The Macroeconomic Accounting Framework and Important Identities

1. Three Approaches to National Accounting

In a macroeconomic context, expenditure = income = output

1) **Expenditure approach: Y ≡ C + I + G + X – M**

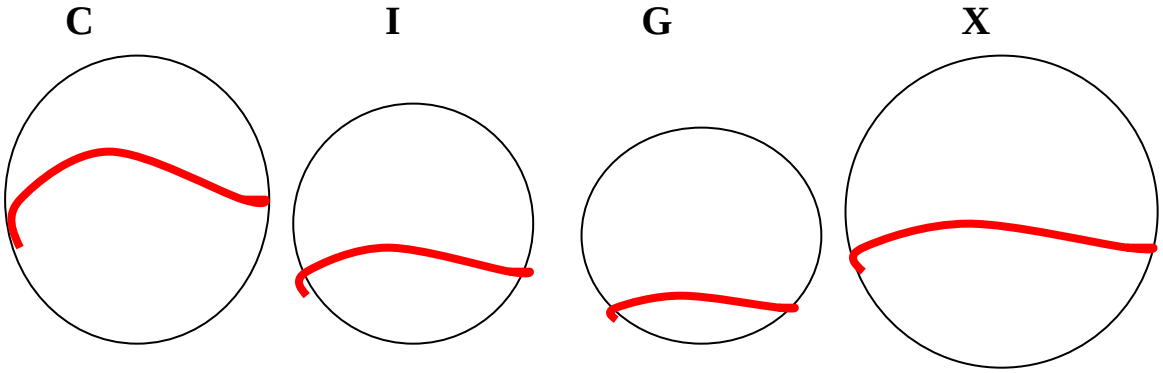
2) Income: Y ≡ wages + profits + interest payments + taxes

3) Production: Y ≡ primary output + secondary output + tertiary output

In practice in Hong Kong:

C -- Private consumption expenditure + Government consumption expenditure
I -- Gross domestic fixed capital formation (private sector + government)
INV -- Changes in inventories
X -- Exports of goods and services
M -- Imports of goods and service

Imports are also "embedded" in C, I, G and X.



In other words, C, I, G and X have different "import contents" in various proportions.

$$Y \equiv \underbrace{C + I + G}_{\text{Domestic demand}} + \underbrace{X - M}_{\text{External demand}}$$

2. An Important Macroeconomic Identity

(Read Dornbusch, Macroeconomics, 6th ed., chapter 2)

We start with the basic national accounting identity using the expenditure approach:

$$Y \equiv C + I + G + NX \qquad (1)$$

where Y is GDP, C consumption, I investment, G government expenditure and NX net export (X - M).

Secondly, there is an important relation between output and disposable income. Part of our income is spent on taxes and that some of us in the private sector receive net transfers (TR) from the government other than national income. Hence, disposable income (YD) is therefore equal to income plus transfers less taxes(TA):

$$YD \equiv Y + TR - TA \qquad (2)$$

Disposable income is, in turn, divided by individuals into consumption and saving:

$$YD \equiv C + S \qquad (3)$$

From (2) and (3), we arrive at:

$$C + S \equiv YD \equiv Y + TR - TA \qquad (4)$$

Or

$$C \equiv YD - S \equiv Y + TR - TA - S \qquad (5)$$

Identity (5) states that consumption is disposable income minus saving. Alternatively, consumption is equal to income plus transfers less taxes and saving.

We can now use the right-hand side of equation (5) to substitute for C in identity (1). With some rearrangements (try to work that out….), we will obtain

S – I ≡ (G + TR – TA) + NX (6)

Net saving budget deficit trade surplus

Equation (6) is a very important identity. The first set of terms on the RHS, (G + TR – TA), is the government budget deficit. (G + TR) is total government spending, i.e. government purchases of goods and services (G) plus government transfer payments (TR). TA is the amount of taxes collected by the government. The difference (G + TR – TA) is the excess of government spending over its revenues, i.e. its budget deficit.

The second term on the RHS is the excess of exports over imports, or net exports.

In a nutshell, identity (6) shows that the excess of saving over investment (S – I) of the private sector is equal to the government budget deficit plus the trade surplus.

Using this identity, we can investigate various relations among the excess of private saving over investment (S – I), the government budget (G + TR – TA), and the economy's external balance.

For example, if saving is equal to investment, the government's budget deficit (surplus) is matched by an external deficit (surplus) of an equal amount.

Any of the three sectors in the identity that spends more than it receives must borrow to pay for the excess expenditure. The private sector has three ways of disposing of its excess saving (on top of investment).

(1) It can lend to the government, and pays for the latter's excess of spending over the taxes it receives.

(2) Or it can lend to foreigners, who are buying more of our exports than we are buying imports from them. They are earning less from us than they need to pay for the goods and services they purchase from us. We can have our excess saving to lend to them so that they can import more than they export.

(3) Or it can lend to other businesses, which can use the funds for investment.

In all these three cases, the lenders will be paid back later, receiving interest or dividends in addition to the amount they lent.

To look at the matter from another angle, how can a government finance its deficit? Or how can it spend its surplus?

Finally, how can an economy balance itself if it has a trade surplus? Or a trade deficit?

Warnings

The above identity is exactly what it is: an identity. It is not a behavioural equation. In other words, it only gives a *prima facie* set of relationships amongst the variables that it defines. Given everything equal, the changes in other variables should be as indicated.

However, in reality, everything may not be equal, and the **variables** in the identity may be ***correlated*** in various positive or negative ways, e.g. if there is excess saving, one way to balance, i.e. maintain the identity, is to invest more

$$S - I > (G + TR - TA) + NX \qquad (6)$$

However, higher investment may lead to higher imports, and NX will fall, or even turn into negative! Then the balance may not be achieved.

That is why in a behavioural equation system, we have to further define each variable and their possible interactions, before we can use the system to analyse and predict.

In any case, the identity gives us a good first approximation to their relations. The lesson to keep in mind is to use it carefully.

3. Another Identity: The Money Supply Formation Table

(Read Artis, Macroeconomics, pp.43-49)

There are two main reasons for introducing the money supply formation table at this juncture. First, the money supply formation table rests on a set of identities in the same manner as do the national income accounts (which we discussed), flow-of-funds accounts, and the balance of payments accounts. The equalities under study are true by definition. So there is a methodological link between these sets of accounts.

Second, the money supply formation table looks at the public sector borrowing requirement, which is closely related to the public sector deficit, and also calls on elements of the balance of payments.

Let us look at a closed economy first. We shall aggregate the personal and corporate sectors together into one 'private sector', and we shall adopt first a simple definition of 'money'. Money is to be identified with the total quantity of bank deposits. (Later money is redefined to include currency (cash) as well).

We assume that there is a banking system the function of which is to issue deposits and to lend to the private sector and government. We also postulate that the government does issue its own debt instruments (bonds, bills and notes).

In the model, there are three identities.

(1) The banking sector

The first identity is the equality of assets and liabilities in the **banking system's balance sheet**. We suppose that all bank liabilities are bank deposits. The banking system lends these deposits to the government sector by buying the bonds and bills issued by the government. It also lends to the private sector, by way of making advances.

The banking system's balance sheet therefore has the simple structure:

Liabilities ≡	Assets
D (deposits)	A (advances) Gb (government bonds and bills)

So

$$D \equiv A + G_{b.}$$

And

$$\Delta D \equiv \Delta A + \Delta G_b$$

(2) The public sector

The second identity states that the net increase in government bonds must be held by the private sector directly (G_p), or by the banking system (G_b). The net increase in the amount of the government's bonds on issue in any period is the net amount by which government spending exceeds its revenue, i.e. the public sector deficit (PSD). Assuming that government revenue remains unchanged, we can write this as:

$$PSD \equiv \Delta\overline{G} \equiv \Delta G_b + \Delta G_{p.}$$

Substituting from the above expression for ΔG_b in the bank balance sheet identity, we have

$$\Delta D \equiv \Delta A + (PSD - \Delta G_p).$$

This means that the increase in the money supply in any period can be regarded as the sum of the public sector deficit less net sales of bonds and bills to the private sector plus the increase in bank lending.

(3) The money supply

While the expression derived above is the basic identity of the money supply formation table, we have omitted a number of complications. First, we can relax two other simplifying assumptions. Assume now that the money supply is defined (as it actually is) as the sum of currency or notes and coin (N) held by the public plus bank deposits. So

$$M \equiv N + D$$

and

$$\Delta M \equiv \Delta N + \Delta D$$

Assume also that the government may engage in some nationalization or privatization of assets. It will be able to buy shares in private companies or sell off shares in public corporations. The government's need to borrow is accordingly increased or decreased. In the UK, this is called the "public sector borrowing requirement" (PSBR). It is defined as the PSD plus net lending (L), where 'net lending' is understood to include nationalization or privatization. So

$$PSBR \equiv PSD + L \equiv \Delta\overline{G}\,.$$

The inclusion of currency in the definition of the money supply involves a further complication. The currency is also a debt of the government, so $\Delta\overline{G}$, which previously was an increase in government bonds and bills, now includes currency. Hence

$$\Delta\overline{G} \equiv \Delta G_b + \Delta G_p + \Delta N.$$

The money supply formation table can now be derived from the three identities:

$$\Delta M \equiv \Delta D + \Delta N \quad \text{(money supply identity)} \quad (1)$$

$$\Delta D \equiv \Delta A + \Delta G_b \quad \text{(banking sector identity)} \quad (2)$$

$$\Delta G_b \equiv PSBR - \Delta G_p - \Delta N \quad \text{(government financing identity)} \quad (3)$$

Substituting from the government financing identity into the banking sector identity, and from there into the money supply identity, we arrive at

$$\Delta M \equiv \Delta A + (PSBR - \Delta G_p).$$

Note that currency drops out as an explicit term. The terms can obviously be arranged in different ways if so desired.

We now take account of the foreign sector. The money supply, in the presence of foreign-held deposits, is strictly described as residents' holdings of currency plus bank deposits. The banks' balance sheet, allowing for lending to, and depositing by, non-residents (NR) is as follows:

Liabilities	≡	Assets
D_R		$A = A_R + A_{NR}$
D_{NR}		G_b
D	≡	$A + G_b$

So $\Delta D \equiv \Delta A + \Delta G_{b.}$

$$\Delta D_R \equiv \Delta A_R + \Delta G_b + \Delta A_{NR} - \Delta D_{NR.} \qquad (4)$$

A further consequence of the presence of the foreign sector is the need to allow for the possibility of the government being financed by overseas purchases of its debt (ΔG_o). Taking this into account, we shall have

$$PSBR \equiv \Delta\overline{G} \equiv \Delta G_b + \Delta G_p + \Delta G_o + \Delta N. \qquad (5)$$

$$G_b \equiv PSBR - \Delta G_p - \Delta G_o - \Delta N. \qquad (5')$$

Substituting (5') into (4) and then the money supply identity, i.e. (1), we have,

$$\Delta M \equiv \Delta D_R + \Delta N \equiv \Delta A_R + (PSBR - \Delta G_p - \Delta G_O) + \Delta(A_{NR} - D_{NR}).$$

So the money supply formation equation is:

$$\Delta M \equiv \Delta A_R + (PSBR - \Delta G_p - \Delta G_O) + \Delta(A_{NR} - D_{NR}).$$

credit policy **fiscal policy** **BOP policy**

Policy implications can be drawn from it.

[There may be two further adjustments, one for the increase in residents' holdings of foreign currency deposits and the other for the increase in banks' non-deposit liabilities. The need for the first of these adjustments arises from the fact that the conventional definition of the money supply includes only domestic currency bank deposits, so holdings of foreign currency deposits have to be netted off. The need for the latter is perhaps less obvious at first sight. It arises because the banks have some liabilities that are not deposits, and so are not counted as part of the money supply. When such non-deposit liabilities (NDL) are included, the banking sector

balance sheet will read

$$\Delta D_R + \Delta D_{NR} + \Delta NDL = \Delta A + \Delta G_b$$

so the money supply equation will read

$$\Delta M = \Delta D_R + \Delta N$$

$$= \Delta A_R + \Delta G_b + \Delta(A_{NR} - D_{NR}) - \Delta NDL.] \text{ etc.....}$$

Warnings

The above identity is exactly what it is: just an identity. It is not a behavioural equation. In other words, it only gives a *prima facie* set of relationships amongst the variables that it defines. Given everything equal, the changes in other variables should be as indicated.

However, in reality, everything may not be equal, and the **variables** in the identity may be ***correlated*** in various positive or negative ways, e.g. the central bank tightens credit, i.e. $\Delta A_R < 0$, to try to reduce money supply. However if the resulting higher interest rates would attract more inflow of capital, i.e. $\Delta(A_{NR} - D_{NR}) > 0$, then the money supply may increase, offsetting or even exceeding the government's intended effect.

$$\Delta M = \Delta A_{R\downarrow} + (\text{PSBR} - \Delta G_p - \Delta G_O) + \Delta(A_{NR} - D_{NR})\uparrow .$$

Overall

The identities are first approximations, ***prima facie*** explanations. At the end of the day, behavioural models are needed to explain the changes in Y or MS.