CS 2401 Assignment #3

Due Date: Tuesday, February 16, 11:59PM

(See the syllabus for late policy)

Objective: To practice using and creating objects and methods, and running a simulation.

Assignment:

One of the key principles of successful investing is diversification, which is spreading out your assets across many different investments. For example, in the stock market this means buying a portfolio of many different stocks rather than buying a single stock. In this assignment you will create a simple simulation to explore the impact of diversification.

For this, you will need to develop three classes: a Stock class, a Portfolio class, and a Simulation class. The simulation class will hold your main method, and will control the basic logic for your simulation. The portfolio class will contain a collection of individual Stocks.

Your Stock class will hold basic information about a single stock, and should include fields for the name of the company, the stock symbol, the number of shares owned, the purchase price, and the current price. These should all be private members, and you will need getter/setter methods for each of them. You should also create a suitable constructor method. You should also implement a getCurrentValue method that returns the current value (number of shares times current price), and an updatePrice method. The updatePrice method will use a random walk to update the current price of the stock. First, you will need to generate a percentage change using a random number generator. For this we will use the following code:

```
double multiplier = 1.05 + new Random().nextGaussian() * 0.25;
```

To get the new price of the stock you should multiply the current value by this multiplier, which corresponds to a 5% average annual gain with a 25% variance.

Next, you should implement a Portfolio class to hold and array of Stocks. First, create an initialize method that is passed a parameter n that determines how many Stocks will be in the portfolio. Then, initialize the prices of the n stocks to $100 (i.e., both the purchase price and current price should be set to $100 for every stock). The number of shares should be equal to 10000/n. You may initialize the names and stock symbols in any way you like, but they should all be different.

Next, implement two methods that will allow you to get the total value of the portfolio (the sum of the values of all shares held) and the percentage changes from the initial value. Finally, create a method that will update the prices of all of the Stocks in the portfolio, simulating the passing of one year of time.

Finally, you should design a Simulator class that holds your main method. This method should initialize the portfolio with n stocks, and then simulate the changes in value of the portfolio for 30 years. At the end of 30 years, record the total value of the portfolio and

the percentage change. Repeat this overall process 100 times starting with a new initial portfolio each time, and record the minimum, maximum, and average values and percent changes at the end of 30 years.

Try this experiment with several different values of n: 1, 5, 10, 50, and 100. These correspond to increasing amounts of diversification in the portfolio. Record your results. What do you observe?

To get you started, an incomplete implementation has been provided.

Deliverables: All deliverables must be submitted via Blackboard. TAs will instruct you with further information.