FN201: Lecture Note 4

Time Value of Money

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Overview

Application:

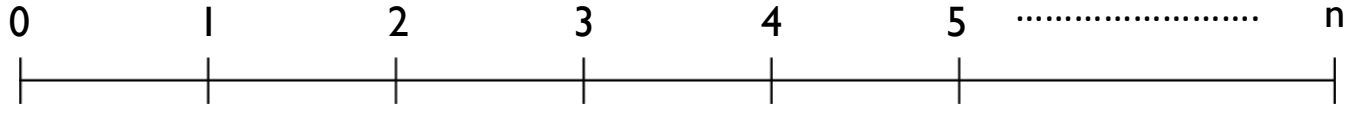
Feasibility Analysis, Investment Analysis, etc.

Investment time line

Future Value vs. Present Value

Investment time line

Present cash flow



Future cash flow

Cash Flows Pattern

1. Single sum

2. Annuity

3. Perpetuity

4. Uneven cash flows

Types of Interest

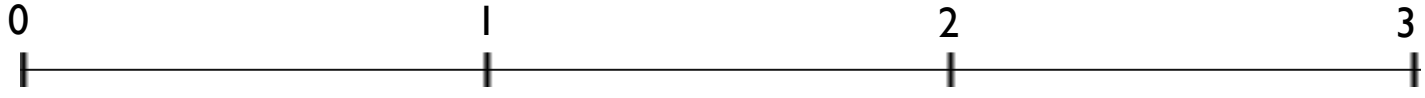
<u>Example</u>: What is the future value of $10,000 for the next 3 year if interest is 5% for one year?

1. Simple interest

Principal = 10,000

Interest = = =

Future Value =



2. Compound interest

Principal = 10,000

Interest = = =

= =

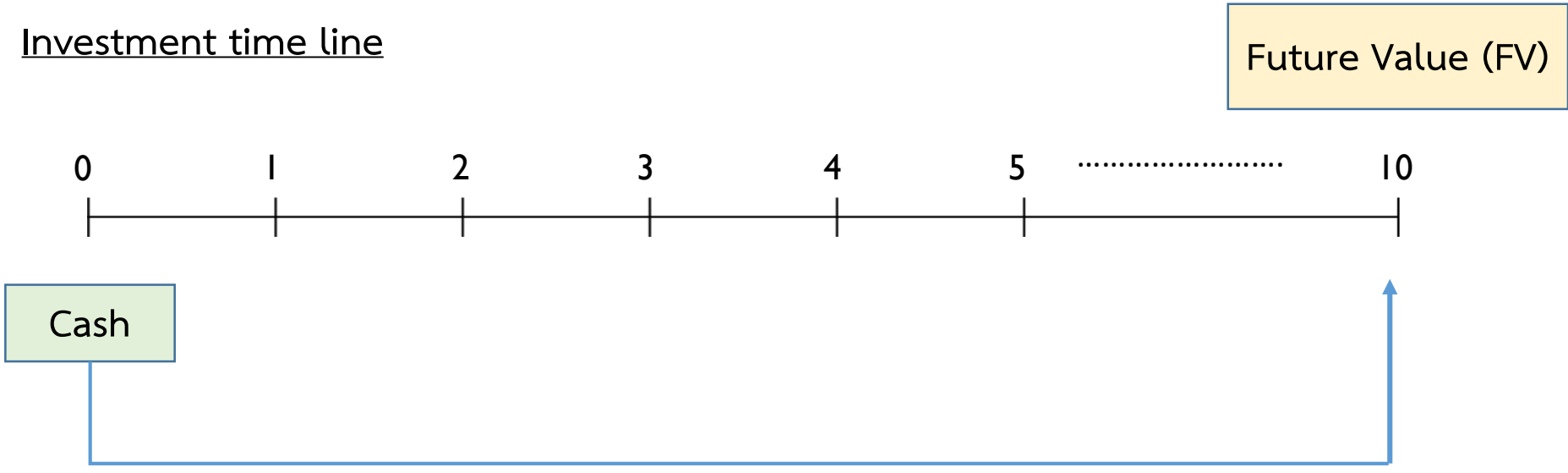
Future Value =

Single Sum Cash Flows:

Present Value and Future Value

Future Value

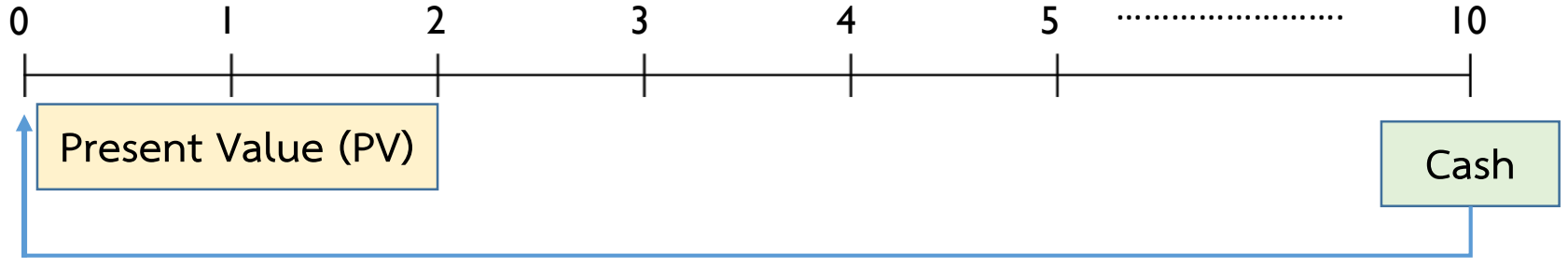
Investment time line



Example *What is the future value of $400,000 if interest is compounded annually at a rate of 5% for one year? – Using Table (FVIF)*

Present Value

Investment time line



Example *Tony plans to invest in one project which will bring back return at $450,000 at the end of 8th year, what is the present value of that project? – Using Table (PVIF)*

Example – Future Value

1. If you need $6,000 5 years from now, how much of a deposit must you make in your savings account first year, assuming an 8 percent annual interest rate?

2. You estimate an ancient wood-horse will be worth $2,000,000 when you retire at the end of twenty years. If you expect a 12% return on your investment, how much will you pay for it?

3. You just bought a new computer for $3,000. The payment terms are 2 years same as cash. If you can earn 8% on your money, how much money should you set aside today in order to make the payment when due in two years?

Example – Future Value

3. As part of your financial planning, you wish to purchase a new car exactly 5 years from today. The car you wish to purchase costs $14,000 today, and your research indicates that its price will increase by 2% to 4% over the next 5 years due to inflation.

a. Estimate the price of the car at the end of 5 years if inflation is (1) 2% per year, and (2) 4% per year.

b. How much more expensive will the car be if the rate of inflation is 4% rather than 2%?

c. If return from saving in bank is 8%, how much should you save money to get a new car at the end of 5^{th} year if inflation is (1) 2% per year, and (2) 4% per year?

Example – Present Value

1. Ron Jaffe has been given an opportunity to receive $20,000 (6 years from now). If he can earn 10 percent on his investments, what is the most he should pay for this opportunity?

Example – Present Value

2. You just won a lottery that promises to pay you $1,000,000 exactly 10 years from today. Because that $1,000,000 payment is guaranteed by the government in which you live, opportunities exist to sell claim today for an immediate single cash payment.

a. What is the least you will sell your claim for if you can earn the following rates of return on similar-risk investments during the 10-year period? (1) 6%, (2) 9%, and (3) 12%.

b. Rework part (a) under the assumption that the $1,000,000 payment will be received in 15 rather than 10 years.

c. From the finding in parts (a) and (b), discuss the effect of both size of rate of return and the time until receipt of payment on the present value of the future sum.

Annuity Cash Flows:

Present Value and Future Value

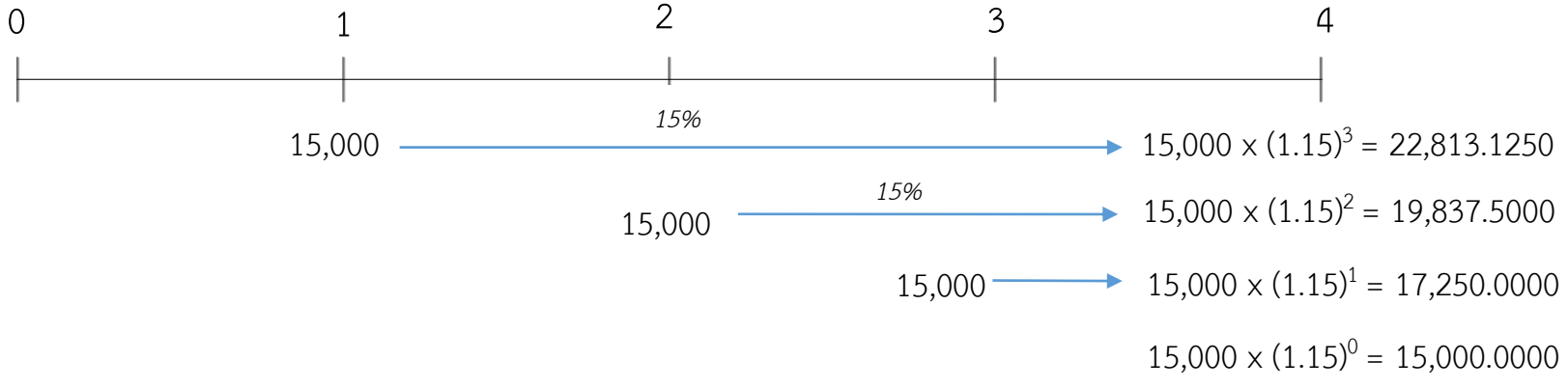
Future Value and Present Value for Annuities Due

Ordinary Annuities = Payment at the end of period

Annuities Due = Payment at the beginning of period

Future Value

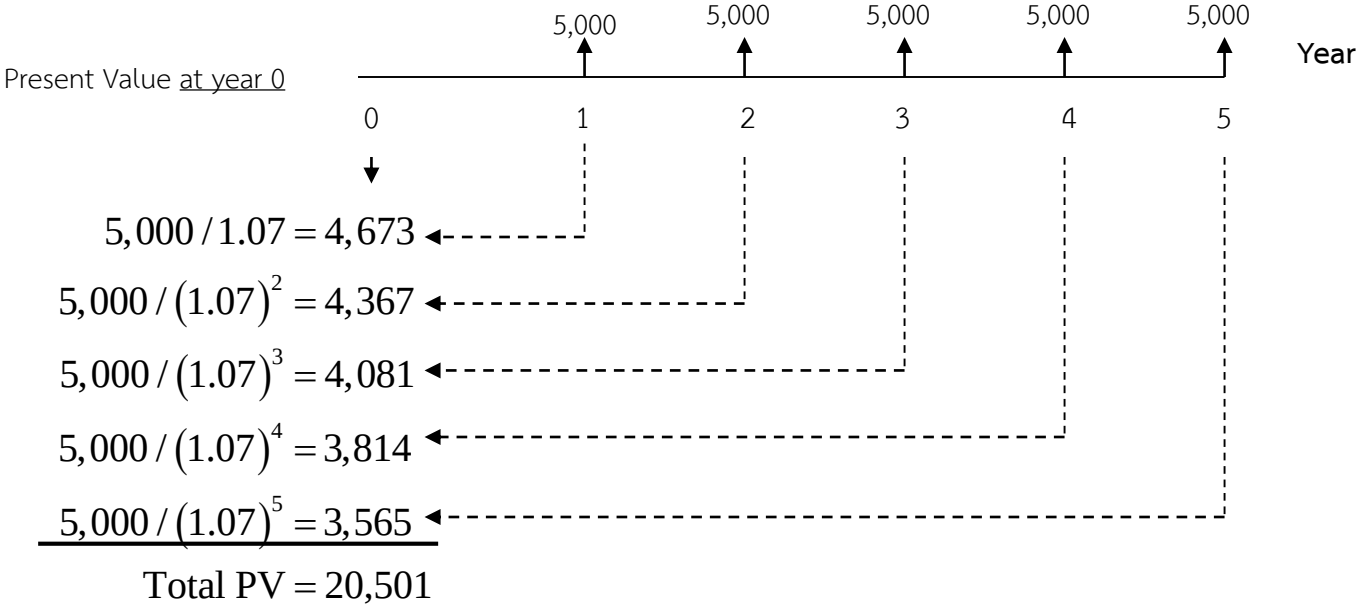
Assume that BMX company receives annuity cash flows from project invested $15,000 at the end of each year until 4^{th} year with an annual growth rate 15%. Find future value at the end of 4^{th} year?



Present Values

Example

Tiburon Autos offers you "easy payments" of $5,000 per year, at the end of each year for 5 years. If interest rates are 7%, per year, what is the cost of the car?



Future Value and Present Value of Ordinary Annuities

Example

1. What is the future value of $20,000 paid at the end of each of the following 5 years, assuming your investment returns 8% per year?

2. Your favorite uncle has offered you the choice of the following options. He will give you either $2,000 1 year from now or $3,000 4 years from now. Which would you choose if the discount rate is (a) 10 percent? (b) 20 percent?

3. A 55-year-old executive will retire at age 65 and expects to live to age 75. Assuming a 10 percent rate of return, calculate the amount he must have available at age 65 in order to receive $10,000 annually from retirement until death.

Future Value and Present Value for Annuities Due

Ordinary Annuities = Payment at the end of period

Annuities Due = Payment at the beginning of period

Future Value and Present Value for Annuities Due

Example:

Answer the questions that follow:

Case	Amount of Annuity	Interest	Period (Years)
A	2,500	8%	10
B	500	12%	6
C	30,000	20%	5
D	11,500	9%	8
E	6,000	14%	30

a. Assume you deposit the amount of annuity, calculate the future value when it is (1) an ordinary annuity, and (2) an annuity due.

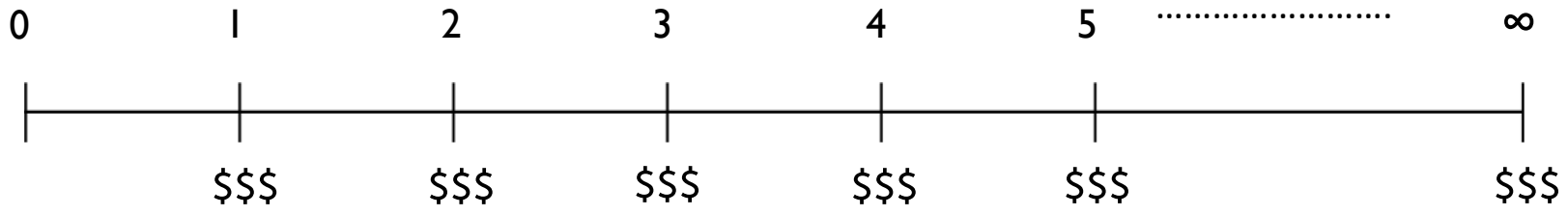
b. Assume you have the annuity return from investment, calculate the present value when it is (1) an ordinary annuity, and (2) an annuity due.

c. Compare the finding in parts a.1 vs. a.2, and b.1 vs. b.2. All else being identical, which type of annuity – ordinary or annuity due – is preferable? Why?

Present Value of Perpetuity Cash Flows

Present Value of Perpetuity Cash Flows

Regular perpetuity



Present Value of Perpetuity Cash Flows

Example:

1. What is the present value of a perpetuity of $80 per year if the discount rate is 11 percent?

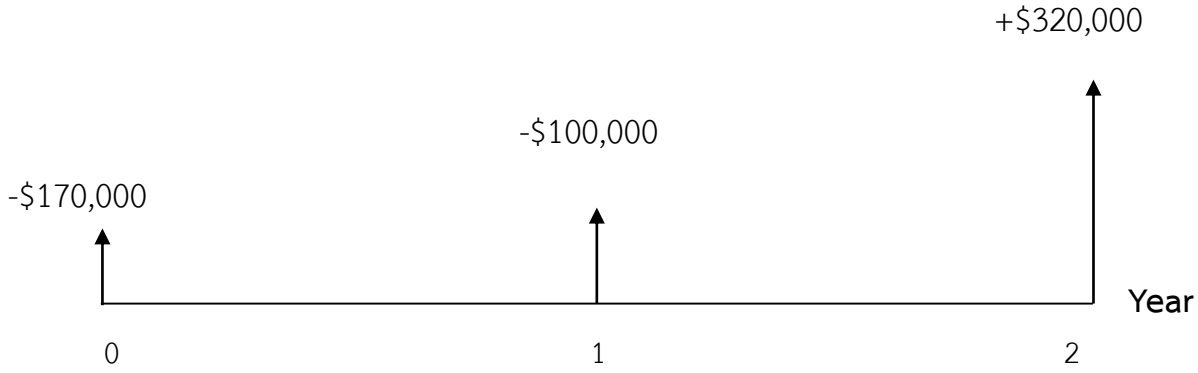
2. You want to invest in long-lived company with perpetuity dividend and risk (as presented by different values of discount rates) as below table. Which company would bring you highest present value?

Company	Annual amount	Interest
A	20,000	8%
B	100,000	10%
C	3,000	6%
D	60,000	5%

Present Value of Uneven Cash Flows

Present Value of Uneven Cash Flows

Assume that the cash flows from the construction and sale of an office building is as follows. Given a 5% required rate of return.



Present Value	
Year 0	
-170,000	= -$170,000
-100,000/1.05	= -$95,238
$320,000/1.05^2$	= $290,249
Total (Net) Present Value	= $25,011

Present Value of Uneven Cash Flows

Example:

1. Candy Parker has been offered an opportunity to receive the following mixed stream of revenue over the next 3 years. What is present value of this opportunity given interest rate at 15%?

Year	Annual amount
1	1,000
2	2,000
3	500

Present Value of Uneven Cash Flows

Example:

2. As a financial consultant for ABCompany, which project results in the most profitable (Hint: by calculating present value of the streams of cash flows). Assume that the firm's opportunity cost is 12%.

A		B		C	
Year	Cash Flows	Year	Cash Flows	Year	Cash Flows
1	-2000	1	10000	1-5	10000/year
2	3000	2-5	5000/year	6-10	8000/year
3	4000	6	7000		
4	6000				
5	8000				

Question?