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.

1 Flow · stock

deficit · debt

- **Deficit** = spending − taxes, **one year** = **flow** (tap) · toy: $200B − $180B = **$20B**
- **Debt** = all money owed today = **stock** (water in the tub) · $500B + $20B = **$520B** · any deficit ⇒ debt ↑
- **Bond** = promise to pay back later **+ interest** · buyers: banks · pension funds · foreigners · central bank (public bank that issues the money)

2 Yardstick

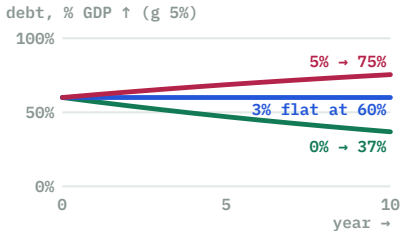
debt ÷ GDP

- **GDP** = all a country makes in a year = size of the tub · **ratio** = `debt ÷ GDP` = 500 ÷ 1,000 = **50%**
- $900B on GDP $3,000B = **30%** < $500B on $1,000B = 50% ⇒ more dollars, lighter debt

3 Flat ratio

deficit = g × ratio

- **g** = GDP growth rate · `ratio next year = (ratio + deficit) ÷ (1 + g)` · **flat** if `deficit = g × ratio`
- Lesson: ratio 50%, g 4% ⇒ deficit **2%** · debt $500B → **$740B**, GDP $1,000B → $1,480B, ratio still 50% · deficit 0 → 34% · 5% → 74%
- Practice: ratio 60%, g 5% ⇒ deficit **3%** · 5% → **75%** · g falls to 3%, deficit 3% ⇒ ratio ↑ to **70%** (flat deficit now 1.8%)



4 Interest

bill · primary deficit

- **Interest bill** = `debt × rate` · 3% × $500B = **$15B** a year
- **Primary deficit** = deficit **without** interest · $20B − $15B = **$5B**
- Practice: debt $800B, rate 5%, deficit $60B ⇒ interest **$40B** · primary deficit **$20B** · debt **$860B** (whole deficit is borrowed)

5 r vs g

rate against growth

- **r** = interest rate · no primary deficit ⇒ debt grows at **r**, GDP at **g** · `R < G` ratio **falls** · `R > G` ratio **rises** · r = g ⇒ flat
- Debt 100%: r 2%, g 4% ⇒ 102 ÷ 104 ≈ **98%** · r 6%, g 2% ⇒ 106 ÷ 102 ≈ **104%** · g < 0 (slump) ⇒ worst case
- **Primary surplus** to stay flat = `(r − g) × ratio` · ratio 100%, r 5%, g 3% ⇒ interest 5% − allowed deficit 3% = **2% of GDP** (check: 103 ÷ 1.03 = 100)
- Bill: A = 1% × 200% = **2%** of GDP · B = 5% × 100% = **5%** ⇒ rate matters as much as debt

6 Evidence

Greece · Japan

- **Greece** · 2009 debt **127%** of GDP · deficit **15.4%** · ≈ ¾ owed abroad · 10-year rate 5.2% (2009) → **22.5%** (2012 avg) · GDP ≈ −25% 2008-13 · debt ≈ 175% (2013) · May 2010 rescue **€110B** (euro countries + IMF = fund that lends to countries in trouble) for cuts
- **Debt spiral** = doubt ⇒ higher rate ⇒ bigger bill ⇒ ratio ↑ ⇒ more doubt · **austerity** = cuts · tax ↑ to shrink deficit · in a slump (output falling): $120B ÷ $96B = **125%** (= $125B ÷ $100B without cuts) · how much of the fall came from cuts: **debated**
- **Japan** · debt ≈ **200%** (2009) → **240%** (2023) · 10-year rate ≈ **1%** or less until 2024 (> 3% in 2026) · owed **at home** · **in yen** (central bank issues it; holds ≈ half) · Greece: euros, cannot print
- Japan rate 1% → 3% ⇒ bill 2.4% → **7.2%** of GDP · own money removes the risk of running out of it, not of higher rates

7 Trade-off

who pays · card

- **Who pays** → future taxpayers (taxes ↑ or spending ↓ later) · **crowding out** = borrowing ⇒ rates ↑ ⇒ firms invest ↓ ⇒ growth ↓ 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 ⇒ ratio shrinks, no pain · `AGAINST` interest each year · crowding out · crisis risk when lenders get scared
- **Positive** "Greece 2009: 127%" ≠ **normative** "never owe more than GDP" · positive = what is (data can check) · normative = what should be (values)
- Policy card: problem **deficits pile up** → tool **borrow · cut · tax** → model **ratio = debt ÷ GDP · flat if deficit = g × ratio · falls if r < g** → evidence **Greece 127%, rates > 20% · Japan 240%, ≈ 1% until 2024** → trade-off **help now vs interest · crisis risk**