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

131 Undergraduate Public Economics
Emmanuel Saez
UC Berkeley
GOVERNMENT BUDGETING

**Debt**: The amount borrowed by government through bonds to individuals, firms, or foreign governments. 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

In 2020: US Federal debt (held outside govt) is $17Tr around 80% of GDP ($21Tr), US deficit is large 4.5% ($1Tr) of GDP

US government owns assets worth about 80% of GDP
Federal outlays, adjusted to exclude shifts in the timing of certain payments, are projected to climb from 21.0% of GDP in 2020 to 23.0% in 2029 (see Figure 1-2).

Deficits are projected to average 4.7% of GDP over the 2020–2029 period. Over the past 50 years, deficits have averaged 2.9% of GDP; and in years when the unemployment rate has been below 6% percent, deficits averaged just 1.5% of GDP.

Primary deficits—that is, deficits excluding net outlays for interest—are projected to decrease over time, averaging 2.7% of GDP from 2020 through 2024 and 2.2% from 2025 through 2029. At the same time, because of projected increases in interest rates and federal borrowing, net interest outlays grow steadily, from 1.8% of GDP in 2020 to 2.6% in 2029 (see Figure 1-3 on page 14).

Those deficits are projected to boost federal debt held by the public, which consists mostly of the securities that the Treasury issues to raise cash to fund federal activities and pay off the government’s maturing liabilities. The net amount that the Treasury borrows by issuing those securities (calculated as the amounts that are sold minus the amounts that have matured) is influenced primarily by the annual budget deficit. Consequently, under current law, debt held by the public would increase in upcoming years. In CBO’s baseline, after accounting for all of the government’s borrowing needs, debt held by the public rises from $17.8 trillion at the end of 2020 to $29.3 trillion at the end of 2029 (see Table 1-3 on page 15). As a percentage of GDP, that debt would increase from 79% in 2019 to 95% by the end of the projection period (see Figure 1-4 on page 16). At that point, such debt would be the largest since 1946 and more than twice the 50-year average.

Outlays Over the coming decade, CBO projects, federal outlays would grow at an average annual rate of 5% percent, reaching $7.1 trillion in 2029 (adjusted to exclude the effects of timing shifts). Outlays for Social Security, Medicare, and net interest account for about two-thirds of that $2.7 trillion increase.

---

**Figure 1-2.**

**Total Revenues and Outlays**

Percentage of Gross Domestic Product

---

Source: Congressional Budget Office.
The Deficit in 2018

CBO estimates that, under current law, the budget deficit in 2018 will be $804 billion, $139 billion more than the shortfall last year. That increase would be even larger if not for shifts in the timing of certain payments. The 2018 deficit will be reduced by $44 billion because certain payments that would ordinarily have been made on October 1, 2017 (the first day of fiscal year 2018), were instead made in fiscal year 2017 because October 1 fell on a weekend.

2. October 1 will fall on a weekend again in 2022, 2023, and 2028. In such cases, certain payments due on October 1 are made at the end of September and thus are recorded in the previous fiscal year. Those shifts will noticeably boost spending and the deficit in fiscal years 2022 and 2028; the timing shifts will reduce federal spending and deficits in fiscal year 2024.

In such cases, certain payments due on October 1 are made at the end of September and thus are recorded in the previous fiscal year. Those shifts will noticeably boost spending and the deficit in fiscal years 2022 and 2028; the timing shifts will reduce federal spending and deficits in fiscal year 2024.

CBO projects that, under current law, revenues—which rose by 1.5 percent in 2017—will increase by only 0.6 percent (or $21 billion) this year, to $3.3 trillion. The main reason for the smaller increase is the effect of Public Law 115-97 (referred to here as the 2017 tax act), which, on net, will reduce revenues by an estimated $144 billion (or 0.7 percent of GDP) in 2018.

Outlays (adjusted to exclude the effects of the timing shifts)—which rose by 4.4 percent in 2017—will increase by 5.2 percent (or $208 billion) this year, to $4.2 trillion, CBO estimates. All three major components of spending contribute to that increase:

- Net outlays for interest are anticipated to jump from $263 billion in 2017 to $316 billion in 2018, an increase of 20 percent (or $53 billion). Higher interest rates this year account for most of that change.

- Discretionary outlays are expected to rise by 7 percent (or $84 billion) this year, significantly faster than the 2 percent increase in 2017 and the fastest rate of increase since 2010. The rapid growth projected for discretionary outlays stems primarily from recently enacted legislation.

- Mandatory spending is expected to increase by almost 3 percent (or $71 billion) in 2018, to $2.6 trillion. That rate of growth, which occurs for many different reasons, is roughly half the rate of increase recorded for such outlays in 2017.

Deficits as a percentage of gross domestic product are projected to increase over the next few years and then largely stabilize. They exceed their 50-year average throughout the 2018–2028 period.

Source: Congressional Budget Office.
The Budget and Economic Outlook: 2018 To 2028

Summary

Deficits Are Projected to Be Larger Than CBO Previously Estimated

The deficit that CBO now estimates for 2018 is $242 billion larger than the one that it projected for that year in June 2017. Accounting for most of that difference is a $194 billion reduction in projected revenues, mainly because the 2017 tax act is expected to reduce collections of individual and corporate income taxes.

For the 2018–2027 period, CBO now projects a cumulative deficit that is $1.6 trillion larger than the $10.1 trillion that the agency anticipated in June. Projected revenues are lower by $1.0 trillion, and projected outlays are higher by $0.5 trillion.

Laws enacted since June 2017—above all, the three mentioned above—are estimated to make deficits $2.7 trillion larger than previously projected between 2018 and 2027, an effect that results from reducing revenues by $1.7 trillion (or 4 percent) and increasing outlays by $1.0 trillion (or 2 percent).

The reduction in projected revenues stems primarily from the lower individual income tax rates that the tax act has put in place for much of the period. Projected outlays are higher mostly because the other two pieces of legislation will increase discretionary spending. Those revenue reductions and spending increases would result in larger deficits and thus in higher interest costs than CBO previously projected.

In contrast, revisions to CBO's economic projections caused the agency to reduce its estimate of the cumulative deficit by $1.0 trillion. Expectations of faster growth in the economy and in wages and corporate profits led to an increase of $1.1 trillion in projected tax receipts from all sources. Other changes had relatively small net effects on the projections.

Debt Held by the Public Is Projected to Approach 100 Percent of GDP

As deficits accumulate in CBO's projections, debt held by the public rises from 78 percent of GDP (or $16 trillion) at the end of 2018 to 96 percent of GDP (or $29 trillion) by 2028. That percentage would be the largest since 1946 and well more than twice the average over the past five decades (see Summary Figure 2).

Such high and rising debt would have serious negative consequences for the budget and the nation:

- Those estimates generally reflect the budgetary effects reported in CBO's cost estimates at the time the new laws were enacted and do not include the budgetary effects of information that has become available in recent months about the 2017 tax act. Those adjustments are classified as technical updates.

Summary Figure 2.

Federal Debt Held by the Public

Percentage of Gross Domestic Product

Source: Congressional Budget Office.
GOVERNMENT DEBT

Government debt increases private wealth at the expense of public wealth (but no direct effect on national wealth = private + public wealth in closed economy)

Govt debt is not borrowing on the back of future generations but rather changing the distribution of future 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): close to zero in real terms

⇒ Makes govt debt more attractive especially to fund public infrastructure (e.g. decarbonization)

Govt debt can also be borrowed from abroad (40% of US debt held abroad but US also own foreign assets that pay higher returns)
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)

In recent years, Senate vote requires 60/100 super-majority (due to filibuster)

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
Budget Policies and Deficits at the State Level

Balanced budget requirement (BBR): Law forcing a government to balance its budget each year (spending = revenue).

ex-post BBR: government needs to balance its budget by the end of each fiscal year

ex-ante BBR: government needs to submit/pass a balanced budget at the start of each fiscal year, or both (easier to evade with rosy predictions)

California has ex-ante BBR: 2008 recession lowered tax revenue and forced cuts in government spending (now CA has built a rainy fund but still pretty small)
STATIC VS. DYNAMIC SCORING

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

**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.

**Intertemporal budget constraint**: An equation relating the present discounted value of the government’s obligations to the present discounted value of its revenues.

\[
P_{\text{PDV}} \text{ of Tax Payments} =
\]
\[
P_{\text{PDV}} \text{ of All Future Govt Spending} + \text{Current Govt Debt}
\]
BACKGROUND: PRESENT DISCOUNTED VALUE

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.
ALTERNATIVE MEASURES OF LONG-RUN GOVERNMENT BUDGETS

Long-run Fiscal Imbalance

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?

Example: In 2003 alone, the government added roughly $20 trillion to the fiscal imbalance (due to tax cuts and medicare prescription drug benefit of Bush administration)
PROBLEMS WITH LONG-RUN FISCAL MEASURES

The fiscal imbalance calculations are fairly tenuous:

1) They depend critically on many assumptions about future growth rates in costs and incomes, and the interest rate used for discounting

⇒ Those assumptions become heroic for long-distance future (example: how will health care costs evolve?)

2) The calculations also assume that government policy remains unchanged (but if big imbalance arises, then government will typically be forced to act and fix it)

⇒ Makes most sense to consider a time window that is longer than 1 year but less than infinity
CBO projects that economic activity will expand at a pace this year and next that will lower the unemployment rate and place upward pressure on inflation and interest rates.

**Growth of Real GDP**

**Unemployment Rate**

**Inflation**

**Interest Rates**

PROBLEMS WITH LONG-RUN FISCAL MEASURES

Some programs are easier to project than others.

Example: social security retirement benefits are easier to project than medicare benefits

Social security benefits depend on demography and longevity (slow moving variables) ⇒ Social security does fairly reliable 75 year projections

Medicare depends on growth of health care costs that have been growing very fast (before the Great recession) ⇒ such a rate of growth is not sustainable for ever so making a long-run projection based on those rates is not meaningful

CBO makes budget projections over the next 10 years in its official budget projection
# CBO’s Baseline Budget Projections, by Category

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>In Billions of Dollars</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Revenues</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Individual income taxes</td>
<td>1,684</td>
<td>1,698</td>
<td>1,800</td>
<td>1,895</td>
<td>1,981</td>
<td>2,076</td>
<td>2,171</td>
<td>2,272</td>
<td>2,501</td>
<td>2,731</td>
<td>2,838</td>
<td>2,962</td>
<td>9,923</td>
<td>23,227</td>
</tr>
<tr>
<td>Payroll taxes</td>
<td>1,171</td>
<td>1,247</td>
<td>1,281</td>
<td>1,332</td>
<td>1,385</td>
<td>1,442</td>
<td>1,505</td>
<td>1,567</td>
<td>1,629</td>
<td>1,692</td>
<td>1,759</td>
<td>1,828</td>
<td>6,945</td>
<td>15,420</td>
</tr>
<tr>
<td>Corporate income taxes</td>
<td>205</td>
<td>228</td>
<td>245</td>
<td>268</td>
<td>298</td>
<td>335</td>
<td>371</td>
<td>400</td>
<td>409</td>
<td>398</td>
<td>407</td>
<td>415</td>
<td>1,517</td>
<td>3,547</td>
</tr>
<tr>
<td>Other</td>
<td>271</td>
<td>278</td>
<td>293</td>
<td>298</td>
<td>307</td>
<td>309</td>
<td>345</td>
<td>345</td>
<td>361</td>
<td>385</td>
<td>386</td>
<td>415</td>
<td>1,552</td>
<td>3,443</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>3,330</td>
<td>3,451</td>
<td>3,620</td>
<td>3,792</td>
<td>3,971</td>
<td>4,163</td>
<td>4,392</td>
<td>4,585</td>
<td>4,900</td>
<td>5,206</td>
<td>5,390</td>
<td>5,619</td>
<td>19,937</td>
<td>45,637</td>
</tr>
<tr>
<td>On-budget</td>
<td>2,475</td>
<td>2,532</td>
<td>2,677</td>
<td>2,811</td>
<td>2,951</td>
<td>3,104</td>
<td>3,292</td>
<td>3,443</td>
<td>3,714</td>
<td>3,974</td>
<td>4,111</td>
<td>4,291</td>
<td>14,835</td>
<td>34,368</td>
</tr>
<tr>
<td>Off-budget(^a)</td>
<td>855</td>
<td>919</td>
<td>943</td>
<td>981</td>
<td>1,020</td>
<td>1,059</td>
<td>1,100</td>
<td>1,142</td>
<td>1,186</td>
<td>1,231</td>
<td>1,279</td>
<td>1,328</td>
<td>5,103</td>
<td>11,269</td>
</tr>
<tr>
<td><strong>Outlays</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Discretionary</td>
<td>1,262</td>
<td>1,332</td>
<td>1,400</td>
<td>1,446</td>
<td>1,481</td>
<td>1,513</td>
<td>1,543</td>
<td>1,584</td>
<td>1,622</td>
<td>1,661</td>
<td>1,706</td>
<td>1,736</td>
<td>7,382</td>
<td>15,690</td>
</tr>
<tr>
<td>Net interest</td>
<td>325</td>
<td>372</td>
<td>390</td>
<td>418</td>
<td>456</td>
<td>506</td>
<td>554</td>
<td>602</td>
<td>653</td>
<td>704</td>
<td>758</td>
<td>807</td>
<td>2,325</td>
<td>5,848</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>4,109</td>
<td>4,411</td>
<td>4,628</td>
<td>4,826</td>
<td>5,130</td>
<td>5,344</td>
<td>5,543</td>
<td>5,869</td>
<td>6,174</td>
<td>6,466</td>
<td>6,868</td>
<td>6,997</td>
<td>25,470</td>
<td>57,845</td>
</tr>
<tr>
<td>On-budget**</td>
<td>3,261</td>
<td>3,505</td>
<td>3,661</td>
<td>3,794</td>
<td>4,027</td>
<td>4,166</td>
<td>4,287</td>
<td>4,533</td>
<td>4,763</td>
<td>4,969</td>
<td>5,277</td>
<td>5,309</td>
<td>19,935</td>
<td>44,785</td>
</tr>
<tr>
<td>Off-budget(^a)**</td>
<td>849</td>
<td>906</td>
<td>967</td>
<td>1,032</td>
<td>1,102</td>
<td>1,179</td>
<td>1,256</td>
<td>1,336</td>
<td>1,412</td>
<td>1,497</td>
<td>1,591</td>
<td>1,689</td>
<td>5,536</td>
<td>13,059</td>
</tr>
<tr>
<td><strong>Deficit (-) or Surplus</strong></td>
<td>-779</td>
<td>-960</td>
<td>-1,008</td>
<td>-1,034</td>
<td>-1,159</td>
<td>-1,181</td>
<td>-1,151</td>
<td>-1,284</td>
<td>-1,274</td>
<td>-1,260</td>
<td>-1,479</td>
<td>-1,378</td>
<td>-5,533</td>
<td>-12,208</td>
</tr>
<tr>
<td>On-budget**</td>
<td>-785</td>
<td>-972</td>
<td>-984</td>
<td>-983</td>
<td>-1,076</td>
<td>-1,062</td>
<td>-995</td>
<td>-1,048</td>
<td>-995</td>
<td>-1,167</td>
<td>-1,017</td>
<td>-1,017</td>
<td>-5,100</td>
<td>-10,417</td>
</tr>
<tr>
<td>Debt Held by the Public</td>
<td>15,750</td>
<td>16,685</td>
<td>17,755</td>
<td>18,841</td>
<td>20,042</td>
<td>21,264</td>
<td>22,457</td>
<td>23,784</td>
<td>25,102</td>
<td>26,407</td>
<td>27,917</td>
<td>29,322</td>
<td>n.a.</td>
<td>n.a.</td>
</tr>
<tr>
<td><strong>Memorandum:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gross Domestic Product</td>
<td>20,236</td>
<td>21,157</td>
<td>22,013</td>
<td>22,870</td>
<td>23,727</td>
<td>24,611</td>
<td>25,529</td>
<td>26,514</td>
<td>27,518</td>
<td>28,582</td>
<td>29,699</td>
<td>30,847</td>
<td>118,750</td>
<td>261,911</td>
</tr>
</tbody>
</table>
Short-Run Effects of the Govt on the Macroeconomy

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, unemployment insurance extensions)

⇒ Ability to run deficits in recessions is a great tool for short-run business cycle stabilization (but need to reduce debt during good times to keep ability to run deficits when needed)
% 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
LONG-RUN EFFECTS OF GOVERNMENT DEBT

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

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.

Health care cost growth has slowed down sharply since 2008, substantially improving the long-term Federal budget outlook.

But 2018 tax reform has worsened the budget situation.
REFERENCES

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


Congressional Budget Office “The Budget and Economic Outlook: Fiscal Years 2019 to 2029”, August 2019 (web)

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