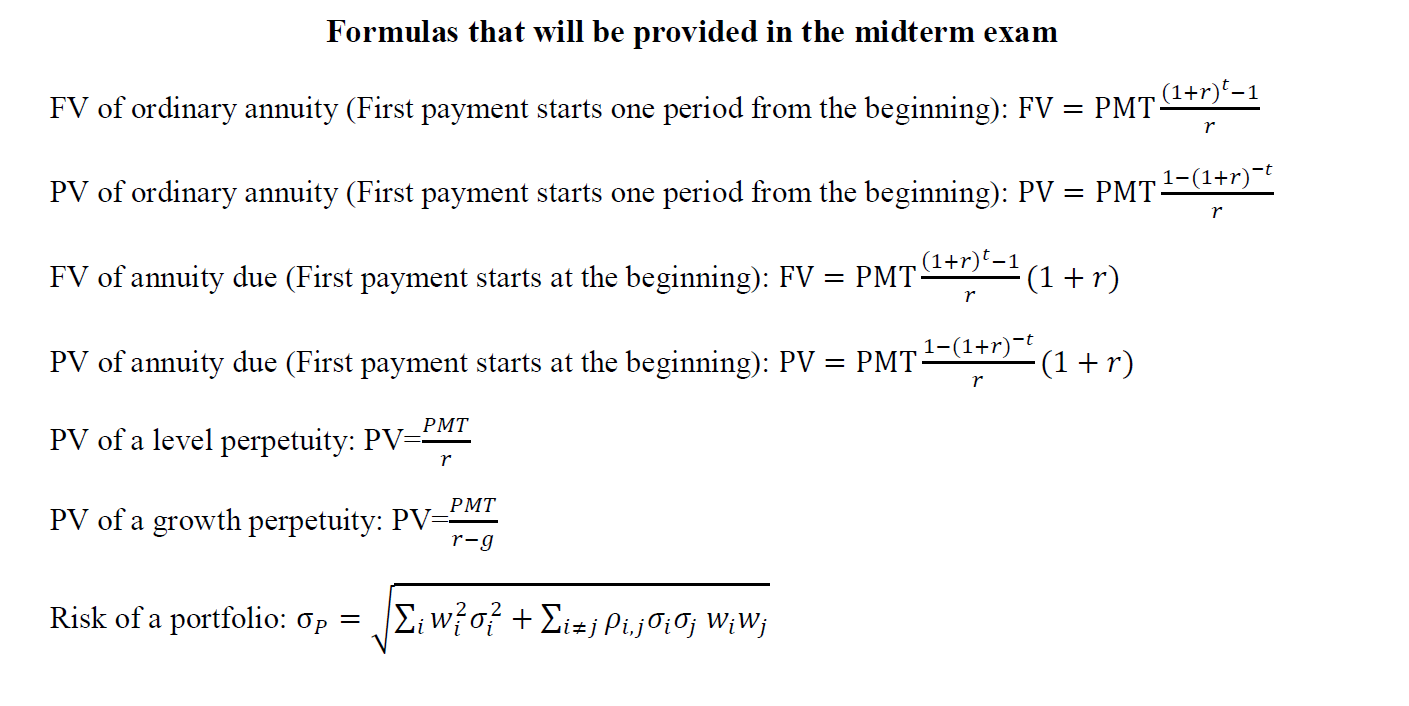
**Mock Midterm**



**Multiple Choice**

1. When a corporation is liquidated, which of the following investors has the top priority in claiming the assets over the other two types?

(A) Common stock holders

(B) Preferred stock holders

(C) Bond holders

2. Ant Financial wants to raise capital by issuing stocks. CITIC Securities will take charge of the issuance by matching individual and institutional investors and Ant Financial. CITIC Securities is playing the role of a \_\_\_\_\_\_\_\_\_\_\_\_

(A) Investing sector

(B) Savings sector

(C) Broker

(D) Financial intermediary

3. Standard & Poor’s has assigned an AAA credit rating to Corporation AAA, and it has assigned a BBB credit rating to Corporation BBB. Holding everything else equal, Corporation AAA has \_\_\_\_\_\_\_ default risk than Corporation BBB. Thus, bond investors will require \_\_\_\_\_\_\_ expected return on their investment in Corporation AAA.

(A) Higher, Higher

(B) Higher, Lower

(C) Lower, Higher

(D) Lower, Lower

4. Which of the following is FALSE?

(A) Holding everything else equal, the price of a long-term bond is more sensitive to changes in the interest rate than the price of a short-term bond is

(B) Holding everything else equal, the price of a stock with a higher required rate of return should be higher than the price of a stock with a lower required rate of return

(C) When a corporation decides to pay out dividends, preferred stock holders take priority over common stock holders

(D) Holding everything else equal, the price sensitivity of a zero-coupon bond is higher than the price-sensitivity of an annual-coupon paying bond when there is a change in the interest rate

5. Which of the following is an example of unsystematic risk?

(A) A sudden cut in the interest rate

(B) A pandemic

(C) A retail store has been robbed

(D) An increase in the oil price

6. You want to make stock investments in WeMade Inc, which is a firm that produces online games, has 2 million common stocks outstanding, and reported 10 million dollars of earnings this year. As you would like to use the relative multiple method to find what should be the stock price of the firm, you came up with the following information after doing some research:

|  |  |
| --- | --- |
|  | Price-to-Earnings ratio |
| Online Game Industry | 2 |
| Food Industry | 0.5 |
| Car Industry | 4 |

What should be the stock price of WeMade?

(A) $2.5/share

(B) $5/share

(C) $10/share

(D) $20/share

EPS = 10M/2M = $5/share

Price = 5\*2 = $10/stock

Note:

Market capitalization = stock price \* number of stocks outstanding = 10\*2 million   
= $20 million

7. Last year, you purchased 100 shares of Apple, and the price of each stock was $8.

Also, you bought an annually coupon-paying bond issued by Apple, whose maturity is 5 years, at the price of $950.

You have held on to these stocks and the bond over the past year;

today, you collected a dividend of $0.1 per share and you collected a coupon of $5.

The current Apple stock price is $8.2/share and the current bond is $1000.

What is the holding period return of your portfolio of the 100 shares and the bond over the past year?

(A) 3.33%

(B) 4.34%

(C) 4.86%

(D) 5.12%

Initial investment = 100\*8 + 950 = 1750

Current valuation = 100\*8.2 + 1000 = 1820

Income from dividends and coupon = 100\*0.1 + 5 = 15

HPR = (15+1820 -1750)/1750 = 4.86%

8. Since Charles is a good boy, his mother plans to give him pocket money five times:  
$100 today, $100 a year from today, $100 2 years from today, $100 3 years from today, and $100 4 years from today from today. If the interest rate is equal to 10% per year, how much wealth would Charles have 10 years from today?

(A) $566.23

(B) $888.78

(C) $983.23

(D) $1081.56

Cashflow consists of $100 today and annuity of $100 over the next four years

PV = 100 + 100/0.1\*(1-1/1.1^4) = 416.99

FV = PV\*(1.1^10) = $1081.56

9. Stock X has a beta of 0.4 and Stock Y has a beta of 0.8, and these two stocks have a perfectly positive correlation. The expected return on the market portfolio and the risk-free rate are some positive numbers. You want to create a portfolio by putting an equal weight on each of the stocks. Which of the following are TRUE?

~~I. The expected return on Stock X is twice the expected return on Stock Y.~~

~~II. The beta of the portfolio is 1.2.~~

III. You can have a better risk-return profile when investing in the portfolio rather than holding an individual Stock X or Y.

(A) I

(B) I and II

(C) III

(D) None of the above

I. The correct statement should be that expected EXCESS return on Stock Y is twice the expected EXCESS return on Stock X.

E[Rx] =Rf + betax\*(E[Rm] – Rf) => E[Rx] - Rf = betax\*(E[Rm] – Rf)

E[Ry] =Rf + betay\*(E[Rm] – Rf) => E[Ry] - Rf = betay\*(E[Rm] – Rf)

II. The correct statement should be that the beta of the portfolio is 0.6. Beta of a portfolio is a weighted average of the betas of different stocks in a portfolio. Since we are putting equal weights, beta of the portfolio = 0.5\*0.4 + 0.5\*0.8 = 0.6

***III. You can form a higher Sharpe ratio for a portfolio if the correlation between two assets is smaller than 1. Correlation of 1 is a special case in which investors do not benefit from diversification. Hence, III is wrong.***

10. You just performed a security characteristic line analysis on the Apple stock by regressing the excess Apple stock returns over the past 1 year at the daily frequency against the excess S&P 500 returns over the same period at daily frequency. Here is the result from the Excel regression.

|  |  |  |  |
| --- | --- | --- | --- |
|  | *Coefficients* | *Standard Error* | *t Stat* |
| Intercept | 0.04448 | 0.01592256 | 2.793520634 |
| X Variable 1 | 1.33142 | 0.349038593 | 3.814535199 |

Which of the following are true?

I. On average, when S&P 500’s excess return goes up by 1 percent, the Apple stock’s excess return will go up by more than 1%.

II. Whenever S&P 500’s excess return goes up by 1 percent, the Apple stock’s excess return will go up by more than 1%.

III. Capital Asset Pricing Model holds true in this case.

(A) I

(B) I and II

(C) I and III

(D) I, II, and III

Beta represents the average relationship between the excess return of the market portfolio and the excess return of the stock. In other words, when S&P 500’s excess return goes up by 1 percent, the Apple stock’s excess return will go up by 1.33142% ON AVERAGE. This statement is different from the statement that WHENVER S&P 500’s excess return goes up by 1 percent, the Apple stock’s excess return will go up by 1.33142%; sometimes, the excess stock return will be higher than the Beta percentage and sometimes lower than the Beta percentage if the market portfolio’s excess return goes up by 1% (Thus, stock return can be lower than 1% for some scenario.)

Capital Asset Pricing Model suggests that the excess return of a stock can only be explained by the excess return of the market portfolio. In other words, the alpha in Security Characteristic Line should be zero according to this theory. You identify whether the alpha is statistically significantly different from zero based on the t-stat of the intercept. If the t-stat is greater than 2, the alpha is different from zero (in the positive direction), hence the model is not correct. Similarly, if the t-stat is smaller than -2, the alpha is different from zero (in the negative direction.) On the other hand, if the t-stat is between -2 and 2, alpha is not different from zero, and hence the model should be correct. In this case, the t-stat is 2.79, hence CAPM does not hold true.

The standard error talks about how precisely we estimated the alpha and beta. t-stat = coefficient/standard errors.

11. You have just bought a 5 year zero-coupon bond which has a YTM of 10% and a face value of $1000. 15 seconds after you purchased the bond, the YTM changes to 9%. What is the holding period return over this 15-second horizon?

(A) 0%

(B) 4.67%

(C) -4.46%

(D) 5.21%

Old price = 1000/1.1^5 = 620.92

New price = 1000/1.09^5 = 649.93

HPR = 649.93/620.92 – 1 = 0.0467

12. Which of the following is NOT true?

(A) If the Korean government is considered to have more default risk than the U.S. government, then investors will demand a higher expected return on Korean government bonds than they would demand on U.S. government bonds

(B) If the coupon rate on a bond is greater than the market interest rate, then the bond is being sold at **discount**

“If the coupon rate on a bond is greater than the market interest rate, then the bond is being sold at **premium**” is a correct statement

(C) When the market interest rate suddenly drops, the price of a bond tends to increase

(D) If you intend to sell the stocks you have been holding for one year but you find it difficult to find investors in the market who will buy your stocks, then your stocks involve illiquidity risk

13. The nominal yield-to-maturity for a bond is currently 8%. The maturity of the bond is 10 years, the coupon rate (paid semi-annually) is 4%, and the face value is $1000. What is the price of the bond?

(A) $516

(B) $728

(C) $1030

(D) $1118

Coupon: $20 every six month

Discount rate: 4% per six month

Number of periods: 20 of six months

Price = 20/0.04\*(1-1/1.04^20) + 1000/1.04^20 = 728

14. What is the yield-to-maturity of an annual coupon paying bond that has a face value of $1000, coupon rate of 5%, maturity of 5 years when its price in the market is $900?

(A) 4.50% PV = 50/0.045\*(1-1/1.045^5)+1000/1.045^5 = 1021.95

(B) 5.00% PV = 50/0.05\*(1-1/1.05^5)+1000/1.05^5 = 1000 (par bond)

(C) 7.46% PV = 50/0.0746\*(1-1/1.0746^5)+1000/1.0746^5=900.37

(D) 9.45% PV = 50/0.0945\*(1-1/1.0945^5)+1000/1.0945^5 = 828.91

This is a discount bond, which implies that YTM should be higher than 5%.

**Free Response**

1. You will make three monthly payments of $100 at the end of each month to purchase a phone. The annual percentage rate is 3%.

(A) What is the present value of the payments?

The effective interest rate is 0.03/12 per month i.e. 0.0025 per month

PV = 100/1.0025^1 + 100/1.0025^2 + 100/1.0025^3 = 100/0.0025\*(1-1/1.0025^3) = 298.51

(B) Compute the principal payment in the last month.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Monthly Payment | Interest Expense | Principal Payment | Ending Balance |
|  |  |  |  | 298.51 |
| Month 1 | 100 | 0.75 | 99.25 | 199.25 |
| Month 2 | 100 | 0.50 | 99.50 | 99.75 |
| Month 3 | 100 | 0.25 | 99.75 | 0.00 |

Hence, the principal payment in the last month is 99.75.

2. On March 8, 2022, Company XYZ issued 1 million of bonds whose face value is $1000, has a maturity of 11 years, and pays coupons annually at the coupon rate of 10%. At the time of issuance, the yield-to-maturity (YTM) was 10%. Today, Company XYZ just paid coupons, and YTM on March 8, 2023 is 9%.

(A) On March 8, 2022, you bought one of the bonds that were issued by Company XYZ. How much did you pay for the bond?

This is a par bond. $1000

(B) What is the price of the bond on March 8, 2023?

The bond’s original maturity was 11 years, but on March 8, 2023, it became a 10-year maturity bond.

1 2 3 4 5 6 7 8 9 10

100 100 100 100 100 100 100 100 100 1100

PV@9% 91.74 84.17 77.22 70.84 64.99 59.63 54.70 50.19 46.04 464.65

Sum 1064.18

On the Exam, I would use the following:

100/0.09\*(1-1/1.09^10) + 1000/1.09^10 = 1064.18

$1064.18

(C) What is the holding period return over the one year horizon (from March 8, 2022 to March 8, 2023)?

(100 + 1064.18 – 1000)/1000 = 0.1642

3. Company ABC’s stock has a beta of 2 and a standard deviation of 40%.

The market portfolio has an expected return of 1.5% and standard deviation of 10%.

The risk-free rate is 1%.

Company ABC has just made a dividend payment of $1/share. The dividend will go up by 10% every year over the next two years, and then it will go up by 1% per year thereafter.

(A) Find the correlation between the stock return and the market portfolio return

beta = cov(RABC,Rm)/var(Rm)

2 = correlation\*std(RABC)\*std(Rm) / std(Rm)2 = correlation \*0.4\*0.1/0.1/0.1

Correlation = 0.5

(B) Find the expected return on this stock

Expected return = Rf + beta(E[Rm]-Rf) = 0.01 + 2\*(0.015-0.01) = 0.02

(C) What should be the price of the stock?

|  |  |  |  |
| --- | --- | --- | --- |
| Year | 1 | 2 | 3 |
| Dividend | 1.1 | 1.21 | 1.2221 |
| CF |  | 122.21 |  |
| PV @ r = 0.02 | 1.08 | 118.63 |  |
| Sum of PV | 119.71 |  |  |

D1 = 1\*1.1 = 1.1

D2 = 1\*1.1^1 = 1.21

D3 = 1\*1.1^2 \* 1.01 = 1.2221

Using constant growth model, P2 = D3/(r-g) = (1.2221)/(0.02-0.01) = 122.21

Price = PV(D1) + PV(D2) + PV(P2) = 1.1/1.02 + 1.21/1.02^2 + 122.21/1.02^2 = 119.71

4. Over the next year, the economy will fall under three possible states of the world: good economy / regular economy / bad economy.

The good economy is likely to happen with 50%,

the regular economy is likely to happen with 25%,

and the bad economy is likely to happen with 25%.

You believe that investments in Apple will give you 10% return in a good economy,

0% return in a regular economy,

and -1% return in a bad economy.

The risk-free rate in the economy is 2%. You want to create a portfolio of Apple stocks and risk-free assets.

(A) What is the expected return on Apple stocks?

0.1\*0.5 + 0\*0.25 + (-0.01)\*0.25 = 0.0475

(B) What is the standard deviation of return on Apple stocks?

sqrt(((0.1-0.0475)^2)\*0.5 + ((0-0. 0475)^2)\*0.25 + ((-0.01-0. 0475)^2)\*0.25) = 0.05262

(C) What is the standard deviation of return on risk-free assets?

Expected return on risk-free asset = 0.02\*0.5 + 0.02\*0.25 + 0.02\*0.25 = 0.02

Sqrt(((0.02-0.02)^2)\*0.5 + ((0.02-0.02)^2)\*0.25 + ((0.02-0.02)^2)\*0.25) = 0

Regardless of the probability distribution, the risk-free assets will always give a return of 0.02. Hence, there is no uncertainty, i.e. std = 0

This implies that covariance between return on Apple stocks and return on risk-free assets is 0, i.e. no relationship between return on Apple stocks and return on risk-free assets

(D) You have $100 to invest and you want to allocate $60 to investments in Apple stocks and $40 to investments in the risk-free asset in your portfolio. What is the Sharpe ratio of your portfolio?

Expected return on portfolio = 0.6\*0.0475 + 0.4\*0.02 = 0.0365

Std of portfolio = sqrt(0.6^2\*0.05262^2) = 0.03157

SR = (0.0365-0.02)/ 0.03157 = 0.5227

5. You are considering investing in two different bonds:  
Bond X has a face value of $1000, coupon rate of 20% (and it pays coupons semi-annually), Effective Annual Yield of 10.25%, and maturity of 2 years.  
Bond Y has a face value of $1000, pays no coupon, and Effective Annual Yield of 10.25%, and maturity of 2 years.

(A) Which bond has a higher price?

For Bond X,

1 + Effective Annual Yield = (1+ Interest Rate per 6 months)2 = 1.1025

Interest rate per 6 months = 5%

i.e. nominal YTM = 10%

For Bond Y,

1 + Effective Annual Yield = (1+ Interest Rate per year)1 = 1.1025

Interest rate per 1 year = 10.25%

i.e. nominal YTM = 10.25%

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Bond X |  |  |  |  |
| Period (6 months) | 1 | 2 | 3 | 4 |
| CF | 100 | 100 | 100 | 1100 |
| PV @5% per period | 95.24 | 90.70 | 86.38 | 904.97 |
| Sum of PV | 1177.30 |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

Price of Bond X = 100/0.05\*(1-1/1.05^4) + 1000/1.05^4 = 1177.30

|  |  |  |
| --- | --- | --- |
| Bond Y |  |  |
| Period (1 Year) | 1 | 2 |
| CF | 0 | 1000 |
| PV @10.25% per period | 0.00 | 822.70 |
| Sum of PV | 822.70 |  |

Price of Bond Y =1000/1.1025^2 = 822.70

Bond X has a higher price.

(B) Suppose that the Effective Annual Yield has suddenly changed to 12.36% for both bonds. What is the price of each bond?

For Bond X,

1 + Effective Annual Yield = (1+ Interest Rate per 6 months)2 = 1.1236

Interest rate per 6 months = 6%

i.e. nominal YTM = 12%

Bond X

Period (6 months) 1 2 3 4

CF 100 100 100 1100

PV @6% per period 94.34 89.00 83.96 871.30

Sum of PV 1138.60

Price of Bond X = 100/0.06\*(1-1/1.06^4) + 1000/1.06^4 = 1138.60

For Bond Y,

1 + Effective Annual Yield = (1+ Interest Rate per year)1 = 1.1236

Interest rate per 1 year = 12.36%

i.e. nominal YTM = 12.36%

|  |  |  |
| --- | --- | --- |
| Bond Y |  |  |
| Period (1 Year) | 1 | 2 |
| CF | 0 | 1000 |
| PV @12.36% per period | 0.00 | 792.09 |
| Sum of PV | 792.09 |  |

Price of Bond Y = 1000/1.1236^2 = 792.09

(C) Which bond has higher price sensitivity to a change in the interest rate?

A bond with a lower coupon rate has higher price sensitivity to a change in the interest rate, because a higher fraction of money is coming in later years for the bond with a lower coupon rate. Hence, this zero-coupon bond Y has a higher price sensitivity to an interest rate change.

This can be seen by percentage change in the bond price.

For Bond X, %change in price = |(1138.60 -1177.30 )/1177.30|\*100 = 3.29%

For Bond Y, %change in price = |(792.09-822.70 )/ 822.70 |\*100 = 3.72%