Lab: Implementing Value-at-Risk Model in Python

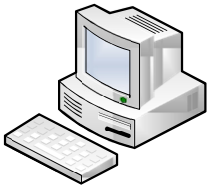
Overview

In this lab you will use Python to complete the exercises.

Lab Activities

Exercise 1: Implement Value-at-Risk Model in Python

System Requirements



- A Windows computer
- 32 / 64-bit Intel Processor
- 10 GB of Free Hard Drive Space
- 2 GB of RAM

Resources and References

"Python for Finance" – Yuxing Yan

1. Yahoo Finance database: http://finance.yahoo.com/

Exercise 1: Implementing Value-at-Risk Model in Python

Overview: VALUE-at-RISK MODEL

Value at Risk (VaR) represents the maximum loss over a predetermined period considering a confidence level. VaR can be written in the following form for short periods:

$VaR = p * z * \sigma.$

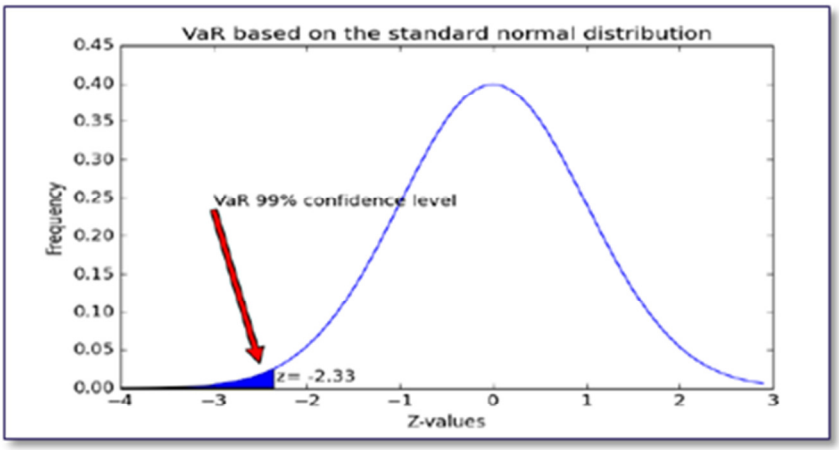
p – portfolio value

z – the number of standard deviations away from the mean

σ – volatility of the portfolio

$z = 2.33$ for a 99 % confidence level considering the normal distribution

$z = 1.64$ for a 95 % confidence level considering the normal distribution



Graph from "Python for Finance" by Yuxing Yan

1. Import matplotlib.finance module	from matplotlib.finance import quotes_historical_yahoo
2. Import scipy module	import scipy as sp
3. Import numpy module	import numpy as np
4. Import pandas module	import pandas as pd

Exercise 1: Implementing Value-at-Risk Model in Python	
5. Import scipy.stats module	from scipy.stats import norm
6. Indicate the number of shares in the portfolio	number_shares=5000 # input 1
7. Choose 99 % confidence level	confidence_level=0.99 # input 2
8. Indicate the number of days	number_days=10 # input 3
9. Obtain z for 99 % confidence level	z=norm.ppf(confidence_level)
10. Choose Microsoft stock for the portfolio	ticker='MSFT'
11. Indicate beginning date	begdate=(2015,1,1)
12. Indicate end date	enddate=(2015,9,9)
13. Extract information about Microsoft stock from Yahoo Finance	x=quotes_historical_yahoo(ticker,begdate,enddate,asobject=True, adjusted=True)
14. Calculate the daily return of Microsoft stock	ret = (x.aclose[1:]-x.aclose[:-1])/x.aclose[:-1]
15. Calculate portfolio value (number of stocks*current price of a stock)	position=number_shares*x.close[0]
16. Calculate VaR	VaR=position*z*sp.std(ret)*sp.sqrt(number_days)
17. Print results	print("Holding=",position, "VaR=", round(VaR,4), "in ", number_days, "Days")

Conclusion and Summary

The portfolio value os 229,137.89 USD and the maximum expected loss in the next 10 days is 30,936.2492 USD