END OF CHAPTER EXERCISES

Chapter 3 : Stock Index Futures

Financial Engineering : Derivatives And Risk Management

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1. You are the manager of a pension fund with $50m in a diversified portfolio of stocks, which has to be paid out and converted to a pension annuity in 12 months time. You are very uncertain about the future course of the stock market over the next 6 months but believe it will return to "normal" after that. What are the relative merits of selling the stocks and moving into risk free assets (e.g. T-bills) over the next 6 months versus using a futures contract ?

2. What is an "intracommodity spread" in the futures market and how would you use it to speculate if you thought a bull market was imminent but you did not want to have an extremely exposed position.

3. How can stock index futures be used as a low cost speculative "market timing" strategy?

4. What is the minimum variance hedge ratio, when hedging a portfolio of stocks? What role does' the basis' play?

5. The stock price is currently at 400, and the quoted futures price on a 4-month contract is 405, r = 10% and the dividend yield is 4% (both continuously compounded). How could you make an arbitrage profit ?

6. You are faced with the following information :

   'Long' a diversified portfolio of stocks, value = $20m
   The beta (with respect to the market portfolio) = 1.2
   Futures contract on S&P500, F_0 = 400 (each contract is for $250 times the index)

   (a.) How many futures contracts are required to hedge the portfolio of stocks?
   (b.) If you want to reduce the 'beta' of the hedged portfolio to 0.6, what should you do ?

7. It is the 8th November and the S&P500 stands at S_0 = 441.15. The dividend yield is 3% and the risk free rate = 3.2 % (both continuously compounded). The December futures contract which expires in 40 days (on 18th December) has a quoted price of F_0 = 444.

   (a.) Calculate the synthetic or fair price of the December futures.
   (b.) Work out an index arbitrage strategy with your maximum allowed credit line from the bank of $20m and calculate your risk free profits, if we assume the

spot rate at expiry is $S_T = 439$. (This can be any number and you will still make profits).