

Digression on balance of payments accounting identities

2.1 Accounting identity based on trade balance and income balances

The balance of payments records all economic transactions between residents and non-residents during a specific period of time. In the balance of payments statistics,¹ an economy's current account is decomposed into international flows associated with transactions in goods and services, net factor income—also called primary income—and unilateral current transfers—also called secondary income (IMF, 2008, p. 13). The (nominal) current account balance over period t (CAB_t^n) can thus be written as the sum of balances on trade in goods and services (TB_t^n), primary income (PIB_t^n), and secondary income (SIB_t^n):

$$CAB_t^n = TB_t^n + PIB_t^n + SIB_t^n.$$

The superscript n indicates that the variables are measured in nominal terms. The trade balance equals the difference between exports (X_t^n) and imports (M_t^n) of goods and services: $TB_t^n = X_t^n - M_t^n$. The secondary income account records current transfers between residents and nonresidents, such as social benefits and contribution or current international cooperation (IMF, 2008, p. 307). The primary income account shows amounts payable and receivable in return for providing to another entity a temporary use of labor such as compensation of employees, investment income such as interest and dividends, and nonproduced nonfinancial assets such as rents (IMF, 2008, pp. 271-2). Investment income in the current period can be expressed as the return on the beginning of period's net international investment position (also called net foreign asset position or net external position). The net international investment position (NIIP) is the difference between the economy's external financial assets and liabilities at a point in time (IMF, 2008, p. 173). A positive NIIP indicates net foreign assets, and a negative NIIP net foreign liabilities. Countries with a positive NIIP are called "net creditors," and countries with a negative NIIP are often labeled as "net borrowers" or "net debtors"—although, strictly speaking, only nonequity components of the negative NIIP can be described as (external) debt. In sum, the current account balance can be rewritten as follows:

$$CAB_t^n = TB_t^n + i_t B_{t-1}^n + PIB_t^{rest,n} + SIB_t^n \quad (2.1)$$

¹ The accounting concepts used in this work are based on the Sixth Edition of the IMF's Balance of Payments Manual (IMF, 2008).

where B_{t-1}^n denotes the (nominal) NIIP at the end of period $t - 1$, i.e., at the beginning of period t , the rate of return on the NIIP is approximated by the (nominal) interest rate that prevailed on date t (i_t), and $PIB_t^{rest,n}$ denotes all components of the NIIP except investment income. Equation (2.1) shows that a surplus in the current account arises from net exports of goods and services, from the return on economy's net foreign assets, or from compensation received by employees. Linking the current account to national income and product accounts leads to two further identities.

2.2 Accounting identity based on income and absorption

In the national account statistics, gross domestic product (GDP) measures the total market value of all goods and services produced domestically in one year and can be expressed as

$$Y_t^n = C_t^n + G_t^n + I_t^n + TB_t^n \quad (2.2)$$

where Y_t^n denotes (nominal) GDP, C_t^n denotes (nominal) private consumption, G_t^n is (nominal) public consumption, and I_t^n denotes (nominal) gross private and public investment (Carranza, 2002, p. 99). The sum of (private and public) consumption and investment equals the total expenditures on goods and services by domestic residents, also called domestic absorption (A_t^n): $A_t^n = C_t^n + G_t^n + I_t^n$. Consequently, the trade balance can be expressed as the difference between GDP and domestic absorption: $TB_t^n = Y_t^n - A_t^n$. Thus, identity (2.1) can be rewritten as

$$CAB_t^n = Y_t^n - C_t^n - G_t^n - I_t^n + i_t B_{t-1}^n + PIB_t^{rest,n} + SIB_t^n. \quad (2.3)$$

The sum of GDP and primary income equals gross national income (GNI). Adding the secondary income balance to GNI leads to gross national disposable income (GNDI) which is the most comprehensive income measure in an open economy:

$$GNDI_t^n = Y_t^n + i_t B_{t-1}^n + PIB_t^{rest,n} + SIB_t^n. \quad (2.4)$$

Combining identities (2.3) and (2.4) shows that the current account deficit equals the excess of domestic absorption over GNDI: $CAB_t^n = GNDI_t^n - A_t^n$. However, in practice, it should be taken into account that the national account and the balance of payments statistics may apply different definitions of certain accounting concepts, for example, concerning the treatment of net factor income payments and transfers (Isard et al., 2001, p. 6; IMF, 2008, pp. 122-3).

2.3 Accounting identity based on saving and investment

Subtracting private and public consumption from gross national disposable income yields gross domestic saving (S_t^n), that is, the share of GNDI which is not used for consumption: $S_t^n = GNDI_t^n - C_t^n - G_t^n$. Using this definition to rearrange the terms in identity (2.3), the current account can be expressed as the gap between gross domestic saving and gross domestic investment:

$$CAB_t^n = S_t^n - I_t^n. \quad (2.5)$$

Equation (2.5) implies first that an open economy can save either by acquiring foreign wealth (i.e., generating a current account surplus) or by building its capital stock (Krugman and Obstfeld, 2003, p. 304). Second, identity (2.5) indicates that investment can be financed with either external saving (i.e., running a current account deficit) or domestic saving (Carranza, 2002, p. 100).

The relationship between the public and private sectors can be seen more clearly by distinguishing between government saving and private saving. Private saving ($S_t^{p,n}$) can be defined as that part of GNDI less net taxes (i.e., net taxes minus all government transfer payments) which is not used for private consumption: $S_t^{p,n} = GNDI_t^n - T_t^n - C_t^n$ where T_t^n denotes net taxes. Government saving ($S_t^{g,n}$) can be expressed as the excess of government's net tax revenues over government spending: $S_t^{g,n} = T_t^n - G_t^n$ (Krugman and Obstfeld, 2003, p. 305). Trivially, government and private savings add up to total domestic saving. Using the definitions of public and government savings, equation (2.5) can be rewritten as

$$CAB_t^n = (S_t^{p,n} - I_t^n) + (T_t^n - G_t^n). \quad (2.6)$$

Identity (2.6) shows that the current account balance equals the gap between private saving and investment plus the fiscal balance.² In other words, a government budget deficit can be financed either with external saving (i.e., current account deficit) or with the excess of private saving over private investment (Carranza, 2002, p. 100).

2.4 Combining accounting identities

Ignoring net errors and omissions, the balance of payments is offset if the current account balance, the capital account balance (KAB^n), and the financial account balance (FAB^n) sum up to zero:

$$CAB_t^n + KAB_t^n + FAB_t^n = 0. \quad (2.7)$$

The capital account records all transactions involving the receipt or payment of capital transfers and the acquisition or disposal of nonproduced, nonfinancial assets (IMF, 2008, p. 321). The financial account pertains to transactions associated with the net acquisition and disposal of foreign financial assets and liabilities of an economy (IMF, 2008, p. 194). A surplus in the financial account ($FAB^n > 0$) corresponds to the net acquisition of financial assets, and a financial account deficit ($FAB^n < 0$) to the net purchase of assets. Rewriting identity (2.7) as $CAB_t^n + KAB_t^n = -FAB_t^n$ implies that a surplus (deficit) in the current and capital accounts must be matched by a deficit (surplus) in the financial account. In other words, the net provision of resources to the rest of the world (i.e., a surplus in the current and capital accounts) must equal an increase in net claims on the rest of the world (i.e., a financial account deficit) or, to put it differently, net lending (borrowing) on the current and capital accounts equals net borrowing (lending) on the financial account. Since a surplus in the financial account corresponds to an increase in

² More precisely, investment should be split up into private and public investment. In this case, equation (2.6) becomes $CAB_t^n = (S_t^{p,n} - I_t^{p,n}) + (S_t^{g,n} - I_t^{g,n})$ where the superscripts p and g denote the private and the public sector, respectively. If net dissaving of the government sector is not offset by net saving of the private sector, the current account is in deficit (IMF, 2008, p. 159).

economy's net foreign liabilities or a reduction in net foreign assets, i.e., $FAB_t^n = -(B_t^n - B_{t-1}^n)$.³ the current and capital accounts equal the change in the net international investment position:

$$CAB_t^n + KAB_t^n = \Delta B_t^n$$

where the (first) difference operator Δ denotes the change of a variable between two subsequent points, e.g., $\Delta B_t^n \equiv B_t^n - B_{t-1}^n$. Abstracting, for simplicity, from the capital account shows that the current account deficit (surplus) equals a decrease (an increase) in the NIIP:

$$CAB_t^n = \Delta B_t^n. \quad (2.8)$$

Equation (2.8) also implies that the NIIP corresponds to the accumulation of current account balances from period t back to period zero (Holmes, 2006, p. 17).⁴

$$B_t^n = CAB_t^n + CAB_{t-1}^n + CAB_{t-2}^n + \dots + CAB_0^n. \quad (2.11)$$

Following the so called “analytic” presentation of the balance of payments which distinguishes between net reserve asset transactions (FX_t^n) and other items (IMF, 2008, p. 334), identity (2.8) can be rewritten as

$$CAB_t^n = \Delta B_t^{NR,n} - KAB_t^n + \Delta FX_t^n \quad (2.12)$$

where the superscript NR denotes financial account transactions excluding net reserve assets.⁵ Equation (2.12) shows that a current account deficit can be financed through private funds—viz. financial inflows, i.e., a reduction in the NIIP net of reserves ($\Delta B_t^{NR,n} < 0$) and capital inflows ($KAB_t^n > 0$)—as well as through official funds via liquidating international reserves ($\Delta FX_t^n < 0$). A current account surplus is reflected in a net purchase of international reserves on the part of monetary authorities ($\Delta FX_t^n > 0$) or an increase in other net claims towards the rest of the world ($\Delta B_t^{NR,n} - KAB_t^n > 0$). In an independently floating exchange rate arrangement in which monetary authorities do not intervene in exchange markets, the stock of international reserves does

³ More precisely, the financial account corresponds to the difference between the closing value (at the end of the period) and the opening value (at the beginning of the period) in the integrated statement of the NIIP if other changes in financial assets and liabilities (e.g., due to changes in volume or exchange rates) are neglected (IMF, 2008, pp. 11, 174).

⁴ This can be shown by solving equation (2.8) for B_t^n and adding at first B_{t-2}^n on both sides of equation (2.8). This yields

$$B_t^n = CAB_t^n + B_{t-1}^n + B_{t-2}^n - B_{t-2}^n. \quad (2.9)$$

Substituting $CAB_{t-1}^n = B_{t-1}^n - B_{t-2}^n$ and adding B_{t-3}^n on both sides of equation (2.9) results in

$$B_t^n = CAB_t^n + CAB_{t-1}^n + B_{t-2}^n + B_{t-3}^n - B_{t-3}^n. \quad (2.10)$$

Substituting $CAB_{t-2}^n = B_{t-2}^n - B_{t-3}^n$ in equation (2.10) one obtains

$$B_t^n = CAB_t^n + CAB_{t-1}^n + CAB_{t-2}^n + B_{t-3}^n.$$

Repeated substitution finally leads to equation (2.11).

⁵ In addition, in the “analytic” presentation of the balance of payments, exceptional financing items (e.g., debt forgiveness, debt for equity swaps, debt rescheduling/refinancing) are taken out from the current, capital, and financial accounts and are moved to the reserves and related items heading (see IMF, 2008, pp. 334, 352-375 for details). For simplicity, exceptional financing items are ignored here.

not change ($\Delta FX_t^n = 0$) so that $CAB_t^n = \Delta B_t^{NR,n} - KAB_t^n$. In a fixed peg arrangement, transactions in reserve assets are determined by the net demand or supply of foreign exchange at the particular exchange rate. Finally, in the intermediate exchange rate arrangement (such as crawling bands or managed floating), monetary authorities typically undertake purchases and sales of reserve assets aimed at influencing the exchange rate (IMF, 2008).⁶ However, financing a current account deficit through a recourse to official reserves is limited as the stock of reserve assets is finite. Moreover, foreign private investors' willingness to lend might diminish when the monetary authorities are expected to shortly deplete an economy's reserves since a possible depreciation might *ceteris paribus* reduce the rate of return expected by investors (IMF, 2008). This situation can result in a currency crisis in which a speculative attack precipitates a devaluation or a sharp depreciation of the currency, or leads to a rapid exhaustion of international reserves or a sharp increase in interest rates (IMF, 1998). In contrast, purchases of international reserves are, at least theoretically, unlimited. Thus, there is an asymmetry between countries running current account deficits and those with current account surpluses. However, a large accumulation of reserve assets—if not sterilized through a matching reduction in net domestic assets—might increase a money supply and, thus, create inflationary pressures.⁷

Rearranging the terms in identity (2.12) one obtains

$$CAB_t^n + KAB_t^n - \Delta B_t^{NR,n} = \Delta FX_t^n \quad (2.13)$$

where the left-hand side of identity (2.13) represents the overall or external account, that is, the balance of payments net of reserve assets (which is sometimes simply referred to as the “balance of payments”). A deficit (surplus) in the external balance can be financed by a decrease (increase) in reserve assets. Finally, the external balance is achieved when the economy records no changes of reserve assets. From the global perspective, the sum of all balance of payments balances in the world must add up to zero (apart from statistical discrepancies) or, to put it differently, the sum of external imbalances of all countries in the world must equal the change in net world reserves (Gandolfo, 2001, pp. 64–68).

As already mentioned in chapter 1, the analysis of external sustainability should not rely exclusively on the current account balance, instead, it should consider all dimensions of the balance of payments. Specifically, this can be accomplished either by analyzing identity (2.12) or by combining identity (2.8) with identities (2.1), (2.3), or (2.5). This yields the following three balance of payments identities which represent different perspectives on the economy's transactions with the rest of the world:

$$B_t^n - B_{t-1}^n = TB_t^n + i_t B_{t-1}^n + PIB_t^{rest,n} + SIB_t^n + KAB_t^n \quad (2.14)$$

$$B_t^n - B_{t-1}^n = Y_t^n - C_t^n - G_t^n - I_t^n + i_t B_{t-1}^n + PIB_t^{rest,n} + SIB_t^n + KAB_t^n \quad (2.15)$$

$$B_t^n - B_{t-1}^n = S_t^n - I_t^n + PIB_t^n + SIB_t^n + KAB_t^n. \quad (2.16)$$

⁶ The classification system of *de facto* exchange rate arrangements as identified by the IMF staff can be found in Ishii and Habermeier (2003).

⁷ For costs and risks of the reserve accumulation see Higgins and Klitgaard (2004). The analysis of motives for accumulation of international reserves is provided by Aizenman and Lee (2007); Jeanne (2007); Aizenman (2008); Barnichon (2009). The general discussion of the effectiveness of foreign exchange interventions and sterilization can be found in Caballero and Krishnamurthy (2001); Taylor and Sarno (2001); Weber (1994); Reitz and Taylor (2008).

The left-hand side of each of the three identities represents trade in foreign assets. This international perspective is combined with the perspective based on international trade in goods and services (identity (2.14)) or with the domestic perspective based on national income and product accounts (identities (2.15) and (2.16), respectively) (Mann, 2002). By definition, each identity holds *ex post* in the particular period. Since identities are not based on any theory about the behavior of economic agents, no causal relationships can be deduced.

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