Mathematics 5621-Financial Math II
Spring 2012
Final Examination
April 27 - April 30, 2012

This is an open book take-home exam. You may consult any books, notes, websites or other printed material that you wish. Having so consulted then submit your own answers as written by you.

Do NOT under any circumstances consult with any other person. Do NOT under any circumstances cut and paste any material from another source electronically into your answer. Do NOT under any circumstances electronically copy from a spreadsheet that was not created by you. Failure to follow these rules will be grounds for a failing grade for the course.

Put your name on all papers submitted and please show all of your work so that I can see your reasoning. The grade will be based on your two best answers, equally weighted, out of the five questions below. If you like, you can just pick two questions to answer and you are done. Any more than two that you answer will just be buying you insurance in case you botched one and didn't know it. Exam grades and grades on your papers will be posted on the course website (by ID number) no later than 5 PM Saturday, May 4.

Submit your completed exams by 5 PM Monday April 30, at my office (under the door if closed), in my mailbox on the first floor, or by email.

1. Alpha Gaming has a current price of $4 per share. You believe that the appropriate market capitalization rate for Alpha is 10%. Its annual sales are $2, 400, 000, 000. Total annual expenses including depreciation, amortization, interest, and taxes are $2, 100, 000, 000. On a book value basis debt is $720, 000, 000. The payout ratio is 75%. The price/book ratio is 200%. There are 400 million shares outstanding. (a) What present value of growth opportunities (PVGO) is implied by Alpha's market valuation? (b) Grow or Die: what is the maximum possible growth rate Alpha Gaming can sustain without raising any new outside capital?

2. A company has net assets with a market value of $7, 500, 000 and a financial structure involving 40% debt. The company believes that its current optimal financial structure should inolve 45% debt. The company is considering a new project that requires an investment of $2, 375, 000. The company believes that afer taking on the project it will have an optimal capital structure requiring 50% debt. If the company's after tax $WACC$ is 15%, its marginal cost of new debt is 6% before tax, and its marginal tax rate is 40%, then what after tax rate of return does the project need to earn in order to to be acceptable, assuming that it will be financed optimally?

3. Assume that the entire market contains only 3 risky assets $\tilde{r}_1$, $\tilde{r}_2$, and $\tilde{r}_3$ plus the risk free asset $\tilde{r}_f$. Assume that their expected returns are $r_1 = .10$, $r_2 = .20$, $r_3 = .01$, and $r_f = .03$ and that their variances of return are $\sigma_1 = .20$, $\sigma_2 = .25$, and $\sigma_3 = .35$. Finally, assume that the correlation coefficients among the returns are $\rho_{12} = .80$, $\rho_{13} = 0$, and $\rho_{23} = -.25$. (a) In the CAPM, what will be the relative weightings m_1, m_2, and m_3 (with $m_1 + m_2 + m_3 = 1$) of the three risky assets in the entire market (i.e. in the market portfolio $\tilde{r}_M$)? You can use formulas from your notes without actually deriving those formulas, but your answer must (b) give a reason why you used the formulas that you did.

4. Build a binomial pricing model using the following assumptions: $r_f = .03$, $\sigma = .25$, $T = 2$, $N = 4$, $S_0 = 50$, and $q_u = 1/2$. (Do NOT use any other choice for q_u. You will get NO credit at all for this question if you use any different choice for q_u). Use the model that you have built to price an American Call option on S with strike price 55 expiring at $T = 2$, assuming that S pays a dividend of 2 every 6 months. (a) What is the value of the call at time 0? (b) What is the value of the position held in S_0 at time 0 in the replicating portfolio? (c) How much larger is the value of the American Call at time 0 than the value of the corresponding European Call at time 0? Your boss remembers hearing in a class once that American Calls have the same value as the corresponding European Calls. (d) What would you tell your boss to explain why it makes sense for this American Call to be worth more than this European Call?

5. With a WAAC or Opportunity Cost of Capital of 17.5% (a) is a project with the following cash flows financially acceptable? (b) Is it acceptable to your boss who (irrationally) won't accept "any project with payouts that have less than a 20% return"? In justifying your answer, be sure to calculate (c) the Net Present Value (d) the IRR and (e) one other measure of the rate of return that helps you to answer (a) and (b). Finally, (f) be sure to explain to your boss why your answer to (b) fits his rule about 20%

t	CF_t
0	-2
1	0
2	1
3	-10
4	3
5	3
6	5
7	5
8	5
9	5
10	-7