
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
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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,

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

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

period 1: $C_1 = Y_1 - S$

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 :

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

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

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:

$$dU = U_{c_1} dC_1 + U_{c_2} dC_2 = 0 \quad \rightarrow$$

$$dC_2 / dC_1 = -U_{c_1} / U_{c_2}$$

Fisher's model of intertemporal choice

- Combining, we have the optimality condition:

$$U_{c_1} / U_{c_2} = MRS = 1 + r$$

- 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

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

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

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

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:

$$U_{c_1} / U_{c_2} = MRS \neq 1 + r$$

- 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:

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

- 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 of 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