END OF CHAPTER EXERCISES

Chapter 22 : Market Risk

Financial Engineering : Derivatives And Risk Management

(Keith Cuthbertson, Dirk Nitzsche)

1. Why is the assumption that assets returns are normally distributed so useful when calculating VaR?

2. What is 'backtesting' in the VaR methodology?

3. What is the "pre-commitment approach" when applied to the regulation of financial intermediaries subject to market risk?

You can easily set up most of the following answers in the form $VaR=(ZCZ')^{1/2}$ using Excel or many other software packages (e.g. Gauss, RATS, Mathematica)

4. A zero-coupon bond will pay £1,000 in 2 years' time. You have the following information:

   (a.) current yield y = 8.25%p.a.
   (b.) standard deviation of change in yield σ_y =1.009%p.d.
      (i.) Calculate the market value of the zero.
      (ii.) Calculate VaR for this asset using $\sigma(dP/P) = n\ \sigma_y$ where n = maturity of the cash flow (= duration)
      (iii.) Calculate the 10-day and 25-day VaR for this asset.

5. You have a portfolio consisting £10,000 in each of 3 assets, 1, 2 and 3. You have calculated the daily standard deviations to be 5.418%, 3.0424%, 3.6363%. The correlation between returns on assets 1 and 2 is 0.962, between assets 1 and 3 is 0.403, and between assets 2 and 3 is 0.610.

   (a.) What is the VaR for this portfolio?
   (b.) What would VaR be if returns on all assets were perfectly positively correlated?

6. What is your DOLLAR VaR when holding a UK portfolio of £100m, if the current USD-GBP exchange rate is 1.5 $/£, the correlation between the return on the UK portfolio and the $/£ exchange rate is ρ = 0.5. The return on the FT All-Share index has a standard deviation of 1.896%p.d. and σ_{FX} = 3% p.d.

7. You are a US resident with DM 100m (DM = Deutchemarks) in the DAX-index and \$100m face value in a US zero-coupon bond which matures in one year. The current spot rate is 0.6 (\$ per DM) and the one year US spot interest rate is r = 3% p.a. The *daily* standard deviations are σ_s = 3%, σ_{DAX} = 2% and σ_B = 0.5%, where σ_B = standard deviation of the bond price, σ_S = standard deviation of the dollar-DM exchange rate. The correlation coefficients are $\rho_{S,DAX}$ = -0.5, $\rho_{S,B}$ = 0, $\rho_{B,DAX}$ = 0.2. *Indicate* how you might calculate the daily value at risk of your portfolio? (using the 5% left tail cut off point).