

Name _____

Financial Risk Management
Practice Midterm Examination
Summer 2009

Please answer all questions. You can write your answers in the spaces provided, on the back of the exam, or on a separate plain piece of paper. Calculators, pens and pencils are allowed, but no books and no notes please.

Short questions (5 points each)

1. What are the “fat tails” in financial securities markets?
2. What is a P-E ratio?
3. What is meant by Cash Settlement of derivatives contracts?
4. What is the difference between an Oil Forward and Oil Futures contract?
5. What is the difference between an annuity and a perpetuity?

Medium questions (10 points each)

6. Suppose that a share of IBM costs \$10 and a share of Intel costs \$15. What does “no arbitrage” mean and how could you use it to find the value of a portfolio which is long 10 shares of IBM and 10 shares of Sears?
7. What’s the difference between a short-sale and a sale?
8. Describe the Crude Oil Futures trading activity at the New York Mercantile Exchange (NYMEX) known as “open outcry”. What is it and how does it work?

Longer Questions (15 points each)

9. Suppose that your net worth without hedging with

with probability 50%, bad outcome: \$100,000

with probability 50%, good outcome: \$500,000.

If you buy an insurance contract for \$30,000, your net worth in the good outcome is the same but

with probability 50%, bad outcome: \$200,000.

Should you buy this insurance contract? Why or why not?

10. We worked hard to come up with a forecast for the oil price over the next 10 years. What's wrong with using our oil price forecast to calculate the NPV of our project?

11. We expect to sell 1million barrels of crude oil. The lot size on NYMEX is 1,000 and the spot price is 78. The forward (futures) price is 82 and the prices of two options are:

Strike 82 costs \$1.10 per barrel

Strike 80 costs \$6.00 per barrel.

If our expected costs associated with customer cancellation is \$1.5million, which option should we use and why?

Answers

1. Fat tails, or excess kurtosis, is when there is a high probability of very large up or down moves. The Normal distribution or Bell Curve has kurtosis of 3, but financial returns have kurtosis that is much higher. There have been crashes where the market dropped 20 standard deviations in one day.
2. A P-E ratio is the price-earnings ratio. It tells you how much you are paying per dollar of earnings. It is the leading method for valuing stocks. It is the natural measure of expensiveness implied by the Gordon growth model. The P-E ratio can also be interpreted as the inverse of the expected return.
3. Under Cash Settlement, the holder of a future or option is granted (charged) the value of the future upon expiration. For example, if you bought a future on a barrel of crude oil with a strike of \$45, and the spot price at expiration is \$50, then the exchange will deposit \$5 in your account. In this way, you do not need to ever buy the oil.
4. A future trades on an exchange. A forward trades OTC. Since futures are exchange-traded, they are regulated. They are highly customized and so they are very limited but very liquid. You can only trade them if you set up a margin account which can meet margin calls every day.
5. An annuity is an asset that makes payments for a fixed number of years. A perpetuity is an asset that lasts forever, at least in principle, such as a stock.

6. The portfolio contains 10 shares of IBM and 10 shares of Intel. It must cost the same as

$$10x \text{ cost of IBM} + 10x \text{ cost of Intel.}$$

If the portfolio cost less than this, then you could buy the portfolio, unbundled it, and make money. If the portfolio cost more than this, then you could buy the individual securities, create the portfolio and sell it.

Thus, by no arbitrage, the portfolio must cost

$$10(\$10) + 10(\$15) = \$250.$$

7. A short sale is a sale of an asset which you do not own. This is done by borrowing the security from someone who owns it and then selling it on the open market. Many exchanges have short-sale restrictions such as the "uptick rule". Corporate officers are not allowed to short-sell their own securities. It is relatively easy to short sell, but it does require a margin account since the lender of the security does not want to be exposed to the risk that you cannot buy back the asset.

8. The CME is a leading futures exchange. Futures traders gather in a physical location known as a trading pit. Members trade for themselves and for the public using voice and hand signals. Trades and quotes are recorded and instantly reported to the public. Because the trading is done by voice and hand, there is a high error rate. However, orders can be communicated very quickly. There are very few open outcry exchanges left in the world. However, some of the most important futures exchanges including those in Chicago and New York are still open outcry.

9. If you do not hedge, your expected net worth is

$$\frac{100k}{2} + \frac{500k}{2} = 300k .$$

If you buy the hedge, your expected net worth is

$$-30k + \frac{200k}{2} + \frac{500k}{2} = 320k .$$

This hedge contract more than pays for itself, so you should buy it.

10. By definition, forecasts are almost always wrong. Even the best cash flow forecasts are calculated on the basis of forecasted demand, supply and prices. But demand and supply conditions in the future, and future prices, are uncertain in general.

Prices and future demand depend on exogenous variables. Hence our NPV is itself uncertain. We can only work with *expected NPV* or other summary statistics. Another summary statistic is the value-at-risk, which is the lower tail of a confidence interval.

11. To hedge the right amount we have to buy options on 1million barrel of oil. If we use a free forward, the guaranteed price is 82, so you're guaranteed a cost of no more than \$82million.

If we pay \$1.1million for the options at 82. This guarantees a cost of no more than \$82million+\$1.1million = \$83.1m.

If we pay \$6million for the options at 80. This guarantees a cost of no more than \$80million+\$6million = \$86m. We will obviously not choose to pay \$86million.

If we are going to hedge, the choice is whether to pay for the *optionality feature* optionality feature which costs \$1.1million. Since the expected cancellation cost is \$1.5million, which is more than this, we should do it.