**Software description**:

**Platform**: Matlab R2015a

**Purpose of the model**: Given historical price data of several stocks and number of shares of stocks and options in user’s portfolio, the software is designed to compute the exponential weighted parametric VaR, historical VaR and Monte Carlo VaR with user’s choice of relevant variables, including VaR percent, year window and days of VaR. Then backtest the model based on historical data to validate its correctness.

Assumptions: GBM stocks; fixed variables in Black Scholes equation like rate and volatility.

**Input**: Close price of all stocks involved in the portfolio (the price input of the model); Strike Price of each option (the options input of the model); number of shares of stocks and options(the port input in the model ).

For example, one fund manager purchased 500 shares of apple, 300 shares of IBM, 50 shares of $120 apple call option of apple, 20 shares of $90 put option, 30 share of $75 IBM call option, 99 shares of $50 IBM put option. Then price should be the historical prices of apple and IBM, port=[500 300 50 30 20 99], options = [120 90; 75 50].

The input percent is the percent of VaR, so are window and day.

**Architecture:**

1. Use BS equation to compute option price corresponding to each day’s stock price
2. Put prices of stocks and options together as a combined portfolio
3. Do GBM to the portfolio and compute parametric VaR
4. Compute historical VaR
5. Compute Monte Carlo VaR
6. Backtest: compare actual P&L to VaR and sum up exceptions.
7. Plot all the outcomes

**Images: 把画的图贴一下。。**

Plots of parametric var and Monte Carlo var are almost same, except that of monte carlo is noiser, which is verified by the homework we have done.

**Backtest is almost perfect. …**