Commerce 374
Winter Semester 2007
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Homework 1: Suggested Answers

Part I: Multiple Choice

1. The bid price of a treasury bill is _____.
   A) the price at which the dealer in treasury bills is willing to sell the bill
   B) the price at which the dealer in treasury bills is willing to buy the bill
   C) greater than the ask price of the treasury bill expressed in dollar terms
   D) the price at which the investor can buy the treasury bill

2. If a treasury note has a bid price of $982.50, the quoted bid price in the Wall Street Journal would be _____.
   A) $98:08
   B) $98:25
   C) $98:50
   D) $98:40

3. A treasury bill has a face value of $10,000 and is selling for $9,900. If the treasury bill matures in 80 days, its effective annual yield is ...
   A) 1.01%
   B) 4.50%
   C) 4.61%
   D) 4.69%

4. A 10 year Treasury bond with an 8% coupon rate should sell for ____ a 10 year Treasury bond with a 12% coupon rate.
   A) less than
   B) more than
   C) the same as
   D) indeterminate

5. The price quotations of treasury bonds in the Wall Street Journal show an ask price of 104:16 and a bid price of 104:08. As a buyer of the bond you expect to pay _____.
   A) $1,041.60
   B) $1,045.00
   C) $1,040.80
   D) $1,042.50

6. Which of the following most closely approximates the performance of a buy and hold portfolio strategy?
   A) an equally weighted index

B) a price weighted index
C) a value weighted index
D) weights are not a factor in this situation

7. In calculating the DJIA, the adjustment for a stock split occurs….
A) automatically
B) by adjusting the divisor
C) by adjusting the numerator
D) none of the above

8. What would you expect to have happened to the spread between yields on commercial paper and Treasury bills immediately after September 11, 2001.
A) No change, the spread does not usually react to a crisis
B) Increase, the spread usually increases in response to a crisis
C) Decrease, the spread usually decreases in response to a crisis
D) The spread has no "usual" reaction to a crisis

9. Underwriting is one of the services provided by ____.
A) the SEC
B) investment bankers
C) publicly traded companies
D) FDIC

10. _____ is a false statement regarding specialists.
A) On a stock exchange all buy or sell orders are negotiated through a specialist
B) Specialists can not trade for their own accounts
C) Specialists earn income from commissions and spreads in stock prices
D) Specialists stand ready to trade at quoted bid and ask prices

11. Barnegat Light sold 200,000 shares in an initial public offering. The underwriter's explicit fees were $70,000. The offering price for the shares was $25, but immediately upon issue, the share price jumped to $41. What is the best estimate of the total cost to Barnegat Light of the equity issue?
A) $ 70,000
B) $3,200,000
C) $3,270,000
D) $8,200,000

12. According to Loughran and Ritter, initial public offerings tend to exhibit _____ performance initially, and _____ performance over the long term.
A) bad; good
B) bad; bad
C) good; good
D) good; bad

13. The bid-ask spread exists because of _____.

A) market inefficiencies
B) poor communication
C) the need for dealers to cover expenses and make a modest profit
D) all of the above

14. Consider the following limit order book of a specialist. The last trade in the stock occurred at a price of $40.

Limit Buy Orders		Limit Sell Orders	
Price	Shares	Price	Shares
$39.75	100	$40.25	100
$39.50	100	$40.50	100

If a market buy order for 100 shares comes in, at what price will it be filled?
A) $39.75
B) $40.25
C) $40.50
D) $40.25 or less

15. You purchased 100 shares of ABC common stock on margin at $50 per share. Assume the initial margin is 50% and the maintenance margin is 30%. Below the stock price of _____ you would get a margin call. Assume the stock pays no dividend and ignore interest on margin.
A) $35.71
B) $42.86
C) $53.57
D) $57.14

16. Consider the following limit order book of a specialist. The last trade in the stock took place at a price of $35.

Limit Buy Orders		**Limit Sell Orders**	
Price	**Shares**	**Price**	**Shares**
$34.25	100	$35.25	800
$34.00	200	$35.50	500
$33.50	500	$36.00	1,000
$33.00	100	$36.25	400

If you were the specialist what would you want to do with your inventory of this stock?
A) decrease
B) increase
C) does not matter
D) there is not enough information to decide

17. Assume you purchased 200 shares of XYZ common stock on margin at $80 per share from your broker. If the initial margin is 60%, the amount you borrowed from the broker is _____.

A) $4000
B) $6400
C) $9600
D) $16000

18. You purchased 300 shares of common stock on margin for $50 per share. The initial margin is 60% and the stock pays no dividend. Your rate of return would be … if you sell the stock at $40 per share. Ignore interest on margin.
    A) 33%
    B) -33%
    C) -44%
    D) -56%

Part II: Detailed Questions

Question 1:

Consider the three stocks in the following table. P_t represents the price at time t, and Q_t represents shares outstanding (in millions) at time t.

Name	*Symbol*	$P_{01/03/06}$	$Q_{01/03/06}$	$P_{12/30/05}$	$Q_{12/30/05}$
Bank of Montreal	*BMO*	*57.25*	*500.22*	*55.94*	*500.22*
Nortel Networks	*NT*	*3.18*	*4,330*	*3.06*	*4,330*
Petro Canada	*PCA*	*48.58*	*262.100*	*46.65*	*262.100*

a. Compute the market capitalization of the three companies on December 30, 2005.

The market capitalization is the product of the number of shares outstanding and the price:

MC_{BMO}= 500.22*55.94=$ 27,982.31M
MC_{NT}= 4,330*3.06=$ 13,249.80M
MC_{PCA}= 262.1*46.65=$ 12,226.97M

b. Calculate the rate of return on an equally-weighted index of the three stocks on January 3rd, 2006

The return of the three stocks is: R_{BMO}=57.25/55.94-1= 2.34%
R_{NT}=3.18/3.06-1= 3.92%
R_{PCA}=48.58/46.65-1= 4.14%;

The return of the equally-weighted index is:

EWR = (2.34+3.92+4.14)/3= 3.47%

c. Calculate the rate of return on a value-weighted index of the three stocks on January 3rd, 2006

The initial total market value of the three stocks is:

27,982.31 + 13,249.80 + 12,226.97 = $53,459.07 M

The relative market values of the three companies are:

W_{BMO}=27,982.31/53,459.07=0.5234
W_{NT}=13,249.80/53,459.07=0.2479
W_{PCA}=12,226.97/53,459.07=0.2287

The return of the value-weighted index is:

VWR=0.5234*2.34+0.2479*3.92+0.2287*4.14=3.14%.

d. Calculate the rate of return on a price-weighted index of the three stocks. (Assume that the initial divisor equals 3.)

The initial index is (55.94+3.06+46.65)/3=35.22. The next trading day, it is (57.25+3.18+48.58)/3=36.34. Thus the return is;

PWR=36.34/35.22-1 = 3.18%

Suppose for the remainder of this problem that PCA splits its stock 2 for 1 after the market closes on December 30th, 2005.

e. What happens to the number of shares outstanding immediately after the split? At which price would PCA have traded on January 3rd if markets are efficient?

The number of shares would double to 524.2 million and the price of PCA would need to halve to $24.29 if markets are efficient.

f. What must happen to the divisor for the price-weighted index after the close on December 30th, 2005?

We need to set the divisor d such that the index does not change by the split:

35.22= (55.94+3.06+23.325)/d,

which implies a divisor of d=2.34.

g. Calculate the return of the equally-weighted, the value-weighted, and the price-weighted indices.

The equally-weighted and the value-weighted index returns are not affected by the split. On the other hand, the price-weighted index on January 3rd 2006 is (57.25+3.18+24.29)/2.34=36.21. Thus the return is;

PWR = 36.21/35.22-1 = 2.81%

Question 2:

a. Which security offers a higher effective annual yield?
(1) A three-month bill selling at $9,764.
(2) A six-month bill selling at $9,539.
b. Calculate the bank discount yield on each bill.

a. i. $1 + r = (10{,}000/9{,}764)^4 = 1.100$

$r = 10.0\%$

ii. $1 + r = (10{,}000/9{,}539)^2 = 1.099$

r = 9.9%

The three-month bill offers a higher effective annual yield.

b. i. $r_{BD} = \frac{10{,}000 - 9764}{10{,}000} \times \frac{360}{91} = .0934 = 9.34\%$

ii. $r_{BD} = \frac{10{,}000 - 9539}{10{,}000} \times \frac{360}{182} = .0912 = 9.12\%$

Question 3:

Microsoft is currently selling at $26.84 per share. You buy 1000 shares by using $15,000 of your own money and borrowing the remainder of the purchase price from your broker. The rate on the margin loan is 8%. The account has an initial margin of 50 percent and a maintenance margin of 25 percent.

a) What is the percentage increase in the net worth of your brokerage account if the price of MSFT immediately changes to: (i) $30; (ii) $25? What is the relationship between your percentage return and the percentage change in the price of MSFT?

The purchase costs you $26,840. You borrow $11,840 from the broker and invest $15,000 of your own funds. The initial net value of the account is $26,840-$11,840=$15,000. Note that returns are always measured relative to the value you first invest in your account.

(i) The net account value increases to $30,000-$11,840=$18,160. Thus, the return is 18,160/15,000-1=21.07%

(ii) The net account value falls to $25,000-$11,840=$13,160. Thus the return is 13,160/15,000-1= -12.27%

The relationship between the percentage change in the price of the stock and the investor's percentage gain is given by:

$$\%\text{ gain} = \%\text{ change in price} \times \frac{\text{Total investment}}{\text{investor's initial equity}} = \%\text{ change in price} \times 1.789$$

Thus, the leverage of this position is 1.789 (26840/15000). For example, when the stock price rises by 1 percent, then your account value will increase by 1.789 percent.

b) If the maintenance margin is 25%, how low can the price of MSFT fall before you get a margin call? (You can ignore the interest expenses in the margin account.)

The value of the 1,000 shares is 1000*P. Equity is 1000*P – 11,840. You will receive a margin call when

$$\frac{1000P - 11{,}840}{1000P} = 0.25 \Rightarrow P = \$15.79 .$$

c) *How much money do you need to send your broker to satisfy the margin call if the stock price drops below the level computed in b?*

You will need to add cash until your margin equals the initial margin of 50 percent. The value of the securities is $15,790 (15.79*1000) and you can borrow at most 50 percent of this (15790/2=7895). Thus, you need to pay back $3,945 (11840-7895) of the original margin loan of $11,840.

d) *What is the rate of return on your margined position if MSFT is selling after one year at: (i) $30; (ii) $25? What is the relationship between your percentage return and the percentage change in the price of MSFT? (You can ignore the dividend payments by MSFT).*

The margin loan with accumulated interest will be $11,840*1.08=$12,787.20. The equity in your account is 1000P-$12,787.2. Therefore your rates of return are:

(i) $\frac{1000 \times 30 - \$12{,}787.2}{\$15{,}000} - 1 = 14.75\%$

(ii) $\frac{1000 \times 25 - \$12{,}787.2}{15{,}000} - 1 = -18.58\%$

The relationship between the percentage change in the price of Intel and investor's percentage return is given by:

$$\text{\% gain} = \text{\% change in price} \times \frac{\text{Total investment}}{\text{investor's initial equity}} - \text{Margin Interest} \times \frac{\text{Funds borrowed}}{\text{investor's initial equity}}$$

For example, when the stock price rises from 80 to 88, the percentage change in price is 10%, while the percentage gain for the investor is

$$10\% \times \frac{20{,}000}{15{,}000} - 8\% \times \frac{5000}{15{,}000} = 10.67\%$$

Question 4:

"Excel question". It is a computer exercise, i.e. I want you to do it using excel spreadsheet.

You have $20,000 to invest in the shares of Gucci Group (GUC). Let the price of its stock be $80 per share. You estimate that the stock will be selling at a price of $110 in one year. Assume that no cash dividends will be paid over the next year and that the rate on margin loans is currently 0%.

1. *What would be the expected return on the investment assuming that you used the maximum allowable margin of 50%?*
2. *At what price would you get a margin call assuming the maintenance margin was 30%?*
3. *Construct two data tables that compare the return on investment for a margin trade and a trade with no margin for ending stock prices that range from $20 to $140 in increments of $10. How would you interpret the difference in returns?*
4. *What would be the expected return on investment if you were to use an initial margin of 80% rather than the maximum allowable margin of 50%?*
5. *How far could the stock price fall with an initial margin of 80% assuming the maintenance margin remains at 30%?*
6. *Construct two data tables that compare the return on investment for the margin trade and a trade with no margin for ending stock prices that range from $20 to $140 in increments of $10. Compare the results to the ranges in point 3.*
7. *Show how your results for point 3 would change if the rate on margin loans was 7%, instead of 0%. This is a more realistic assumption, which you may face in reality. Hint: the rate on margin loans is the cost for the investor, so it should probably decrease his/her income from investment.*

1) Since the initial margin is 0.5 we can calculate the amount of loan that can be used to lever up your investment.

Margin = (Value of Investment - Loan)/Value of Investment

Or 0.5 = 1 - Loan/Value of Investment

Since Value of Investment = Loan + 20,000 we have the following:

0.5 = 1 - Loan/(Loan + 20,000) => Loan = $20,000

It means that an investor uses $20,000 from his account and $20,000 from the loan.

Since the total investment is $40,000, he can buy 40,000/80 = 500 of the stocks.

Therefore, the return on his investment is:

Return = (500*110-500*80)/20000 = 75%

2) In order to find the price you have to solve the following inequality:

(500*P-20000)/500*P <0.3
0.7*500*P < 20000

Hence, P < $57.14

3) The table below provides you with the returns calculated the way as in point a)

Ending Stock Price	Return on Investment with margin	Ending Stock Price	Return with no margin
20	-150.00%	20	-75.00%
30	-125.00%	30	-62.50%
40	-100.00%	40	-50.00%
50	-75.00%	50	-37.50%
60	-50.00%	60	-25.00%
70	-25.00%	70	-12.50%
80	0.00%	80	0.00%
90	25.00%	90	12.50%
100	50.00%	100	25.00%
110	75.00%	110	37.50%
120	100.00%	120	50.00%
130	125.00%	130	62.50%
140	150.00%	140	75.00%

4) To calculate the return with margin 0.8 you have to calculate the loan as in point a) and then appropriate return on your investment.

Margin = (Value of Investment - Loan)/Value of Investment

Or 0.8 = 1 - Loan/Value of Investment

Since Value of Investment = Loan + 20,000 we have the following:

0.8 = 1 - Loan/(Loan + 20,000) => Loan = $5,000

It means that an investor uses $20,000 from his account and $5,000 from the loan.

Since the total investment is $25,000, he can buy 25,000/80 = 312.5 of the stocks.

Therefore, the return on his investment is:

Return = (312.5*110-312.5*80)/20000 = 46.88%

5) Similar to b) we can calculate the price below which we would get a margin call.

(312.5*P-5000)/312.5*P <0.3
0.7*312.5*P < 5000

Hence, P < $22.86

6) The table with the returns is depicted below:

Ending St Price	Return on Investment	Ending St Price	Return with No Margin
20	-93.75%	20	-75.00%
30	-78.13%	30	-62.50%
40	-62.50%	40	-50.00%
50	-46.88%	50	-37.50%
60	-31.25%	60	-25.00%
70	-15.63%	70	-12.50%
80	0.00%	80	0.00%
90	15.63%	90	12.50%
100	31.25%	100	25.00%
110	46.88%	110	37.50%
120	62.50%	120	50.00%
130	78.13%	130	62.50%
140	93.75%	140	75.00%

Since we are using much lower amounts of leverage with the initial margin at 80%, return on investment is much less volatile that when using 50% margin.

6) In order to calculate the returns on your position, which accounts for the interest on the loan we assume that after one year we return only the interest on the loan but not the entire principal.

Hence, given 7% interest rate the return on our investment can be calculated as follows:

Return = (110*500-80*500-7%*20,000)/20,000 = (15,000-1400)/20,000 = 13,600/20,000 = 68%

Similar to b) we can calculate the price below which we would get a margin call.

(500*P- 20,000) /500*P <0.3

0.7*500*P < 20,000

Hence, P < $57.14, which is exactly the same as the price derived in b), because the interest on loan is not included in the calculation of margin. Finally, the table with the returns is included below:

Ending St Price	Return on Investment	Ending St Price	Return with No Margin
20	-157.00%	20	-75.00%
30	-132.00%	30	-62.50%
40	-107.00%	40	-50.00%
50	-82.00%	50	-37.50%
60	-57.00%	60	-25.00%
70	-32.00%	70	-12.50%
80	-7.00%	80	0.00%
90	18.00%	90	12.50%
100	43.00%	100	25.00%
110	68.00%	110	37.50%
120	93.00%	120	50.00%
130	118.00%	130	62.50%
140	143.00%	140	75.00%