Homework on the Greeks

1. What is the delta of a short position in 1000 European call option on silver futures? The options mature in eight months, and the futures contract underlying the option matures in nine months. The current nine month futures price is $8 per ounce, the exercise price of the options is $8, the risk free interest rate is 12% per annum and the volatility of silver is 18% per annum.
2. In the previous problem, what initial position in nine month silver futures is necessary for delta hedging? If silver itself is used, what is the initial position? Assume no storage cost for silver.
3. A financial institution has just sold 1000 seven month European call options on the Japanese yen. Suppose that the spot exchange rate is 0.80 cent per yen, the exercise price is 0.81 cent per yen, the risk free interest rate in the United States is 8% per annum, the risk free interest rate in Japan is 5% per annum and the volatility of the yen is 15% per annum. Calculate the delta, gamma vega, theta and rho of the financial institution’s position. Interpret each number.
4. A fund manager has a well diversified portfolio that mirrors the performance of the S&P 500 and is worth $360 million. The value of the S&P is 1200 and the portfolio manager would like to buy insurance against a reduction of more than 5% in the value of the portfolio over the next six months. The risk free interest rate is 6% per annum. The dividend yield on both the portfolio and the S&P 500 is 3% and the volatility of the index is 30% per annum.
5. If the fund manager buys traded European put options, how much would the insurance cost?
6. Explain carefully alternative strategies open to the fund manager involving traded European call options, and show that they lead to the same result.
7. If the fund manager decides to provide insurance by keeping part of the portfolio in risk free securities, what should the initial position be?
8. If the fund manager decides to provide insurance by using nine month index futures what should the initial position be?