Lessons VII and VIII: BoP Accounting Mechanisms and Models of Exchange Rate Determination

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Balance of Payments
FX Demand and Supply
The Building Blocks
Accounting Mechanisms
A Powerful Tool for Economic Analysis
BoP Exchange Rate Regimes
The BoP and the Recent Financial Crisis
Models of Exchange Rate Determination
Flow Models
Stock Models
Terminology
To Put It into Practice

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Getting Started

An exchange rate can be thought of as the **price of one currency in terms of another** currency

$\Downarrow$

With exchange rates being a price, it is reasonable to assume they are the result of **supply and demand dynamics**

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BoP: a Broad Definition

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The BOP account is a nation-wide document, summing up all the reasons for a currency being **supplied (- sign)** or **demanded (+ sign)**

FC Demand and DC Supply (-)

FC demand = DC supply

- Imports of goods and services
- Income payments
- Unilateral transfers (directed abroad)
- Increase in home country - owned assets abroad (both public and private)
- Foreign debt repayment
- Decrease in domestic assets held by foreigners (both public and private)

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FC Supply and DC Demand (+)

FC supply = DC demand

- Exports of goods and services
- Income receipts
- Unilateral transfers (directed at home)
- Purchases of domestic assets by non residents (both public and private sectors)
- Settlement on foreign credit
- Decrease in home country-owned assets abroad

BoP: the Building Blocks

The Balance of Payments is made up of **4 building blocks**:

- Current Account Balance (**CAB**)
- Capital Account Balance (**KAB**)
- Official Reserve Settlement (**ORS**)
- Statistical Discrepancies (**SD**)

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The Current Account Balance

- Exports of goods and services (+)
- Imports of goods and services (-)
- Income receipts (+)
- Income payments (-)
- Unilateral transfers (directed at home) (+)
- Unilateral transfers (directed abroad) (-)

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The Capital Account Balance

- Purchases of domestic assets by non residents (+)
- Sales of domestic assets by non residents (-)
- Purchases of foreign assets by residents (-)
- Sales of foreign assets by residents (+)
- Settlement on foreign credit (+)
- Repayment of foreign debt (-)

The Official Reserve Settlement

- Decreases in official reserves held by the CB (+)
- Increases in official reserves held by the CB (-)
- Decreases in assets other than official reserves (+)
- Increases in assets other than official reserves (-)

The Statistical Discrepancies

Once called **Errors and omissions**: unrecorded debits or credits in the BOP accounting.
This may be due to several reasons, such as:

- Lags between the time that current-account entries are made and the time that the associated payments appear elsewhere in the balance-of-payments account
- Many entries are just ballpark figures/estimates (e.g. data on travel expenditures are estimated from questionnaire surveys of a limited number of travelers)

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BoP Accounting

The BoP accounting is based on a **double-entry accounting principle** $\Rightarrow$ every positive entry is **matched** by a negative entry.

- An American corporation sells USD 2 million worth of US-manufactured goods to Britain; the British buyer, in turn, pays from a US dollar account that is kept in a US bank.
  - **Export of goods** $=$ +2 mio USD
  - **Foreign assets in the US** $=$ -2 mio USD
- An American corporation purchases USD 5 million worth of a certain product from a British manufacturer; the British company, in turn, puts the USD 5 million it receives into a bank account in the United States.
  - **Import of goods** $=$ -5 mio USD
  - **Foreign assets in the US** $=$ +5 mio USD

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Double-Entry Book Keeping

Double-entry book keeping has a few major **implications**:

- All the entries in the BoP must **add to zero**, so that

$$\text{CAB} + \text{KAB} + \text{ORS} + \text{SD} = 0$$

BoP Accounting Identity

- If the BoP entries do not sum to zero, **errors must have been made**: this will be in turn the exact size of the **SD**
- A **deficit** in the current account must be either **financed by borrowing from abroad or by divesting of foreign assets**, while a **surplus must be loaned abroad or invested in foreign assets**.

To Make Matters Explicit

A current-account **deficit can be financed** selling to foreigners domestic bills, bonds, stocks, real estate, or selling off previous investments in foreign bills, bonds, stocks, real estate, and operating businesses (via divestment)$\Rightarrow$ the reverse is true whenever there is a surplus

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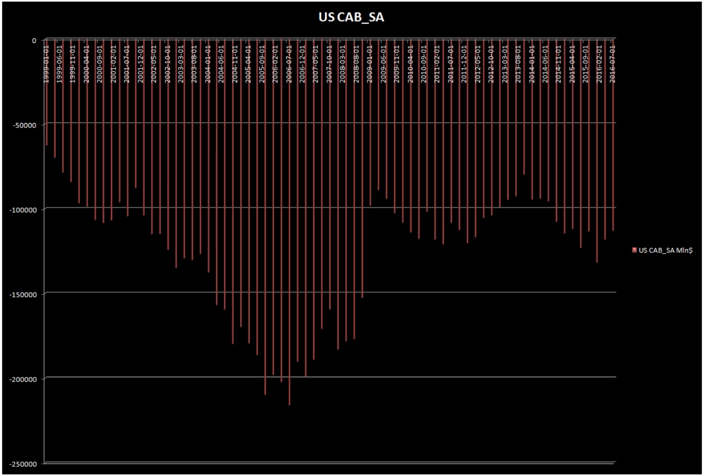
US CAB - FRED



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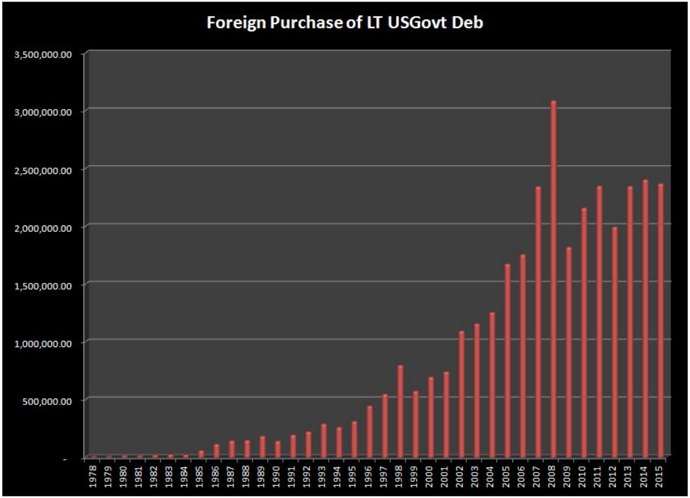
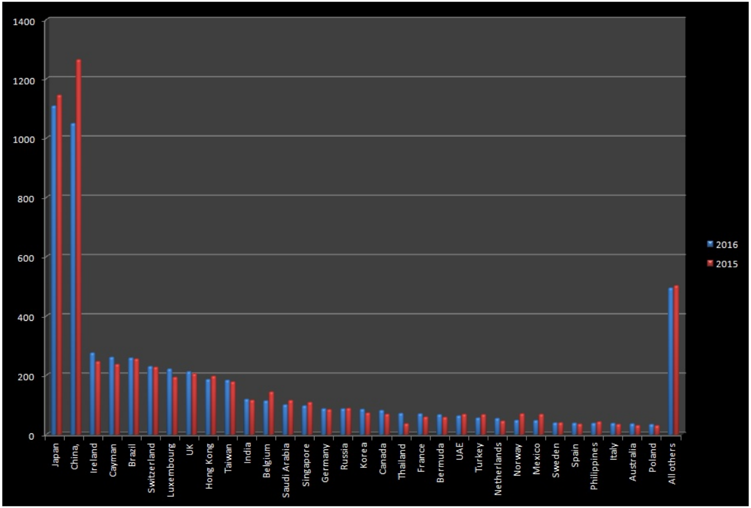
Foreign Purchases of LT US Govt Deb - Dept of Treasury



Foreign Holders of US Govies (bn USD) - Dept of Treasury



Is It All That Bad?

- CAB is a meaningless concept (**former Treasury Secr. O'Neill**)
- CAB is irrelevant: integrated asset markets make adjustment easier (**Greenspan**)
- U.S. is the best place for the world to invest (**Laffer**)
- It's all fault of excessive global saving (**common sense**)

It just depends...

The Firm and the Economy

The **CAB** can be seen as a **firm's income statement**:

- BoP **Credit** entries ⇒ Firm's **revenues**
- BoP **Debit** entries ⇒ Firm's **costs**

If the firm has a **surplus** on its income statement, it can **add to its investments or build up reserves** against possible losses in the future. If the firm has a **deficit** in its income statement, it must **borrow, raise more equity, or divest** itself of assets purchased in the past.

Is this the Whole Story?

If this were the whole story, all CAB deficits should be conceived as imbalances that have to be corrected as such. This said, what if costs > revenues because the firm is expanding and enhancing its K stock through heavy investments in new technologies?

A negative CAB is not necessarily a matter of concern as long as the deficit results from capital investments (infrastructures, new technologies...) and is not the result of current operating and debt costs exceeding current revenues

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Digging a Little Deeper...

Common wisdom: even though running CAB deficits may be healthy if it is due to importing K equipment, it is better to achieve trade surpluses than deficits.

$\Downarrow$

Objection: even running persistent surpluses may be detrimental, provided that indefinite trade surpluses mean a country is living below its means

National Income Accounting Identity

National Income Accounting Identity

$$Y = C + I + G + (Exp - Imp)$$

where

- **Y**= GDP
- **C**= Private Consumption
- **I**= Gross Investment
- **G**= Public Expenditures
- **Exp-Imp**= Net Exports

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BoP Imbalances and National Income Accounting Identity

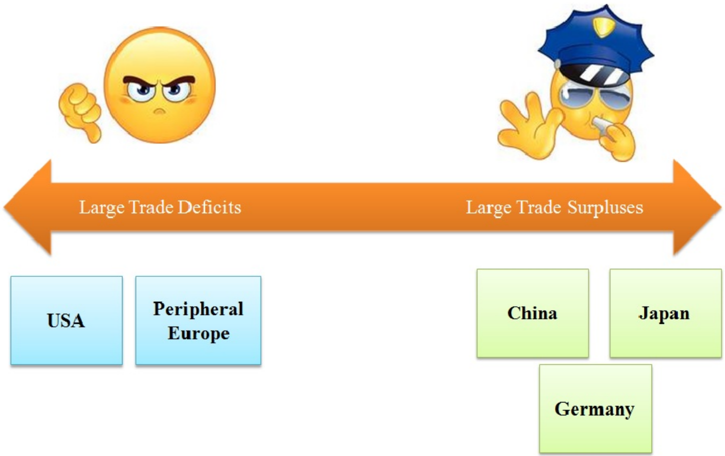
$$(Exp - Imp) = Y - (C + I + G)$$

- Exp-Imp: Running a **persistent** surplus (deficit)...
- Y-(C+I+G):...means producing more (less) than **what it is absorbed by the economy** in the form of C, I and G

$$\Downarrow$$

- **Persistent trade deficits**$\Rightarrow$ a country is living **above** its means
- **Persistent trade surpluses**$\Rightarrow$ a country is living **below** its means

The Spectrum of Trade Imbalances



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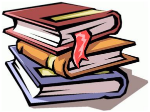
ORS and FX regimes

- When exchange rates are **fixed, central banks participate actively in the FX markets** to prevent their currency from falling/rising (**non-zero OR's balance**)
- When exchange rates are **floating, CBs do not enter the FX markets**, leaving the exchange rate to be determined by the market forces of supply and demand (**zero OR's balance**).

Watch out: even when exchange rates are deemed to be flexible, the CB always tries to **smooth** excessive fluctuations in the domestic currency value, so that, in practice, it is very likely that $OR \neq 0$



Flexible Exchange Rates

Assume SD $= 0$ and consider a purely flexible exchange rate regime ($ORS = 0$): the BoP Accounting Indentity would simplify to

$$CAB = -KAB$$

Thus implying that **any CAB deficit/surplus** (CAB) should be **offset** by a corresponding **KAB surplus/deficit**

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Flexible Exchange Rates and Trade Imbalances

If CAB is **persistently** < 0 (and KAB is persistently > 0), **long run sustainability** may become an issue: a country has to pay for its excess of imports over exports by borrowing abroad or divesting itself of investments made in the past. This is **sustainable in the short run, but not in the long run**.

- For how long will foreigners be willing to lend money?
- Negative spiral: the CAB also includes income payments and receipts, so that it will become more and more negative, as time goes by.

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Fixed Exchange Rates

Assume SD $= 0$ and consider a purely fixed exchange rate regime ($ORS \neq 0$): the BoP Accounting Indentity would simplify to

$$ORS = -(CAB + KAB)$$

Thus implying that the **increase/decrease in OR equals the combined deficit/surplus in the CAB and in the KAB**.

Fixed Exchange Rates and Trade Imbalances

If CAB and KAB are **persistently** < 0 (and ORS is persistently > 0), **long run sustainability** may become an issue: the CB is **buying up its own currency against gold and FX reserves** to offset the net excess supply due to the (CAB+KAB) deficits. However, even assuming a very large stock of reserves, this **cannot keep going on indefinitely**: eventually, the country is likely to run out of credit.

Imbalances and the Recent Financial Crisis

Understanding global trade and capital imbalances helps us gain a deeper **insight into the recent financial crisis**. Three related points to bear in mind:

- Imbalances need **not** be destabilizing in and of themselves!
- Trade imbalances can persist even for a very long time, whenever they have been incurred to finance new productive investments. Once these projects have become fully operative, however, **imbalances should be gradually reabsorbed** (higher production of goods and services, lower imports, more resources available to pay foreign debt back)
- If, conversely, trade imbalances have been brought about by policy distortions (e.g tariffs, quotas, currency manipulation, poorly regulated financial environments...), **adjustment can be violent** and is very likely to lead to financial instability and economic recession

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The Background

LARGE TRADE SURPLUS COUNTRIES

All over the years, they have implemented a wide range of policies to **force savings up** at the **expense of households** (China, Japan, Germany…)

LARGE TRADE DEFICIT COUNTRIES

They have experienced an **unsustainable increase in debt** → e.g. USA: huge trade deficit, overly abundant K inflows and low interest rates have all fuelled the real estate bubble that finally led to the sub-prime crisis - (USA, Peripheral Europe – PIIGS…)

The Way Out

Re-adjustment should be **twofold**: heavily indebted countries must necessarily deleverage (i.e. reduce debt), while surplus countries should conversely focus on economic policies aimed at boosting internal consumption.

Austerity alone is **not** enough

The Long Run Implications

Assume that the foregoing twofold adjustment process were gradually completed...

$$\Downarrow$$

What do you think will be the long run effect on FX rates (EUR, USD, RMB)?

$$\Downarrow$$

Will these currencies appreciate/depreciate?

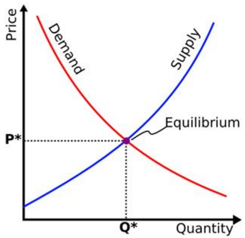
$$\Downarrow$$

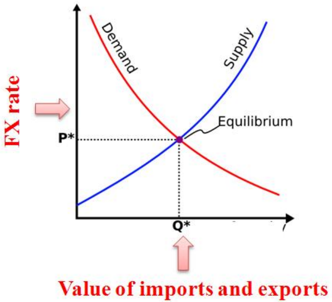
Could you explain why?

Flow vs Stock models

- **Flow models**: focus on the currency flows of supply and demand⇒ **Amounts demanded or supplied per period of time**
- **Stock models**: focus on the stocks of currencies⇒ **Amounts existing at a given point in time**

Watch Out





Notice we do **not** plot quantities on the horizontal axis as we normally do with supply/demand curves: **values involve the multiplication of prices and quantities**!

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Getting Started

The **BoP** records the **flows of payments** into and out of a country: all the exchange rate models **based on the BoP** go under the name of **Flow models**

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Deriving a Currency's Supply Curve

Focus on the **demand for imports**: the importing country's currency has to be sold to buy the exporter's money: the quantity of domestic currency supplied equals the value of imports.
Watch out:

$$\text{ValueImp} = \text{ImpQty} \cdot \text{DomesticPxImpGoods}$$

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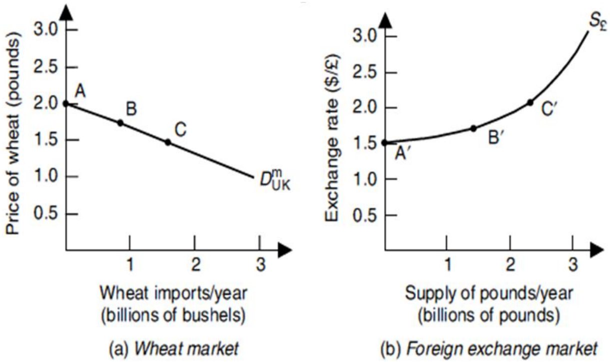
To Make Matters Explicit

UK imports of wheat from US (assuming wheat's USD price=3 USD/bushel)



- If $S_{\frac{USD}{GBP}}$=1.7, the GBP price of wheat will be $\frac{3}{1.7} = 1.76$
- The imported qty will be roughly 0.75 bn bushels and the qty of GBP supplied will be: $1.76 \cdot 0.75 = 1.32$ bn

Deriving a Currency's Demand Curve

Focus on the **demand for exports**: the exporting country's currency has to be bought to pay the exporter: the quantity of domestic currency demanded equals the value of exports

Watch out:

$$\text{ValueExp} = \text{ExpQty} \cdot \text{DomesticPxExpGoods}$$

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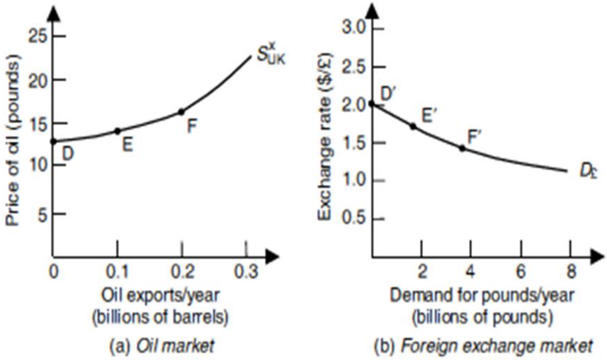
To Make Matters Explicit

UK exports of oil to US (assuming oil's USD price=25 USD/barrel)



- If $S_{\frac{USD}{GBP}}$=1.8, the GBP price of oil will be $\frac{25}{1.8} = 13.89$
- The exported qty will be roughly 0.1 bn barrels and demand for GBP will be: $13.89 \cdot 0.1 = 1.389$ bn

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Exchange Rate Determination

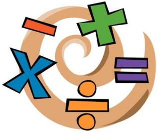
Intersection of the supply and demand curves

$\Downarrow$

Exchange rate that **equates the value of exports and imports**

$\Downarrow$

Supply of a country's currency = Demand for the same country's currency



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Stock models

Exchange rate determination depends on the **existing stocks** of currencies relative to the willingness of people to hold them: **Stock models** are also known as **Asset-based models**

Watch out: Several available models that differ primarily in the range of assets considered and in the level of price flexibility

The Monetary Model

Underlying intuition: a change in the demand **relative** to the supply of one currency versus another will modify the exchange rate.
Stated in simpler terms, Currency A is going to appreciate, whenever the demand for Currency A increases (relative to its supply) by more than the demand for Currency B (relative to its supply)

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The real demand for money at home...

The real domestic demand for money depends on real GDP as well as on interest rate levels:

$$\frac{M_D}{P_D} = Y_D^{\alpha} \cdot r_D^{-\beta}$$

Rearranging the terms:

$$P_D = M_D \cdot Y_D^{-\alpha} \cdot r_D^{\beta}$$

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...and abroad

$$\frac{M_F}{P_F} = Y_F^{\alpha} \cdot r_F^{-\beta}$$

Rearranging the terms:

$$P_F = M_F \cdot Y_F^{-\alpha} \cdot r_F^{\beta}$$

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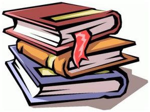
To Rust Off

- Why should **real money demand increase with real GDP**? The more goods and services people buy, the more money they need to hold to make transactions
- Why is **real money demand inversely related to interest rate levels**? The opportunity cost of holding money is higher the higher are the interest rates foregone on alternative investment opportunities (e.g. bonds, stocks...)



Money Mkt Equilibrium

Economic agents **adjust** their money holdings until when Real Money Demand = Real Money Supply: at equilibrium, M_D and M_F represent **both** money demand and supply. **Adjustment Chain - an example**: RMD<RMS, excess supply is used to buy securities, $P_{Securities} \uparrow$, $r_{Securities} \downarrow$, opportunity cost of holding money $\downarrow$, RMD $\uparrow$

From the PPP to the Monetary Model

$$S_{\frac{D}{F}} = \frac{P_D}{P_F}$$

Substituting P_D and P_F (based on the above):

$$S_{\frac{D}{F}} = \frac{P_D}{P_F} = \frac{M_D \cdot Y_D^{-\alpha} \cdot r_D^{\beta}}{M_F \cdot Y_F^{-\alpha} \cdot r_F^{\beta}}$$

Or, equivalently,

$$S_{\frac{D}{F}} = \left(\frac{M_D}{M_F}\right) \cdot \left(\frac{Y_D}{Y_F}\right)^{-\alpha} \cdot \left(\frac{r_D}{r_F}\right)^{\beta}$$

In More Intuitive Terms

- The value of F expressed in terms of D...

$$S_{\frac{D}{F}}$$

- ...increases, if the domestic money supply grows more than the foreign money supply...

$$(\frac{M_D}{M_F})$$

- ...goes up, if the foreign GDP increases by more than the domestic GDP...

$$(\frac{Y_D}{Y_F})^{-\alpha}$$

- ...rises, whenever domestic interest rates are higher than the foreign rates. (**Can you recall the UIRP predictions**?)

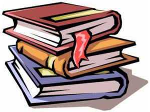
$$(\frac{r_D}{r_F})^{\beta}$$

A Couple of Tricky Points

- What are the consequences of **higher real economic activity**?
  - **Flow model**: Higher GDP goes hand in hand with **higher spending** (including imports)$\Rightarrow$ this will eventually lead to **currency depreciation**
  - **Monetary model**: you cannot overlook the link between the goods and services mkt and the financial mkt$\Rightarrow$ ignoring the relationship between GDP and real money demand may lead to seriously misleading conclusions$\Rightarrow$ **currency appreciation**
- What are the consequences of **higher domestic interest rates**?
  - **Flow model**: Higher domestic interest rates will increase the demand for domestic interest bearing securities$\Rightarrow$ the demand for the domestic currency goes up leading to **currency appreciation**
  - **Monetary model**: A higher interest rate means a high opportunity cost of holding money$\Rightarrow$ RMD$<$RMS$\Rightarrow$ **currency depreciation**

Income Payments and Unilateral Transfers

- **Income payments**: payments by domestic residents of interest, dividends, profit and rent abroad. Income payments to foreigners are higher the higher have been foreign investments in domestic government bonds, corporate bonds, stocks, real estate and operating businesses.
- **Unilateral transfers**: foreign aid, nonmilitary economic development grants, private gifts, donations...$\Rightarrow$ **Unilateral** stems from the fact that there is a unique flow in the direction of the payment (watch out: for most items in the balance of payments, the item being traded goes in one direction and the payment goes in the other direction).

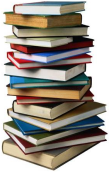


Home country-owned assets abroad: Public Sector

Official reserve assets: liquid assets held by the CB and/or the Dept of Treasury, including gold, foreign currency in foreign banks and balances at the IMF$\Rightarrow$ whatever is purchased determines an accumulation of foreign assets, thus implying a supply of domestic currency (-sign)

Home country-owned assets abroad: Private Sector

- **Direct investments**: occuring when domestic ownership of a foreign operating business is sufficiently extensive to give domestic residents a measure of control
- **Foreign securities**: supply of or demand for the domestic currency deriving from the purchase or sale by residents of foreign stocks (minority equity stakes) and bonds
- **Claims reported by banks and non-banks**: outstanding loans and credits granted by domestic banks and other non-banking institutions



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Twin Deficits

Twin deficits (or **Double deficits**) is a shorthand summary to describe the co-existence of two parallel deficits: one on the government budget and the other on the CAB

To Put It into Practice I

7.1: The Central Bank of China aims at preventing a further appreciation of the RMB against the USD: is it consistent with the Chinese government's desire to fight inflation? Please, explain.

7.2: What does the monetary model predict about the effect of higher expected inflation on the exchange rate?

7.3: Would the U.S. balance-of-trade deficit be larger or smaller if the dollar depreciates against all currencies, versus depreciating against some currencies but appreciating against others? Explain.

7.4: Suppose that South Korea's export growth stalls: some South Korean firms suggest that South Korea's primary export problem is the weakness in the Japanese yen. How would you interpret this statement?

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To Put It into Practice II

7.5: You are given the following info for Country X

Current Account Item	USD mio
Commodity Exports	577.3
Commodity Imports	-1085.5
Services	-209.5
Investment income	-63.4
Interest due on foreign debt	-41.2
Transfers	616.7

- Please, find the CAB
- Do you think Country X is a developed/developing country? Why?

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