Assignment – Health Insurance claim

Problem Statement (Situation):

"Finding out the health parameters that affect health insurance claims"

An insurance company in the US is reviewing its insurance claims/charges and is trying to do a cause and effect analysis for future business decisions. It has collected data for its customers who have made claims till recent time. The data-points collected are age, gender, bmi, number of children/dependents, smoking habit, region they belong to, charges/bills claimed under the insurance. This analysis would have a bearing on what premium should the company charge a customer availing an insurance policy.

The insurance company has collected a dataset of 1338 customers-claims. Please refer to the data dictionary below:

Data Dictionary:

Attribute	Description
Age	Age of the customer/claimant who has claimed insurance for medical treatment charges
Sex	Gender of the customer/claimant
bmi	Health parameter: person's weight in kilograms divided by the square of height in meters
Children	No. of children the claimant has
Smoker	Whether the claimant smokes or not
Region	Region to which the claimant belongs
Charges	The exact medical charges for which the claimant has claimed insurance

Objective (Task):

- **To do a cause and effect analysis on historic-data of insurance claims.**

You have been appointed as the "Analyst" for this project to achieve the objective of the study, your tasks are as under:

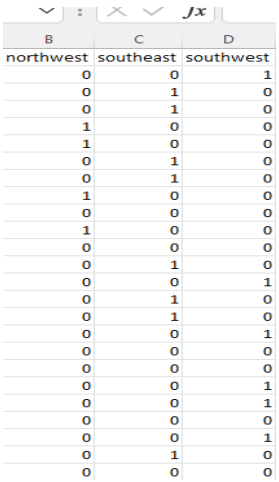
1. Perform the Exploratory Data Analysis on the data.

    a) Identify the categorical and continuous variables
    b) Make Histograms and box plots (univariate analysis) for continuous variables and do a correlation analysis (multivariate analysis)
    c) Make relevant Pivot tables and charts for:
        i. Male/Female ratio and share information on which gender has more smokers
        ii. Charges vs Age
        iii. Charges vs BMI
        iv. Charges for Smokers vs Non-smokers
    d) Region-wise smokers vs Non-smokers analysis with one or more pivot table and charts
    e) Region-wise charges for smokers vs non-smokers
    f) Has charges got something to do with the number of dependents ?

g) Do a similar dependants-charges analysis, Region-wise
h) Do at least one more pivot table and chart of your own choice on the remaining variables
i) Give your understanding from the patterns observed in point (b)
j) Give your interpretation for observations made in point (c)

2. Edit the data as following, to obtain dummy variables: **(5 marks)**

a) Sex : Replace all the “Males” with “1” and “Females” with “0”, creating numerical entries for gender this way will help you do analysis further. You can use the “Replace with Match entire cell content” option. Do a replace all to save time.
b) Smoker: Replace all the “Smokers” with “1” and “Non-smokers” with “0”.
c) Region: We always create one less category column for the dummy data w.r.t the categories available for that original variable. So for Region, we will create three dummy columns, assuming “Northeast” as zero and omit the column for it. Now create three columns for “northwest”, “Southeast”, “Southwest”. Whichever row has “northwest” region as an entry will take “1” as an entry otherwise “0” in “northwest” column. Similarly in the “Southeast” column, whichever row had “southeast” as an entry will take “1” as the new entry and “0” for the rest of the column (Southeast). Do a similar operation on the “Southwest” column. Please refer to the below image for your understanding,



B	C	D
northwest	southeast	southwest
0	0	1
0	1	0
0	1	0
1	0	0
1	0	0
0	1	0
0	1	0
1	0	0
0	0	0
1	0	0
0	0	0
0	1	0
0	0	1
0	1	0
0	1	0
0	0	1
0	0	0
0	0	0
0	0	1
0	0	1
0	0	0
0	0	1
0	1	0
0	0	0

3. Do a descriptive summary analysis for the edited data. Perform a Multiple Linear Regression analysis to identify which variables decide the insurance charges/billed insurance claim. Give your interpretation for the above analysis, do another set of regression analysis by dropping insignificant variables, if needed.

Learning Outcome (Result):

- Understand implementation of Exploratory Data Analysis to understand the nature of different data-attributes, through pivot tables and different types of visualizations
- Understand how to use various statistical/analytical tools in MS Excel like Summary statistics, Histogram, correlation table, Pivot tables, Regression analysis (using Data analysis tool pack)