

MGT 890

Bonus Homework Set #2 (Very long)

Due Tuesday February 13

1. Planet of the Grapes (Present Value of One-Period Risky Investment):

New research has revealed that Mars is not actually a “red planet”. New photos from the Hubbell Space telescope reveal that it is a purple planet as a result of being overrun with sweet, juicy grapes. You have assembled an investment team to build and launch a spaceship to travel to Mars, harvest the grapes, and return to Earth to sell them. The entire journey will take one year.

The spaceship will cost 50 in year 0 to build, and you must also pay 10 in advance for licenses and supplies. Let  $r_m$  represent the market return,  $r_f$  the risk free rate (always .10), and  $P$  the price of your harvest of grapes on Earth. If the ship makes it back to Earth, the grapes crop has the following values depending upon the state of the economy.

	Poor Economy	Good Economy
$r_m$	.05	.35
$P$	150	170

The economy is either poor or good with probability .5. Your spaceship itself can be resold on Earth for 50 if it makes it back to Earth. Unfortunately, spaceship technology needs improvement, and there remains a 20% chance that your spaceship will explode before making it back to Earth. The grapes will not spoil during the journey.

What is the present value of making this investment? (Hint, you do not need to calculate a beta to solve either this question or the next question.)

2. ALIENS!

It looks like harvesting grapes from Mars is a little bit riskier than you originally thought. Malevolent aliens inhabit your shipping route. If they attack your ship, your destruction is guaranteed. The good news is that the United Earth Space Force patrols the area. The bad news is that their budget depends upon whether the economy on Earth is poor or good. In good times there are more UESF spaceships making it more difficult for the aliens. Given that the spaceship does not explode, the aliens will attack with probability .6 if the economy is poor and probability .1 if it is good.

What is the present value of making this investment?

3. You have the following data regarding a firm's revenues:

Year	1	2	3	4	5
Market Return	20%	8%	-5%	17%	13%
Revenues (in millions)	10	12	6	14	13

Calculate the beta for the revenues. Assume the risk free rate equals 3%, historical market return has been 15% and historical standard deviation of market return has been 20%.

4. Computer Chips:

You are running a firm that produces computer chips that other firms use in their video boards. There is a new technology on the horizon regarding the transmission of video images and you believe that you may be able to use your current production facilities to produce chips for this new technology. It will cost \$20 million in period 0 to conduct the necessary research needed to develop the technology. However there is a 30% chance that even with this development effort it will fail and that your firm will be unable to produce the chip. Should the effort succeed, there is a chance that a competitor will beat you to market and again you will not earn anything. Since your competition is more likely to attempt a simultaneous development effort in a good economy you believe that if you succeed in development then the chance your competition will win the race equals 20% if the economy is strong, and 10% if the economy is weak.

Should you win the development race (that is your research effort is both successful and your competition does not beat you to market) then you believe that you will earn \$50 million if the economy is good and \$40 million if it is weak. These profits will arrive in period 1.

Assume the probability that the economy is either strong or weak equals 50%. If the economy is strong the stock market returns 30%, and if it is weak the stock market returns -10%. Further assume that the risk free rate equals 5%.

Based upon the above information should you proceed with the development effort?