

Stocks and Flows

(variables)

Flow variables: measured per unit of time (for example, per quarter or per year).

Ex: annual GDP figures measure the economy's production per year; Balance of payments; government budget deficit (change in government debt).

Stock variables: defined at a point in time.

Ex: the amount of money in your bank account on November 10 of this year; the total value of all houses in the U. S. on January 1, 2009; Government debt.

In many applications a flow variable is the rate of change in a stock variable. A bathtub with water flowing in from a faucet. The amount of water in the tub at any moment is a stock variable. The units of a stock variable (gallons, in this case) don't have a time dimension.

The rate at which water enters the tub is a flow variable; its units (gallons per minute) have a time dimension. In this case the flow equals the rate of change of the stock.

Wealth and Savings as Stock and Flow

Saving and wealth are related to each other in much the same way that the flow and stock of water in a bathtub are related.

The wealth of any economic unit is its assets (the things that it owns, including IOUs from other economic units) minus its liabilities (what it owes to other units).

Wealth is measured in dollars at a point in time and is a stock variable. Saving is measured in dollars per unit time and is a flow variable.

Because saving takes the form of an accumulation of assets or a reduction in liabilities (for example, if saving is used to pay off debts), it adds to wealth just as water flowing into a bathtub adds to the stock of water.

Debt and Deficit as Stock and Flow

Suppose that starting from a balanced budget, the government cuts taxes, thus creating a deficit. What will happen to debt over time? Will the government need to increase taxes later? If so, by how much?

Let us start with the definition of the budget deficit. We can write the budget deficit in year t as

$$\text{deficit} = i B_{t-1} + G_t - T_t$$

Where B_{t-1} is government debt at the end of year t-1, or equivalently at the beginning of year t; i is the nominal interest rate. Thus $i B_{t-1}$ is equal to the nominal interest payments on the existing government debt.

G_t is government spending on goods and services in year t.

T_t is equal to taxes minus transfers in year t.

Thus the budget deficit is equal to spending, inclusive of interest payments, minus taxes net of transfers.

The change in government debt during year t is equal to the deficit in year t.

$$B_t - B_{t-1} = \text{deficit}$$

If the government runs a deficit, government debt increases. If the government runs a surplus, government debt decreases.

It is often convenient to decompose the deficit into the sum of two terms:

(1) Interest payments on the debt, $i B_{t-1}$ and;

(2) The difference between spending and taxes, $G_t - T_t$.

The second term is called the primary deficit (or primary surplus if taxes exceed spending).