Solutions to Homework Assignment #6

1. Consider the AIG stock only.
   - The estimate $\beta$ for AIG is 0.90913. The VaR for the position is $34718$. The expected shortfall is $39776$.
   - VaR is $37027$ and expected shortfall is $42456$.
   - VaR is $41786$ and expected shortfall is $56881$.

2. The parameter estimates are $(\xi, \sigma, \mu) = (0.6158, 0.0211, 0.02522)$. These estimates are statistically significant at the 5% level. Based on the estimates, VaR = $80134$ and 10-day VaR is $330866$.

3. For threshold 4%, the estimates are $(\xi, \beta) = (0.5168, 0.0314)$. These estimates are significantly different from zero. The VaR and expected shortfall are $142256$ and $316683$, respectively. For 8% threshold, the parameter estimates are $(\xi, \beta) = (0.3694, 0.05826)$ with $\xi$ only marginally significant at the 5% level. The VaR and expected shortfall are $148625$ and $281215$, respectively. The results are not too sensitive to the choice of threshold.

4. For the long position on IBM stock, the VaR is $20759$ and that of the combined position is $45107$. The sample correlation between IBM and AIG stock is 0.2764.
   If time-varying correlations are used, the estimated correlation on April 30, 2011 is 0.1413 so that the VaR becomes $42895$. See the R output for estimation results.

5. Since AIG is a short financial position, we use the log returns of AIG stock in the analysis. Negative IBM returns are used because the position is long. For RiskMetrics, VaR for AIG and IBM remain unchanged as before. However, their correlation becomes -0.2764. Therefore, VaR of the portfolio is $35183$.
   For GARCH models, the VaR is $37665$. Steps of calculation are in the R output.