

National Accounts and Model Consistency

Concepts and identities

Concepts

- Geographic vs residence criteria
- Resident units (national) vs Rest of the World
- Flows versus stocks
- Transactions with and without counterpart
- Gross versus net
- Assets: produced, financial, non-produced non-financial

Identities

- Production and income:
 - Total value of production must equal the value of income (excluding transfers) generated domestically.
- Income, expenditure, and savings:
 - For any economic agent, income earned plus transfers must be equal to expenditure plus savings.
- Savings and asset accumulation:
 - Savings plus borrowing must equal asset acquisition for any economic agent.

Three approaches to measure economic activity

- The product (V.A.) approach
 - Looks at the supply of goods in the **territory (Domestic)**
 - The key measure is Gross Domestic Product (GDP) at basic prices: the value of all (*intermediate* and *final*) goods and services produced as output by firms, *minus* the value of all goods and services purchased as inputs by firms.
- The expenditure approaches
 - Looks at the *final* demand for durable and non-durable goods and services.
 - The key measure is GDP at market prices.
- The income approach
 - Focuses on payments to **owners** of factors (residency) Wages and salaries, firm' operating surpluses, property income, and imputed compensation
 - The key measures are Gross National Income (GNI) and Gross National Disposable Income (GNDI).

Value added approach

GDP at factor costs

- GDP at factor costs (basic prices), Q_{fc}
 - Sum of
 - Employee compensation (wages, salaries and incomes of own-account producers)
 - Operating surpluses of all enterprises.
 - By convention, accrues to households or government.

$$GVA = WN + GOS = GDP_{fc}$$

GDP at market prices

- GDP at Market Prices:

$$GDP_{mp} = GVA + T_i = P_Y Q$$

- T_i =indirect taxes- subsidies (Nominal).

Gross National Expenditure

$$GNE = P_C C + P_K I + P_G G$$

GNE, also labeled as “Absorption” or “Domestic Demand” is the total expenditure on final goods and services by home entities:

C: Private consumption

- Expenditures by private sector on final goods and services
- Includes nondurable goods, durable goods, and services.

I: Gross private investment

- Additions to the stock of capital by domestic units
- Construction, equipment, vehicles of a new house or a new factory, the purchase of new equipment, and net increases in inventories.

G: Government consumption

- Includes spending on goods and services, national defense, the police, and the civil service.
- It does *not* include any transfer payments or income redistributions, such as Social Security or unemployment insurance payments—these are *not* purchases of goods or services.

From expenditure to production

- **Gross Domestic Product (GDP)** measures the volume of production within a country's borders.

$$\begin{aligned}
 GDP = \underbrace{P_Y Q}_{\substack{\text{Gross domestic} \\ \text{product} \\ \text{at market prices}}} &= \underbrace{P_C C + P_K I + P_G G}_{\substack{\text{Gross} \\ \text{national} \\ \text{expenditure} \\ (GNE)}} + \underbrace{\left(\underbrace{P_X X}_{\substack{\text{All exports,} \\ \text{final \& intermediate}}} - \underbrace{P_M M}_{\substack{\text{All imports,} \\ \text{final \& intermediate}}} \right)}_{\text{NetExports (TB)}}
 \end{aligned}$$

- The **Trade Balance** is an item in the Balance of Payments
 - Difference between exports and imports of goods and services

Income, savings, current account

Income

- Gross national income

$$GNI = P_Y Q + e_t i^* B_{t-1}^*$$

- Gross national disposable income

$$GNDI = P_Y Q + e_t i^* B_{t-1}^* + NUT$$

National Savings

$$P_Y S_t = GNDI - P_C C - P_G G$$

Main identity

$$\begin{aligned} P_Y S_t &= \\ &= P_K I + (P_X X - P_M M + e_t i^* B_{t-1}^* + NUT) = \\ &= P_K I + CA \end{aligned}$$

$$P_Y S - P_K I = CA$$

Private Sector (incl. Banks)

Transactions

GDP	$P_Y Q$
- Taxes + Subsidies + Gov Transfers	-T
+ Transfers from abroad	NUT^P
+ Interest on government debt	$+ iD_G^P$
+ Income from external assets	$+ i^* eB_P^*$
- Consumption	$-P_C C$
= Current Savings	$P_Y S^P$
- Investment	$P_K I^P$
+ Other Capital	KA^P
=Net Lending	

$$P_C Y_{dt}^P = P_Y Q + e_t i^* B_{P,t-1}^* - T + NUT^P + iD_{G,t-1}^P$$

$$P_Y S_t^P = P_Y Y_{dt}^P - P_C C$$

$$P_Y S_t^P - P_K I^P + KA^P = \dots$$

Government Sector (incl. C. Bank)

$$P_Y S_t^G = T - iD_{G,t-1}^P + i^* e (B_{C,t-1}^* - D_{G,t-1}^*) + NUT^G - P_G G$$

Transactions

Taxes - subsidies - Transfers	T
- Government Expenditures	G
+ Net Transfers from abroad	NUT _G
- Interest on domestic debt	- iD_P^G
- Interest on foreign debt	- $i^* e (D_G^* - B_C^*)$
= Current Savings	$P_Y S_G$
- Investment	$P_K I_G$
+ Other Capital	KA_G
= Net Lending	

$$P_Y S_t^G - P_K I_G + KA_G = \dots$$

Foreign Sector (Balance of payments)

$$CA + KA = P_X X - P_M M + e_i^* B_{t-1}^* + NUT + KA = e\Delta B^*$$

Transactions

Exports of goods and services	$P_X X$
- Imports of goods and services	$P_M M$
= Trade balance	TB
+ Primary income balance (NFIA)	$e_t i^* B_{t-1}^*$
+ Secondary income (NUT)	NUT
= Current Account	CA
+ Capital Account	KA
= Net Lending	$e\Delta B^*$

$$B_t^* = B_{Pt}^* + B_{Ct}^* - D_{Gt}^*$$

Production, redistribution and uses of income:

1. **Current account: flows of goods and services, factor incomes, and gifts.**

Accumulation accounts:

2. **Capital account: flows of special categories of assets.**

- Capital transfers (i.e., gifts of assets), such as Debt forgiveness and Investment Grants.
- Acquisitions and disposals of non-produced non-financial assets (e.g., trade-marks, franchises, permits to explore a natural resource).

3. **Financial account: flows of financial assets.**

- Debt (bonds, loans) or equity, issued by any entity.
- Categories: Portfolio investment, FDI, Derivatives, Other, **Central Bank' Reserve Assets**
- Surplus in the financial account (FA>0) means that the country is a net exporter of assets (net borrower)

Main identity

$GDP = P_Y Q = P_C C + P_K I + P_G G + P_X X - P_M M$	Nominal GDP
$CA = P_X X - P_M M + e i^* B_{t-1}^* + NUT = e \Delta B^*$	Current account
$P_Y S_t^P = P_Y Q + e i^* B_{P,t-1}^* - T + NUT^P + i D_{G,t-1}^P - P_C C$	Private savings
$P_Y S_t^G = T - i D_{G,t-1}^P + i^* e (B_{C,t-1}^* - D_{G,t-1}^*) + NUT^G - P_G G$	Government savings
$P_Y (S_t^P + S_t^G) = [P_Y Q + i^* e B_{t-1}^* + NUT] - P_G G - P_C C$	National savings
$P_Y S_t = P_K I + (P_X X - P_M M + e i^* B_{t-1}^* + NUT) = P_K I + CA$	Main identity

Consistency framework

- An integrated and consistent set of economic accounts is a **pre-requisite** for any modelling exercise in macroeconomic analysis
- Here, we present a model than can be explored in the construction of a fully-fledged macro-fiscal model (monetary or new-Keynesian)
- The model specifies
 - Nonfinancial private sector.
 - The government sector
 - The central bank.
 - Commercial banks
 - The balance of payments.
- For simplicity, in the following it is assumed that **banks receive no income**
 - Commercial banks are integrated in the private sector
 - The central bank is integrated in the government sector
 - The respective financial positions already reflect consolidation
- The financial sector only brings changes in assets and liabilities

Balance sheets

NF Private sector (NF)		Depository banks (B)		External sector (*)	
M_2	L_B^{NF}	R	D	eD_G^*	eB_C^*
D_G^{NF}		D_G^B	L_C^B	$NIIP$	eB_P^*
eB_P^*	NW_{NF}	L_B^{NF}	NW_B		
$P_K K_P$					

General Government (G)		Central bank (C)	
$P_K K_G$	$D_G^P = D_G^{NF} + D_G^B$	eB_C^*	M_B
	D_G^C	D_G^C	NW_C
	eD_G^*	L_C^B	
	NW_G		

$$NW_{NF} = P_K K_P + M_2 + B_P$$

$$B_P = eB_P^* + D_G^{NF} - L_B^{NF}$$

$$NW_B = R + L_B^{NF} + D_G^B - L_C^B - D$$

$$NW_G = P_K K_G - D_G^P - D_C^P - eD_G^*$$

$$NW_C = eB_C^* + (D_G^C + L_C^B) - M_B$$

$$M_B = R + X$$

$$NW = NW_P + NW_G + NW_C + NW_B = e[B_C^* - D_G^* + B_P^*] + P_K K = eB^* + P_K K$$

Flow of funds

	Non-Fin. Private Sector	Government	Central Bank	Commercial Banks	Total
Gross Savings	$P_Y S_P$	$P_Y S_G$			$P_Y S$
(-) Investment	$P_K I_P$	$P_K I_G$			$P_K I$
(+) Other Capital (net)	KA_P	KA_G			KA
(=) Net Lending (+) or Borrowing (-)	$P_Y S_P - KA_P - P_K I_P$	$P_Y S_G - P_K I_G - KA_G$			CA+ KA
(=) Money	ΔM_2		$-\Delta M_B$	$\Delta R - \Delta D$	0
(+) Domestic Credit	$-\Delta L_B^P$		ΔL_C^B	$\Delta L_B^P - \Delta L_C^B$	0
(+) Securities placed at home	ΔD_G^{NF}	$-\Delta D_G^P - \Delta D_G^C$	ΔD_G^C	ΔD_G^B	0
(+) Cross-border asset transactions (net)	$e\Delta B_P^*$	$-e\Delta D_G^*$	$e\Delta B_C^*$		$e\Delta B^*$

The Net International Financial Position

$$CA + KA = e\Delta B^*$$

Net lending or borrowing

- The CA measures external imbalances in trade of goods, services, factor services, and unilateral transfers.
- By the BOP identity, deficits on the current account side must be matched by surpluses on the asset side.
 - IF $CA+KA < 0$, the country is a **net borrower** to foreigners.
 - IF $CA+KA > 0$, the country is a **net lender** to foreigners

$$NIIP = eB^*$$

The NIIP (stock variable)

(where e stands for the exchange rate)

A country **external wealth** is given by net holdings of foreign assets:

- Foreign assets owned by the home country
- Minus external liabilities (home assets owned by foreigners).

This is the Net International Financial Position (stock measure)

- If $NIIP > 0$, net creditor: *external assets exceed liabilities*
- If $NIIP < 0$, net debtor: *external liabilities exceed assets.*
- The NIIP increases with CA surpluses
- Since it is calculated at market prices, also changes value with asset price movements

Changes in Net worth

$$\Delta NW = \Delta eB^* + e\Delta B^* + P_K \Delta K + \Delta P_K K$$

$$\Delta NW = (P_Y S - \delta P_K K) + KA + (\Delta eB^* + \Delta P_K K)$$

	Non-Fin. Private Sector	Government	Central Bank	Commerci al Banks	Total
Gross Savings	$P_Y S_P$	$P_Y S_G$			$P_Y S$
(-) Capital depreciation	$\delta P_K K_{P,t-1}$	$\delta P_K K_{G,t-1}$			$\delta P_K K$
(=) Net Savings	$P_Y S_{NF} - \delta P_K K_P$	$P_Y S_G - \delta P_K K_{G,t-1}$			
(+) Capital Transfers	KA_P	KA_G			KA
(+) Valuation changes	$\Delta eB_P^* + \Delta P_K K_P$	$\Delta P_K K_G - \Delta eD_G^*$	ΔeB_C^*		$\Delta eB^* + \Delta P_K K$
(=) Change in NW	ΔNW_{NF}	ΔNW_G	ΔNW_C	-	ΔNW

Changes in net worth: private NF sector

$$NW_{NF} = P_K K_P + M_2 + eB_P^* + D_G^{NF} - L_B^{NF}$$

$$P_Y S_t^P - P_K I_{P,t} = \Delta M_2 - \Delta L_B^{NF} + e\Delta B_P^* + \Delta D_G^P$$

$$\Delta NW_{NF} = (P_K \Delta K_P + \Delta P_K K_P) + (\Delta M_2 + \Delta D_G^P - \Delta L_B^{NF} + e\Delta B_P^*) + \Delta eB_P^*$$

$$\Delta NW_{NF} = (P_K \Delta K_P + \Delta P_K K_P) + P_Y S_t^P - P_K I_t^P + \Delta eB_P^*$$

$$\Delta K_t^P = I_t^P - \delta K_{t-1}^P$$

$$\Delta NW_{NF} = (P_Y S_t^P - P_K \delta K_{t-1}^P) + (\Delta P_K K_P + \Delta eB_P^*)$$

Change in net worth: Government

$$NW_G = P_K K_G - D_G^P - D_G^C - eD_G^*$$

$$P_Y S_G - P_K I_G = \Delta D_G^P + \Delta D_G^C + e\Delta D_G^*$$

$$\Delta NW_G = (P_K \Delta K_G + \Delta P_K K_G) - (\Delta D_G^P + \Delta D_G^C + e\Delta D_G^*) - \Delta e D_G^* \quad \Delta K_t^G = I_t^G - \delta K_{t-1}^G$$

$$\Delta NW_G = (P_K \Delta K_G + \Delta P_K K_G) + P_Y S_G - P_K I_G - \Delta e D_G^*$$

$$\Delta NW_G = (P_Y S_G - \delta P_K K_{t-1}^G) + (\Delta P_K K_G - \Delta e D_G^*)$$