FN 201 Business Finance

Final Exam Exercise 1-2018

(Guided Solutions)

INVESTMENT CRITERIA AND DECISION

Question 1 (30 Points)

Sweetie Icy Company is considering including two pieces of equipment, a machine and an overhead pulley system, in this year's capital budget. The projects are independent. The cash outlay for the machine is $17,100 and that for the pulley system is $22,430. The firm's cost of capital is 14%. After-tax cash flows, including depreciation, are as follows:

Year	Machine	Pulley
1	$5,100	$7,500
2	5,100	7,500
3	5,100	7,500
4	5,100	7,500
5	5,100	7,500

1.1 Calculate the Net Present Value (NPV) and the Internal Rate of Return (IRR) for each project, and indicate whether to accept or reject each project. And why? (20 Points)

Answer:

Cost of capital 14%

	Machine	Pulley
NPV	408.71	3,318.11
IRR	14.99%	20.00%
PI	1.0239	1.1479

Since the projects are independent, the company can invest in both projects. Machine and pulley investment plans are all profitable because NPV is positive, IRR is higher than cost of capital and PI is greater than 1.

1.2 Calculate the Regular Payback Period for each project. Explain the meaning and decide which project is more attractive. (10 Points)

Answer:

	Machine	Pulley
Payback period	3.3529	2.9907

Question 2 (25 Points)

Project A and B, of equal risk, are alternatives (or mutually exclusives projects) for expanding the Winnie Company's capacity. The cash flows for each project are shown in the following table.

	Project A	Project B
Initial Investment	$80,000	$50,000
Year	**Cash Inflow**	
1	$15,000	$15,000
2	15,000	15,000
3	25,000	15,000
4	25,000	15,000
5	30,000	15,000

As a financial analyst of the company, help Winnie make an investment decision on its project by answering the following questions.

2.1 Calculate the internal rate of return (IRR) to the nearest whole percent for each of the projects. Please provide all necessary information used in the calculation procedures. **(5 Points)**

Answer:

	Project A	Project B
IRR	10%	15%

2.2 If the company's cost of capital is 3%, calculate the net present value (NPV) for each project. **(5 Points)**

Answer:

	Project A	Project B
NPV	19,671.03	18,695.61

2.3 According to IRR and NPV values from (1.1) and (1.2), respectively, discuss any conflict in ranking that may exist between NPV and IRR. And which project will you recommend Winnies to invest? Why? **(10 Points)**

Answer: Since the projects are mutually exclusive, company can choose only one project to invest. However, the decision depends on criteria they consider: IRR suggests project B, while NPV suggests project A. In this case, using NPV is more reliable.

2.4 Explain possible reasons that lead to conflict in ranking between NPV and IRR in this case. **(5 Points)**

Answer: 1) Different in initial investment and 2) Timing of cash inflows.

Question 3 (25 Points)

Winnie Inc. is considering two mutually exclusive projects of this year's capital budget. The firm's cost of capital is 4%. The cash outlay and after-tax cash flows received are as follows.

	Project A	Project B
Initial Investment	$79,607.52	$54,071.64
Year	**Cash Inflow**	
1	21,000	15,000
2	21,000	15,000
3	21,000	15,000
4	21,000	15,000
5	21,000	15,000

3.1 Calculate the Net Present Value (NPV) for each project. Which project will you recommend Winnie to invest? **(10 Points)**

Answer:

Cost of capital 4%

	Project A	Project B
NPV	$13,880.75	$12,705.69

Since the two projects are mutually exclusive, company should select the highest NPV project, which is project A.

3.2 Calculate the internal rate of return (IRR) to the nearest whole percent for each of the projects. Please provide all necessary information used for calculation. Which project will you recommend Winnie to invest? **(10 Points)**

Answer:

	Project A	Project B
IRR	10%	12%

The company should choose the highest IRR project, which is project B.

3.3 Does conflict exist from using NPV and IRR when making decision? If so, which project will you choose? Why? **(5 Points)**

Answer: Yes, the conflict exists from using NPV and IRR for making decision. In this case, NPV is more reliable. Thus, project A should be selected.

Question 4 (25 Points)

WinHom Roofing Materials, Inc., is considering two mutually exclusive projects. The cash outflows and inflows are as follows:

	Project A	Project B
Initial Investment	$145,000	$150,000
Year	**Cash Inflow**	
1	$45,000	$75,000
2	45,000	60,000
3	45,000	30,000
4	45,000	30,000
5	45,000	30,000
6	45,000	30,000

As an assistant project manager, help WinHom Roofing Materials make an investment decision on its projects by answering the following questions.

4.1 Calculate the internal rate of return (IRR). Please provide all necessary information used in the calculation procedures. Which project would you recommend to invest? **(5 Points)**

Answer:

	Project A	Project B
IRR =	21.28%	22.71%

4.2 If the company's cost of capital is 4%, calculate the net present value (NPV) and the profitability index (PI) for each project. **(5 Points)**

Answer:

	Project A	Project B
NPV =	90,896.16	78,270.02
PI =	1.63	1.52

4.3 According to IRR and PI from (4.1) and (4.2), respectively, discuss any conflict in ranking that may exist between IRR and PI. And which project will you recommend to invest? Why? **(10 Points)**

Answer:

	Project A	Project B
IRR =	21.28%	22.71%
NPV =	90,896.16	78,270.02
PI =	1.63	1.52

Yes, in this case, we should believe NPV.

So that, the company should invest in Project A.

4.4 Explain possible reasons that lead to conflict in ranking between IRR and PI in this case. **(5 Points)**

Answer:

1. Initial investment difference
2. Timing of cash flows

BOND

Question 5 (25 Points)

HENGHENG Company has two bond issues outstanding. Both bonds pay $100 annual interest plus $1,000 at maturity. Bond M has a maturity of 15 years, and Bond N has a maturity of 5 year.

5.1 Draw an investment time line and find that if both bond M and bond N are sold at part, what are yields to maturity (YTM) of each bond? (5 Points)

Answer: YTM = Coupon rate = 10%

5.2 What will be the value of these bonds when the going YTM or rate of interest is at 5%, 8%, and 12%? Show the derivation and put the final answers into below table. (10 Points)

Answer:

	Bond M's Value (Price)	Bond N's Value (Price)
5%	1,518.98	1,216.47
8%	1,171.19	1,079.85
12%	863.78	927.90

5.3 Show percent changes in bond value when the interest rate is going up (compared with the values when interest rate is 5%). Then, explain why the value of longer-term bond fluctuate more when interest rates change than does the shorter-term bond? (10 Points)

Answer:

	Bond M's Value (Price)	Bond N's Value (Price)
5%	-	-
8%	-22.90%	-11.23%
12%	-43.13%	-23.72%

Question 6 (20 Points)

David's broker has shown him two bonds selling at par. Both have the same par value of $2,000 and pay 10.00% coupon annually. The difference is that bond X has a maturity of 5 years, while bond Y has a maturity of 20 years.

6.1 Draw an investment time line for each bond, find yields to maturity (YTM) of each bond? **(5 Points)**

Answer:

6.2 The broker expects that yield to maturity of bond X and Y would increase to 12.00% and 13.50%, respectively, at the end of this year. Calculate current yields, expected prices, and percent change in price of the two bonds. **(10 Points)**

Answer: From YTM = Current Yield + Capital Gain/Loss Yield

For X: YTM = 12% = (200/2,000) + Capital Gain/Loss Yield

We get Capital Gain/Loss Yield = 2% = percent change in price

So, expected price = 2,040.

For Y: YTM = 13.50% = (200/2,000) + Capital Gain/Loss Yield

We get Capital Gain/Loss Yield = 3.50% = percent change in price

So, expected price = 2,070.

6.3 If David wants to minimize interest rate risk, which bond should he purchase? Why? **(5 Points)**

Answer: Should buy Bond X, since it has lower fluctuation in price changes.

Question 7 (25 Points)

Tony is a risk-averse investor. He plans to invest in fixed income securities. One investment company shows him two bonds – Bond X and Y. Both pay 9% coupon interest rate with $1,000 par value. The difference is that bond X has 25 years to maturity, while bond Y has 7 years to maturity.

7.1 Draw an investment time line for each bond. If Tony's required rate of return is at 12%, how much should he pay for bond X and Y? **(5 points)**

Answer: Price of bond X = 764.7058
Price of bond Y = 863.0873

7.2 From bond prices in **(11.1)**, calculate Current Yield and Capital Gain/Loss Yield of each bond. Explain how these yields are related to each other. **(5 points)**

Answer: **YTM = Current Yield + Capital Gain/Loss Yield**

Bond P:	Current Yield	= 11.7692%
	Capital gain/loss yield	= 0.2308%
Bond D:	Current Yield	= 10.4277%
	Capital gain/loss yield	= 1.5723%

7.3 What will be the value of these two bonds when the going YTM or rate of interest become 15%? Calculate percentage change in price, compared with prices at 12% required rate of return, and fill in below table **(10 points)**

Answer:

YTM	Bond X		Bond Y	
	Price	Change (%)	Price	Change (%)
12%	764.7058		863.0873	
15%	612.1511	-19.9495%	750.3748	-13.0592%

7.4 Which bond should you recommend Tony to purchase? Why? **(5 points)**

Answer: Bond Y

Question 8 (25 Points)

Consider two bonds with 8 percent coupon rate, all selling at face value of $1,000. The short-term bond has a maturity of 8 years, and the long-term bond has maturity 30 years.

8.1 If both bonds have yield to maturity (YTM) at 7%, what will be the price of each bond? From the information obtained, classify the structure of YTM by dividing into Current Yield and Capital Gain/Loss Yield of each bond. **(10 Points)**

Answer:

YTM = 7%

	Price	YTM	Current Yield	CapGain/Loss
8-year	**1059.713**	7%	**7.5492%**	**-0.5492%**
30-year	**1124.09**	7%	**7.1169%**	**-0.1169%**

8.2 If interest rates suddenly rise by 2 percent or suddenly fall by 2 percent, what are the prices and the percentage change in price of these bonds? Please fill you answer in the table below. **(10 Points)**

Answer:

YTM	8-year Bond		30-year Bond	
	Price	Change (%)	Price	Change (%)
9%	**944.652**	**-10.86%**	**897.263**	**-20.18%**
5%	**1193.896**	**12.66%**	**1461.174**	**29.99%**

8.3 What does this problem tell you about the interest rate risk? Why does the percentage price change of a longer-term bond fluctuate more when interest rates change than does the shorter-term bond? **(5 Points)**

Answer:

Longer-maturity bond implies higher interest rate risk as we can observe from the percent change in price corresponding to interest rate change.

COMMON STOCK

Question 9 (25 Points)

Winnie Corp. is a leading company in automobile industry. According to market research, the company's beta is 1.4 when the risk-free rate is 5.6% and the market risk premium is 6%. Winnie has current return on equity (ROE) at 17.5% and pays out 60% of its earnings as dividends. Its dividend paid last year (D_0) was $2. One investor is considering to invest in this company, but has no background in common stock valuation. Please help this investor by answering the following questions.

9.1 According to above information, what are the investor's require rate of return and the expected dividend growth rate? (5 Points)

Answer: From CAPM, we have investor's require rate of return = R_e = 14%.

Expected dividend growth rate = g = ROE x Retention Ratio

= 17.5% x (1-60%) = 7%.

9.2 An investor intends to hold Winnie's stock for **only 3 years** and expects to sell at price \$26.22 at the end of year 3. Assume that expected dividend growth rate follows **(9.1)**, what would be a proper stock price for the investor? Should the investor buy if Winnie's current market stock price is \$25? Why? (10 Points)

Answer:

Year	0	1	2	3
Div		2.14	2.2898	2.450086
Price3				26.22
Common Stock Price =			**22.99061**	

9.3 As a leading company in the industry, Winnie has decided to invest R&D project to improve the operating performance. If the project is successfully completed, this will let Winnie to have earnings and dividends growing at a rate of 50% [$D_1 = D_0(1 + g) = D_0(1.50)$] this year and 25% the following two years, after which growth would return to 9%. If it is believed that the project would be successful, what is the value per share of Winnie's common stock? (10 Points)

Answer:

Year	0	1	2	3	4
Growth		50%	25%	25%	9%
Div		3.0000	3.7500	4.6875	5.1094
Price3				102.1875	
Common Stock Price =			**\$77.655**		

Question 10 (25 Points)

AROI Inc. is in the agricultural business. The company could maintain its return on equity at 15% and keep paying dividend 40% of its earnings. One investor is considering to invest in this company with required rate of return 15%. Please help this investor by answering the following questions.

10.1 What is the company expected dividend growth rate? **(5 points)**

Answer: g = ROE x Retention Ratio = 15% x (1 – 40%) = 9%

10.2 An investor intends to hold AROI Inc.'s stock for **only 3 years** and expects to sell at price \$26.50 at the end of year 3. Assume that last year AROI paid its dividend \$2 per share (D_0=*\$2*) and expected dividend growth rate is from (10.1), what would be a proper stock price for the investor? **(10 points)**

Answer:

Year	0	1	2	3
Div		2.18	2.3762	2.590058
Price3				26.5
Price of Common Stock =		**22.8196**		

10.3 AROI Inc. has an R&D project which is expected to complete in the next two years. If the project is successful, this will lead earnings and dividends to grow at a rate of 40% at the end of year 3, 20% at the end of year 4, after which growth would return to 10%. Given dividend paid last year at $2 per share, what is the appropriate value of AROI Inc.'s common stock under this scenario? **(10 points)**

Answer:

Year	0	1	2	3	4	5
Growth		9%	9%	40%	20%	10%
Div		2.1800	2.3762	3.3267	3.9920	4.3912
Price4					87.824	
Price of Common Stock =		**$58.38**				

Question 11 (25 Points)

Storico Co. just paid a dividend of $2.75 per share. The company will increase its dividend by 20 percent next year and will then reduce its dividend growth rate by 5 percentage points per year until it reaches the industry average of 5 percent dividend growth, after which the company will keep a constant growth rate forever. According to market research, the company's beta is 1.4 when the risk-free rate is 5.6% and the market risk premium is 6%.

11.1 Draw an investment time line presenting dividend payment plan of Storico. **(5 points)**

Answer:

Year	0	1	2	3	4
div	2.75	3.3	3.795	4.1745	4.383225

11.2 If one investor intends to hold Storico's stock for **only 2 years** and expects to sell at $55 at the end of year 2, what will be a proper stock price for the investor? What should be appropriate investment strategy (i.e. to buy, sell, or hold) if Storico's current market stock price is $45? Why? **(10 points)**

Answer:

Year	0	1	2
div	2.75	3.3	3.795
Price			55
PV		2.894736842	45.24084334
Price =	**48.13558018**		

Recommend to BUY!

11.3 An investor has a long-term investment plan in Storico in that he has no plan to sell in a short period of time. According to the above information, what is the value per share of Storico's common stock? And what should be appropriate investment strategy (i.e. to buy, sell, or hold) if Storico's current market stock price is $45? Why? **(10 points)**

Answer:

Year	0	1	2	3	4	5
div	2.75	3.3	3.795	4.1745	4.383225	4.60238625
Price					51.137625	
PV		2.89473684	2.92012927	2.81766859	32.8728002	
Price =	41.5053349					

Recommend to SELL!

Question 12 (25 Points)

Win Hom Hotels, Inc., is entering into a 3-year remodeling and expansion project. The construction will have a limiting effect on earnings during that time, but when it is complete, it should allow the company to enjoy much improved growth in earnings and dividends. Last year, the company paid a dividend of $3.40. It expects zero growth in the next year. In years 2 and 3, 5% growth is expected, and in year 4, 15% growth. In year 5 and thereafter, growth should be a constant 10% per year.

According to market research, the company's beta is 1.4 when the risk-free rate is 5.6% and the market risk premium is 6%.

12.1 Draw an investment time line presenting expected dividend payment of Win Hom Hotels. What are the investor's require rate of return? **(5 points)**

Answer:

year	0	1	2	3	4	5
g		0	5%	5%	15%	10%
Div	**3.40**	**3.40**	**3.57**	**3.75**	**4.31**	**4.74**
Re	**14%**					

12.2 What is the maximum price per share should an investor pay for Win Hom Hotels' common stock? What should be appropriate investment strategy (i.e. to buy, sell, or hold) if the current market stock price is $75? Why? **(10 points)**

Answer:

year	0	1	2	3	4	5
TV					118.5463	
PV		2.98	2.75	2.53	72.74	
Price =	**81.00084**					

Suggest to BUY!

12.3 If the remodeling and expansion project is failed at the end of year 2, so that that the growth in earnings and dividends is constant at 5% starting from year 3, what will be the

common stock value of Win Hom Hotels? Will this change your recommendation in (12.2)? How? **(10 points)**

Answer:

Year	0	1	2	3	4	5
g		0	5%	5%	5%	5%
Div	3.40	3.40	3.57	3.75	3.94	4.13
TV		39.66667				
Price =	**37.77778**					

Should SELL!

INTRODUCTION TO RISK

Question 13 (25 Points)

Mr. Benny has a portfolio investment with current expected return at 8.5% and variance at 110 (or 10.4881 standard deviation). He was suggested by two trading companies to include one more stock into his portfolio - Company A introduced stock X, while Company B suggested stock Y. Below table provides additional information on stock X and Y, and the correlation with Benny's current portfolio.

	Company A: Stock X	**Company B: Stock Y**
Expected Return	10%	15%
Variance	140	180
Standard Deviation	11.8322	13.4164

Correlation between Benny's current portfolio return and stock X is 0.75, while the correlation with stock Y is 0.50.

Due to budget constraint, Benny can afford either stock X or stock Y. His new portfolio would have 40% weighting on new stock and the other 60% is allocated for the combination of old stocks. As a financial planner, please help Benny to decide which stock to be chosen into his current portfolio investment by answering the following.

13.1 Calculate expected return and measure risk (i.e. from variance and standard deviation) that associated with the new portfolio if Benny decides to pick **stock X** into his current portfolio. (10 Points)

Answer: Expected Return = 9.10%

Variance = 106.675

13.2 Calculate expected return and measure risk (i.e. from variance and standard deviation) that associated with the new portfolio if Benny decides to pick **stock Y** into his current portfolio. (10 Points)

Answer: Expected Return = 11.10%

Variance = 102.171

13.3 With the findings from **(13.1)** and **(13.2)**, which stock would you recommend Mr. Benny to include into his current portfolio? Why? (Note that only one stock will be selected). (5 Points)

Answer: Choose stock Y, since higher expected return and lower risk.

Question 14 (25 Points)

Tony has a portfolio investment consisting of stock A and B. Now, he is considering to include stock C into his portfolio. Given the information below, please help Tony decide whether he should include stock C into his current portfolio by answering the following questions.

State of Economy	Probability	Rate of Return if State Occurs		
		Stock A	Stock B	Stock C
Boom	0.20	30.00	45.00	33.00
Good	0.40	12.00	10.00	15.00
Poor	0.30	1.00	-15.00	-5.00
Bust	0.10	-6.00	-3.00	-9.00
Expected Return		10.50	8.20	10.20
Variance		745.00	446	219
Standard Deviation		27.29	21.12	14.81

14.1 Tony's portfolio is invested 30% in stock A and 70% in stock B. Suppose that correlation coefficient of stock A and B returns is equal 0.65, what are the expected return of the portfolio and risk as measured by variance and standard deviation? **(10 points)**

Answer: Expected return = 8.89%
Variance = 442.9376

14.2 In case Tony includes stock C, his new portfolio would have 40% weighting on new stock and the other 60% is allocated for the combination of old stocks. Given the correlation between current portfolio return and stock C is 0.75, what are Tony's new expected return, variance, and standard deviation of new portfolio? **(10 points)**

Answer: Expected return = 9.41%
Variance = 306.7068

14.3 Using appropriate criteria, decide if stock C should be invested? Why? **(5 points)**

Answer: Tony should include stock C into his portfolio, since expected return is higher with lower variance, compared with previous one.

Question 15 (30 Points)

Winnie has a portfolio investment with expected portfolio return at 9% and variance at 110 or 10.4881 standard deviation. Now, he is considering to include ONE stock into his current portfolio. He contracted two investment companies and got the following suggestions – Company A introduced stock X for Winnie, and Company B convinced him to invest in stock Y. Winnie formed below table presenting return and variance of stock X and Y to make his own analysis:

	Company A: Stock X	**Company B: Stock Y**
Expected Return	12%	18%
Variance	145	175
Standard Deviation	12.0416	13.2288

Correlation between Winnie's current portfolio return and stock X is 0.75, while the correlation with stock Y is 0.90.

Due to Winnie's plan to invest in only one stock, he intends to allocate 40% for new stock investment and the other 60% for the combination of old stocks. As a financial planner, please help Winnie to obtain appropriate investment strategy.

15.1 Calculate expected return and measure risk (i.e. from variance and standard deviation) that associated with the new portfolio if Winnie decides to pick **stock X** into his current portfolio. **(10 points)**

Answer:

X	r	12%		Return	**10.200%**
0.75	var	145		var	**108.2655914**
	sd	12.04159458		CV	**1.020105419**

15.2 Calculate expected return and measure risk (i.e. from variance and standard deviation) that associated with the new portfolio if Winnie decides to pick **stock Y** into his current portfolio. **(10 points)**

Answer:

Y	r	18%		**Return**	**12.600%**
0.9	var	175		**var**	**127.5375675**
	sd	13.2288		**CV**	**0.896289935**

15.3 With the findings from **(13.1)** and **(13.2)**, which stock would you recommend Winnie to include into current portfolio? Why? (Note that only one stock will be selected). **(10 points)**

Answer: To buy stock Y

Question 16 (25 Points)

David, a new graduate, is considering to invest in the stock exchange market. The stocks he planned to invest have return patterns corresponding to economic conditions as the table below.

State of Economy	Probability of State of Economy	Rate of Return if State Occurs	
		Stock A	Stock B
Recession	0.15	6%	-20%
Normal	0.60	7%	13%
Boom	0.25	11%	33%
Expected Return		**?**	**13.05%**
Variance		**?**	**263.35**
Standard Deviation		**?**	**16.2280**

Note: Assume correlation between stock A and stock B is 0.80.

As a financial planner, please help David for his investment plan by answering the following questions.

16.1 David intends to invest in stock A. Calculate expected return and measure risk from variance and standard deviation of the stock return. **(10 points)**

Answer:

Expected Return	**7.85%**
Variance	**3.4275**
SD	**1.8514**
CV	**0.2358**

16.2 In addition to stock A, he plans to include stock B into his investment. The portfolio would be 60% investing in stock A and the other 40% investing in stock B. What are David's new expected return, variance, and standard deviation of portfolio investment? **(10 points)**

Answer:

Expected Return	**9.93%**
Variance	**54.9067**
SD	**7.4099**
CV	**0.7462**

16.3 If David is a risk-averse investor, decide if stock B should be also invested. Why? **(5 points)**

Answer:

Better to invest just stock A!

COST OF CAPITAL

Question 17 (35 Points)

Win Hom Production has **book value** balance sheet as shown below:

Current assets	$30,000,000	Long-term debt	30,000,000
Fixed assets	50,000,000	Common stock (1 million shares)	50,000,000
Total Assets	**80,000,000**	**Total Claims**	**80,000,000**

Under this capital structure, the long-term debt consists of 30,000 bonds, each with a par value of $1,000, an annual coupon interest rate of 12%, and a 20-year maturity with 15% yield to maturity (YTM). The company has a dividend yield of 4%, an expected constant growth rate of 8%, and the market price of common stock at $60 per share. The company's marginal tax rate is 40%.

17.1 Calculate Win Hom's **market value** capital structure. (10 Points)

Answer: MV of Common Stock = 1 million x 60 = 60 Million
MV of Debt = 30,000 x 812.22 = 24,366,600
Hence, We = 71.12% and Wd = 28.88%.

17.2 Find the component after-tax costs of debt and cost of common stock. Then, calculate weighted average cost of capital (WACC) under the current market capital structure. (10 Points)

Answer: Re = 4% + 8% = 12%
Rd x (1-t) = 15% x (1 – 40%) = 9%
Hence, WACC = 12% x (0.7112) + 9% x (0.2888) = 11.1336%

17.3 If Win Hom Production plans to raise $40 million capital for new projects, in order to maintain the present market capital structure, how much of the new investment must be financed by common equity? What could be the reason why Win Hom wants to maintain the current capital structure? (5 Points)

Answer: New common equity to be raised = 71.12%($40 million)
The reason is to maintain optimal capital structure.

17.4 (10 Points) ***Qualitatively speaking***, what will happen to the WACC if:

(1) There is not enough internal cash flow and Win Hom must issue new shares of stock with the flotation cost?
Answer: WACC increases, due to higher cost of equity.

(2) The new projects of Win Hom are more risky?
Answer: WACC increases, since Rd and Re are higher.

Question 18 (30 Points)

MAMAMIA reported its total market value as January 1 at $80 million. During the year, the company plans to raise and invest $30 million in new projects. The firm's present market value capital structure, shown below, is considered to be optimal. There is no short-term debt.

Debt	$30,000,000
Common equity	50,000,000
Total capital	**$80,000,000**

New bonds will have a 9% coupon rate, and they will be sold at par. MAMAMIA's current EPS is $6.50. It was $4.42 five years ago. The company pays out 40% of its earnings as dividends, and the stock sells for $36.

18.1 What are the historical growth rate in earnings of MAMAMIA and next expected dividend per share, assuming the past growth rate will continue? Given this information, what is cost of equity? **(10 points)**

Answer: Solving for g from $4.42 \times (1 + g)^5 = 6.50$, we have g = 8.0185%
Next dividend or D1 = 6.50 x (1+8.0185%) x 40% = 2.8085
Cost of equity = Re = 15.8199%

18.2 Calculate weighted average cost of capital (WACC) under the current market capital structure assumed tax is paid at 40%. **(5 points)**

Answer: From that We = 62.5% and Wd = 37.5%
WACC = 11.9124%

18.3 In order to maintain the present capital structure, how much of the new investment must be financed by common equity? What could be the reason why MAMAMIA wants to maintain the current capital structure? **(5 points)**

Answer: New capital is to be financed as equity = 62.5% x 30 = 18.75.
Possible reason to maintain current capital structure is that it is already an optimal level which results in maximum firm value and lowest WACC.

18.4 **(10 points)** ***Qualitatively speaking***, what will happen to the WACC if:

(1) There is not enough internal cash flow and MAMAMIA must issue new shares of stock with the flotation cost?

Answer: WACC will increase, due to higher Re.

(2) The new projects of MAMAMIA are more risky?

Answer: WACC will increase, because of higher Rd and Re.

Question 19 (30 Points)

iPhome Co. Ltd. reported its capital structure as follows:

- 8.5 million shares of common stocks selling at $34 in the market;
- 200,000 shares of preferred stocks with selling price of $83 a share (it was estimated 7% return per annum); and
- 85,000 shares of 15-year corporate bonds with 8.5% coupon interest rate sold at par or $1,000.

The company uses the CAPM to estimate its cost of common equity. It estimates that the risk-free rate is 5%; the market risk premium from 6-month T-bills is 6%, and from 6-year Government Bond is 9%; company's beta is 1.20; and the company's tax rate is 35%.

19.1 Find the component after-tax costs of debt, preferred stock, and common stock. **(5 points)**

Answer:

Source	Cost
CS	15.80%
PS	7.00%
Bond	5.53%

19.2 Calculate market value of iPhome's capital structure and percentage of each source of capital. **(10 points)**

Answer:

	Price	Number	MV	Wi
CS	34	8.5	289	73.99%
PS	83	0.2	16.6	4.25%
Bond	1000	0.085	85	21.76%
		Total Capital	**390.6**	**100%**

19.3 iPhome considers to have a new production base in China in order to lower costs from local production and increase revenues from international market. If this new project has the same risk level as company's other projects, what will be an appropriate *discount rate* for project analysis given the same percentages of each source of capital? **(5 points)**

Answer:

	Price	Number	MV	Cost	Wi	WACC
CS	34	8.5	289	15.80%	73.99%	11.69%
PS	83	0.2	16.6	7.00%	4.25%	0.30%
Bond	1000	0.085	85	5.53%	21.76%	1.20%
		Total Capital	390.6		100%	**13.19%**

WACC = 13.19%

19.4 **(10 points)** ***Qualitatively speaking***, what will happen to the WACC of iPhome if:

(1) iPhome issues new shares of common stock with higher flotation cost?
Answer: WACC increases due to higher Re.

(2) The new project is granted considerably lower tax rate?
Answer: WACC increases due to higher portion from cost of debt, Rd(1-t).

Question 20 (35 Points)

Cookie Win Manufacturing has the following capital structure, which it considers to be optimal:

- ***Debt***: 5,000 7 percent coupon bonds outstanding, $1,000 par value, 20 years to maturity, selling for 92 percent of par; the bonds make semiannual payments.
- ***Common stock***: 100,000 shares outstanding, selling for $57 per share; the beta is 1.15.
- ***Preferred stock***: 13,000 shares of 7 percent return preferred stock outstanding, currently paying dividend for $8 per share.

Assume the company's tax rate is 35 percent. From current market condition, it is found that market return is at 14 percent, and the 6-month T-bills and the 6-year government bonds are at 4 percent and 6 percent, respectively.

20.1 What are Cookie Win Manufacturing's capital structure weights on a market value basis? **(10 points)**

Answer:

	#share	Price	Cost	MV	Wi
Debt	5,000	920	7.80%	4,600,000.00	39.03%
CS	100,000	57	15.20%	5,700,000.00	48.36%
PS	13,000	114.29	7.00%	1,485,714.29	12.61%
			Total	11,785,714.29	100.00%

20.2 Find the component after-tax costs of debt, cost of common stock, and cost of preferred stock. Then, calculate weighted average cost of capital (WACC) under the current market capital structure. **(10 points)**

Answer:

	#share	Price	Cost	MV	Wi
Debt *(AF)*	5,000	920	5.07%	4,600,000.00	39.03%
CS	100,000	57	15.20%	5,700,000.00	48.36%
PS	13,000	114.29	7.00%	1,485,714.29	12.61%
			Total	11,785,714.29	100.00%

beta	1.15
Rf	6%
Rm	14%
WACC	**10.2125%**

20.3 If Cookie Win Manufacturing plans to raise $15 million capital for new projects, in order to maintain the present market capital structure, how much of the new investment must be financed by equity? Furthermore, if this new project has higher risk level than company's other projects, what will be an appropriate *discount rate* for project compared with WACC obtained from **(5.2)**? **(10 points)**

Answer:

Total capital	15
New Equity	7.2545

The appropriate discount rate should be HIGHER than **10.2125**%

20.4 *Qualitatively speaking*, if Cookie Win Manufacturing issues new shares of common stock with flotation cost, do you think CAPM is still an appropriate tool to estimate cost of equity? If not, what should be an alternative approach? **(5 points)**

Answer:
CAPM seems to be no longer an appropriate tool.
We should use dividend discounted model.

CAPITAL STRUCTURE DECISION

Question 21 (30 Points)

Minnie Ltd. is trying to determine its optimal capital structure, which now consists of only debt and common equity. In order to get information how much debt would cost at different levels, the company consulted with investment bankers and got the following table:

Long-term debt fraction (W_D)	Equity fraction (W_E)	Before-tax cost of debt (R_D)
0	100%	7%
20%	80%	8%
40%	60%	10%
60%	40%	12%
80%	20%	15%

* The company does not currently use preferred stock in its capital structure, and it does not plan to do so in the future.

Minnie uses the CAPM to estimate its cost of common equity, Rs. The company estimates that the risk-free rate is 5%; the market risk premium is 6%, and the company's tax rate is 40%. Elliott estimates that if it had no debt, its "unlevered" beta, bU, would be 1.20.

21.1 Without numerical calculation, what would be criteria when the company wants to decide its optimal capital structure? (5 Points)

Answer: At level at which (1) firm value is maximized or (2) WACC is minimized.

21.2 Given the above information, what is the weighted average cost of capital (WACC) when company has no debt? (5 Points)

Answer: (Wd = 0%): WACC = Re = 12.20%

21.3 What would be the weighted average cost of capital (WACC) under different levels of debt (starting from 20%)? Determine at which level debt should be financed? Why? (20 Points)

Answer:

Wd = 20%	new beta =	1.38	Wd = 60%	new beta =	2.28
	new Re =	13.2800%		new Re =	0.1868
	new Rd =	8%		new Rd =	0.12
	WACC =	**11.5840%**		**WACC =**	**11.7920%**
Wd = 40%	new beta =	1.68	Wd = 80%	new beta =	4.08
	new Re =	15.0800%		new Re =	0.2948
	new Rd =	10%		new Rd =	0.15
	WACC =	**11.4480%**		**WACC =**	**13.0960%**

Thus, Wd = 40% is the optimal capital structure of company.

Question 22 (30 Points)

Beckman Company has a total market value of $100 million, consisting of 50% debt and 50% equity. The company's EBIT is $13.24 million, and its tax rate is 40%. Beckman can change its capital structure either by increasing its debt to 70% (based on market values) or decreasing it to 30%. If it decides to ***increase*** its use of leverage, it must call its old bonds and issue new ones with a 12% coupon. If it decides to ***decrease*** its leverage, it will call its old bonds and replace them with new 8% coupon bonds.

The company will sell or repurchase stock at the new equilibrium price to complete the capital structure change. The firm pays out all earnings as dividends; hence its stock is a zero-growth stock. The beta on its common stock at the current level of debt is 1.5, the risk-free rate is 6%, and the market risk premium is 4%

22.1 Without numerical calculation, what would be criteria when the company wants to decide its optimal capital structure? **(5 points)**

Answer: At level at which (1) firm value is maximized or (2) WACC is minimized.

22.2 What is Beckman Company's unlevered beta? And what will be the new beta and new cost of equity under different debt levels (e.g. 30% and 70%)? **(10 points)**

Answer: Unlevered beta = 1.5 / [1 + (1-40%)x(50%/50%)] = 0.9375

Wd 30%	new beta =	1.178571429

	new Re =	10.71%
	new Rd =	8%
	WACC =	8.94%
Wd 70%	new beta =	2.25
	new Re =	15.00%
	new Rd =	12%
	WACC =	9.54%

22.3 What is the firm's WACC and total corporate value under each capital structure – one is to increase debt to 70%, and the other one is to decrease debt to 30%? **(10 points)**

Answer:

Wd 30%	**WACC =**	8.94%
	Corporate value =	88.85906
Wd 70%	**WACC =**	9.54%
	Corporate value =	83.27044

22.4 Determine at which level debt should be financed? Why? **(5 points)**

Answer: Beckman Company should increase debt level to be at 30%, since firm value is higher than at 30% and also for WACC.

Question 23 (30 Points)

Winnie Company has a total market value of $100 million in its capital structure, consisting of 1 million shares selling for $50 per share and $50 million of 10% perpetual bonds now selling at par. The company's EBIT is $15 million, and its tax rate is 35%. Winnie can change its capital structure either by increasing its debt to 70% (based on market values) or decreasing it to 30%.

- If it decides to ***increase*** its use of leverage, it must call its old bonds and issue new ones at par with a 12% coupon.
- If it decides to ***decrease*** its leverage, it will call its old bonds and replace them with new 8% coupon bonds at par. The company will sell or repurchase stock at the new equilibrium price to complete the capital structure change.

The company pays out all earnings as dividends; hence its stock is a zero-growth stock. The beta on its common stock at the current level of debt is 1.25, the risk-free rate is 5%, and the market risk premium is 8%.

23.1 Without numerical calculation, do you agree that the company's optimal capital structure should be the level that debt is as high as possible? **(5 points)**

Answer:

No. - The costs of debt and equity are to be increasing due to higher debt = higher risk.
- We should focus on the objectives of firm value maximization or WACC minimization.

23.2 What is Winnie Company's unlevered beta? At current capital structure, what is the weighted average cost of capital (WACC), firm value, and equity value per share? **(10 points)**

Answer:

beta_u	**0.7576**	beta_50	1.25
WACC_50	**0.1075**	Rf	5%
		MRP	8%
		Re_50	**15.00%**

Firm Value	**90.6977**
E value / share	**45.35**

23.3 What are the company's WACC and total corporate value under each capital structure – one is to increase debt to 70%, and the other one is to decrease debt to 30%? Also, calculate firm value, and equity value per share under each scenario. **(10 points)**

Answer:

EBIT	15		
Wd =	0.7	Wd =	0.3
We =	0.3	We =	0.7
beta_70	1.9066	beta_70	0.9686
Re	20.25%	Re	12.75%
Rd	12%	Rd	8%
WACC	**11.5358%**	**WACC**	**10.48%**
Firm Value	**84.5198**	**Firm Value**	**92.9967**
E value / share	**42.26**	**E value / share**	**46.50**

23.4 Determine at which level debt should be financed? Why? **(5 points)**

Answer:

Should be at level of Wd = 30% since we could get minimum WACC and maximum Firm Value!

Question 24 (30 Points)

OMG Corp. is planning for restructuring of its capital structure, which currently consists of 50% of common equity and 50% of debt. It has 1 million shares of common stocks outstanding. The company will sell or repurchase stock at the new equilibrium price to complete the capital structure change. For long-term debt use, it is considering the following choices at different desired levels:

- The company can ***increase*** its leverage to 70% by calling its old bonds and issuing new ones with a 12% cost of debt; or
- The company can ***decrease*** its use of leverage to 30%% by calling its old bonds and replacing them with new 8% coupon bonds.

OMG Corp. has EBIT at $2,800,000 with marginal tax rate at 40%. At current capital structure, the company pays 10% before-tax cost of debt. The firm pays out all earnings as dividends; hence, its stock is a zero-growth stock. The beta on its common stock at the current level of debt is 1.15, the risk free rate is 4%, and average market return is at 12%.

24.1 Under this scenario, what would be criteria for OMG Corp. to decide whether its optimal capital structure should be at 70% or 30% debt level? **(5 points)**

Answer: Choose capital structure that leads to
- Min WACC or
- Max Firm Value

24.2 At current capital structure, what is unlevered beta of the company? What are the current weighted average cost of capital (WACC), firm value, and equity value per share? **(10 points)**

Answer:

Debt	Unlevered beta =	0.71875
0.5	re	0.132
	af rd	0.06
	WACC	0.096
	Firm Value	17.5
	Equity value (and per share)	8.75

24.3 What is the firm's WACC and total corporate value under each capital structure – one is to increase debt to 70%, and the other one is to decrease debt to 30%? Also, calculate firm value, and equity value per share under each scenario. **(10 points)**

Answer:

Debt		
0.7	new b	1.7250
	re	0.1780
	af rd	0.0720
	WACC	0.1038
	Firm Value	16.1850
	Equity value (and per share)	4.8555

0.3	new b	0.9036
	re	0.1123
	af rd	0.0480
	WACC	0.0930
	Firm Value	18.0645
	Equity value (and per share)	12.6452

24.4 Determine at which level debt should be financed? Why? **(5 points)**

Answer: At debt = 30%

TIME VALUE OF MONEY

Question 25 (30 Points)

When you were born, your dear old Uncle Winnie promised to deposit $1,500 in a savings account for you on each and every one of your birthdays, beginning with your first. The savings account bears a 7 percent compound annual rate of interest.

25.1 Draw the saving time lines of your money. **(5 Points)**

Answer:

25.2 Suppose you have just turned 20 and want all the cash. How much would you have received? **(10 Points)**

Answer:

Total money in an account would be = **61,493.24**

N	I/Y	PMT	PV	FV
20	7%	1,500	0	?

25.3 Ignore the amount from (25.2) since it turns out that dear old (forgetful) Uncle Winnie forgot making deposits on your fifth, seventh, and eleventh birthdays. How much is in the account now – on your twentieth birthday? **(10 Points)**

Answer:

FV of the 5th year = - 4,138.55
FV of the 7th year = - 3,614.77
FV of the 11th year = - 2,757.69

Total money in an account would be
= 61,493.24 - 4,138.55 - 3,614.77 - 2,757.69
= **50,982.23**

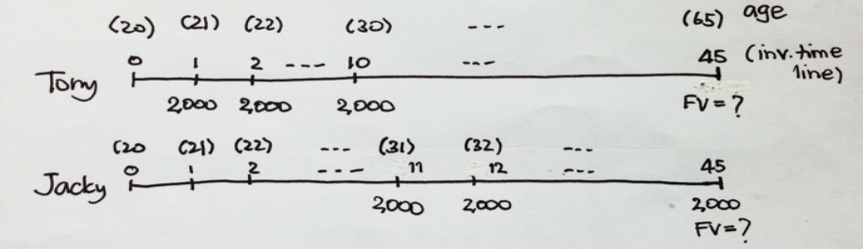
Question 26 (30 Points)

Tony has decided to start saving for his retirement. Beginning on his twenty-first birthday, Tony plans to invest $2,000 each birthday into a savings investment earning a 7 percent compound annual rate of interest. He will continue this savings program for a total of 10 years and then stop making payments. But his savings will continue to compound at 7 percent for 35 more years, until Tony retires at age 65.

Jacky also plans to invest $2,000 a year, on each birthday, at 7 percent, and will do so for a total of 35 years. However, he will not begin his contributions until his thirty-first birthday.

26.1 Draw the investment time lines of Tony's and Jacky's plans. (5 Points)

Answer:



26.2 How much will Tony's and Jacky's savings programs be worth at the retirement age of 65? (10 Points)

Answer:

Tony's FV = 2,000 x ($FVIFA_{7\%, 10 \text{ years}}$) x ($FVIF_{7\%, 35 \text{ years}}$)
= 295,026.864

Jakky's FV = 2,000 x ($FVIF_{7\%, 35 \text{ years}}$)
= 276,480

26.3 Who is better off financially at retirement, and by how much? (5 Points)

Answer:

Tony has more saving from his program, which is higher than Jakky's
= 295,026.864 – 276,480
= 18,546.864

Question 27 (30 Points)

An executive of Win Hom Company Limited plans to retire at age 65 and expects to live more 10 years. He wants to receive the following annual money for living from retirement until death.

Year (after retirement)	1-5	6-7	8-10
Cash	$10,000	$12,000	$15,000

As a financial planning consultant, please help this executive by answering the following questions.

27.1 Draw the financial planning time line of this executive. **(5 Points)**

Answer:

Year	0	1	2	3	4	5	6	7	8	9	10
Cash		10,000	10,000	10,000	10,000	10,000	12,000	12,000	15,000	15,000	15000

27.2 Assuming an average 8% rate of return he can earn after retirement, calculate the amount he must have available at age 65 in order to receive annual money as shown in the table. **(10 Points)**

Answer:

Age	65	66	67	68	69	70	71	72	73	74	75
Year	0	1	2	3	4	5	6	7	8	9	10
Cash		10,000	10,000	10,000	10,000	10,000	12,000	12,000	15,000	15,000	15000
PV		9,259.26	8,573.39	7,938.32	7,350.30	6,805.83	7,562.04	7,001.88	8,104.03	7503.73	6947.9

Sum	77,046.6907

27.3 Suppose he is 55 years old now. Given the amount from (27.2), if he plans to save annually during his working period starting at the end of his 55th year, how much annuity must he invest into a savings program earning an 8% compound annual rate of interest? **(10 Points)**

Answer:

FV =	77,046.69
FVIFA =	14.486562
Annuity =	**5,318.49**

Question 28 (30 Points)

Jammy and Tony, a 20-year-old officer, have planned for their retirement. Both will retire at age 65 and expect to live to age 75. Assume an annual compound interest rate is fixed at 8% for the whole period of investment. Please suggest them by answering the following questions.

28.1 If they want to receive $15,000 annually from retirement until death, what will be the amount they must have available at retirement (at age 65)? Draw an investment time line and show your calculation. **(10 Points)**

Answer:

The amount they must have available at retirement (at age 65)

= **100,651.22**

N	I/Y	PMT	PV	FV
10	8%	15,000	?	0

28.2 For Tony, he will start saving on his thirty-first birthday until retirement. In order to have the total amount from (28.1), how much does he need to save equally each year? **(10 Points)**

Answer:

The amount he must save equally each year = **584.1057**

N	I/Y	PMT	PV	FV
35	8%	?	0	100,651.22

28.3 Jammy plans to start an annuity saving on his twenty-first birthday for a total of 10 years and then stop making payments. However, his savings will continue to compound at 8 percent until he retires at age 65. In order to have the total amount from (28.1), how much does he need to save equally each year? **(10 Points)**

Answer:

From that

$$100,651.22 = A \times FVIFA_{(8\%,10)} \times (1+8\%)^{35}$$

$$6,807.4992 = A \times FVIFA_{(8\%,10)}$$

Hence, the amount he must save equally each year = **469.9182**

N	I/Y	PMT	PV	FV
10	8%	?	0	6,807.4992

28.4 According to your answers in (28.2) and (28.3), who could have less saving each year but get the same amount of (28.1)? Explain possible reasons. **(5 Points)**

Answer:

Jammy could have less saving, but get the same required amount. This is because he starts saving first, so he has longer investment period. Even though a shorter period of deposit, thanks to the 8% rate of return, he could eventually earns the same amount.

Question 29 (30 Points)

Tony is 35 years of age and expects to work until the age of 60. He is considering to save $8,000 every year with the Philo Life Insurance Company, starting from the end of his 35 years old. Assume the approximate rate of return is 8%.

29.1 Please draw an investment time line of Tony's investment plan. What will be the amount Tony must have available at retirement? **(10 Points)**

Answer:

N	I/Y	PV	PMT	FV
25	**8%**	**0**	**8,000**	**?**

FV = 584,847.5196

29. 2 After careful consideration, Tony realizes that he could save $2,000 more for 10 consecutive years in the investment plan. Assuming 8% rate of return, would you recommend Tony to save in the first 10 years or the last 10 years? Show your calculation to support the suggestion. **(15 Points)**

Answer:

The first 10 years: => FV = 676,755.1724

N	I/Y	PV	PMT	FV	FV+15
10	8%	0	10,000	**144,865.6247**	**459,538.261**

N	I/Y	PV	PMT	FV	
15	8%	0	8,000	**217,216.9114**	

The last 10 years => FV = 613,820.6445

N	I/Y	PV	PMT	FV
25	8%	0	8,000	**584,847.5196**

N	I/Y	PV	PMT	FV
10	8%	0	2,000	**28,973.1249**

29. 3 Tony expects to live for more 12 years after retirement. Suppose his saving plan yields 10% of return for the period after retirement. How much could Tony spend each year given the total amount at retirement from (29.1)? **(10 Points)**

Answer:

N	I/Y	PV	PMT	FV
12	**10**	**584,847.5196**	**?**	**0**

PMT = 85,834.16

Question 30 (30 Points)

Tony is 38 years old and expects to retire at the age of 65. He wishes to provide saving for himself and is considering an annuity contract with the Philo Life Insurance Company. Such a contract pays him an equal- dollar amount each year that he lives after retirement. According to actuary tables, his life expectancy after retirement is 15 years, and that is the duration on which the insurance company bases its calculations regardless of how long he actually lives.

30. 1 If Philo Life uses a compound annual interest rate of 5 percent in its calculations, what must be the insurance cost when Tony retires in order to provide him an annuity amount of $15,000 per year? **(10 Points)**

Answer:

N	I/Y	PV	PMT	FV
15	**5%**	**?**	**15,000**	**0**

PV = 155,694.87

30. 2 If Tony wants to pay the insurance cost as an annuity payment at the end of the year for the rest of his working period, how much does he have to pay? Assume a compound annual interest rate of 5 percent**. (10 Points)**

Answer:

Tony is now 38 years old (= year 37 in the investment timeline). Assuming he would make payment at the end of the year, there are thus 65-37 = 28 years left from now.

N	I/Y	PV	PMT	FV
28	5%	0	?	155,694.87

PMT = 2,665.89

30. 3 Tony realizes that he has another possible investment plan, which is the Retirement Mutual Fund (RMF). This option yields only 3% return, but requires him to save $7,000 each year for the rest of his working period. If he chooses this plan, how much will he have at the retirement year? Is it better than saving with Philo Life? Why? **(15 Points)**

Answer:

N	I/Y	PV	PMT	FV
28	3%	0	7,000	?

FV at 65 = 300,516.46. **So, this plan is better.**