SIMULATION AND MODELLING

COURSEWORK

DEADLINE:10/09/2024

**QUESTION ONE**

You have been selected to simulate the checkout process in an e-commerce store (such as a small gift shop). The setup includes one cashier and one line of customers waiting for service. The objective is to determine two key performance measures:

* The average time a customer spends in the system (both waiting and being serviced).
* The percentage of time that the checkout clerk is idle.

**Assumptions**

**Interarrival Times**. The time between customer arrivals is uniformly distributed between 1 and 15 minutes, rounded to the nearest whole minute.

**Service Times**. The time required to service each customer is uniformly distributed between 1 and 8 minutes, rounded to the nearest whole minute.

**Required**

1. Create an MS Excel spreadsheet to simulate the checkout process.
2. The simulation should calculate two measures of performance:

* Average customer time in the system (W).
* Proportion (or %) of time the server is idle (1-ρ).

**Instruction**

1. Simulate 20 customers.
2. Simulate for 3 hours.
3. Use MS Excel’s Data Table to generate 50 replications of the simulation.
4. Write a brief report summarizing your results and the methodology used to conduct the simulation.
5. Use your GitHub account to create a new repository titled “SM\_CW-QN1.” Upload your Excel file and a summary/overview of your results, including how you arrived at these results (in Word or PDF format).
6. Use Screen Pal Screen Recorder to record the process of conducting the simulation in Excel.
7. Save and provide the URLs/Links for both your GitHub repository and the YouTube video showing the simulation process.
8. In your COURSEWORK ANSWER BOOKLET, submit the URLs/Links of the GitHub repository and the YouTube link as your answer for this question.

**Question Two**

Using the "Life Expectancy (WHO)" dataset from Kaggle, simulate and model the relationship between life expectancy and socio-economic factors in different countries.

Kaggle URL/ LINK for the [Life Expectancy](https://www.kaggle.com/datasets/kumarajarshi/life-expectancy-who) Dataset

<https://www.kaggle.com/datasets/kumarajarshi/life-expectancy-who>

**Required**

1. Import the "Life Expectancy (WHO)" dataset into SPSS and clean the data for any inconsistencies or missing values.
2. Use SPSS to perform a multiple linear regression analysis to model the relationship between life expectancy and socio-economic factors such as GDP, adult mortality, and immunization rates.
3. Simulate the effect of changes in socio-economic factors (e.g., increase in GDP, decrease in mortality) on life expectancy, and discuss the potential impact on public health policies.
4. Validate your model by comparing the predicted values with actual life expectancy values and perform a sensitivity analysis to understand how changes in socioeconomic factors affect life expectancy.

**Instructions**

1. SPSS output showing the regression analysis, simulation, and validation steps.
2. Provide a report summarizing your model, the simulation outcomes, and the policy implications.
3. Use your GitHub account created from GitHub and create a new repository "SM\_CW-QN2" to upload your Excel file and a summary/overview of your results (Word or PDF).
4. Use the Screen Pal Screen Recorder to record how you conducted the simulation and modeling in SPSS.
5. Submit both the GitHub repository URL and the YouTube link of your recorded simulation in your coursework answer booklet.