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#Question No: 01
import numpy as np
import matplotlib.pyplot as plt
import pandas as pd
from math import erf

def remove(X):
    y = [x for x in X if not np.isnan(x)]
    return y

def read_data(filename):
    df = pd.read_csv(filename)
    df.set_index('Date',inplace=True)
    data = df.to_dict()
    for key, vals in data.items():
        data[key] = remove(list(vals.values()))
    return data

def historical_volatility(prices, duration):
    req_prices = prices[-duration:]

    R = []
    for i in range(1, len(req_prices)):
        ri = (req_prices[i] - req_prices[i-1])/req_prices[i-1]
        R.append(ri)

    var = np.var(R)
    sigma_d = np.sqrt(var)
    sigma_a = np.sqrt(252)*sigma_d
    return sigma_a

def d(x, tau, sigma, K, r):
    d_plus = (1/(sigma*np.sqrt(tau)))*(np.log(x/K) + tau*(r + (sigma*sigma)/2))
    d_minus = (1/(sigma*np.sqrt(tau)))*(np.log(x/K) + tau*(r - (sigma*sigma)/2))

    return d_plus, d_minus

def N(x):
    return 0.5*(1 + erf(x/np.sqrt(2)))

def C(t, x, T, sigma, K, r):
    if x == 0:
        return 0
    if t == T:
        return max(x - K, 0)

    tau = T-t
    d_plus, d_minus = d(x, tau, sigma, K, r)

    price = x*N(d_plus) - K*np.exp(-r*tau)*N(d_minus)

    return price

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.return price
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def P(t, x, T, sigma, K, r):
    call = C(t,x,T,sigma,K,r)
    put = call + K*np.exp(-r*(T-t)) - x

    return put

bse_data = read_data('bsedata1.csv')
nse_data = read_data('nsedata1.csv')

def function():

    n_days = 20

    for company, prices in bse_data.items():
        vol = historical_volatility(prices, n_days)
        print("Historical Volatility for %s BSE = %.6f"%(company, vol))

    for company, prices in nse_data.items():
        vol = historical_volatility(prices, n_days)
        print("Historical Volatility for %s NSE = %.6f"%(company, vol))

def main():
    function()

if __name__ == '__main__':
    main()
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➞ Historical Volatility for Ongc BSE = 1.247391
Historical Volatility for JindalSteels BSE = 2.130666
Historical Volatility for Black rock BSE = 0.864739
Historical Volatility for Maruti Suzuki India Limited BSE = 1.230432
Historical Volatility for Apple Inc. BSE = 1.365543
Historical Volatility for Havells BSE = 1.277393
Historical Volatility for Reliance BSE = 1.455876
Historical Volatility for BombayDyeing BSE = 3.708524
Historical Volatility for Berger Paints BSE = 1.079034
Historical Volatility for Nokia BSE = 1.207657
Historical Volatility for ICICI NSE = 1.260666
Historical Volatility for TataMotors NSE = 1.319446
Historical Volatility for Jp Morgan NSE = 1.243619
Historical Volatility for Voltas NSE = 1.221813
Historical Volatility for BajajFinsv NSE = 1.429702
Historical Volatility for Havells NSE = 1.282626
Historical Volatility for Reliance NSE = 1.463992
Historical Volatility for Asian Paints NSE = 0.894112
Historical Volatility for Berger Paints NSE = 1.100809
Historical Volatility for MuthootFin NSE = 1.185406
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