

UNIVERSITY OF MANITOBA

Name: \_\_\_\_\_ Student ID: \_\_\_\_\_

Instructor: \_\_\_\_\_ Section: \_\_\_\_\_

**KEY**

**1999**

9.220  
Paper Number 237

Department of Accounting and Finance  
Corporation Finance Final Exam  
April 14, 9:00 a.m. - 12:00 p.m.

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NOTE: This examination is out of a total of 120 points

Multiple Choice Section:

Instructions: Each of the following statements or questions is followed by several suggested answers or completions. Select the **best** alternative and place the corresponding letter on the accompanying **computerized answer sheet**.  
(Value: 30 x 1.5 = 45 points)

1. Corporations are often faced with a "principal-agent" problem. Respectively, the principals and agents are
  - a) bondholders and managers.
  - b) bondholders and shareholders.
  - c) short-term creditors and bondholders.
  - d) shareholders and managers.**
  - e) short-term creditors and managers.
  - f) managers and short-term creditors.
  - g) managers and bondholders.
  - h) shareholders and bondholders.
  - i) bondholders and short-term creditors.
  - j) managers and shareholders.
  
2. In perfectly competitive financial markets
  - a) the equilibrium rate of interest is the rate that "clears" the market. ✓
  - b) many "arbitrage" opportunities exist. ✗
  - c) there are many traders, and no single trader can have a significant impact on market prices. ✓
  - d) the equilibrium rate of interest is the rate that equates the amount of borrowing to the amount of lending. ✓
  - e) information about borrowing and lending is readily available. /
  - f) all of the above are true.
  - g) a), b), and e) are true.
  - h) a), c), and e) are true.
  - i) a), c), d) and e) are true.**
  - j) none of the above is true.
  
3. Peter's earnings this year are \$50,000 and are guaranteed to be \$60,000 next year. This year Peter has decided to consume \$44,000 and invest \$40,000. Peter knows that his investment will return \$48,000 next year. In addition Peter has calculated that his maximum consumption next year will be \$69,750. The equilibrium market rate of interest is
  - a) 9%.
  - b) 9.5%.
  - c) 10%.
  - d) 10.5%.
  - e) 11%.
  - f) 11.5%.
  - g) 12%.
  - h) 12.5%.**
  - i) 20%.
  - j) none of the above.

4. Jennifer has just received an insurance settlement from her accident claim and the insurance company has offered her several alternatives for receiving her settlement. If the equilibrium market rate of interest is an effective annual rate of 12%, Jennifer would receive the greatest benefit by selecting
- a) a one-time cash payment of \$100,000 immediately.
  - b) 10 annual cash payments of \$16,000 starting one year from today.
  - c) 10 annual cash payments of \$15,000 with the first payment to be paid immediately.
  - d) \$50,000 immediately and 5 annual payments of \$13,000 starting one year from today.
  - e) 5 payments of \$35,000 to be paid every two years with the first payment in two years time,
  - f) 4 payments of \$34,000 to be paid every two years with the first payment to be paid immediately.
  - g) a one-time cash payment of \$300,000 to be paid in 10 years.
5. The present value of a growing annuity of six annual payments where the first payment of \$12,000 is today, each subsequent payment is 10% greater than the previous payment, and the effective annual discount rate is 10% is
- k) \$64,285.71
  - l) \$65,571.43
  - m) \$67,481.58
  - n) \$68,987.66
  - o) \$72,000.00
  - p) not determinable since the growth rate equals the discount rate.
  - q) none of the above.
6. An interest rate of 12% per year compounded quarterly is the same as
- a) 3% per quarter compounded quarterly.
  - b) an effective annual rate of 12.55088%.
  - c) 6.09% per 6 months compounded semi-annually.
  - d) 16.12222469% per year compounded every five years.
  - e) all of the above.
  - f) a) and b) above.
  - g) a) and c.) above,
  - h) a) and d) above.
  - i) a), b) and c) above.
  - j) a), c) and d) above.
7. In shopping for a 5-year GIC that provides the best return on investment, you see that trust companies and banks have provided several options. The investment that would provide the best return to you is one that pays
- ~~a)~~ 6.00% per year compounded continuously.
  - b) 6.05% per year compounded monthly.
  - ~~c)~~ 6.10% per year compounded quarterly.
  - d) 6.15% per year compounded semiannually.
  - e) 6.20% per year compounded annually.
  - f) 6.50% per year compounded every 5 years.
  - g) 7.00% per year compounded every decade.

8. Mr. and Mrs. Homebuyer have negotiated a 25-year, \$85,000 mortgage at a rate of 6.95% per year compounded semi-annually with the Toronto-Dominion Bank. Their monthly payment for principal and interest should be
- a) \$573.66
  - b) **\$586.63**
  - c) \$592.73
  - d) \$601.26
  - e) \$605.09
  - f) \$612.14
  - g) \$618.72
  - h) \$634.53
  - i) none of the above.
9. A company is considering a 4-year project with the following cash flows:  
 $C_0 = -\$1,000$      $C_1 = C_2 = C_3 = C_4 = \$4,000$   
If the company's opportunity cost of capital is 12%, then
- a) the project's NPV = \$2,149.40.
  - b) the project's IRR = 21.86226961%.
  - c) the project will have more than one IRR.
  - d) the project's PI = 1.21493974.
  - e) the project should be accepted because its payback period is longer than two years.
  - f) the project should be rejected because its IRR > the hurdle rate.
  - g) the project should only be accepted if it's a mutually exclusive project.
  - h) a) and f) are true.
  - i) a), c) and d) are true.
  - j) a), b) and d) are true.**
10. A retirement annuity will pay nominal cash flows of \$75,000 per year for 25 years. The expected inflation rate is 4% per year. The expected growth rate in annuity's real cash flows is
- a) 96.15384615% per year
  - b) 96.0% per year.
  - c) **+4.0% per year.**
  - d) -4.0% per year.
  - e) +3.923465 17% per year.
  - f) -3.923465 17% per year.
  - g) +3.84615385% per year.
  - h) -3.84615385% per year.**
11. A company with an opportunity cost of capital of 14% is considering a major 4-year project and has projected that its incremental working capital needs are as follows:  
Now = \$10,000    Yr. 1 = \$15,000    Yr. 2 = \$15,000    Yr. 3 = \$8,000    Yr. 4 = \$0  
The net present value of the working capital cash flows to the project is
- a) \$-48,000.00
  - b) \$-40,099.68
  - c) \$-28,000.00
  - d) \$-20,099.68
  - e) \$-4,924.52**
  - f) \$4,924.52
  - g) \$20,099.68
  - h) \$28,000.00
  - i) \$40,099.68
  - j) \$48,000.00

12. Assume that the following annual returns were realized during a five year holding period.

Year	1	2	3	4	5
Return	35%	125%	0.0%	-40%	5%

Your holding period rate of return expressed as an effective rate per year was

- a) 0.0%
  - b) 13.86004922%
  - c) 18.2725%
  - d) 25.0%
  - e) 38.2725%
  - f) 91.3625%
  - g) none of the above.
13. The expected return on any individual security
- a) is best calculated as the sum of the risk free rate and the market return.
  - b) is its beta coefficient.
  - c) equals the beta of the security times the historical market risk premium.
  - d) could never exceed the risk-free rate times the security's beta.
  - e) will always equal the return of the diversified portfolio to which the security belongs.
  - f) is both a) and e) above.
  - g) is both d) and e) above.
  - h) is both c) and e) above.
  - i) is none of the above.
14. A fully diversified portfolio composed of many assets
- a) can eliminate all risk.
  - b) can eliminate only systematic risk.
  - c) can eliminate both systematic and unsystematic risk, but not unique risk.
  - d) can eliminate unsystematic risk, but not systematic risk.
  - e) has a variance equal to the weighted average of the variances of the individual securities in the portfolio.
  - f) has a beta = 0.
  - g) is both b) and e) above.
  - h) is both c) and e) above.
  - i) is both d) and e) above.
  - j) is b), e) and f) above.
15. Mary is considering investing in a portfolio of two stocks (A and B) and has determined that  $E[R_A] = 10\%$ ,  $\sigma_A = 0.2$ ,  $E[R_B] = 25\%$ ,  $\sigma_B = 0.3$  and  $\rho_{AB} = -1$ . Assuming that Mary is rational and risk averse,
- a) she would choose a portfolio composed of 100% of A to minimize her risk.
  - b) she would prefer a portfolio composed of 80% of A and 20% of B to one composed of 40% of A and 60% of B.
  - c) she could obtain zero risk from a portfolio composed of 60% of A and 40% of B.
  - d) she knows that as long as  $X_A + X_B = 1$  for positive weights of A and B, the combination she selects will be in the efficient set.
  - e) she would calculate the expected return on the minimum variance portfolio to be 16%.
  - f) she would do both a) and d) above.
  - g) she would do both c) and e) above.
  - h) she would do b), c) and e) above.
  - i) she would do c), d) and e) above.

16. The covariance between a risky asset's returns and the market return, and the correlation coefficient between the same risky asset's returns and the market return, differ in that the correlation coefficient
- a) depends on expected return.
  - b) can never be negative.
  - c) is calculated at a point in time based on historical data.
  - d) is essentially a scaled covariance that must have a value between 0 and +1.
  - e) increases exponentially as the number of assets in a portfolio increases.
  - f) is used as the input in finding dominant portfolios on the efficient frontier.
  - g) is none of the above.
17. Delta international (DI) is evaluating a new project that has 10% less systematic risk than its portfolio of existing investments. If DI uses its current WACC to determine the NPV of the new project, then
- a) DI may incorrectly accept the project by using a discount rate that is too low.
  - b) DI may incorrectly reject the project by using a discount rate that is too low.
  - c) DI may incorrectly accept the project by using a discount rate that is too high.
  - d) DI may incorrectly reject the project by using a discount rate that is too high.
  - e) DI will correctly accept the project.
  - f) DI will correctly reject the project.
18. Roger is considering a portfolio composed of a risk-free asset with  $R_f = 6\%$  and the market portfolio with  $E[R_M] = 16\%$ . Roger has \$20,000 and knows that
- a) if he shorts \$5,000 of the risk-free asset (borrows) and invests \$25,000 in the market portfolio, the beta of his portfolio will be 1.25.
  - b) if he shorts \$5,000 of the risk-free asset (borrows) and invests \$25,000 in the market portfolio, the expected return of his portfolio will be 18.5%.
  - c) if he buys \$5,000 of the risk-free asset and invests \$15,000 in the market portfolio, the beta of his portfolio will be 0.75.
  - d) if he buys \$5,000 of the risk-free asset and invests \$15,000 in the market portfolio, the expected return of his portfolio will be 13.5%.
  - e) if he invests all \$20,000 in the market portfolio, the beta of his portfolio will be 1 and the expected return on his portfolio will be 16%.
  - f) all of the above are true.
19. Each of the following statements regarding efficient markets is true **except**.
- a) A person who believes in the strong-form of market efficiency believes that access to "insider" information cannot result in abnormal profits in the long run.
  - b) "The semi-strong form of the efficient market hypothesis (EMH) states that investors cannot use either public or past information to make abnormal profits over the long run.
  - c) The weak form of the efficient markets hypothesis (EMH) states that investors cannot use past information to make abnormal profits over the long-run.
  - d) A person who believes in the weak form of market efficiency also believes, by implication, that technical analysis (charting etc.) does not work.
  - e) Studies in serial correlation generally support the random walk theory.
  - f) Mutual fund managers consistently out-perform the market because they have access to hordes of analysts who can find untapped sources of publicly available information.
  - g) If the weak form of market efficiency is contradicted, then the semi-strong form of market efficiency must also be contradicted.

20. A six-month American call option on a non-dividend-paying stock has an exercise price of \$65. The underlying stock price is currently \$58, and the continuously compounded risk-free interest rate is 5% per annum. The lower bound for the price of this American call option is
- a) \$0
  - b) \$7.00
  - c) \$6.98
  - d) \$58.00
  - e) \$65.00
  - f) is always greater than the exercise price of \$65.
  - g) is indeterminate because it is an American option.
  - h) none of the above.
21. European call and put options on a stock both have an exercise price of \$80 and an exercise date in three months. The underlying stock price is currently \$82, and the present value of a risk-free asset with a face value of \$80 and with maturity in three months is \$78.42. The call option sells for \$6. The price of the put option should be
- a) \$0
  - b) \$0.36
  - c) \$1.58
  - d) \$2.00
  - e) \$2.42
  - f) \$3.58
  - g) \$9.58
  - h) none of the above.
22. The writer (seller) of an American call option
- a) is said to be in a 'long' position.
  - b) is said to be in a 'short' position.
  - c) hopes that the stock price will not be greater than the exercise price for the life of the option.
  - d) hopes that the stock price will be greater than the exercise price for the life of the option.
  - e) will earn a premium from the sale of the option.
  - f) hopes to sell the underlying stock and receive the exercise price.
  - g) is both a) and f).
  - h) is both b) and c).
  - i) is b), c) and e).
  - j) is a), e) and f).
23. When an investor purchases callable preferred stocks, the issuing firm has the right to repurchase these preferred stocks for a pre-specified call-price. Thus, we can say
- a) that the firm has sold a call option on the preferred stock to the investor.
  - b) that the firm has bought a call option on the preferred stock from the investor.
  - c) that the investor has sold a call option on the preferred stock to the firm.
  - d) that the investor has bought a call option on the preferred stock from the firm.
  - e) that the investor has sold a put option on the preferred stock to the firm.
  - f) that the firm has sold a put option on the preferred stock to the investor.
  - g) that the investor has bought a put option on the firm's common stock from the firm.
  - h) both a) and d) above are true.
  - i) both b) and c) above are true.
  - j) none of the above are true.

24. European call and put options on a stock both have an exercise price of \$60 and an exercise date in three months. The underlying stock price is currently \$61, and the present value of a risk-free asset with a face value of \$60 and with maturity in three months is \$58. The call option sells for \$9 and the put option sells for \$4. To gain an arbitrage profit one should
- a) buy (long) the stock, buy (long) the put, buy (long) the call, and buy (long) the risk-free asset.
  - b) buy (long) the stock, buy (long) the put, buy (long) the call, and sell (short) the risk-free asset.
  - c) buy (long) the stock, buy (long) the put, sell (short) the call, and buy (long) the risk-free asset.
  - d) buy (long) the stock, buy (long) the put, sell (short) the call, and sell (short) the risk-free asset.
  - e) buy (long) the stock, sell (short) the put, buy (long) the call, and buy (long) the risk-free asset.
  - f) buy (long) the stock, sell (short) the put, sell (short) the call, and buy (long) the risk-free asset.
  - g) buy (long) the stock, sell (short) the put, buy (long) the call, and sell (short) the risk-free asset.
  - h) sell (short) the stock, buy (long) the put, sell (short) the call, and buy (long) the risk-free asset.
  - i) sell (short) the stock, buy (long) the put, buy (long) the call, and sell (short) the risk-free asset.
  - j) sell (short) the stock, sell (short) the put, buy (long) the call, and buy (long) the risk-free asset.
25. The opportunity to earn **riskless** profits with a zero net investment is
- a) known as a T-Bill investment.
  - b) known as the put-call parity equation.
  - c) known as securitizability.
  - d) known as a diversified portfolio.
  - e) accomplished in a portfolio of 2 stocks (A and B) whose  $\rho_{AB} = 0$ .
  - f) only available in a strong-form **informationally** efficient market.
  - g) ideal investing.
  - h) always accomplished by using a combination of American and European options.
  - i) passing 9.220.
  - j) none of the above.
26. Fortunato Corporation has outstanding 200,000 shares of common stock and 30,000 cumulative preferred shares with a \$2 annual dividend. Fortunato has paid no dividends for two years, but this year has declared dividends on both its common and preferred shares. If Fortunato has decided that it wishes to distribute \$680,000 of earnings to shareholders, the largest dividend per share that common shareholders can receive is
- a) \$3.40
  - b) \$3.10
  - c) \$2.80
  - d) \$2.50
  - e) \$2.20
  - f) none of the above.

27. Occasionally, a new issue of securities is first offered only to sophisticated market participants (i.e. financial institutions, funds managers) giving only those deemed to be knowledgeable investors the right to purchase part of new issue. This is known as
- a) a private placement.
  - b) a public placement.
  - c) a public offering.
  - d) a "free-for-all" placement.
  - e) an "open house" deal.
  - f) a regulated placement.
  - g) a covered call.
  - h) a market offering.
  - i) none of the above.

**Use the following information for questions 28 - 30**

Trans-Manitoba Gas Corporation has callable convertible bonds outstanding with the following features: face value of \$1,000; coupon rate of 8.5%, coupons paid semi-annually; conversion price of \$50; callable with a 6.5% call premium; maturity in 12 years. The current stock price is \$49.25 per share.

28. The conversion ratio for the bonds is
- a) 50
  - b) 49.25
  - c) 24
  - d) 21.62
  - e) 20.3
  - f) 20
  - g) none of the above.
29. If the bonds are called, then the amount of ~~cash~~ that Trans-Manitoba must pay is
- a) \$ 1,065 if the bonds are converted; \$0 if they are not converted.
  - b) \$1,065 if the bonds are converted; \$1,000 if they are not converted.
  - c) \$1,065 if the bonds are converted; \$1,065 if they are not converted.
  - d) \$985 if the bonds are converted; \$0 if they are not converted.
  - e) \$985 if the bonds are converted; \$1,065 if they are not converted.
  - f) \$985 if the bonds are converted; \$1,000 if they are not converted.
  - g) \$0 if the bonds are converted; \$1,000 if they are not converted.
  - h) \$0 if the bonds are converted; \$1,065 if they are not converted.
30. If S is the stock price, the condition necessary for the corporation to be able to force conversion by calling the bond is
- a)  $S = \$50$
  - b)  $S > \$50$
  - c)  $S \geq \$50$
  - d)  $S = \$52.45$
  - e)  $S > \$52.45$
  - f)  $S \geq \$52.45$
  - g)  $S = \$53.25$
  - h)  $S > \$53.25$
  - i)  $S \geq \$53.25$
  - j) none of the above.



Problem Section: <sup>11</sup> @Problems = Total points 75)

Instructions: Answer each question in the spaces provided. Show all relevant work (i.e., formulas and substitutions). Do not round any intermediate calculations. Final dollar answers may be rounded to the nearest cent; other final answers may be rounded to 8 decimal places unless otherwise specified.

1. Consider the following two problems on investment and consumption.  
a) If your maximum consumption this year could be \$122,000 and next year could be \$140,300, what is the implied equilibrium market of interest? (2 points)

$$\left. \begin{aligned} -(1+r) &= \frac{0 - 140,300}{122,000 - 0} \\ 1+r &= 1.15 \\ r &= \underline{15\%} \end{aligned} \right\} \begin{array}{l} \frac{1}{2} \text{ for set up} \\ \frac{1}{2} \text{ for sol'n.} \end{array}$$

- b) Assume that your earnings this year will be \$60,000 and that next year will be \$75,000. The market rate of interest is 12%. You have a one-time investment opportunity of \$40,000 available right now which will pay you \$44,000 guaranteed in one year. If you decide to consume \$65,000 this year, what would be your maximum consumption next year? (3 points)

Note: Do NOT take investment since NPV < 0

This year:		Next year:	
income	60,000	income	75,000
consumption	(65,000)	repay loan 5,000 x 1.12	(5,600)
Borrow	(5,000)	maximum cons.	<u>69,400</u>

You'll get 68,600 if investment included.

1 off per error  
- including investment \*  
- incorrect incomes/consumption/spend

2. Calculate each of the following.  
a) Given an effective interest rate of 14% per year, determine the effective quarterly rate. (1 point)

$$r_{\text{quarterly}} = (1.14)^{1/4} - 1 = 0.0332994848 \text{ or } 3.32994848\% \quad \boxed{1} \text{ of non}$$

- b) Given a rate of 14% per year compounded continuously, determine the equivalent effective rate per year. (1% point)

$$\left. \begin{aligned} (1+r)^t &= e^{rt} \\ r &= e^r - 1 = e^{.14} - 1 = 0.1502737989 = 15.02737989\% \end{aligned} \right\} \begin{array}{l} \boxed{1} \text{ for set-up + subst.} \\ \boxed{1/2} \text{ for correct answer} \end{array}$$

- c) Given an interest rate of 18% per year compounded monthly, determine the equivalent rate per year compounded every 3 years. (2% points)

These might be combined, ... that's ok

$$\left. \begin{aligned} \text{eff mthly rate} &= \frac{.18}{12} = 0.015 \text{ or } 1.5\% \\ \text{eff 3yr. rate} &= (1.015)^{36} - 1 = 0.7091395381 \text{ or } 70.91395381\% \\ \text{stated rate} &= \frac{70.91395381}{3} = \underline{23.6379846\% / \text{yr compd. every 3yrs}} \end{aligned} \right\} \begin{array}{l} \boxed{1/2} \\ \boxed{1} \\ \boxed{1} \end{array}$$

not necessary.

3. Nancy was recently hired by Forrest Pump Inc. (FPI) and has decided to contribute to a pension plan. The plan calls for her to make monthly payments of \$400 starting one month from today. The brochure describing the plan indicates that the pension contribution are invested in a portfolio that earns an effective rate of return of 12% per year and that this return is expected to continue indefinitely. Nancy plans to contribute to the plan for 30 years and, immediately following payment of her last pension contribution, intends to retire. Her pension fund will begin sending her monthly pension cheques starting one month after her retirement date. If Nancy expects to receive pension cheques for thirty-five years after retirement, how large will each monthly cheque be? (5 points)

Contributions:  $FV = \frac{C}{r} [(1+r)^T - 1]$  &  $r_m = (1.12)^{1/12} - 1 = 0.94887929\%$  (1)

$$= \frac{400}{0.0094887929} [(1.0094887929)^{360} - 1]$$

$$= \$1,220,805.32$$

Withdrawals:  $PV = \frac{C}{r} [1 - \frac{1}{(1+r)^T}]$

$$1,220,805.32 = \frac{C}{0.0094887929} [1 - \frac{1}{(1.0094887929)^{420}}]$$

$$C = \$11,807.60$$

off per error  
follows continuing error into 2nd part  
... wrong off. rate  
... substitution.  
... incorrect T's

4. Peagram Canada's 1<sup>st</sup> quarterly dividend is expected to be 2 years from today with an expected amount of \$1.50 per share. Each subsequent quarterly dividend is expected to grow by 4%. Following the quarterly dividend 8 years from now, the quarterly dividends are expected to grow by 2% each quarter. Given the risk associated with Peagram's stock, the required expected return is 18% per year (effective). What is the price of one share of Peagram's stock? (5 points)

eff. quart r =  $(1.18)^{1/4} - 1 = 4.22466355\%$

quarters → 0 1 8 32 33

1.50

$C_1$  for perpetuity

$$C_1 = (1.50)(1.04)^{24} (1.02)$$

$$C_1 = 3.92185587$$

$$PV_3 = \frac{C_1}{r-g} [1 - (\frac{1+g}{1+r})^T]$$

$$= \frac{1.50}{0.0422466355 - 0.04} [1 - (\frac{1.04}{1.0422466355})^{25}]$$

$$= \$35.06$$

$$PV_0 = \frac{35.06}{(1.0422466355)^2}$$

$$= \$26.24$$

off per error  
... wrong off. rate  
... incorrect T's  
... C<sub>1</sub> for perpetuity  
... other subst.  
... not summing both parts

$$PV_{32} = \frac{C_1}{r-g}$$

$$= \frac{(1.50)(1.04)^{24} (1.02)}{0.0422466355 - 0.02}$$

$$= \$176.29$$

$$PV_0 = \frac{176.29}{(1.0422466355)^{32}}$$

$$= 46.90$$

Note: if T's are incorrect but are consistent with an incorrect strategy point (-2)

price =  $26.24 + 46.90 = \$73.14$

Also acceptable: In 1<sup>st</sup> part if T=24;  $PV_3 = 33.70$  &  $PV_0 = 26.22$   
 AND In 2<sup>nd</sup> part  $C_1 = (1.50)(1.04)^{24}$ ;  $PV_{31} = 172.83$  &  $PV_0 = 47.92$   
 price =  $\$73.14$

5. Consider the following data about two assets, A & B, and the market portfolio, M:

Asset	E[R] (%)	$\sigma$	Correlation, $\rho_{EM}$
A	14	0.4	
B			0.5
Market	10	0.2	
Risk-free	6	0	

a) Calculate A's beta,  $\beta_A$ . (1 point)

$$r_A = R_f + \beta_A (R_m - R_f)$$

$$.14 = .06 + \beta_A (.10 - .06)$$

$$\beta_A = 2.0$$

11 or 0

b) Calculate the correlation of A's returns with the market's,  $\rho_{AM}$ . (1% points)

$$\rho_{AM} = \frac{\beta_A \sigma_m}{\sigma_A} = \frac{2(0.2)}{0.4} = +1$$

11/2 ... 1/2 off if answer incorrect

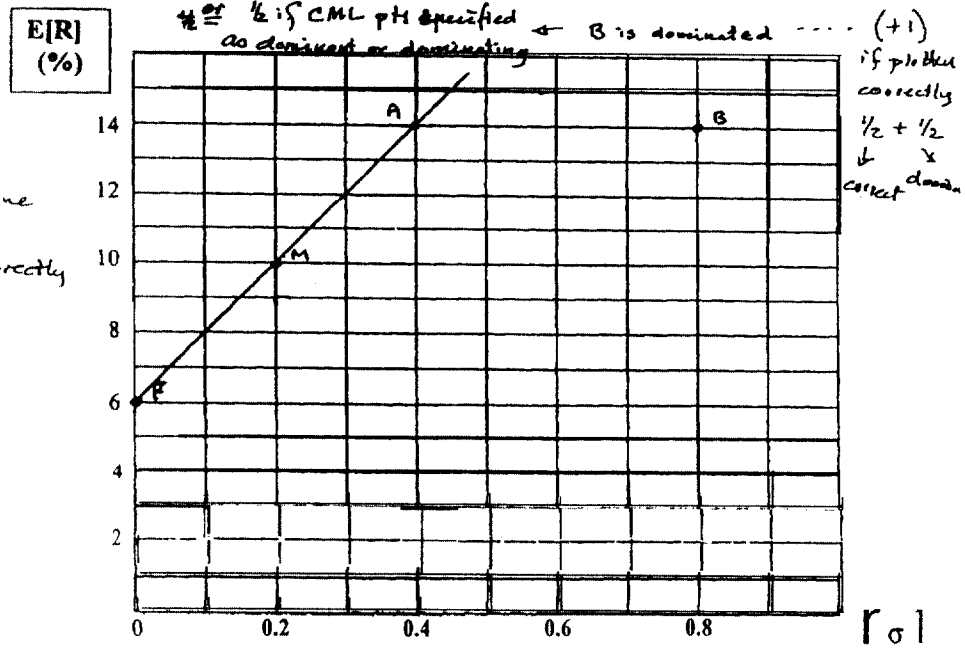
c) If  $\beta_B = 2.0$ , calculate the standard deviation of B's returns. (1% points)

$$\sigma_B = \frac{\beta_B \sigma_m}{\rho_{BM}} = \frac{2(0.2)}{0.5} = 0.8$$

11/2 ... 1/2 off if answer incorrect

Notes:  $r_B = R_f + \beta_B (R_m - R_f) = .06 + 2(.10 - .06) = 0.14$

d) Using the above data plot the Capital Market Line (CML) showing the positions of all 4 assets (portfolio), indicate clearly which asset(s) are dominated. (3 points)



11 off if NOT straight line

1/2 off per incorrectly plotted pt. to a max of 11

11

- e) If you held a fully diversified portfolio, i.e., one that was strictly efficient, which asset would you choose to hold, A or B, or would you be indifferent between them. Explain briefly. (3 points)

⇒ in a fully diversified portfolio, all unsystematic risk is eliminated. Since both assets have same  $\beta$  and same  $E[R]$ , with the same  $\beta$  one should be indifferent.

⇒  $A > B$ , ~~same~~ in terms of total risk

6. Peter Pepper, owner of Pepper's Plastic Products Inc. (PPP), is pursuing a government contract to produce a specialty space-age plastic for use in the International Space Station. PPP has already invested \$2.5 million dollars into research and development connected with the design and production of new space-age plastics and is now considered a leader in the field. The contract will last 4 years. If they land the government contract, PPP will have to invest an additional \$1,800,000 in production equipment, but expects to be able to sell it to a competitor after the four years for \$350,000. This new machinery will be placed in a 35% CCA class. PPP owns a great deal of equipment and that particular CCA pool has a UCC of \$52,000,000. The government contract calls for PPP to receive pre-tax revenues of \$1,000,000 per year for each of the four years of the project. PPP has also estimated that additional expenses of \$200,000 per year for each of the four years will be incurred. If PPP lands the contract, raw material inventories related to plastic production will have to be increased immediately by \$300,000 and will have to remain at that higher level until the project is completed, at which time they will return to pre-project levels. PPP also estimates that landing the government contract will result in an increase in sales of their regular plastic products by \$100,000 per year and that this increase will last indefinitely. Assume PPP's corporate tax rate is 40%,  $R_f = 7%$ ,  $E[R_M] = 15%$ , and the CAPM is true.

- a) PPP is currently financed with \$400 million of debt in the form of bonds and \$600 million of equity. Each bond has a \$1,000 face value, a current market value of \$981.28, 22 years to maturity and carries a coupon rate of 8% with coupons paid semi-annually. PPP's  $\beta_{equity} = 1.2$ . Calculate the WACC of PPP. (6 points)

Also acceptable

$$PV = \sum_{t=1}^T \frac{PMT}{(1+r)^t} + \frac{FV}{(1+r)^T}$$

$$r_B = \text{yield to maturity of the bonds} \quad \left. \begin{aligned} r_s &= R_f + \beta_s (R_M - R_f) \\ &= 0.07 + 1.2(0.15 - 0.07) \\ &= 16.6\% \end{aligned} \right\}$$

$$PV = \frac{C}{r} \left[ 1 - \frac{1}{(1+r)^T} \right] + \frac{FV}{(1+r)^T}$$

$$981.28 = \frac{40}{r} \left[ 1 - \frac{1}{(1+r)^{44}} \right] + \frac{1000}{(1+r)^{44}}$$

eff. bmo.  $r = 4.09243767\%$

eff. ann.  $r = 8.35235580\%$

$$r_{WACC} = \frac{400}{1,000} (.083523558)(1-.4) + \frac{600}{1,000} (0.166)$$

$$0.02004565 + 0.0996$$

$$= 0.11964565$$

or 11.964565%

1 off per error in each part to max for the part

- ... incorrect subs. to get  $r_B, r_s$
- ... not eff. annual  $r_B$
- ... incorrect wts for  $r_{WACC}$
- ... not after-tax for  $r_{WACC}$
- ... Do follow continuing error

- b) Calculate the present value of the CCA tax shields associated with the PPP project. Assume that the appropriate discount rate is the risk-free interest rate. (2 points)

$$PV_{CCA} = \frac{CdTc}{k+d} \cdot \frac{1+k}{1+k} - \frac{SdTc}{k+d} \cdot \frac{1}{(1+k)^T}$$

$$= \frac{1,800,000(.35)(.40)}{.07+.35} \cdot \frac{1.035}{1.07} - \frac{350,000(.35)(.40)}{.07+.35} \cdot \frac{1}{(1.07)^4}$$

$$= \$80,373.83 - 89,004.44$$

$$= \underline{\underline{\$491,369.39}}$$

off per error  
... subst. exp. for 'k'  
... calc. error

off the if lot CCA tax shield on salvage

- c) Assume in your calculations you determined the following:

$PV_{CCA \text{ tax shields}} = \$490,000$   
 $E[R_{PPP's \text{ debt}}] = 8.35\%$   
 $E[R_{PPP's \text{ equity}}] = 16.6\%$   
 $WACC_{PPP} = 13.3\%$

NOT included.

All other cash flows from the PPP project are of the same systematic risk as PPP.

Do an NPV analysis to determine if PPP should be trying to land the government contract. (11 points)

1 for not including sunk cost  
+1 for actual outlay = 3

do NOT include sunk costs from R & D  
-1,500,000.00 [2]

① Initial cash outlay:

② Revenues: (assume at end of 4y)

off per error to max of 2

$$PV = \frac{C}{r} \left[ 1 - \frac{1}{(1+r)^T} \right] = \frac{1,000,000 - 200,000}{.133} (1-.4) \left[ 1 - \frac{1}{(1.133)^4} \right] = 1,418,892.24 [2]$$

③ CCA tax shield:

off per error to max of 2  
PV = 490,000.00 [1]

④ WIC:

off per error to max of 2

$$PV = -300,000 + \frac{300,000}{(1.133)^4} = -117,945.42 [2]$$

⑤ Salvage:

off per error to max of 2

$$PV = \frac{350,000}{(1.133)^4} = 212,397.01 [1]$$

⑥ Side effects:

off per error to max of 2

$$PV = \frac{C}{r} = \frac{100,000(1-.4)}{.133} = 451,127.82 [2]$$

NPV

$$= \underline{\underline{654,471.65}}$$

PPP should be trying to land the govt. contract [1]

do NOT mark

7. The Put-Call Parity relationship determines the functional relationship between four securities: the underlying stock, a European call and a European put on this stock (both options have the same exercise price and the same length of time to maturity), and a T-bill (with a current value equal to the present value of the exercise price and with the same maturity date as the options). Thus, the Put-Call Parity relationship allows you to create a synthetic position in one of the four securities using the other three. Complete the table below to determine the position (buy or sell) one needs to take in each security in order to synthetically create each of the positions specified in the first column. For each of the three "replicating" securities, write the buy or sell recommendation in the blank space. (4 x 1½ = 6points)

$\frac{1}{2}$  each square

Position	For each of the three "replicating" securities, write the buy or sell recommendation in the blank space			
	Call	Put	Stock	T-bill
Buy A Synthetic Call		buy	buy	sell
Sell A Synthetic Put	sell		buy	sell
Sell A Synthetic Stock	sell	buy		sell
Buy A Synthetic T-bill (Give A Synthetic Loan)	sell	buy	buy	

8. For each of the following statements regarding American options indicate whether the statement made is TRUE or FALSE. (5 x 1 = 5)
- a) All other things being equal, the lower the risk-free borrowing/lending rate the lower the value of a put option. FALSE
  - b) All other things being equal, a put option on a stock with a  $\sigma = 0.20$  is more valuable than the put option on a stock with a  $\sigma = 0.15$ . TRUE
  - c) All other things being equal, a call option with 3 months to maturity is more valuable than a call option with 6 months to maturity. FALSE  $\frac{1}{2}$  each or 1
  - d) All other things being equal, a call option on a stock where the stock price is \$25 is more valuable than a call option on a stock where the stock price is \$35. FALSE
  - e) All other things being equal, a call option with an exercise price of \$25 on a stock where the stock price is \$30 is more valuable than a put option with an exercise price of \$25 on a stock where the stock price is \$30. TRUE

$r_f = 4.8\%$   
 $r_m = 16.2\%$

9. Assume the M & M model with no taxes holds and that the CAPM is true. The risk-free rate of return is 4.8% and the expected rate of return on a market portfolio is 16.2%. Allied Business Corp. (ABC) is an all-equity firm with a market value of \$600 million. The return on investment in ABC's stock is 19.05%.

a) Determine the  $\beta$  of ABC's equity. (2 points)

$$r_0 = r_s = R_f + \beta_s (R_m - R_f)$$

$$.1905 = .048 + \beta_s (.162 - .048)$$

$$\beta_s = 1.25$$

or  $\beta = \frac{r_s - R_f}{R_m - R_f}$

b) Assume that ABC converts \$240 million of its equity to \$240 million of debt paying 7.5%. Calculate

i) the market value of ABC now. (1 point)

$$V_L = V_u = \$600,000,000$$

give 1/2 if not ok but they didn't say  $V_L = V_u$

ii) the return on ABC's equity now. (2 points)

$$r_s = r_0 + \frac{B}{S} (r_0 - r_b)$$

$$= .1905 + \frac{240}{360} (.1905 - .075)$$

$$= 0.2675 \text{ or } 26.75\%$$

600-240

iii) ABC's WACC and the weighted average  $\beta$  of ABC's securities. (1 point)

$$r_{WACC} = .1905 \text{ \& } \beta_{firm} = 1.25$$

or 19.05% 1/2 each  
 no work need be shown

10. Assume the Miller Model with corporate and personal taxes holds. Assume that investors are taxed at a rate of 22% on equity income and 48% on debt income. Dynamic Executive Furniture (DEF), an unlevered firm with a corporate tax rate of 36% and a market value of \$360,000,000, has detected management shirking and perquisite consumption occurring and has estimated the PV of the associated costs to be \$63,000,000. (This is already included in the \$360,000,000 value.) If DEF converted \$100,000,000 of its equity to debt, the estimated PV of the costs of management shirking and perquisite consumption would be reduced to \$24,000,000, but expected costs of financial distress with a PV \$23,000,000 would arise. Calculate the total market value of DEF assuming DEF levered its capital structure as indicated, (2 points)

$$V_L = V_u + B \left[ 1 - \frac{(1-T_c)(1-T_s)}{1-T_b} \right]$$

$$= 360,000,000 + 100,000,000 \left[ 1 - \frac{(1-.36)(1-.22)}{1-.48} \right]$$

$$= 364,000,000$$

Additional adj.

$$V_L = 364,000,000 + \text{reduced perks} - \text{increased fin. distress}$$

$$V_L = 364,000,000 + (63,000,000 - 24,000,000) = 399,000,000$$

$$V_L = \$380,000,000$$

39,000,000

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11. Assume the M & M model with corporate taxes holds and that the CAPM is true. General Holdings Inc. (GHI) is a corporation financed with \$110 million of debt giving a return of 7% per year (effective) and the remainder with equity. GHI's earnings are subject to corporate taxes at a rate of 40%. A financial analyst has estimated that if GHI were an all-equity firm, it would have a market value of \$280 million and that the return on investment in GHI's equity would be 17.7%.

a) Calculate

- i) the market value of GHI under its leveraged capital structure. (2 points)

$$V_L = V_U + T_c B$$

$$= 280,000,000 + .4(110,000,000)$$

$$= \$324,000,000$$

- ii) the market value of GHI's equity under its leveraged capital structure.

(1 point)

Allow continuing error for a) i)

$$S = 324,000,000 - 110,000,000$$

$$= 214,000,000$$

- b) Calculate the  $r_{WACC}$  for GHI assuming  $V_L = \$324$  million and  $S = \$214$  million.

(4 points)

$$r_B = .07$$

$$r_S = r_o + \frac{B}{S}(1 - T_c)(r_o - r_B)$$

$$= 0.177 + \frac{110}{214}(1 - .4)(.177 - .07)$$

$$= 0.21 \text{ or } 21\%$$

324-214

$$r_{WACC} = \frac{110}{324}(.07)(1 - .4) + \frac{214}{324}(0.21)$$

$$= 0.15296296 \text{ or } 15.296296\%$$

off per error  
to a max of 4

.... wrong subtrats.  
.... not after tax  
... wrong weights.

67