Understanding Interest Rates

BFI Lecture 2.2.

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Outline

Why are interest rates important?

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- the most closely watched variables in the economy. Why?
- directly affect life of citizen and firms
- buy a house or invest on the stock market or put your money in a bank?
- invest in a new project, or buy government bonds?

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Definition: Interest Rate

Interest rate is the amount of money that a given asset or debt instrument worth 100 units of money produces per unit of time to its owner

However, assets live infinitely long, bonds can be very short-term. How do we compare the money that they produce for us?:

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The Present Value

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Definition: Present Value

Present Value of an asset is what the lifetime yield of an asset is worth today

How do we calculate the present value of an asset?

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You require 10% back at the end of the period.
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Suppose you give these 121 to your friend again.
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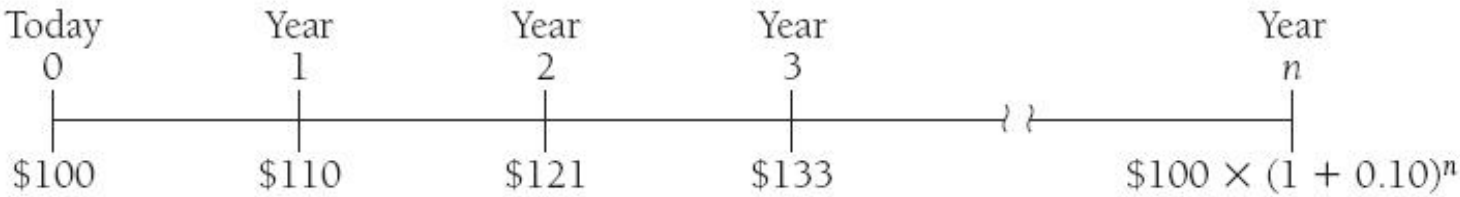
How much will you get at the end of the period?
$121 + 12.1 = 131.1 = 100(1 + 0.1)^3$

Calculating the Present Value

How to generalize the argument for n periods?



The **present value** is:

$$PV = \frac{FV}{(1+i)^n}$$

Back to the lottery example. How much did you really win?

Calculating the Present Value

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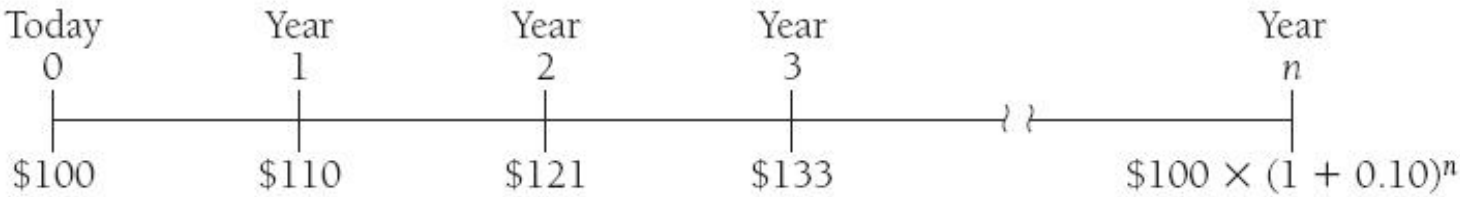

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6,759,019 or something;-)

The Yield to Maturity (Internal Rate of Return)

The Internal Rate of Return (IRR) is the most accurate measure of interest rates; It is what economists mean when they use the term interest rate.

Definition: Internal Rate of Return (IRR)

The **IRR** is an *interest rate* with a special quality: it equates the present value of payments received from a debt instrument with its face value today

How do we calculate the IRR?

Calculating the IRR for a simple loan

How to calculate the IRR of a 1-year simple loan with 10% interest rate?

Face value today	Present value
100	$\frac{110}{1+i}$

Now solve for i.

$i = ...$

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For simple loans, the interest rate equals the IRR.

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Example: The price of a car today is 1000. The car company offers you a payment plan of 2x600 at the end of the 1st and the 2nd years. What is the IRR for this loan?

Calculating the IRR for a fixed payment loan

Value today	PV
1000	$\frac{600}{1+i} + \frac{600}{(1+i)^2}$

Let's solve for i...

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Answer: $1000(1 + 0.131)^2 = ...$

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So, the interest rate and the IRR for any other loan besides a simple one are different.

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Disentangling the Rate of Return

What stands behind it?

Definition: Current yield

Current yield of an asset is the interest payments to the owner expressed as a fraction of its purchase price: $i_c = \frac{C}{p_t}$

Definition: Capital gain

Capital gain of an asset is the increase of its price expressed as a fraction of its purchase price: $g = \frac{p_{t+1} - p_t}{p_t}$

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Pretty different concepts: the *interest rate*, the *rate of return*, and the *internal rate of return*.

Real and Nominal Interest Rates

What is the effect of inflation on interest rates?

Definition: Nominal Interest Rate

The **Nominal Interest Rate** is the interest rate that is written down in a mortgage contract, on the face of a bond as a coupon, or on another debt instrument such as a fixed-term loan

Definition: Real Interest Rate

The **Real Interest Rate** is the inflation-adjusted nominal interest rate: $i_r = i - \pi_e$

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Real and Nominal Interest Rates

How do the real and nominal interest rates compare?