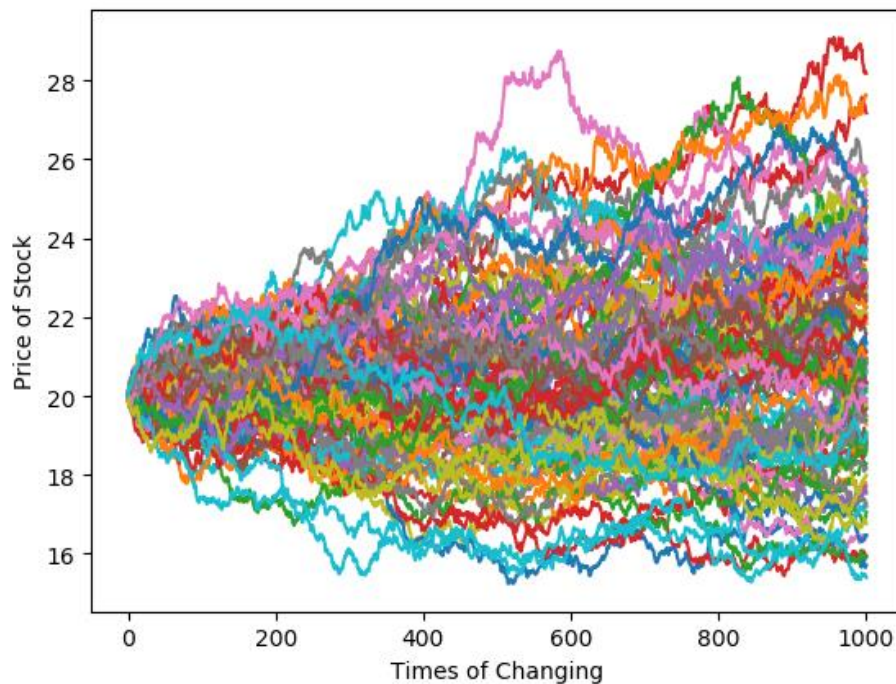


专业：金融

学号：1901210016

姓名：杨诚

1. 生成的效果图



2. C++代码（3 个文件）

①Random1.h:

```
#ifndef RANDOM1_H
#define RANDOM1_H
double GetOneGaussianByBoxMuller();
#endif
```

②Random1.cpp:

```
#include "Random1.h"
#include <cstdlib>
#include <cmath>
#include <ctime>
#if !defined(_MSC_VER)
using namespace std;
#endif
double GetOneGaussianByBoxMuller()
{
    static double V1, V2, S;
    static int phase = 0;
```

```

double X;
if (phase == 0) {
    do {
        double U1 = (double)rand() / RAND_MAX;
        double U2 = (double)rand() / RAND_MAX;
        V1 = 2 * U1 - 1;
        V2 = 2 * U2 - 1;
        S = V1 * V1 + V2 * V2;
    } while (S >= 1 || S == 0);
    X = V1 * sqrt(-2 * log(S) / S);
}
else
    X = V2 * sqrt(-2 * log(S) / S);
phase = 1 - phase;
return X;
}

```

③StockPath. cpp:

```

#include "Random1.h"
#include <iostream>
#include<fstream>
#include <cmath>
#define NUM 100 //变化曲线的数目
#define EXPIRY 1
#define N 1000 // [0, T] 股价的间隔数
#define deltaT (double)EXPIRY/N
#define R 0.0317
#define S0 20.0
#define VOL 0.14
using namespace std;
//已知 T 时刻的股价，返回 T+1 时刻的股价
double SimpleMonteCarlo1(double ST)
{
    double variance = VOL*VOL; //delta2
    double rootVariance = VOL * sqrt(deltaT);
    double itoCorrection = -0.5*variance;
    double movedSpot = ST*exp((R + itoCorrection) * deltaT);
    double thisGaussian = GetOneGaussianByBoxMuller();
    double thisSpot = movedSpot*exp(rootVariance*thisGaussian);
    return thisSpot;
}
int main()
{
    cout << deltaT << endl;
}

```

```

ofstream outfile;
double stock[NUM][N+1];
for (int i = 0; i < NUM; i++){
    stock[i][0] = S0;
    for (int j = 0; j < N; j++){
        stock[i][j+1] = SimpleMonteCarlo1(stock[i][j]);
    }
}
//把股价数据输出到.csv 文件，每行是同一时刻的股价，每一列代表一条变化曲线
outfile.open("stock.csv", ios::out | ios::app);
for (int j = 0; j < N + 1; j++){
    outfile << stock[0][j];
    for (int i = 1; i < NUM; i++){
        outfile <<","<< stock[i][j];
    }
    outfile << endl;
}
outfile.close();
double tmp;
cin >> tmp;
return 0;
}

```

3. Python 画图代码

```

import numpy as np
import matplotlib.pyplot as plt
my_matrix = np.loadtxt(open("stock.csv","r"),delimiter=",",skiprows=0)
my_matrix = my_matrix.T
x = np.arange(1001)
for i in range(100):
    plt.plot(x,my_matrix[i])
plt.xlabel("Times of Changing")
plt.ylabel(("Price of Stock"))
plt.show()

```