

Rensselaer Polytechnic Institute

MGMT 6030
Financial Management II

Instructor: John Teall
Spring Term 2014

Mid-term Exam: Practice Version 1, Part 1, Closed-Book
3 hours for both parts

1. Answer each of the following with one word only: True or false:
 - a. The two-stage growth model cannot be used when the discount rate for the first stage cash flows is lower than the growth rate for the first stage of cash flows.
 - b. The two-stage growth model cannot be used when the discount rate for the second stage cash flows is lower than the growth rate for the second stage of cash flows.
2. How does a forward contract on foreign exchange differ from a call option on foreign exchange?
3. List a set of conditions that are sufficient for a zero NPV (or even a positive NPV) merger to be detrimental to the shareholders of both the acquiring and target firms. You may assume that taxes and transactions costs are irrelevant.

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4. The Berger Publishing Company in its last fiscal year realized revenues equal to \$1,000,000 and operating costs equal to \$1,400,000. However, a takeover of Berger by another publishing or printing company should result in labor efficiencies that would reduce Berger Company's operating costs to \$1,200,000 per year. Furthermore, projects in development should result in Berger's revenues growing at an annual rate of 10% indefinitely. Assume that target and prospective acquiring companies operate in a 40% tax bracket and discount all of their cash flows at an annual rate of 12%. What is the present value of Berger as a takeover candidate?

5. The Pamplin Company, which has \$30,000,000 in assets, intends to take over Stern Corp., which has \$10,000,000 in assets. Pamplin has \$20,000,000 in zero coupon debt maturing in three years and Stern has \$5,000,000 in zero coupon debt maturing in three years. The combination is expected to generate \$2,000,000 in cost-reducing synergies. Assume that all Black-Scholes assumptions apply to each of the two firms and their securities. The standard deviations of asset returns for Pamplin and Stern's are, respectively, .5 and .7 and the synergies will have no impact on either the individual or combined firm standard deviations. The riskless return rate is currently .05. The correlation coefficient between asset returns for the two firms is .1. What will be the post merger debt and equity values of the combined firm? By how much will the merger change overall equity value? Is it possible for shareholders of both firms to benefit from the takeover?

6. The Henderson Company needs to raise \$1,400,000 to purchase a new machine. The company wishes to maximize its annual earnings per share levels and must decide whether to borrow the required funds at an interest rate of 12% (the same rate as the average rate on its existing long term and short term debt) or to sell additional shares of stock at its current book value. Henderson currently has outstanding 100,000 shares of stock. The company is projecting an EBIT level next year of \$500,000 and is taxed at the corporate rate of 34%. Henderson's balance sheet is given as follows:

<u>ASSETS</u>	<u>CAPITAL</u>
Current Assets...\$ 400,000	Current Liabilities.....\$ 200,000
	Long Term Debt.....\$1,200,000
Fixed Assets.....\$3,600,000	Equity.....\$2,600,000
Total Assets.....\$4,000,000	Total Capital.....\$4,000,000

How should the Henderson Company finance its purchase?

7. A firm needs to decide between the purchase of two computer systems. The first system, a Moon Microgalactica, currently sells for \$25,000; the second, a Star Minicom sells for \$30,000. Both systems have ten year life expectancies. The Moon system has an expected salvage value of \$5,000 and the Star system has an expected salvage value of \$10,000. The Moon system requires

the firm to maintain a \$5000 inventory of miscellaneous hardware on hand; this hardware can be sold when the system is salvaged. Thus, this inventory can be treated as a working capital requirement. Both systems have identical operating costs and will be depreciated on a straight-line basis. The firm discounts all cash flows at a rate of ten percent and operates in a forty percent income tax bracket. Does the NPV of the Moon system exceed that of the Star system? If your answer is yes (or no), by how much do their prices differ?

8. What are the total annual transactions costs for cash of a firm using the Baumol Cash Management Model if brokerage costs per transaction are \$75, annual cash demand is \$2,000,000 and the annual interest rate on marketable securities is 15%?

9. The Oberlin Car Service is considering the purchase of one of two models of cars to replace its current fleet. Mercedes Benz vehicles can be purchased for \$50,000 that will generate annual profits equal to \$20,000 for four year life expectancies. Alternatively, the company can purchase Cadillacs for \$38,000 that will generate annual profits of \$20,000 for three years before they are retired. The cars will be replaced after their useful lives. All cash flows are to be discounted at 10%.

- a. Calculate base case NPVs for both fleets on a per car basis.
- b. Calculate perpetual NPVs for the two models of cars assuming perpetual replication.
- c. Calculate Equivalent annuities for the two models of cars.
- d. Which car is more profitable?

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Mid-term Exam Solutions: Practice Version 1

- 1.a. False
b. True

2. A call option provides its owner the right to purchase the underlying currency whereas a long position in a forward contract provides for both the right and the obligation to purchase the underlying currency. Furthermore, option contracts are frequently listed on exchanges while forward contracts are not.

3. 1. There exists uncertainty regarding firm return outcomes. 2. Firm return outcomes are not perfectly correlated. 3. At least one of the firms is leveraged. 4. There is no (or at least minimal) transfer of wealth between shareholders of the two firms. 5. Both firm's shareholders face limited liability.

$$4. \quad [(-1,200,000)(1-.4)/(.12)] + [1,000,000(1-.4)*(1 + .10)]/ [.12-.10] \\ = -6,000,000 + 33,000,000 = 27,000,000$$

5. Inputs are as follows:

Pamplin:

$$t = 3$$

$$r_f = .05$$

$$X = 20,000,000$$

$$S_0 = 30,000,000$$

$$\sigma = .5$$

$$\sigma^2 = .25$$

Stern:

$$t = 3$$

$$r_f = .05$$

$$X = 5,000,000 \quad S_0 = 10,000,000$$

$$\sigma = .7 \quad \sigma^2 = .49$$

Computations are as follows:

Pamplin:

$$d_1 = 1.074 \quad N(d_1) = .859$$

$$d_2 = .208 \quad N(d_2) = .583$$

$$c_0 = \$15,732,553 = \text{equity value}$$

$$p_0 = \$2,946,713$$

$$D = \$17,214,161 - \$2,946,713 = \$14,267,447$$

Stern:

$$d_1 = 1.3016 \quad N(d_1) = .903$$

$$d_2 = .089 \quad N(d_2) = .536$$

$$c_0 = \$6,730,083 = \text{equity value}$$

$$p_0 = \$1,033,623$$

$$D = \$4,303,541 - \$1,033,623 = \$3,269,917.$$

Using the simple two-security risk equation, we find that the combined firm standard deviation of returns equals .429 because the correlation coefficient is .1 and the weights are 1/4 and 3/4:

$$.429 = [(.75^2 * .5^2) + (.25^2 * .7^2) + 2(.75 * .25 * .5 * .7 * .1)]^{.5}$$

Combined firm:

$$X = 25,000,000 \quad S_0 = 42,000,000 \text{ (Including synergies)}$$

$$d_1 = 1.271 \quad N(d_1) = .898$$

$$d_2 = .527 \quad N(d_2) = .701$$

$$c_0 = \$22,637,807 = \text{equity value}$$

$$p_0 = \$2,155,506$$

$$D = \$21,517,702 - \$2,155,506 = \$19,362,193$$

Note that the combined firm equity has been increased by \$175,171 and creditor wealth has increased by \$1,824,829. Note that the sum of the wealth increases equals \$2,000,000, the value of the synergies.

$$6. \text{ EPS}_D = (500,000 - .12(1,200,000) - .12(1,400,000))(1 - .34)/100,000 = 1.2408$$

$$\text{EPS}_E = (500,000 - .12(1,200,000))(1 - .34)/(100,000 + 1,400,000/26) = 1.5173$$

$$\text{EPS}_D < \text{EPS}_E \quad \text{Therefore, sell equity}$$

7. The NPVs are the same. The working capital requirement offsets the difference between the purchase prices at time zero and the differences in salvage value in the tenth year. The depreciation write-offs are the same for both systems.

$$8. \quad c = \$44,721.36. \text{ Transactions costs equal } (\$2,000,000/\$44,721.36) \cdot \$75 = \$3354.102$$

9.a. Base case NPVs are easily determined with present value functions as follows:

$$NPV(4, \infty)_A = 13,397.31 \frac{1}{1 - .6830} = 42,264.60$$

b.

$$NPV(6, \infty)_B = 11,737.04 \frac{1}{1 - .7513} = 47,196.37$$

$$PMT_A = \frac{13,397.31}{\left[\frac{1}{.1} - \frac{1}{.1(1+.1)^4} \right]} = 4,226.46$$

c.

$$PMT_B = \frac{11,737.04}{\left[\frac{1}{.1} - \frac{1}{.1(1+.1)^3} \right]} = 4,719.64$$

d. Each of the above figures indicate that the Cadillacs are preferable.

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1. Describe how an increase in the variance in cash balances would affect the level of marketable security purchases made by a firm using the Miller-Orr Cash Management Model.
2. List the weaknesses of the payback rule as a capital budgeting technique.
- 3.a. Why is a call and put hedge strategy less expensive for hedging exchange risk than a put hedge alone?
 - b. Describe a zero cost collar.
4. Suppose that the revenue associated with harvesting timber increase as the length of time the trees are permitted to grow increases. That is, timber revenues increase as the firm waits to cut trees. At the same time, there is an opportunity cost associated with waiting to harvest timber. The firm loses interest on revenues as it waits to sell timber. How might you determine the appropriate time to harvest timber? Describe your solution procedure. No "formulas" are necessary here.

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5. Suppose an investor has the opportunity to invest in a stock currently selling for \$85 per share. The stock is expected to pay a \$3 dividend next year (at the end of year 1). In each subsequent year until the start of the fifth year, the annual dividend is expected to grow at an annual rate of 20%. Starting at the end of the fifth year, the annual dividend is anticipated grow at an annual rate of 10% through the eighth year. Starting at the end of the ninth year, dividends are anticipated to grow at an annual rate of 1%. All cash flows are to be discounted at an annual rate of 7%. Should the stock be purchased at its current price?
6. The Smith Company is considering the purchase of a new machine to replace the one with which it currently operates. The old machine was purchased four years ago for \$700,000 and can be traded in now for \$300,000. Both machines may be depreciated on a straight- line basis; both have expected salvage values of \$100,000. The old machine had a life expectancy when purchased of ten years and is capable of producing 60,000 units per year. Each unit can be sold for \$9. The new machine can be purchased for \$900,000 and qualifies the company to an investment tax credit totaling \$45,000. The new machine has a life expectancy of six years and is capable of producing 100,000 units. The company operates in the forty percent marginal income tax bracket and discounts all of its cash flows at eleven percent. Annual operating costs are the same (\$300,000) for both machines. Should the Smith Company purchase the new machine or continue to operate with the old machine? Would your answer change if the company discounted all of its cash flows at a twenty percent rate?
7. Smedley Company stock is currently selling for \$40 per share. Its historical variance of returns is .25, compared to the historical market variance of .10. The current one-year treasury bill rate is 5%. Assume that all of the standard Black-Scholes Option Pricing Model assumptions hold.
- What is the current value of a put on this stock if it has an exercise price of \$35 and expires in one year?
 - What is the implied probability that the value of the stock will be less than \$30 in one year?
8. The following chart represents initial investments, net annual cash flows (these projects generate annuities for N years) and life expectancies (N) of two projects. Assume all cash flows are to be discounted at a ten percent rate.

	<u>A</u>	<u>B</u>
Initial Investment	1100	1600
Annual Cash Flow	350	500
N	6	7

When the projects terminate in N (6 for A and 7 for B) years, the firm can re-invest the same sum (either 1100 for A or 1600 for B) and receive identical annual cash flows in the N years following the second investment; this process is assumed to last forever. Thus, each project is assumed to be

replicated on a constant scale forever. Comparing the simple NPV's of these projects is complicated by the fact that they have different life expectancies. This complication is worst when the longer term project has the higher NPV because one has to wait longer to re-invest to replicate the project. Thus, the problem here is to evaluate the "lifetime" or perpetual NPV's of these projects given that each will be replicated every N years. For example, every 6 years, Project A will require a \$1100 investment every six years and generate \$350 annual cash flows each year except during the years that the \$1100 investments are made.

- a. Derive an expression for generating NPV's for a project which can be replicated on a constant scale forever. Your final expression should not involve an infinite series and should be capable of generating a numerical solution within a reasonably short period of time. Your expression should account for the annual cash flows and the initial investments each time the project is replicated.
- b. Assuming that the projects may be replicated on a constant scale perpetually, which of the projects represents the best investment? What is the present value associated with each of these perpetually replicated projects (Account for all cash flows assuming they are generated forever)?

9. A firm uses a variation of the Baumol Cash Management Model where brokerage commissions are a function of the level of marketable securities sold. More specifically, the brokerage commission B is determined by the function $B = F + v \cdot c$ where F is the fixed portion of the brokerage expense and v is that part which varies directly with the size of the order c . Thus, the per transaction brokerage cost for this firm equals $\$40 + .001c$ where c represents the dollar value of marketable securities sold. Total brokerage expenses for a given period equal the brokerage cost per transaction B times the number of transactions during that period X/c where X represents total cash usage during the period. Total cash usage equals \$100,000,000 for this firm. The firm is able to obtain a return equal to 8% (per year) on its marketable securities. Furthermore, the firm maintains an interest bearing checking account, so that it is able to receive an interest rate equal to 3% on its cash balances.

- a. Derive a formula that will enable its user to determine an optimal cash order quantity for the firm.
- b. How many days (you may assume 365 days in a year) will elapse between transactions for cash for this firm?

10. First National Bank needs to raise \$8,000,000 to finance a leasing operation. The bank will raise part of its required funding through changes in current liabilities and from its retained earnings. The bank intends to sell long-term notes at an annual interest rate of 9% to raise the remaining funds required to finance this operation. This operation will increase the bank's current liabilities (through accrued wages, taxes payable and other short-term debts) by \$1,000,000. The bank's EBT (Earnings Before Tax = Taxable Income) level next year is projected to be \$7,500,000. All interest payments, including the interest on the \$8,000,000 in notes, have been deducted from earnings before computing EBT. The bank pays corporate taxes at a rate of 30% and pays 50% of its after tax earnings (NIAT) in dividends. After accounting for retained earnings and changes in current liabilities, compute the external funding needs (EFN) for the bank.

11. The Smith Company of America has just sold equipment to a Japanese client for ¥12,500,000.

Payment is due nine months from now. Relevant data is as follows:

Spot exchange rate: ¥110/\$

Nine month forward exchange rate: ¥108/\$

Japanese Borrowing interest rate: 5.0%

U.S. Borrowing interest rate: 6.0%

Japanese Lending interest rate: 2.0%

U.S. Lending interest rate: 5.0 %

Size of futures contracts: ¥12,500,000

Term to expiration/settlement of all contracts: 9 months

Transactions cost on ¥12,500,000 forward contract: \$1,500

Assume that appropriate options are not available with the desired term to expiration and that borrowing and lending interest rates are not compounded. What is the most appropriate exchange rate hedge for the Smith Company? Why?

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Mid-term Exam Solutions: Practice Version 2

1. Increased σ leads to an increased z ; Marketable security purchases will increase by $2z$.
2. Doesn't account for risk, cash flows received after the payback date or for the scale of the investment. Also, its accounting for time value of money is incomplete.
- 3.a. The put in the put-call hedge is financed with the proceeds from the sale of the call. It is, in effect, a zero- or low- cost collar.
 - b. A *Zero Cost Collar* is a package of options designed to require zero net investment. Typically, the collar consists of a package with a long position in a put enabling its owner to sell the underlying security if its price drops to a specified price along with a short position in a call whose exercise price is set so that it exactly offsets what is paid for the put. Hence, such a collar requires no net investment.
4. Determine the NPV function's relation to time and maximize NPV with respect to time.
5. The following Three Stage Growth Model can be used to evaluate this stock:

$$P_0 = DIV_1 \left[\frac{1}{k - g_1} - \frac{(1 + g_1)^{n(1)}}{(k - g_1)(1 + k)^{n(1)}} \right] + DIV_1 \left[\frac{(1 + g_1)^{n(1)-1}(1 + g_2)}{(1 + k)^{n(1)}(k - g_2)} - \frac{(1 + g_1)^{n(1)-1}(1 + g_2)^{n(2)-n(1)+1}}{(k - g_2)(1 + k)^{n(2)}} \right]$$

$$+ \frac{DIV_1(1 + g_1)^{n(1)-1}(1 + g_2)^{n(2)-n(1)}(1 + g_3)}{(k - g_3)(1 + k)^{n(2)}}$$

$$P_0 = \$3 \left[\frac{1}{.07 - .20} - \frac{(1 + .20)^4}{(.07 - .20)(1 + .07)^4} \right] + \$3 \left[\frac{(1 + .20)^{4-1}(1 + .10)}{(1 + .07)^4(.07 - .10)} - \frac{(1 + .20)^{4-1}(1 + .10)^{8-4+1}}{(.07 - .10)(1 + .07)^8} \right]$$

$$+ \frac{\$3(1 + .20)^{4-1}(1 + .10)^{8-4}(1 + .01)^1}{(.07 - .01)(1 + .07)^8} = 104.748$$

Note that the definition for $n(2)$ is a little different from before in the formula; the numbers should work out to be the same. Since the \$85 purchase price of the stock is less than its \$104.748 value, the stock should be purchased.

6. First, make note of the following:
 - 700,000 = Purchase price of the old asset
 - 240,000 = Accumulated depreciation of the old asset = $(700,000 - 100,000) / 10 \times 4$

300,000 = 300,000 = Current trade-in value of the old asset

.4 = Corporate income tax rate

Now, we easily calculate the following:

700,000 - 240,000 = Current book value of old asset

700,000 - 240,000 - 300,000 = Capital gain on trading in the old asset

$(700,000 - 240,000 - 300,000) \times .4$ = Cash flow reduction from annual depreciation tax write-off on the new asset

So with capital gains, it is better to spread the gain out over the next 6 years with the reduced tax write-off than to take the gain at time zero. Next, solve for NPVs as follows:

$$NPV_{old} = [540,000(1 - .4)] + \left(\frac{700,000 - 100,000}{10} \times .4 \right) \left[\frac{1}{.11} - \frac{1}{.11(1.11)^6} \right] + \frac{100,000}{(1 + .11)^6} = 1,525,691.257$$

$$NPV_{new} = -900,000 + 45,000 + 300,000 + [(700,000 - 240,000 - 300,000) \times .4]$$

$$+ [900,000(1 - .4)] + \left(\frac{900,000 - 100,000}{6} \times .4 \right) \left[\frac{1}{.11} - \frac{1}{.11(1.11)^6} \right] + \frac{100,000}{(1 + .11)^6} = 2,027,583.21$$

Thus, the new machine should be purchased. A higher discount rate will not change the answer.

7. a. $d1 = .6172$; $d2 = .1178$; $N(d1) = .7314$; $N(d2) = .5469$

$c0 = 11.05$; with put-call parity: $p0 = 4.34$

b. Use $X=30$; $d1 = .925$; $d2 = .4245$; $N(d2) = .6644$

$1 - N(d2) = .3356$

8. a. Assuming that these projects are replicated at the end of their expected lives forever, NPV's are found as follows by first defining D_n as a discount function; that is, $D_n = 1/(1+k)^n$. We will make this substitution only for the sake of writing fewer terms. We can think the first investment into one of the projects described above as being an investment into an n year project with an NPV equal to $NPV(n,1)$. If the project is to be replicated an infinite number of times, its NPV might be written as $NPV(n,\infty)$. Each time the project is replicated, the discount function D_t is revised. Thus, in this case, a series similar to one presented above might be written as follows:

$$NPV(n, \infty) = NPV(n, 1) \cdot [1 + D_n + D_n^2 + D_n^3 + \dots]$$

First, we multiply both sides of this equation by D_n :

$$NPV(n, \infty) D_n = NPV(n, 1) \cdot [D_n + D_n^2 + D_n^3 + D_n^4 + \dots]$$

Next, we subtract the first equation from the second to obtain:

$$NPV(n, \infty) \cdot (D_n - 1) = NPV(n, 1) \cdot [-1]$$

$$NPV(n, \infty) = NPV(n, 1) \cdot \frac{-1}{D_n - 1} = NPV(n, 1) \cdot \frac{1}{1 - D_n}$$

$$NPV(7, 1)_B = -1600 + 500 \cdot \left[\frac{1}{.1} - \frac{1}{.1(1+.1)^7} \right] = 834.21$$

$$NPV(6, 1)_A = -1100 + 350 \cdot \left[\frac{1}{.1} - \frac{1}{.1(1+.1)^6} \right] = 424.34$$

$$NPV(6, \infty)_A = 424.34 \frac{1}{1 - .5645} = 974.32 \quad \text{since } NPV(6, 1) = 424.34$$

$$NPV(7, \infty)_A = 834.21 \frac{1}{1 - .4868} = 1713.51 \quad \text{since } NPV(7, 1) = 834.21$$

We rewrite this equation to obtain:

Alternatively, we might have found the NPV function by treating the annual cash flows as a perpetuity, then deducting the from the purchase price paid every n years the annual cash flow not received each n years and treating the purchase price as a perpetuity to be paid every n years.

9. Use the following total cost function where i' is the interest rate on checking:

$$\begin{aligned} \$ &= \frac{X}{c} B + \frac{c}{2} (i - i') = \frac{X}{c} (F + v \cdot c) + \frac{c}{2} (i - i') \\ &= XFc^{-1} + Xv + \frac{(i - i')}{2} c \end{aligned}$$

Now, find the derivative of $\$$ with respect to c and set equal to zero:

$$0 = \frac{d\$}{dc} = -XF c^{-2} + \frac{i-i'}{2}; \quad c = \sqrt{\frac{2XF}{i-i'}}$$

$$c = \sqrt{\frac{2 \cdot 100,000,000 \cdot 40}{.08 - .03}} = \$400,000$$

One interesting result is that the variable cost component does not affect the optimal cash order quantity. Cash will be ordered X/c times per year, or 250 times. Thus, 1.46 days, on average will elapse between transactions.

10. $EFN = \$8,000,000 - (\$7,500,000 \cdot .7 \cdot .5) - \$1,000,000 = \mathbf{\$4,375,000}$

11. Since options are not available, only the futures market hedge and the money market hedge should be considered. The cash flows are given as follows:

1. Forward market hedge:

Strategy: Sell ¥12,500,000 forward for dollars at once.

Result: \$115,740.74 will certainly be received in nine months. Transactions costs at time zero will total \$1,500. Forgone interest over nine months totals \$56.25. The total amount (net of forgone interest) to be received in nine months is \$114,184.49. This amount is certain.

2. Money market hedge:

Strategy: Borrow ¥12,048,192.77 in Japan for nine months @ 5% p.a.

Exchange ¥12,048,192.77 for \$109,529.03 now

Invest \$109,529.03 for nine months @ 5% p.a.

Result: Yen loan is repaid by receipts from sale in nine months. \$113,636.36 is obtained from U.S. investment. This amount is certain. Notice that this strategy is inferior to the forward market hedge.

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Additional Practice Mid-term Exam Questions

1. Suppose that a bank with \$1 billion market value in assets is obliged to repay \$900 million face value in debt in two years. The current riskless rate of return is 3% per annum and the standard deviation of annual returns on the bank's portfolio of assets is .2. Black-Scholes assumptions hold in this corporate securities framework. By how much would the value of the bank's equity increase if the standard deviation of the bank's asset returns increased to .3?

2. The following chart represents initial investments, net annual cash flows and life expectancies of several projects. Assume a ten percent discount rate.

	<u>A</u>	<u>B</u>	<u>C</u>	<u>D</u>
Investment	1000	1200	1500	1800
Annual Cash Flow	300	350	500	600
N	5	6	7	6

- Assuming that the projects may be replicated on a constant scale perpetually, which of the projects represents the best investment?
- Assume that the projects are mutually exclusive and cannot be replicated. Which of the projects is preferred?
- Compute profitability indices for each of the projects assuming that none are replicated.

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Solutions to Additional Practice Mid-term Exam Questions

1. Our first step is to obtain the bank's initial equity value, based on the assumption that the equity is a call option to purchase the firm's assets:

$$d_1 = \frac{\ln\left(\frac{1,000,000,000}{900,000,000}\right) + \left(.03 + \frac{1}{2} \times .2^2\right) \times 2}{.2\sqrt{2}} = 0.726; N(d_1) = .766$$

$$d_2 = 0.726 - .2\sqrt{2} = .443; N(d_2) = .671$$

$$\text{Equity Value} = c_0 = 1,000,000,000 \times .766 - \frac{900,000,000}{e^{.03 \times 2}} \times .671 = 197,201,500$$

Next, we work through the same formulas, with the new standard deviation = .3:

$$d_1 = \frac{\ln\left(\frac{1,000,000,000}{900,000,000}\right) + \left(.03 + \frac{1}{2} \times .3^2\right) \times 2}{.3\sqrt{2}} = 0.602; N(d_1) = .726$$

$$d_2 = 0.602 - .3\sqrt{2} = .178; N(d_2) = .570$$

$$\text{Equity Value} = c_0 = 1,000,000,000 \times .726 - \frac{900,000,000}{e^{.03 \times 2}} \times .570 = 242,834,400$$

We see that the value increase in the bank's equity is $242,834,400 - 197,201,500 = 45,633,900$.

2.a.

$$NPV_A = \{-1000 + 300[\frac{1}{.1} - \frac{1}{.1(1.1)^5}]\} \bullet \{\frac{1}{1 - 1/1.1^5}\} = 362$$

$$NPV_B = \{-1200 + 350[\frac{1}{.1} - \frac{1}{.1(1.1)^6}]\} \bullet \{\frac{1}{1 - 1/1.1^6}\} = 745$$

$$NPV_C = \{-1500 + 500[\frac{1}{.1} - \frac{1}{.1(1.1)^7}]\} \bullet \{\frac{1}{1 - 1/1.1^7}\} = 1918$$

$$NPV_D = \{-1800 + 600[\frac{1}{.1} - \frac{1}{.1(1.1)^8}]\} \bullet \{\frac{1}{1 - 1/1.1^8}\} = 1867$$

Project C has the highest NPV.

b. Here, we merely compute base case NPV's. We find that Project C is still best.

$$NPV_A = \{-1000 + 300[\frac{1}{.1} - \frac{1}{.1(1.1)^5}]\} = 137$$

$$NPV_B = \{-1200 + 350[\frac{1}{.1} - \frac{1}{.1(1.1)^6}]\} = 324$$

$$NPV_C = \{-1500 + 500[\frac{1}{.1} - \frac{1}{.1(1.1)^7}]\} = 934$$

$$NPV_D = \{-1800 + 600[\frac{1}{.1} - \frac{1}{.1(1.1)^8}]\} = 813$$

- c. $PI_A = 1137/1000 = 1.137$
 $PI_B = 1524/1200 = 1.270$
 $PI_C = 2434/1500 = 1.623$
 $PI_D = 2613/1800 = 1.452$

**Mid Term Exams Stop Here.
Final Exams Follow.**

Rensselaer Polytechnic Institute

MGMT 6030
Financial Management II

Instructor: John Teall
Spring Term 2014

Final Exam: Practice Version 1
3 hours

1. A firm with risk neutral shareholders (they are able to diversify all firm specific risk) and limited liability to creditors has the opportunity to invest all of the firm's assets in "Dog Meat", a 20 to 1 long shot running in Saturday's horse race at the local track. If the horse should win, the payoff on the 200,000 investment would be 4,000,000. If the horse should place second, the track would still pay 800,000 on the 200,000 investment. Management, whose risk preferences are identical to those of shareholders, estimate the probability that the horse will win is .03 and the probability that the horse will finish second is .05. Of the 200,000 in company assets, 100,000 is financed with debt. In the event of bankruptcy (value of remaining assets is less than 100,000), creditors will take over the firm's assets and previous shareholders and managers will owe nothing. The time value of money can be ignored. Is the investment in "Dog Meat" acceptable to managers acting on behalf of shareholder interests?
2. Describe why adoption of a greenmail provision in a corporate charter might actually increase share prices.
3. Stassen Company employs the cumulative voting mechanism to elect its board members. The company has 500 outstanding shares. If a given shareholder wishes to assure control of one director out of five up for election, what is the minimum number of shares that he must hold?
4. List a set of conditions that are sufficient for a zero NPV (or even a positive NPV) merger to be detrimental to the shareholders of both the acquiring and target firms. You may assume that taxes and transactions costs are irrelevant.
5. Why do takeovers seem to always benefit target firm shareholders more than acquiring firm shareholders?
6. What are the disadvantages to a corporation of establishing a stock-based compensation plan?
7. Which stakeholder groups are most likely to prefer a cumulative voting system to a majority voting system?
8. Why are larger firms much more likely to make public offerings of bonds than small firms?

Note: Closed-book short essay questions have not been separated from open-book problems here. The actual exam will separate these. Short essays will be in "closed book" format; numerical problems will be in "open book" format.

9. An industry comprised of eight equal-sized firms is reduced by one or more mergers. As measured by the Herfindahl Index, which of the following series of combinations results in greater industry concentration? Support your answer with relevant index computations.

a. Each of four firms acquires one of the remaining firms such that the industry is reduced to four firms.

b. One of the four firms acquires two of the remaining firms such that the industry is reduced to six firms.

10. McNamara Company employs the cumulative voting mechanism to elect its board members. The company has 8000 outstanding shares. If a given shareholder wishes to assure control of three directors out of nine up for election, what is the minimum number of shares that he must hold?

11. Assume that option-pricing methodology can be applied to the valuation of corporate securities and that put-call parity holds in this type of setting. Demonstrate the M&M Irrelevance proposition in the no-tax setting with standard M&M assumptions. Prove that the leveraged firm cannot be worth less than the unleveraged firm.

Rensselaer Polytechnic Institute

MGMT 6030
Financial Management II

Instructor: John Teall
Spring Term 2014

Final Exam Solutions: Practice Version 1

1. Because managers and investors are risk neutral and we ignore the time value of money, pure security prices equal outcome probabilities. If the investment is not taken, shareholder wealth is:

$$200,000 - 100,000 = 100,000$$

If the investment is taken, shareholder wealth totals:

$$.03(4,000,000-100,000) + .05(800,000-100,000) + .92(0) = 152,000$$

Thus, this firm should invest its assets at the race track.

2. It has been argued that without the possibility of receiving greenmail, many raiders would not seek value-increasing takeovers. Shareholders would lose wealth given a reduced market for takeovers. In this scenario, the greenmail prospects may benefit shareholders in the long run.

3. 84, The minimum number of shares is determined as follows:

$$\min \# \text{ shs. req.} = \frac{\# \text{ seats required} \bullet \# \text{ shs. outstanding}}{\# \text{ seats to be elected} + 1} + 1 = \frac{1 \bullet 500}{5 + 1} + 1 = 84$$

4. There exists uncertainty regarding firm return outcomes. Firm return outcomes are not perfectly correlated. At least one of the firms is leveraged. There is no transfer of wealth between shareholders of the two firms.

5. There is generally at least potential competition for the acquisition of desirable targets. Bidders often bid up target firm share values in an effort to gain control of the firm. Takeover defenses may force acquirers to make takeover offers more attractive.

6. Consider items in the following list:

1. Performance-based compensation can reduce motivation by reducing the importance of other "intrinsic rewards"
2. It can encourage workers or managers to narrow their focus to a particular task or to work as quickly as possible
3. It often discourages managers from taking risks
4. One cannot measure performance perfectly. Furthermore, what is the appropriate time frame for performance measurement?
5. Performance based compensation often results in long-term accounting profits being sacrificed for short-term profits emphasis.
6. It is usually to difficult to change incentives in the middle of a manager's tenure. (e.g: try

changing salespersons commission schedule)

7. One cannot to set rewards contingent on all possible outcomes That is, performance based compensation schemes are typically too narrow in outlook.
8. Performance based compensation schemes introduce into managers' compensation risks over which they have no control.

7. The power (potential for board representation) of minority shareholder groups is increased by cumulative voting regimes. Hence, such groups tend to prefer such regimes.

8. Public offerings of bonds involve a large fixed issuing cost that exceed most small firms' abilities to pay.

9. $H_a = .25^2 + .25^2 + .25^2 + .25^2 = .25$
 $H_b = .375^2 + .125^2 + .125^2 + .125^2 + .125^2 + .125^2 = .21875$
 The four-firm industry is more concentrated.

10. The minimum number of shares is determined as follows:

$$\begin{aligned} \min .\# \text{ shs. req.} &= \frac{\# \text{ seats required} \bullet \# \text{ shs. outstanding}}{\# \text{ seats to be elected} + 1} + 1 \\ &= \frac{3 \bullet 8000}{9 + 1} + 1 = 2,400 \end{aligned}$$

11. Assume that there are two identical firms except that one is leveraged (L) and the other is unleveraged (U). Suppose that $S_U > S_L$. For the leveraged firm: $X > 0$, Asset value $S = E + D$, $E = c$ and $D = Xe^{-rt} - p$. Thus: $S_L = c_L + X_L e^{-rt} - p_L$

For the unleveraged firm: $X = 0$ which means that $S = c$ and $p = 0$.

$$S_U = c_U + X_U e^{-rt} - p_U = c_U$$

The terminal value of both firms equals S_T . Sell the equity of the unleveraged firm and use the proceeds to purchase the securities of the leveraged firm. The profit will be $S_L - S_U$. The terminal payoff will be:

$$-\text{MAX}[S_T - X_U, 0] + \text{MAX}[S_T - X_L, 0] + X_L - \text{MAX}[X_L - S_T, 0]$$

which, since $X_U = 0$, simplifies to $-S_T + S_T + X_L - X_L = 0$. Since the initial payoff exceeds zero, and the terminal payoff equals zero, an arbitrage opportunity exists and the condition cannot persist.

Rensselaer Polytechnic Institute

MGMT 6030
Financial Management II

Instructor: John Teall
Spring Term 2014

Final Exam: Additional Practice Questions

1. Why are mutual fund and bank trust shareholders more likely than individual investors to vote with managements of firms in which they hold stock?
2. What types of takeovers characterized the merger boom of the 1960's? What were the primary motivations for these takeovers?
3. What were the provisions of the Hart-Scott-Rodino Antitrust Improvements Act of 1976?
4. What is a dual class re-capitalization? How can it be used as a takeover defense?
5. Describe how the cumulative voting procedure differs from the majority voting procedure.
6. What are some of the explanations for the finding that acquirers earn smaller returns in a takeover than targets earn?
7. Describe the difference between direct and indirect bankruptcy costs. Give examples of each. Which are likely to be higher in a typical bankruptcy? Why?
8. Why is it frequently difficult for creditors to agree to a firm restructuring outside of bankruptcy court? Under what circumstances is it likely that bankruptcy court will be necessary to restructure a firm?
9. The Stanley Company has 5000 outstanding bonds with a face value of \$1000 each maturing in one year. One large creditor owns 4000 of these bonds and 1000 small creditor own 1000 of them. Equityholders could force liquidation of the firm now for \$2,000,000. However, if the firm continues to operate for one more year (until the bonds mature), the firm could be liquidated for a minimum of \$2,500,000. Otherwise, if the firm's revenues strengthen, the firm could be liquidated for \$4,000,000. All creditors and shareholders expect that the probability of firm value equaling \$2,500,000 in a year equals .40; the probability that firm value will equal \$4,000,000 equals .60. Assume that there is no time value of money and that shareholders are risk neutral (discount rates are zero).
 - a. If the firm were to undergo a restructuring and the \$1000 face value bonds were to be re-issued, what would be the maximum face value for the bonds such that shareholders would agree to offer the restructuring agreement? Assume that all creditors agreed to the restructuring.
 - b. What is the total expected value of each of the classes of claims given your answer to part a?
 - c. If the firm were to undergo a restructuring and the \$1000 face value bonds were to be

re-issued, what would be the maximum face value for the bonds such that shareholders would agree to offer the restructuring agreement? Assume that only the large creditor agreed to the restructuring.

- d. What is the total expected value of each of the classes of claims given your answer to part c?
- e. Why would the small creditors refuse to agree to this restructuring?

10. Rumsfeld Company employs the cumulative voting mechanism to elect its board members. The company has 8000 outstanding shares. If a given shareholder wishes to assure control of three directors out of nine up for election, what is the minimum number of shares that he must hold?

Rensselaer Polytechnic Institute

MGMT 6030

Financial Management II

Instructor: John Teall

Spring Term 2014

Final Exam Sample Questions Solutions: Practice Version

1. These institutional managers frequently have professional relationships with firms in which they invest, including consulting and board relationships.
2. Conglomerate mergers were very common during the 1960's. Corporate giants such as ITT and Litton Industries exemplified conglomerates created during this period. Diversification and application of "proven" management techniques to other industries were motivations offered to many of these takeovers.
3. The Hart-Scott-Rodino Antitrust Improvements Act of 1976 requires that the FTC and the Justice be given the opportunity to review and pass judgement on all proposed takeover transactions. A number of exemptions were to apply, including transactions for less than \$15 million.
4. Dual classes of shares enables a firm to vary the number of votes associated with each share. For example, dual share classes enable firms to designate a different numbers of votes per share for each of two share classes. Dual class recapitalization is simply the classification of shares into two classes where there had previously been one. Dual class recapitalization can serve to concentrate more votes in held by management, making it more difficult for an outsider to gain control of the firm.
5. Under a cumulative voting system, shareholders may re-allocate their votes towards any combination of issues on the election agenda. Under cumulative voting, votes cast for members of a corporate board may be allocated so that a shareholder casts his votes towards any combination of candidates he finds suitable. For example, the shareholder may cast all of his votes for a single member to ensure that he at least controls a single seat. Cumulative voting is intended to permit minority shareholders to more easily obtain some representation on the board of directors.
6. i. Schipper and Thompson [1983] argue that acquiring firm returns are very difficult to measure because bidding activity is likely to be part of an ongoing program by the acquiring firm. One cannot easily ascertain exactly when this program begins; thus, one cannot easily measure its return. Perhaps acquiring firm longer term returns are higher than cumulative average residuals would indicate.
 - ii. Acquiring firm competition for sources of efficiency may enable target firms to capture all of the gains from a takeover. This explanation seems consistent with the finding that acquiring firm returns prior to passage of the Williams Act of 1968 were higher than after passage. Yet, this explanation would not explain the negative returns often observed for acquiring firms.
 - iii. Acquiring firm managers may benefit from a takeover even when their shareholders do not. Such benefits may include higher compensation due to the increased firm size or complexity or

increased diversification enjoyed by managers.

iv. Some acquirers simply make mistakes.

v. Also, acquiring firms are typically larger than target firms, so that takeovers have a greater impact on target firm returns. In addition, some observers argue that either a “Winner’s Curse” affects acquiring firms or that acquiring firm managers experience an inappropriate hubris.

7. Direct bankruptcy costs are the administrative costs associated with resolution of the firm. Such costs include fees for lawyers, accountants and other administrative expenses. Indirect bankruptcy costs are associated with hindered firm operations, including loss of revenues, client base, access to employees, managers and suppliers due to firm instability. Most studies suggest that the indirect costs far exceed the direct costs of bankruptcy.

8. Individual bondholders have an incentive to hold out and free-ride on the concessions made by participating bondholders as long as the restructuring agreement is not very sensitive to the actions of an individual bondholder. This is because the concessions agreed to by other creditors may be sufficient to ensure the success of the restructuring agreement.

The claimants in the firm are unlikely to agree to an informal restructuring one or more of the following is true: 1) the costs and delays associated with a formal Chapter 11 court process are relatively low, 2) if the restructuring is likely to succeed or fail on the basis of one of many investors' decisions, 3) if the restructuring is likely to substantially reduce the wealth of a pivotal set of claimants, and 4) perhaps, most importantly, the firm having many claimants, particularly of varying sizes and in different classes.

9. a. $\$4,000,000 \div 5000 = \800 per bond

b. Creditors: $(.4 \cdot \$2,500,000) + (.6 \cdot \$4,000,000) = \$3,400,000$ or \$680 per bond;

Shareholders: 0

c. $[\$4,000,000 - (\$1,000 \cdot 1000)] \div 4000 = \750 per bond

d. Large Creditor: $(.4 \cdot .75 \cdot \$2,500,000) + (.6 \cdot .75 \cdot \$4,000,000) = \$2,550,000$, or \$637.5 per bond

Small Creditors: $(.4 \cdot .25 \cdot \$2,500,000) + (.6 \cdot .25 \cdot \$4,000,000)$
 $= \$850,000$, or \$850 each

e. They would receive more money by holding out.

10. $(3 \cdot 8,000) / ((9+1) + 1) = 2,401$

**Questions on Material not covered this term
Questions that follow are not related to your
exams.**

2. Describe characteristics of the "ideal" LBO candidate.

2. The "ideal" LBO candidate is a mature company that generates more cash in a predictable manner than it can profitably re-invest in its own business. The debt service of the LBO of the "cash cow" is funded by the cash obtained from operations. Companies which are restructured by an LBO often realize improved efficiency and overall performance, largely due to the increased shareholdings of the management team and the close monitoring of the LBO firm which funded the buy out.

4. The Stanley Company has 5000 outstanding bonds with a face value of \$1000 each maturing in one year. One large creditor owns 4000 of these bonds and 1000 small creditor own 1000 of them. Equity holders could force liquidation of the firm now for \$2,000,000. However, if the firm continues to operate for one more year (until the bonds mature), the firm could be liquidated for a minimum of \$2,500,000. Otherwise, if the firm's revenues strengthen, the firm could be liquidated for \$4,000,000. All creditors and shareholders expect that the probability of firm value equaling \$2,500,000 in a year equals .40; the probability that firm value will equal \$4,000,000 equals .60. Assume that there is no time value of money and that shareholders are risk neutral (discount rates are zero).

- a. If the firm were to undergo a restructuring and the \$1000 face value bonds were to be re-issued, what would be the maximum face value for the bonds such that shareholders would agree to offer the restructuring agreement? Assume that all creditors agreed to the restructuring.
 - b. What is the total expected value of each of the classes of claims given your answer to part a?
 - c. If the firm were to undergo a restructuring and the \$1000 face value bonds were to be re-issued, what would be the maximum face value for the bonds such that shareholders would agree to offer the restructuring agreement? Assume that only the large creditor agreed to the restructuring.
 - d. What is the total expected value of each of the classes of claims given your answer to part c?
 - e. Why would the small creditors refuse to agree to this restructuring?
5. a. $\$4,000,000 \div 5000 = \800 per bond
b. Creditors: $(.4 \cdot \$2,500,000) + (.6 \cdot \$4,000,000) = \$3,400,000$
or \$680 per bond; Shareholders: 0
c. $[\$4,000,000 - (\$1,000 \cdot 1000)] \div 4000 = \750 per bond
d. Large Creditor: $(.4 \cdot .75 \cdot \$2,500,000) + (.6 \cdot .75 \cdot \$4,000,000)$
 $= \$2,550,000$, or \$637.5 per bond

$$\text{Small Creditors: } (.4 \cdot .25 \cdot \$2,500,000) + (.6 \cdot .25 \cdot \$4,000,000) \\ = \$850,000, \text{ or } \$850 \text{ each}$$

Shareholders: 0

e. They would receive more money by holding out.

8.a. In a perfectly efficient capital market, is it possible for a high-risk security to have a higher NPV (Net Present Value: Present value less initial cash investment) than a low risk security? Why or why not?

b. Shiv et al [2005] studied the relative abilities of brain-damaged study participants to make gambling decisions. Describe the methodology and results of their study, along with potential implications for investing.

8.a. No - In a perfectly efficient market, all securities have zero NPV (by definition of a perfectly efficient market).

b. This study gathered 19 subjects that had incurred damage (stable focal lesions) to parts of their brains impairing their abilities to process emotions. The subjects were asked to participate in a series of gambles along with two control groups, one that had experienced no brain damage and a second group that had experienced some other type of brain damage. Each study participant was asked to participate in a sequential series of 20 gambles, betting \$1 against a 50/50 chance at either 0 or \$2.50. The expected value of each gamble was \$1.25, \$.25 higher than its cost. The subjects experiencing damage to their emotional circuitry bet more consistently than their “normal” counterparts and earned more money. The performance differences were more pronounced after non-impaired subjects experienced losses, making them even more reluctant to take advantage of expected wealth-increasing gambles. The performance of the emotionally damaged group compared favorably to the control group of participants who had experienced no brain damage and to the second control group who had experienced unrelated types of brain damage. A potential implication of this study is that emotions may impair investors’ abilities to respond rationally to situations involving risk, particularly after experiencing series of losses.

8. An investor has the opportunity to purchase and sell without restriction the up to 5% of securities of Companies A and B. Pro-forma income statements which apply each year for ever, with three equally likely outcomes 1, 2 and 3 are given below:

<u>Company:</u>	<u>A</u>			<u>B</u>		
<u>Outcome:</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>1</u>	<u>2</u>	<u>3</u>
NOI:	1000	2000	3000	1000	2000	3000
INT:	0	0	0	200	200	200
NI:	1000	2000	3000	800	1800	2800

Current total market values of corporate securities are given below:

V_D 0 2,000

V_E 10,000 7,000

Standard Modigliani-Miller assumptions apply here (perfectly efficient capital markets, no taxes, riskless debt, etc.); investors may borrow and lend unlimited sums at the corporate borrowing rate of 10%.

NOI: Net Operating Income
 INT: Interest Payments on Debt
 NI: Net Income
 V_D : Debt Value
 V_E : Equity Value
 NIAT: Net Income After Taxes

a. Devise an arbitrage position with the simultaneous purchase and sale of securities. This position will finance the purchase of securities with the sale of others and will have zero risk. This position will either generate a positive profit at time zero or will generate a positive cash flow in at least one future outcome. In no time period or outcome will there be a negative net cash flow. Demonstrate how your position earns a profit.

b. Now, assume that a 30% corporate income tax is to be imposed on NI. Thus, NI will be reduced by 30% for each company in each outcome to obtain NIAT. Assume that the value of debt for the leveraged firm does not change. Further assume that the value of unlevered firm equity decreases by (1-.3) to 7000. In the absence of arbitrage opportunities, what will be the equity value of Firm B?

8.a.Outcome:		1	2	3
Buy 5% of Stock B: CF = -350		40	90	140
Buy 5% of B Bonds: CF = -100		10	10	10
Sell 5% of Stock A: CF = +500		-50	-100	-150
Totals: CF =	+50	0	0	0

OR:

Outcome:		1	2	3
Buy 5% of Stock B: CF = -350		40	90	140
Buy 5% of B Bonds: CF = -100		10	10	10
Sell 5% of Stock A: CF = +500		-50	-100	-150
Loan 50 @ 10%: CF = -50		5	5	5
Totals: CF =	0	+5	+5	+5

b. $V_{\text{levered}} = V_{\text{unlevered}} + .3(V_{\text{debt}})$; $V_{\text{levered}} = 7000 + .3(2000) = 7600$
 $V_{\text{equity B}} = 7600 - 2000 = 5600$