0.89%	−0.04%	−0.63%
2013-2023	0.38%	5.04%	4.66%	6.25%

No-QE Counterfactual

1998-2023	1.34%	2.59%	1.25%	0.66%
1998-2012	1.03%	0.89%	−0.14%	−0.87%
2013-2023	1.77%	5.04%	3.28%	2.75%

Currency-Hedged Counterfactual

- **Assumption**: All currency risk is hedged (no currency carry trade).

	r^L	r^A	$r^A - r^L$	$(r^A A - r^L L)$
1998-2023	0.69%	2.59%	1.90%	2.28%
1998-2012	0.92%	0.89%	−0.04%	−0.63%
2013-2023	0.38%	5.04%	4.66%	6.25%

Currency-Hedged Counterfactual

1998-2023	0.69%	1.89%	1.20%	1.07%
1998-2012	0.92%	1.07%	0.15%	−0.44%
2013-2023	0.38%	3.05%	2.67%	3.11%

Joint Counterfactual

- **Assumption**: No QE + full currency hedging.

Periods	Liabilities	Assets	Difference	$(r^A A - r^L L)$
1998-2023	0.69%	2.59%	1.90%	2.28%
1998-2012	0.92%	0.89%	−0.04%	−0.63%
2013-2023	0.38%	5.04%	4.66%	6.25%

Combined Counterfactual

1998-2023	1.34%	1.89%	0.55%	−0.55%
1998-2012	1.03%	1.07%	0.04%	−0.67%
2013-2023	1.77%	3.05%	1.28%	−0.38%

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Financial Repression

- Financial repression

  occurs when governments implement policies to channel to themselves funds that in a deregulated market environment would go elsewhere.

  (Reinhart et al (2011))

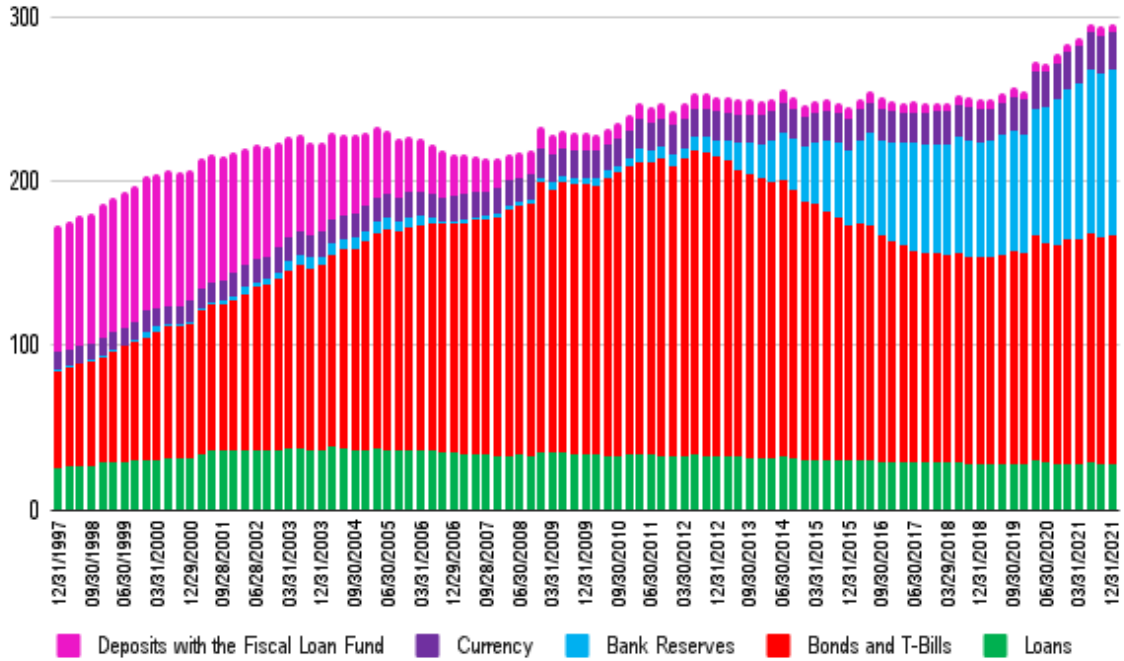
- Instruments of financial repression:
  - Directed lending by national pension funds, banks, central banks etc.
  - Non-marketable debt.
  - Caps on interest rates.
  - Government ownership of banks.
  - Macroprudential regulation.
- Commonly used to finance **wars**, even in U.S. (WW-I, WW-II, pandemic).
  - See Hall and Thomas J. Sargent (2022).
  - See Thomas J Sargent et al. (2019) for U.K., U.S., French and Italian interbellum experiences.

Japanese Financial Repression

- Prior to 2001: Cheap funding for government.
  - Participation by HH in capital markets was expensive (Kashyap et al (1999))
  - HH trapped in deposits:
    - Interest rate ceilings on deposits.
    - HH deposits at Japan Post and pension fund reserves required to fund FILF.

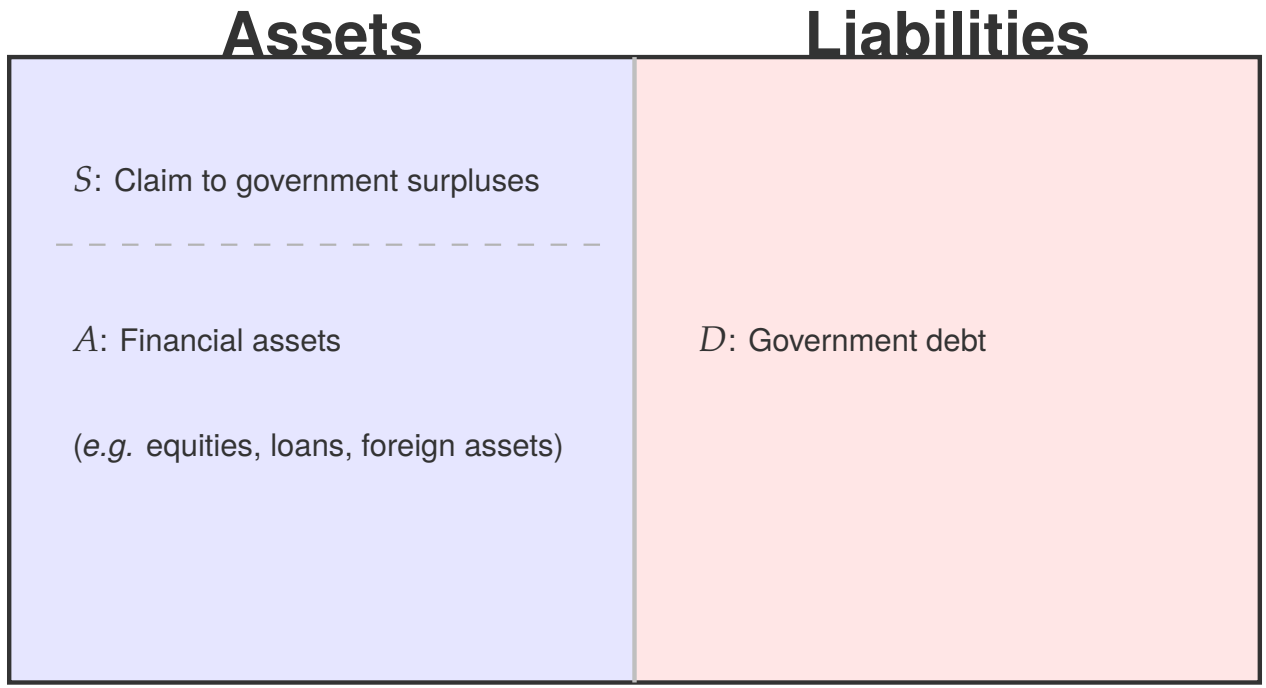
- Post-2001 liberalization: Alternative sources of cheap funding.
  - HH participation rates still low.
  - 2001: BoJ starts large scale asset purchases; Replacing FILF deposits with bank reserves at BoJ. .
  - 2016: BoJ starts YCC .
  - 2025: BoJ still buying bonds with inflation at 3% .
  - Domestic market segmented by large CIP deviations.

Financial Repression Lite



- Replacing FILF deposits with bank reserves at BoJ: BoJ starts large scale asset purchases in 2001.
- BoJ starts YCC in 2016.

Is Debt Priced Correctly?



- **No Arbitrage:** Expected Return on the government debt portfolio:

$$\mathbb{E}_t\left[R^D_{t+1} - R^f_t\right] = (1 - \tfrac{A_t}{D_t})\mathbb{E}_t\left[R^S_{t+1} - R^f_t\right] + \tfrac{A_t}{D_t}\mathbb{E}_t\left[R^A_{t+1} - R^f_t\right].$$

  - The 2023 ratio of risky assets to debt $\frac{A_t}{D_t}$ is 0.66.
- Can you run a SWF (e.g., like Norway) with borrowed money, while keeping debt risk-free?

Is Debt Priced Correctly?

- Can you run a SWF like Norway with borrowed money, while keeping debt risk-free? Not if debt is priced correctly.
- **No Arbitrage:** Expected Return on the government debt portfolio:

$$\mathbb{E}_t\left[R^D_{t+1} - R^f_t\right] = (1 - \tfrac{A_t}{D_t})\mathbb{E}_t\left[R^S_{t+1} - R^f_t\right] + \tfrac{A_t}{D_t}\mathbb{E}_t\left[R^A_{t+1} - R^f_t\right].$$

- The implied spread on risky assets A minus D:

$$\mathbb{E}_t\left[R^A_{t+1} - R^D_t\right] = (1 - \tfrac{A_t}{D_t})\mathbb{E}_t\left[R^A_{t+1} - R^S_t\right].$$

  - The 2023 ratio of risky assets to debt $\frac{A_t}{D_t}$ is 0.66.
- Claim to S needs to be much safer than D:

$$\mathbb{E}\left[R^A_{t+1} - R^S_t\right] = \mathbb{E}\left[R^A_{t+1} - R^D_t\right] \times \tfrac{1}{0.34} = \tfrac{1.9\%}{0.34} = 5.55\%.$$

  - Realized ER on risky assets $\mathbb{E}\left[R^A_{t+1}\right]$ is 1.9%.
  - Implied ER on the surplus claim $\mathbb{E}\left[R^S_t\right]$ is -2.96% $= 2.59\% - 5.55\%$
    - S needs $\beta < 0$ (counter-cyclical), but surpluses are strongly pro-cyclical.

Measuring the FR Wedge

- Government debt is overpriced:

$$\mathbb{E}_t \left[M_{t+1} R^D_{t+1} \right] < 1.$$

- **Simple case**: T and G are constant fractions of Y:

$$\beta^D_t = (1 - \tfrac{A_t}{D_t})\beta^Y_t + \tfrac{A_t}{D_t}\beta^A_t.$$

  - In 2022, the unlevered beta of equity β^Y_t in Japan is 0.45.
  - The ratio of risky assets to debt $\frac{A_t}{D_t}$ is 0.66.
  - $\beta^A_t = 0.5\beta^E_t$

- The FR wedge between realized and implied ER:

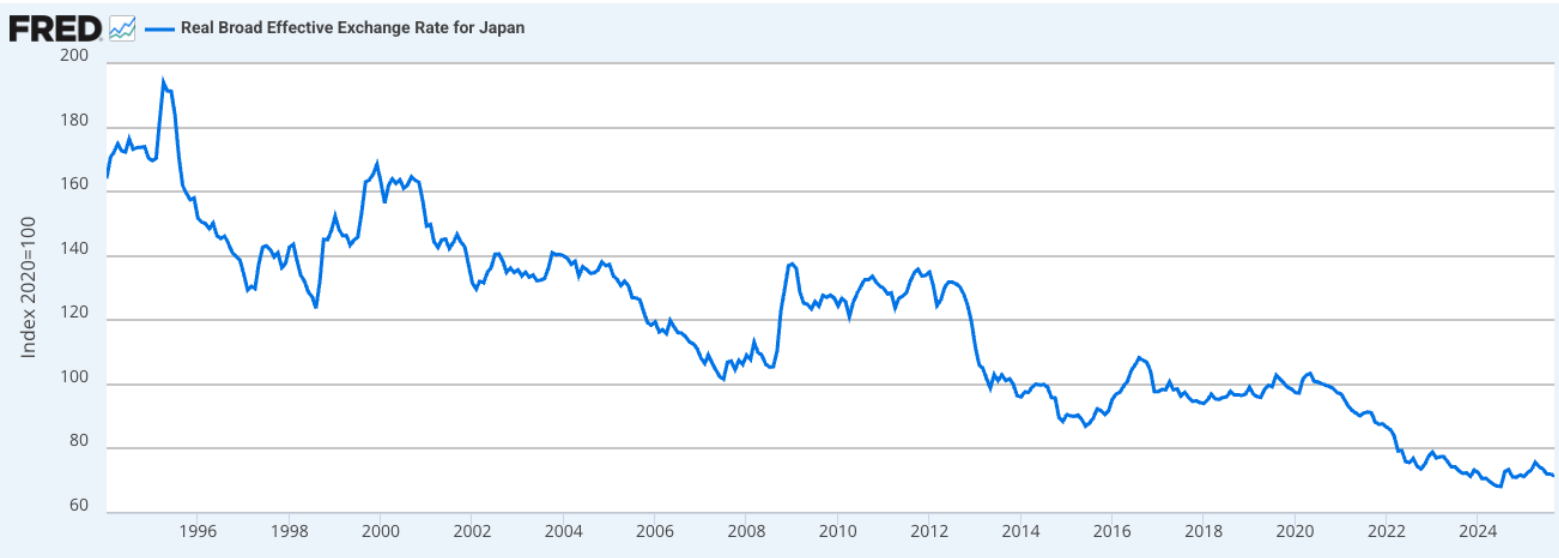
$$\varpi_t = E_t \left[R^D_{t+1} - R^f_t \right] - \left((1 - 0.66) 0.45 \beta^E_t + 0.66 \times 0.5 \beta^E_t \right) \times 5\%.$$

- ϖ_t denotes the Euler equation wedge: 182 bps.

Yen Depreciation

- The Japanese real exchange rate has depreciated by **45% over 27 years** or 1.68% per annum.
- If long-run UIP holds for the real exchange rate, then expected depreciation of USD is yield spread:

$$\mathbb{E}_t \Delta s_{t \to t+k} \approx k(y_t^{\$,k} - y_t^{Yen,k})$$



- For long k, % deviation of the real exchange rate from the long-run mean is spread: $(s^* - s_t) \approx k(y_t^{\$,k} - y_t^{Yen,k})$.
- As JPY yields decline, JPY has to depreciate.

Backing out the Wedge

- The Japanese real exchange rate has depreciated by **45% over 27 years** or 1.68% per annum.
  - For long k, this implies that the % deviation of the real exchange rate from the long-run mean is determined by the spread:

$$(s^* - s_t) \approx k(y_t^{\$,k} - y_t^{Yen,k}).$$

    - % Depreciation of the Yen is the change in the long yield differential:

$$\Delta(s_{t \to t+N}) \approx N \left((y_{t \to t+N}^{\$,k} - y_{t \to t+N}^{Yen,k}) - (y_t^{\$,k} - y_t^{Yen,k}) \right)$$

      over 27 years.
    - If the long-term real Japanese rate in 2023 was 168 bps higher than it is now, then the Japanese Yen would not have depreciated between 1997 and 2023.
    - The 182 bps wedge accounts for the entire real depreciation of the Yen.

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Foreign Investment

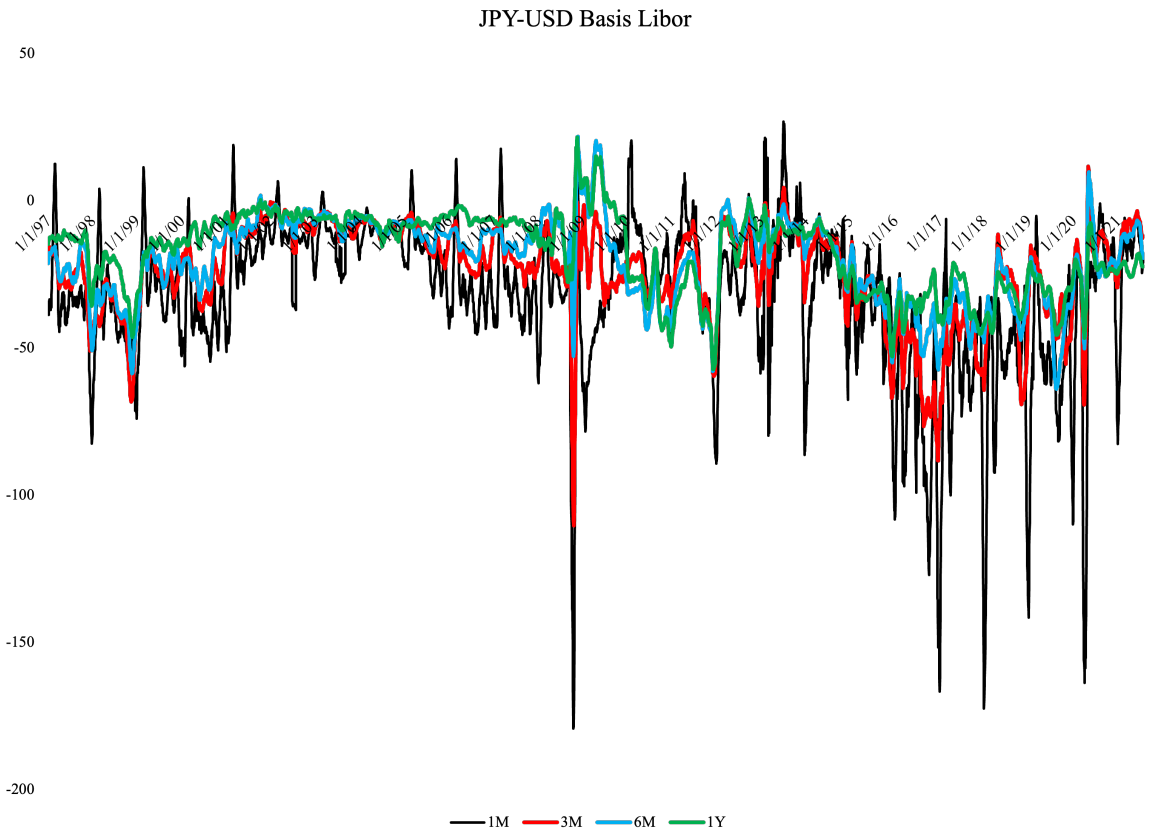
- Why don't Japanese financial intermediaries invest abroad? They have to hedge (part of the) currency risk (unlike government sector).
- CIP deviations.

- Let S_t denote Yen per dollar.

  where $\rho_{t,t+n} = (1/n)(f_t^n - s_t)$ denotes the forward premium (logs) from forward f_t^n and spot s_t.
- To hedge USD a Japanese investor is borrowing synthetic dollars at rate $(r_{t,t+n}^{Libor} - \rho_{t,t+n})$.
- The Libor basis USD/Yen basis is defined as:

$$x_{t,t+n} = r_{t,t+n}^{\$,Libor} - (r_{t,t+n}^{Libor} - \rho_{t,t+n}).$$

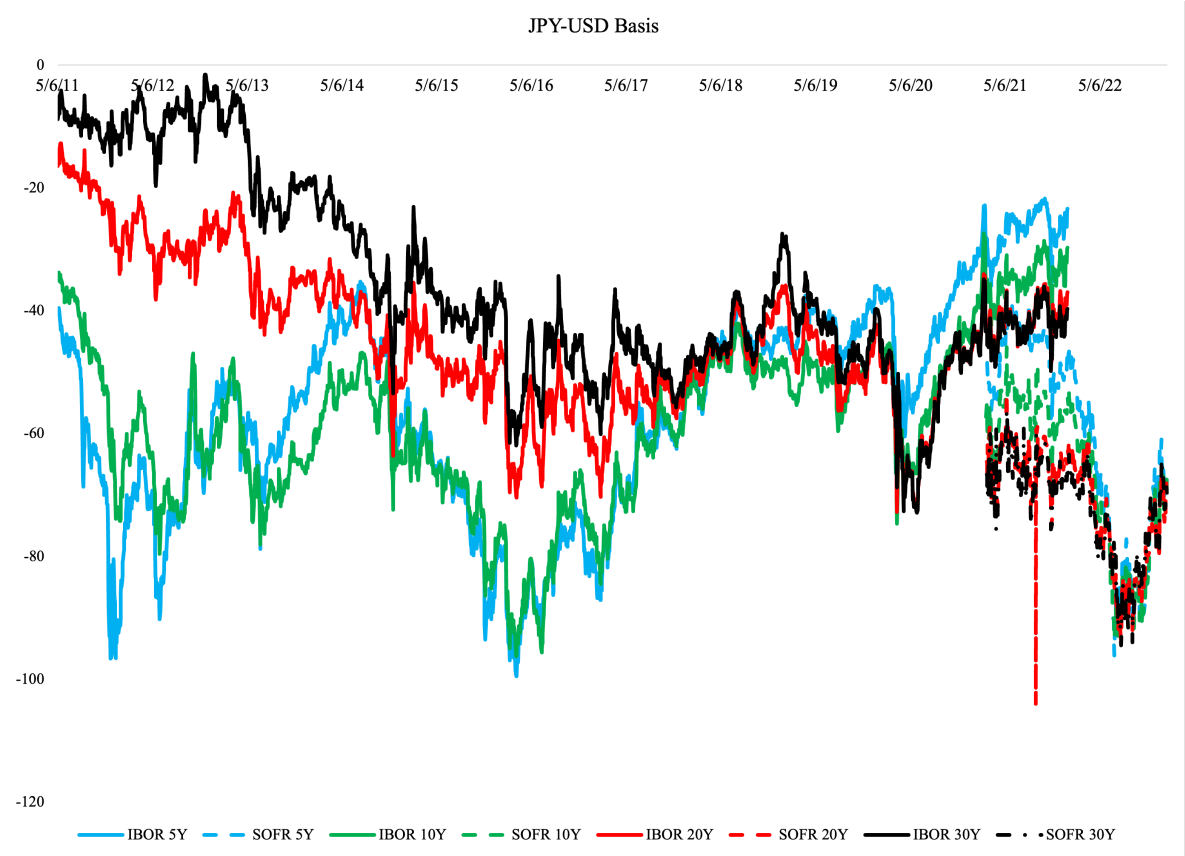
LIBOR CIP Deviations



Libor USD/Yen basis: $x_{t,t+n} = r^{\$,Libor}_{t,t+n} - (r^{Libor}_{t,t+n} - \rho_{t,t+n})$, with $\rho_{t,t+n} = (1/n)(f^n_t - s_t)$.

- Since the GFC, large negative bases have opened up in USD/Yen and have persisted.

LIBOR CIP Deviations



Libor USD/Yen basis: $x_{t,t+n} = r^{\$,Libor}_{t,t+n} - (r^{Libor}_{t,t+n} - \rho_{t,t+n})$, with $\rho_{t,t+n} = (1/n)(f^n_t - s_t)$.

- Since the GFC, large negative bases have opened up in USD/Yen and have persisted.

CIP Deviations as Footprint of FR

- Japanese intermediaries must intermediate about $3\times$ GDP in deposits, insurance, pensions (large domestic Yen depositor to be invested in dollars).

- They cannot replicate the government's foreign investment strategy:
  - They must hedge at least part of the currency risk.
  - Hedging demand for synthetic dollars pushes up synthetic dollar rate, lowers the basis:

$$x_{t,t+n} = r^{\$,Libor}_{t,t+n} - \underbrace{(r^{Libor}_{t,t+n} - \rho_{t,t+n})}_{\text{Cost of synthetic dollars}} .$$

  - The negative basis is akin to a tax on hedged foreign currency investments.
- Low-rate currencies (surplus countries) tend to have more negative bases vs USD as investors seek higher returns abroad (Du, Tepper, and Verdelhan, 2018).
- Connection with financial repression:
  - BoJ's QQE and negative rates widen USD/JPY basis.

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Negative Duration of Net Debt

- Duration measures interest rate sensitivity of an asset

$$\Delta P/P \approx -\textit{Duration} \times \Delta r$$

- Net debt ND of about 147% of GDP.

- Negative duration of 22 years for net debt ND : $\frac{D}{ND} \times \textit{Dur}^D - \frac{A}{ND} \times \textit{Dur}^A$.

  1. The duration of risky assets A is around 29 years.
     - The duration of equity is 75.66 years.
     - The duration of bonds is 7.19 years.
     - The duration of loans is 3 years.
     - The duration of deposits (cash and bank reserves) is 1 year (0 years).
  2. The duration of liabilities D is only 3.69 years.

- But surpluses are far in the distant future.

Government Duration Mismatch

- Iterate forward on the government's budget constraint to obtain debt valuation expression:

$$\text{Net Debt} = \mathbb{E}_0 \sum_{t=0}^{\infty} R^{-t}(T_t - G_t).$$

- Gauge the effect of real rate declines on the government's spending possibilities:
  - (a) If $Dur^{Debt} < Dur^{T-G}$ then spending possibilities expand when the interest rate falls.
  - (b) If $Dur^{Debt} > Dur^{T-G}$ then spending possibilities contract.
- Japan is in case (a): Negative $D^{NetDebt}$ of 22 yrs because $Dur^{A} \gg Dur^{D}$, and Dur^{T-G} of 55 yrs.

$$\text{Net Debt} \searrow \ll \mathbb{E}_0 \sum_{t=0}^{\infty} R'^{,-t}(T_t - G_t) \nearrow$$

- Rate decrease generates extra fiscal capacity.
- Gov't is borrowing at lower rates for a long time (because surpluses are far away).

Roadmap

1. Looking Backwards: Debt Dynamics
2. Net Debt Dynamics for Japanese Public Sector
3. Quantifying Financial Repression
4. Tax on Foreign Investments
5. Gov't Duration Mismatch and Fiscal Capacity
6. HH Duration Mismatch and Welfare Losses

Japanese HH Balance Sheet: Trapped in Deposits.

	Japan		U.S.	
% of GDP, Year End	1997	2023	1997	2023
Assets				
Currency and Deposits	127.6%	188.9%	43.4%	61.8%
Debt Securities	11.7%	4.8%	20.0%	20.3%
Equities	20.4%	63.4%	128.2%	196.9%
Insurance & Pension	63.1%	90.2%	112.0%	117.3%
Other Assets	12.8%	11.9%	10.6%	9.7%
Sum	**253.7%**	**352.9%**	**314.1%**	**406.0%**
Liabilities				
Loans	64.8%	61.9%	63.2%	69.0%
Other Liabilities	10.5%	2.4%	0.2%	0.1%
Sum	**75.3%**	**64.4%**	**63.5%**	**69.1%**
Net Wealth	**160.4%**	**294.8%**	**250.6%**	**336.9%**

Unit: % of GDP. Source: Japan's Flow of Funds. Federal Reserve Board of Governors, Z.1 Financial Accounts of the United States, Table B.101.h.

Asset Market Participation.

Income Quintile	1st	2nd	3rd	4th	5th	Avg
Demand Deposits	65	74	76	81	86	**76**
Time Deposits	46	55	58	59	70	**57**
Securities (stocks, bonds and trust)	12	19	22	26	37	**23**
Stocks	7	12	15	18	28	**16**
Unit & Open-end Trust	6	10	10	13	18	**12**

Unit: Percentage of Households. Source: National Survey of Family Income, Consumption and Wealth 2019 Report: Table 4-20.

Duration Mismatch on Japanese HH Balance Sheet

- **Duration mismatch** on JP stand-in HH balance sheet.
- Mismatch especially pronounced for young JP households who hold mainly deposits (no duration).
  - A decrease in real rates shrinks consumption possibility set, because
    1. The young's financial wealth has little duration (no capital gains),
    2. But the young need to finance future consumption out of savings at a low rate (excess consumption has high duration). (Greenwald et al., 2022)
  - These households will be future net buyers of assets at higher prices.
- Large welfare losses for young non-participants.
- Financial Repression is a regressive tax on young non-participants.

Household Duration

- Iterate forward on the HH budget constraint to obtain expression for financial wealth:

$$\theta_0 = \mathbb{E}_0 \sum_{t=0}^{\infty} R^{-t}(C_t - Y_t).$$

- Gauge the effect of real rate declines on the household's consumption possibilities (Greenwald et al., 2022):
  - (a) If $Dur^{\theta} > Dur^{c-y}$ then consumption possibilities expand when the rate falls.
  - (b) If $Dur^{\theta} < Dur^{c-y}$ then consumption possibilities contract.
  - (c) If $Dur^{\theta} = Dur^{c-y}$ then households is perfectly hedged.
- In case (c), when rates fall: perfectly hedged.

$$\theta_0' \nearrow\nearrow = \mathbb{E}_0 \sum_{t=0}^{\infty} R'^{,-t}(C_t - Y_t) \nearrow\nearrow .$$

Household Duration

- Gauge the effect of real rate declines on the household's consumption possibilities (Greenwald et al., 2022):
  - (a) If $Dur^{\theta} > Dur^{c-y}$ then consumption possibilities expand when the rate falls.
  - (b) If $Dur^{\theta} < Dur^{c-y}$ then consumption possibilities contract.
- In case (b), when rates fall:

$$\theta_0' \nearrow \ll \mathbb{E}_0 \sum_{t=0}^{\infty} R'^{,-t}(C_t - Y_t) \nearrow \nearrow .$$

  - Lower real rates $\longrightarrow$ young Japanese households (deposit savers) are worse off.
- In case (a), when rates fall:

$$\theta_0' \nearrow \ll \mathbb{E}_0 \sum_{t=0}^{\infty} R'^{,-t}(C_t - Y_t) \nearrow \nearrow .$$

  - Lower real rates $\longrightarrow$ older households with bonds/equities are better off.

The Welfare Cost of a 1% Decline in Interest Rate

- The welfare gain (Greenwald et al., 2022; Fagereng et al., 2022):

$$\textit{Welfare gain}_j(\theta, z) \approx (Dur^{c-y} - Dur^{\theta})\theta_0 \times d\log R.$$

- Assumption: Euler equation holds.
- We compute Dur^{c-y} for cross-section of Japanese households.
- Large welfare losses for young non-participants. ▸ Welfare losses

Non-Participants						
Inc. Dec.	under 35	35 to 44	45 to 54	55 to 64	64 to 74	75 & above
5th	9.1	8.5	7.8	6.4	4.1	−0.6
Participants						
5th	−1.0	1.0	−1.1	−17.7	−20.3	−25.1

Traditional Macro View

- Advanced economies experiencing:
  1. Demographic transition (see, e.g., Auclert et al., 2021)
  2. Secular stagnation (see, e.g., Eggertsson, Neil R Mehrotra, and Summers, 2016)
  3. Increase in inequality (Mian, Straub, and Sufi, 2020)
- Forces lead to lower equilibrium long-run real rates (neutral w.r.t. monetary and fiscal policy).

- Creates extra fiscal capacity (Blanchard, 2019; Neil R. Mehrotra and Sergeyev, 2021).

- Economies bump into **ZLB**; CBs deploy large-scale asset purchases to lower long-term nominal rates.
  - Guided by r^* estimates (Laubach and Williams, 2003; Laubach and Williams, 2016; Holston, Laubach, and Williams, 2017).

This Paper: Alternative (Complementary) View

- Advanced economies experiencing:
  - Demographic transition
  - Secular stagnation
- Forces lead to large government deficits.

- Low-rate policies: governments lower real rate on government debt *to create extra fiscal capacity*.
  - CBs deploy large-scale asset purchases to lower long-dated real rates (Bianchi, Lettau, and Ludvigson, 2022).
  - Government debt appears expensive (Jiang et al., 2019; Di Tella et al., 2023).
- Heterogeneity in duration of HH financial wealth $\Longrightarrow$ increased wealth inequality (Auclert, 2019; Greenwald et al., 2022)
  - Not just paper gains and losses.

Conclusion

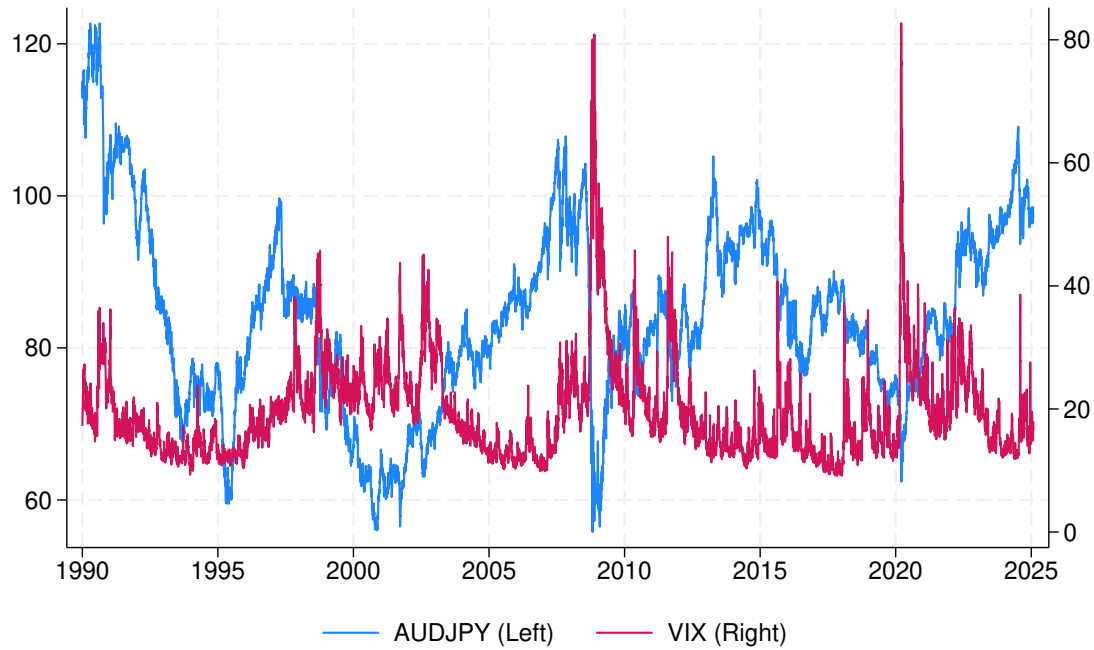
- Consolidate Japanese government's balance sheet.
- Japanese government engaged in risky maturity transformation (with financial repression).
- Japanese government engaged in global currency carry trade (with financial repression).

- Japanese government has engineered large maturity mismatch between surpluses and debt.
  - Duration mismatch on government balance sheet: fiscal capacity boost from lower real rates

- Japanese households have large maturity mismatch between spending needs and assets.
  - Duration mismatch on HH balance sheet: large welfare losses (gains) for young non-participants (older participants)

Currency Carry Trade

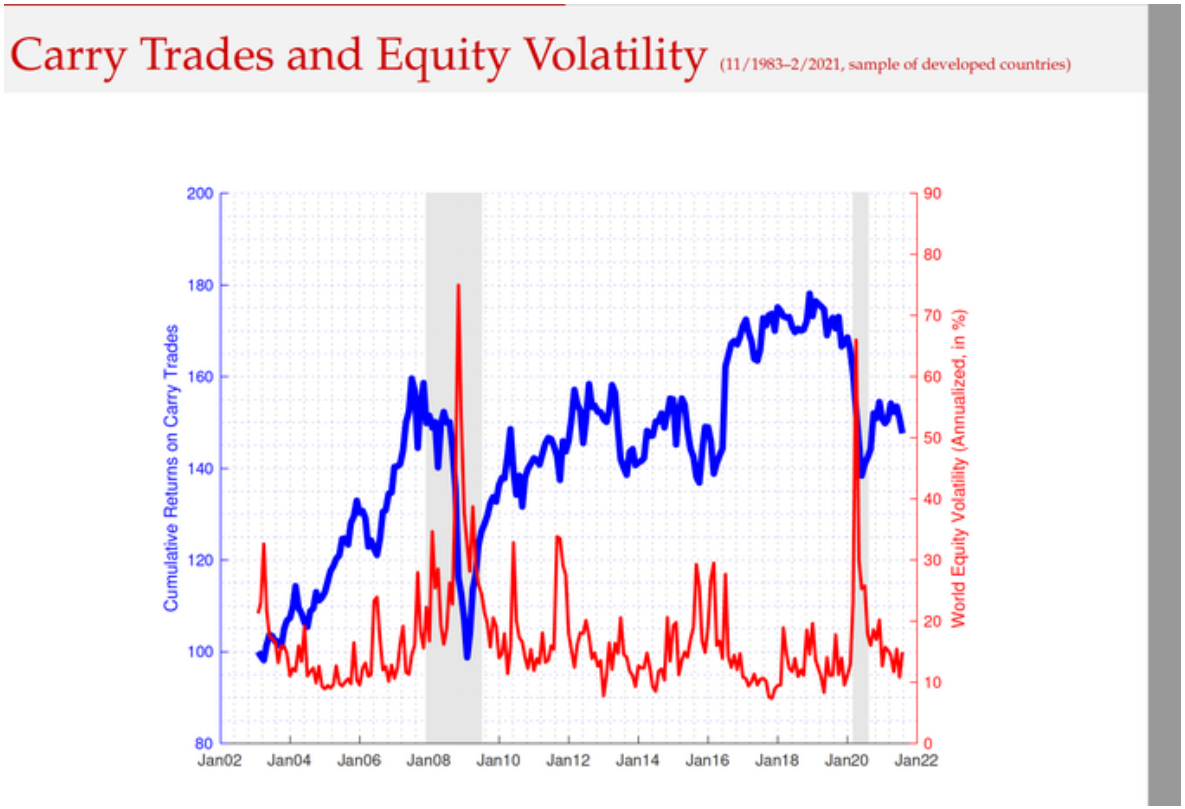
- Persistent rate differentials across DM and EM
- Persistently high (low) y_t^* $\Longrightarrow$ persistently high (low) FXRP e.g. AUD,NZD (CHF,JPY).



This figure plots the Yen/AUD exchange rate against the VIX.

Currency Carry Trade

- Persistent rate differentials across DM and EM
- long (short) in portfolios of high (low) interest rate currencies.



This figure plots the returns on Global Currency Carry Trade (Data from Adrien Verdelhan, MIT.

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Welfare Cost of 1% Decline in R.

Non-Participants						
	Age Group					
Inc. Dec.	under 35	35 to 44	45 to 54	55 to 64	64 to 74	75 & above
5th	9.1	8.5	7.8	6.4	4.1	−0.6
Participants						
5th	−1.0	1.0	−1.1	−17.7	−20.3	−25.1