Introductory Macroeconomics

Lecture 24: review, part two

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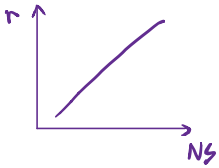
Decomposition of National Saving

- Recalling that T refers to a net tax, national savings NS

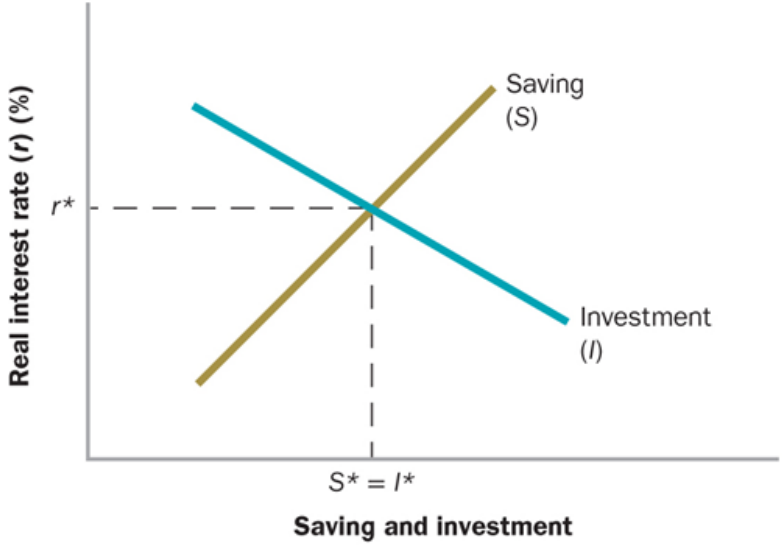
$$NS = \underbrace{(Y - T - C)}_{private\ saving} + \underbrace{(T - G)}_{public\ saving}$$



- What is the national saving?
  - nation's income Y is the income of private (non-government) sector
  - private saving is by households and firms
  - recall that public saving equals primary fiscal surplus

NS > 0 fiscal surplus
NS < 0 fiscal deficit

Equilibrium Real Interest Rate



Production Function

- *Production function* is a general mathematical expression of the relationship between factors of production and output Y_t

$$Y_t = A_t f(K_t, L_t)$$

  - L_t is labour
  - K_t is capital
  - A_t is total factor productivity

Production Function

- Standard Assumptions
  - Marginal product of capital is positive $\left(\frac{\partial Y_t}{\partial K_t} > 0\right)$
  - Marginal product of labour is positive $\left(\frac{\partial Y_t}{\partial L_t} > 0\right)$
  - Diminishing marginal product of capital $\left(\frac{\partial MPK}{\partial K_t} < 0\right)$
  - Diminishing marginal product of labour $\left(\frac{\partial MPL}{\partial L_t} < 0\right)$
  - Production function exhibits constant returns to scale (CRS)

Cobb-Douglas Production Function

- Cobb-Douglas production function is a widely used production function, satisfying standard assumptions

$$Y_t = A_t K_t^{\alpha} L_t^{1-\alpha},$$

where $0 < \alpha < 1$

- Capital (labour) share is the share of national income allocated to capital (labour)

- Assuming Cobb-Douglas production function,

  - capital share is $\dfrac{(r+\delta)K_t}{pY_t} = \alpha$ (MRPK)

  - by a similar derivation, labour share $\frac{WL_t}{pY_t}$ (MRPL) is $1-\alpha$

Growth Accounting

- *Growth accounting* is a method of decomposing a country's historical growth in output per capita into factors of production

- Growth accounting formula

$$\log\left(\frac{y_t}{y_{t-1}}\right) = \log\left(\frac{A_t}{A_{t-1}}\right) + \alpha\log\left(\frac{k_t}{k_{t-1}}\right)$$

$$\frac{y_t - y_{t-1}}{y_{t-1}} = \frac{A_t - A_{t-1}}{A_{t-1}} + \alpha\left(\frac{k_t - k_{t-1}}{k_{t-1}}\right)$$

growth in y growth in A growth in K

- Output per person growth is explained by TFP growth and capital per person growth

- TFP growth is often called as *Solow residual*

Solow-Swan Model

- Assumptions
  - CRS assumption implies

$$\frac{Y_t}{L_t} = Af(\frac{K_t}{L_t}, \frac{L_t}{L_t}) = Af(\frac{K_t}{L_t}, 1) = Af(\frac{K_t}{L_t})$$

  - Fraction θ of output (income) per person is saved

$$\frac{S_t}{L_t} = \theta \frac{Y_t}{L_t} = \frac{I_t}{L_t}$$

  - Investment per person $\frac{I_t}{L_t}$ is the sum of *replacement investment* per person and *net investment* per person

net investment = 0

$\frac{I_t}{L_t} = (n+d)\frac{K_t}{L_t}$

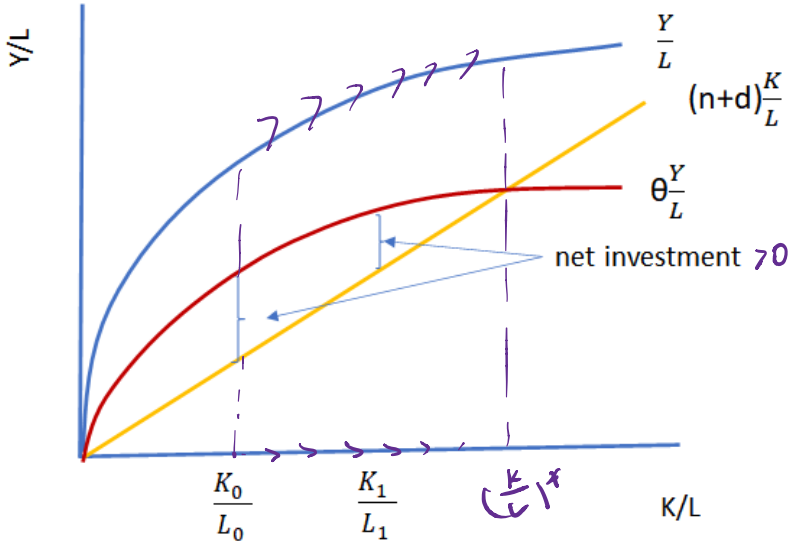
$$\frac{I_t}{L_t} = \underbrace{\left(\frac{K_{t+1}}{L_{t+1}} - \frac{K_t}{L_t}\right)}_{net\ investment} + \underbrace{(n+d)\frac{K_t}{L_t}}_{replacement\ investment}$$

Steady State

- Results
  - If net investment $= 0$, capital per person remains constant
  - If net investment > 0, capital per person increases
  - If net investment < 0, capital per person decreases
- *Steady state* is a state of the economy where capital per person is unchanged
  - steady state is reached when

$$\theta \frac{Y_t}{L_t} = (n+d)\frac{K_t}{L_t}$$

Transition to Steady State

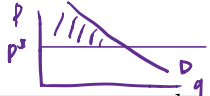


Specialisation

- Absolute and comparative advantage
- *Specialisation* refers to a situation in which a worker focuses on producing a product that she/he has a comparative advantage of
- *Production possibilities curve* (PPC) is a graph that describes the maximum amount of one good that can be produced for each level of production of the other good
- The aggregate consumption level of the economy with specialisation is higher than that of the economy with no specialisation
- Trades between two individuals occur only when the market price of goods lies between the two individual opportunity costs

condition: incentive to trade

Consumer, Producer, and Economic Surplus



- *consumer surplus* measures the welfare of a consumer and is the difference between the maximum price a consumer is willing to pay and the actual price they do pay

- *producer surplus* measures the welfare of a supplier and is the difference between the actual price and the minimum price that a producer requires

- *economic surplus* is the sum of consumer surplus and producer surplus and measures the welfare of an economy

if government intervenes. surplus = CS + PS + government surplus

Exchange Rates

- *Nominal exchange rate* is the amount of foreign currency needed to purchase one unit of domestic currency (more conventional in textbooks)

- *Real exchange rate* is the price of average domestic goods and services in terms of the average foreign goods and services when both prices are measured in the same currency

$$RER = \frac{P}{\frac{P^f}{e}}$$

  - P is the home country price level
  - P^f is the foreign country price level
  - e is the nominal exchange rate

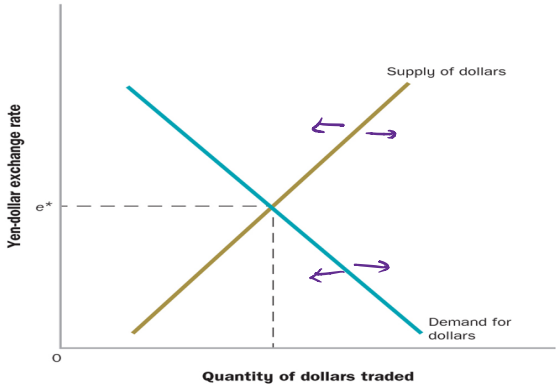
Purchasing Power Parity

- *Purchasing Power Parity* (PPP), which is based on the law of one price, is a theory that explains nominal exchange rates in the long-run
  - the *law of one price* states that the price of traded goods must be the same in all countries if transport costs are small
- Under the Purchasing Power Parity, growth in nominal exchange rates are affected by inflation in two countries

$$P = \frac{P^f}{e}$$

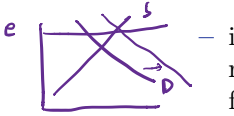
$$RER = \frac{P}{\frac{P^f}{e}} = 1 \Rightarrow P = \frac{P^f}{e}$$

Demand and Supply in the Yen-Dollar Market



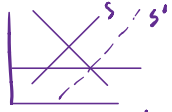
Fixed Exchange Rates

- *Overvalued exchange rate* is an exchange rate that has a fixed value higher than its equilibrium value
- *Undervalued exchange rate* is an exchange rate that has a fixed value less than its equilibrium value
- To maintain an overvalued or undervalued exchange rate, a central bank holds *international reserves*, that is a stock of foreign currencies
  - if the equilibrium exchange rate goes below the overvalued exchange rate, the central bank purchases the domestic currency and sells foreign currencies (depletion of international reserves)



RBA increase D
(RBA purchase AUD)

  - if the equilibrium exchange rate goes above the undervalued exchange rate, the central bank sells the domestic currency and purchases foreign currencies (build-up of international reserves)



RBA increase supply of AUD

Policy Trilemma

- *The policy trilemma* states that a central bank can only pursue two of the following three goals simultaneously
  - independent monetary policy
  - free capital flows
  - fixed exchange rate

Balance of Payments

- *Current account* is a part of the balance of payments that records transactions of goods and services or a transfer of income
  - net exports, net services, net income, net current transfers
- *Capital account* is a part of the balance of payments that records transactions involving the purchase and sale of financial or real assets
  - net capital inflow, changes in the central bank's holding of international reserves

Balance of Payments

- In every period, the current account balance (CAB) and the capital account balance (KAB) sum to zero

$$CAB + KAB = 0$$

- Rewriting the equation above

$$net\ capital\ inflows = -net\ exports \quad (1)$$

- In an open economy,

$$S + net\ capital\ inflows = I \quad (2).$$

close economy
$S = I$

- Using the fact that net exports equal to *negative* capital inflow,

$$\begin{aligned} S - I &= -net\ capital\ inflows \\ &= net\ exports \end{aligned}$$

$S < I$ net exports < 0
trade deficit.

Exam

- Open book
- Online exam administered through Canvas
- Questions 1 to 20 are multiple choice questions
- Questions 21 to 30 are true/false questions 3-4 sentences
  - have to write brief explanation why you have chosen true/false
- Covers lectures 1 to 24 and tutorials 1 to 11
- See LMS announcement for details