These slides are by courtesy of Prof. 李稻葵 and Prof. 郑捷.

Chapter Ten

Intertemporal Choice

In this Chapter?

- **We apply our method of consumer choices to consumption choices over time**
- **Saving vs borrowing**

Present and Future Values

- Two periods: 1 and 2.
- Let r denote the interest rate between these two period
  - Every consumer can give the bank $s in period 1. In period 2, the bank gives back $s(1+r).
  - s > 0: saving
  - s < 0: borrowing

Future Value

- **The future value of $m in period 1 is**

$$FV = m(1 + r).$$

Present Value

- The present value of $m in period 2 is

$$PV = \frac{m}{1 + r}$$

The Intertemporal Choice Problem

- **m_1 and m_2: incomes received in periods 1 and 2.**
- **c_1 and c_2: aggregate consumption in periods 1 and 2**
- **p_1 and p_2: aggregate price in periods 1 and 2.**

Intertemporal Choice

- **Budget in period 1:**

$$p_1 c_1 + s \leq m_1$$

- **Budget in period 2:**

$$p_2 c_2 \leq m_2 + (1 + r)s$$

where s is saving in period 1.

Intertemporal Budget Constraint

- Combining these two budgets, we get

$$(1+r)p_1c_1 + p_2c_2 \leq (1+r)m_1 + m_2$$

This is known as the **intertemporal budget constraint**, expressed in **future value**, i.e. in period 2 dollars.

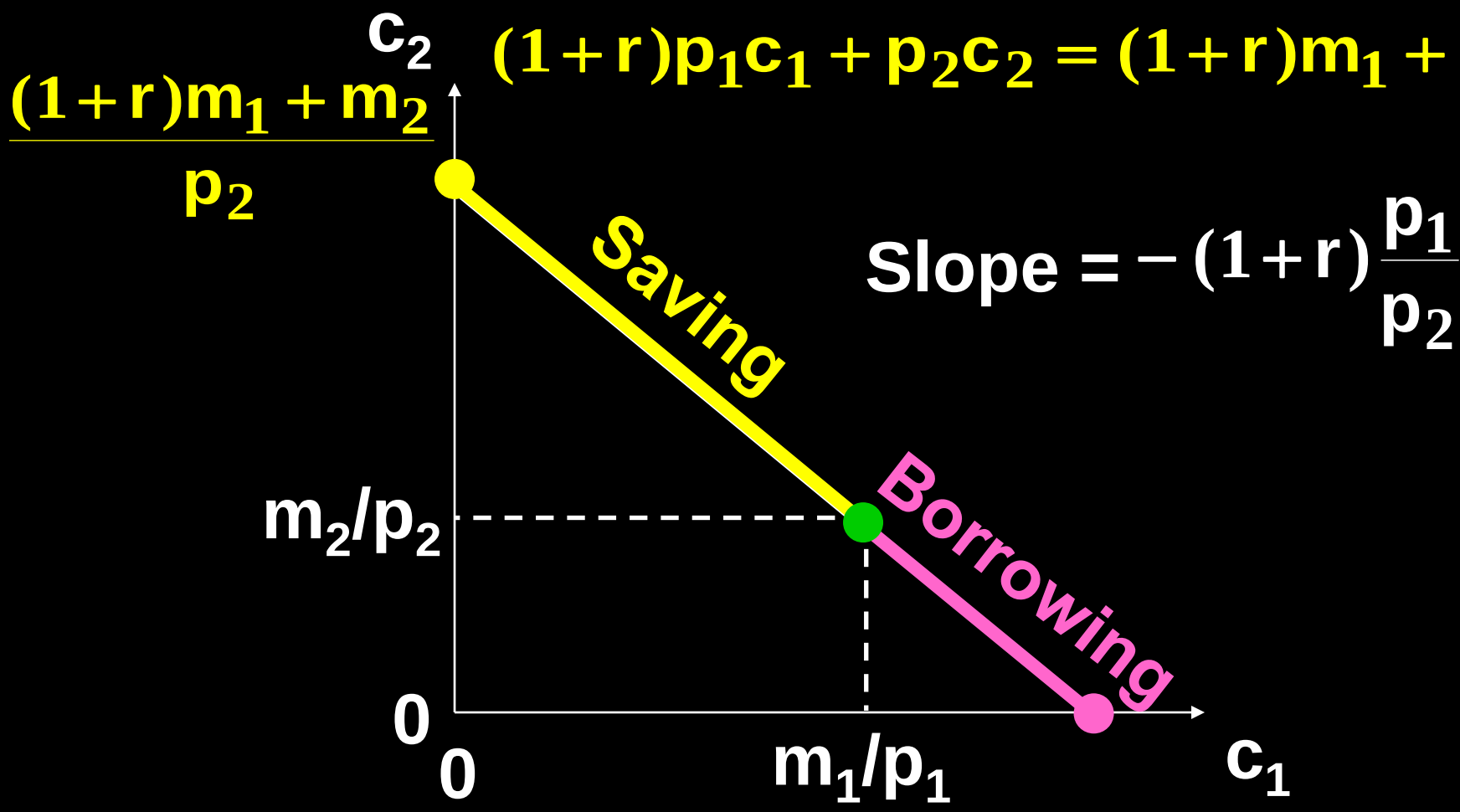
Intertemporal Budget Constraint

- **Equivalently, we may write down the intertemporal budget constraint expressed in present value, i.e. in period 1 dollars:**

$$p_1 c_1 + \frac{p_2}{1+r} c_2 \leq m_1 + \frac{m_2}{1+r}$$

Intertemporal Budget Line

$$(1+r)p_1c_1 + p_2c_2 = (1+r)m_1 + m_2$$



Inflation

- Define the **inflation rate** π as

$$1 + \pi = p_2 / p_1$$

- π = 0.05 means 5% inflation

Inflation

- We can define the amount of consumption that costs $1 in period 1 as one "**basket**".
- Then price of c_1 is $1 per basket. Price of a basket of consumption in period 2 is $ $p_2 = 1+ \pi$.
- The budget constraint:

$$c_1 + \frac{1+\pi}{1+r} c_2 \leq m_1 + \frac{m_2}{1+r}$$

Inflation

- **The slope of the budget line**

$$c_1 + \frac{1+\pi}{1+r} c_2 = m_1 + \frac{m_2}{1+r}$$

is $-(1+r)/(1+\pi)$

Real Interest Rate

- Define the **real interest rate**

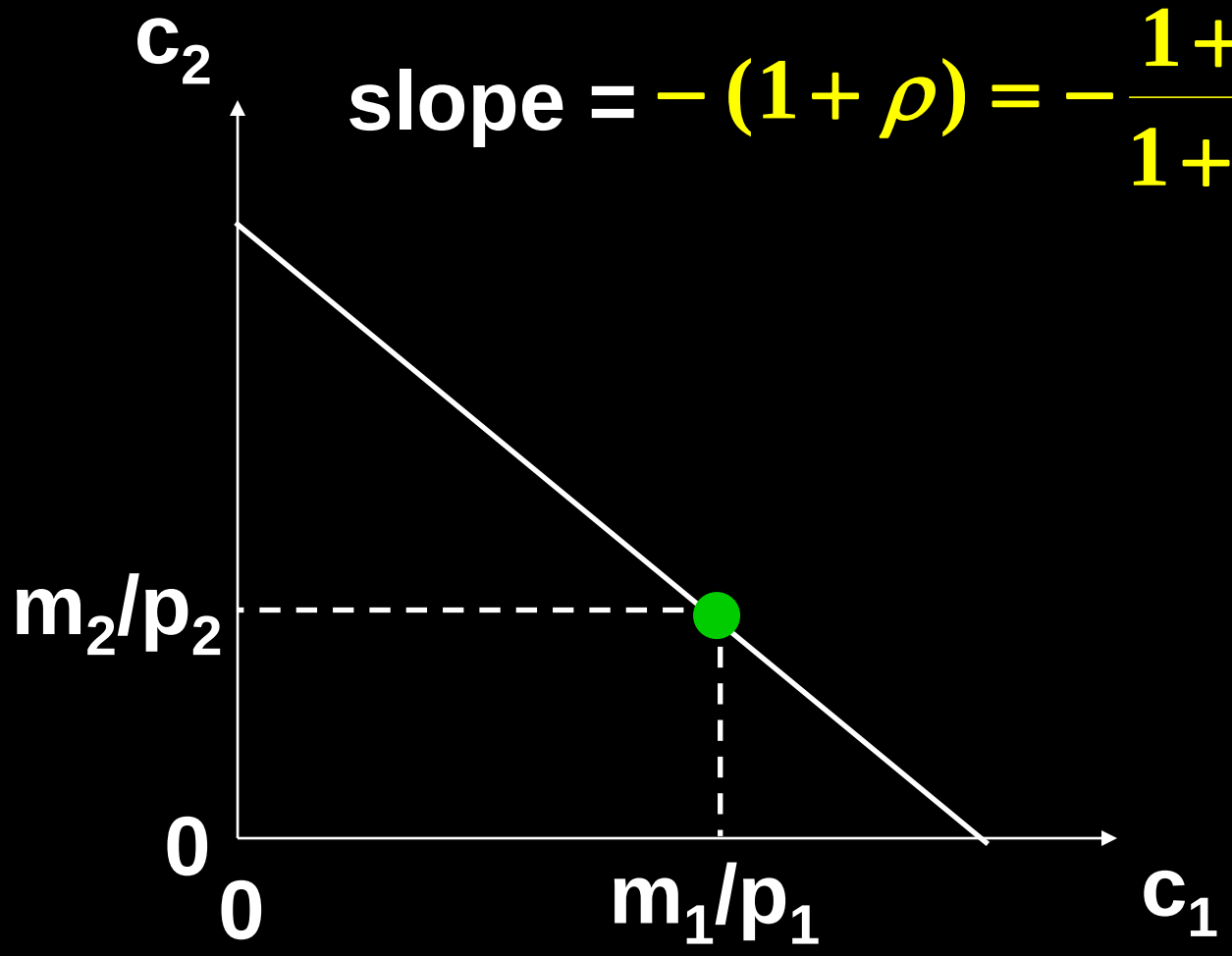
$$\rho := \frac{r - \pi}{1 + \pi}$$

- We can verify

$$1 + \rho = (1 + r)/(1 + \pi)$$

- So the slope of the intertemporal budget line is $-(1 + \rho)$

Comparative Statics



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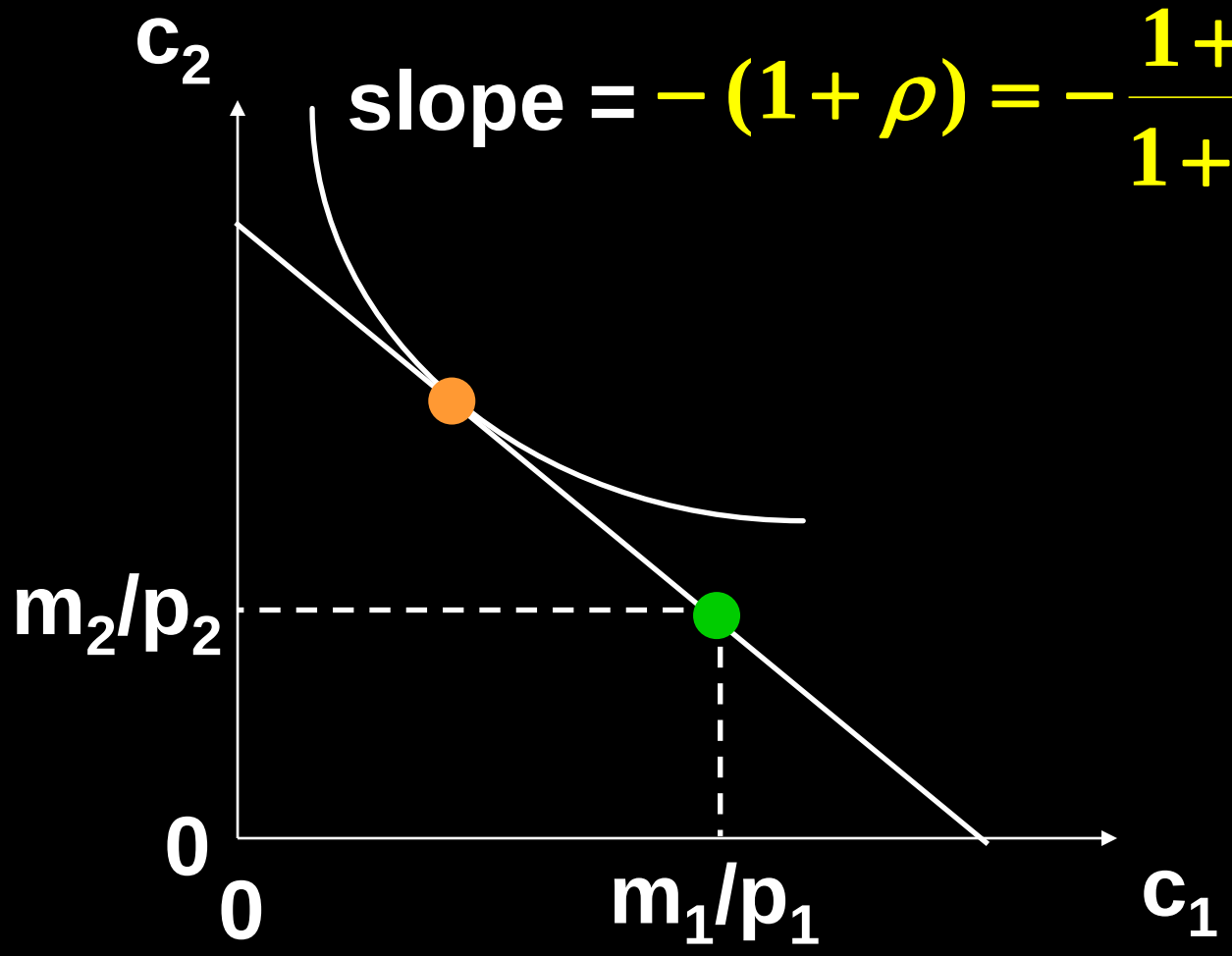

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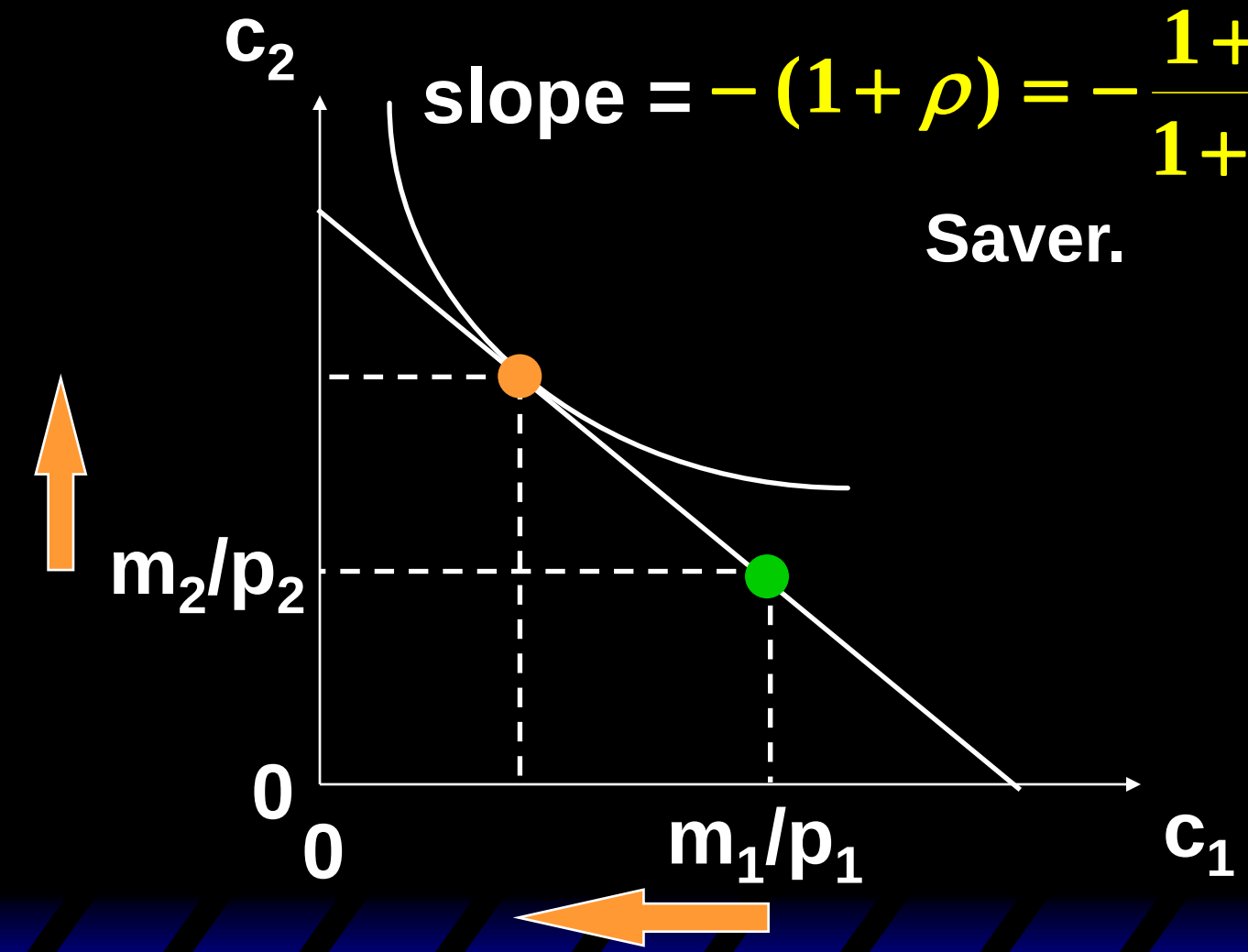

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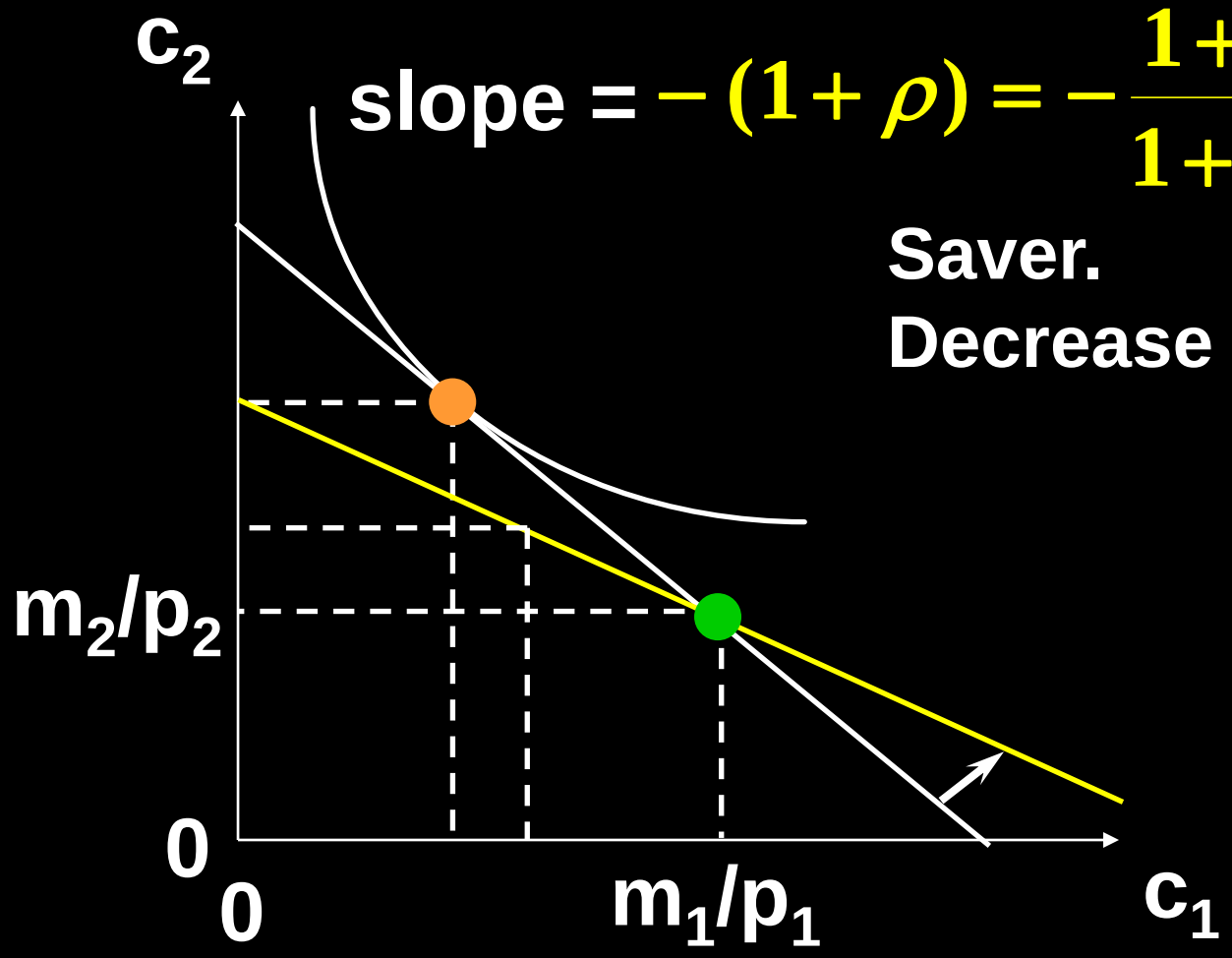

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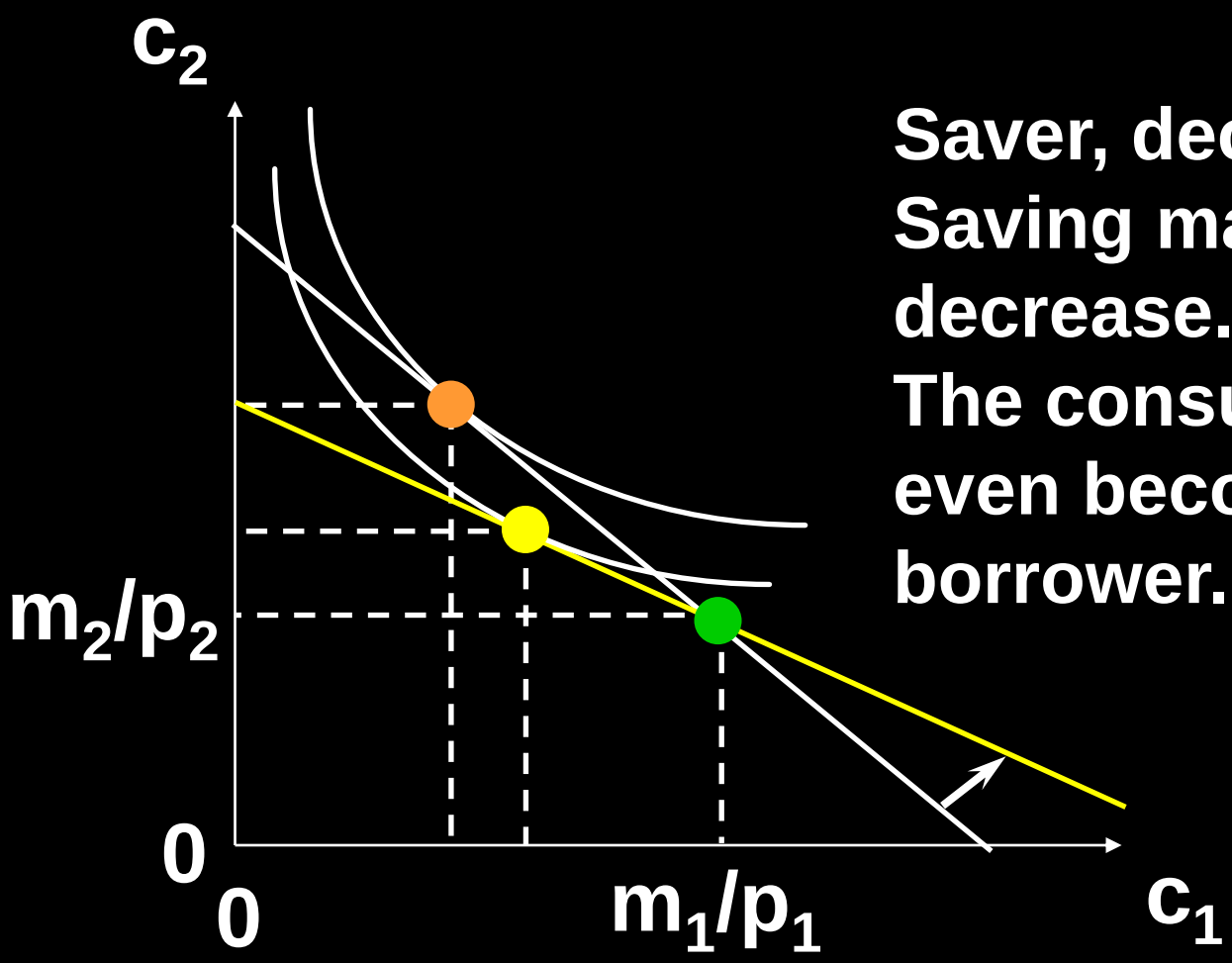
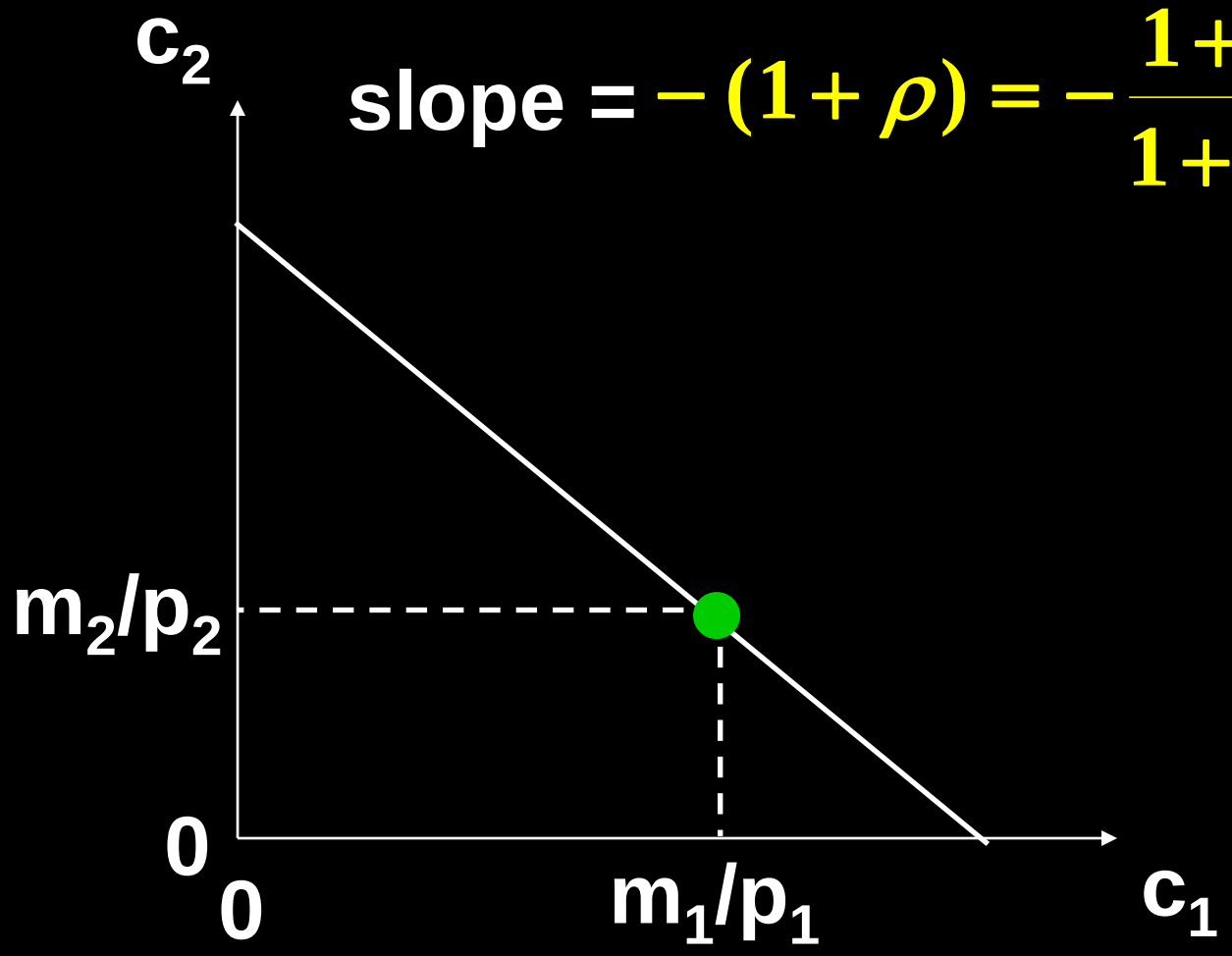


Saver, decrease in r:
Saving may increase or decrease.
The consumer may even become a borrower.

Comparative Statics



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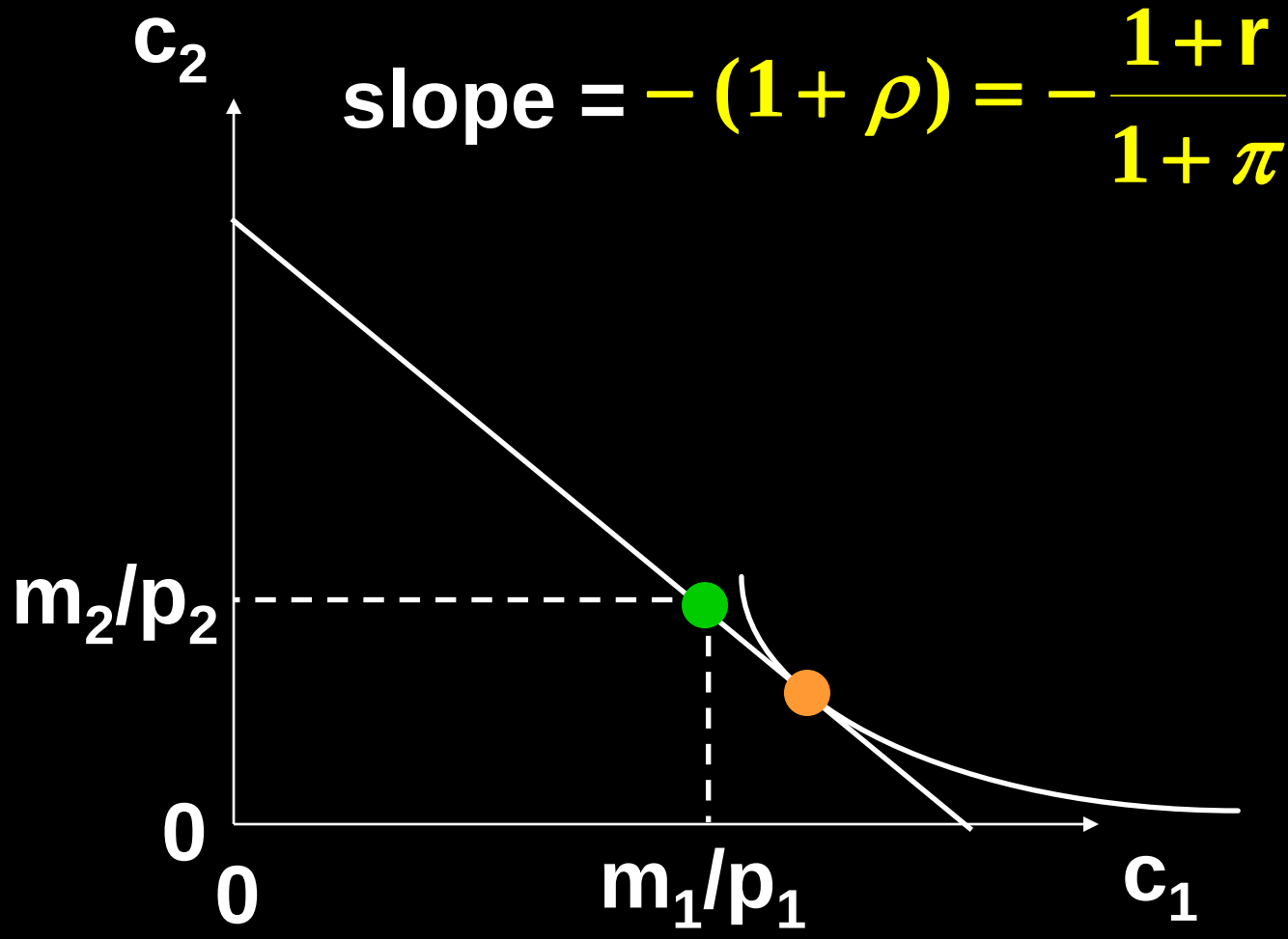

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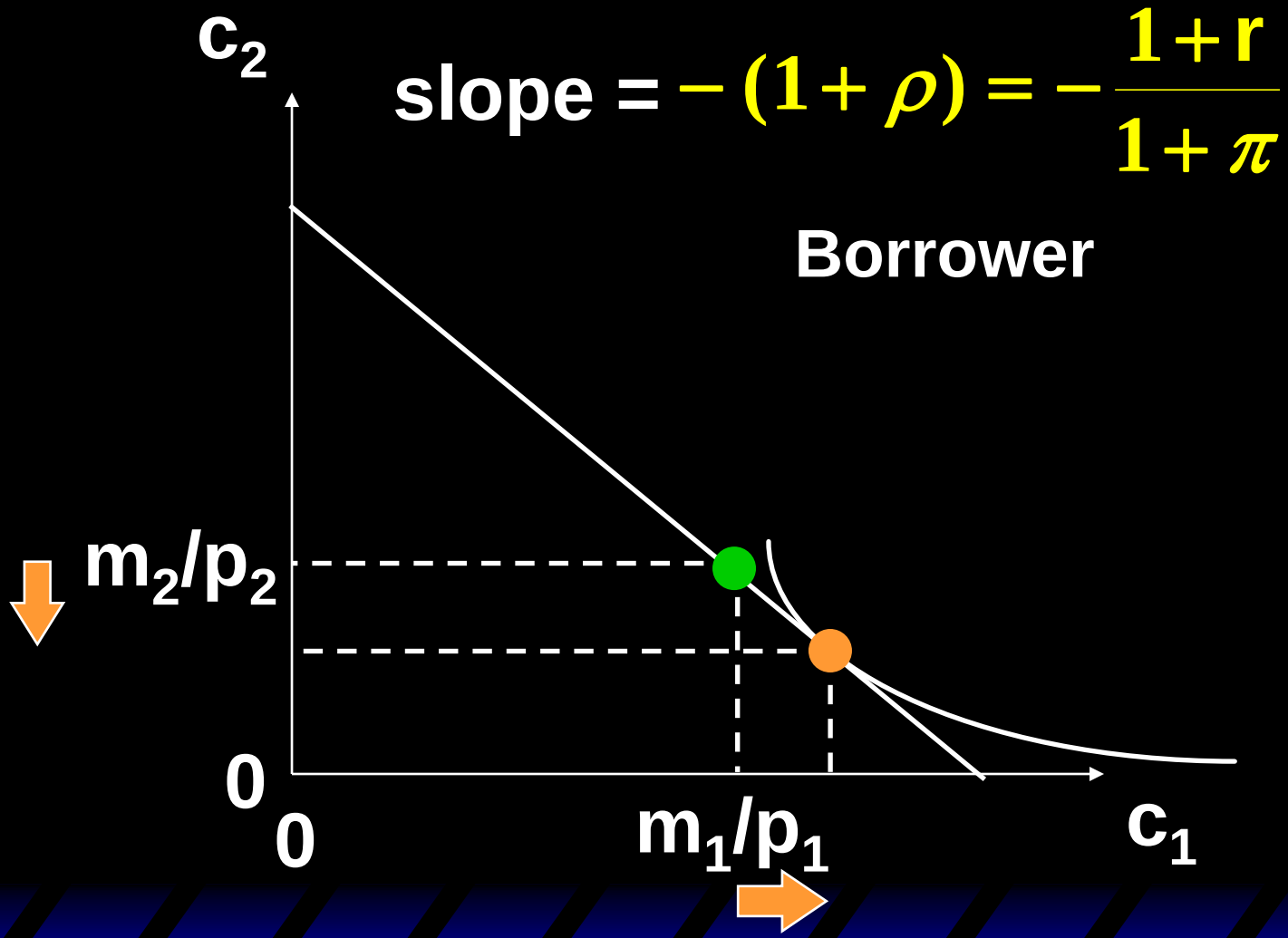

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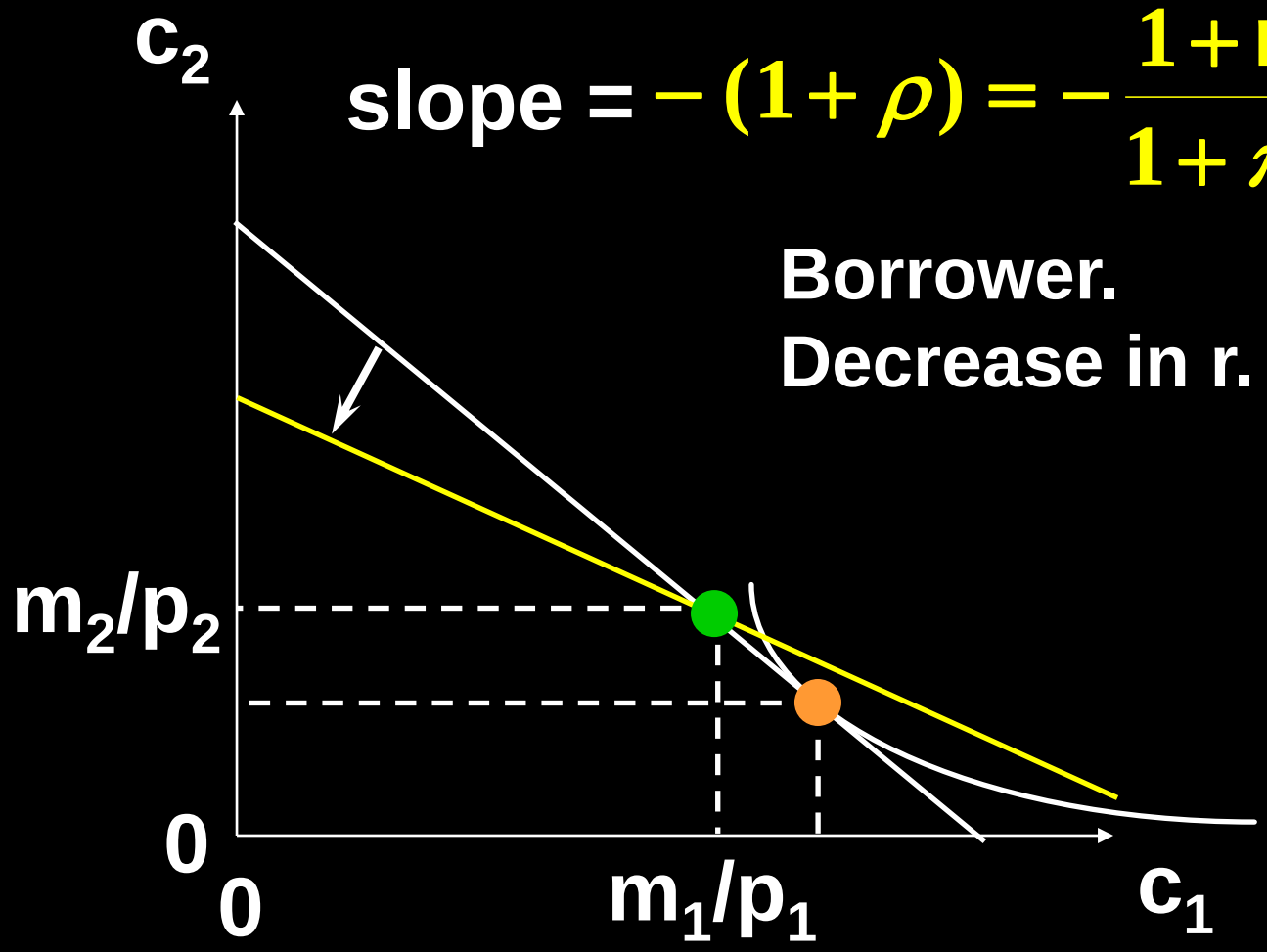

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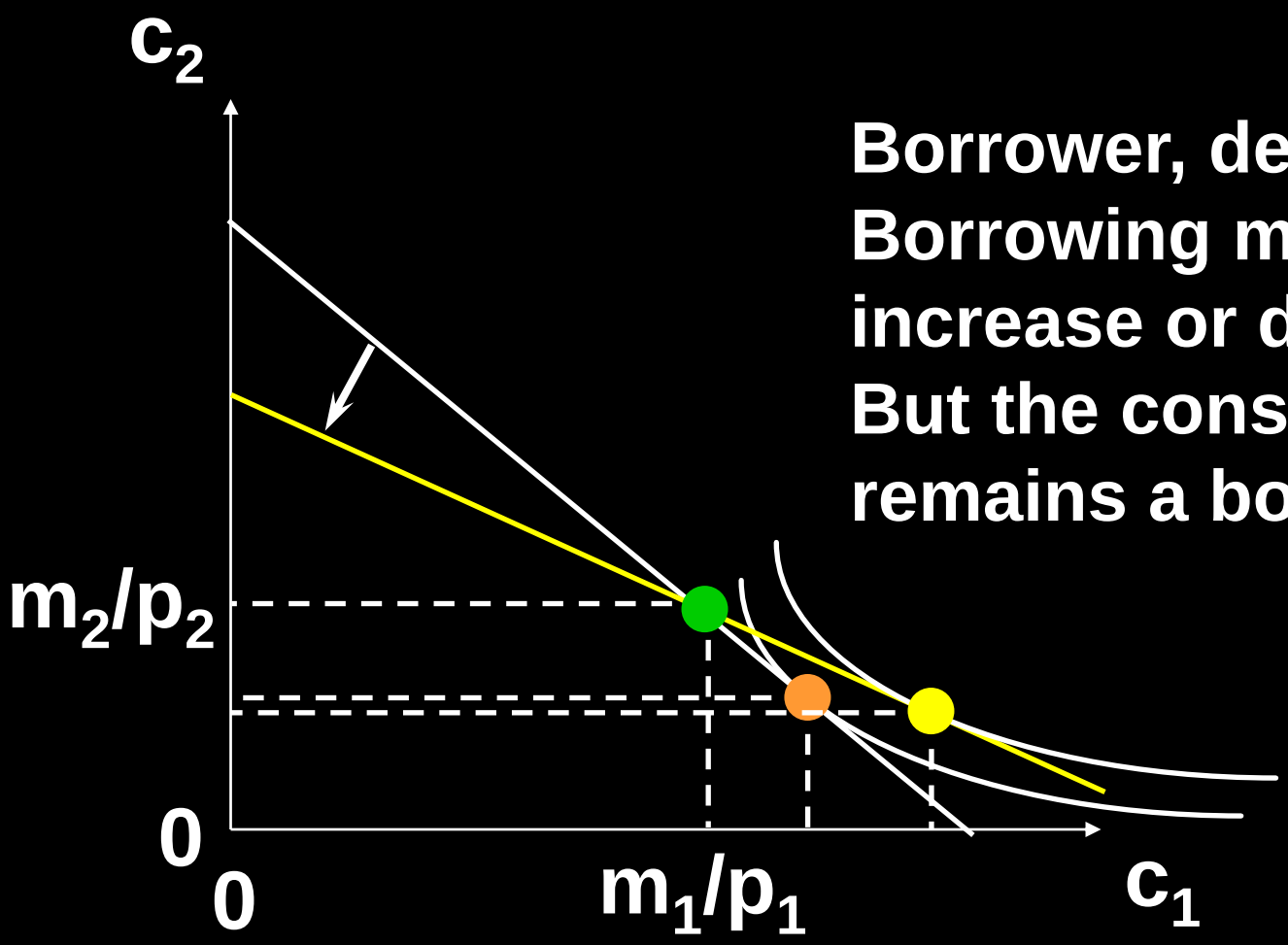

Borrower, decrease in r: Borrowing may increase or decrease. But the consumer remains a borrower.

Summary

- We treat intertemporal choices as regular consumer choice problems by letting the prices be p_1 and $p_2/(1+r)$.
- Analysis can be performed as in previous chapters.
- You may skip materials after the section “Present Value: A Closer Look”.