ENG 111 Winter 2013 Final Exam

1) (contributed by the guest speaker) (1 point) Name three types of private equity investments and the corresponding company stage / life cycle.

(Any three of the following would work, give 1/3 points for each)

Angel - Idea stage / early stage

Incubator - Idea stage / early stage

Venture Capital - Early stage / Growth stage

Growth Capital - Growth stage

Buyout - Mature / Distressed

Distressed or Special Situations - Distressed

2) (contributed by the guest speaker) (1 point) Which of the following was NOT discussed as a factor contributing to a thriving startup community in Southern California?

a) Ecosystem of top universities and academics

b) Incubators

c) Venture Capital firms

d) Recession

e) Stock Market

3) (contributed by the guest speaker) (1 point) As an engineer, what is a potential pitfall one can encounter when entering a corporate environment?

(Any one of the following would work)

The perception of being overly technical
Lack of familiarity with business terms and customs
Difficulty seeing the "big picture"

4) Each TRUE/FALSE question is worth 2 points. For each, circle TRUE or FALSE and EXPLAIN your reasoning with a few sentences.

TRUE/FALSE: At the accounting break-even point, the IRR is zero.

At the accounting break-even point, (sales price-variable cost) just covers the initial cost and fixed cost. Hence, there is no return obtained.

TRUE/FALSE: At the financial break-even point of a project, payback period must be less than the length of the project.

At the financial break-even point, initial cost, fixed cost, as well as the opportunity cost of initial cost is covered. Hence, during the lifetime of the project, more than initial cost has been obtained as cash inflow. Since payback period is the time in which the initial cost is covered, it must be less than the life of the project.

TRUE/FALSE: Geometric average would be more useful in guessing the return of an asset in a given year in the future than the arithmetic average would.

Arithmetic return would give the expected value within a given year. It does not involve compounding. Geometric return is better for assessing how well an investment has done in the past.

TRUE/FALSE: At the financial break-even point, IRR is the same as the market rate.

At the financial break-even point, we do not only cover the initial investment dollar for dollar, we also cover the opportunity cost, that is, the money that could have been made by investing it in the market. Hence, every dollar we invest brings as much as the market. This implies that the Internal Rate of Return is equal to the market rate.

TRUE/FALSE: If added to a positive beta portfolio, a negative beta asset would reduce the overall beta. For this reason, a rational investor would demand a positive premium for a negative beta asset.

A negative beta asset would reduce the riskiness of the portfolio. Then, it acts as an insurance policy. Then we are ready to pay for this policy by accepting a lower rate (negative premium).

TRUE/FALSE: If the return of asset A is twice as sensitive to market changes as asset B, then investors would demand twice as much risk premium (extra return over the risk free rate) from A.

A's beta is twice that of B. Then, according to CAPM model

$R_B = R_F + \beta_B (R_M - R_F)$

$R_A = R_F + \beta_A (R_M - R_F) = R_F + 2\beta_B (R_M - R_F)$

Then, extra return over the risk free rate (the risk premium) for asset A is $2\beta_B (R_M - R_F)$ which is twice as much as B's risk premium; $\beta_B (R_M - R_F)$.

TRUE/FALSE: "The Separation principle" refers to the following:

> In order to calculate the Incremental Internal Rate of Return, first take the difference between two different projects' cash flows and then calculate the Internal Rate of Return of this new cash flow.
>
> *Separation Principle refers to the fact that any investor would first find the optimal portfolio which is composed of risky assets without taking into account his risk tolerance level. Then, after finding the optimal portfolio*

(market portfolio), he will combine it with the risk free asset to achive the desired (return,risk) combination.

TRUE/FALSE: As the total money invested on the market portfolio goes up, the idiosyncratic risk the market portfolio has goes down.

The amount of money invested on a portfolio does not change the idiosyncratic (unsystematic) risk level of a portfolio. Rather, the diversity of the portfolio, that is, the number of different assets in a portfolio affect the idiosyncratic risk. As more assets are added to a portfolio, the variability of each offset the other and the idiosyncratic risk goes down. It does not matter whether I invested $100 or $1 million on each asset.

TRUE/FALSE: In the context of the dividend growth model, the growth rate in dividends and the growth rate in the price of the stock are identical.

If the price of stock A is $P_A=Div/(r-g_A)$ today, a year from now it will be $P_A=(1+g_A)Div/(r-g_A)$. So, if the dividends are growing at a certain rate, the price of the stock will be growing at the same rate.

5) (10 points) Assume stocks A and B have the following characteristics:

Stock	Expected Return(%)	Standard Deviation(%)
A	9	22
B	15	45

The covariance between the returns on these two stocks is 0.001.

a. If the expected return of the minimum variance portfolio of two assets equals to 10.14%, what percentage of the portfolio is invested on stock A?
E(.) ist he expected value, w_A is the share of stock of A and w_B is the share of stock B.
$E(R_P) = w_A E(R_A) + w_B E(R_B)$
$E(R_P) = w_A E(R_A) + (1-w_A) E(R_B)$

$0.1014 = w_A (.09) + (1-w_A)(0.15)$

$w_A = .8096$

b. What is the standard deviation of the minimum variance portfolio?

. $\sigma_P^2 = w_A^2 \sigma_A^2 + w_B^2 \sigma_B^2 + 2 w_A w_B Cov(A,B)$

$\sigma_P^2 = .8096^2 .22^2 + .1904^2 .45^2 + 2 * .8096 * .1904 * .001$

σ_p^2 =.0394

The square root is the standard deviation: 19.84%

c. A risk averse investor would like to put some portion of her money on this minimum variance portfolio. She will put the rest of her money on the risk free asset. Overall she does not want have a risk level higher than 10%. What is the maximum expected return she can get if the risk free rate is 3%?

The standard deviation of the new portfolio is 10%. If the weight of risk-free asset is w_F and the weight of the min-var portfolio is w_M we have:

$(0.10)^2=(w_F\ \sigma_F)^2+(w_M\ \sigma_M)^2+2w_Fw_MCov(F,M)$

Since the standard deviation of the risk-free rate and the covariance between the risk-free rate and the minimum-variance portfolio rate are zero, we have: $(0.10)^2=(w_M\ \sigma_M)^2=(w_M)^20.0394$. *Hence, the percentage invested on minimum-variance portfolio is 50.38%. Then the weight of the risk-free asset is 1-0.5038=0.4962.*

maximum expected return = .5038.10.14+.4962*.03 = 6.60%*

d. Another investor, who is not so risk averse, would like to invest on the minimum variance portfolio and obtain an expected return of 15%. What percentage of his portfolio is going to be coming from borrowed money?

0.15 = x 0 .1014+(1-x) .03

x=1.68

168% of his money is invested on the minimum var portfolio and -68% is invested on risk free rate. This means he invests all of his own money on the min var portfolio and borrows 0.68 times more at the risk free rate and invests that on the min var portfolio as well.

(if the student makes the above calculation and says, all the money the investor has, borrowed or otherwise, 100% invested on the minimum variance portfolio, that is fine.)

e. What is the probability that he will lose half or more of the total money he invested?
We are looking for the probability that the realized return will be equal to or less than -50%. With prob 95% the return will be in the following interval:
*[15%-2*33%, 15%+2*33%] = [-49%,81%], then with prob 2.5% his return is 49% or less.*

f. Would he be better off by investing only on stock B?

No. By investing on only stock B, he would have an expected return of 15% at 45% risk level. By investing on 168%on the minvar and -68%on risk free, he gets 15% expected return at 33% risk (where risk is represented by the standard deviation).

6) (5 points) A portfolio that combines the risk-free asset and the market portfolio has an expected return of 9% and a standard deviation of 13%. The risk-free rate is 5%, and the expected return on the market portfolio is 12%. Assume that the capital asset pricing model holds. What expected rate of return would a stock, stock K, earn if it had a 0.45 correlation with the market portfolio and a standard deviation of 40% ?(beta of stock K , $\beta_K = (\rho_{K,M})(\sigma_I) / \sigma_M$)

First, we can calculate the standard deviation of the market portfolio using the Capital Market Line (CML). We know that the risk-free rate asset has a return of 5 percent and a standard deviation of zero and the portfolio has an expected return of 9 percent and a standard deviation of 13 percent. These two points must lie on the Capital Market Line. The slope of the Capital Market Line equals:

$Slope_{CML}$ = Increase in expected return / Increase in standard deviation
$Slope_{CML}$ = (.09 – .05) / (.13 – 0)
$Slope_{CML}$ = .31

According to the Capital Market Line:

$E(R_I) = R_f + Slope_{CML}(\sigma_I)$

Since we know the expected return on the market portfolio, the risk-free rate, and the slope of the Capital Market Line, we can solve for the standard deviation of the market portfolio which is:

$E(R_M) = R_f + Slope_{CML}(\sigma_M)$
$.12 = .05 + (.31)(\sigma_M)$
$\sigma_M = (.12 – .05) / .31$
$\sigma_M = .2275$ or 22.75%

Next, we can use the standard deviation of the market portfolio to solve for the beta of a security using the beta equation. Doing so, we find the beta of the security is:

$\beta_I = (\rho_{I,M})(\sigma_I) / \sigma_M$

$\beta_I = (.45)(.40) / .2275$

$\beta_I = 0.79$

Now we can use the beta of the security in the CAPM to find its expected return, which is:

$E(R_I) = R_f + \beta_I[E(R_M) - R_f]$

$E(R_I) = 0.05 + 0.79(.12 - 0.05)$

$E(R_I) = .1054$ *or* 10.54%

7) (6 points) You have observed the following returns on Corporation X's stock over the past five years: 34%, 16%, 19%, -21%, 8%. Suppose the average inflation rate over this period was 4.2% and and the average Treasury Bill rate was 5.1%.

a. What was the arithmetic average return over this five year period?

(34% +16% +19% - 21% + 8%) / 5 = 11.2%

b. What was the average real return?

Using the fisher formula: (1+real rate) = (1+nominal rate)/(1+inflation rate)

Either calculate the real rate for each year and take the average or, calculate the real rate as follows:

(1.112/1.042) - 1= 0.0672

c. What was the average nominal risk premium on Corporation X's stock?

Again, either calculate the risk premium for each year by taking the difference between the nominal rate and the T-bill rate each year and take the average or

11.2% - 5.1% = 6.1%

8) (6 points) Groupooff Inc. has $6.25 EPS now and every coming year if the firm makes no new investment and returns the earnings as dividends to the shareholders. The new CEO would like to change the company policy and retain 20% of the earnings beginning three years from today. He expects to invest the retained money each year and earn 11%, the return beginning one year after each investment is made. Market rate is 13%.

a. What is the price per share of Groupoff Inc. Stock today, if new investment will not be undertaken?

If the company does not make any new investments, the stock price will be the present value of the constant perpetual dividends. We need to find the stock price of the firm as a cash cow. In this case, all earnings are paid as dividends, so, applying the perpetuity equation, we get:

P = Dividend / R

P = $6.25 / 0.13

P = $48.08

b. If the new investment is expected to be made, what would the price of the stock be now?

We can think of at least two ways of solving this problem. The first one is:

The investment occurs every year in the growth opportunity, so the opportunity is a growing perpetuity. So, we first need to find the growth rate. The growth rate is:

g = Retention Ratio × Return on Retained Earnings

g = 0.20 × 0.11

g = 0.022 or 2.20%

Next, we need to calculate the NPV of the investment. During year 3, 20 percent of the earnings will be reinvested. Therefore, $1.25 is invested ($6.25 × .20). One year later, the shareholders receive an 11 percent return on the investment, or $0.138 ($1.25 × .11), in perpetuity. The perpetuity formula values that stream as of year 3. Since the investment opportunity will continue indefinitely and grows at 2.2 percent, apply the growing perpetuity formula to calculate the NPV of the investment as of year 2. Discount that value back two years to today.

NPVGO = [(Investment + Return / R) / (R – g)] / (1 + R)^2

NPVGO = [(–$1.25 + $0.138 / .13) / (0.13 – 0.022)] / (1.13)^2

NPVGO = –$1.39

The value of the stock is the PV of the firm without making the investment plus the NPV of the investment, or:

P = PV(EPS) + NPVGO

P = $48.08 – 1.39

P = $46.68

Alternative solution:

Cash Flow with the investment:

Year 0	*Year 1*	*Year 2*	*Year 3*	*Year 4*	*Year 5*
	6.25	*6.25*	*0.8*6.25*	*6.25+6.25*0.20*0.11* *=6.25 (1+g) 0.8*	*6.25 $(1+g)^2$ 0.8*

The pattern of dividends after year 5 is apparent from the above table. For year 6, dividends will be 6.25 $(1+g)^3$ 0.8, and for year 7, they will be

6.25 $(1+g)^4$ 0.8. etc…

*Price of the stock in year 2 with the investment = 6.25*0.80/r-g =5/.13-.022 =46.29*

Price of stock in year 0 will be then: 46.29/$(1.13)^2$ + 6.25/$(1.13)^2$ + 6.25/1.13 = $46.68

c. Is 20% retention ratio is the optimal ratio chosen by the new CEO given the above investment opportunity? If not, what should the retention ratio be to make this investment attractive?

Zero percent! There is no retention ratio which would make the project profitable for the company. If the company retains more earnings, the growth rate of the earnings on the investment will increase, but the project will still not be profitable. Since the return of the project is less than the required return (market rate) on the company stock, the project is never worthwhile. In fact, the more the company retains and invests in the project, the less valuable the stock becomes.

9) (6 points) You buy a 20-year Treasury Bond for a $1,000, with 6.5% coupon rate and $1,000 face value today. At the same time, your friend Michael buys a 2-year Treasury Bond for $1,000 with 6% coupon rate and $1,000 face value. Assume both Treasury bonds make coupon payments annually. Both you and Michael would like to sell your bonds, one year from today, right after you made your first coupon collections, when the market rate is 7%.

a. What is the return you got from your investment? What is Michael's return?

Your return:

Price of your bond at 7% one year after the bond is issued:

Bond value of a 20-year bond with a coupon rate of 6.5%, and a face value of $1,000 and with 19 years left to maturity is

$1,000/(1.07)^{19} + (65/0.07)*(1-(1/(1+0.07)^{19})) = 948.32$ and your return is (65+948.32)/1000=1.3%

Michael's return:

Price of Michael's bond at 7% one year after the bond is issued:

Bond value of a 2-year bond with a coupon rate of 6%, and a face value of $1,000 and with 1 year left to maturity is

1,000/(1.07) + (60/(1+0.07)) = 990.65 and Michael's return is (60+990.65)/1000=5%

b. Your mutual friend, David, does not make the calculations and predicts that you got a higher return since you had the higher coupon rate. Is David correct? Why or why not?

Michael got the higher return because:

his bond had the shorter term hence, he was not exposed to the interest rate risk. Market rate went up within the last year and longer term bond's price was affected more by this change.

The bond with the longest maturity is the most sensitive to interest rate changes!

Each multiple choice question is worth 2 points:

10) An analysis of what happens to the estimate of net present value when only one variable is changed is called _____ analysis.
A. forecasting
B. scenario
C. sensitivity
D. simulation
E. break-even

11) The present value break-even point is superior to the accounting break-even point because:
A. present value break-even is more complicated to calculate.
B. present value break-even covers the economic opportunity costs of the investment.
C. present value break-even is the same as sensitivity analysis.
D. present value break-even covers the fixed costs of production, which the accounting break-even does not.
E. present value break-even covers the variable costs of production, which the accounting break-even does not.

12) All else constant, a coupon bond that is selling at a premium, must have:
A. a coupon rate that is equal to the yield to maturity.
B. a market price that is less than par value.
C. semi-annual interest payments.
D. a yield to maturity that is less than the coupon rate.
E. a coupon rate that is less than the yield to maturity.

13) The mixture of debt and equity used by a firm to finance its operations is called:
A. working capital management.
B. financial depreciation.
C. cost analysis.
D. capital budgeting.
E. capital structure.

14). Working capital management:
A. ensures that sufficient equipment is available to produce the amount of product desired on a daily basis.
B. ensures that long-term debt is acquired at the lowest possible cost.
C. ensures that dividends are paid to all stockholders on an annual basis.
D. balances the amount of company debt to the amount of available equity.
E. is concerned with the upper portion of the balance sheet.

15) A project has an accounting break-even point of 2,000 units. The fixed costs are $4,200 and the depreciation expense is $400. The projected variable cost per unit is $23.10. What is the projected sales price?
A. $20.80
B. $21.00
C. $21.20
D. $25.40
E. $25.60

Accounting break-even Q = 2,000 = ($4,200 + $400) ÷ (P - $23.10); P = $25.40

16) Which of the following are advantages of the corporate form of business ownership?
I. limited liability for firm debt
II. double taxation
III. ability to raise capital
IV. unlimited firm life
A. I and II only
B. III and IV only
C. I, II, and III only
D. II, III, and IV only
E. I, III, and IV only

17) Dividends per share:
A. increase as the net income increases as long as the number of shares outstanding remains constant.
B. decrease as the number of shares outstanding decrease, all else constant.
C. are inversely related to the earnings per share.
D. are based upon the dividend requirements established by Generally Accepted Accounting Procedures.
E. are equal to the amount of net income distributed to shareholders divided by the number of shares outstanding.

18) Total assets are $900, fixed assets are $600, long-term debt is $500, and short-term debt is $200. What is the amount of net working capital?
A. $0
B. $100
C. $200
D. $300
E. $400

Net working capital = $900 - $600 - $200 = $100

19) Katelyn's Kites has net income of $240 and total equity of $2,000. The debt-equity ratio is 1.0 and the plowback ratio is 40%. What is the internal growth rate?
A. 2.46%
B. 3.00%
C. 4.92%
D. 5.88%
E. 6.00%

Total assets = $2,000 + $2,000 = $4,000 (The debt-equity ratio of 1.0 means TD = TE.); Return on assets = $240 ÷ $4,000 = .06; Internal growth = [.06 × .40] ÷ [1 - (.06 × .40)] = 2.46%

20) The highest effective annual rate that can be derived from an annual percentage rate of 12% is computed as:
A. 0.06e - 1
B. e^0.06 × 2
C. e × (1 +0.12)
D. (e^0.12)- 1
E. (1 +e^0 .12)

21) Todd is able to pay $160 a month for five years for a car. If the interest rate is 4.9%, how much can Todd afford to borrow to buy a car?
A. $6,961.36
B. $8,499.13
C. $8,533.84
D. $8,686.82
E. $9,588.05

22) Which one of the following statements is correct concerning the payback period?
A. An investment is acceptable if its calculated payback period is less than some pre-specified period of time.
B. An investment should be accepted if the payback is positive and rejected if it is negative.
C. An investment should be rejected if the payback is positive and accepted if it is negative.
D. An investment is acceptable if its calculated payback period is greater than some pre-specified period of time.
E. An investment should be accepted any time the payback period is less than the discounted payback period, given a positive discount rate.

23) An investment is acceptable if the profitability index (PI) of the investment is:
A. greater than one.
B. less than one.
C. greater than the internal rate of return (IRR).
D. less than the net present value (NPV).
E. greater than a pre-specified rate of return.

24) Matt is analyzing two mutually exclusive projects of similar size and has prepared the following data. Both projects have 5 year lives.

	Project A	Project B
Net present value	$15,090	$14,693
Payback period	2.76 years	2.51 years
Required return	8.3%	8.0%

Matt has been asked for his best recommendation given this information. His recommendation should be to accept:
A. project B because it has the shortest payback period.
B. both projects as they both have positive net present values.
C. project A and reject project B based on their net present values.
D. project B and reject project A based on other criteria not mentioned in the problem.
E. project B and reject project A based on both the payback period and the average accounting return.

25) You are considering a project with the following data:
Internal rate of return 8.7%
Profitability ratio .98
Net present value -$393
Payback period 2.44 years
Required return 9.5%

Which one of the following is correct given this information?
A. The discount rate used in computing the net present value must have been less than 8.7%.
B. The discounted payback period will have to be less than 2.44 years.
C. The discount rate used to compute the profitability ratio was equal to the internal rate of return.
D. This project should be accepted based on the profitability ratio.
E. This project should be rejected based on the internal rate of return.

26) A cost that has already been paid, or the liability to pay has already been incurred, is a(n):
A. salvage value expense.
B. net working capital expense.
C. sunk cost.
D. opportunity cost.
E. erosion cost.

27) The cash flows of a new project that come at the expense of a firm's existing projects are called:
A. salvage value expenses.
B. net working capital expenses.
C. sunk costs.
D. opportunity costs.
E. erosion costs.

28) Which of the following should be included in the analysis of a project?
I. sunk costs
II. opportunity costs
III. erosion costs
IV. incremental costs
A. I and II only
B. III and IV only
C. II and IV only
D. II, III, and IV only
E. I, II, and IV only

29) Wilbert's, Inc. paid $90,000, in cash, for a piece of equipment three years ago. Last year, the company spent $10,000 to update the equipment with the latest technology. The company no longer uses this equipment in its current operations and has received an offer of $50,000 from a firm who would like to purchase it. Wilbert's is debating whether to sell the equipment or to expand its operations such that the equipment can be used. When evaluating the expansion option, what value, if any, should Wilbert's assign to this equipment as an initial cost of the project?
A. $40,000
B. $50,000
C. $60,000
D. $80,000
E. $90,000

30) A project will increase sales by $60,000 and cash expenses by $51,000 annually. The project will cost $40,000 and will be depreciated using straight-line depreciation to a zero book value over the 4-year life of the project. The company has a marginal tax rate of 35%. What is the annual operating cash flow of the project?
A. $5,850
B. $8,650
C. $9,350
D. $9,700
E. $10,350

$$OCF = [(\$60{,}000 - \$51{,}000) \times (1 - .35)] + [(\$40{,}000 \div 4) \times .35] = \$9{,}350$$

31) A project is expected to create operating cash flows of $22,500 a year for three years. The initial cost of the fixed assets is $50,000. These assets will be worthless at the end of the project. An additional $3,000 of net working capital will be required throughout the life of the project. What is the project's net present value if the required rate of return is 10%?
A. $2,208.11
B. $2,954.17
C. $4,306.09
D. $5,208.11
E. $5,954.17

$$NPV = -\$50{,}000 - \$3{,}000 + \frac{\$22{,}500}{(1+.10)^1} + \frac{\$22{,}500}{(1.10)^2} + \frac{\$22{,}500 + \$3{,}000}{(1+.10)^3} = \mathbf{\$5{,}208.11}$$

CF_0	**-$53,000**
$C0_1$	**$22,500**
$F0_1$	**2**
$C0_2$	**$25,500**
$F0_2$	**1**
I = 10%	
NPV CPT	
$5,208.11	

32) The Mini-Max Company has the following cost information on its new prospective project. Calculate the present value break-even point.

Initial investment: $700
Fixed costs are $200 per year
Variable costs: $3 per unit
Depreciation: $140 per year
Price: $8 per unit
Discount rate: 12%
Project life: 3 years
Tax rate: 34%

A. 68 units per year
B. 75 units per year
C. 84 units per year
D. 114 units per year
E. None of the above