Report of Group 13 *

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In modern financial market,changes in prices of equity,commodities, FX rates, interest rates creat exposure to market risk. As a result, one of the basic tasks of the company is managing risk.Furthermore, the risk measurement is the foundation and key of the financial market risk management. Here we introduce the method VaR which can measure the risk quantitatively. The full name of VaR is "Value at Risk". It refers to the part of the value of an asset that is exposed to risk. In this paper we will compute VaR of the share of China Merchants Securities in Delta-Normal model. Meanwhile, we will introduce two different methods for the estimation of the parametersRectangular Moving Average(RMA)and Exponential Moving Average(EMA)

In Delta-Normal model,we need some assumptions:

$$L(Y_{T+1}|F_t) = N(0, \sigma_t)$$

where $Y_{t+1} = logX_{t+1} - logX_t$,$X_t$ denotes the price of the share of CMS in period t. Then the possible profits and losses over a 1 day risk horizon are defined as a difference of portfolio values at $t+1$ and t:

$$L_{t+1} = \lambda_t(X_{t+1} - X_t) \approx w_t Y_{t+1}$$

Thus, we can prove that

$$L(L_{t+1}|F_t) = N(0, \sigma_t^2), \quad where \quad \sigma_t^2 = w_t^T \Sigma_t w_t$$

And there are usually two different methods to estimate Σ_t:
The first method RMA:

$$\hat{\Sigma_t} = \frac{1}{T-1} \sum_{t=1}^{T} (Y_t - \mu)(Y_t - \mu)^T$$

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where $\mu = E(Y_t)$. The expected value of the vector Y_t is assumed to be zero in Delta-Normal model.

The second method EMA:

The forecast of Σ_t for time t is a weighted average of the previous forecast using a decay factor $0 < \gamma < 1$ and of the latest squared innovations, using weight (1-γ):

$$\hat{\Sigma_t} = \gamma\Sigma_{t-1} + (1-\gamma)Y_{t-1}^2 = (1-\gamma)(Y_{t-1}^2 + \gamma Y_{t-2}^2 + \cdots + \gamma^m Y_{t-m}^2)$$

Finally, VaR in a Delta-Normal framework is given by

$$VaR_\alpha = \sigma_t z_\alpha$$

where z_α is the α-quantile of the standard normal pdf.

In this report, using the data of the daily closing price of CMS from January 4, 2010 to July 8, 2016, we get the VaR timeplot in the following figure: