1. We decided that the VaR and the binomial model doesn’t really provide us with enough information to make a decision regarding a balanced portfolio.
   * *By definition, an VaR of dollars means that we have chance of losing dollars in the next period that we are concerned. If we use that along with the binomial tree model, it would imply that the ‘down’ scenario is the stock price today minus X with a probability of going down of . The reason why it doesn’t make sense is that if we have the VaR chosen at a certain percentile or a certain number, it would simultaneously fix our probabilities and it would contradict with the risk-neutral probability.*
2. Go with Bayesian statistics[[1]](#_[1]:_http://en.wikipedia.org/wiki/B). We formulate a distribution of the expected return and the volatility of the stock in the future from our analysts’ report, and use that as a prior distribution[[2]](#_[2]:_http://en.wikipedia.org/wiki/P). (use the return and volatility implied by the report as mean and variance)
3. We assume that the stock return follows a normal distribution (as in the assumption of the Black-Sholes model[[3]](#_[3]:_http://en.wikipedia.org/wiki/B)), which implies that the stock itself follows a lognormal distribution. We can estimate the parameters from historical prices
4. After that, we can get a posterior distribution[[4]](#_[4]:_http://en.wikipedia.org/wiki/P) of the stock expected return and volatility.
5. We also decided that, in order to have a balancing portfolio under the constraints of percentage holding in each sector, we need to have more than one asset in each sector to allow us to do that.
6. From historical prices, we can estimate the correlation among assets within (and across) each sector.
7. In the end, we use the efficient frontier and capital allocation line[[5]](#_[5]:_http://en.wikipedia.org/wiki/M) to determine the optimal portfolio composition. (which use the information we got from previous steps: expected return and volatility for each asset, and inter-asset correlations)

## [1]: <http://en.wikipedia.org/wiki/Bayesian_statistics>

## [2]: <http://en.wikipedia.org/wiki/Prior_probability>

## [3]: <http://en.wikipedia.org/wiki/Black%E2%80%93Scholes_model>, and Hull Chapter 14

## [4]: <http://en.wikipedia.org/wiki/Posterior_probability>

## [5]: <http://en.wikipedia.org/wiki/Modern_portfolio_theory#The_risk-free_asset_and_the_capital_allocation_line>