

# Government budgets

**Definition** – A government budget is a detailed annual plan that outlines its estimated **revenues** and **expenditures**. A **surplus** occurs if collections of revenue are more than is spent. A **deficit** is spending more than collected. If deficits accrue, the total is called **debt**.

Source: <https://www.usa.gov/budget#item-213654>

**Intuition** – Government budgets can be thought of as a bathtub. The water flowing in is the **money collected**, mostly through taxes. The water accumulates and is the amount available for **spending**. The water draining out is the spending on programs like Social Security and national defense. If water remains in the tub, the government has that for later spending. But typically, the government runs out and has to borrow to refill the tub. The extra water or any amounts borrowed is kept track of separately, with more money owed for the interest charged on borrowing. The government decides each year how much water to collect and to let out, and thus, how much to borrow.

## Mathematical / Technical –

- Revenue (*rev*) is government income, the collection of taxes. Expenditures (*spend*) are the spending on programs, services, regulations, and enforcement.

- A **deficit** is the \$ excess of expenditures over income:  
$$deficit = spend - rev$$

- A surplus occurs when income is greater than expenditures, represented above as a **negative deficit**.

- Total **debt** is the accumulation of deficits, denoted by this year's **debt** plus interest plus this year's **deficit**:

$$debt_{t+1} = debt * (1 + r) + deficit$$

where  $r$  is the interest rate for government debt and  $debt_{t+1}$  is debt next year.

- The debt ceiling is a legislative limit on total national debt, restricting how much government may borrow.
- In the short-run, **debt** can stabilize the economy during recessions and allow growth. In the long-run, four main consequences arise from **debt**: lower national savings and income, higher interest payments, leading to large tax hikes and spending cuts, decreased ability to respond to problems, and greater risk of a fiscal crisis.<sup>c</sup>
- Governments make projections of *rev* and *spend*, to plan and make decisions about budgetary policies.
- The amounts of planned revenue and spending, which are future values,  $F_1, F_2, F_3, \dots$ , need to be converted to present-discounted values (*PDV*):

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

where  $\rho$  is the discount rate, as distinct from the **debt** interest rate.

- If incomes or payments,  $F$ , are the same in perpetuity, and start next year, the calculation is

$$PDV = \frac{F}{\rho}$$

- The intertemporal budget constraint equalizes the *PDV* of the government obligations with *PDV* of revenue:

$$PDV(rev_t) + PDV(rev_{t+1}) = PDV(spend_t) + PDV(spend_{t+1})$$

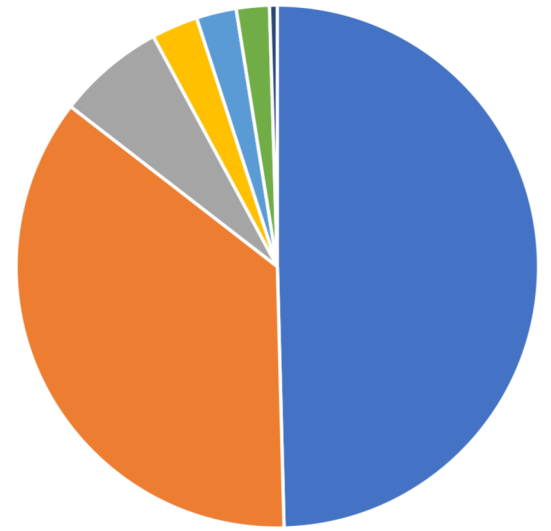
but assumes known  $\rho$  and consistent government policy.

<sup>c</sup> <http://www.crfb.org/blogs/cbo-consequences-growing-national-debt>

## Graphical – Money collected & spent

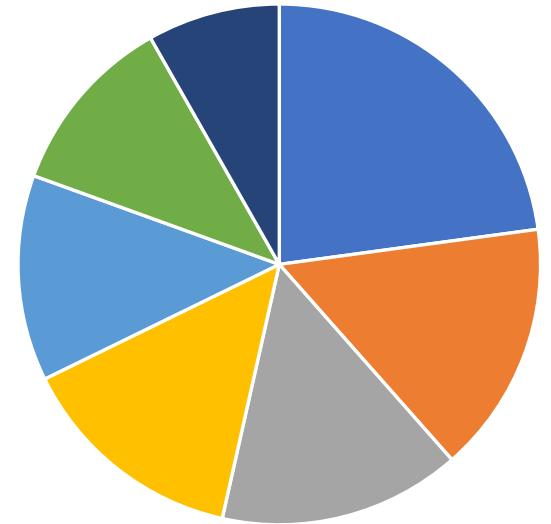
### Revenues

- Individual income taxes
- Social insurance and retirement
- Corporation income taxes
- Excise taxes
- Miscellaneous receipts
- Customs duties and fees
- Estate and gift taxes



### Expenditures

- Social security
- Miscellaneous
- National Defense
- Medicare
- Health
- Income security
- Net interest



US federal revenue and expenditures, largest to smallest in the lists, and clockwise in pie slices; data from 2019 fiscal year. Income taxes from individuals were nearly half the revenues. Total revenue was \$3.46 trillion. Expenditures were \$4.57 trillion, thus in 2019, a **deficit of \$1.11 trillion!**

Source of data: <https://tinyurl.com/yd7mc3bs>

## Real-world aspects –

Annual US deficits have been rising, thus debt is accruing, ever since the 1960's, with some exceptions in the 1990's. The growth is due to increases in government spending without comparable increases in tax revenues.<sup>a</sup> The federal debt reached an all-time high time high of \$25 trillion in 2020. The Congress and President decide on taxes, spending, and debt ceiling. New policies and laws on budgetary matters require majority vote in both the House and Senate, and then the President's signature. In 2020, the coronavirus pandemic caused widespread issuance of "stay at home" orders, which crippled the economy. Congress passed the CARES Act: \$2.3 trillion in lending to businesses, cities, and states, trying to provide relief and stability.<sup>b</sup> However, in order to provide this liquidity, the entire amount was borrowed, adding more to the US debt.

Sources: <sup>a</sup> Gruber, J. (2016) *Public Finance & Public Policy*

<sup>b</sup> <https://home.treasury.gov/policy-issues/cares>

## Practice questions

- Explain the benefits for increasing the deficit, if any? Disadvantages?
- Suppose spending for a local government is \$1,000/year, in perpetuity. Revenue for the 1<sup>st</sup> year is \$1,000; after that, it is \$990 forever. Let  $\rho = 3\%$ . Guesstimate the *PDV* (how big? deficit or surplus?) and explain your reasoning. Then, calculate the *PDV* and compare.
- Let the interest on debt be  $r = 5\%$  and current debt be \$500,000. Next year, expected spending is \$50,000 and expected revenues are \$20,000. Calculate next year's debt and explain.
- State the intertemporal budget constraint, intuitively.

Numerical Solutions: 2.  $PDV = \frac{\$10}{0.03} = \$333$  ; 3.  $Debt = \$550,000$