Ch.5 (INTRODUCTION TO VALUATION: THE TIME VALUE OF MONEY)

Final material

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The phrase time value of money refers to the fact that a dollar in hand today is worth more than a dollar promised at some time in the future.

On a practical level, one reason for this is that you could earn interest while you waited; so a dollar today would grow to more than a dollar later.

The trade-off between money now and money later thus depends on, among other things, the rate you can earn by investing.

Future Value and Compounding

- **Future value (FV)** refers to the amount of money an investment will grow to over some period of time at some given interest rate

❖ INVESTING FOR A SINGLE PERIOD

In general, if you invest for one period at an interest rate of r, your investment will grow to (1 + r) per dollar invested.

✓ Suppose you invest $100 in a savings account that pays 10 percent interest per year, **r** is 10 percent, so your investment grows to 1 + .10 = 1.1 dollars per dollar invested.

You invested $100 in this case, so you ended up with $100* 1.10 = $110.

❖ INVESTING FOR MORE THAN ONE PERIOD

Going back to our $100 investment, what will you have after two years, assuming the interest rate doesn't change?

If you leave the entire $110 in the bank, you will earn $110 * .10= $11 in interest during the second year, so you will have a total of $110 + 11 = $121.

- **compounding**

✓ This process of leaving your money and any accumulated interest in an investment for more than one period, thereby reinvesting the interest

✓ Interest earned on both the initial principal and the interest reinvested from prior periods.

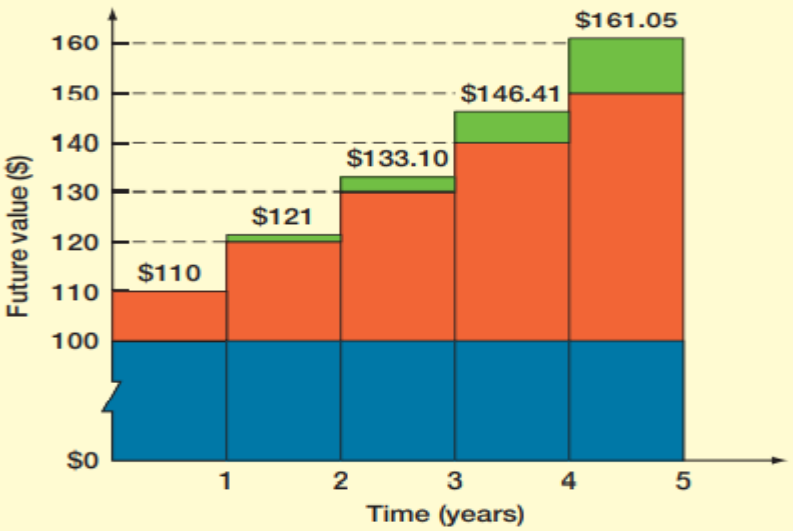
- **simple interest**

✓ The interest is not reinvested, so interest is earned each period only on the original principal.

Interest on interest Interest earned on the reinvestment of previous interest payments.

Compounding The process of accumulating interest on an investment over time to earn more interest.

Future value= 1$* (1 +r)^ t



Growth of $100 original amount at 10% per year. The red shaded area shows the simple interest. The green shaded area represents the portion of the total that results from compounding of interest.

- Ex: Dividend Growth

The X Corporation currently pays a cash dividend of $5 per share; you believe the dividend will be increased by 4 percent each year indefinitely.

How big will the dividend be in eight years?

Future value = $5 * (1.04)^8 = $5 * 1.3686 = $6.84

✓ The dividend will grow by $1.84 over that period.

أسئلة القسم

1. You are investing $100 today in a savings account at your local bank. Which one of the following terms refers to the value of this investment one year from now?

A. future value B. present value

C. principal amounts D. discounted value E. invested principal

2. Steve invested $100 two years ago at 10 percent interest. The first year, he earned $10 interest on his $100 investment. He reinvested the $10. The second year, he earned $11 interest on his $110 investment. The extra $1 he earned in interest the second year is referred to as:

A. free interest. B. bonus income.

C. simple interest. D. interest on interest.

3. Gerold invested $6,200 in an account that pays 5 percent simple interest. How much money will he have at the end of ten years?

A. $8,710 B. $9,000

C. $9,300 D. $9,678

E. $10,099

4. You invested $1,650 in an account that pays 5 percent simple interest. How much more could you have earned over a 20-year period if the interest had compounded annually?

A. $849.22 B. $930.11

C. $982.19 D. $1,021.15

E. $1,077.94

5. What is the future value of $7,189 invested for 23 years at 9.25 percent compounded annually?

A. $22,483.60 B. $27,890.87

C. $38,991.07 D. $51,009.13

E. $54,999.88

6. You hope to buy your dream car four years from now. Today, that car costs $82,500. You expect the price to increase by an average of 4.8 percent per year over the next four years. How much will your dream car cost by the time you are ready to buy it?

A. $98,340.00 B. $98,666.67

C. $99,517.41 D. $99,818.02

E. $100,023.16

Present Value and Discounting

Present value (PV) The current value of future cash flows discounted at the appropriate discount rate.

Discount Calculate the present value of some future amount.

❖ THE SINGLE-PERIOD CASE

Reverse of future value. Instead of compounding the money forward into the future, we discount it back to the present.

Ex: Suppose you need $400 to buy textbooks next year. You can earn 7 percent on your money.

How much do you have to put up today?

Present value * 1.07 = $400

We can now solve for the present value:

Present value = $400 * (1/1.07) = $373.83

❖ PRESENT VALUES FOR MULTIPLE PERIODS

✓ **You would like to buy a new automobile. You have $50,000 or so, but the car costs $68,500. If you can earn 9 percent, how much do you have to invest today to buy the car in two years? Do you have enough? Assume the price will stay the same.**

PV = $68,500/(1.09)^2= $68,500/1.1881= $57,655.08

You're still about $7,655 short, even if you're willing to wait two years.

P.V= 1/(1+R)^n

Discount rate: The rate used to calculate the present value of future cash flows.

Discounted cash flow (DCF): valuation calculating the present value of a future cash flow to determine its value today.

أسئلة القسم

1. Your father invested a lump sum 26 years ago at 4.25 percent interest. Today, he gave you the proceeds of that investment which totaled $51,480.79. How much did your father originally invest?

A. $15,929.47 B. $16,500.00

C. $17,444.86 D. $17,500.00

E. $17,999.45

2. What is the present value of $150,000 to be received 8 years from today if the discount rate is 11 percent?

A. $65,088.97 B. $71,147.07

C. $74,141.41 D. $79,806.18

E. $83,291.06

3. You want to have $35,000 saved 6 years from now to buy a house. How much less do you have to deposit today to reach this goal if you can earn 5.5 percent rather than 5 percent on your savings? Today's deposit is the only deposit you will make to this savings account.

A. $733.94 B. $791.18

C. $824.60 D. $845.11

E. $919.02

More about Present and Future Values

- What we called the present value factor is just the reciprocal of (that is, 1 divided by) the future value factor:

  - ✓ PV * (1+r)^ t = FV.
  - ✓ PV= FV/(1+r)^ t.

Evaluating Investments

To give you an idea of how we will be using present and future values, consider the following simple investment.

Your company proposes to buy an asset for $335, this investment is very safe, you would sell off the asset in three years for $400.

You know you could invest the $335 elsewhere at 10 percent with very little risk.

What do you think of the proposed investment? This is not a good investment. Why not? Because you can invest the $335 elsewhere at 10 percent.

If you do, after three years it will grow to:

$$\begin{aligned} \$335 \times (1 + r)^t &= \$335 \times 1.1^3 \\ &= \$335 \times 1.331 \\ &= \$445.89 \end{aligned}$$

Because the proposed investment pays out only $400, it is not as good as other alternatives we have. Another way of seeing the same thing is to notice that the present value of $400 in three years at 10 percent is:

$$\$400 \times [1/(1 + r)^t] = \$400/1.1^3 = \$400/1.331 = \$300.53$$

This tells us that we have to invest only about $300 to get $400 in three years, not $335. We will return to this type of analysis later on.

❖ DETERMINING THE DISCOUNT RATE

- ✓ **We frequently need to determine what discount rate is implicit in an investment.**
- ✓ **We can do this by looking at the basic present value equation:**

$$PV = FV_t/(1 + r)^t$$

- There are only four parts to this equation: the present value (PV), the future value (FV t), the discount rate (r), and the life of the investment (t).
- Given any three of these, we can always find the fourth.

- Finding **r** for a Single-Period Investment

You are considering a one-year investment. If you put up $1,250, you will get back $1,350. What rate is this investment paying?

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r = (FV/PV)^(1/n) -1

- Finding **r** for a multiple-Period Investment

Penn Station is saving money to build a new loading platform. Two years ago, they set aside $24,000 for this purpose. Today, that account is worth $28,399. What rate of interest is Penn Station earning on this investment?

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You estimate that you will need about $80,000 to send your child to college in eight years. You have about $35,000 now. If you can earn 20 percent per year, will you make it? At what rate will you just reach your goal?

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❖ FINDING THE NUMBER OF PERIODS

You've been saving up to buy the Godot Company. The total cost will be $10 million. You currently have about $2.3 million. If you can earn 5 percent on your money, how long will you have to wait?

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$$t = \frac{\text{Ln (FV/PV)}}{\text{Ln (1+r)}}$$

Some time ago, Julie purchased eleven acres of land costing $36,900. Today, that land is valued at $214,800. How long has she owned this land if the price of the land has been increasing at 10.5 percent per year?

A. 13.33 years B. 16.98 years

C. 17.64 years D. 19.29 years

E. 21.08 years

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