2014/2015, week 1

Consumption

Mankiw, Chapter 16

Introduction

- Why study consumption and investment?
- Consumption is the goal of all activities:

  "Consumption is the sole end and purpose of all production; and the interest of the producer ought to be attended to, only so far as it may be necessary for promoting that of the consumer.", Adam Smith
- Consumption broad measure, including
  - Goods, services, leisure, public goods like quality of environment, safety

Introduction

- Investment in capital increases future consumption possibilities
- Investment is a broad term, including
  - Investment in physical capital (machinery, equipment, buildings, ICT)
  - Investment in human capital (education, lifelong learning, learning by doing)

Introduction

- Consumption and investment are intertwined
- Indeed, in a closed economy, investment equals savings and savings and consumption add up to income
- Hence, the consumption-saving decision implies a tradeoff between output in the short run and output in the long run:
  - Higher consumption may imply higher output in the short run
  - Higher saving increases output in the long run

Keynesian and classical models

- Keynesian models (think of IS-LM and Mundell-Fleming models)
  - Focus on the short run
  - Take prices as fixed
  - View disequilibrium (demand falls short of supply) as the normal state of markets
  - Model agents as ‘homo instinctus’

Keynesian and classical models

- Classical models (think of model of perfect competition or model of comparative advantage)
  - Focus on the long run
  - Take prices as flexible
  - View equilibrium (demand equals supply) as the normal state of markets
  - Model agents as ‘homo economicus’

Keynesian and classical models

- Classical models
  - derive equations for the demand and supply behaviour of agents from optimization under constraints
  - can be used to answer normative questions (welfare analysis)
  - are not that flexible in practical work

Keynesian and classical models

- Keynesian models
  - postulate equations for the demand and supply behaviour of agents, based on for example introspection
  - can be used only to describe effects and developments
  - are quite flexible in practical work: equations can easily be taken to the data and changed if required

Keynesian and classical models

- None of the two types of models is better than the other
  - Keynesian models more focussed on the short run and classical models on the long run
  - However, the Keynesian model was born to explain a long-run phenomenon, namely the Great Depression in the thirties
    - Keynes: “In the long run, we are all dead”

Keynesian and classical models

- Classical models often applied to explain short-run behaviour on markets as well (think of financial markets)
- Homo economicus versus homo instinctus
  - Optimizing behaviour versus rule-of-thumb behaviour
  - For evidence for rule-of-thumb behaviour see literature on behavioral economics
  - Empirical evidence on impact of financial incentives abound

Three views on consumption

- Keynesian view
  - current income determines consumption
- Classical view
  - The model of intertemporal choice (Fisher)
  - The life-cycle hypothesis (Modigliani)
  - The permanent-income hypothesis (Friedman)
  - The random-walk hypothesis (Hall)
- Behavioural economics view
  - Hyperbolic discounting

The Keynesian model

- Empirical evidence on consumption
  - Cross-sectional data on households:
    - Consumption, C, higher when income, Y, is higher
    - Savings higher when income is higher
    - Average propensity to consume (APC=C/Y) lower when income is higher
  - Time-series data:
    - Consumption low when income is temporarily low
    - Savings low when income is temporarily low
    - APC high when income is temporarily low

The Keynesian model

Basic elements:

- The marginal propensity to consume is between 0 and 1
- Average propensity to consume falls as income increases
- Income is the primary determinant of consumption (the interest rate does not play an important role)
- Summarizing,

$$C = \bar{C} + cY \quad \text{with} \quad \bar{C} > 0,\ 0 < c < 1$$

The Keynesian model

- Shortcoming of the Keynesian model: in the long run, the APC does not fall when income increases
  - See period after WWII
  - Aggregate data dating back to 1869 (Kuznets)

The Keynesian model

- The empirical regularity that the APC does not fall when income increases, is known as the consumption puzzle
- Below, we will see that both Modigliani and Friedman solved this puzzle

Fisher's model of intertemporal choice

- Basic elements:
  - The consumer is rational and forward-looking
  - He/she makes an intertemporal choice, that is, a choice that involves different periods of time
  - Therefore, we need to consider
  - A budget constraint that covers different time periods
  - Preferences with respect to current and future consumption goods

Fisher's model of intertemporal choice

- To simplify, assume that consumers live two periods
- Further, assume that consumers are free to borrow and save and that the two interest rates are equal
- This allows us to derive the intertemporal budget constraint

Fisher's model of intertemporal choice

$$\text{period } 1: \; C_1 = Y_1 - S$$

$$\text{period } 2: \; C_2 = (1+r)S + Y_2$$

where S>0 denotes savings and S<0 denotes borrowings

- Eliminating S, we get the intertemporal budget constraint (IBC):

$$C_1 + \frac{C_2}{1+r} = Y_1 + \frac{Y_2}{1+r}$$

Fisher's model of intertemporal choice

Note that:

- $1/(1+r)$ is the price of period 2 consumption in terms of period 1 consumption
- $Y_1 + Y_2/(1+r)$ is the present value of total income, or wealth

Fisher's model of intertemporal choice

- To represent the consumer's preferences regarding consumption in the two periods, we use indifference curves
- Optimality implies that the consumer selects the indifference curve that is most distant from the origin, but within the budget constraint (boundary included)
- At the optimum, the indifference curve and the budget constraint have equal slopes

Fisher's model of intertemporal choice

- The slope of the budget constraint follows upon writing the constraint as an equation for C_2 in terms of C_1:

$$C_2 = (1+r)(Y_1 + Y_2/(1+r) - C_1)$$

$$\rightarrow \quad dC_2/dC_1 = -(1+r)$$

Fisher's model of intertemporal choice

- The slope of the indifference curve can be derived similarly
- Define the intertemporal utility function:

$$U \equiv U(C_1, C_2)$$

- Along the indifference curve, utility is a constant:

$$dU = U_{c1}\, dC_1 + U_{c2}\, dC_2 = 0 \quad \rightarrow$$

$$dC_2 / dC_1 = -U_{c1} / U_{c2}$$

Fisher's model of intertemporal choice

- Combining, we have the optimality condition:

$$U_{c1} / U_{c2} = MRS = 1 + r$$

- Technically, this is one equation with two unknowns, C_1 and C_2
- The IBC is a second equation in terms of C_1 and C_2
- Combining the two equations gives equations for consumption and saving, all in terms of wealth and the interest rate

How to solve the two-period Fisher model?

Use Lagrange function Λ

$$\Lambda = U(C_1, C_2) + \lambda[Y_1 + \frac{Y_2}{1+r} - C_1 - \frac{C_2}{1+r}]$$

$$\frac{\partial \Lambda}{\partial C_1} = 0 \Rightarrow \frac{\partial U}{\partial C_1} = \lambda, \quad \frac{\partial \Lambda}{\partial C_2} = 0 \Rightarrow \frac{\partial U}{\partial C_2} = \lambda / (1+r)$$

$$(\frac{\partial U}{\partial C_1} / \frac{\partial U}{\partial C_2}) = 1 + r$$

Fisher's model of intertemporal choice

- After solving we can determine if the consumer is saver or a borrower in period 1
- We can also determine what is the impact of a change in income, Y_1,Y_2, or a change in the interest rate, r, for consumption, C_1,C_2
- We can add taxes and evaluate what is their impact on consumption
- We can be more realistic and evaluate what happens to the previous results if the consumer cannot borrow

The effect of a change in the interest rate

- Effect consists of a substitution effect and an income effect
- Substitution effect: $r\uparrow$, $C_1\downarrow$, $C_2\uparrow$
- Income effect: either $C_1\uparrow$, $C_2\uparrow$ or $C_1\downarrow$, $C_2\downarrow$
- In former case, effect on C_1 unsigned, effect on C_2 ambiguous; in latter case, vice versa

Empirical effect of interest rate changes

- Empirically, the effect of the interest rate on consumption seems small
- Possible explanations:
  - Income effect and substitution effect are offsetting
  - Fisher model is not appropriate
  - Borrowing constraints

Borrowing constraint

- Effect of an interest rate change may be zero in the latter case
- Note that the slopes of the indifference curve and the budget constraint are unequal:

$$U_{c1} / U_{c2} = MRS \neq 1 + r$$

- How to solve now for the two unknowns, C_1 and C_2?
- The IBC is one equation in terms of C_1 and C_2
- The borrowing constraint is the second one

The life-cycle hypothesis

- The life-cycle hypothesis (LCH), developed by Franco Modigliani, also stems from the classical view
- Whereas the model of intertemporal choice focuses on the role of the interest rate, the LCH focuses on (the effects of) variations in income over the life cycle

The life-cycle hypothesis

- Furthermore, the LCH explains the consumption puzzle
  - cross-sectional evidence: a higher income implies a lower APC
  - time-series evidence: the APC is roughly constant despite continuous economic growth (increase of Y over time)

The life-cycle hypothesis

- A basic version of the LCH model makes the following assumptions. The consumer
  - expects to live another T years
  - has initial wealth W
  - expects to earn Y until he/she retires R years from now
  - prefers to smooth consumption as much as possible over time
- The interest rate is assumed to be zero

$$C = \frac{W + RY}{T} = \frac{1}{T}W + \frac{R}{T}Y$$

The life-cycle hypothesis

- Rewrite this as a Keynesian consumption function:

$$C = \alpha W + \beta Y \qquad \rightarrow \qquad APC = \frac{C}{Y} = \alpha \frac{W}{Y} + \beta$$

- Prediction 1: If households differ little in terms of W, APC and Y are negatively correlated
- Prediction 2: If W and Y rise more or less proportionally over time, the APC will be constant over time, despite economic growth

The life-cycle hypothesis

- The LCH predicts that households will engage in life-cycle saving
- The reason is that they earn zero (non-capital) during retirement
- Life-cycle saving is then required to avoid a large drop of consumption upon retirement
- Prediction 3: If a household begins adulthood with zero wealth, he/she will accumulate wealth during the working years and turn deplete this wealth during retirement

The permanent-income hypothesis

- Friedman suggested the permanent-income hypothesis (PIH): income, Y, consists of a permanent component, Y^P, and a transitory component, Y^T:

$$Y = Y^P + Y^T$$

- Permanent income: income that is expected to persist into the future
- Transitory income: the remainder, which can be positive or negative

The permanent-income hypothesis

- Further, Friedman suggested consumption is a fraction of permanent income rather than total income:

$$C = \alpha Y^P$$

- The PIH implies the following relation between the APC and Y:

$$APC = \frac{C}{Y} = \alpha \frac{Y^P}{Y^P + Y^T} = \alpha \left[1 - \frac{Y^T}{Y} \right]$$

The permanent-income hypothesis

- The PIH implies that transitory income fluctuations imply variations in the APC
- Related, when transitory and permanent income vary proportionally, the APC will be a constant, despite economic growth
- This way, the PIH solves the consumption puzzle

The random-walk hypothesis

- According to the LCH, only wealth matters for consumption
- Hence, variation in income over time does not imply variation in consumption, but stable consumption (consumption smoothing)
- Robert Hall derived that consumption will only change over time in case of unexpected fluctuations in income
- Hence, changes in consumption are unpredictable: consumption follows a random walk

The random-walk hypothesis

- One implication is that credible announcements of future policy changes
  - matter for consumption at the time of announcement
  - but do not matter for consumption at the time opf the policy change
- Empirically, consumption and income are strongly correlated
- Possible explanations:
  - Expectations are not rational
  - Consumers are borrowing-constrained
  - Consumers are not forward looking, but more Keynesian-type

Behavioral economics

- Candy example:
  - Would you prefer to have a candy today (A1) or two tomorrow (B1)?
  - Would you prefer to have a candy 100 days from now (A2) or two 101 days from now (B2)?
  - If your answers are A1 and B2, your preferences are time-inconsistent: your preferences change with the passing of time
- Hence, preferences do not feature exponential discounting, but a sort of hyperbolic discounting

Behavioral economics

- Consumers may want to be able to commit themselves to save in order to prevent them from saving too little
- The role of the default option
- “Save More Tomorrow”, Richard Thaler
  - High enrollment
  - Little opting-out
  - Result: higher savings than otherwise