



How much debt is too much?

Deficit vs debt, the debt-to-GDP ratio, interest, r vs g , the primary surplus a country needs, and what Greece and Japan show.

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Flow · stock

deficit · debt

- **Deficit** = spending – taxes, **one year = flow** (tap) · toy: $\$200\text{B} - \$180\text{B} = \$20\text{B}$
- **Debt** = all money owed today = **stock** (water in the tub) · $\$500\text{B} + \$20\text{B} = \$520\text{B}$ · any deficit $\Rightarrow$ debt $\uparrow$
- **Bond** = promise to pay back later + **interest** · buyers: banks · pension funds · foreigners · central bank

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Yardstick

debt $\div$ GDP

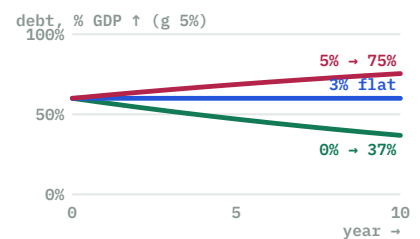
- **GDP** = all a country makes in a year = size of the tub · **ratio** = $\frac{\text{debt}}{\text{GDP}} = 500 \div 1,000 = 50\%$
- $\$900\text{B}$ on GDP $\$3,000\text{B} = 30\% < \500B on $\$1,000\text{B} = 50\% \Rightarrow$ more dollars, lighter debt

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Flat ratio

deficit = $g \times \text{ratio}$

- g = GDP growth rate ·
 $\text{ratio next year} = (\text{ratio} + \text{deficit}) \div (1 + g)$ · flat if
 $\text{deficit} = g \times \text{ratio}$
- Lesson: ratio 50%, g 4% $\Rightarrow$ deficit **2%** · debt $\$500\text{B} \rightarrow \740B , GDP $\$1,000\text{B} \rightarrow \$1,480\text{B}$, ratio still 50% · deficit 0 $\rightarrow$ 34% · 5% $\rightarrow$ 74%
- Practice: ratio 60%, g 5% $\Rightarrow$ deficit **3%** · 5% $\rightarrow$ **75%** · g falls to 3%, deficit 3% $\Rightarrow$ ratio $\uparrow$ to **70%** (flat deficit now 1.8%)



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Interest

bill · primary deficit

- **Interest bill** = $\text{debt} \times \text{rate}$ · $3\% \times \$500\text{B} = \15B a year
- **Primary deficit** = deficit **without** interest · $\$20\text{B} - \$15\text{B} = \$5\text{B}$
- Practice: debt $\$800\text{B}$, rate 5%, deficit $\$60\text{B} \Rightarrow$ interest **\\$40B** · primary deficit **\\$20B** · debt **\\$860B** (whole deficit is borrowed)

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r vs g

rate against growth

- r = interest rate · no primary deficit $\Rightarrow$ debt grows at r , GDP at g · $R < G$ ratio **falls** · $R > G$ ratio **rises** · $r = g \Rightarrow$ flat
- Debt 100%: r 2%, g 4% $\Rightarrow 102 \div 104 \approx 98\%$ · r 6%, g 2% $\Rightarrow 106 \div 102 \approx 104\%$ · $g < 0$ (slump) $\Rightarrow$ worst case
- **Primary surplus** to stay flat = $(r - g) \times \text{ratio}$ · ratio 100%, r 5%, g 3% $\Rightarrow$ interest 5% – allowed deficit 3% = **2% of GDP** (check: $103 \div 1.03 = 100$)
- Bill: $A = 1\% \times 200\% = 2\%$ of GDP · $B = 5\% \times 100\% = 5\%$ $\Rightarrow$ rate matters as much as debt

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Evidence

Greece · Japan

- **Greece** · 2009 debt **127%** of GDP · deficit **15.4%** · $\approx \frac{1}{4}$ owed abroad · 10-year rate 5.2% (2009) $\rightarrow$ **22.5%** (2012 avg) · GDP $\approx -25\%$ 2008-13 · debt $\approx 175\%$ (2013) · May 2010 rescue **€110B** (euro countries + IMF) for cuts
- **Debt spiral** = doubt $\Rightarrow$ higher rate $\Rightarrow$ bigger bill $\Rightarrow$ ratio $\uparrow$ $\Rightarrow$ more doubt · **austerity** in a slump: $\$120\text{B} \div \$96\text{B} = 125\%$ (= $\$125\text{B} \div \100B without cuts) · how much of the fall came from cuts: **debated**
- **Japan** · debt $\approx 200\%$ (2009) $\rightarrow$ **240%** (2023) · 10-year rate $\approx 1\%$ or less · owed **at home** · **in yen** (central bank issues it; holds $\approx$ half) · Greece: euros, cannot print
- Japan rate 1% $\rightarrow$ 3% $\Rightarrow$ bill 2.4% $\rightarrow$ **7.2%** of GDP · own money removes the risk of running out of it, not of higher rates

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Trade-off

who pays · card

- **Who pays** $\rightarrow$ future taxpayers (taxes $\uparrow$ or spending $\downarrow$ later) · **crowding out** = borrowing $\Rightarrow$ rates $\uparrow \Rightarrow$ firms invest $\downarrow \Rightarrow$ growth $\downarrow$ later (Macro 8) · borrowing pays for itself only if it **widens the tub** (roads, schools) or in a deep recession (Policy 8)
- **FOR** spreads cost of roads, schools, slumps · $r < g \Rightarrow$ ratio shrinks, no pain · **AGAINST** interest each year · crowding out · crisis risk when lenders take fright
- **Positive** “Greece 2009: 127%” $\neq$ **normative** “never owe more than GDP” (values)
- Policy card: problem **deficits pile up** $\rightarrow$ tool **borrow** · **cut** · **tax** $\rightarrow$ model **ratio = debt $\div$ GDP** · flat if deficit = $g \times \text{ratio}$ · falls if $r < g \rightarrow$ evidence **Greece 127%**, rates $> 20\%$ · **Japan 240%**, $\approx 1\%$ $\rightarrow$ trade-off **help now vs interest** · crisis risk