Bryan Collins

IS 520

Monte Carlo Simulation

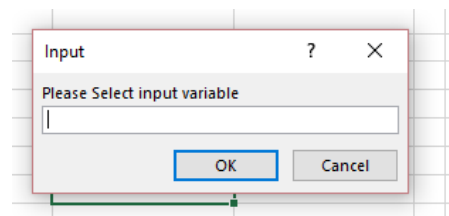
Executive Summary

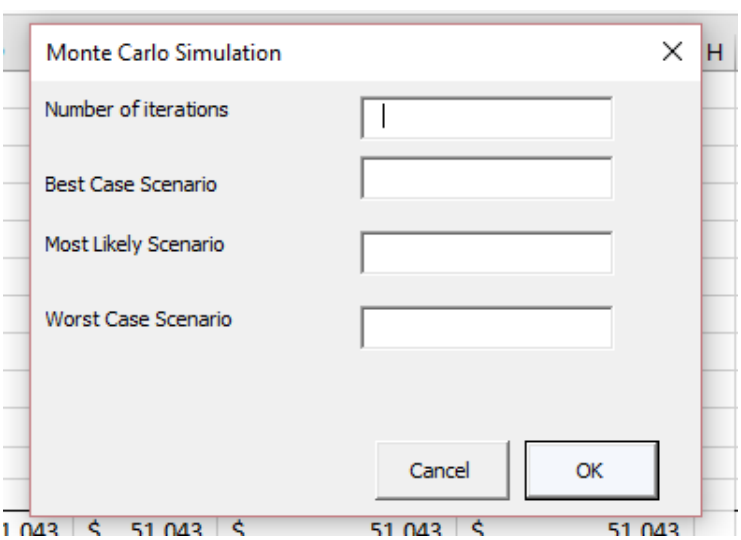
When the scientists for the Manhattan project needed to understand fully all the risks that were associated with splitting an atom. In order for that to happen they needed a way to simulate different outcomes using variable inputs. They worked tirelessly to compute the outcomes using different iteration using a range of input. This was the birth of the Monte Carlo Simulation.

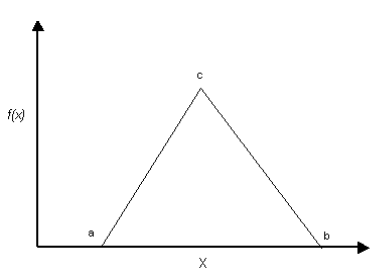
Real Estate investors make assumptions when creating models to see if an investment will have an above average return. In order to more fully understand the impact of the assumptions a Monte Carlo Simulation is needed to understand risk. My project consisted of creating a simulation that allowed the investor to test different inputs to see their impact on the overall returns of the investment.

Implementation and Concepts

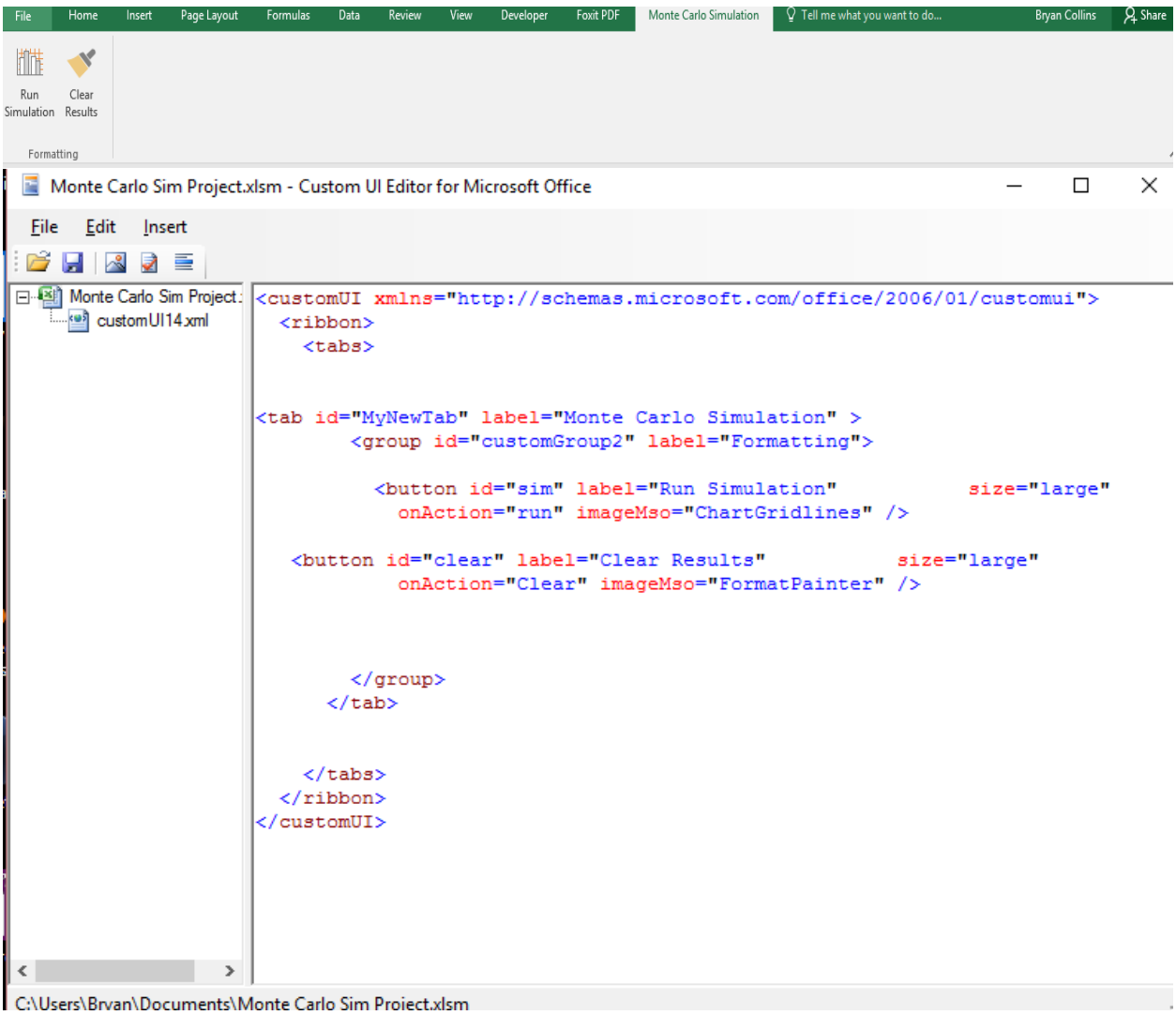
Creating the simulation required that the user is prompted to provide the inputs for the simulation. Using an inputbox the user can select the variable that they would like to test. The inputbox will only accept a value that is a number. If the user tries to enter another data type, they will be prompted to choose a new variable. After the input variable is selected by the user, a User form is initialized for the user to input number of iterations and the best, worst, and most likely case scenario for the variable. In order for the simulation to remain efficient the iterations cannot be over 10,000 and the User must select a number greater than 0. For the best worst and most likely cases the user can input any value but they must input a value or the program will not run and prompt the user to input a variable. After the user has input their data, it is time for the simulation to run. The program is set to run once to user clicks OK on the User form. The simulation needs to run with a triangular distribution around the input variable. A function was created for the input variable so when each iteration is run a new value is spit out. In a triangular distribution the majority of the outputs should center around the most likely scenario. This require the function to accurately produce a new value each time the iteration is run that represents a triangular distribution. After an iteration is run the worksheets is recalculated to represent the new IRR and NPV for that instance. Arrays were used to store each new iteration







output dynamically with the number of iterations inputted by the user. After the simulation completed the data is outputted on the results sheet. The average, standard deviation, minimum, and maximum values for each output is also included on the results page. These outputs work dynamically with the number of iterations inputted by the user. The Results page has all of the data necessary for further exploration into the sensitivity of the input variable. In order for complete control and simplicity a new ribbon was created for the user. Using the custom ui editor I created two buttons for the user to control the program. The first button is the Run simulation and will allow the user to input and control the simulation as explained above. The next button will simply clear the results for the user. The results are cleared every time a new simulation is run but this allows for the user to have full control over the program. Data types used in the workbook are mainly variant because the user selects many of the variables and they can be a wide range of variables. Like currency or a percentage, so variants are used throughout the code.



Discussion of Learning and Conceptual Difficulties Encountered

By far the most difficult part of this project is understand and implementing the math behind the simulation. Creating the random triangular function took the most amount of research and work in order for it for be working properly. Not only was it difficult to program it was also difficult to understand the under lying concepts behind the distribution. After a long time researching and reworking the function finally worked to the standards of the distribution.

Another very difficult aspect of the project will dealing with User defined variables. With the user defining many of the variables it is vital that data validation is happening to make sure those variables will be consistent with the program. Each time a new variable was defined by the user it took some time to think about all the different ways a user could select a variable that will cause problems for the program. That being said this is still just a tool for investor to use to see the impact of their underlying assumptions. So the program is only as good as the inputs from the User. If the user does not fully understand the implications of their inputs, then the simulation will work but the data outputted will not be very useful for the user

Assistance

No assistance was received by anyone except for the wonderful invention of Google.