

## Economics 136. Financial Economics

Sample Midterm 2B, Suggested solution, Fall 2009

### 1. True or false. (25 points, 5 each)

(i) False. High dividend-price ratios predicted essentially no subsequent dividend growth, and high (positive) subsequent price growth.

(ii) False. The dividend/price ratio in the Gordon model is  $D/P = R - G$ , and even if  $G$  is the same,  $R - G$  can differ across companies if the expected rate of return  $R$  differs, perhaps because one company is riskier than the other.

(iii) True. The proposed strategy only makes use of information incorporated in prices. The weak form of the EMH says that you should not be able to earn positive abnormal returns by trading on information contained in prices.

(iv) True. The optimal share of stocks is  $(ER_{\text{stocks}} - R_f)/A\sigma^2$  and this is positive even if  $\sigma^2$  is very big (if it is finite).

(v) False. This is typically bad news, because the investor now has to re-invest the prepaid amount, which used to be in the high-yield pass-through, at the current, lower, interest rate. This reduces the investor's overall return.

### 2. Stock valuation (25 points, 5 each)

(a) By the Gordon model,  $P_7 = D_8/(R - G) = 20/0.02 = \$1000$ .

(b) The price today is  $P_0 = P_7/(1 + R)^7 = 1000/1.06^7 = \$665.06$ .

(c) Since ABC is not paying dividends between today and year 7, its expected return is

$$1 + R = (P_{t+1} + D_{t+1})/P_t = P_{t+1}/P_t$$

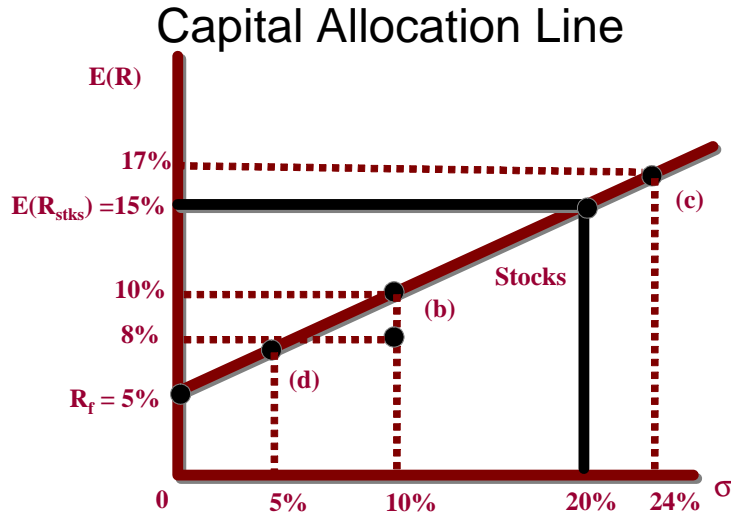
in each year during this time. Thus the growth rate of prices is equal to  $R = 6\%$ ; intuitively, this is because all of the return is coming from price appreciation.

(d) Now dividends grow at a constant rate  $G$  and hence prices also grow at the same rate:  $P_{t+1}/P_t = 1 + G$ . Thus prices grow at a rate 4% which is smaller than the discount rate (or expected return) of 6%, because part of the return is coming from dividends.

(e) The expected return is always equal to  $R = 6\%$  per year both before and after year 7. Intuitively, before year 7, the entire 6% rate of return is earned through price appreciation, because the company is not paying dividends. After year 7, part of the return is coming from price appreciation, and part of it is coming from dividend growth. This can also be seen formally by computing

$$\frac{P_{t+1} + D_{t+1}}{P_t} = \frac{P_{t+1}}{P_t} + \frac{D_{t+1}}{P_t} = (1 + G) + (R - G)$$

where  $1 + G$  is price growth and  $R - G$  is coming from the Gordon model. So the total return is  $1 + R$  as it should be.



### 3. CAL and portfolio choice (25 points, 5 each)

(a) See the figure.

(b) This portfolio is below the capital allocation line in the figure, so it can be improved on, for example by increasing the expected return while holding fixed the standard deviation. An equal weighted portfolio of stocks and T-bills has expected return  $(5\% + 15\%)/2 = 10\%$  and standard deviation  $20\%/2 = 10\%$ , so this would be better than the client's current portfolio.

(c) This portfolio has an expected return of  $R_f + 1.2(\bar{R}_1 - R_f) = 5\% + 1.2 \cdot 10\% = 17\%$  and standard deviation  $\sigma_p = 1.2 \cdot \sigma_1 = 1.2 \cdot 20\% = 24\%$ .

(d) The optimal stock share is  $w_1 = (\bar{R}_1 - R_f) / A\sigma_1^2 = 0.1 / (10 \cdot 0.2^2) = 0.25$ . The optimal portfolio is to invest 25% in stocks. This portfolio has an expected return of  $R_f + 0.25(\bar{R}_1 - R_f) = 5\% + 0.25 \cdot 10\% = 7.5\%$  and standard deviation  $\sigma_p = 0.25 \cdot \sigma_1 = 0.25 \cdot 20\% = 5\%$ .

(e) The Sharpe-ratio for all portfolios is 0.5. Since all portfolios are on the efficient frontier, their Sharpe-ratios are equal to the slope of the capital market line, which is 0.5.

### 4. Efficient markets (25 points, 5 each)

(a) By the Gordon model,  $P_1 = D_2 / (R - G) = 10 / 0.08 = \$125$  if the product is a failure, and  $P_1 = D_2 / (R - G) = 20 / 0.08 = \$250$  if the product is a success.

(b) We have  $EP_1 = 0.648 \cdot \$250 + 0.352 \cdot \$125 = \$206$ . The expected dividend is

$ED_1 = D_1 = \$10$  for sure. Thus

$$P_0 = \frac{EP_1 + ED_1}{1 + R} = \frac{216}{1.08} = \$200.$$

(c) The actual return is  $(P_1 + D_1)/P_0 = 260/200 = 1.3$  or 30% if the product is a success, and  $(P_1 + D_1)/P_0 = 135/200 = 0.675$  or  $-32.5\%$  if the product is a failure.

(d) The abnormal return is  $30 - 8 = 22\%$  if the product is a success and  $-32.5 - 8 = -40.5\%$  if it is a failure. The expected abnormal return is  $0.648 \cdot 22 + 0.352 \cdot -40.5 = 0$ . This is consistent with the EMH which says that the expected abnormal return should be zero.

(e) This argument is incorrect: in the example, if at  $t = 1$  XYZ fails to make an announcement, investors will realize that the drug is a failure and the stock price drops from \$200 per share to \$125 per share.