

Macroeconomics A, EI056

Class 10

Government spending and fiscal policy

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What you will get from today class

- Economic roles of governments.
- Deficits: stylized facts and theories.
 - Tax smoothing, political economy considerations.
- Can government spending sustain growth? The fiscal multiplier.
- Debt: empirical pattern and policies.
 - The dynamics of debt, and “debt revenue”.
 - Debt overhang and fiscal consolidation.

G ↓ T ↑

A question to start

USE OF DEBT (INVEST) → HIGH MULT.
MATURITY

Public debt reflect excessive **short-term** views of politicians.
We should require that it is ultimately **paid back** so as to limit the
temptation to borrow. → ϕ DEBT? FUNCTION

PAY BACK → ↑ TAX BASE

$$\frac{\text{DEBT}}{Y}$$

$$\frac{i \cdot B}{Y}$$

RISK ANALYSIS

Do you agree? Why or why not?

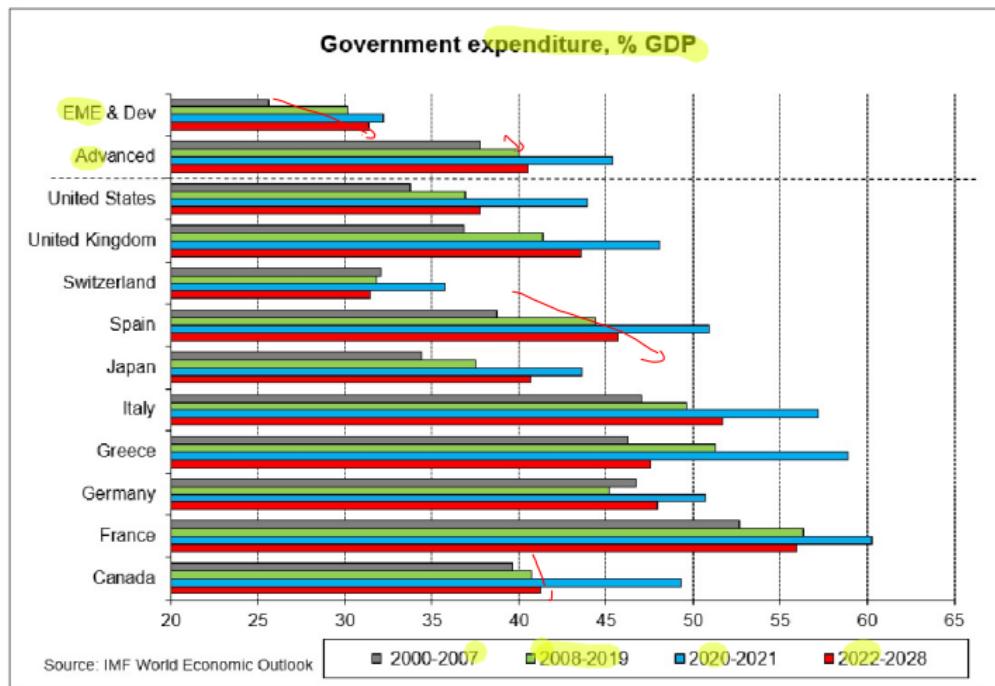
ECONOMIC SHARE OF GOVERNMENT FACTS

Economic roles of governments

- Provision of **public goods**: cannot be appropriated for private consumption (**law and order**, defense), or entail **externalities** (roads, education).
- **Income redistribution** motivated by equity.
 - **Progressive** income tax with rates rising with income
 - Retirement, **health care**
 - Entails some cost in efficiency.
- **Smoothing** of the **business cycle**. *COUNTER CYCL.*
- Multiple **layers** of government: national government, states, towns.
 - **National** is the main component in most countries (France).
 - **Sub-national** plays a substantial role in others (U.S.), or can be the dominant component (Switzerland).
- **"Core"** government functions (**tax** and purchases of goods and services), other functions can be operated outside the core (retirement administration, health care).
- The size of government varies across countries.

Spending

- Steady increase of spending / GDP, with substantial heterogeneity, surge in Covid.



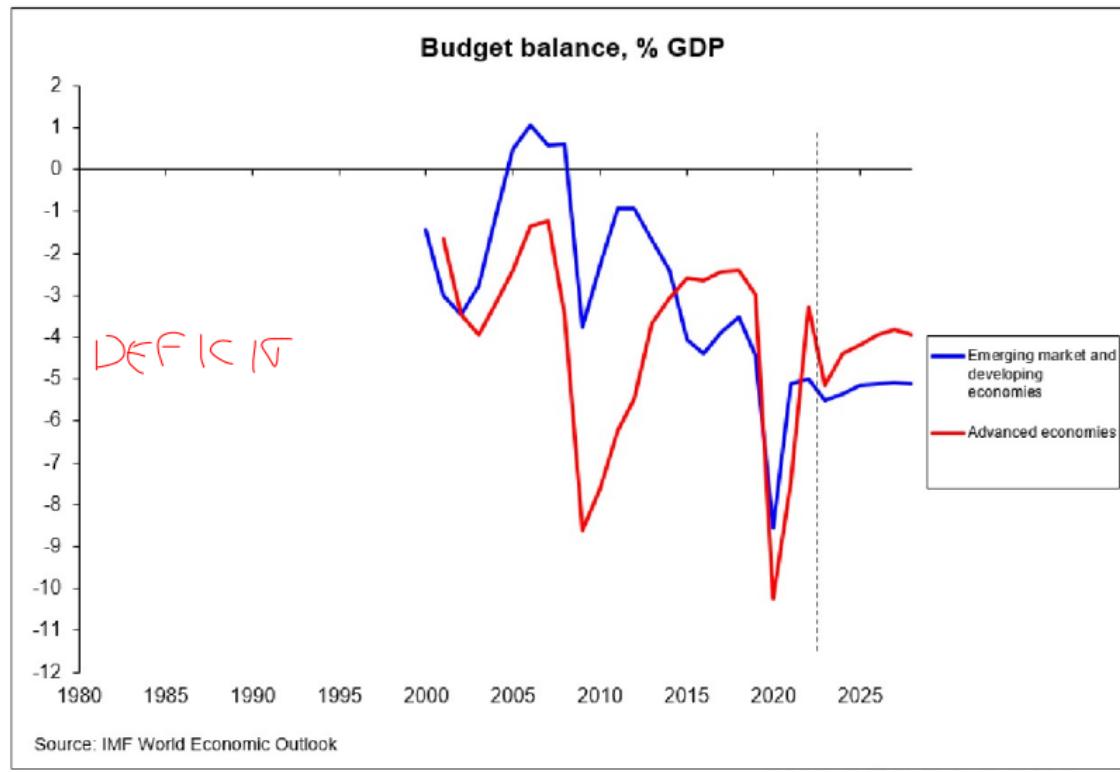
DEFICITS

Budgetary deficits

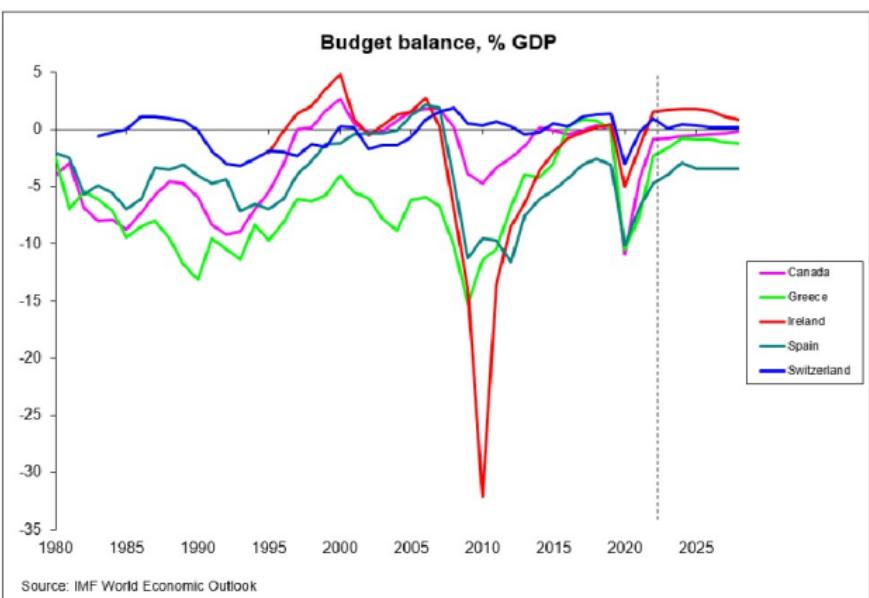
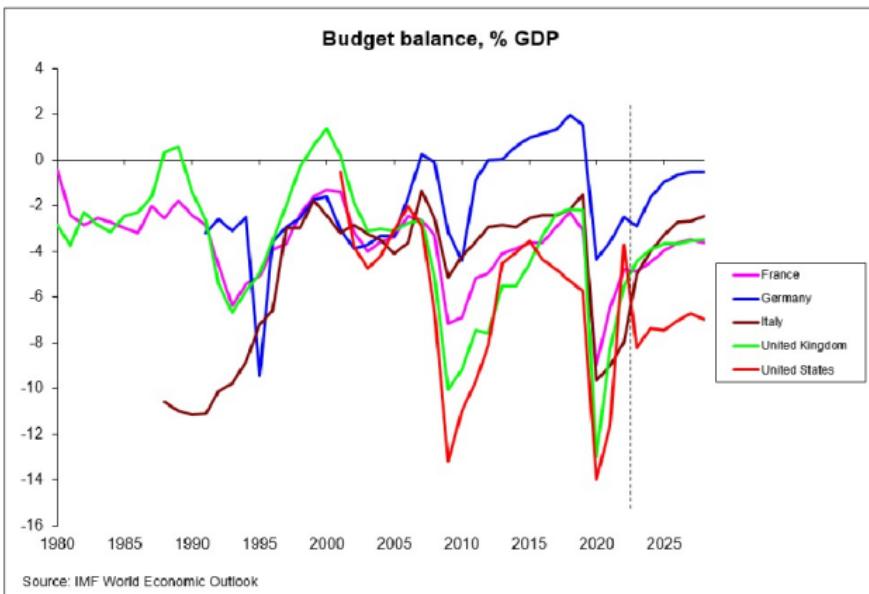
- Governments rarely raise enough in taxes to finance its expenditures. The gap is funded through borrowing.
 - Persistent deficits are a broad feature of the public sector.
AVC DEFICIT > 0 G > T
- Borrowing is appropriate to finance investments (such as infrastructure), more worrying for current expenditures if sustained.
- Deficit automatically increases in recessions: tax revenue falls and spending increases (unemployment benefits).
 - Automatic stabilizers, as government activity moves against the business cycle.
- Concepts of deficit (purchases G_t , taxes T_t , debt B_t with interest rate i_t).
 - Primary deficit, $D_t^{\text{prim}} = G_t - T_t$: difference between purchases and taxes. Overall deficit, $D_t^{\text{total}} = G_t - T_t + i_t B_t$: includes interest payments:
 - Structural deficit: overall deficit filtering out the impact of the business cycle.

Deficits: advanced and emerging countries

- Higher deficits in advanced economies.

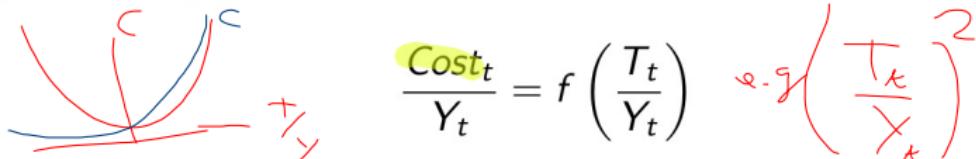


- Deficits by countries.



Why do we have deficits? Tax smoothing

- If government spending does not matter much for growth (i.e. it is offset by lower private spending), shouldn't we aim for a balanced budget with taxes covering spending period by period?
- Yes if taxes entail no side effects (lump sum taxes unrelated to earnings or labor supply).
- In reality taxes distort economic decisions (wage tax discourages work), and more so when taxes are high.
- Model this as a cost, Cost, that is convex in the tax / GDP ratio ($f(0) = 0$, $f'(0) = 0$ and $f'' > 0$, as in a quadratic function):

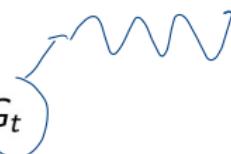


- The government minimizes the net present value of the cost, subject to the intertemporal budget constraint. This implies a constant tax rate T_t/Y_t .

Smoothing computations

Debt dynamics

- G^{perm} : permanent-equivalent level of government spending (gives the same present value as actual spending):

$$\sum_{t=0}^{\infty} \frac{1}{(1+r)^{t+1}} G^{perm} = \sum_{t=0}^{\infty} \frac{1}{(1+r)^{t+1}} G_t$$
$$G^{perm} = r \sum_{t=0}^{\infty} \frac{1}{(1+r)^{t+1}} G_t$$


- From flow constraint, debt changes reflect movements in spending around the permanent level (similar to permanent income hypothesis for consumption): $\text{DO} \Rightarrow \text{PERIODIC}$ IS G UNUSUALLY HIGH

$$B_{t+1} - B_t = r(B_t - B_0) + (G_t - G^{perm})$$

- Temporary expenditures (wars) funded by debt instead of large temporary taxes.
- Problem: implies zero deficit on average, which is not the case empirically.

Political economy view of deficits

- Two period model (interest rate set to zero). In each period the economy has an endowment W .
containing R&D TRAIN
- Government spending on two types of goods, M and N . Budget constraints are (B denotes debt):

$$M_1 + N_1 = W + B \quad ; \quad M_2 + N_2 = W - B$$

- Heterogenous population, different preferences over the two goods.
Utility of individual i is:

$$V_i = E \sum_{t=1}^2 [\alpha_i U(M_t) + (1 - \alpha_i) V(N_t)]$$

- U and V are standard concave utility functions. Individuals differ according to their weight $\alpha_i \in [0, 1]$ on good M .

Median voter

PER 1 ≠ PER 2

- In each period spending and debt are chosen by the median voter: the individual whose α_i is the median of the distribution.
- Variant with corner preferences.
 - Some people care only about good M , so that $\alpha_i = 1$.
 - Others care only about good N , so that $\alpha_i = 0$.
- In period 2 spending falls entirely on M if the median voter cares only about M . Otherwise, spending falls entirely on N .
- π : probability that the median voter of period 1 is still the median voter in period 2. of REELECTION

Choice of spending and debt

- If median voter in period 1 cares only about M , she maximizes:

$$\begin{aligned} & E \sum_{t=1}^2 [\alpha_{High} U(M_t) + (1 - \alpha_{High}) V(N_t)] \\ &= \underbrace{U(W+B)}_{1} + [\pi U(W-B) + (1 - \pi) U(0)] \end{aligned}$$

- First-order condition with respect to debt:

$$\Rightarrow \frac{W+B}{W-B} > 1 \quad \frac{U'(W+B)}{U'(W-B)} = \pi < 1$$

- U is concave, so U' is a decreasing function. This implies $W+B > W-B$, and there is debt $B > 0$. Similar reasoning also leads to debt if median voter cares only about N .
- Intuition: risk that the next government buys goods that the current median voter does not like. Debt is a way to limit future spending.

More general preferences

- Instead of corner preferences, U and V are CRRA utilities:

$$V_i = E \sum_{t=1}^2 \left[\alpha_i \frac{(M_t)^{1-\theta}}{1-\theta} + (1 - \alpha_i) \frac{(N_t)^{1-\theta}}{1-\theta} \right]$$

- Two offsetting forces:
 - Median voter of period 1 wants to constrain the future median voter to avoid wasteful spending (as before).
 - But not too much because the future median voter will also purchase goods that the current median voter likes.
- With a log utility ($\theta = 1$) the two cancel out and we get no deficit.
- If utility is not very concave ($\theta < 1$) we get an initial debt ($B > 0$) as the desire to constrain the future dominate.
- We get a surplus ($B < 0$) if utility is very concave ($\theta > 1$), as the desire to get enough consumption of the preferred good dominates.
[Detailed computations](#)

ARE DEFICITS EXPANSIONNARY?

Does G-T move IS?

How to measure effectiveness

- Governments in advanced economy has **massively used** fiscal policy during the **2008-9** and **Covid** crises.
- How much extra GDP do we get with extra spending?

$$\text{multiplier} = \frac{dY}{dG}$$

SHOCK

- **Three ranges** of the multiplier:
 - **0**: higher government spending fully offset by lower private spending (**crowding out**). Only the **composition** of GDP changes.
 - Between **0 and 1**: strong offset from private demand, but not a full one. GDP increases.
 - **Above 1**. **No offset**, maybe even a **positive spillover** as higher public demand stimulates investment because firms see better prospects (**crowding in**).
- Theory: does government spending / taxes affect **labor input**, as capital cannot be changed in the short run?

Multiplier in theory

- **Wealth effect:** higher spending raises taxes and lowers private wealth. Lower consumption of goods and leisure, higher hours worked. Small magnitude.
- With nominal frictions labor is demand determined. Effects can be big if specific conditions are met.
 - "Hand to mouth" consumers do not optimize across time (Ricardian equivalence is not an issue). Households with borrowing constraints who would like higher consumption but cannot borrow. More generally, bigger effect if resources are under-utilized.
 - **Zero lower bound** of interest rate. Central bank does not raise interest rates to counter inflationary pressures from higher government spending, so the real interest rate falls.
 - Government spending on infrastructure that raises private productivity.
 - Limited use of distortionary taxes to ultimately finance government spending.

Empirical evidence

2007

- Little interest before the crisis, studies found a small multiplier, especially before the 1980s. Fiscal expansion fuels inflation, leading to monetary contraction. CB COUNTERS
- Survey puts multiplier between 0.8 and 1.5, or 0.6-1.0 more recently (Ramey 2019). Quite heterogeneous.
 - Composition of spending: spending on infrastructure raises productivity of private firms, and thus raises GDP more.
 - State of the business cycle. Fiscal stimulus more effective in recessions (multiplier of 1.0-1.5) than in booms (0-0.5), sensitive to econometric approach.
 - Monetary policy. Stimulus more effective if central bank remains passive (stuck at ZLB). Recent proposals for central-bank directed fiscal expansions.
- Higher multiplier for tax cuts, but evidence is limited.
- Evidence on multiplier from transfers limited, points to stronger effect is targeted at constrained households (unemployment benefits).
- Effect may rely on a well-anchored long run fiscal picture.

PRe 2021

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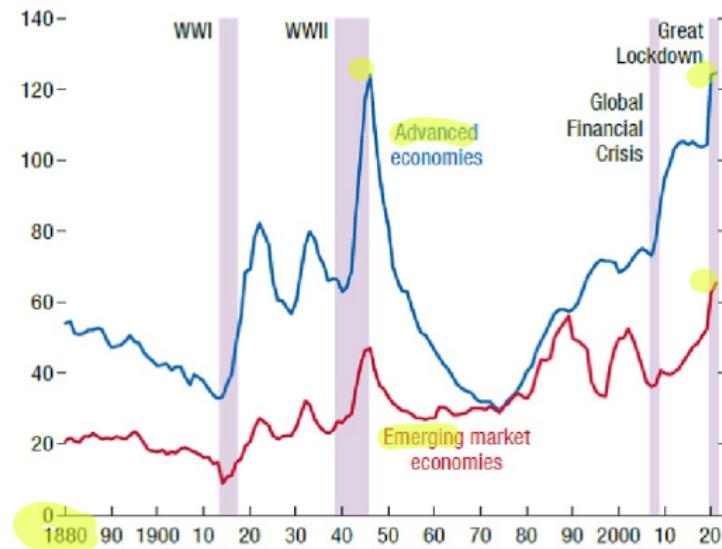
PUBLIC DEBT

- Deficit add up to debt.
- Successive increases during the global financial crisis (especially in advanced economies) and Covid.
 - Increases particularly sharp in US and China.
- Long time series show that debt levels have been higher in history (following wars).

Historical paths of debt

- Recent increases, especially in advanced economies.

**Figure 1.2. Historical Patterns of General Government Debt
(Percent of GDP)**



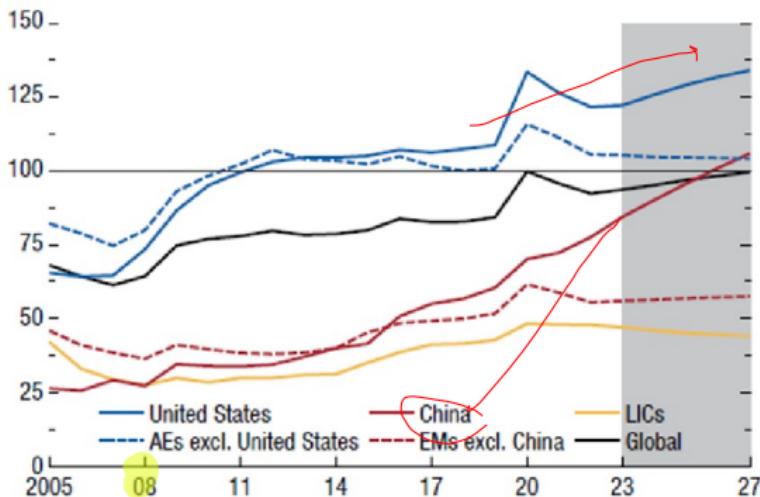
Sources: IMF, Historical Public Debt Database; IMF, World Economic Outlook database; Maddison Database Project; and IMF staff calculations.
IMF Fiscal Monitor

Recent increase and prospects

- Recent increases, especially in advanced economies.

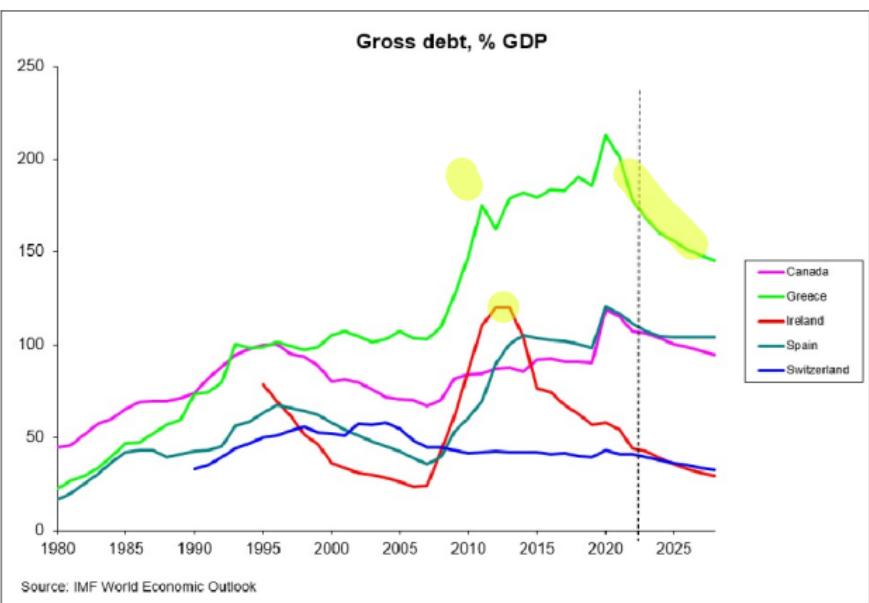
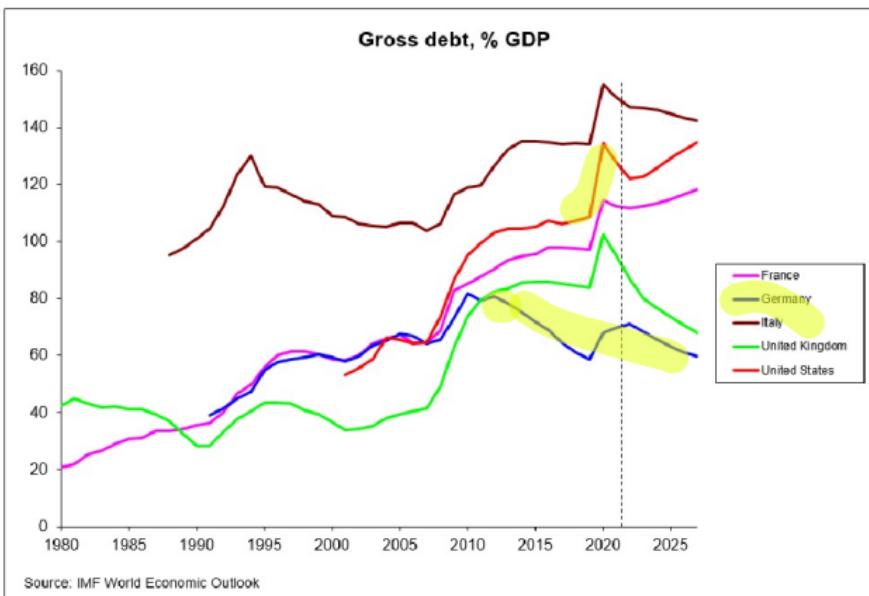
Figure 3.1. Public Debt Trends
(Percent of GDP)

Public debt remains elevated.



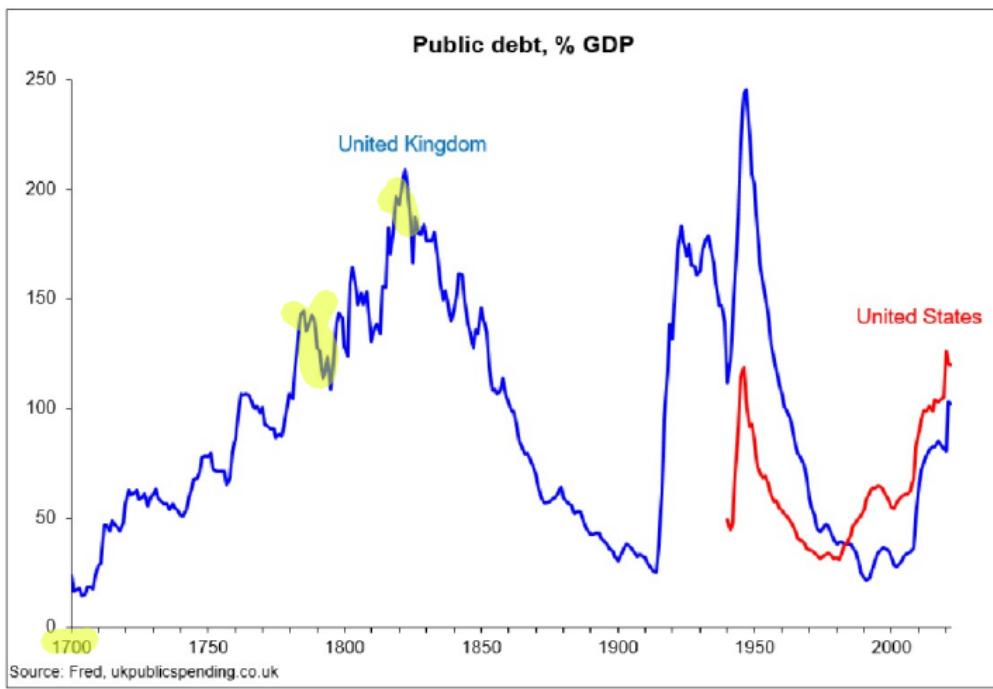
IMF (2023). "Coming Down to Earth: How to Tackle Soaring Public Debt", *World Economic Outlook chapter 3*, April.

- Debt by countries.



Long series: UK and US

- Larger debt levels in previous episodes (but current one large nonetheless).



ARE DEBT DYNAMICS "SELF STABILYZING"?

Flow budget constraints

- Government **expenditures** are funded by taxes and new debt (also transfer from central bank from printing money, but these are small):

$$G_t + i_t B_t = T_t + B_{t+1} - B_t$$

- Debt increases with the deficit and interest payments:

$$B_{t+1} = D_t^{\text{prim}} + (1 + i_t) B_t$$

- What matters is the **debt/GDP ratio**:

$$\frac{B_{t+1}}{Y_{t+1}} \frac{Y_{t+1}}{Y_t} = \frac{D_t^{\text{prim}}}{Y_t} + (1 + i_t) \frac{B_t}{Y_t}$$

CROWDTHER

- Nominal GDP grows at a rate g_t .

Debt dynamics: interest vs. growth

- Dynamics of the debt ratio $b = B/Y$:

$$b_{t+1} - b_t = \frac{d_t^{\text{prim}}}{1 + g_{t+1}} + \frac{i_t - g_{t+1}}{1 + g_{t+1}} b_t$$

- If $i_t > g_{t+1}$, debt has explosive dynamics. Keeping b constant requires a primary surplus:

$$d^{\text{prim}} = -(i - g) b < 0 \leftarrow \text{SURPLS}$$

- Self-stabilizing dynamics if $i_t < g_{t+1}$. A primary deficit is possible.
 - Blanchard (2019): $i_t < g_{t+1}$ is the case for the US, and advanced economies. Even more pronounced in Germany and Switzerland.
 - Emerging economies have destabilizing dynamics. the budget constraint is fine.
 - Non-pecuniary return on government bonds: liquid and safe (parallel with cash).
- Even a growing b can be OK if the discounted value goes to zero (transversality).

- Nominal interest rate is mostly lower than the nominal growth rate in the US.

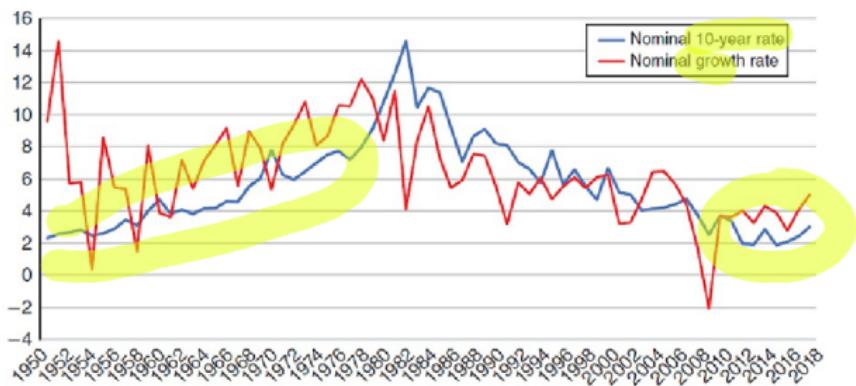


FIGURE 2. NOMINAL GDP GROWTH RATE AND 10-YEAR BOND RATE, 1950–2018

→ ~~2000 AD~~

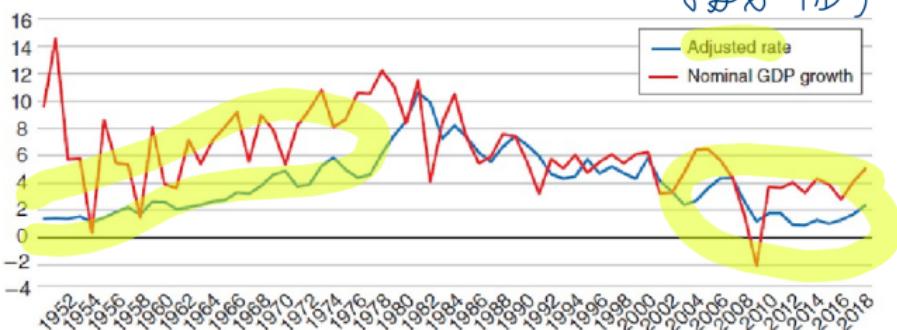


FIGURE 4. NOMINAL GDP GROWTH RATE AND ADJUSTED RATE, 1950–2018

Blanchard, Olivier (2019a). "Public debt and low interest rates", *American Economic Review* 109 (4), pages 1197-1229.

<https://www.aeaweb.org/articles?id=10.1257/aer.109.4.1197>

The “debt revenue”

- Intertemporal budget constraint (constant i_t and g_t for brevity):

$$b_t = \frac{1}{1+i} \sum_{s=0}^{\infty} \left(\frac{1+g}{1+i} \right)^s \left(-d_{t+s}^{\text{prim}} \right) + \lim_{k \rightarrow \infty} \left(\frac{1+g}{1+i} \right)^k b_{t+k+1}$$

- Last term does not converge to zero if $i < g$. 
- Discount with return to private capital, $m > g$ (Reis 2022):

$$\begin{aligned} b_t &= \frac{1}{1+m} \sum_{s=0}^{\infty} \left(\frac{1+g}{1+m} \right)^s \left[-d_{t+s}^{\text{prim}} + (m-i) b_{t+s} \right] \\ &\quad + \lim_{k \rightarrow \infty} \left(\frac{1+g}{1+m} \right)^k b_{t+k+1} \end{aligned}$$

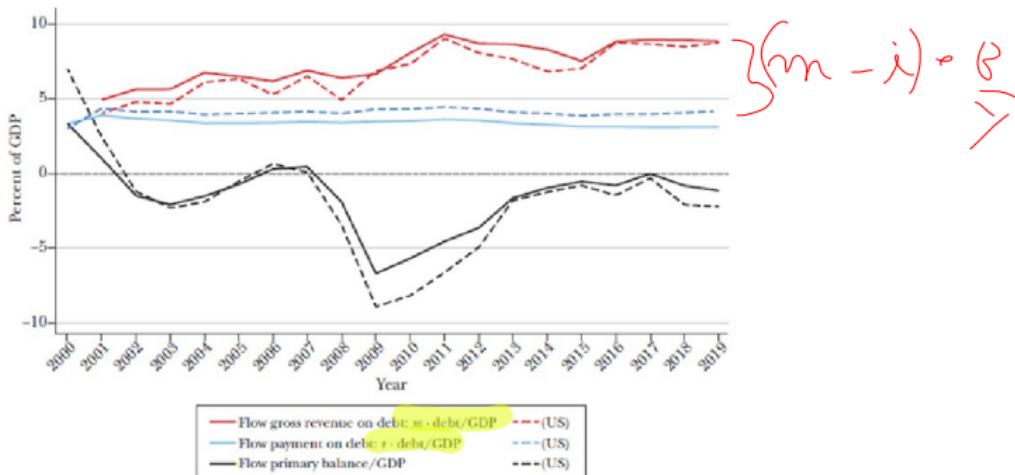
- Last term goes to zero. Second term, $(m-i) b_{t+s}$, is “debt revenue”: government earns a spread (Reis: $m-i$ between 0% and 8.9%).

Debt revenue

- $m \cdot b$ much larger than $i \cdot b$.

Figure 1

The Flow Budget Components as a Ratio of GDP for the G-7 Countries and the United States



Source: IMF (1972–2019a, b, 2021b).

Note: Interest payments as a ratio of GDP; public debt as a ratio of GDP times 0.06 plus inflation; primary balance as a ratio of GDP. Adding over all countries in the G-7.

Reis, Ricardo (2022). "Debt revenue and the sustainability of public debt", *Journal of Economic Perspectives* 36(4), pages 103-124.
<https://www.aeaweb.org/articles?id=10.1257/jep.36.4.103>

GETTING OUT OF DEBT

3 approaches

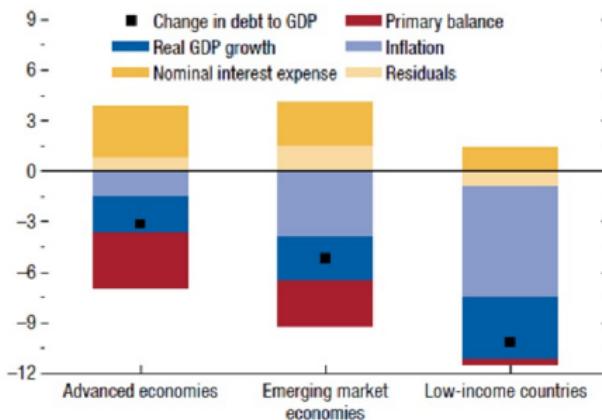
- Debt can be lowered through a primary **surplus**, fast **growth**, **inflation**, or **default**.
- Inflation lowers the real value of existing debt. Nominal interest rate on new debt is higher as investors expect inflation. Repeated use can lead to hyperinflation.
- Default can lead to country to be shut out of financial markets (does not happen much in practice) or face high interest rates. It imposes a cost on domestic agents (disruption of financial markets) which limits its use.
- Recent study of policy to reduce debt (IMF WEO 2023).

Role of inflation in past reduction

- Higher nominal GDP growth reduces debt ratios, but often via inflation (with adverse side effects). Interest expenses are a headwind.

Figure 3.2. Contribution to Change in Debt to GDP during Reduction Episodes
(Percent)

Primary balance is more important in advanced economies, but growth and inflation play a bigger role in emerging market economies and low-income countries.



IMF (2023). "Coming Down to Earth: How to Tackle Soaring Public Debt", *World Economic Outlook chapter 3*, April.

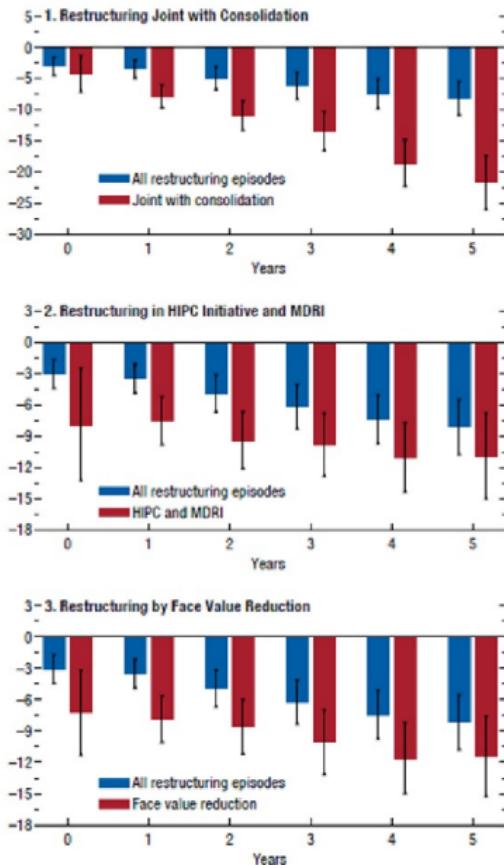
How to reduce debt to GDP?

- **Fiscal consolidation** (lower deficit) reduced debt / GDP only in half the cases.
- A fiscal consolidation is more likely to be successful if:
 - Done at time of relatively high **growth** (don't wait for a recession).
 - Done by **lower spending** rather than higher taxes.
 - Done as part of a **broad package** with reforms to support growth.
- In problematic cases, debt **restructuring** is needed (reduction of face value of debt, lengthening of maturity).
 - Effective in lowering debt to GDP.
 - Especially if done with consolidation, as part of a broad package, and via reduction of face value.

- Debt / GDP ratio decreases after a restructuring, especially with consolidation, face value reduction, and broad package.

**Figure 3.9. Impact of Restructuring on Debt to GDP
(Percentage point change)**

Debt restructuring has a large and long-lasting impact on the debt ratio and is more effective when combined with fiscal consolidation.



Impact of austerity

- Detailed study of **austerity** episodes (200) with deliberate action to reduce the deficit (higher taxes or lower spending, Alesina, Favero and Giavazzi 2019).
- Austerity lowers growth, but less if **done by lower spending** than if done by higher taxes.
 - Austerity of 1% of GDP reduces GDP by 0.24% over two years if done by spending, and by 2% over 3-4 years if done by taxes.
 - Difference reflects behavior of investment.
- Debt / GDP ratio is reduced if adjustment via expenditures, not if via taxes because of recession.
- Sharp effect of fiscal austerity in euro area consistent with estimates. Driven by the reliance on higher taxes.

- Concern of “free-rider” problem in the euro area (countries do not face prompt discipline from markets).
 - Stability and growth **pact** restricting deficits and debt, clause that no country would be bailed out. Rules were not respected.
- **Anchor medium-run** fiscal behavior to free space for short-run adjustment (similar to rules for monetary policy).
- Debt brake rules in Germany and Switzerland to avoid persistent deficit.
 - Asymmetric reaction led to persistent surpluses (overestimation of expenditures in surplus).
- Independent fiscal councils making judgments on whether the structural balance is adequate or not.
 - Advisory role only.

EXTRA SLIDES :

TAX SMOOTHING

Tax smoothing

- Intertemporal budget constraint: net present value of spending, G_t , plus initial debt, B_0 , equal to the net present value of taxes, T_t :

$$\sum_{t=0}^{\infty} \frac{1}{(1+r)^{t+1}} T_t = B_0 + \sum_{t=0}^{\infty} \frac{1}{(1+r)^{t+1}} G_t$$

- Minimize the net present value of the cost subject to the intertemporal budget constraint. Lagrangian:

$$\begin{aligned}\mathcal{L} &= \sum_{t=0}^{\infty} \frac{1}{(1+r)^{t+1}} Y_t f\left(\frac{T_t}{Y_t}\right) \\ &\quad - \mu \left[\sum_{t=0}^{\infty} \frac{1}{(1+r)^{t+1}} T_t - B_0 - \sum_{t=0}^{\infty} \frac{1}{(1+r)^{t+1}} G_t \right]\end{aligned}$$

- Optimal to have a **constant marginal cost** and T_t/Y_t : [◀ Return](#)

$$f'\left(\frac{T_t}{Y_t}\right) = \mu$$

EXTRA SLIDES :

POLITICAL ECONOMY

Choice with CRRA preference

- Utility of agent of type i is:

$$V_i = E \sum_{t=1}^2 \left[\alpha_i \frac{(M_t)^{1-\theta}}{1-\theta} + (1 - \alpha_i) \frac{(N_t)^{1-\theta}}{1-\theta} \right]$$

- Median voter in period 2 maximizes (weight $\alpha_{med,2}$ on M):

$$\alpha_{med,2} \frac{(M_2)^{1-\theta}}{1-\theta} + (1 - \alpha_{med,2}) \frac{(W - B - M_2)^{1-\theta}}{1-\theta}$$

- Optimal choice **equalizes marginal utilities** of spending:

$$M_2 = \frac{(\alpha_{med,2})^{\frac{1}{\theta}}}{(1 - \alpha_{med,2})^{\frac{1}{\theta}} + (\alpha_{med,2})^{\frac{1}{\theta}}} (W - B)$$

$$N_2 = W - B - M_2 = \frac{(1 - \alpha_{med,2})^{\frac{1}{\theta}}}{(1 - \alpha_{med,2})^{\frac{1}{\theta}} + (\alpha_{med,2})^{\frac{1}{\theta}}} (W - B)$$

Spending choice in period 1

- Median voter in period 1 has preference weight $\alpha_{med,1}$ and maximizes ($\Omega_2 \in [0, 1]$ is a function of $\alpha_{med,1}$ and $\alpha_{med,2}$):

$$\begin{aligned} & E \sum_{t=1}^2 \left[\alpha_{med,1} \frac{(M_t)^{1-\theta}}{1-\theta} + (1 - \alpha_{med,1}) \frac{(N_t)^{1-\theta}}{1-\theta} \right] \\ = & \alpha_{med,1} \frac{(M_1)^{1-\theta}}{1-\theta} + (1 - \alpha_{med,1}) \frac{(W + B - M_1)^{1-\theta}}{1-\theta} \\ & + \frac{(W - B)^{1-\theta}}{1-\theta} \Omega_2 \end{aligned}$$

- First-order condition with respect to M_1 implies:

$$M_1 = \frac{(\alpha_{med,1})^{\frac{1}{\theta}}}{(1 - \alpha_{med,1})^{\frac{1}{\theta}} + (\alpha_{med,1})^{\frac{1}{\theta}}} (W + B)$$

Debt choice in period 1

- Using the solution for M_1 the expected utility is ($\Omega_1 \in [0, 1]$ is a function of $\alpha_{med,1}$):

$$\frac{(W + B)^{1-\theta}}{1 - \theta} \Omega_1 + \frac{(W - B)^{1-\theta}}{1 - \theta} \Omega_2$$

- First-order condition with respect to debt implies:

$$\frac{W + B}{W - B} = \left(\frac{\Omega_1}{\Omega_2} \right)^{1/\theta}$$

- If $\Omega_1 = \Omega_2$ we get $B = 0$. This is the case with log utility ($\theta = 1$).
- With limited concavity ($\theta < 1$) we get a debt ($B > 0$). [◀ Return](#)