Economics Lecture 7

2016-17

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Course Outline

1 Consumer theory and its applications

1.1 Preferences and utility

1.2 Utility maximization and uncompensated demand

1.3 Expenditure minimization and compensated demand

1.4 Price changes and welfare

1.5 Labour supply, taxes and benefits

1.6 Saving and borrowing

2 Firms, costs and profit maximization

2.1 Firms and costs

2.2 Profit maximization and costs for a price taking firm

3. Industrial organization

3.1 Perfect competition and monopoly

3.2 Oligopoly and games

1.6 Saving and borrowing

1. Choices between income streams
2. The intertemporal budget line and present discounted value
3. Perfect capital markets
4. The simplest model of asset pricing
5. Saving and borrowing decisions
6. Effects an interest rate cut
7. Different borrowing and lending rates

1. Choices between income streams

You can lend at 10%. Choose between A, B and C. 

	2016	2017
A	€10,000	€22,000
B	€18,000	€11,000
C	€20,000	€11,000

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A	€10,000	€22,000
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C is better than B.

If you start with A, lend €10,000 in 2016, get back €11,000 in 2017 you get C.

With lending at 10% A and C are 

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	2016	2017
A	€10,000	€22,000
B	€18,000	€11,000
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C is better than B.

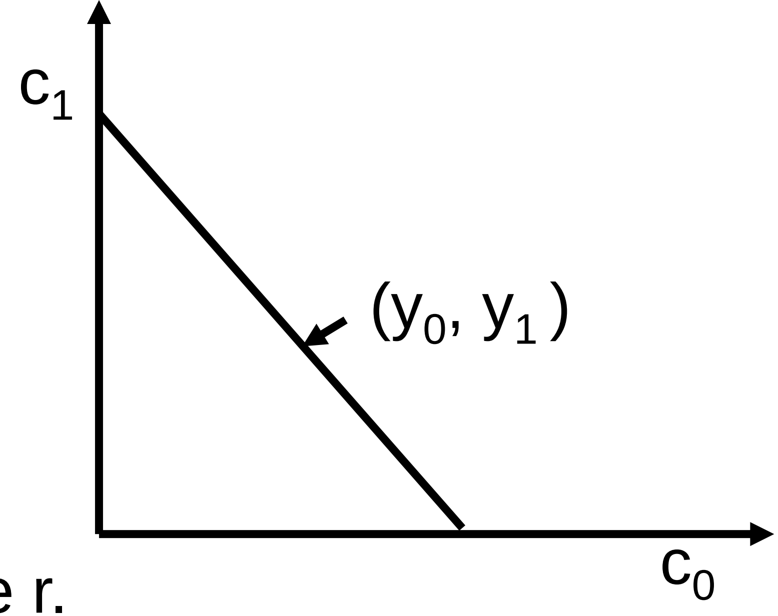
If you start with A, lend €10,000 in 2016, get back €11,000 in 2017 you get C.

With lending at 10% A and C are indifferent, both are better than B.

2. The intertemporal budget line and present discounted value

Assume you know for sure

	2016	2017
income	y_0	y_1



You can borrow and lend at interest rate r.

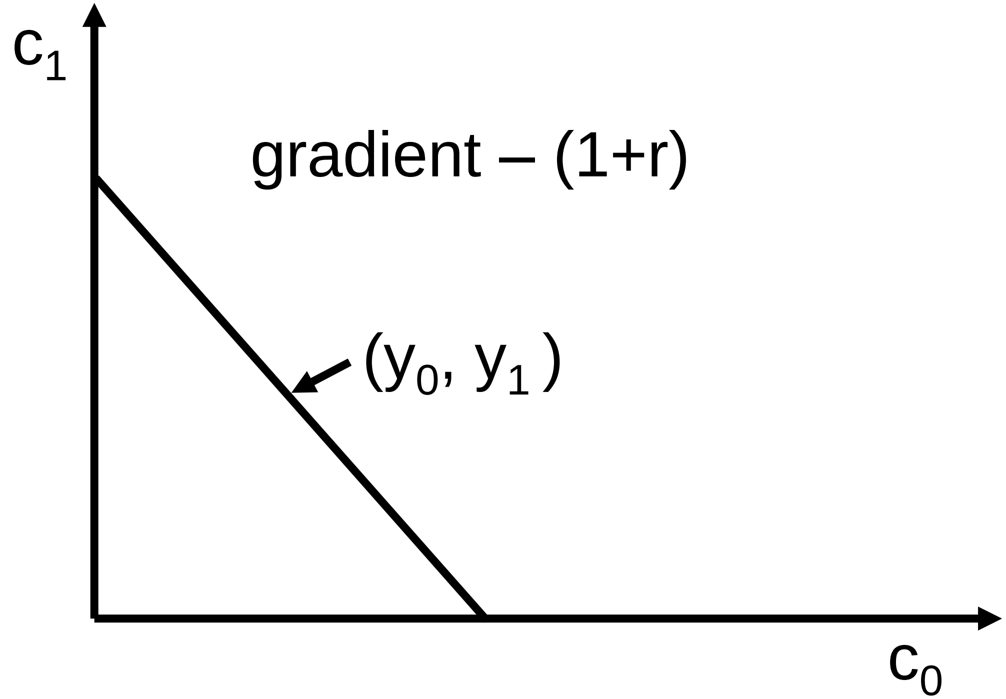
Note that 10% interest → r = 0.10.

c_0 2016 consumption, c_1 2017 consumption

Saving at date 0: $s_0 = y_0 - c_0$ (if $s_0 < 0$ you are borrowing $-s_0$)

Consumption at date 1 $c_1 = y_1 + (1 + r)s_0 = y_1 + (1 + r)(y_0 - c_0)$

Budget constraint $c_1 = y_1 + (1 + r)(y_0 - c_0)$



Budget constraint $c_1 = y_1 + (1 + r)(y_0 - c_0)$ is a straight line with gradient $-(1+r)$.

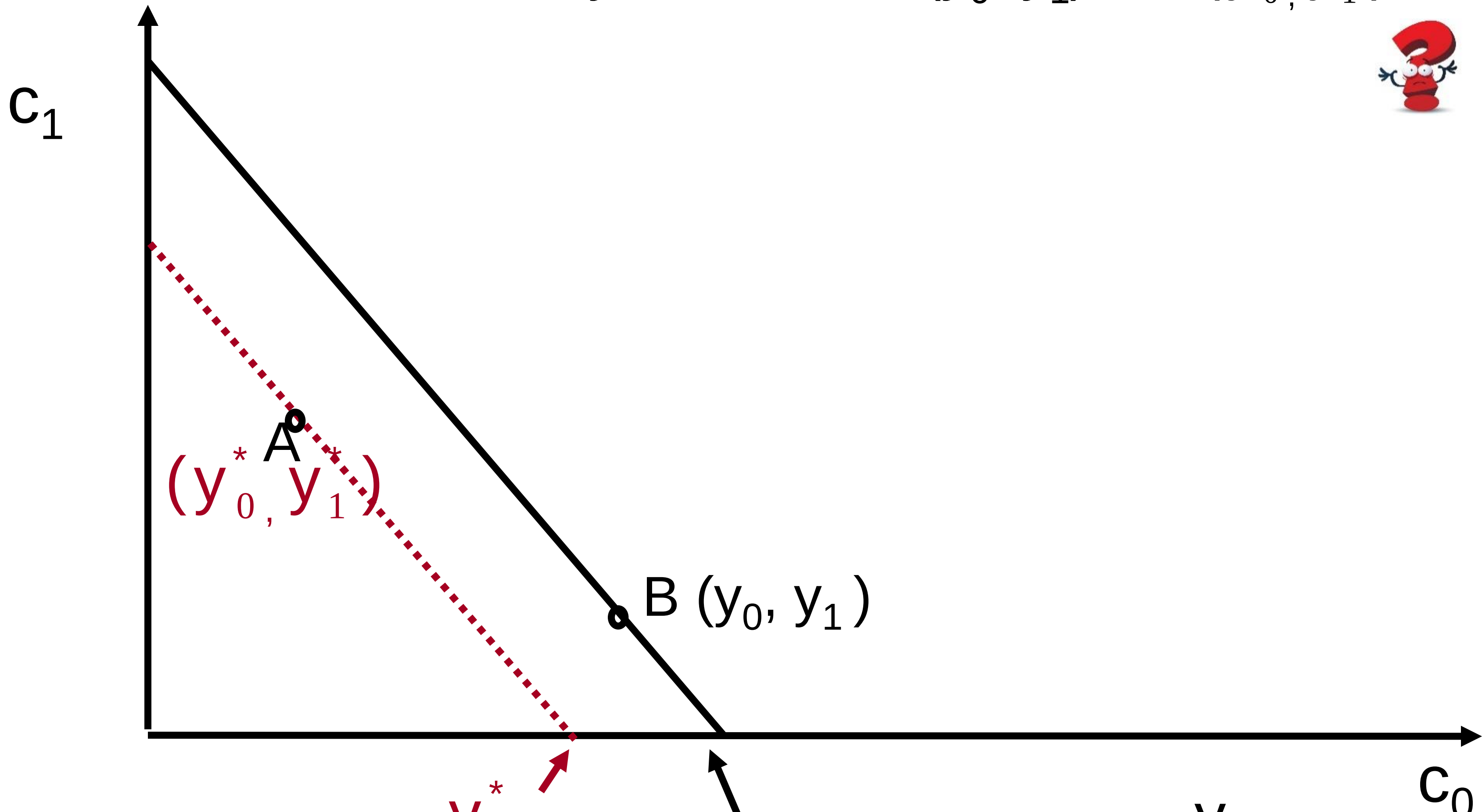
It can be rearranged to get

$$c_0 + \frac{c_1}{(1+r)} = y_0 + \frac{y_1}{(1+r)}$$

This straight line meets the horizontal axis at $y_0 + \dfrac{y_1}{(1+r)}$

Which budget line would you choose, A or B?

Which income stream would you choose (y_0, y_1) or (y^*_0, y^*_1) ?



$$c_0 = y^*_0 + \frac{y^*_1}{(1+r)} \qquad c_0 = y_0 + \frac{y_1}{(1+r)}$$

Which budget line would you choose, A or B?

Non satiation implies that B is better than A.

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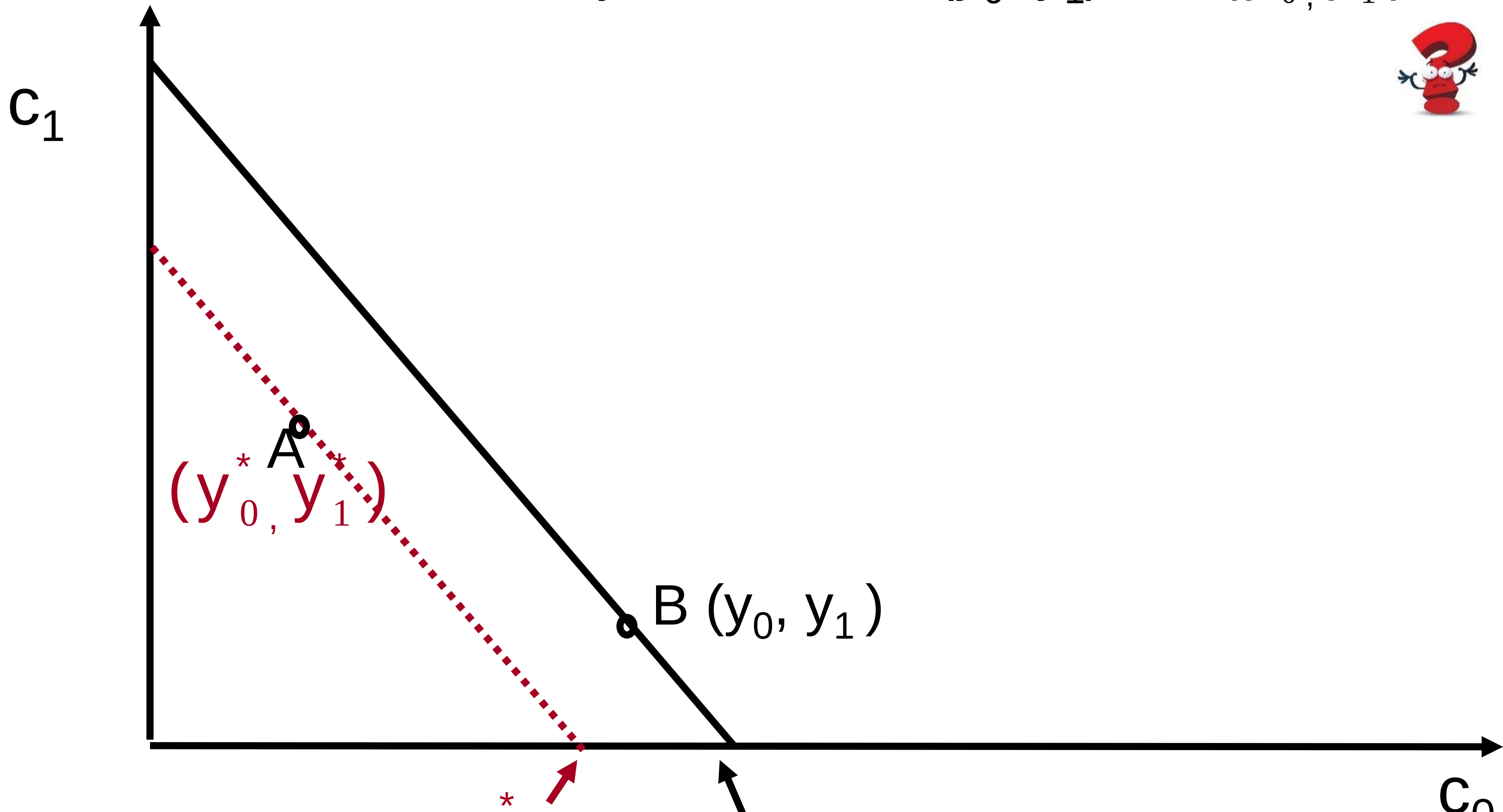

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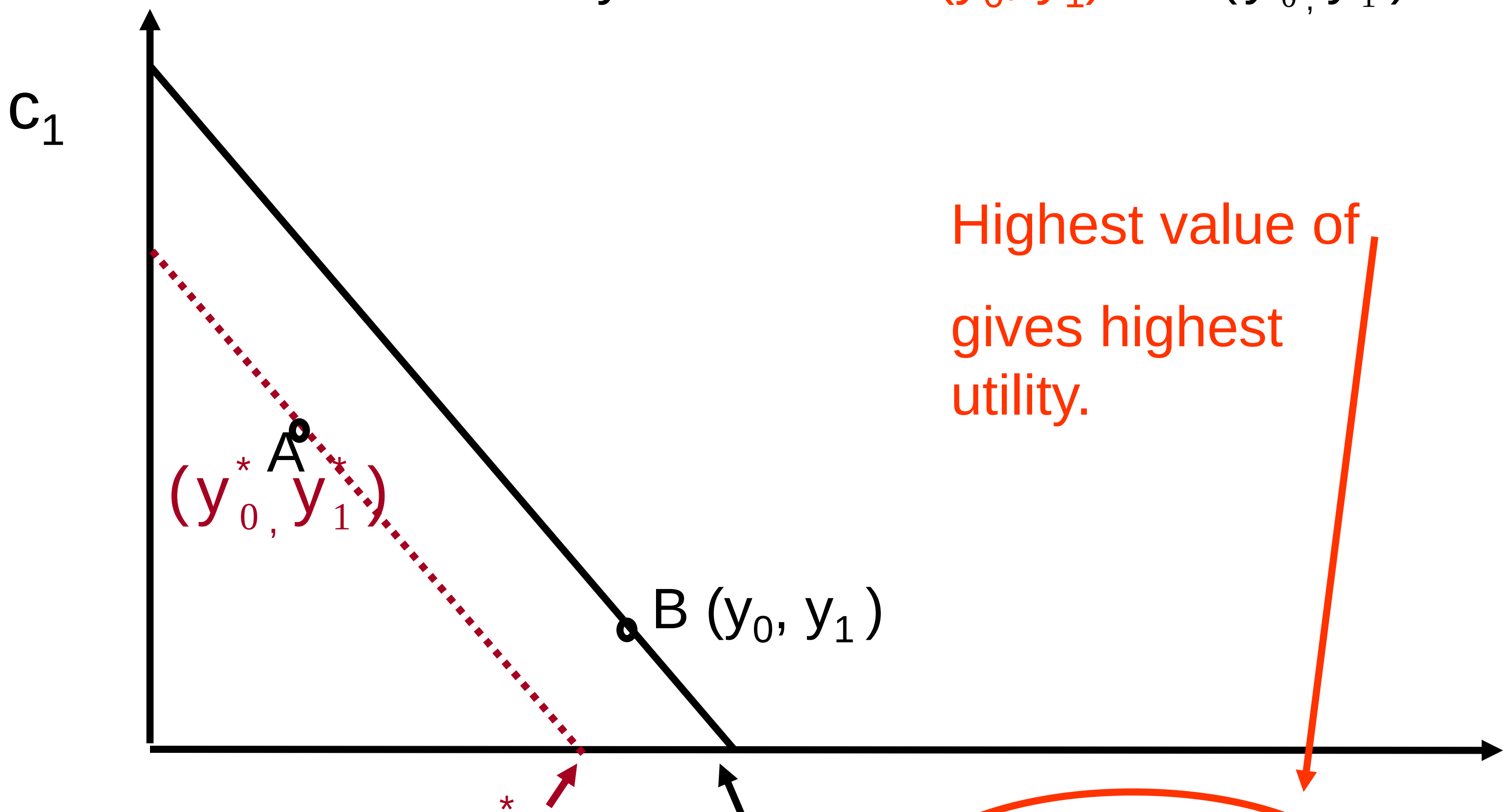

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Present discounted value

The **present discounted value** of the income stream (y_0,y_1) is

$$y_0 + \frac{y_1}{(1+r)}$$

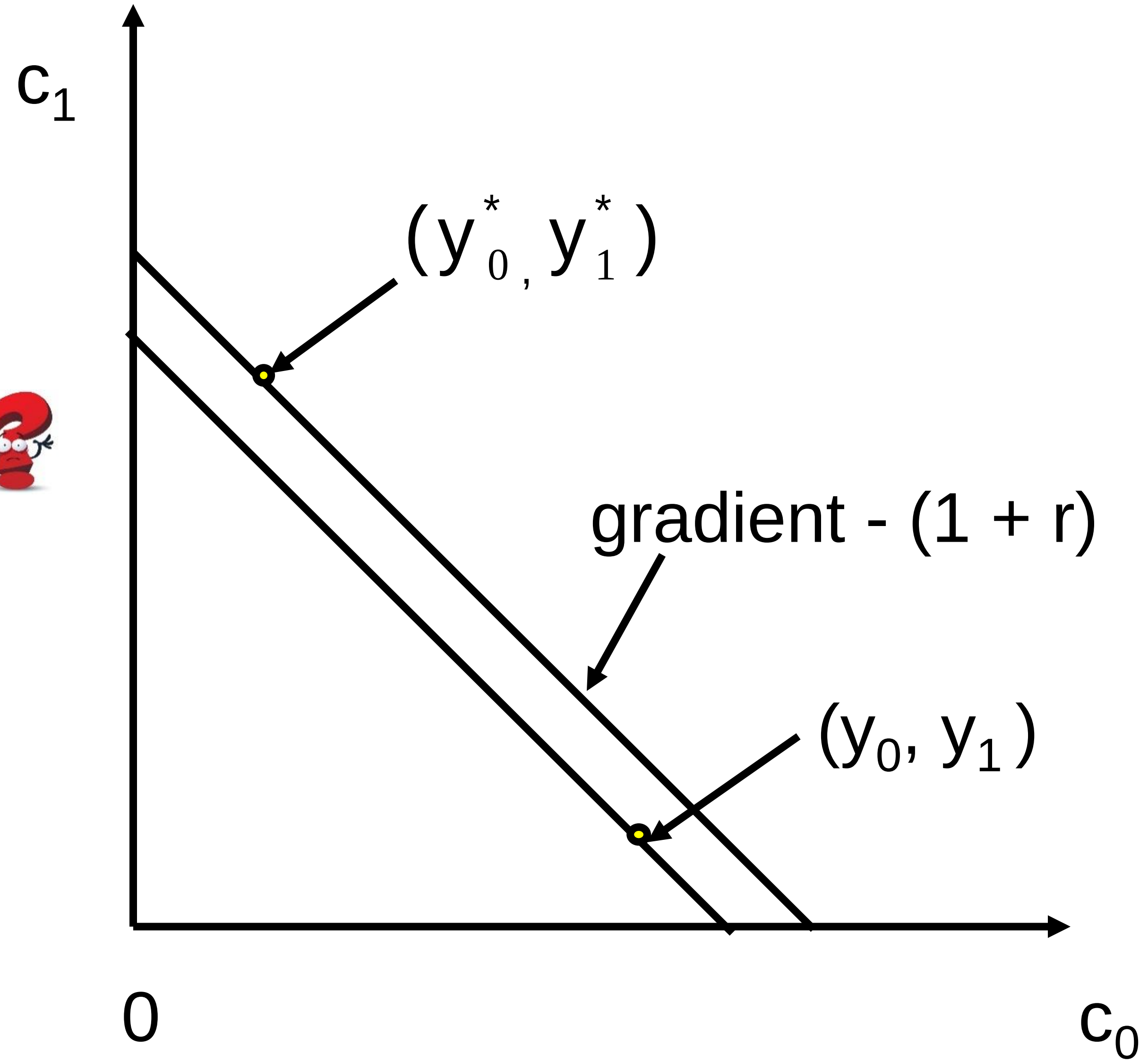
Equations of 2 budget lines

$$c_0 + \frac{c_1}{(1+r)} = y_0 + \frac{y_1}{(1+r)}$$

$$c_0 + \frac{c_1}{(1+r)} = y_0^* + \frac{y_1^*}{(1+r)}$$

In this model non satiation implies that any consumer would choose the income stream with the highest present value.

Which income stream is optimal at interest rate r ?



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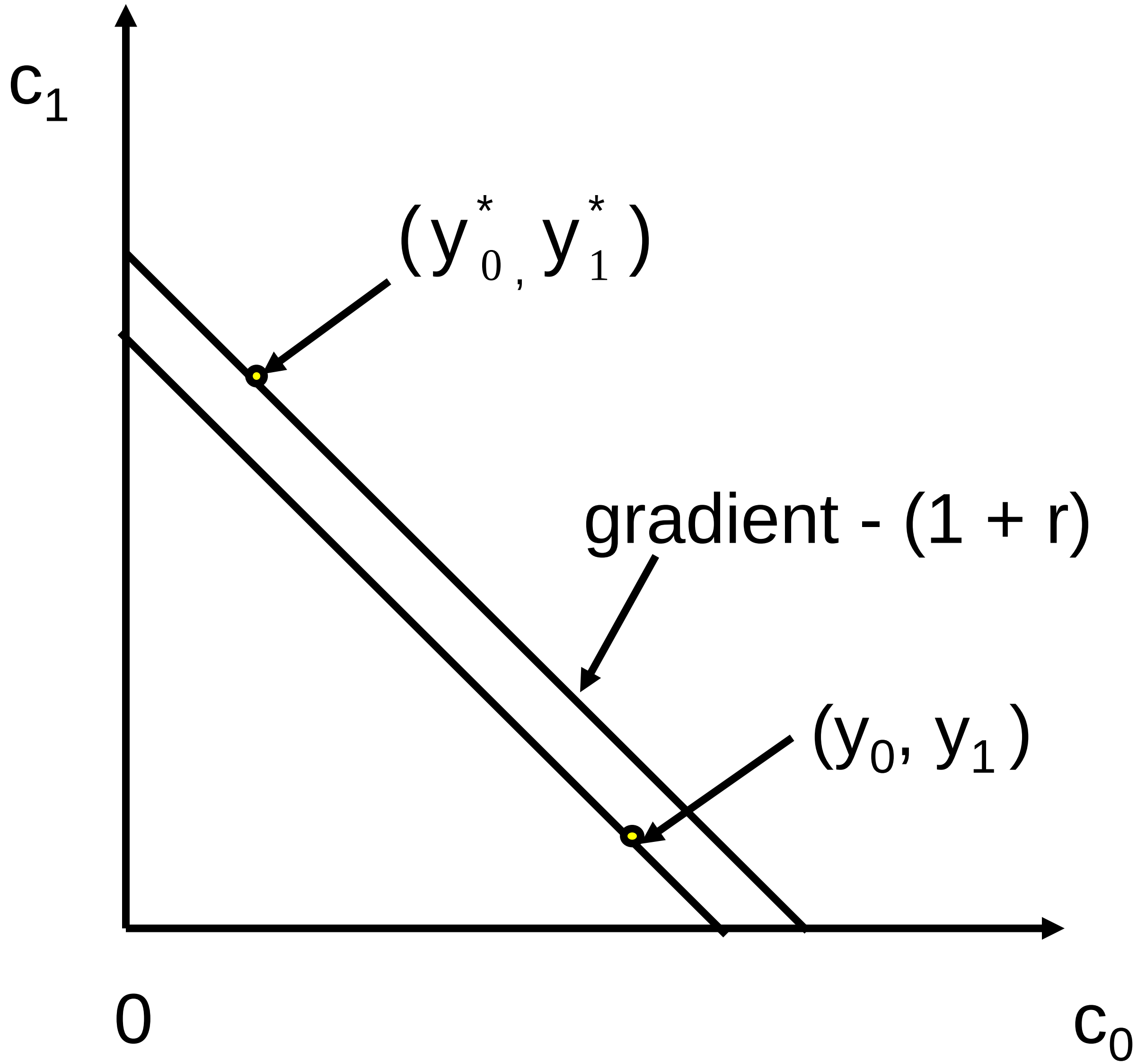

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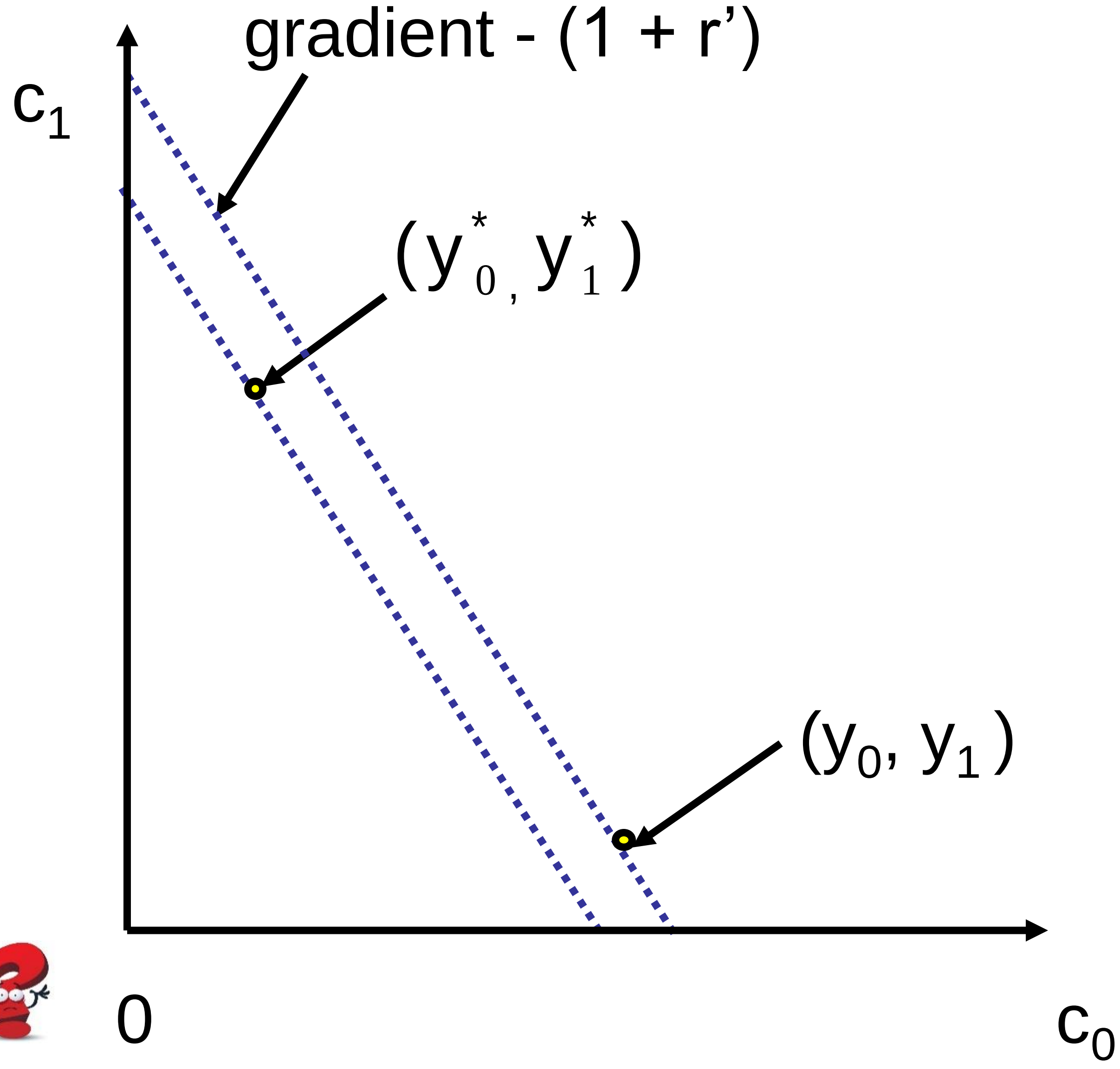

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Which income stream is optimal at interest rate r' ?

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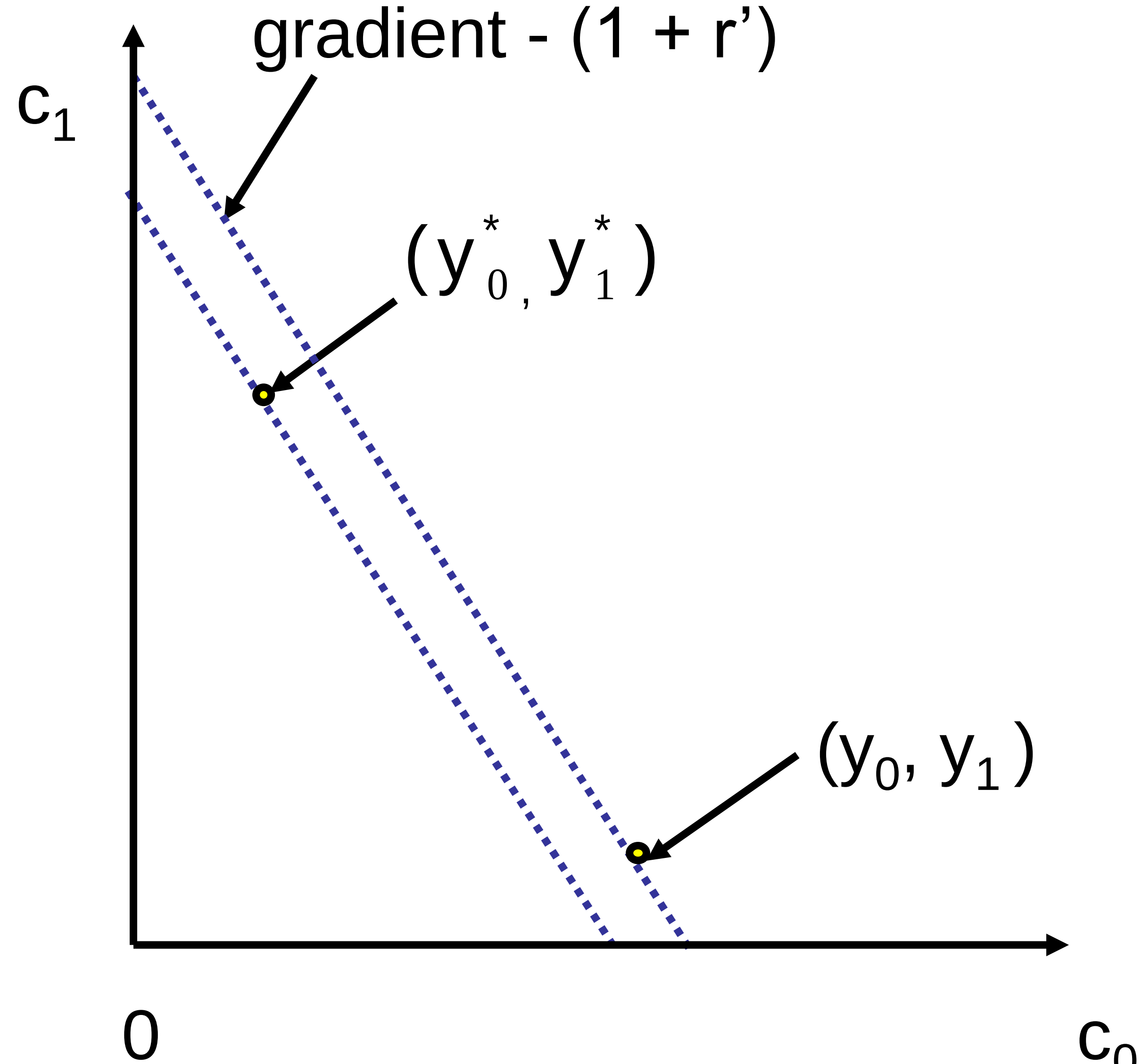

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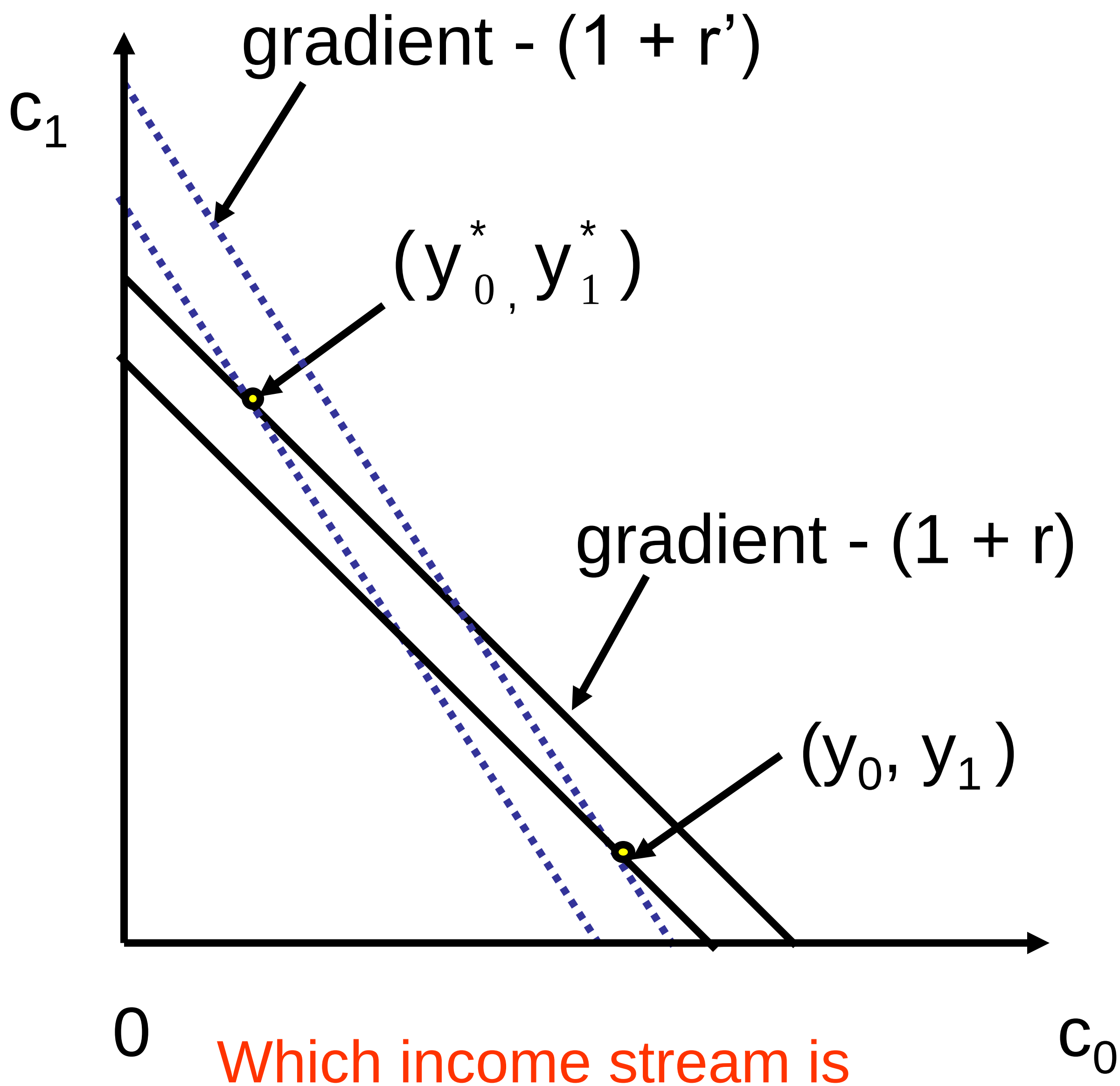

Which income stream is optimal depends on the interest rate.

Definition

- The **present discounted value** (pdv) at date 0 of an income stream y_0, y_1, y_2,....y_t,....y_T, paying y_t at date t, discounted at an interest rate r is

$$y_0 + \frac{y_1}{(1+r)} + \frac{y_2}{(1+r)^2} + \ldots..$$

$$\ldots. + \frac{y_t}{(1+r)^t} + \ldots.. + \frac{y_T}{(1+r)^T}$$

The pdv of $y_0, y_1, y_2, \ldots y_t, \ldots y_T$
is the maximum amount of debt at date 0 which you could repay using the entire income stream $y_0, y_1, y_2, \ldots y_t, \ldots y_T$.

If you get the income stream $y_0, y_1, y_2, \ldots y_t, \ldots y_T$,
at interest rate r, start with no savings and no debt at date 0, you can follow any consumption path
and leave no debt or savings at date T whose pdv

$$c_0 + \frac{c_1}{(1+r)} + \frac{c_2}{(1+r)^2} + \ldots$$

$$\ldots + \frac{c_t}{(1+r)^t} + \ldots + \frac{c_T}{(1+r)^T}$$

is equal to the pdv of the income stream.

3. Perfect capital markets

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a strong assumption

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Credit crunch ???

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Credit crunch ???

4. There is a perfect and costless mechanism which ensures that no one takes on loans that they cannot repay and that all debts are repaid.

Credit Crunch Questions

- Why did households, firms, banks and governments borrow money they are now not able to repay?

- Why were banks willing to lend to them?

The simplest model of asset pricing

Renowned French artist Bernard Maquin created the Royal Diamond Chess set

Valued at over €5 million, it contains diamonds, emeralds, rubies, pearls and sapphires. The king piece alone weighs 165.2 grams of 18 carat yellow gold, 73 rubies and 146 diamonds.

Source: http://www.charleshollandercollection.com/chess.html

The simplest model of asset pricing

Suppose you own the chess set which you do not like so keep it in the bank, you are only interested in it as an asset.

How do you decide whether to sell it now or in 10 years?

- Suppose everyone knows that the price now is €5 million and the price in 10 years will be €15 million.

- Selling the chess set now adds €5 million to  of your monetary wealth.

- Selling the chess set in 10 years adds  million  of your monetary wealth.

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- Suppose everyone knows that the price now is €5 million and the price in 10 years will be €15 million.
- Selling the chess set now adds €5 million to the pdv of your monetary wealth.
- Selling the chess set in 10 years adds

$$\frac{€15}{(1+r)^{10}}$$ million to the pdv of your monetary wealth.

If the alternatives are sell the chess set now or sell in 10 years sell now if

$$€5 \text{ million} > \frac{€15 \text{ million}}{(1+r)^{10}}$$

Sell the chess set in 10 years if

$$€5 \text{ million} < \frac{€15 \text{ million}}{(1+r)^{10}}$$

You are indifferent between selling the chess set now and selling it in 10 years if

$$€5 \text{ million} = \frac{€15 \text{ million}}{(1+r)^{10}}$$

- The chess set is unique, there is no other identical chess sets.

- Now suppose that this is a financial asset that many people (or organisations) own.

- If $€5 \text{ million} > \frac{€15 \text{ million}}{(1+r)^{10}}$ everyone wants to sell now.

- If $€5 \text{ million} < \frac{€15 \text{ million}}{(1+r)^{10}}$ everyone wants to buy now.

The market can only clear if the current price is

$\frac{€15 \text{ million}}{(1+r)^{10}}$ this is a **no arbitrage argument**.

More generally no arbitrage arguments in a model with certainty imply that if an asset pays dividends d_1, d_2, ……d_T at dates 1,2 …T and is sold at price p_T at date T then the price p_0 of the asset at date 0 must be the present discounted value of the dividends + price at date T, that is

$$p_0 = \frac{d_1}{(1+r)} + \frac{d_2}{(1+r)^2} + \frac{d_3}{(1+r)^3} \cdots\cdots$$

$$+ \frac{d_T}{(1+r)^T} + \frac{p_T}{(1+r)^T}$$

- No arbitrage conditions are very important in standard finance theory.

- I have assumed no uncertainty and perfect knowledge of what dividends and asset prices will be in the future.

- No arbitrage arguments can be extended to allow for uncertainty and are the foundation of the Black Scholes model of options pricing.

- Some financial economists argue that there are considerable limits to arbitrage and that this has important consequences for asset pricing.

- The simple asset pricing models assumes that people know what prices will be in the future.
- The model can be extended to allow for uncertainty under strong assumptions.
- If an increase in current asset prices leads people to expect that future asset prices will be even higher, an increase in asset prices can **increase demand** and further increase prices.
- If a fall in current asset prices leads to people to expect that future asset prices will be even lower, a decrease in asset prices can **decrease demand** and further decrease prices.

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bubbles

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crashes

5. Saving and borrowing decisions

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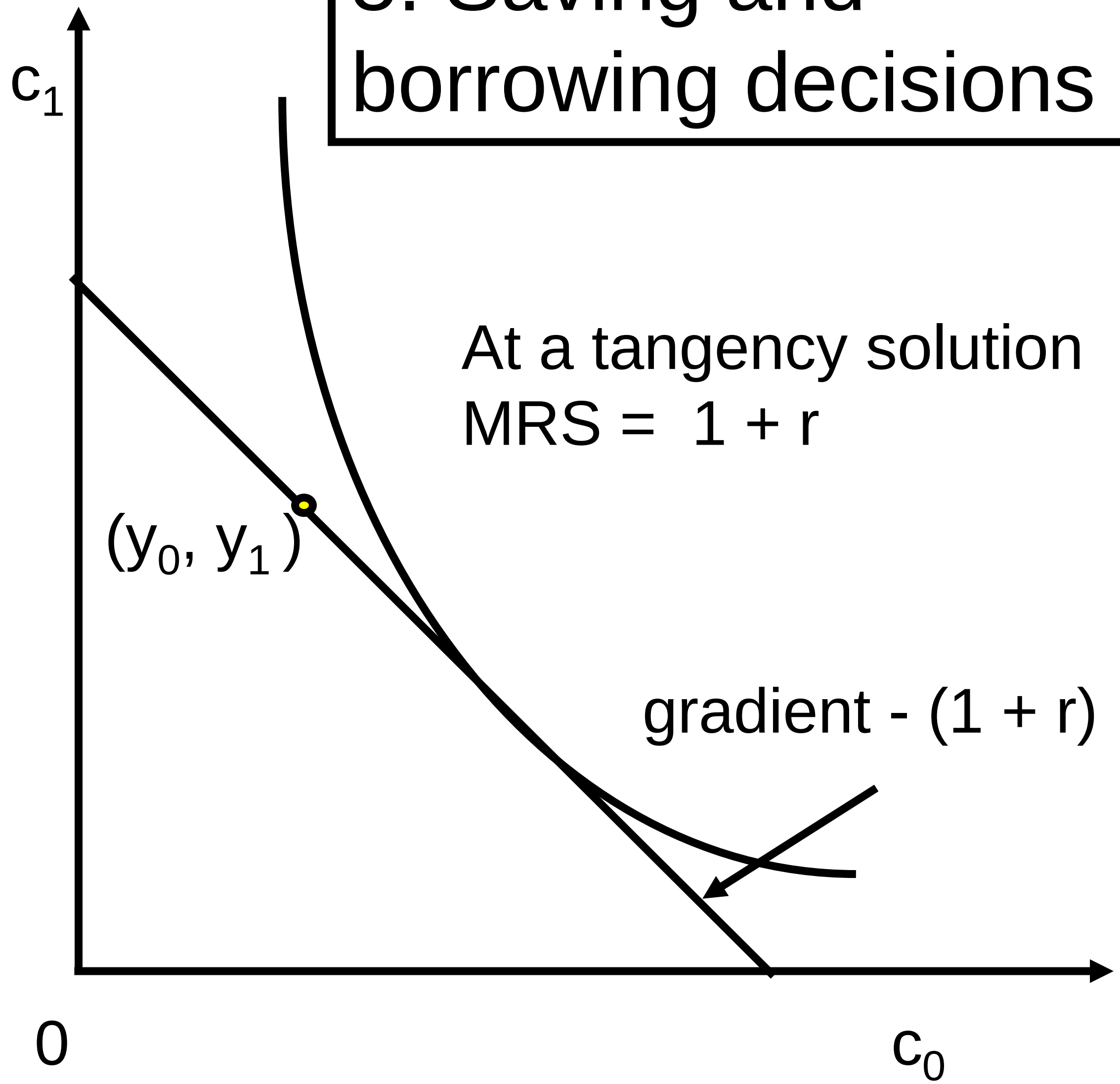
Assume preferences satisfy the standard assumptions of completeness, transitivity, continuity, nonsatiation and convexity so can be represented by a utility function $u(c_0,c_1)$.

The consumer maximizes $u(c_0,c_1)$ subject to the budget constraint

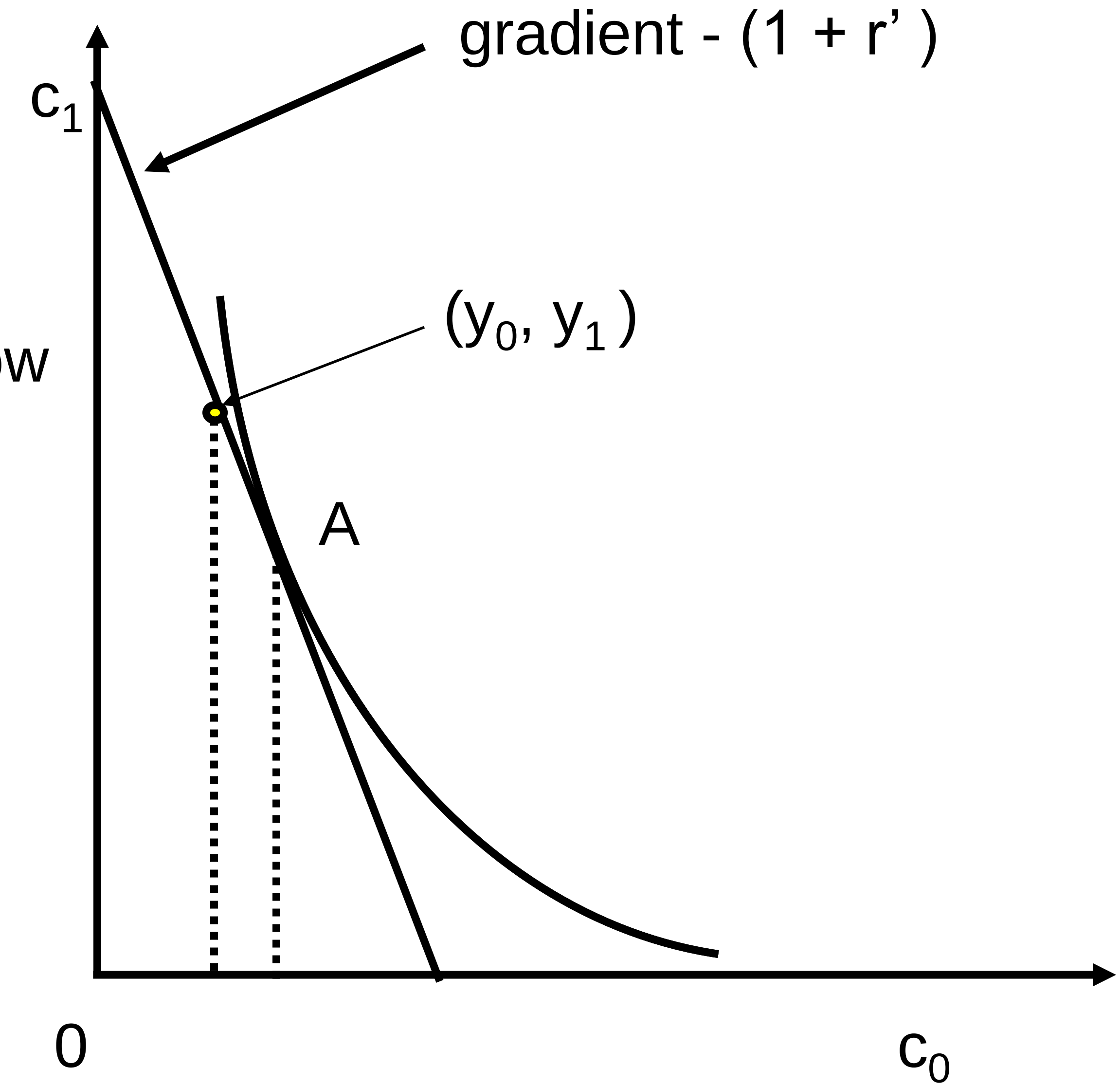


$$c_0 + \frac{c_1}{(1+r)} \leq y_0 + \frac{y_1}{(1+r)}$$

This household's current consumption at A

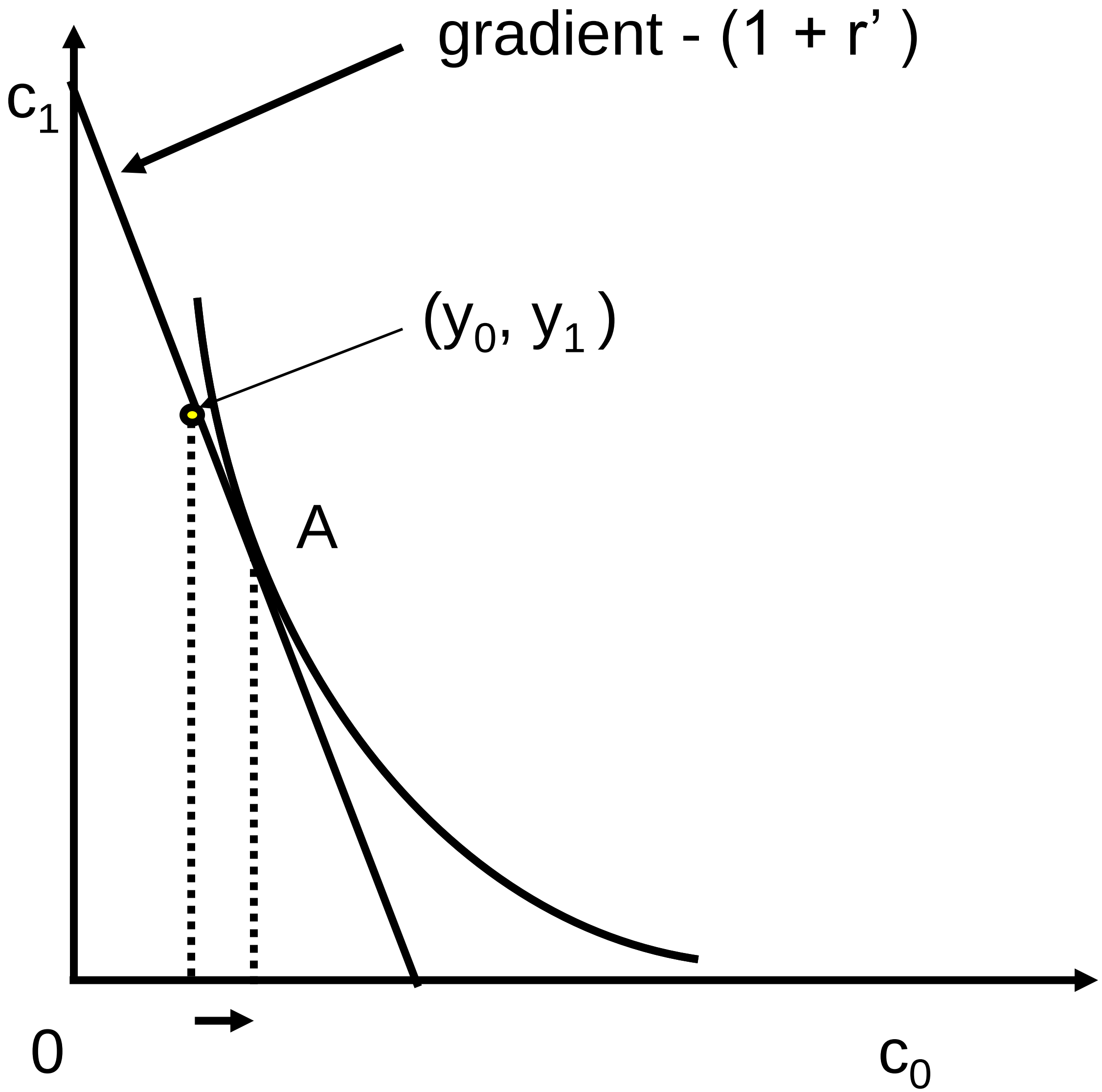
> current income

What should she do borrow or save?



This household's current consumption at A > current income

The household borrows and increases present consumption.



This household's current

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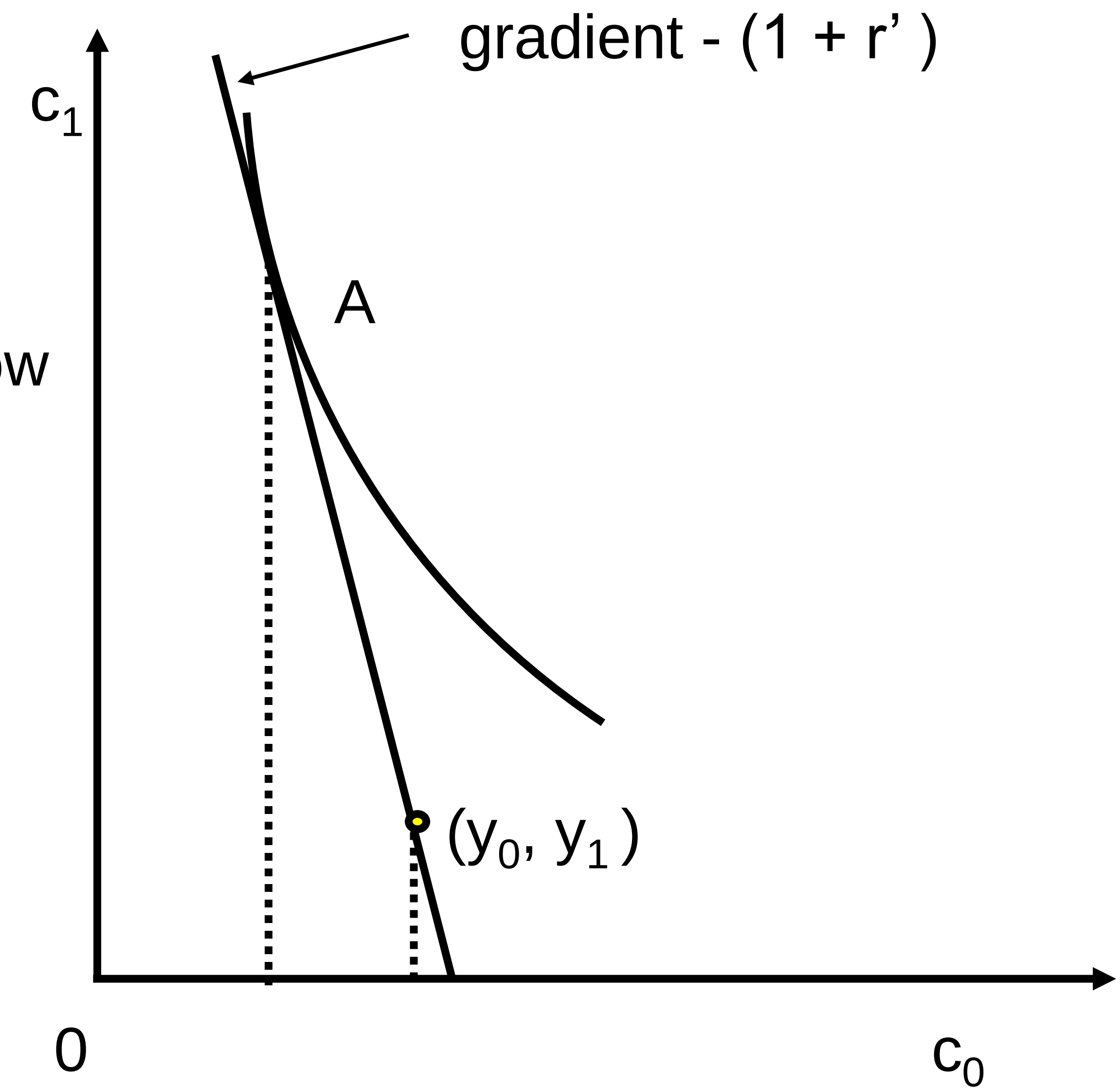
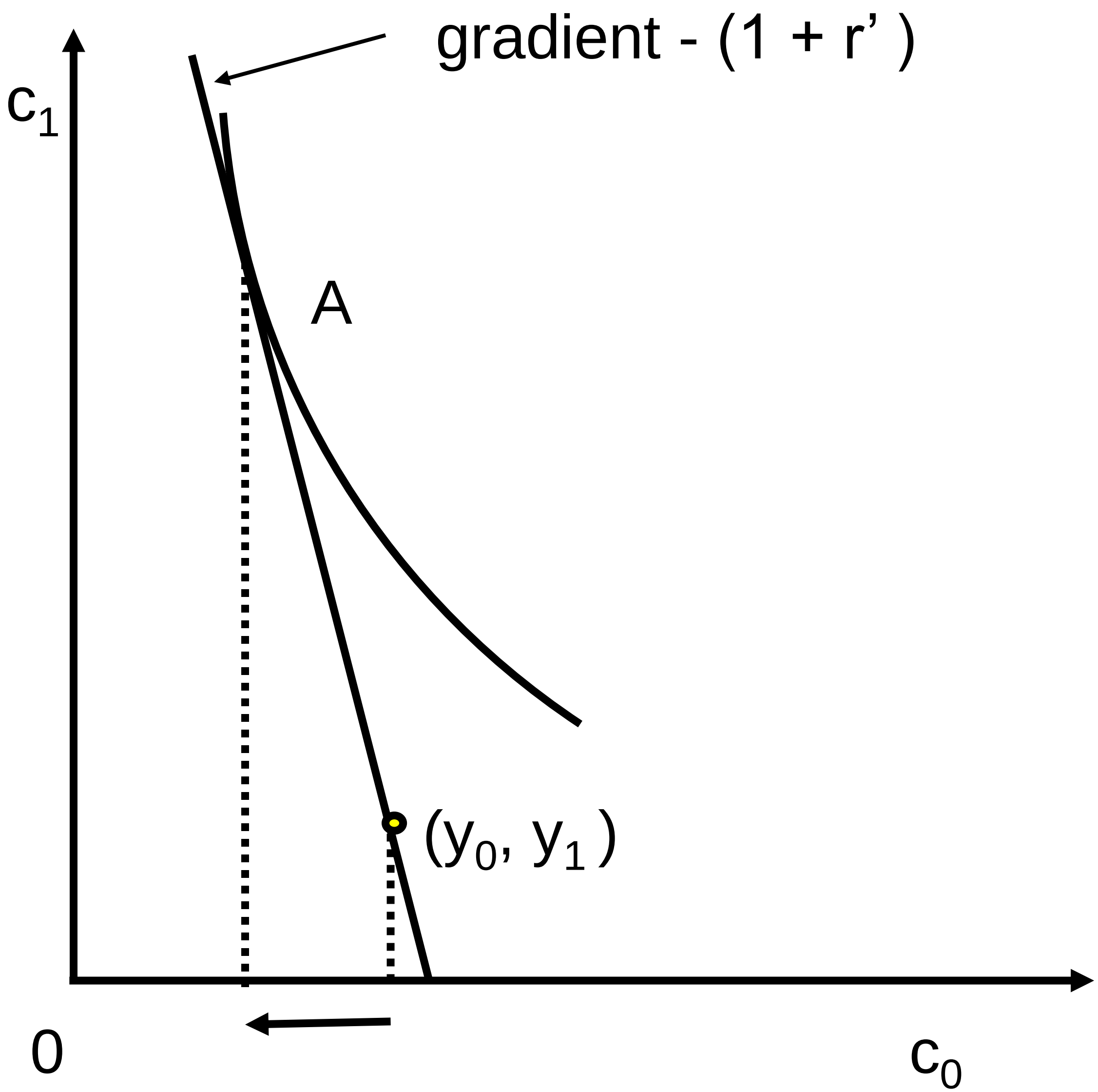


This household's current

consumption at A

< current income

The household saves.



Interest rates are an important policy instrument

- Set by central banks
- Some central banks

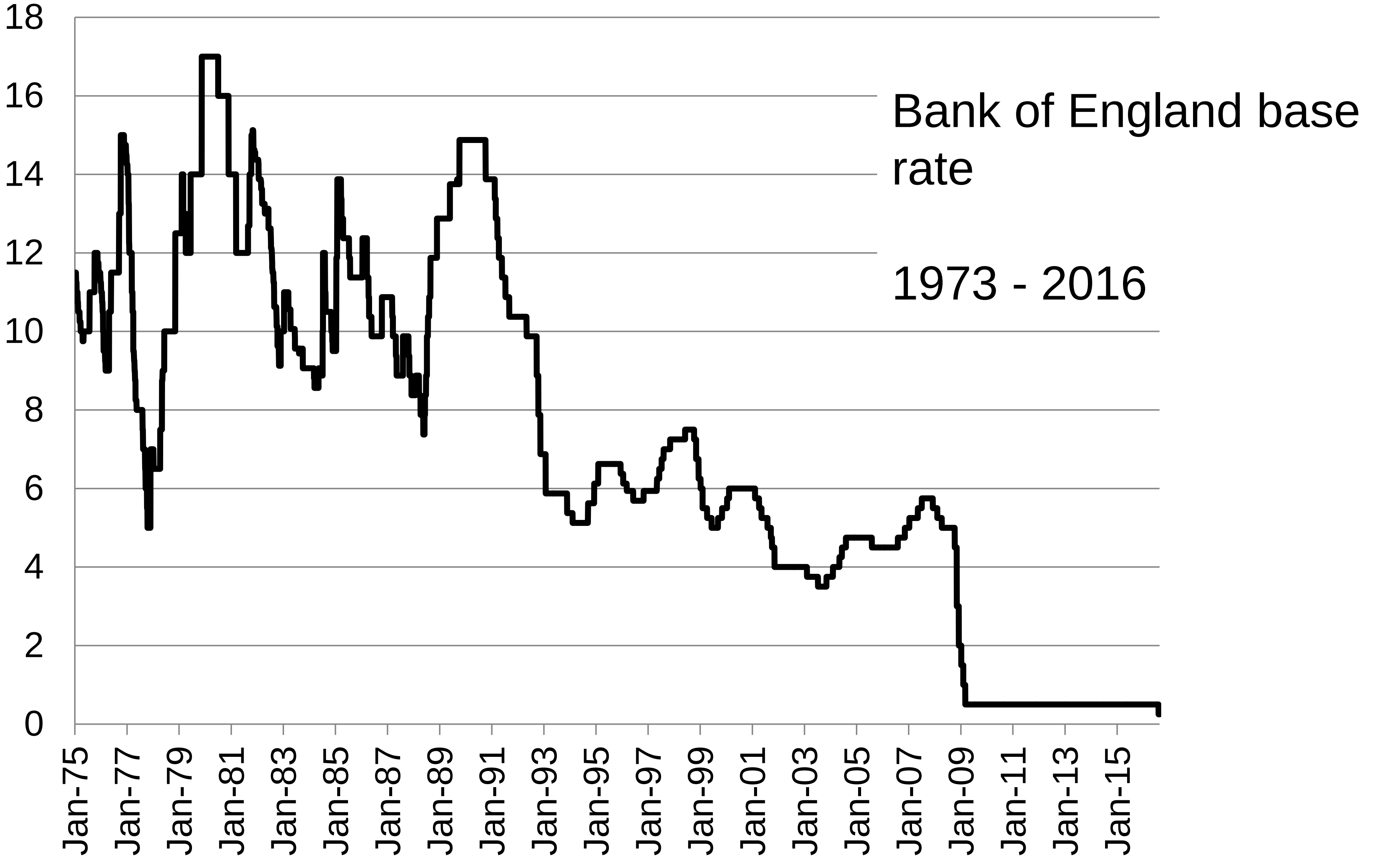
  (e.g. UK, Fed (US), ECB (Eurozone)) have a considerable degree of independence.
- If tax rates are stable or hard to change interest rates are the main short term policy instrument.

Bank of England interest rate

October 2008 4.5%

October 2009 – July 2016 0.5%

August 2016 - 0.25%



http://www.bankofengland.co.uk/boeapps/iadb/index.asp?Travel=NIxRPx&From=Repo&C=13T&G0Xtop.x=1&G0Xtop.y=1

Effects of an interest rate cut

If the interest rate you get on savings falls what do you do?

1. Increase current consumption
2. Decrease current consumption
3. No change in current consumption

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Usually, not generally true

6. Effects an interest rate cut

- In a simple macro model, cutting the interest rate
  - increases growth
  - increases inflation
- by
  - increasing investment by firms
  - increasing current consumption by households.

- The question here is:
  - does the simple consumer theory model imply interest rate cuts increase current consumption?

General Principle

- If the household can continue to do **after** the rate change what it did **before** the rate change

- the rate change can’t make it worse off and usually makes it better off.

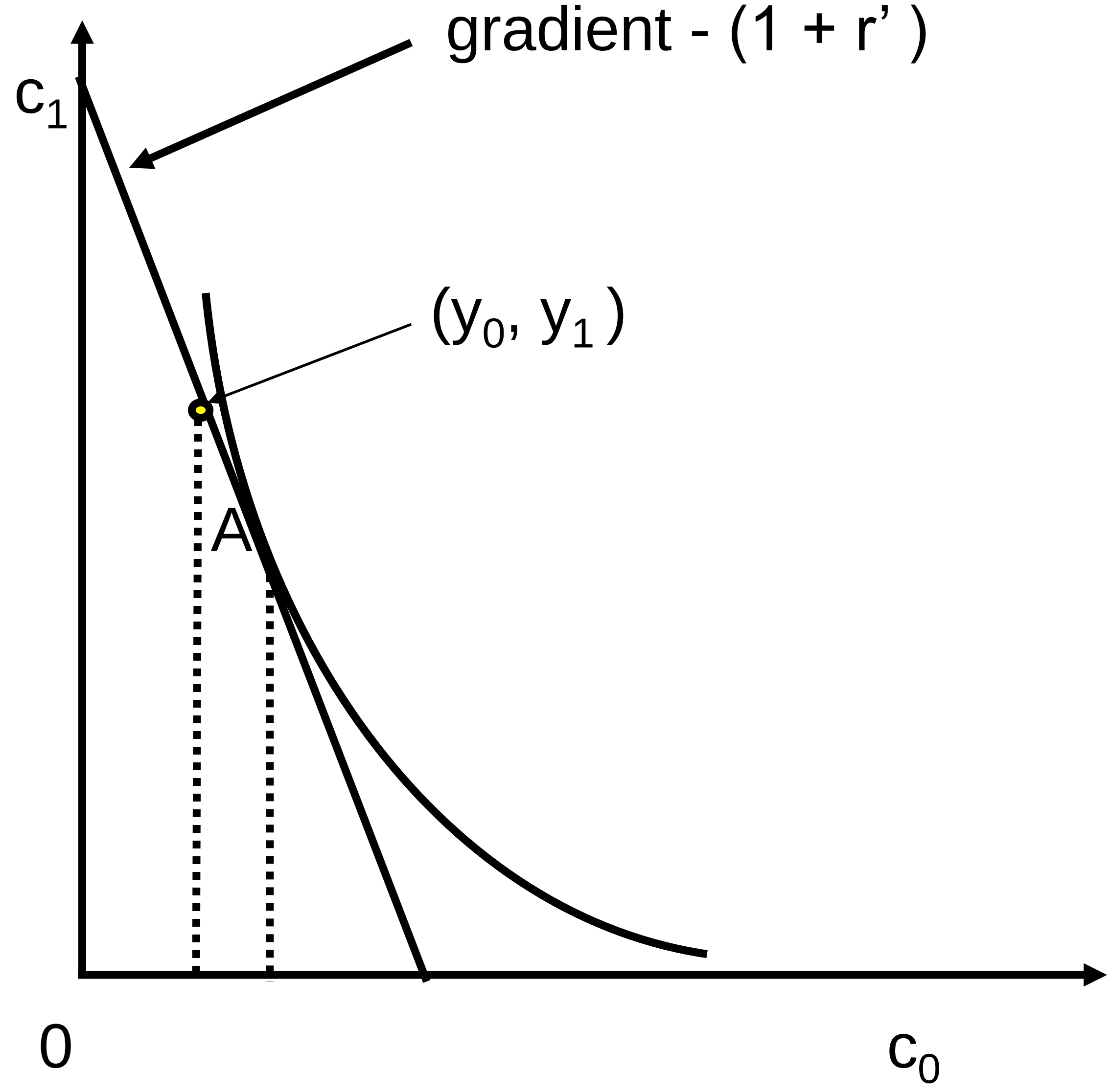
An interest rate cut

- Never makes a borrower worse off

- Usually makes a borrower better off.

This household **borrows**

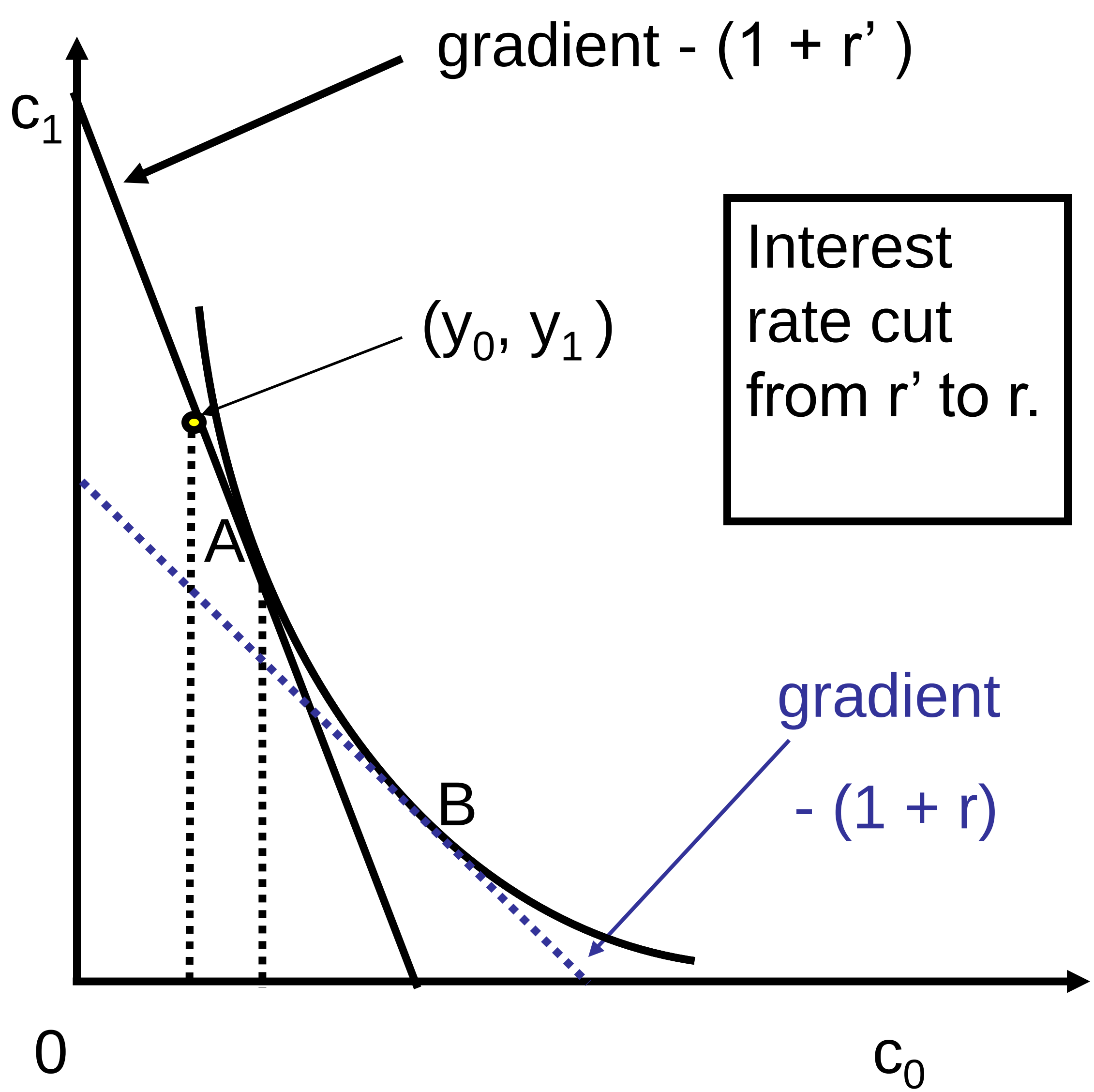
before the rate cut.



This household **borrows** before the rate cut.

The substitution effect A to B of the cut increases consumption at date 0.

The rate cut never decreases a borrower's utility. Here the rate cut increases utility.



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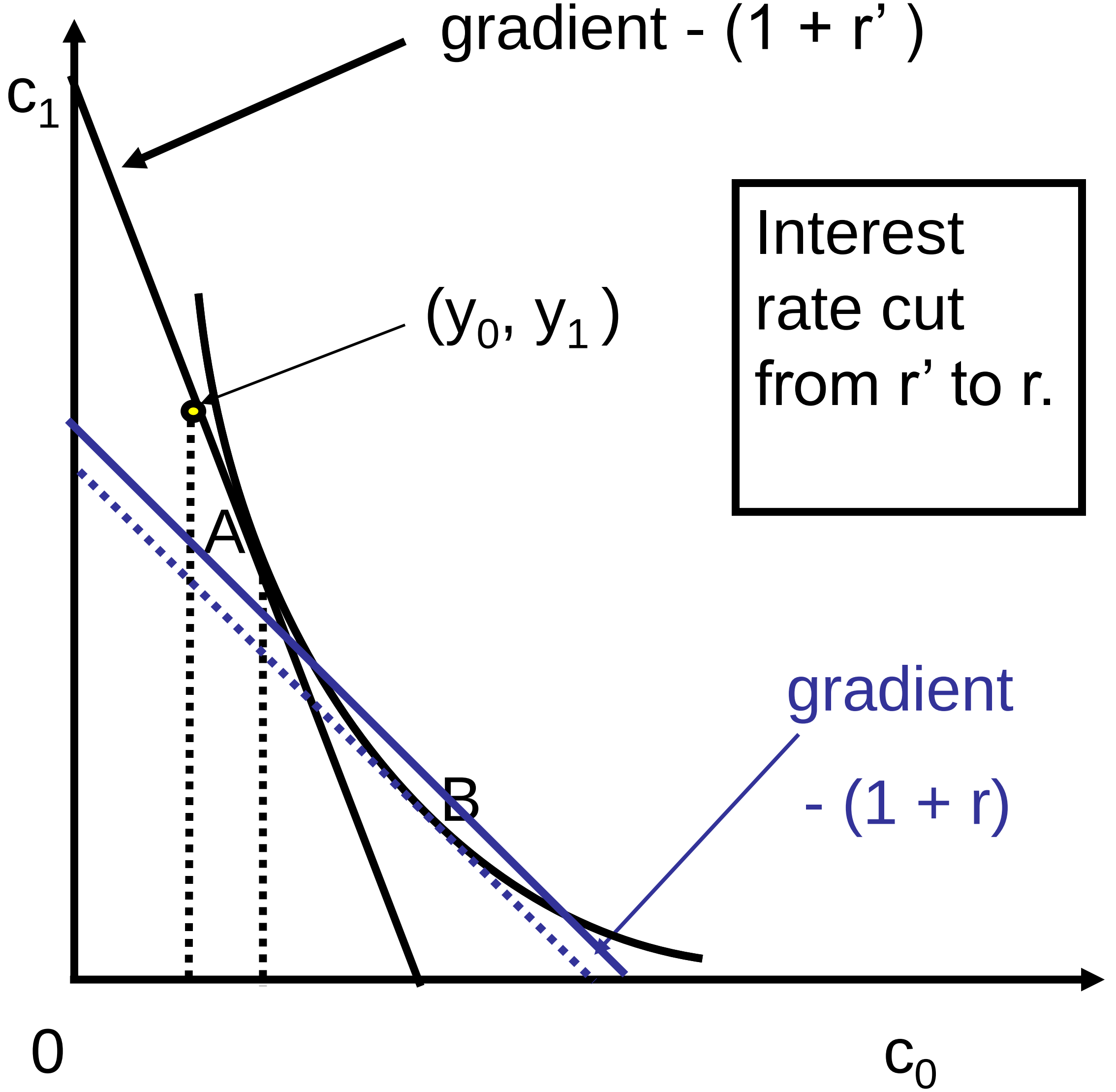

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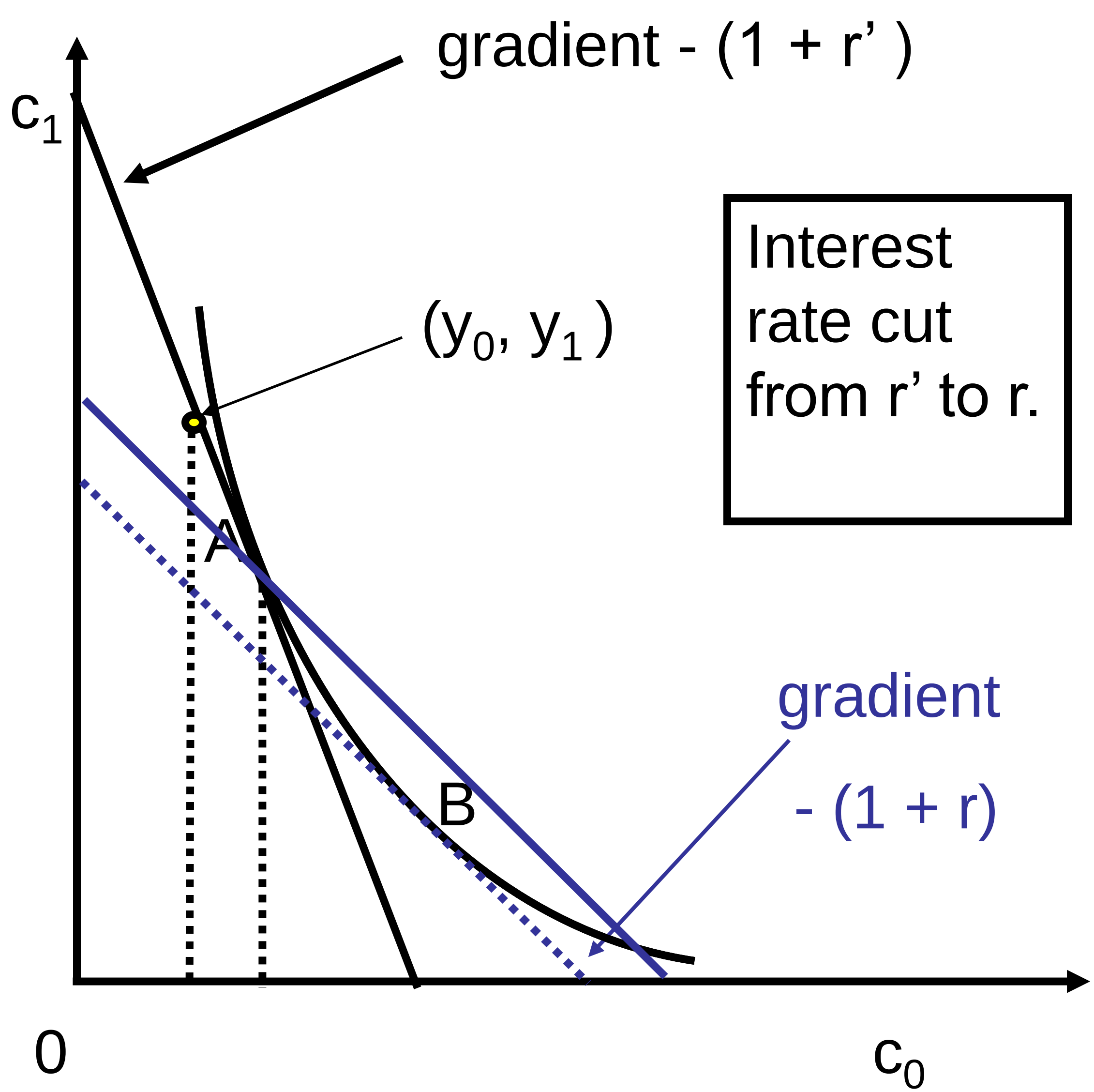

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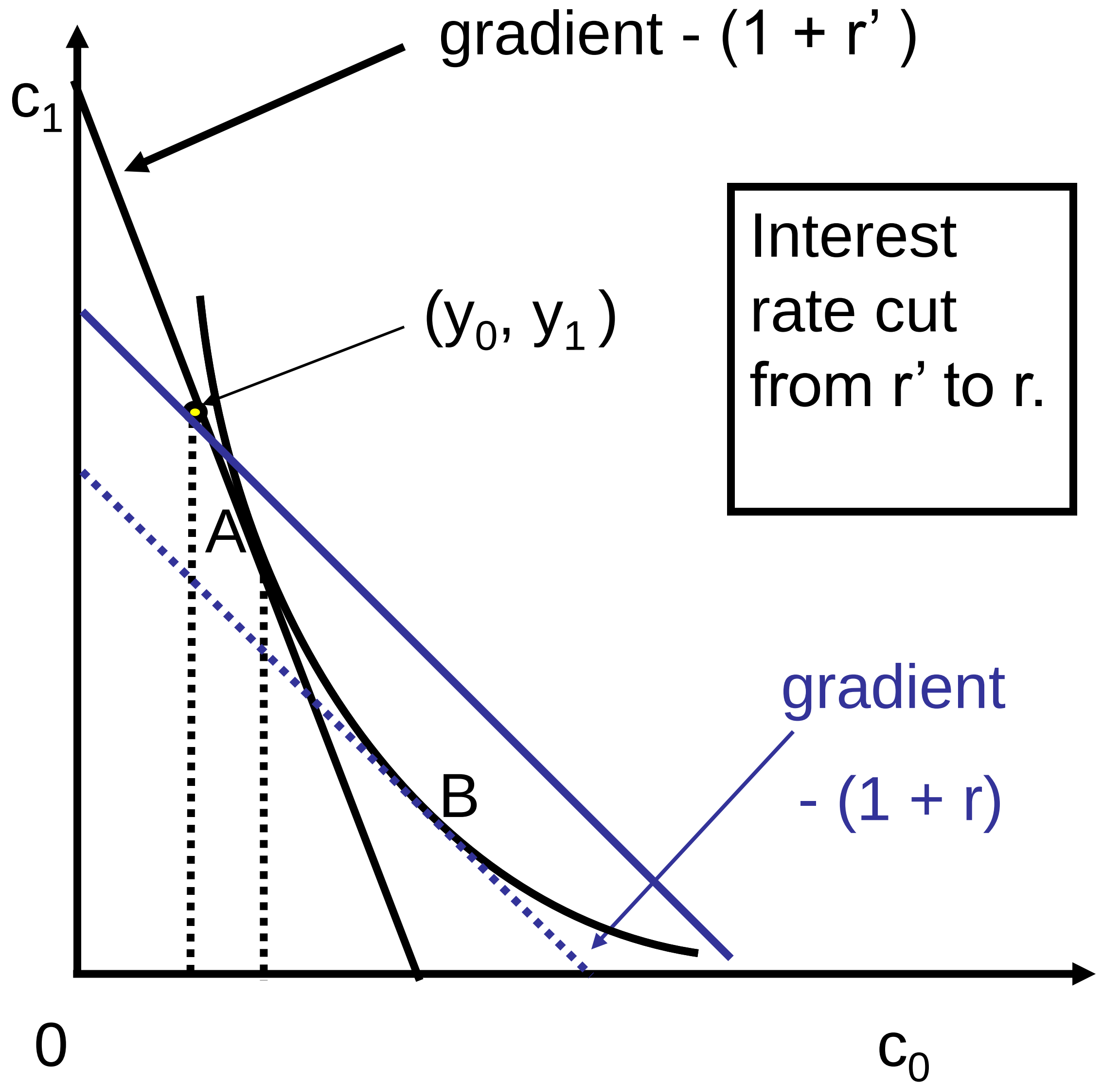

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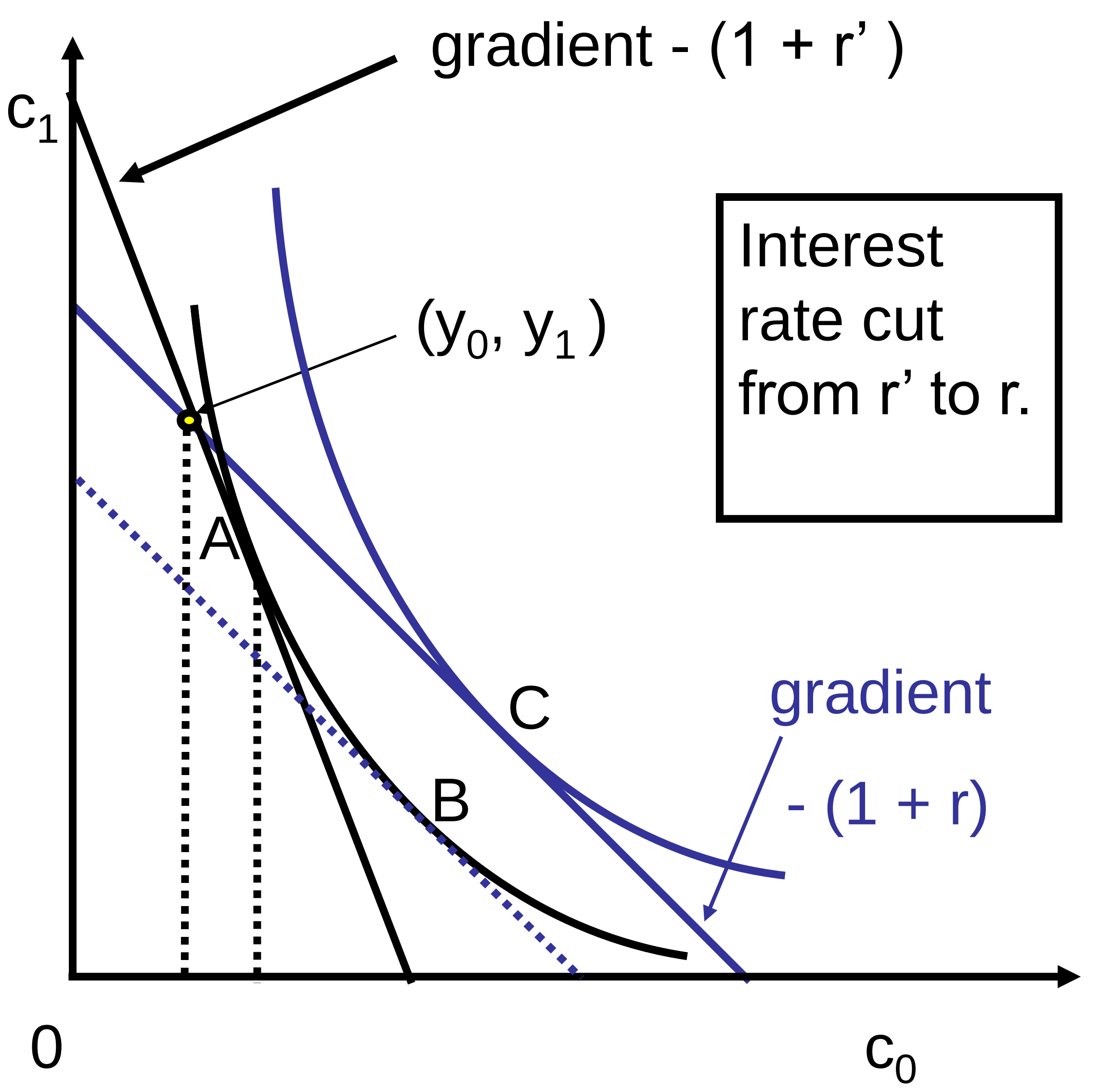
If c_0 is normal the income effect B to C increases c_0.

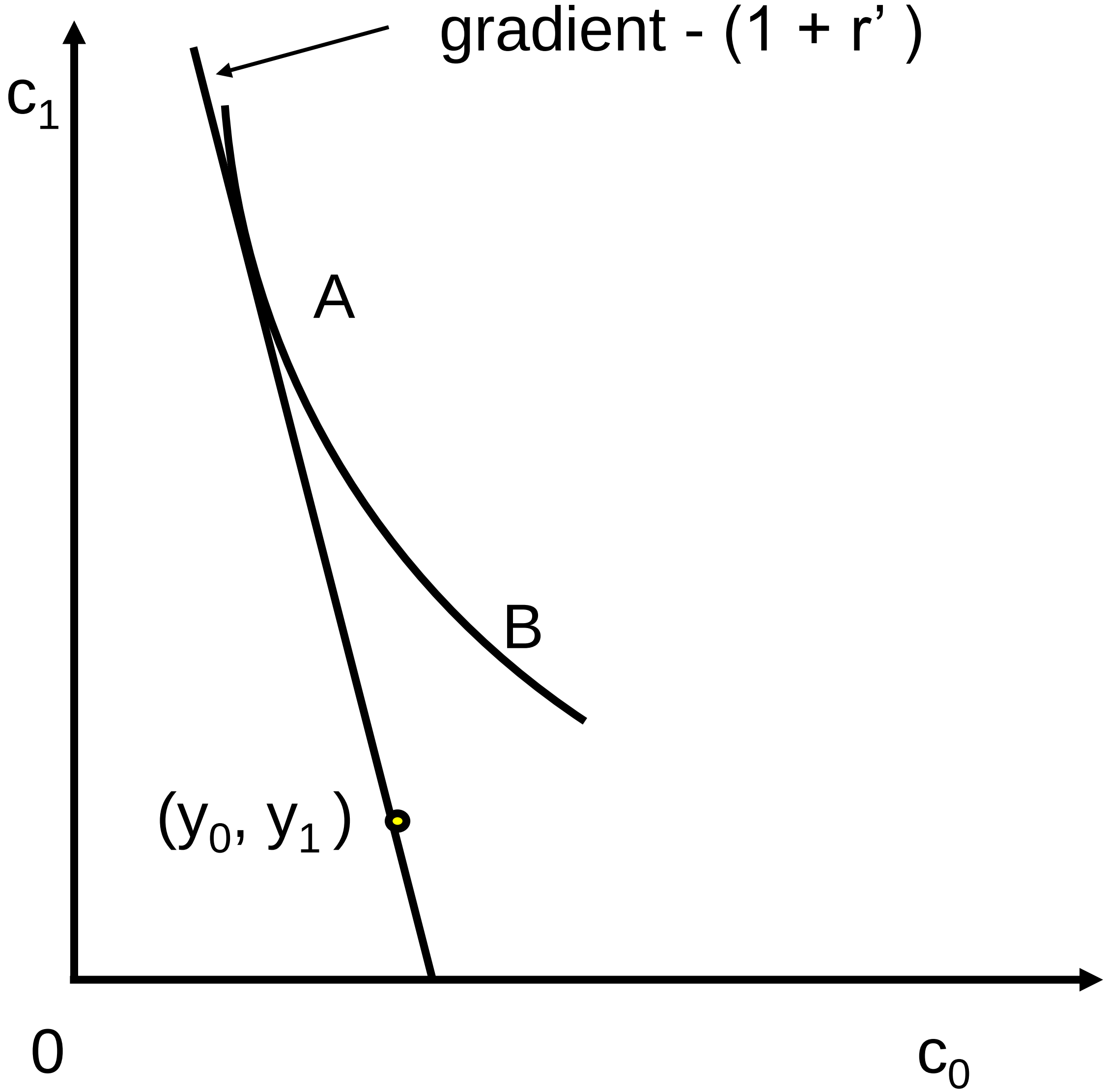


Income and substitution effects on c_0 work in the same direction.

Intuition for the effects of an interest cut on a borrower

- A rate cut makes current consumption relatively cheaper.
- The substitution effect increases current and decreases future consumption.
- A borrower is made better off by the rate cut.
- If current consumption is a normal good the rate cut increases current consumption.
- Income and substitution effects work in the same direction.

This household **saves** both before and after the interest rate cut.



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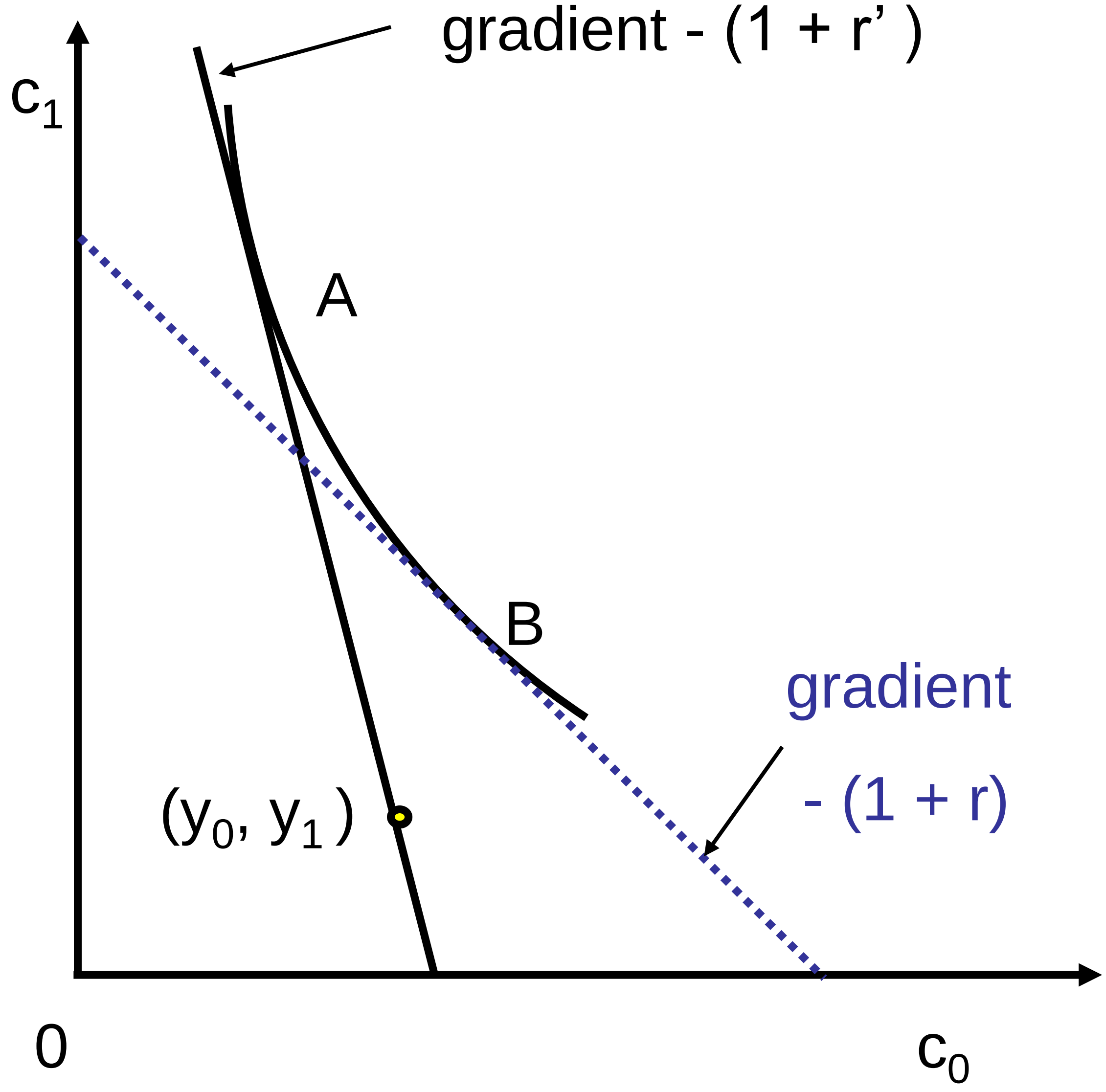

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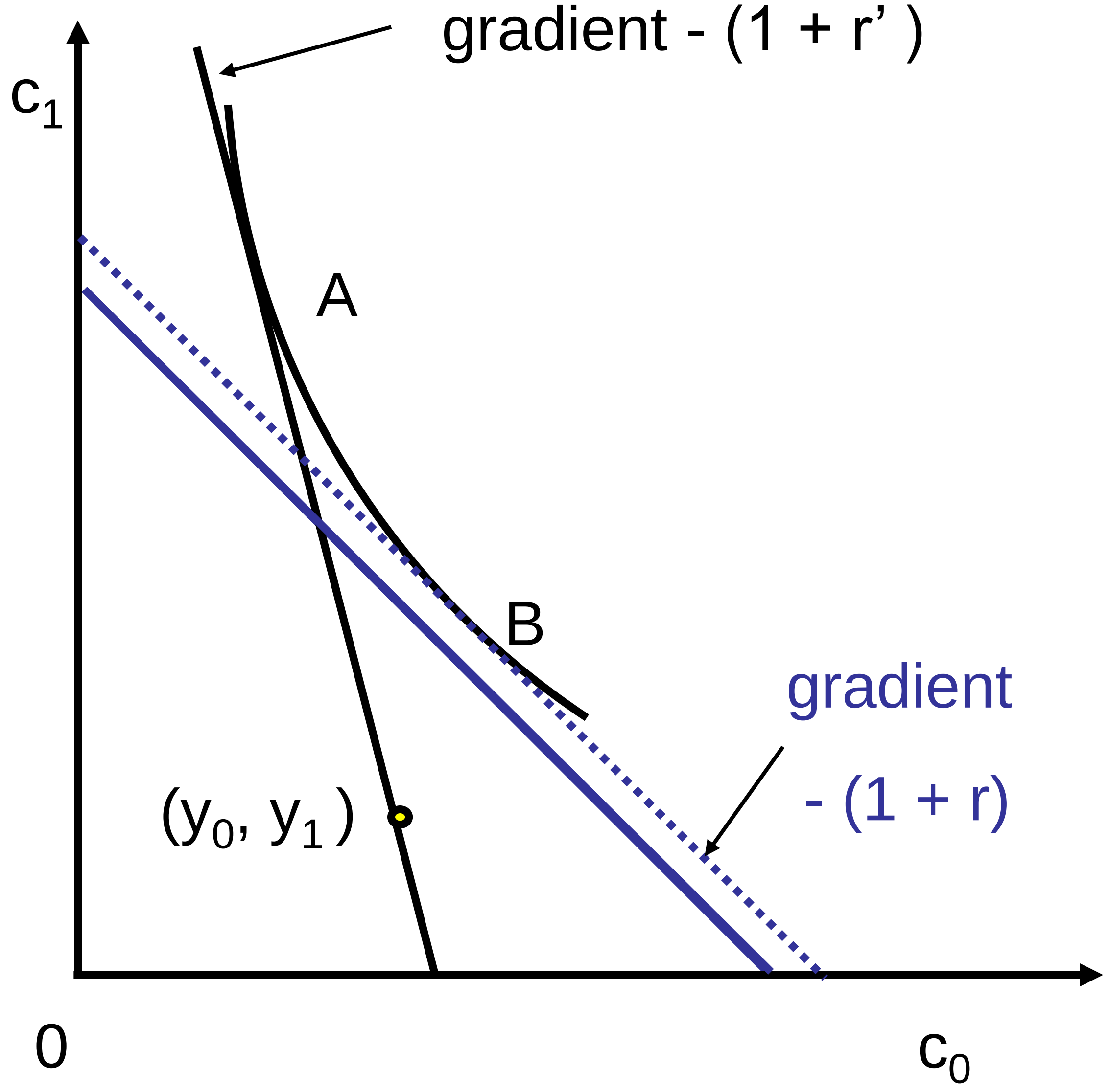

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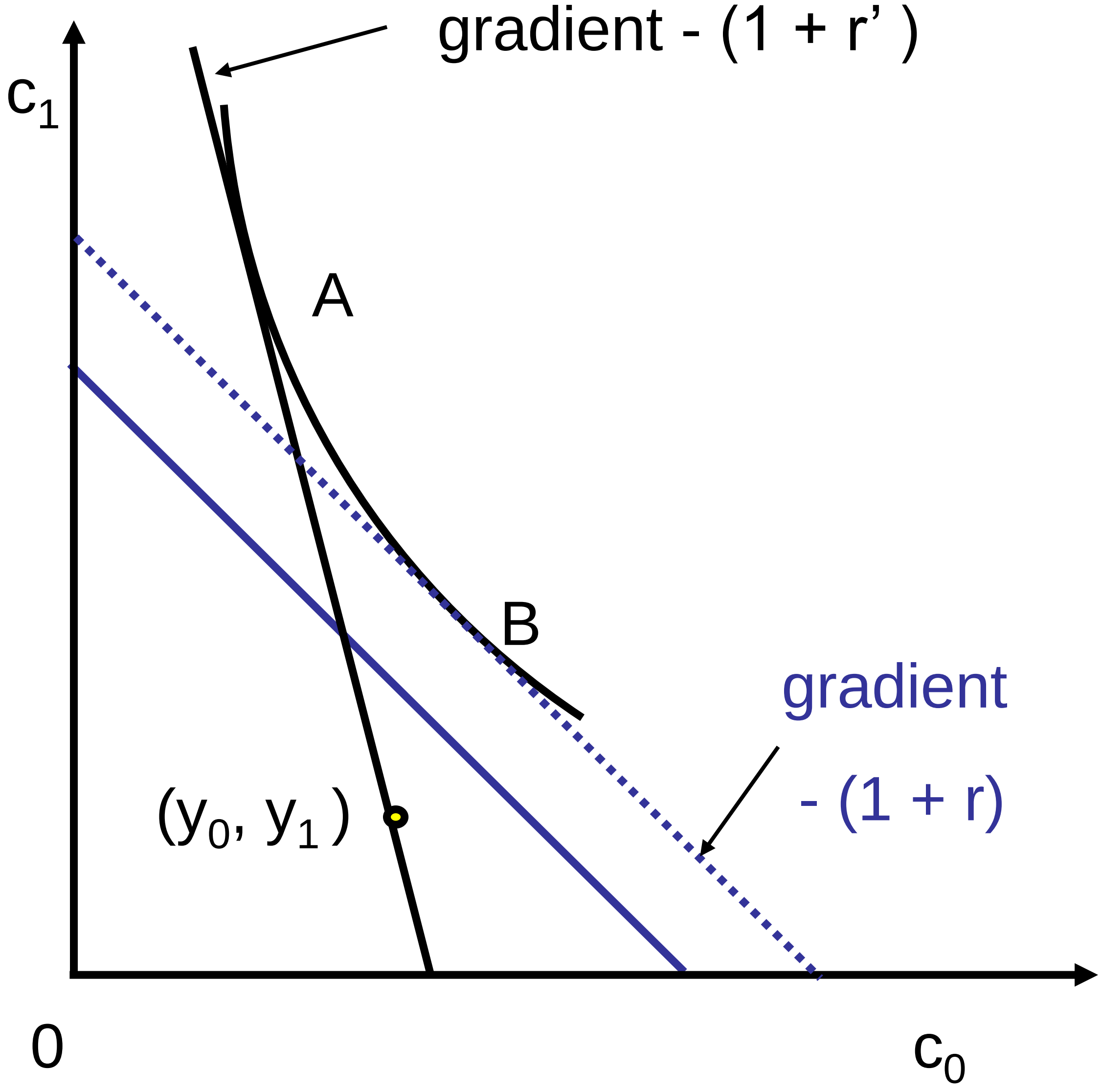

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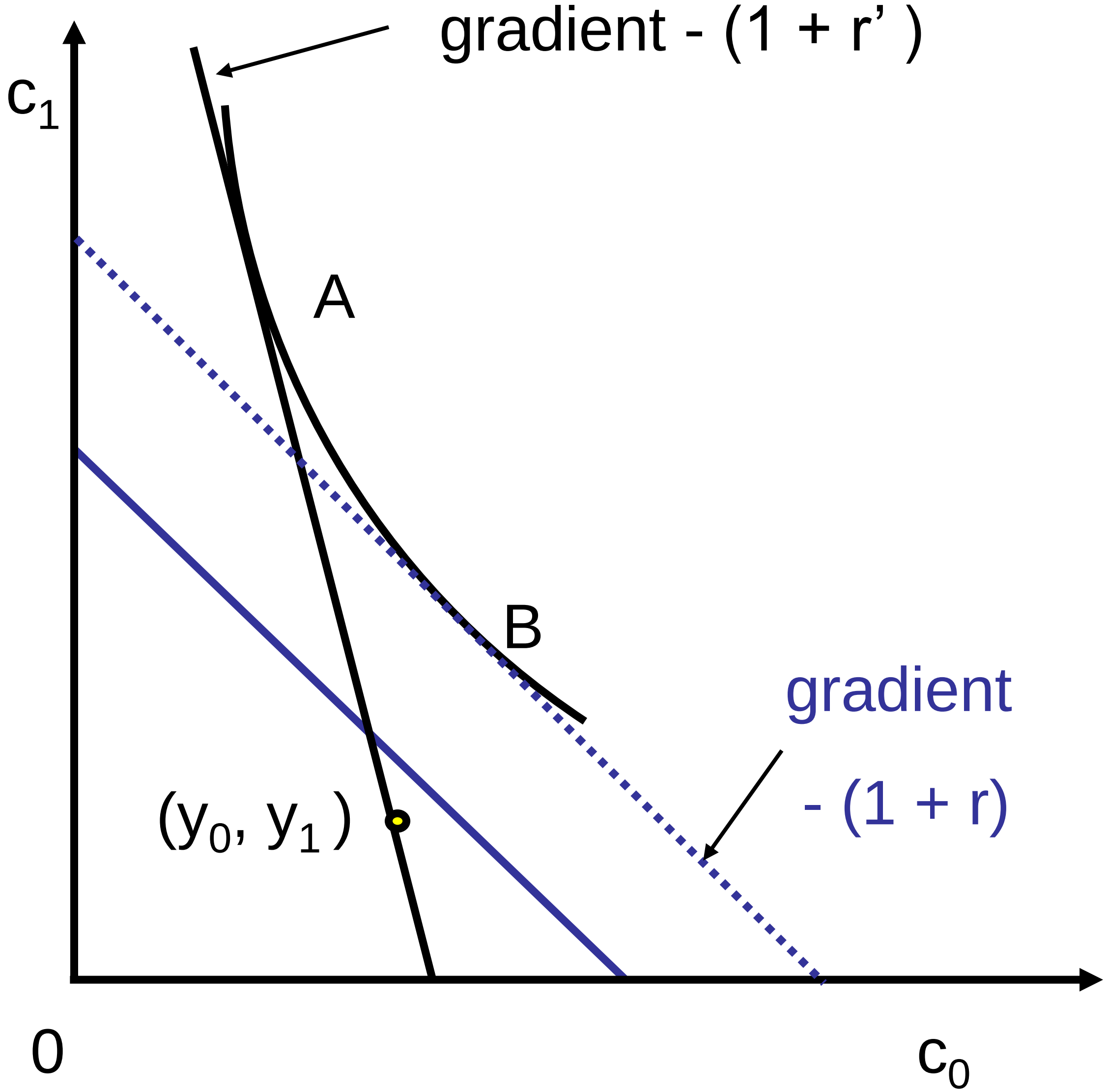


This household **saves**

both before and after the

interest rate cut.

The substitution effect A to

B of the cut increases

consumption at date 0.

The household has

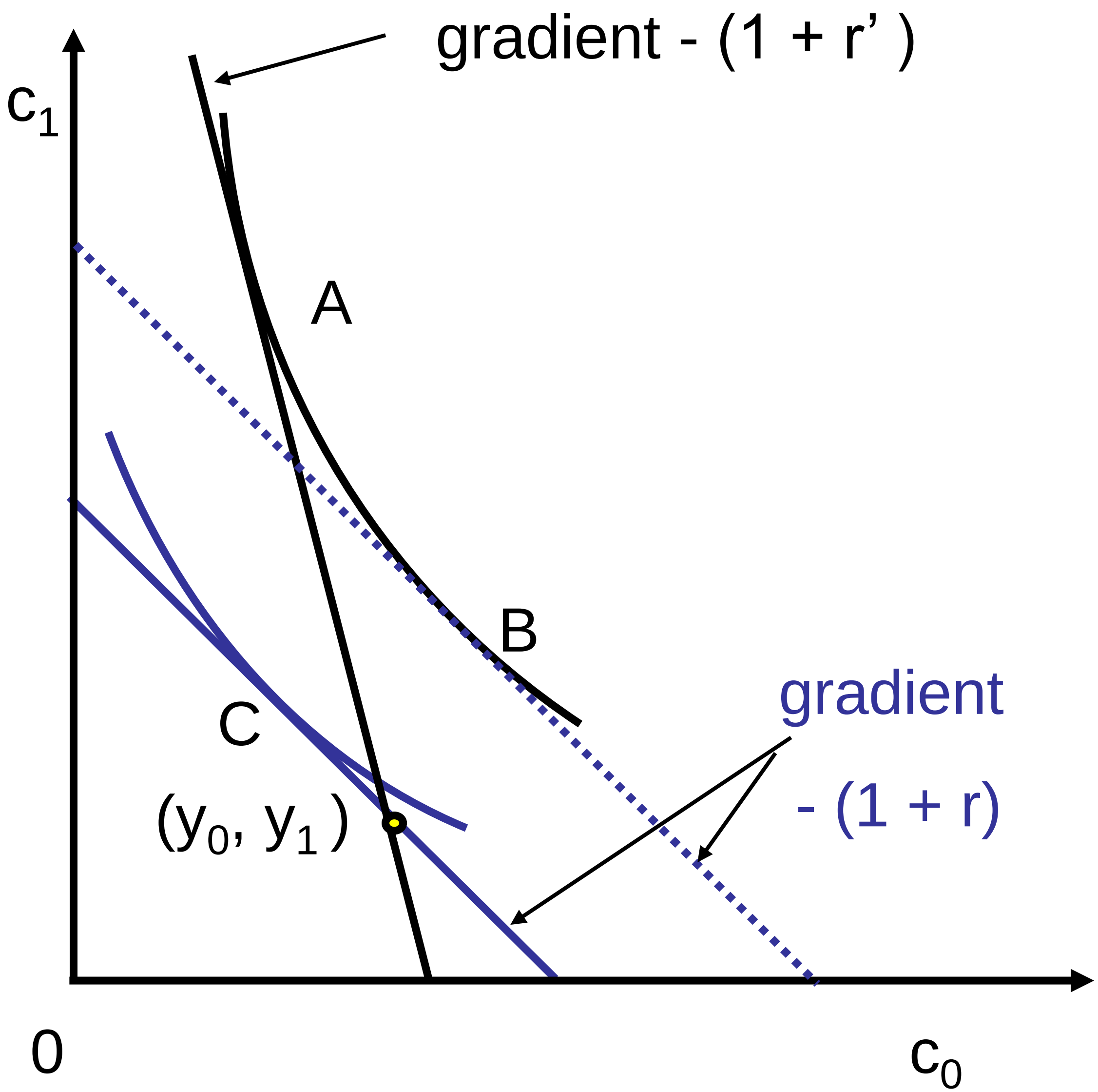
lower utility

after the rate cut

the income effect B to C

decreases c_0

consumption at date 0.



Income and substitution effects on c_0 work in the opposite direction.

Intuition for the effects of an interest cut on a saver

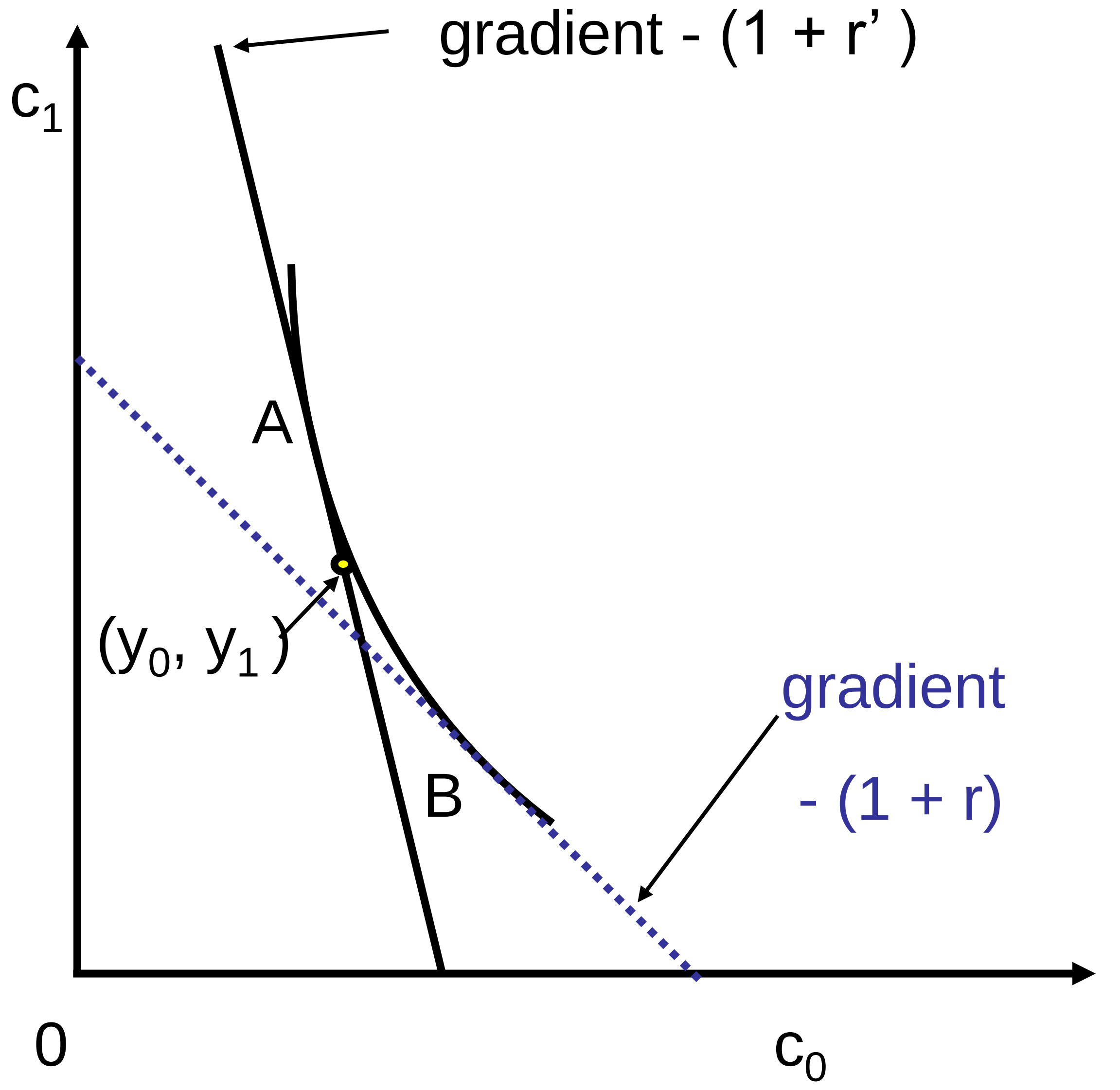
- The substitution effect is the same as for a borrower; it increases current consumption.

- If the household continues to save after the rate cut it is worse off; the income effect gives a decrease in income in which case

  – If current consumption is a normal good the rate cut decreases current consumption.

  – Income and substitution effects work in opposite directions.

Someone who saves before the rate cut and borrows after the rate cut may have higher or lower utility after the rate cut. Here she has higher utility after the rate cut.



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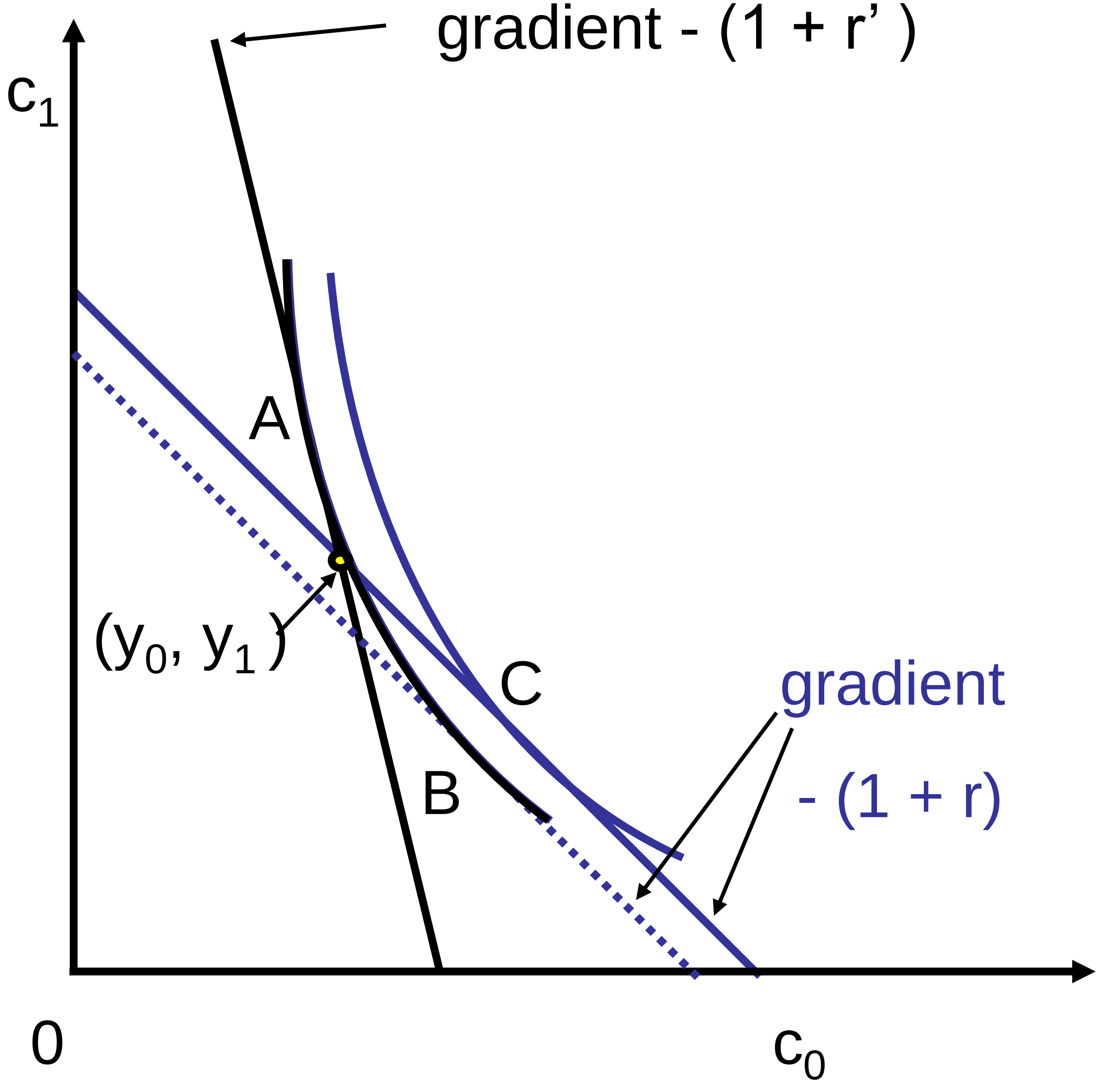
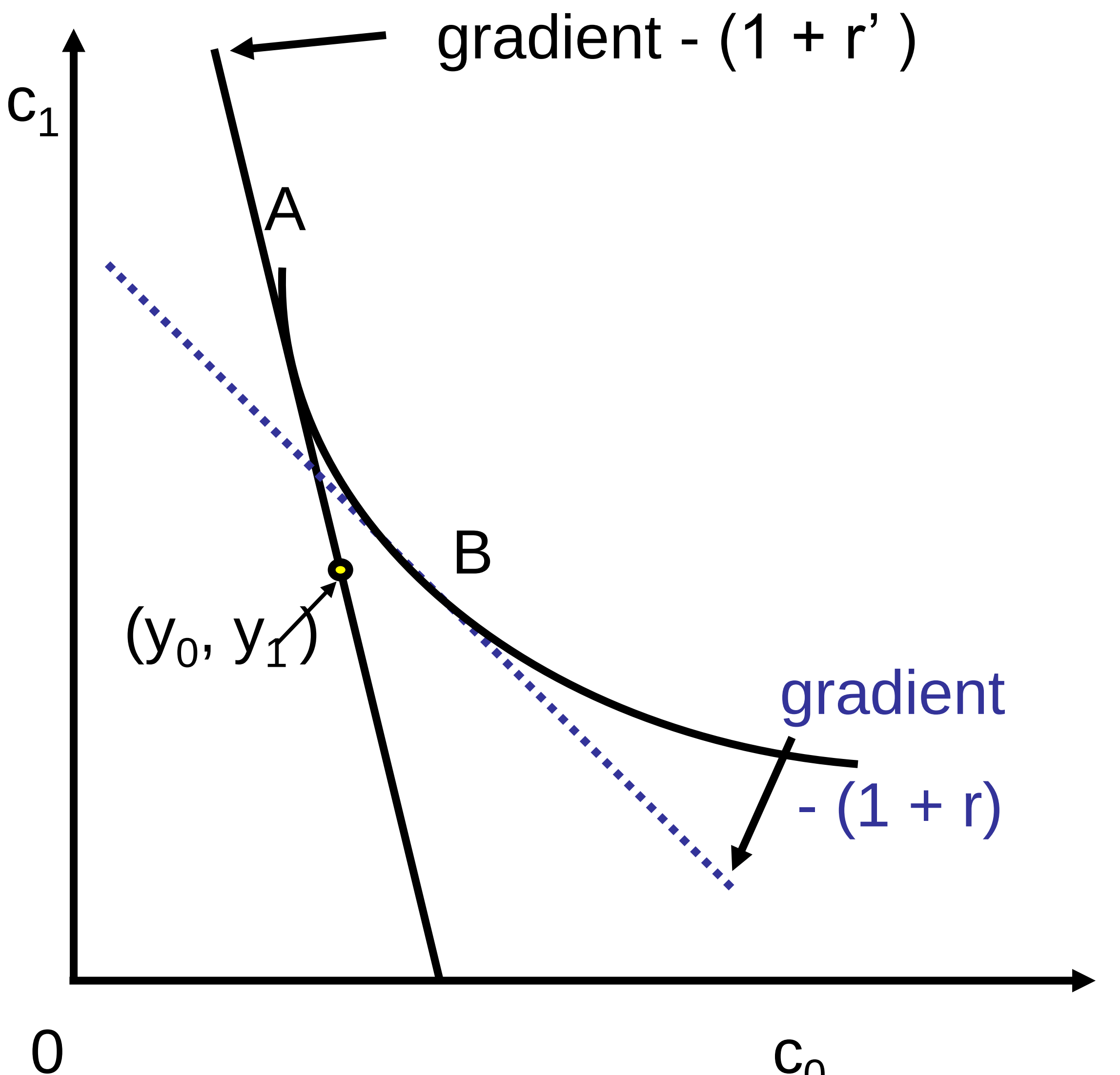


Income and substitution effects on c_0 work in the same direction.

Someone who saves before the rate cut and borrows after the rate cut may have higher or lower utility after the rate cut. Here she has lower utility at the low rate.



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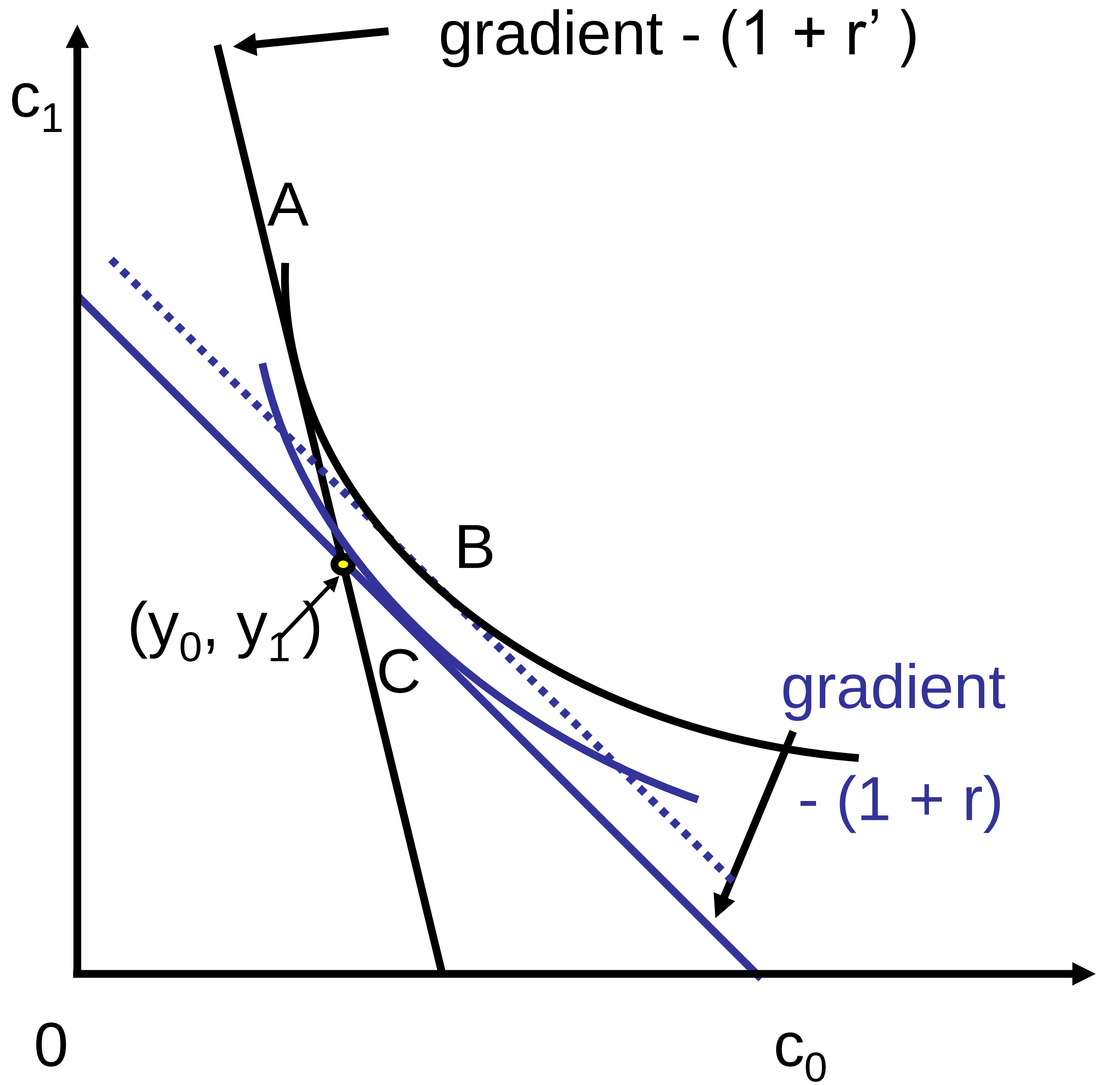

Income and substitution effects on c_0 work in the opposite direction.

Intuition for the effects of an interest cut on a saver

- The substitution effect is the same as for a borrower; it increases current consumption.

- If the household saves before the rate cut and borrows after it may be better off or worse off after the rate cut.

- If the household is better off the income effect increases current consumption, income and substitution effects work in the same direction.

- If the household is worse off the income effect decreases current consumption, income and substitution effects work in opposite directions.

7. Different borrowing and lending rates

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- Banks make a profit on the difference between the rate at which they borrow and the rate at which they lend or invest their money.

- In the standard simple model competition in banking leads to 0 bank profits so borrowing and lending rates are the same.

- Where borrowers from banks may default the interest rate at which banks lend has to be higher than the rate at which they borrow if banks are not to make losses.

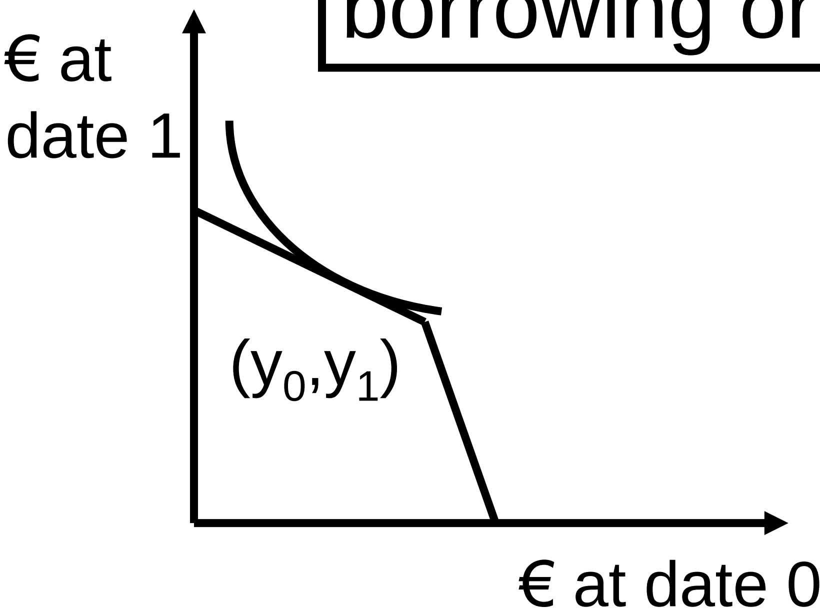
- In 2008 banks were unwilling to lend to each other, due to worries about default due to bank failure.

Sometimes it is possible to borrow at a low rate and invest at a higher rate

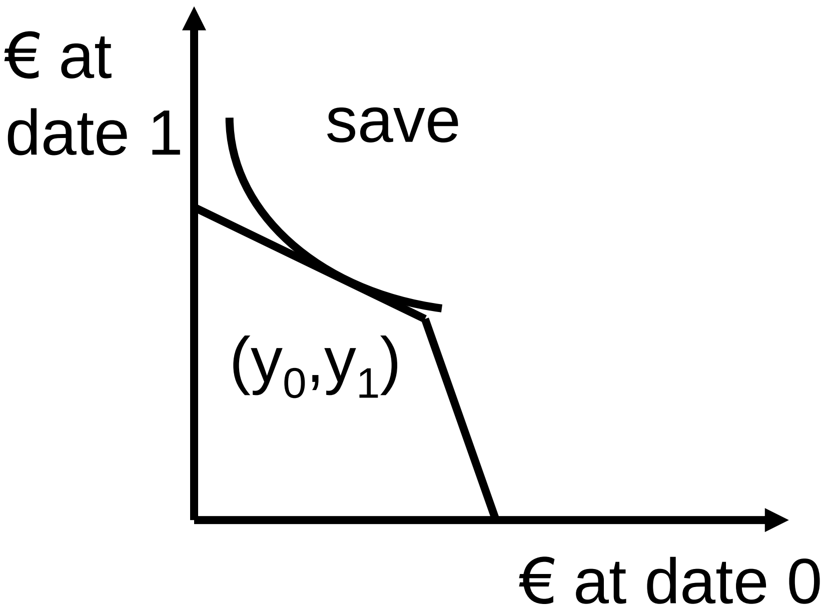
- If this can be done on an unlimited scale it can make unlimited profits.

- Carry trade. Borrow in Japanese yen, sell yen, buy another currency to invest at a higher rate. Buy yen, repay loan. But
  - How risky is your investment?
  - What about exchange rate risk?

borrowing or saving?

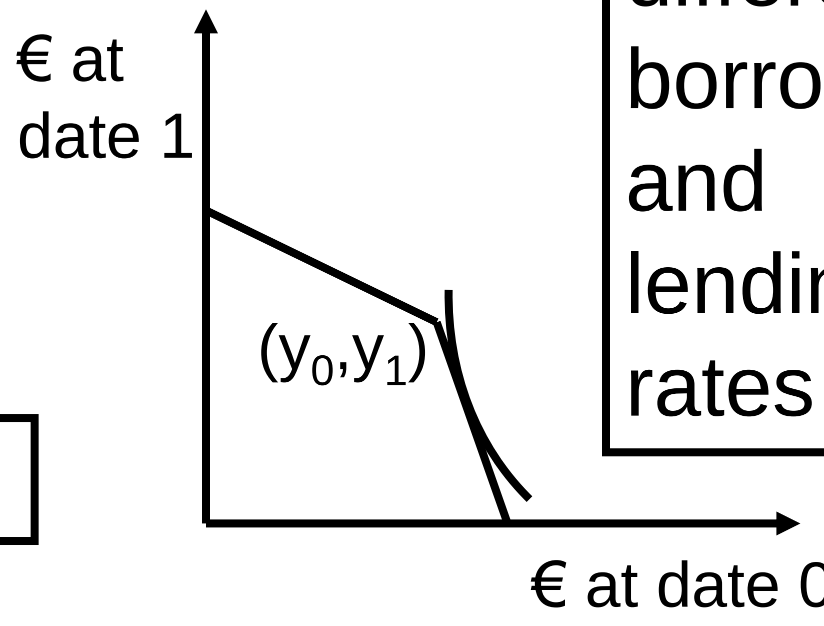


different borrowing and lending rates

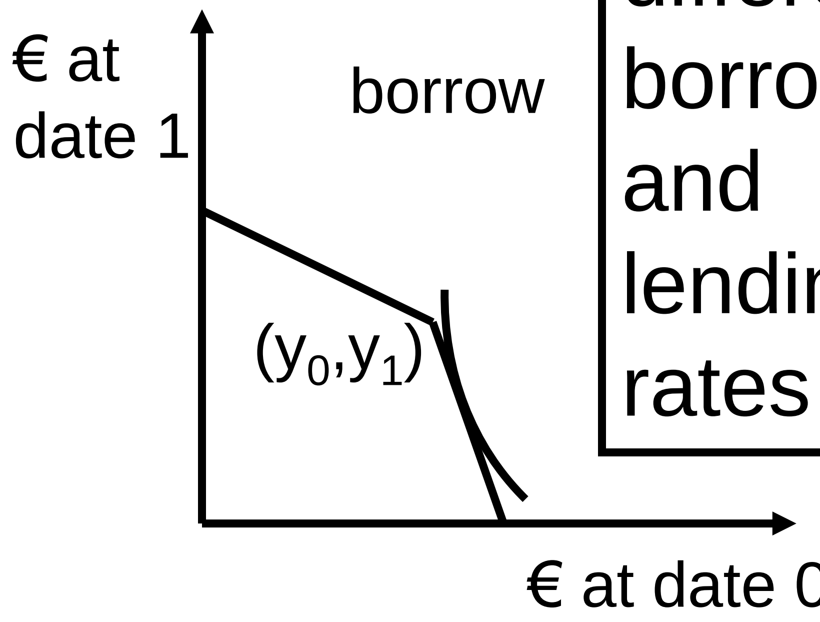


different
borrowing
and
lending
rates

borrowing or saving?



different borrowing and lending rates



different borrowing and lending rates

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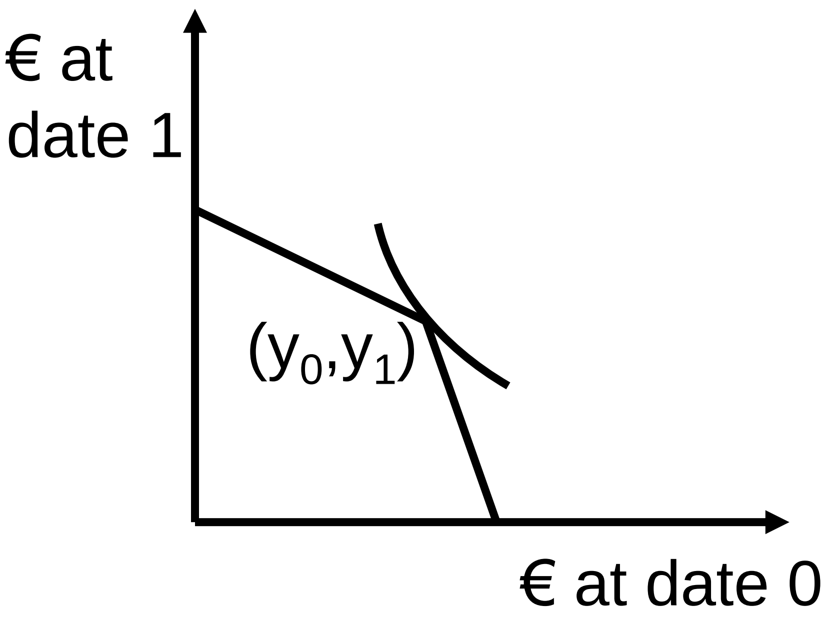
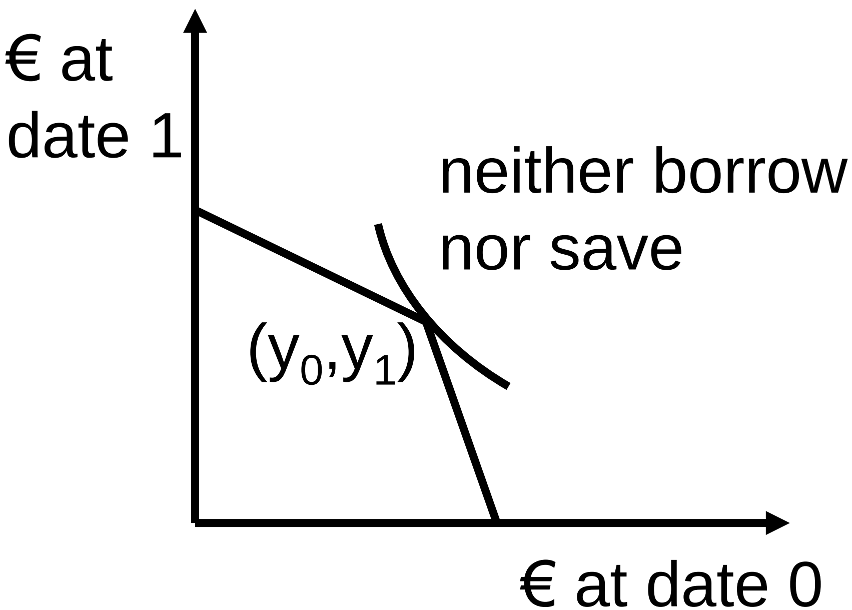
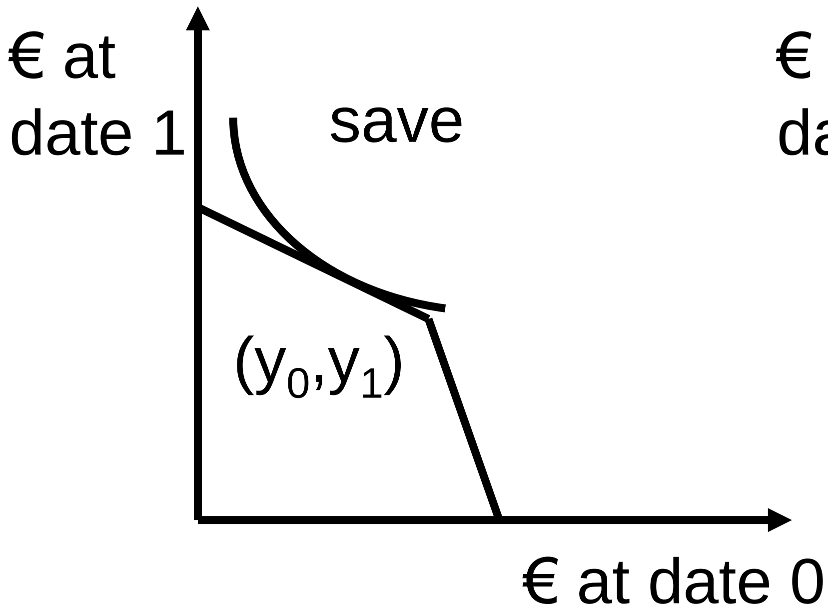


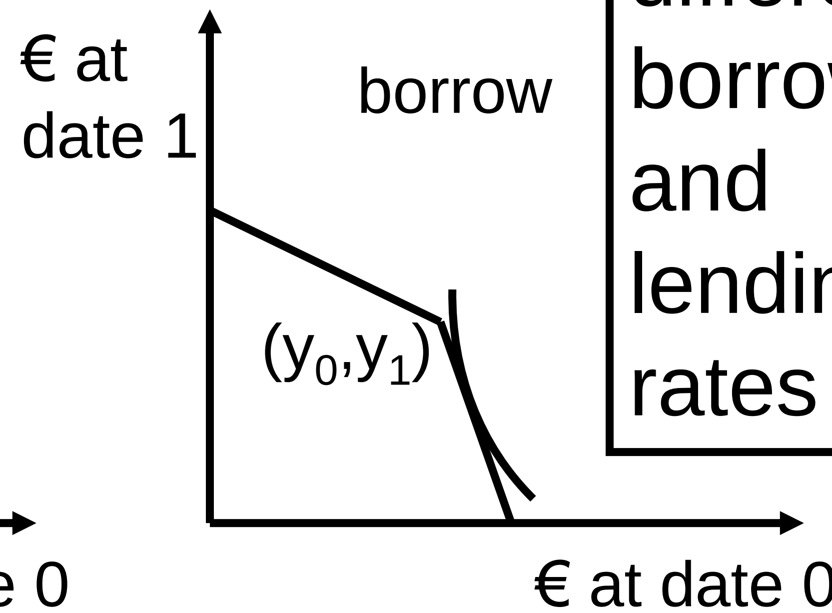
borrowing or saving?

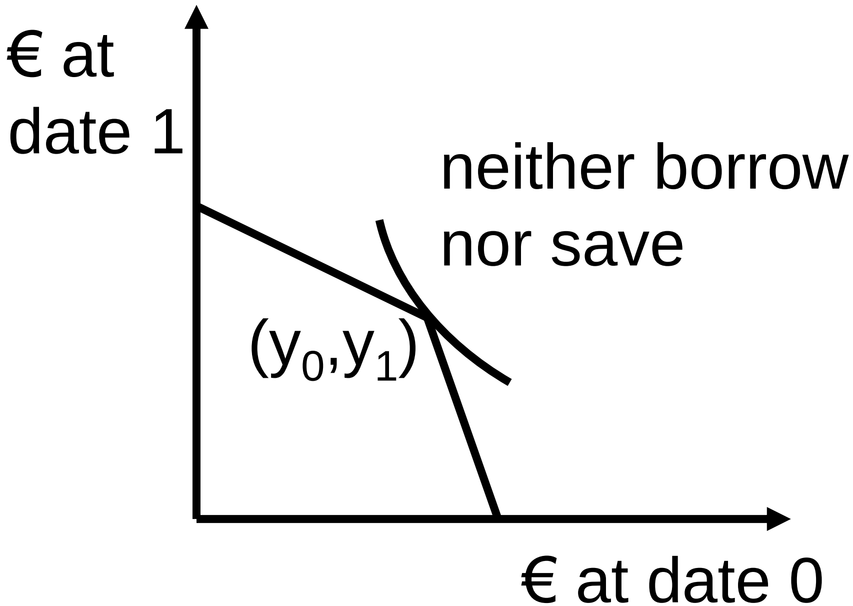
different borrowing and lending rates



different borrowing and lending rates



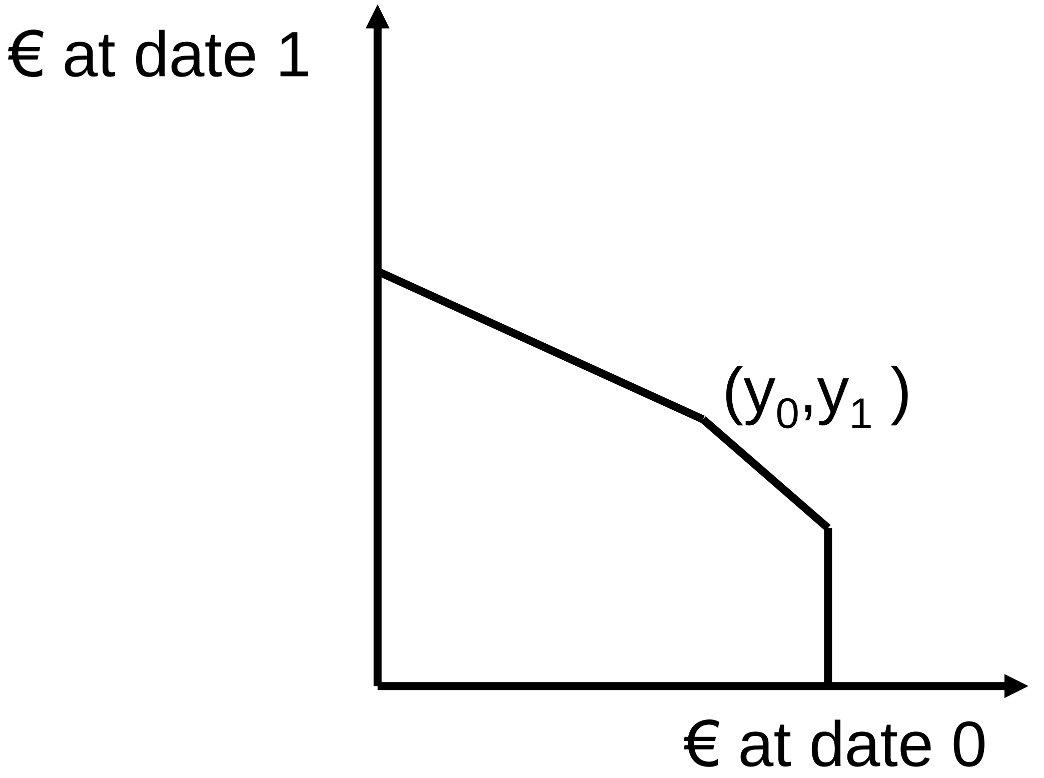




borrow at rate r’, steeper budget line gradient 1 + r’

save at rate r < r’

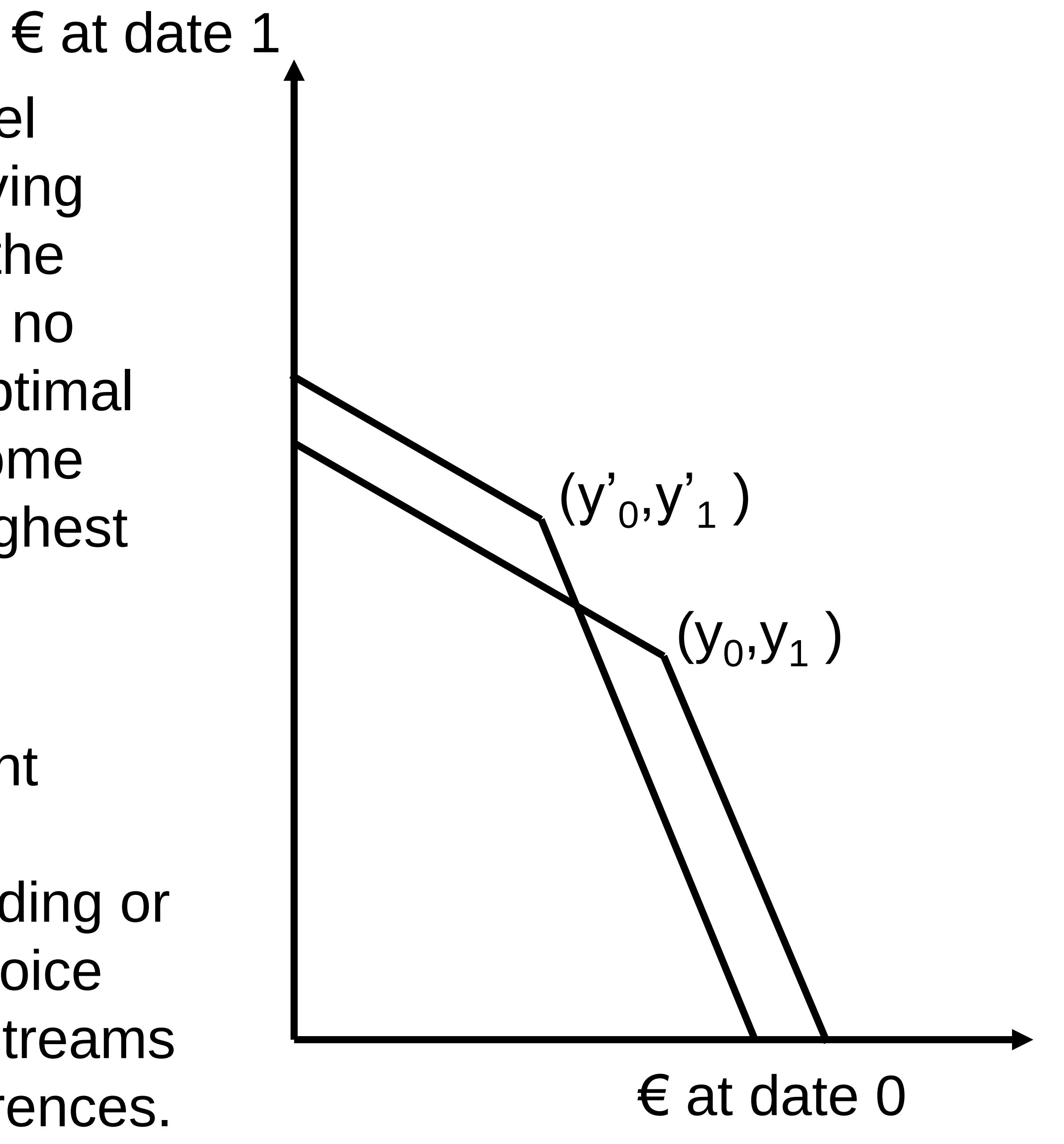
flatter budget line gradient 1 + r



Budget constraint with different borrowing and saving rates and a credit limit.

In the simple model borrowing and saving interest rates are the same and there is no credit limit. It is optimal to choose the income stream with the highest pdv regardless of preferences.

If there are different interest rates for borrowing and lending or credit limits the choice between income streams depends on preferences.



Have you got both debt and savings?

- In this model if the rate at which you borrow is higher than the rate you get on saving it is optimal to

Have you got both debt and savings?

- In this model if the rate at which you borrow is higher than the rate you get on saving it is optimal to

  use your savings to pay off your debt.

- Possible exception you can continue to borrow now but might not be able to borrow in the future.

What have we achieved?

- A very simple model of borrowing and saving.
- Shows ambiguous effects of interest changes on spending and saving.
- Explained why present discounted value can be used to value income streams.
- No uncertainty – but see more sophisticated models of finance.