ENG 111 FINAL EXAM QUESTIONS

1. (8 points) Assume stocks A and B have the following characteristics:

Stock	Expected Return(%)	Standard Deviation(%)
A	10	20
B	15	35

The correlation between A and B is 0.3.

a. A risk averse investor would like to invest some part of her money on a risk free asset which is expected to return 3% and the remaining on the minimum variance portfolio that is formed by A and B. What percentage of the portfolio is invested on stock A if, overall, her risk level (standard deviation) is 8%?

Denote the overall portfolio formed by A, B, and risk free asset by P.
Denote the minimum variance portfolio that is formed by A and B by M.

Setting up the following equation 2 points
$\sigma_M^2 = w_A^2 \sigma_A^2 + (1-w_A)^2 \sigma_B^2 + 2 w_A \sigma_A (1-w_A) \sigma_B \rho_{AB}$

$\sigma_M^2 = w_A^2 (0.2)^2 + (1-w_A)^2 (0.35)^2 + 2 w_A 0.20(1-w_A) 0.35*0.3$

$\sigma_M^2 = w_A^2 0.04 + (1-w_A)^2 0.1225 + 0.042 w_A(1-w_A)$

Minimize with respect to w_A by taking the first derivative and equating it to zero:
$0.08 w_A - 2(1- w_A) 0.1225 + 0.042 w_A - 2*0.042 w_A = 0,$
$w_A = 0.8657$
to graders: please check to see if w_A is calculated correctly.

Finding w_A correctly 1 point

Then, $\sigma_M^2 = 0.037$

$\sigma_P^2 = w_M^2 \sigma_M^2$ (since the risk free asset has zero variance and zero correlation with the minimum variance portfolio formed above)

$0.08^2 = 0.037 w_M^2$
$w_M = 0.1726$

Finding w_M correctly 1 point

*Overall weight of stock A is 0.1726*0.8657=0.1495*

Finding overall weight of stock correctly 1 point

b. Another investor, who is not so risk averse, would like to invest on the minimum variance portfolio as well as the risk free asset and obtain an expected return of 18%. What percentage of his portfolio is going to be coming from borrowed money?

*Expected return of minimum variance portfolio is 0.8657*0.10+(1-0.8657)*0.15=0.1067 1 point*

$18\% = 3\%w_{riskfree} + 10.67\%(1 - w_{riskfree})$

$w_{riskfree} = -0.9557$ *2 points*

If the investor has $1,000, she will invest a total of $1955.7 where $995.7 of her portfolio ($995.7/$1,995.7 = 50%) os coming from borrowed money.

2. (2 points) You invested on a portfolio with 15% expected return 33% standard deviation. Given that the portfolio returns come from a normal distribution, what is the probability that you will lose half or more of the money you 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% return is -49% or less. Then, losing half or more of your money has a probability of around 2.5%.*

3. (3 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 annual inflation rate over this period was 4.2% and the average Treasury Bill rate was 5.1%.

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

(34% +16% +19% - 21% + 8%) / 5 = 11.2% 1 point

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 of the average as follows:

(1.112/1.042) - 1= 0.0672 = 6.72% 1 point

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

The real risk premium is the difference between the real average return of X and the real risk free rate, that is, the real Treasury Bill rate.

The real T-Bill rate 1.051/1.042-1=0.86%

Risk Premium is 6.72-0.86=5.86% 1 point

4. (4 points) A firm is considering raising funds either by issuing bonds or stocks. An investor is considering investing on the asset that will be issued by the firm. From the firm's point of view, what is good and what is bad about issuing a bond? How about issuing stock? How about from an investor's point of view? Please fill out the following table:

I filled out the following table with the items that I discussed in class. MENTIONING ONE ITEM FOR EACH IS ENOUGH. But it is possible that the student was able to figure out a different answer that is correct. Therefore, please pay attention to what the student writes even if it is different than what I say below. If you are not sure about a student's answer, let me know.

There are 8 answer cells in the following table. Each correct cell gets 0.5 points.

		Firm's point of view	Investor's Point of view
Bond	Good	*Interest is a cost item in income statement, therefore it reduces firm's tax liability.*	*-Safe investment since coupon payments and face value is fixed.* *-If the company goes to bankruptcy bondholders are the first to be paid.*
	Bad	*Company has to make the coupon and face value payments.*	*If the company grows fast and/or makes high profit, bond holder will not benefit.*
Stock	Good	*Firm does not have a direct obligation to pay dividends.*	*If the company grows fast and/or makes high profit, stock holder will benefit.*
	Bad	*Firm will need to achieve high performance to make its stock competitive in the market.*	*If the firm goes bankrupt, stocks will lose all of its value. Assets are liquidated but bond holders are paid first.*

5. (3 points) Sniurb, Inc. is a young start-up. It is estimated that the company will not be paying any dividends for the coming 8 years as it needs to use its earnings to fuel growth. The company is expected to pay dividends of $4.5 a share at year 9 and will increase the dividends at 5.5% per year thereafter. If the rate that can be applied to such a company is 13%, what is the current stock price?

(As long as the equations are correct, no need for explanation to get the full points)

Here we have a stock that pays no dividends for 8 years. Once the stock begins paying dividends, it will have a constant growth rate of dividends. We can use the constant growth model at that point. It is important to remember that general form of the constant dividend growth formula is:

$P_t = [D_t \times (1 + g)] / (R - g)$

This means that since we will use the dividend in Year 9, we will be finding the stock price in Year 8. The dividend growth model is similar the PV of a perpetuity: The equation gives you the PV one period before the first payment. So, the price of the stock in Year 8 will be:

$P_8 = D_9 / (R - g) = \$4.50 / (.13 - .055) = \$60.00$

The price of the stock today is simply the PV of the stock price in the future. We simply discount the future stock price at the required return. The price of the stock today will be:

$P_0 = \$60.00 / 1.13^8 = \$22.57$

6. (3 points) The Profit Margin, Total Asset Turnover and Equity Multiplier are 9.5%, 0.57, and 1.28 respectively for a company. If the market rate is 7%, would increasing Retention Ratio make an improvement in the stock price of the company?

No. If Return on Equity (ROE) is less than the market rate (the cost of capital) R, then the value of the company and the stock price is expected to go down.

$ROE = 0.095*0.57*1.28 = 0.069 = 6.9\% < R = 7\%.$

Calculating ROE gets 1 point. Comparing it to the market rate gets 2 points.

7. (3 points) CAFER, Inc. just paid a $12 dividend but the management expects to reduce the payout by 6% per year indefinitely. If the return on comparable firms is 11%, what would you pay for a share today?

Next period's dividend is 12(1-.06) = 11.28*

$P = Div / (R-g) = 11.28 / (0.11 – (-0.06)) = 11.28 /.17 = 66.35$

If student used this period's dividend instead of next period's dividend, take off 1 point.

8. (4 points) You bought a corporate bond one year ago for $943.82. The bond has $1000 face value and 7% coupon rate. These bonds make annual payments and mature six years from now. If you sell your bond today when the discount rate is 8% and if the inflation rate was 4.8% over the past year, what would be your total real return on the investment?

$P_1 = \$70(PVIFA_{8\%,6}) + \$1,000/1.08^6$
$= \$70(1/1.08^1 + 1/1.08^2 + 1/1.08^3 + 1/1.08^4 + 1/1.08^5 + 1/1.08^6) + \$1,000/1.08^6$
$P_1 = \$953.77$

Calculating the price of the bond correctly gets 2 points.

You received the coupon payments on the bond, so the nominal return was:

$R = (\$953.77 – 943.82 + 70) / \$943.82$
$R = .0847 \text{ or } 8.47\%$

Calculating the nominal return correctly gets 1 point.

And using the Fisher equation to find the real return, we get:

$r = (1.0847 / 1.048) – 1$
$r = .0350 \text{ or } 3.50\%$

Calculating the real return correctly gets 1 point.

9. (3 points) You own Corporation X bonds that have 1 year to maturity, $1,000 face value and 10% coupon rate. The promised yield on this bond is 12% today. However, there is a 5% chance

that you will only get half of what is promised from now on. What is the market rate? (hint: remember that the market rate is the rate that your alternative investments offer)

The price of the bond is P = 1,100/1.12 = $982.14 1 point.

The promised cash flow is $1,100.

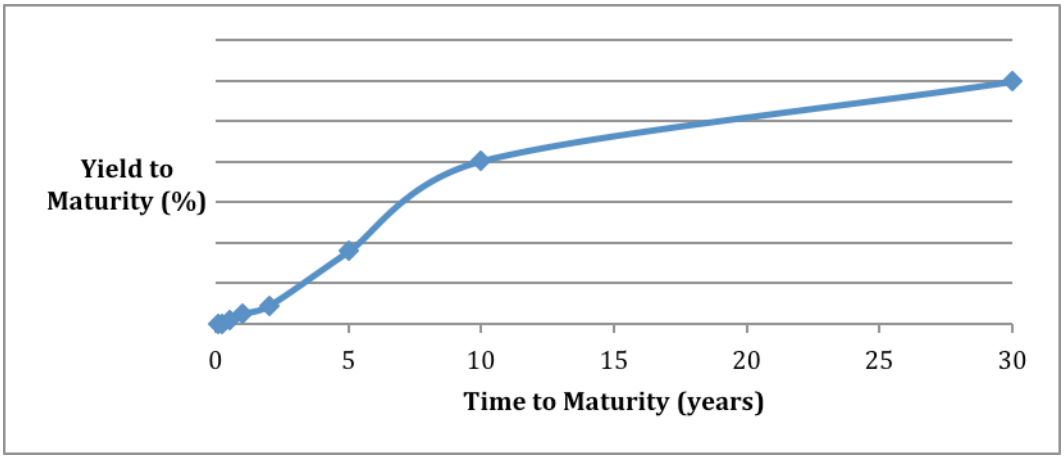
*However, the expected cash flow is 1,100 * 0.95 + 550 * 0.05 = $1,072.5 1 point. (Student might have set up this equation in present value terms rather than future value as it is set up here. Both are correct.)*

Then, the expected rate this investment offers should match the market:

$982.14 = 1,072.5/(1+r)

r = 9.2% 1 point

10. (4 points) a) Draw the Yield Curve for US Treasuries. What kind of a shape does it have? Be sure to label both axes. You do not need to show units.



2 points: Accept it as correct as long as the slope is positive and labels are correct.

b) What does an "inverted yield curve" mean and what does it signify?

Inverted yield curve refers to a case where short term rates are higher than long term rates, that is the Yield Curve has negative slope.

Data shows that, this can be a leading indicator of recession. Thus far is enough to get full points (2 points).

As people's expectations of the economy worsens, they expect that they will not be able get high returns in the future, then, they sell short term bonds and buy long term bonds (by locking their money to high rates now). The price of short term bonds go down, increasing their yield and the price of long term bonds go up decreasing their yield, creating a negatively sloped yield curve.

11. (2 points) You are considering to invest on Project A and/or Project B which have profitability indices of 1.2 and 1.5 respectively. The cash increments of A over B has a profitability index of 0.8. (Assume you do not have a budget constraint.)

a) If A and B are <u>not</u> mutually exclusive, which project(s) should you take on?

Since the projects are not mutually exclusive, you can take both as long as they have a profitability index greater than 1. Both A and B have PI>1. Then accept both projects. 1 point

b) If A and B are mutually exclusive, which project(s) should you take on?

In this case we have to choose one project. We can compare them by inspecting their incremental cash flow. What A offers, as cash flow, over B, has a profitability index of 0.8. Then, accept B and reject A. 1 point

12. (3 points) A Hollywood studio manager is offered the following movie deal: "Super Duper Spiderman" will require an initial investment of $400 million. Manager has the following information on super hero movies: the present value of the box office revenue for such movies is distributed as follows:

Probability	PV of Revenue
0.20	$150 million
0.25	$350 million
0.25	$650 million
0.30	$700 million

What are the expected value and the standard deviation of NPV of Super Duper Spiderman?

Expected Value of the PV of cash flow after initial investment is

*0.2*150+0.25*350+0.25*650+0.30*700 = $490 million.*

Expected value of NPV = 490-400=$90 million 1 point

Standard Deviation of NPV = SQRT [0.20(150-490)^2+ 0.25*(350-490)^2+ 0.25*(650-490)^2+ 0.30*(700-490)^2] =218.29 2 points*

[Alternatively, Standard Deviation of NPV = SQRT [0.20(-250-90)^2+ 0.25*(-50-90)^2+ 0.25*(250-90)^2+ 0.30*(300-90)^2] =218.29*

13. (4 points) A computer chip manufacturer is planning a new 5-year expansion project. It already paid $200K to a company for market research. The project will require an initial fixed asset investment of $4 million. That asset will be depreciated using the straight-line method (i.e. equally)

over the 5 years with no salvage value. The expansion should produce $5,000,000 in annual sales and $2,000,000 of annual expenses during that time. The company's tax rate is 40%, depreciation is tax-deductible, and the discount rate is 12%.

What is the project's NPV? Should the company undertake the expansion project?

$200K is a sunk cost and should not be included in the calculations. 0.5 points

NPV = Initial Investment + PV(OCF) = -5,000,000+ $OCF_1/(1+r)^1 + OCF_2/(1+r)^2 + OCF_3/(1+r)^3 + OCF_4/(1+r)^4 + OCF_5/(1+r)^5$ =$2,642,126, Yes, undertake the project. 2 points

Operating Cash Flow (OCF) can be calculated in one of the following three ways, all acceptable (1.5 points) :

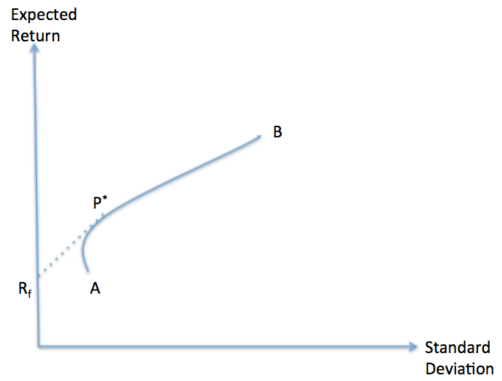
OCF = Sales-Cash Costs-Taxes =
5,000,000-2,000,000-[(3,000,000-800,000).4]=2,120,000*

OCF = Net Income+Depreciation = (Sales-Cash Costs-Depreciation)(1-Taxes)+Depreciation

*OCF = (Sales-Cash Costs)(1-Taxes)+Depreciation * Taxes*

14. (3 points) Assume that risk level is represented by the standard deviation. What is the maximum expected return you can get if you can invest on all the portfolios whose expected returns and standard deviations form the following opportunity set (the line marked by A and B) where P* represents the optimal portfolio and R_f denotes the risk free rate with

$R_f = 2\%$, $E(P^*) = 8\%$, $\sigma_{P^*} = 11\%$:



a) If you can bear a risk as much as the optimal portfolio?

From the graph, we can deduce that P is the optimal portfolio. Then, with a risk level of $\sigma_{P^*} = 11\%$, the maximum return we can get is $E(P^*) = 8\%$. 1 point*

b) If you can bear a risk of $\sigma = 15\%$?

0.15 = X_{P^*} σ_{P^*}, X_{P^*}=1.36, that is we should invest 136% on P and -36% on the risk-free asset.*
That is we should invest all out money on P, plus, we should borrow as much as 36% more and invest that on P* as well.*
*Expected Return = 1.36 * 8% - 0.36 * 2% = 10.16% 2 points*

(More explanation: Let F denote the risk-free asset. We are looking for a portfolio that is composed of P and the risk-free asset whose variance is $0.15^2 = 0.0225$*
$0.0225 = X_{P^*}^2 \sigma_{P^*}^2 + 2 \sigma_{P^*} \sigma_F Cov(P^*,F) + X_F^2 \sigma_F^2$
Here, the second and the third terms on the right hand side are zero.

c) When would the standard deviation be an inferior representation of the risk level of an asset?

If we hold a well-diversified portfolio (big enough portfolio to eliminate the unsystematic (idiosyncratic) risk, the risk level each asset presents is measured by asset's beta, not by its standard deviation.

15. (3 points) Stock Z has an expected return of 12%, standard deviation of 54%. If the risk-free rate is 3%, expected market return is 10.86% and the variance of market return is 18%, what is the correlation (ρ) between the returns of stock Z and the market?

Using the CAPM:
0.12 = 0.03 + (beta of Z) (0.1086-0.03)
beta of Z = 1.145 1 point
Using the formula

$$\beta_i = \frac{Cov(R_i, R_M)}{\sigma^2(R_M)}$$

1.145 = Cov(Z,M)/.18
Cov(Z,M) = 0.20611 point
*Corr(Z,M) = 0.2061/ (0.54 * $0.18^{1/2}$) = 0.90 (rounded) 1 point*

Multiple Choice Questions (3 points each)

1. The financial break-even point is superior to the accounting break-even point because:

A. Financial break-even is more complicated to calculate.
B. Financial break-even takes into account the results from sensitivity analysis.
C. Financial break-even covers the fixed costs of production, which the accounting break-even does not.
D. Financial break-even covers the economic opportunity costs of the investment.
E. Financial break-even covers the variable costs of production, which the accounting break-even does not.

2. 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.

3. 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.

4. 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

5. DROPPED! DO NOT GRADE !!! In the previous question, if the company would like to financially break-even at 2,000 units, would the company need to have a higher or lower than sales price than what you found earlier?

A. $20.80
B. $21.00
C. $21.20
D. $25.40
E. $25.60

6. 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

7. Total assets are $900, fixed assets are $600, long-term debt is $500, and notes payable is $100 and equity is $200. What is the amount of net working capital?

A. $0
B. $100
C. $200
D. $300
E. $400

Net working capital = Current Assets – Current Liabilities = ($900 - $600) –($900- $200-$500) = $100

8. Katelyn's Kites has net income of $240 and total equity of $2,000. The debt-equity ratio is 1.0 and the retention 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%

9. If you got an effective annual rate of 12.6825% by investing your money where compounding was done monthly, what is he highest effective annual rate that you could have obtained?

A. 0.06e - 1
B. $2e^{0.06}$
C. e × (1 +0.12)
D. $(e^{0.12})$- 1
E. $(1 + e^{0.12})$

10. 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

11. 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.

12. You are considering a project with the following data:

Profitability index: 0.98
Net present value: -$393
Payback period: 2.44 years
Market rate: 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 index was equal to the rate that makes NPV zero.
D. This project should be rejected based on the profitability index.
E. None of the above.

13. 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.

14. 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

15. 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

16. 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