ME2720 Macroeconomics for Business

Lecture 7

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Outline

Consumption

- Consumption closely linked to welfare, i.e. higher utility derived from increased consumption in goods and services
- Consumption, the largest part of aggregate spending: $\approx$ 50-70% GDP
- Differences in consumption between developed- and developing-economies
  - ⋆ Developed economies, consumption around 65% of GDP
  - ⋆ Developing economies, around 90% of GDP
- Recall from BCs that:
  - ⋆ consumption is procyclical...
  - ⋆ ...although it fluctuates less than GDP

Two Models of Consumption

1. Keynesian Consumption Theory (1936)

   "*Men are disposed, as a rule and on the average, to increase their consumption as their income increases, but not as much as the increase in their income*"

2. The Permanent Income Model (Friedman, 1957):
   - Important role for expectations and future income

Keynesian Consumption Theory I

- Two claims:
  1. Simple and stable relationship between consumption and current disposable income
  2. Positive relationship between disposable income and savings: higher incomes, higher saving rates
- Consider the Keynesian consumption function:

$$C = A + bY, \quad A > 0, b \in (0, 1) \tag{1}$$

  where A is autonomous consumption and b the marginal propensity to consume
- Equation (1) makes precise the first claim!

Keynesian Consumption Theory II

- What is not consumed is saved:

$$\begin{aligned} S &= Y - C \\ &= Y - A - bY \\ &= Y(1-b) - A \end{aligned} \tag{2}$$

- Proportion of income saved:

$$\frac{S}{Y} = 1 - b - \frac{A}{Y} \tag{3}$$

- Taking the partial derivative wrt income:

$$\frac{\partial S/Y}{\partial Y} = -\left(-\frac{A}{Y^2}\right) = \frac{A}{Y^2} > 0 \tag{4}$$

so that the saving rate is higher when income increases (claim 2)!

Keynesian Consumption Theory III

- Recall that aggregate output in a closed economy is

$$\begin{aligned} Y &= C + I + G \\ &= A + bY + I + G \end{aligned} \tag{5}$$

- Solving for Y,

$$Y = \left(\frac{1}{1-b}\right)(A + I + G) \tag{6}$$

- Thus, output depends positively on (autonomous) consumption, investment and income

- The "Keynesian multiplier":

$$\frac{1}{1-b}$$

is bigger the higher the marginal propensities to consume is!

Keynesian Consumption Theory IV

- Consider now that government increases spending by $dG = X$. Then,

$$dY = \left(\frac{1}{1-b}\right) X \tag{7}$$

  being the final effect on Y larger than the initial increase X

- As evident from (7), the magnitude of the increase is determined by the Keynesian multiplier, which in turn depends on b

- Let's now discover the process behind the Keynesian multiplier!

Keynesian Consumption Theory V

- Multi-period effect of increases in G

Table: Increase of SEK X in G

Period	Effect on income
1	X
2	bX
3	$b(bX) = b^2X$
4	b^3X
$\vdots$	$\vdots$

- Non-linear relationship: positive but diminishing increases
- The effect eventually becomes negligible
- Overall effect given by the following mathematical relationship:

$$dY = X(1 + b + b^2 + b^3 + \cdots) = \left(\frac{1}{1-b}\right)X$$

Keynesian Consumption Theory V

- Consider the following example

Table: Increase of SEK X in G

Region	MPC (b)	Keynesian multiplier ($1/1-b$)	Increase in G (SEK mill.)	Overall effect on Y (SEK mill.)
A	0.9	10	100	1,000
B	0.75	4	100	400
C	0.5	2	100	200
D	0.25	1.33	100	133

- Higher b's $\Rightarrow$ bigger K-multipliers!
- Policy implication? Fiscal policy need not to be as aggressive in regions with high b as there is a greater "vicious" cycle!

Keynesian Consumption Theory VI

Criticism

- Unrealistic consumption function
- Consumption *uniquely* determined by current (disposable) income
- It lacks microfoundations
- Empirically, the relationship only holds for cross-sectional data
- More realist model of consumption?

The Permanent Income Model I

- Lifetime utility of a representative consumer:

$$U_0 = \sum_{t=1}^{T} u(C_t) \tag{8}$$

- utility function has usual properties,

$$u^{'}(C_t) > 0, \;\; u^{''}(C_t) < 0$$

- Consumer chooses consumption in each period so that lifetime utility is maximized
- Consumer is constrained by his/her intertemporal budget constraint,

$$\sum_{t=1}^{T} C_t = X_0 + \sum_{t=1}^{T} Y_t \tag{9}$$

The Permanent Income Model II

- The Lagrangian function is,

$$\mathcal{L}(u(\cdot), X, Y, C, \lambda) = \sum_{t=1}^{T} u(C_t) + \lambda \left(X_0 + \sum_{t=1}^{T} Y_t - \sum_{t=1}^{T} C_t \right) \quad (10)$$

- Consumer must solve,

$$\max_{C_t \in C} \quad \mathcal{L}(\cdot) \quad (11)$$

- FOC:

$$\frac{\partial \mathcal{L}}{\partial C_t} = u'(C_t) - \lambda = 0 \quad \Rightarrow \quad C_t = C, \ \forall t \in T \quad (12)$$

- Using this finding,

$$\sum_{t=1}^{T} C = T \times C = X_0 + \sum_{t=1}^{T} Y_t \quad (13)$$

The Permanent Income Model III

- Solving for C,

$$C = \underbrace{\frac{1}{T}\left(X_0 + \sum_{t=1}^{T} Y_t\right)}_{Y^P} \tag{14}$$

- Y^P, permanent income
- This model predicts consumption smoothing
- Consumption in a given period does not depend on that period's income but rather on lifetime income

The Permanent Income Model IV

- Assume now that consumer wins the lotto and receives (unexpected) extra income in period 1, $dY_1 = Z$.
- What's the increase in consumption?

$$dC = \frac{Z}{T}$$

- Once again, consumption smoothing: only a small part of income Z is consumed directly!
- Policy implication? Consumers do not react to tax cuts with increased consumption if tax cuts are perceived as *temporary*!

The Permanent Income Model V

Introducing subjective discounting and interest rates

- Lifetime utility of a representative consumer is now

$$U_0 = \sum_{t=1}^{T} \beta^t u(C_t), \quad \beta = \frac{1}{1+\rho}, \rho > 0 \tag{15}$$

where ρ captures consumer's time preferences

- utility function has usual properties,

$$u'(C_t) > 0, \;\; u''(C_t) < 0$$

- Consumer chooses consumption in each period so that *discounted* lifetime utility is maximized

- Intertemporal budget constraint is now

$$\sum_{t=1}^{T} R^t C_t = X_0 + \sum_{t=1}^{T} R^t Y_t, \quad R = \frac{1}{1+r}, r > 0 \tag{16}$$

The Permanent Income Model VI

Introducing subjective discounting and interest rates

- Lagrangian function is,

$$\mathcal{L}(u(\cdot), X, Y, C, R, \lambda, \beta) = \sum_{t=1}^{T} \beta^t u(C_t) + \lambda \left(X_0 + \sum_{t=1}^{T} R^t Y_t - \sum_{t=1}^{T} R^t C_t \right) \tag{17}$$

- Consumer must solve

$$\max_{C_t \in C} \quad \mathcal{L}(\cdot) \tag{18}$$

- FOC:

$$\frac{\partial \mathcal{L}}{\partial C_t} = \beta^t u'(C_t) - \lambda R^t = 0 \tag{19}$$

and,

$$\frac{\partial \mathcal{L}}{\partial C_{t+1}} = \beta^{t+1} u'(C_{t+1}) - \lambda R^{t+1} = 0 \tag{20}$$

The Permanent Income Model VII

Introducing subjective discounting and interest rates

- Dividing (20) by (19) gives the key (*Euler*) equation in the model

$$\frac{u'(c_{t+1})}{u'(C_t)} = \frac{R}{\beta} = \frac{1+\rho}{1+r} \tag{21}$$

- Equation (21) explain how consumption changes over time
- Changes in consumption depend on:
  - ⋆ time preferences, ρ
  - ⋆ interest rates, r
- Three possible cases:
  1. $\rho > r$
  2. $\rho < r$
  3. $\rho = r$

The Permanent Income Model VIII

Introducing subjective discounting and interest rates

1. $\rho > r$: consumers' subjective discount rate is higher than the (market) interest rate. From (21),

$$u^{'}(C_{t+1}) > u^{'}(C_t) \quad \Leftrightarrow \quad C_t > C_{t+1}$$

2. $\rho < r$, i.e. consumers' subjective discount rate is lower than the (market) interest rate. From equation (21),

$$u^{'}(C_{t+1}) < u^{'}(C_t) \quad \Leftrightarrow \quad C_t < C_{t+1}$$

3. $\rho = r$, i.e. consumers' subjective discount rate is exactly equal to the (market) interest rate. From equation (21),

$$u^{'}(C_{t+1}) = u^{'}(C_t) \quad \Leftrightarrow \quad C_t = C, \ \forall t \in T$$

The Permanent Income Model IX

In the textbook

- 2-periods model, without borrowing constraints
- Consumers can save and borrow
- Examples:
  - ⋆ **Students** ($Y_1 = 0, C_1 > 0; Y_2 > 0, C_2 > 0$): early-life consumption financed through borrowing
  - ⋆ **Retired people** ($Y_1 > 0, C_1 > 0; Y_2 = 0, C_2 > 0$): late-life consumption financed through savings
- Consumer preferences determined by indifference curves
- Increases in current income cause consumption to rise by less than increases in permanent income
- Precautionary savings and savings for a "rainy day", e.g. unemployment, retirement, sabbatical year, etc.

The Permanent Income Model X

Interest Rates

- Higher interest rates:
  - $\Rightarrow$ greater income for savers (receive higher payments)
  - $\Rightarrow$ lower income for debtors (pay higher payments)
- Zero-sum game: what debtors lose, creditors win
- Consumption is however affected: it falls! (creditors have lower mpc than debtors)
- . . . and remember the multiplier effect!
- Two conflicting effects of IRs on consumption:
  1. **Substitution effect**: fall in first-period consumption
  2. **Income effect**: savers receive higher interest payments and can afford to spend more

Demographic Influences on Consumption I

- People's income and consumption behavior changes substantially over time
- People's saving behavior differs across the life cycle

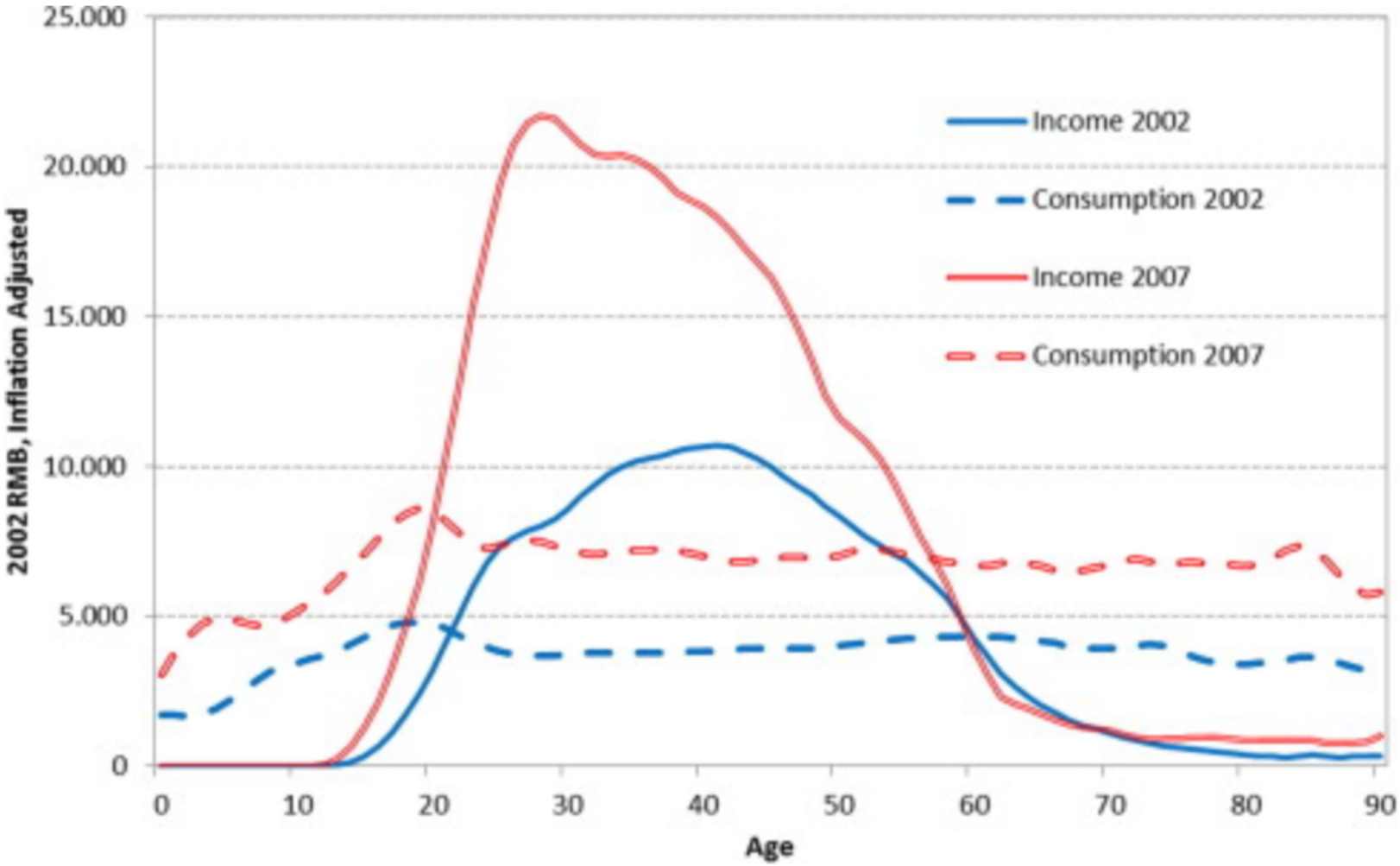
Table: Savings Rates by Age, 2001

< 25	25-34	35-44	45-54	55-64	65-74	> 75
-13.3%	20.2%	20.4%	21.6%	20.2%	1.1%	-3.4%

- Criticism to the permanent income model: elderly do not decumulate wealth very rapidly. Explanations:
  - ⋆ Uncertainty: people just don't know when they will die
  - ⋆ Bequests: hand over wealth to heirs

Demographic Influences on Consumption II

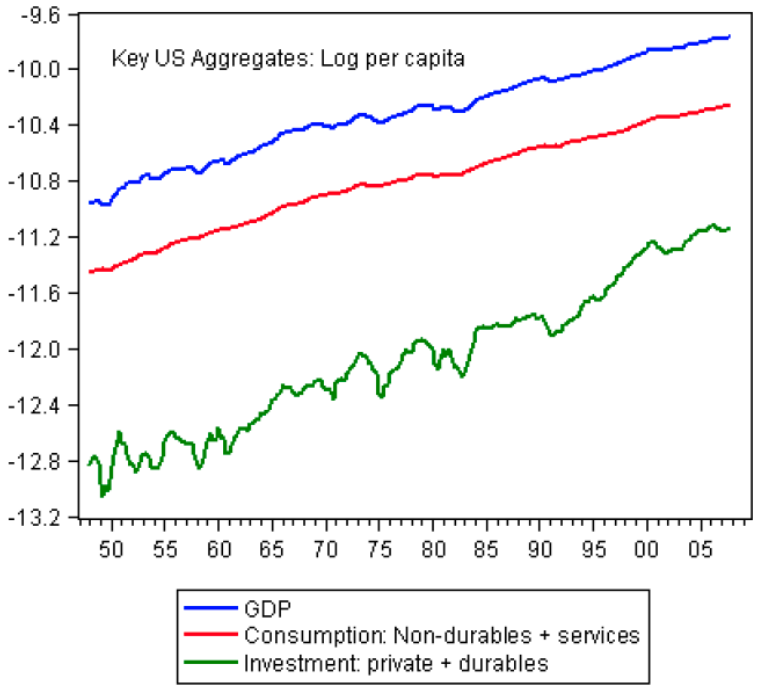
Figure: Consumption and income over the life cycle, China



Investment I

Recall that:

- Investment includes spending on new plants, machines and buildings, and inventory
- Investment is the most volatile concept of GDP
- Investment is procyclical and investment fluctuates more than GDP does

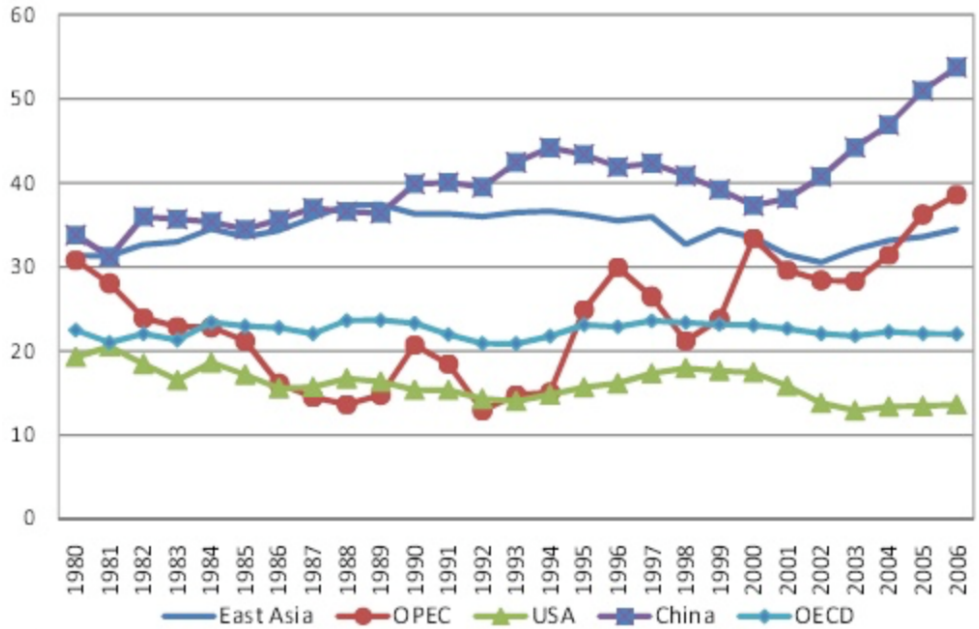


Investment II

Recall that:

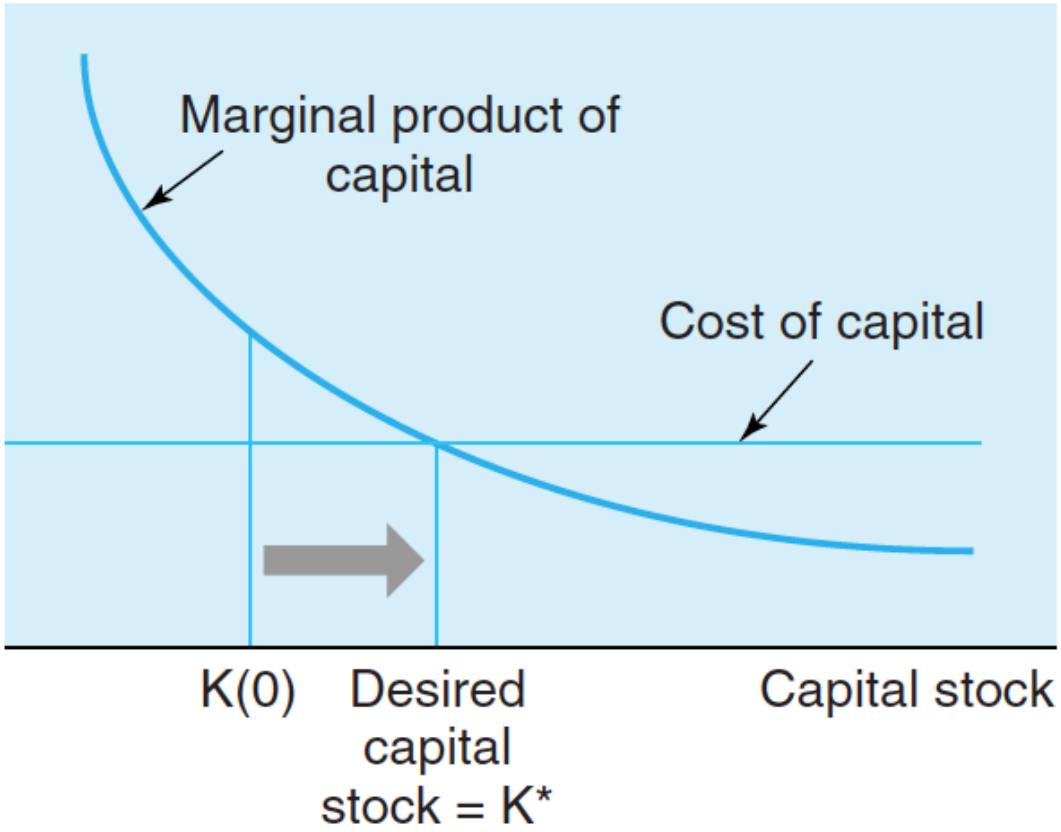
- Investment $\approx$ 25% of GDP
- Developing countries, e.g. China, usually have higher investment-GDP ratios, e.g. 40%
- Gross vs. net investment

Figure: Investment rates



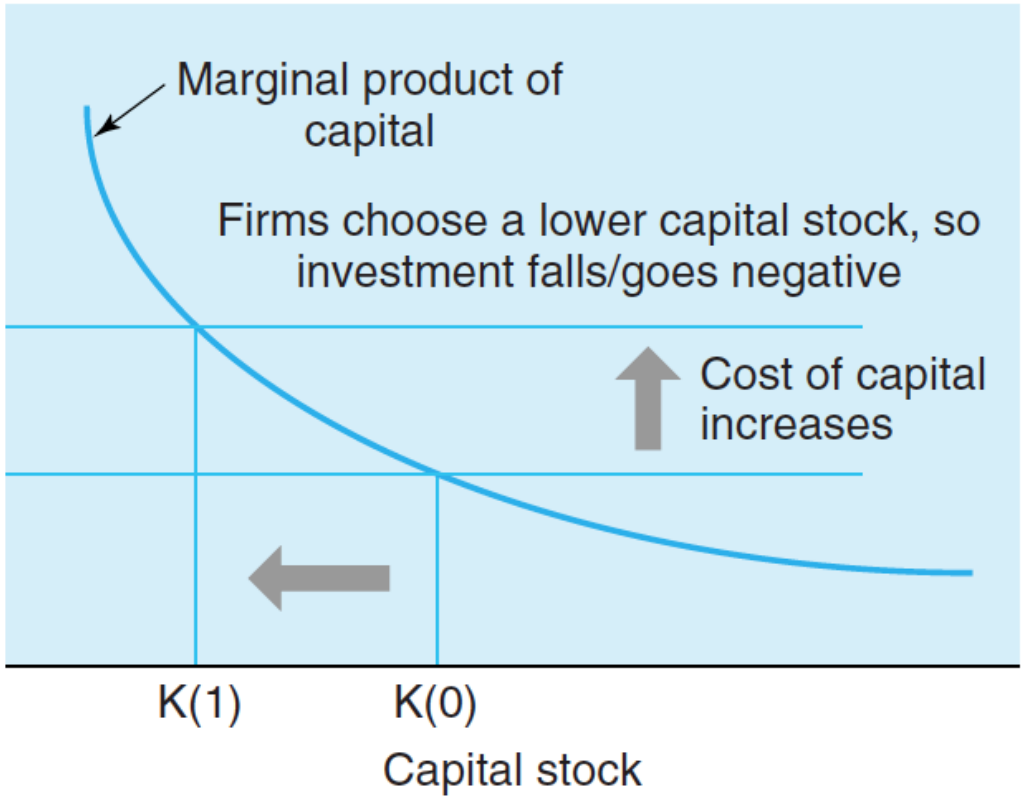
Optimal Investments I

- Expand if $MPK >$ cost of capital (cost of funds + risk premium)



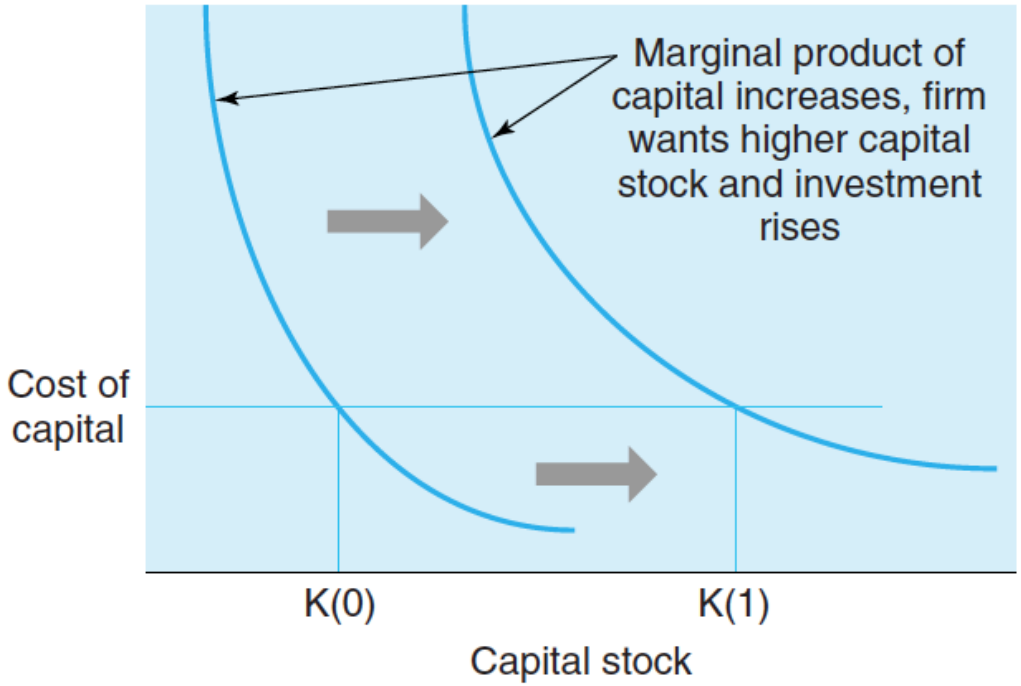
Optimal Investments II

- If cost of capital increases, optimal capital stock is at a lower level
- To get there, firms allow for depreciation to consume existing capital!
- . . . but the process can take years!



Optimal Investments III

- Technological advances increase scrapping of machines, i.e. they become obsolote
- Tech advances drive investments as companies want to keep up
- More productive machines shift the *MPK* curve outwards



Tobin's Q I

- Corporations finance most investment through internal resources
- Link between companies' investments and stock markets
- **Tobin's** Q:If the stock market value of the company is higher than the replacement costs of its assets, the company should invest!
- If the company doubles production capacity, its stock market valuation would increase by more than the cost of investment
- Tobin's Q:

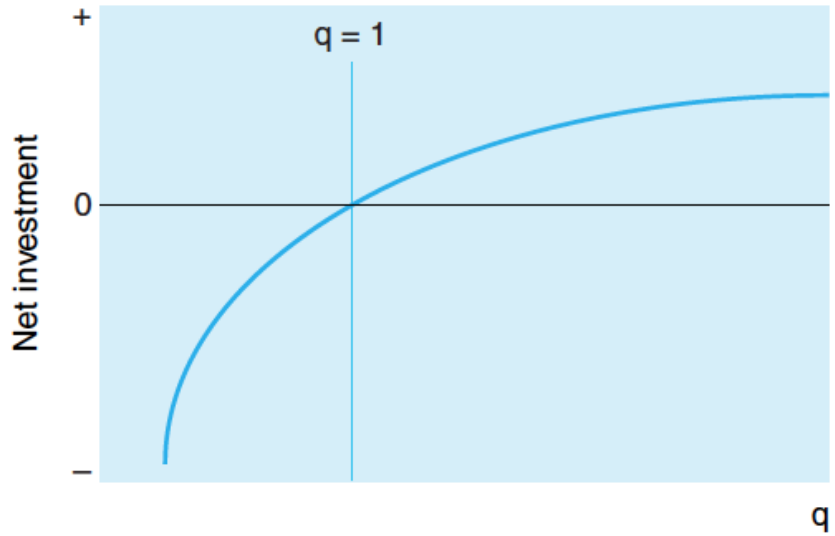
$$q = \frac{\text{stock market valuation}}{\text{cost of replacement}}$$

Tobin's Q II

- Example: stock market valuation is \$200 mill.; cost of replacement is \$150 mill
- Tobin's Q:

$$q = \frac{\text{stock market valuation}}{\text{cost of replacement}} = \frac{200}{150} = 1.33$$

- The company should invest!



Tobin's Q III

- According to Tobin's Q $\begin{cases} q > 1 & \text{invest} \\ q = 1 & \text{indifferent, stay put!} \\ q < 1 & \text{deinvest} \end{cases}$
- Criticism against this theory:
  - ⋆ Intangible assets difficult to measure in practice
  - ⋆ Empirical evidence inconclusive
  - ⋆ Companies do not look at stock market valuations, aware of their volatility, but rather to cash flows, which affect expectations

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2. Investment
   - Optimal Investments
   - Tobin's Q
3. The IS-LM Model (Part I)
   - The IS Curve
4. Students' Presentations
5. Accenture's Invitation

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The IS Curve I

- In a closed economy,
$$PE = C + G + I$$
- Using the Keynesian consumption function,
$$PE = A + bY + G + I$$
- If actual income equals planned expenditure,
$$PE = Y = A + bY + G + I$$
- Solving for Y,
$$Y = \left(\frac{1}{1-b}\right)(A + I + G)$$
- When planned aggregate expenditure equals actual output/income, the economy is in equilibrium

The IS Curve II

- What happens when the economy is not in equilibrium?
  - $\Rightarrow$ Transition dynamics

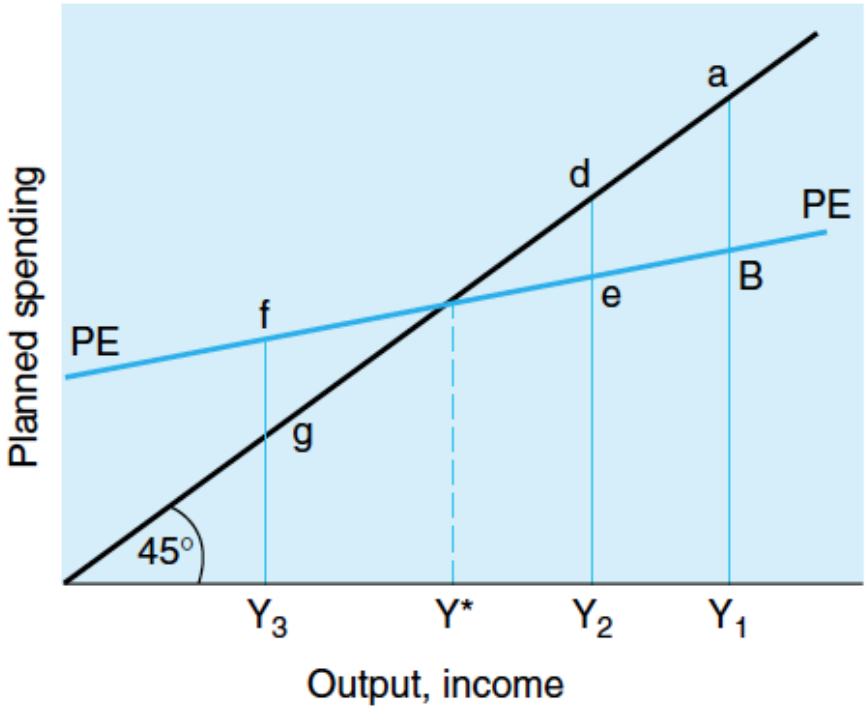

Figure: The Keynesian Cross

The IS Curve III

Keynesian Cross

The Keynesian cross is the point of intersection between the 45-degree line and the planned expenditure line, i.e. the equilibrium point.

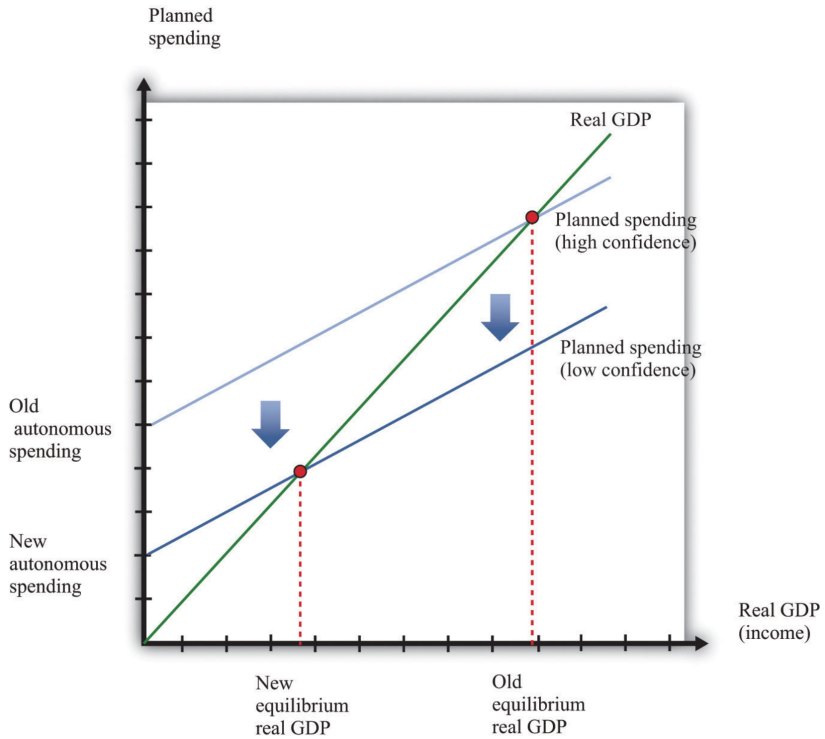

Figure: Animal spirits and different equilibria

The IS Curve IV

- Consumption and investment (*at least*) negatively affected by interest rates
- The (*downward-sloping*) IS curve represents the negative relation between the interest rate and the equilibrium output

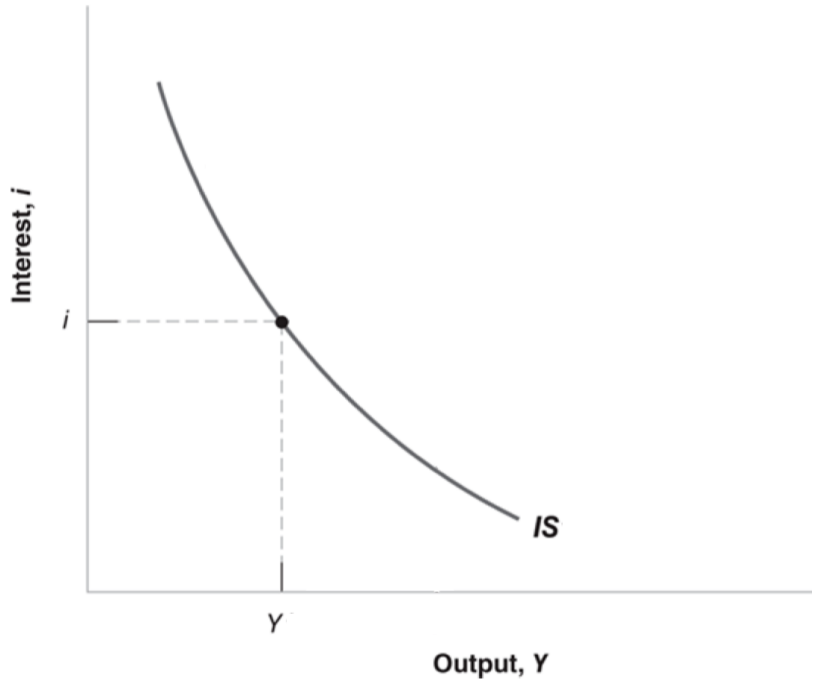

Figure: The IS Curve

The IS Curve V

- Any change (decrease in government spending, increase in taxes, decrease in consumer confidence) that, for a given interest rate, decreases AD creates a shift of the IS curve to the left

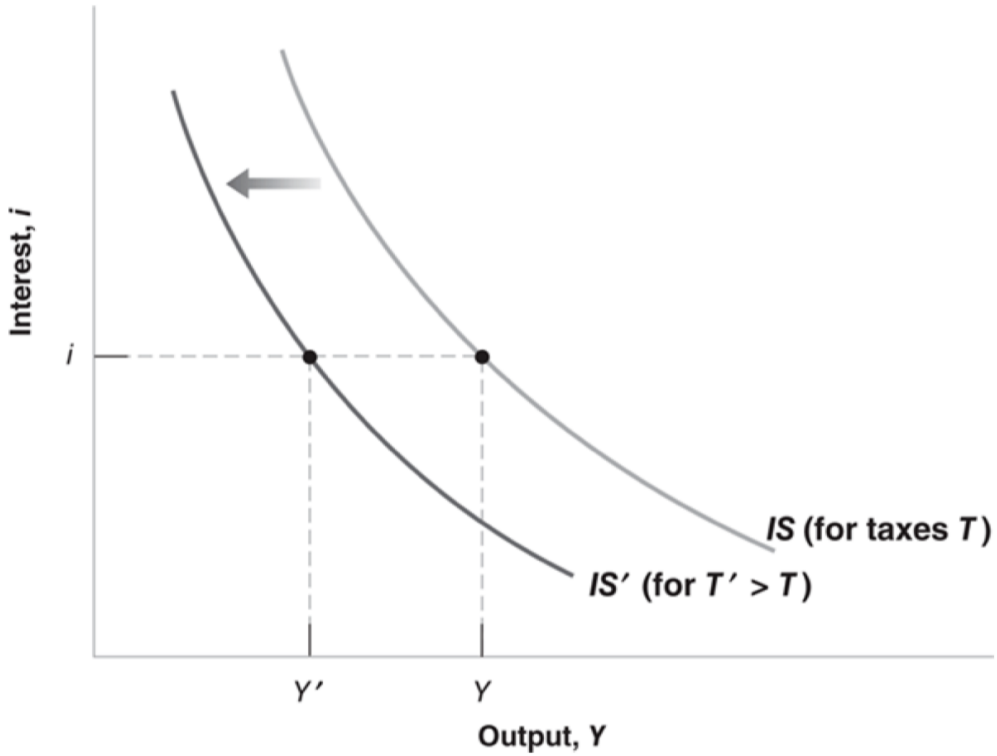

Figure: Effect of increased taxation on the IS Curve

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Accenture's Invitation

- Interested in establishing contact with Accenture?
- Opportunity to participate in a *Glögg Mingle*
- Details:
  - Date: 2017/12/06
  - Time: 17.30
  - Address: Alströmergatan 12
  - Contact: `peyman.safari.hesari@accenture.com`
- Access the following form and register:
  `https://goo.gl/forms/PaPUy1si4ACuSPZH3`

Thank you for your attention!