

FIN2010 Problem Set 2

1. Suppose a company just paid a dividend of \$4. Its manager promises to pay annual dividend growing at 6% per year. If the required return is 10% (in EAR), what would the current price be?

(2) Now assume the manager has decided to pay quarterly dividends instead of annual dividends. It has just paid a dividend of \$1.0. The next dividend will be 3 months from now, with value equal to $\$1.0 \times 1.06^{1/4}$, and will grow at an annual rate of 6%. That is, each dividend payment will be $1.06^{1/4}$ times the previous one. What is the share price now?

(3) Now assume the dividend will grow more slowly at a rate of 1% per year from the 40th quarterly dividend. That is, the 41st dividend will be equal to the 40th dividend multiplied by $1.01^{1/4}$. What is the share price now?

2. The returns of two stocks and one bond in 4 possible states of economies are given below.

| | Probability | Stock A | Stock B | Bond C |
|-------------|-------------|---------|---------|--------|
| Recession | 30% | -25% | -10% | 5% |
| Normal-bad | 10% | -5% | 1% | 5% |
| Normal-good | 20% | 10% | 6% | 3% |
| Boom | 40% | 30% | 9% | 1% |

- (1) What is expected return and the standard deviation of the three assets?
- (2) What are the pairwise correlations among the 3 assets (i.e., ρ_{AB} , ρ_{AC} , ρ_{BC})?
- (3) What is the Sharpe ratio of a 20% stock A, 10% stock B, and 70% bond portfolio (assuming $R_f=0$)?
3. The return profiles of 2 assets are given below. What is the minimum risk, in terms of standard deviation, that can be achieved with a portfolio that holds these two assets? The weight of the 2 assets must be positive and sum up to 1. That is, holding 0 of each and thus having 0 risk is not allowed. (Hint: let weight in asset A be w , and weight in asset B be $1-w$. The standard deviation of the portfolio is a quadratic function of w . You only need to find the minimum for the quadratic function)

| | E[r] | St.dev | Correlation |
|---------|------|--------|-------------|
| Asset A | 10% | 20% | -0.20 |
| Asset B | 5% | 10% | |

Extra credit (10pts. Can be used to make up for points you lost in this problem set. However, the total score of the problem set cannot exceed 100): Assume $R_f=0$. What is the highest Sharpe ratio that can be achieved with the 2 assets?

4. Your friend Kevin is evaluating the stocks of North Great Timber Company. North Great Timber Company expects to have an EPS of \$5/share next year and pay a dividend of \$1.50 a share. You expect that the firms' ROE (meaning the return on both old and new investments) will stay at 5% in the future and its payout ratio will remain unchanged. According to Kevin's analysis of the firms' past stock return, the firm's beta is 1.25. He also expects that the market return will be 4% and the T-bill rate will be 2%. Currently the market price of the stock is \$50/share. (10pts)
 - (1) What is the expected growth rate of the firms' dividend?
 - (2) According to CAPM, what is the appropriate required rate of return on the stock?
 - (3) Please estimate the fair value of the stock using DDM. Use the required return derived from CAPM as the discount rate in the DDM model.
 - (4) Can you make an investment recommendation to your friend?
5. Consider a call and a put option, both with strike price of \$30 and 3 months to expiration. The call trades at \$4, the put price is \$5, the interest rate is 0, and the price of the underlying stock is \$29.
 - (1) Suppose the stock does not pay dividends. Is there an arbitrage? If so, write down the sequence of trades and calculate the arbitrage profit you realize in 3 months. If not, explain why not.
 - (2) Suppose the stock will pay a dividend of \$2 in 2 months. Assume all other prices are as above. Is there an arbitrage? If so, write down the sequence of trades and calculate the arbitrage profit you realize in 3 months. If not, explain why not.
6. Consider the following binomial tree. The interest rate is 0.2% per month.

| Now | 1 Months Later | 2 Months Later |
|--------------|----------------|-----------------|
| | | $u^2S_0=133.10$ |
| | $uS_0=121.00$ | |
| $S_0=110.00$ | | $udS_0=110.00$ |
| | $dS_0=100.00$ | |
| | | $d^2S_0=90.91$ |

- (1) Use the tree to price a put option maturing in 1 month with strike price equal to 108.
- (2) If I sell one contract of this put option, what is my maximum profit and maximum loss?
- (3) Use the tree to price a call option maturing in 2 months with strike price equal to 103.