National Income Identity, Balance of Payments and Sudden Stops

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Chapter Outline

This material was primarily intended as my personal notes for International Economics which I teach as an "intermediate" open economy macro course at Quinnipiac University. The outline of this section is:

1. Open Economy National Income Identity
2. Intertemporal Budget Constraints and the Balance of Payments Identity
3. Savings, Investment and the Open Economy
4. Trade Surpluses and Deficits and Consumption Smoothing
5. Bringing it all together: The case of Sudden Stops

1 Open Economy National Income Identity

$$Y \equiv C + I + G + NX \tag{1.1}$$

We often let $A \equiv C + I + G$ be "absorption" or "domestic absorption".

One can think about NX as EX being the production you didn't "absorb" domestically, and IM being the domestic absorption of stuff you didn't produce domestically. So, we can write

$$Y - A \equiv NX \tag{1.2}$$

Notice the above expressions are identities.

So, what if you want to "consume" more than you produce so $A > Y$? Let $Y = \$100$ and $A = \$120$, where did you get the extra \$20? It must have been brought in from abroad, hence $NX = -\$20$ in this case.

2 Intertemporal Budget Constraints and the Balance of Payments Identity

Basically a budget constraint is just a way of thinking of your "income" versus your spending. "income" can be your flow income or your wealth, but we'll keep it simple and leave it open and loose the way you'd use the term in casual conversation.

$$Income \geq Spending.$$

At some level the inequality is sloppy. If income exceeds spending, then it must show up somewhere so you are forgetting a variable. So, I'll use equality signs instead of inequality signs.

Then at time t (i.e., "today"), if an economy consumes only its own production (or is a closed economy), then the following will be true:

$$\underbrace{Y_t}_{income} = \underbrace{A_t}_{spending}$$

If this were an individual, then it would say you are consuming (or spending) exactly your the amount you earn. But what if your income is \$100 (i.e., $Y = \$100$) and you'd like to consumer \$120 (i.e., $A = \$120$)? It's pretty clear you'd have to borrow an amount, $B = \$20$). In our budget constraint, since this extra \$20 is like income for you today, we'll add it to the left hand side of the constraint. But tomorrow (or next month or next year) when you have to replay it with interest, i, that will show up on the right hand side with the spending/expenses.

More generally then we can write:

$$\underbrace{Y_t + B_t}_{income} = \underbrace{A_t}_{spending}$$

And, in our example,

$$\underbrace{Y_t}_{\$100} + \underbrace{B_t}_{\$20} = \underbrace{A_t}_{\$120}$$

So, everything adds up. This actually can be the general form of the equation because in the case above when we spent exactly our income, the same equation applies, just $B_t = 0$. But, we aren't quite done. What about next period? To get a precise number and keep things simple, let's assume you borrowed at an interest rate of 10% and that your income and your desired spending are unchanged. Then,

$$\underbrace{Y_{t+1}}_{\$100} + \underbrace{B_{t+1}}_{\$42} = \underbrace{A_{t+1}}_{\$120} + \underbrace{\underbrace{B_{t+1}}_{\$20} + \underbrace{i_{t+1}B_{t+1}}_{0.1\times\$20}}_{\$22}$$

So, if your income was constant and you didn't alter your spending, then you have to borrow again and you have to borrow even more. Now you need enough to finance current consumption (in excess of income) and to repay your past borrowing with interest. The expression we've derived, by the way, is a good general form.

$$Y_{t+1} + B_{t+1} = A_{t+1} + B_t + i_t B_t \tag{2.1}$$

And we can rewrite this...

$$\underbrace{Y_{t+1} - A_{t+1}}_{NX_{t+1}} + \underbrace{B_{t+1} - B_t}_{\Delta B_{t+1}} = i_t B_t$$

And,

$$NX_{t+1} - i_t B_t + \Delta B_{t+1} = 0$$

We call the ΔB, the financial or capital flows. The precise textbook definition of capital flows is more rare and includes things like intergovernmental monetary transfers. The financial flows are just the kind of flows we are thinking of. But since we'll consider a full economy with individuals and governments, to keep things simple, I'll refer to ΔB as the finacial-captial flow, or account, FKA.

Notice, we can redo this problem as one where the individual/economy spends less each period than it earns. In this case, it would be saving the money and the B_t would show up as "savings", S_t on the right hand side, since it's an expense today but the repayment plus interest would show up on the left in the future. The general formula would look like this:

$$Y_{t+1} + S_t + i_t S_t = A_{t+1} + S_{t+1} \tag{2.2}$$

Now when we rearrange it we get

$$NX_{t+1} + i_t S_t - \Delta S_{t+1} = 0$$

Rather than have one variable for borrowing, B, and another for saving, S, we just use "B" everywhere and accept that it will sometimes be a positive number (when lending) and other times negative (when borrowing).

To distinguish between the trade account, NX, and the general account between the domestic economy and the rest of the world, we call the $NX + iB$ piece the "Current Account", or CA. In this way we have a new identity that must hold and accounts for both the trade and financial flows in and out of an economy.

$$CA_t + FKA_t = 0 \tag{2.3}$$

But this isn't quite done since an aggregate economy with individuals and government bodies has one other way to "save" or finance things. That is, a government will hold a stock of International Reserves, R, of international currencies. Since it can use this to pay international debts, for instance, the true relations, accounting for all possibilities is below and is called the **Balance of Payments Identity**:

$$CA_t + FKA_t = \Delta R. \tag{2.4}$$

3 Savings, Investment and the Open Economy

Now that we have the Balance of Payments identity, it's clear that, especially in an intertemporal accounting sense, an economy's trade with the rest of the world is intimately linked to financial flows with the rest of the world and to borrowing/lending with the rest of the world. This connection is also immediately seen from simply rearranging the national income identity.

First, observe that a person or an economy's "savings" is simply their "income" (Y) minus their "consumption" (C). We often consider consumption out of "disposable income" (Y-T) which is the income you have after paying taxes. So, private savings is

$$S^p = Y - T - C.$$

For a government we can measure things similarly. The government's "income" is its tax revenue (T) and it's "consumption" is government expenditures (G). So government savings is

$$S^g = T - G.$$

Now back to the national income identity. Add and subtract taxes to it,

$$Y = C + I + G + NX + T - T$$

Then move to the left hand side everything but I and NX,

$$\underbrace{\underbrace{Y - T - C}_{S^p} + \underbrace{T - G}_{S^g}}_{S} = I + NX$$

So, we can just write: $S = I + NX$

Or, more commonly written:

$$S - I = NX \tag{3.1}$$

4 Trade Surpluses and Deficits and Consumption Smoothing Over Time

What all this means at one level is that an economy's trade balance and hence it's CA and FKA fundamentally reflect an economy smoothing consumption over time. Consumption smoothing is something we all do and we generally prefer to non-smooth consumption. An example will illustrate this best.

Suppose you work as a high-school or university teacher. In that case, you are likely on a 9-month contract. That means you "work" all year long except for summer. That also means that technically you have zero income in the summer. If you didn't consumption smooth, then you might just consume your current income every month (the case of $Y = A$ in our budget constraint example). But then for the summer months, $Y = 0$, so you would starve to death since your consumption would also be zero.

Instead you smooth consumption. For example, during the school year, you save, so your budget constraint looks like

$$Y_t + i_{t-1}B_{t-1} = A_t + B_t$$

You might have $Y_t = \$100$ but you only consume/absorb 80%, so $A_t = \$80$ and hence you put \$20 into savings each month from September through May. In all those cases you'd have

$$Y < A \Rightarrow NX > 0 \& S - I = NX > 0 \Rightarrow S > I$$

That is, you are saving. Imagine a whole teacher economy doing this. Then the economy would have to save with the rest of the world and would run a NX surplus, a CA surplus, and an FKA deficit or "outflow" (since your money is flowing out).

$$\underbrace{CA}_{+} + \underbrace{FKA}_{-} = 0$$

Or, $CAS + FKO = 0$ where CAS is a surplus, $CA > 0$ and FKO financial-capital account outflow of funds to the rest of the world, $FKA < 0$.

Notice that an entire economy can't save all at once unless it is trading with the rest of the world.

In the summer, everything would reverse since your income would be ZERO but you'd still like to consume, $A = \$80$ per month. To do that, you have to be spending the interest earnings and spending down your savings that you accumulated over the year.

$$\underbrace{CA}_{-} + \underbrace{FKA}_{+} = 0$$

Or, $CAD + FKI = 0$ where CAD is a deficit, $CA < 0$ and FKI is a financial-capital account inflow of funds from the rest of the world.

So these international flows and accounts can be thought of as reflecting an economy's attempt to smooth consumption over time.

The problem comes with a large and persistent CAD. Why? And if the CAD is a problem, would a large and persistent CAS be a good thing? Why?

5 Bringing it all together: The case of Sudden Stops

Imagine an economy that runs a persistent trade deficit. To finance that it is very likely borrowing persistently from the rest of the world. Suddenly, international lenders become concerned about your economy's new government or the world runs into a recession and suddenly your small economy cannot borrow anything in the world. What happens?

Until now, we've gone this way $Y - A < 0 \Rightarrow CA < 0$. Now suddenly we go the other direction, $CA \to 0 \Rightarrow Y - A = ?$. And what options will the domestic economy have at it's disposal.

To analyze this, start at the highest level: The Balance of Payments.

$$\underbrace{CA_t}_{-} + \underbrace{FKA_t}_{+} = \underbrace{\Delta R_t}_{0}$$

Notice this implies $Y_t < A_t$. Your economy is fundamentally consuming more than it's producing (just like you did in the summers in the teaching example).

Now, at the next date, $FKA \to 0$. If your economy has international reserves, then by accounting alone one could imagine this scenario:

$$\underbrace{CA_t}_{-} + \underbrace{FKA_t}_{0} = \underbrace{\Delta R_t}_{-}$$

Why is this impractical in real life? If it could work it would, however, allow your to maintain your high consumption (relative to income), which is great. Is there any limit to how long your economy could get away with this?

Now suppose you can't do this. What happens now?