Tools of Budget Analysis
(Chapter 4 in Gruber’s textbook)

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GOVERNMENT BUDGETING

**Debt**: The amount borrowed by government through bonds from individuals, firms, or foreigners. Debt is a **stock**

**Deficit**: government’s spending + interest payments on debt minus government revenues in a given year. A negative deficit is called a surplus. Deficit is a **flow**

Evolution of debt from year to year:

\[ \text{Debt}_{t+1} = \text{Debt}_t + \text{Deficit}_t = \text{Debt}_t \cdot (1 + r_t) + \text{Spending}_t - \text{Revenue}_t \]

with \( r_t \) interest paid on government debt

**Primary Deficit** = Spending - Revenue

US Federal debt (held outside govt) is $24Tr around 95% of GDP, 2021 US deficit huge 14% ($3T) of GDP bc COVID

US government owns assets worth about 80% of GDP
CHAPTER 1: THE OUTLOOK FOR DEFICITS AND DEBT

THE BUDGET AND ECONOMIC OUTLOOK: 2022 TO 2032

reach 19.6 percent of GDP this year—the largest that receipts have been as a share of the economy in more than two decades. Outlays, which rose by 4 percent in 2021, are projected to decrease by 15 percent (or $1.0 trillion) this year, to $5.8 trillion, as pandemic-related spending falls. (The amount for 2022 and the projections for outlays and deficits cited throughout the remainder of the chapter reflect adjustments to exclude the effects of timing shifts.) As a percentage of GDP, outlays are estimated to fall from 30.5 percent in 2021 to 23.5 percent this year. That decrease is the net result of changes to the three major components of federal spending:

• Mandatory spending is expected to fall by 24 percent (or $1.1 trillion) in 2022, to $3.7 trillion, as spending related to the pandemic declines rapidly.

3. Mandatory spending consists of outlays for some federal benefit programs, such as Social Security, Medicare, and Medicaid, and certain other payments to people, businesses, nonprofit institutions, and state and local governments. It is governed by statutory criteria and is not normally controlled by the annual appropriation process.

• Discretionary outlays are projected to rise by 5 percent (or $81 billion) this year, to $1.7 trillion. That rate of increase is faster than the 1 percent rate of increase observed last year but slower than the 22 percent jump in 2020. (The growth in discretionary outlays that occurred in 2020 stemmed primarily from legislation enacted in response to the ongoing pandemic.)

• Net outlays for interest are expected to rise from $352 billion in 2021 to $399 billion in 2022, an increase of 13 percent (or $47 billion). Higher inflation this year accounts for most of that change because it boosts the principal of inflation-protected securities, which are recorded as outlays for interest.

Deficits From 2023 to 2032

In CBO’s baseline projections, the budget deficit—relative to GDP—grows from 3.7 percent next year to 4.7 percent in 2025 and remains near that amount through 2027. Thereafter, the deficit increases further.

Figure 1-2.

Total Outlays and Revenues

Percentage of Gross Domestic Product

Outlays are projected to drop from recent highs, as pandemic-related spending wanes, and then trend upward, as they did before the pandemic. Revenues are projected to increase sharply this year and then hover around their historical average as a share of the economy.

Data source: Congressional Budget Office. See www.cbo.gov/publication/57950#data.
CBO’s baseline projections reflect the assumption that funding provided for 2022 by the Infrastructure Investment and Jobs Act (P.L. 117-58) continues each year with adjustments for inflation, the standard assumption for appropriations. If that funding was not assumed to continue beyond the amounts stated in that act, the deficit, including associated debt-service costs, would be smaller by 0.5 percent of GDP, and debt would be lower by about 2.5 percent of GDP in 2032. (For more information on other alternatives to CBO’s baseline projections, see Chapter 5.)

Long-Term Budgetary Pressures

Beyond 2032, if current laws remained generally unchanged, deficits would continue to grow relative to the size of the economy over the following 20 years, keeping debt measured as a percentage of GDP on an upward trajectory throughout that period. Those large budget deficits would arise because outlays—particularly for interest on federal debt and for Medicare—would grow steadily under current law, and revenues would not keep pace with those outlays.

Deficits

Under the assumption that current laws governing taxes and spending generally remain in place, the amount by which the government’s outlays exceed its revenues will fall from $2.8 trillion in 2021 to $1.0 trillion in 2023. That shortfall is similar, in nominal terms, to the one recorded in 2019 before the onset of the pandemic. The budget deficit is projected to increase in most years thereafter, reaching $2.3 trillion in 2032. Relative to the size of the economy, this year’s deficit is projected to total 4.2 percent of GDP, about a third as large as the 12.4 percent shortfall recorded last year.

The Deficit in 2022

According to CBO’s projections, under current law, the budget deficit in 2022 will be $1.0 trillion, $1.7 trillion less than the shortfall recorded last year, as spending in response to the pandemic wanes and revenues increase. That decrease would be larger if not for a shift in the timing of certain payments. Because October 1, 2022 (the first day of fiscal year 2023), falls on a weekend, certain payments that would ordinarily be made on that day are instead made at the end of September and thus are shifted into the previous fiscal year. All projections have been adjusted to exclude the effects of those timing shifts. Historical amounts have been adjusted as far back as the available data will allow.

In CBO’s projections, primary and total deficits initially shrink as a percentage of GDP and then generally increase, particularly in the second half of the projection period. The aging of the population and the rising costs of health care boost primary deficits; net interest outlays, which double as a percentage of GDP over the projection period, further increase total deficits.

Data source: Congressional Budget Office. See www.cbo.gov/publication/57950#data.

Primary deficits exclude net outlays for interest.

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GDP = gross domestic product.
The Long-Term Outlook for the Budget

Beyond the coming decade, the fiscal outlook is more challenging. In CBO’s current long-term projections, which extend through 2052, budget deficits grow steadily relative to GDP. Those long-term projections follow CBO’s 10-year baseline projections for the coming decade and then extend the baseline concept for subsequent years (see Table 1-4 on page 18).

Long-term budget projections are highly uncertain. Nevertheless, growing debt and rising interest rates would cause net outlays for interest as a percentage of GDP to rise rapidly through 2052. In addition, growth in per capita spending on health care and the aging of the population would boost federal outlays significantly relative to GDP over that period if current laws generally remained in effect.

Federal revenues also would increase relative to GDP under current law, but they would not keep pace with outlays. As a result, CBO estimates, public debt would reach 185 percent of GDP by 2052, higher than any percentage previously recorded in the United States (see Figure 1-8).

Moreover, debt is on track to grow even larger after 2052. To avoid the negative consequences of large and growing federal debt and to put debt on a sustainable path, lawmakers would have to make significant changes to tax and spending policies—increasing revenues more than they would under current law, reducing spending for large benefit programs below the projected amounts, or adopting some combination of those approaches.

For further discussion, see Congressional Budget Office, The Economic Effects of Waiting to Stabilize Federal Debt (April 2022), www.cbo.gov/publication/57867.

Figure 1-8.

Federal Debt Held by the Public, 1900 to 2052

Federal debt held by the public is projected to increase in most years in the projection period, reaching 110 percent of GDP in 2032—higher than it has ever been. In the two decades that follow, growing deficits are projected to push federal debt higher still, to 185 percent in 2052.

Data source: Congressional Budget Office. See www.cbo.gov/publication/57950#data.

GDP = gross domestic product.
GOVERNMENT DEBT SUSTAINABILITY

Debt_{t+1} = Debt_t + Deficit_t

Debt/GDP stable \leq 1 if deficit \leq g \times GDP with g nominal GDP growth
If Debt_t = GDP_t and Deficit_t = g \cdot GDP_t then Debt_{t+1} = GDP_t + g \cdot GDP_t = GDP_{t+1}

Pre-COVID: g around 5% per year = 2% price inflation + 1% population growth + 2% real growth per capita

Deficit_t = r_t \cdot Debt_t + Spending_t - Revenue_t

with r_t nominal interest on debt

Debt can snowball when r_t exceeds g_t

Since 2008, in the US, r_t \simeq 2% much lower than g_t = 5%

\Rightarrow US debt sustainable as long as primary deficit Spending-Revenue less than 3% of GDP and r stays low (below 2%)

High COVID price inflation shrinks US debt (as long as r stays low)
GOVERNMENT DEBT IN CLOSED ECONOMY

Govt borrows from private sector (ultimately individuals)

Govt debt increases private wealth and decreases public wealth

No effect on national wealth = private wealth + public wealth

Govt debt is not borrowing on the back of future generations but rather changing the distribution of wealth

High debt with high interest rate limits spending ability of govt (as taxes must pay first interest on debt)

Today: US (and most EU countries and Japan) have very low interest rate on govt debt: about 0% in real terms pre-COVID, -4% with COVID inflation of 6%, about 0% again in 2023.

⇒ Makes govt debt more attractive than taxes in short-run
GOVERNMENT DEBT IN OPEN ECONOMY

Govt debt can also be borrowed from abroad

In this case, govt debt is indeed making future generations poorer (indebted to other countries)

1/3 of US debt ($7T) is held abroad but US also owns foreign assets that pay higher returns

US debt held abroad primarily by foreign central banks that use it as reserves

While interest rate is low, this is a good deal for the US

If interest rate on US debt increases, it will be perceived in US as a heavy burden to be paid to foreigners
THE CENTRAL BANK AND DEBT MONETIZATION

During COVID, US fed government ran huge deficits (12-15% of GDP in 2020 and 2021)

This extra debt was almost entirely purchased by US central bank (federal reserve bank or “the fed”) and counted in debt held by private sector (although the fed is a quasi-govt entity)

Effectively: Central bank creates money (out of thin air) and purchases new US debt from US govt, US govt then spends the money (large COVID related transfers)

This is called “debt monetization”

Very effective to give govt huge spending power without raising taxes but can lead to inflation when the economy recovers

Temporary inflation is good to reduce debt (after WW2) but bad if it becomes permanent (US 1970s, Argentina since 2002)
HISTORICAL EXPERIENCES WITH GOVT DEBTS

Countries have incurred debts of 100-300% of GDP due to crises, wars, foreign coercion. Several ways out:

1) Repay debt over many decades (UK in 19th century): wealthy debt holders win, govt spending suffers

2) Repudiate debt (Soviet Union with Russian debt in 1917): foreign wealthy debt holders lose but hard to borrow afterwards

3) Inflate debt away (US, EU countries after World War II): Debt holders (and many others) lose, risk of hyperinflation if govt cannot fund itself with taxes (Germany 1920s)

4) Exceptional wealth taxes: (partly Germany, Japan after World War II): wealthy in general lose not just debt holders

Debt financing looks attractive in short-run but who ultimately pays is not as clear as with tax financing
THE US FEDERAL PROCESS

Taxes, spending, and debt ceiling are decided by Congress and the President

Any new law requires majority vote both in House and in Senate along with President's signature (veto power)

Two forms of spending:

**Entitlement spending**: Mandatory funds for programs for which funding levels are automatically set by the number of eligible recipients (ex: medicare, social security)

**Discretionary spending**: Optional spending set by appropriation levels each year, at Congress's discretion (ex: defense)

Failure to pass appropriation results in Fed govt shutdown
Short-Run Effects of Fiscal Policy on Economic Growth

**Keynesian theory (IS-LM macro model):** More government spending or tax cuts stimulates the economy in the short-run [and conversely]:

**Short-run stabilization:** Govt can use taxes and spending policies to smooth the peaks and troughs of the business cycle

**Automatic stabilization:** Policies that automatically alter taxes or spending in response to economic fluctuations to offset changes in household consumption levels (ex: unemployment insurance, progressive taxation, corporate profits tax)

**Discretionary stabilization:** Policy actions taken by the government in response to business cycle (ex: Fiscal stimulus with Spring 2008 rebate checks, 2009-12 Obama stimulus, COVID care acts in 2020 and 2021)

⇒ Ability to run deficits in recessions is a great tool for short-run business cycle stabilization
% changes in annual real govt spending and changes in real GDP, 33 EU countries, 2010-11, 2011-2, 2012-3 (=99 dots). Source: Krugman NYtimes blog, January 6, 2015
Hutchins Center Fiscal Impact Measure: Total
Fiscal Policy Contribution to Real GDP Growth, percentage points

Source: Hutchins Center calculations from Bureau of Economic Analysis and Congressional Budget Office data; grey shaded areas indicate recessions and yellow shaded areas indicate projection.
Budget Policies and Deficits at the State Level

In contrast to Federal govt, States have budget balance requirements forcing spending to equate tax revenue each year.

In downturns, tax revenue falls due to decreased incomes ⇒ Forces states to either cut spending and increase taxes ⇒ Further exacerbates the economic downturn.

California had to cut spending drastically during Great Recession 2008-2010 ⇒ California established a rainy fund for future hard times but it remains too small.

2021 COVID stimulus by Biden included lots of state funding allowing states to weather the COVID crisis (otherwise they would have had to cut spending).

CA and NY in surplus in 2022 because the very rich did well during COVID and have continued to pay taxes.
STATIC VS. DYNAMIC SCORING

Govts have agencies evaluating effects of proposed reforms on govt deficit (Congressional Budget Office for US fed govt)

**Static scoring**: A method used by budget modelers that assumes that government policy changes only the distribution of total resources, not the amount of total resources.

**Dynamic scoring**: A method used by budget modelers that attempts to model the effect of government policy on both the distribution of total resources and the amount of total resources.

Example: tax decreases on the rich, static scoring assumes no effect on GDP, dynamic scoring incorporates effects on growth

Static scoring is safest in the absence of good empirical estimates of growth effects (dynamic scoring can be manipulated by ideologues, see Lynch 2015 for detailed pros/cons)
Intertemporal Government Budget Constraint

Policy debates have traditionally focused on the extent to which this year’s governmental spending exceeds this year’s governmental revenues.

The existence of implicit obligations in the future, however, suggests that this does not capture the full picture.

Example: population aging increases cost of social security and Medicare

**Intertemporal budget constraint**: Relates the Present Discounted Value of the government’s obligations to the Present Discounted Value of its revenues (assuming no debt default):

\[ PDV_{\text{of Tax Payments}} = PDV_{\text{of All Future Govt Spending}} + \text{Current Govt Debt} \]
For govt, spending $F$ now has the same cost as spending $F \cdot (1 + r)$ next year with $r$ interest rate on government debt.

**Present discounted value (PDV):** The value of each period’s dollar amount in today’s terms.

Govt spends $F_1, F_2, F_3, \ldots$ in each future year, then the PDV is computed as:

$$PDV = \frac{F_1}{(1 + r)} + \frac{F_2}{(1 + r)^2} + \frac{F_3}{(1 + r)^3} + \ldots$$

If $F_1 = F_2 = \ldots = F$ then

$$PDV = \frac{F}{1 + r} \left[ 1 + \frac{1}{(1 + r)} + \frac{1}{(1 + r)^2} + \ldots \right] = \frac{F}{1 + r} \cdot \frac{1}{1 - \frac{1}{1 + r}} = \frac{F}{r}$$

Paying $F$ in perpetuity is equivalent to paying $F/r$ upfront.
LONG-RUN FISCAL IMBALANCE

It is defined as gap between

1) PDV of All Future Govt Spending + Current Govt Debt

2) PDV of Tax Payments

If the government continues with today’s policies, how much more will the government spend than it will collect in taxes over the entire future?

A long-run fiscal imbalance means that policies will have to be adjusted at some point

Some policies can drastically change the long-run fiscal imbalance even if they don’t affect the current deficit much

Example: In 2003, the government added roughly $20 trillion to the fiscal imbalance (due to tax cuts and medicare prescription drug benefit of Bush administration)
LONG-RUN EFFECTS OF GOVERNMENT DEBT

In the long-run, government debt affects the capital market where savers meet investors

In closed economy: private savings = investment + new govt debt

With more government debt, if private savings do not change, less funds available for investment: investment decreases

Two mitigating factors:

1) In an open economy, investment or govt debt can be funded with foreign savings

2) If individuals are forward looking, they understand that higher debt implies high taxes later on and hence they save more to be able to pay higher taxes later on [Ricardian equivalence but not much empirical support]
CONCLUSION

The deficit has been a constant source of policy interest and political debate over the last decade

Short-run: should the govt spend more and increase deficit to stimulate the economy?

Long-run: should the govt address long-term deficits by increasing taxes or cutting spending?

International evidence shows that austerity during the Great Recession worsens the recession

COVID response has led to a huge increase in govt deficits around the world but not much of an increase in debt to GDP thanks to inflation (hopefully temporary)
REFERENCES

Jonathan Gruber, Public Finance and Public Policy, 2019 Worth Publishers, Chapter 4


2021. “Hutchins Center Fiscal Impact Measure” (web)

Congressional Budget Office “The Budget and Economic Outlook: Fiscal Years 2022 to 2032”, May 2022 (web)

Lynch, Robert 2015 “The benefits and drawbacks of using dynamic scoring in the federal budget”, Equitable Growth (web)
