Measuring U.S. Fiscal Capacity using Discounted Cash Flow Analysis

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Valuation using Textbook Finance

- Government securitizes claim to surpluses

Assets	Liabilities
$PV_{2021}(\{T\})$	$PV_{2021}(\{G\})$
	Debt

- Debt is fully backed by PDV of surpluses; Fiscal Capacity:

$$PV_{2021}(\{T-G\}_{2022}^{2052}) + PV_{2021}(D_{2052}) = PV_{2021}(\{T-G\}_{2022}^{\infty})$$

- Suppose U.S. government collects tax revenue T/Y, spends G/Y and runs surplus S/Y that are constant as % of GDP.

$$PV_{2021}(\{T-G\}) = \frac{S}{Y}\sum_{j=1}^{\infty}\frac{Y_{2021+j}}{(1+r^{\$,y})^j} = pd^y \times \frac{S}{Y} \times Y_{2021}.$$

  - Only GDP is risky in this calculation
  - Measure of extra fiscal capacity per % of surplus (as fraction of GDP): Total Wealth/GDP Ratio

$$pd^y = \frac{1}{\dots} = \frac{1}{\dots}$$

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$$pd^y = \frac{1}{r^{\$,y}-g} = \frac{1}{r^f + term + rp^y - g}$$

  - $r^f - g$ is not sufficient statistic; depends on risk-free rate r^f and growth rate g, but also on term premium and GDP risk premium rp^y (unlevered equity premium).

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U.S. Steady-State Fiscal Capacity

- Total wealth/GDP ratio is given by

$$pd^y = \frac{1}{(r^f + term) + rp^y - g} = \frac{1}{2.07\% + 2.60\% - 3.50\%} = \frac{1}{1.17\%} = 85.8$$

- Total wealth is $85 \times GDP$
- What is steady-state surplus S/Y needed to get to $PV_{2021}(\{T-G\}) = 0.99 \times Y_{2021}$?

Assets/GDP		Liabilities/GDP	
$PV_{2021}(\{T\})/Y_{2021}$	$19.7 = 23.06\% \times 85.8$	$PV_{2021}(\{G\})/Y_{2021}$	$18.7 = 21.9\% \times 85.8$
		D/Y_{2021}	$0.99 = 1.16\% \times 85.8$

- Need a steady-state primary surplus of 1.16% of GDP to get to $D/Y = 0.99$
- CBO projects deficits of 3.19% until 2052.

Upper Bound on U.S. Steady-State Fiscal Capacity

- But tax revenue T/Y is pro-cyclical (risky) and spending G/Y is counter-cyclical (safer)
  - Higher risk premium on T claim $rp^T > rp^Y$; lower risk premium on G claim $rp^G < rp^Y$
  - Lower multiple on T claim $pd^T < pd^Y$; higher multiple on G claim $pd^G > pd^Y$

Assets/GDP		Liabilities/GDP	
$PV_{2021}(\{T\})/Y_{2021} \leq$	$19.7 = 23.0\% \times 85.8$	$PV_{2021}(\{G\})/Y_{2021} \geq$	$18.7 = 21.9\% \times 85.8$
		$D/Y_{2021} \leq$	$0.99 = 1.16\% \times 85.8$

- 0.99 is really an upper bound on fiscal capacity

$$PV_{2021}(\{T - G\}) \leq pd^y \times \frac{S}{Y} \times Y_{2021} = 0.99 \times Y_{2021}.$$

Boost Treasury's Fiscal Capacity

- Unless you think ..Treasury will start to run large surpluses during pandemics and financial crises
- Suppose tax revenue T/Y is counter-cyclical (safe) and spending G/Y is pro-cyclical (in PDV) (risky)

$$PV_{2021}(\{T-G\}) = pd^T \times \frac{T}{Y} \times Y_{2021} - pd^G \times \frac{G}{Y} \times Y_{2021}.$$

  - We can have steady-state deficits $\frac{T}{Y} << \frac{G}{Y}$ and positive fiscal capacity iff $pd^T > pd^Y > pd^G$

Assets/GDP		Liabilities/GDP	
$PV_{2021}(\{T\})/Y_{2021} \geq$	$\frac{T}{Y} \times 85.8$	$PV_{2021}(\{G\})/Y_{2021} \leq$	$\frac{G}{Y} \times 85.8$
		$FC \geq$	$\frac{S}{Y} \times 85.8$

- Taxpayers provide insurance and U.S. Treasury collects insurance premium
- Not what Treasury does (see Pandemic, GFC, etc.) or will do anytime soon!

Textbook Finance vs. Bubbly Finance

1. **Deterministic Economies Approach** ($rp^y = 0$): Debt is not fully backed by PDV of surpluses; $PV_{2021}(D_{2221}) \not\to 0$ because we're discounting at $r^f - g < 0$
   - We can keep rolling over the debt ;There's a lot more wealth than you think! $pd^y \to \infty$

	Assets		Liabilities	
Until 2221	$PV_{2021}(\{T\}_{2022}^{2221})$		$PV_{2021}(\{G\}_{2022}^{2221})$	
After 2221	$PV_{2021}(D_{2221})$	$\not\to \$0$		
			D	$PV_{2021}(\{T-G\}_{2022}^{2221} + D_{2221})$

2. **Our Textbook Finance Approach** ($rp^y > 0$): Debt is fully backed by PDV of surpluses; $PV_{2021}(D_{2221}) \to 0$ because we're discounting at $r^f + term + rp^y - g > 0$
3. **Bubbly Finance Approach.** ($rp^y \approx 0$): Debt is not fully backed by future surpluses and PDV of future debt $PV_{2021}(D_{2221}) \not\to 0$ because we're discounting at $DR < 0$
   - Bubble in some long-lived assets, typically in models without long-lived investors; Total wealth/GDP ratio $pd^y \to \infty$ (missing investors, missing wealth hypothesis)

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   - We cannot keep rolling over the debt because r^f cannot always be smaller than g without creating arb. opps.

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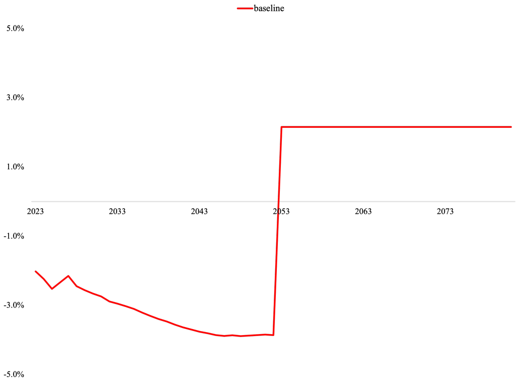
Need to believe U.S. Treasury has special ability to engineer bubbles. U.K. has not been able to do this in 3 centuries.

U.K.	1729 – 1914	1729 – 1946	1946 – 2020
S/Y	2.5%	1.2%	1.8%

Outline

1. Simple Steady-State Example
2. **Fiscal Capacity Measurement using CBO Projections**
3. Duration Mismatch

U.S. Treasury Balance Sheet using CBO Projections



- feed in CBO surplus projections until 2052 and projected $(D/Y)_{2052}$ is 185%.
- **Assumption**: Treasury runs surpluses of 2.16% after 2052 such that $(D/Y)_{2052} = 85.8 \times 2.16\% = 185\%$

U.S. Treasury Balance Sheet using CBO Projections

- CBO projects surpluses until 2052 and debt outstanding at 2052.

	Assets		Liabilities	
Until 2052	$PV_{2021}(\{T\}_{2022}^{2052})$	\$124.95	$PV_{2021}(\{G\}_{2022}^{2052})$	\$146.11
After 2052	$PV_{2021}(D_{2052})$	\$33.54		
			Fiscal Capacity	\$ 12.38

- Baseline fiscal capacity estimate of \$ 12.38 trillion:

$$PV_{2021}^{upper}(\{T-G\}_{2022}^{2052}) + PV_{2021}^{upper}(D_{2052}) = -\$21.16 + \$33.54 = \$12.38 \text{ tr.} << \$22.40 \text{ tr.}$$

- Fiscal capacity limited in spite of low rates
- Market is pricing in large fiscal correction (relative to CBO projections) or financial repression (e.g., Japan)

U.S. Treasury Balance Sheet with Convenience Yields

- US. Treasurys are special and earn convenience yields.
- **Assumption**: Treasury collects $0.60\% \times 99.6\% = 0.598\%$ of GDP in convenience-yield revenues per year

	Assets		Liabilities	
Until 2052	$PV_{2021}(\{T\}_{2022}^{2052})$	\$124.95	$PV_{2021}(\{G\}_{2022}^{2052})$	\$146.11
Until 2052	$PV_{2021}(\{CS\}_{2022}^{2052})$	\$4.04		
After 2052	$PV_{2021}(D_{2052})$	\$33.54		
			Fiscal Capacity	\$ 16.42

- Extended fiscal capacity estimate of \$ 16.42 trillion:

$$PV_{2021}^{upper}(\{T-G\}_{2022}^{2052}) + PV_{2021}^{upper}(D_{2052}) + PV_{2021}^{upper}\left(\{CS\}_{2022}^{2052}\right) = \$12.38 + \$4.04 = \$16.42 \text{ tr.}$$

Creating a Bubble

- We can reverse-engineer $rp^y = 1.37\%$ to match the valuation of Treasurys at $22.40 tr.

	Assets		Liabilities	
Until 2052	$PV_{2021}(\{T\}_{2022}^{2052})$	$150.57	$PV_{2021}(\{G\}_{2022}^{2052})$	$176.55
After 2052	$PV_{2021}(D_{2052})$	$48.38		
			Fiscal Capacity	$ 22.40

- Fiscal capacity estimate boosted to $ 22.40 trillion by increasing PDV of future debt:

$$PV_{2021}^{upper}(\{T-G\}_{2022}^{2052}) + PV_{2021}^{upper}(D_{2052}) = -\$25.98 + \$48.38 = \$22.40 \text{ tr.}$$

- We have generated a bubble: $pd^y \to \infty$

$$(r^f + term) + rp^y - g = 2.07\% + 1.37\% - 3.50\% < 0.$$

- All un-levered companies growing at rate of GDP have infinite valuations; Missing wealth hypothesis!

Outline

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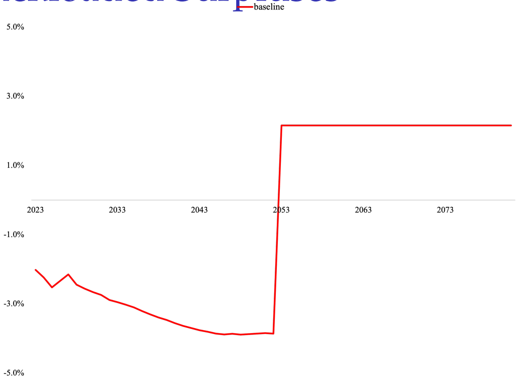
3. **Duration Mismatch**

Backloaded Surpluses

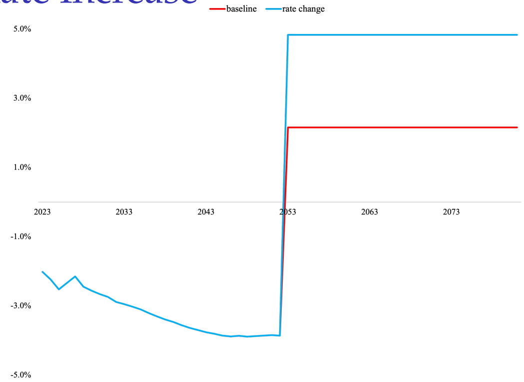


- Treasury runs primary deficits of 3.19% until 2052 ; projected $(D/Y)_{2052}$ 185%
- Treasury runs primary surpluses of 2.16% after 2052 such that $(D/Y)_{2052} = 85.8 \times 2.16\% = 185\%$
- Surpluses have high duration, but the Treasury's debt does not.

	Net Cash Inflows		Cash Outflows	
Until 2052	$PV_{2021}(\{T-G\}_{2022}^{2052})$	(\$21.16)		
After 2052	$PV_{2021}(D_{2052})$	\$33.54		
			FC	\$ 12.38

- Treasury has not matched cash inflows and outflows.

Rate Increase



- Consider permanent rate shock of 100 bps.
- Treasury runs primary surpluses of 4.82% after 2052 such that $(D/Y)_{2052} = 46.18 \times 4.82\% = 223\%$
- An increase in steady-state surpluses by 2.67% of GDP

	Net Cash Inflows		Cash Outflows
Until 2052	$PV_{2021}(\{T-G\}_{2022}^{2052})$	(\$18.07)	
After 2052	$PV_{2021}(D_{2052})$	\$30.09	
			FC \$ 12.03

- Lower risk-free rates and rp^y increase FC, but also increase duration mismatch.

What do you Think?

- Simple framework based in textbook finance for analyzing fiscal capacity using CBO projections
- U.S. Treasury's fiscal capacity is probably more limited than you think, ..unless you think
  - U.S. GDP risk premium is very low and there is a more wealth than commonly thought
  - U.S. Treasury has engineered permanent violations of the no-bubble constraints in securities markets
- Backloading of Surpluses Exposes Treasury to Interest Rate Risk, especially if you think
  - GDP risk premium is very low and there is a more wealth than commonly thought