# Comparing Smoothing and Forecasting for various types of Mean's Moving Average and Moving Median

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# Declaration

I certify that the project report entitled as "Comparison of simple Moving Average Smoothing and Forecasting for different Means and Moving Median" submitted as a partial requirement for the degree of B.S. Honors in Applied Statistics is the result of my own research, except where otherwise acknowledged, and that this report in whole or in part has not been submitted for an award, including a higher degree, to any other university or institution.

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Date:.....

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Dedicated
to
My Parents and My Sister

# Abstract

There are many smoothing and forecasting techniques available and selecting the appropriate technique is very important issue to achieve a good smoothing and forecasting performance. This study intends to compare different mean's moving average smoothing techniques and later used them for time series forecasting. The smoothing process using simple moving average for different means such as arithmetic mean, geometric mean, quadratic mean, cubic mean and moving median are compared here and later forecasting based on them also compare. Some error measures - Mean Error, Mean Absolute Error, and Mean Square Error are calculated for above smoothing techniques to compare the smoothing accuracy of these methods. And error measures - Mean Error, Mean Absolute Error, Mean Square Error and Theil's U are calculated for above forecasting techniques to compare the forecasting accuracy of these methods. The study helps to find out why by saying single moving average one usually means arithmetic moving average.

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# Chapter 1

# Introduction:

## 1.1 Background of The Study

Data for time series is gathered from various points throughout time. As a result, the data set has a great deal of variety. So, a technique known as smoothing is employed to lessen these variations. Techniques for removing noise from a time series of data include smoothing techniques. It aids in determining the datset's trend. When data is compiled, any volatility or other types of noise can be removed or reduced. Data smoothing is the term for this. Data smoothing is based on the notion that it can recognize simpler changes to assist in the prediction of various trends and patterns. It serves as a tool for statisticians or traders who must examine a lot of data, which is frequently challenging.

## 1.2 Objective of The Study

Among all others smoothing methods moving average methods is the oldest and simplest smoothing methods. The main object of that study is comparing different types of moving average smoothing techniques such as simple moving average(SMA),exponentially-weighted moving average (EWMA), weighted moving average (WMA), double exponential moving average(DEMA),Hull moving average(HMA), Zero lag exponential moving average(ZLEMA) etc. Among them the syudy compares SMA, EWMA, WMA, DEMA,HMA and ZLEMA.

# Chapter 2

# Literature review

Raudys et al. [2013] smoothed financial data using the moving average.

Ivanovski et al. [2018] extrapolated the number of tourists using the moving average. The study aids in making wise decisions for the future.

Hameed [2015] compares every smoothing method currently in use to forecast future demand for private universities in Bangladesh. They contrast different kinds of currently used smoothing techniques and discover that Holt's method provides the optimum accuracy for their work.

For the purpose of early detection of infectious disease outbreaks, [Yang et al., 2018] conducts simulation-based studies on the comparison of statistical and time series forecasting techniques. Here, various approaches are discussed in an effort to use simulation to produce the greatest results.

Sinaga and Irawati [2020] studied about medical disposable supply demand forecasting

by moving average and exponential moving average method.

For predicting power load, [Karim and Alwi, 2013] employed exponential smoothing and moving average, and exponential moving average outperformed moving average.

Fong et al. [2020] tried to find an accurate early forecasting model from Small dataset of 2019-nCoV Novel Coronavirus outbreak.

# Chapter 3

# Analysis

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Table 3.1: Smoothing comparison table

| Normal Distribution | | | Poisson Distribution | | | Weibull Distribution | | |
|---|---|---|---|---|---|---|---|---|
| TYPE | MAE | MSE | TYPE | MAE | MSE | TYPE | MAE | MSE |
| SMA | 2.819 | 12.495 | SMA | 1.776 | 4.997 | SMA | 0.321 | 0.166 |
| EMA | 1.630 | 4.172 | EMA | 1.030 | 1.666 | EMA | 0.185 | 0.055 |
| DEMA | 0.743 | 0.868 | DEMA | 0.470 | 0.347 | DEMA | 0.085 | 0.012 |
| WMA | 1.879 | 5.553 | WMA | 1.184 | 2.221 | WMA | 0.214 | 0.074 |
| HMA | 1.879 | 5.553 | HMA | 1.184 | 2.221 | HMA | 0.214 | 0.074 |
| ZLEMA | 1.889 | 5.589 | ZLEMA | 1.187 | 2.223 | ZLEMA | 0.214 | 0.073 |

Table 3.2: Smoothing comparison table

| Gamma Distribution | | | T Distribution | | | Exponential Distribution | | |
|---|---|---|---|---|---|---|---|---|
| TYPE | MAE | MSE | TYPE | MAE | MSE | TYPE | MAE | MSE |
| SMA | 1.776 | 4.997 | SMA | 0.617 | 0.622 | SMA | 0.100 | 0.020 |
| EMA | 1.030 | 1.666 | EMA | 0.356 | 0.208 | EMA | 0.059 | 0.007 |
| DEMA | 0.470 | 0.347 | DEMA | 0.163 | 0.043 | DEMA | 0.027 | 0.001 |
| WMA | 1.184 | 2.221 | WMA | 0.411 | 0.276 | WMA | 0.067 | 0.009 |
| HMA | 1.184 | 2.221 | HMA | 0.411 | 0.276 | HMA | 0.067 | 0.009 |
| ZLEMA | 1.187 | 2.223 | ZLEMA | 0.414 | 0.278 | ZLEMA | 0.069 | 0.009 |

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