Analysis of Moving Average Methods

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***Abstract*— Moving Average method is specifically used to generate predictions using the average values of various subsets derived from the given set of values. In this paper usage of moving method is considered to analyses data points and future value predication. As you go through this paper you will understand the usefulness of Moving Average with respect to various applications.**

***Index Terms*— moving average, simple moving average, Data Points Analysis**

I. INTRODUCTION

Moving Average is a statistical method to analyze data points from the collected information for future prediction or to find out hidden information from those details by generating subsets of values and getting their means regarding to various subsets. Sometimes it is referred as "Rolling Mean" as well.

Technical Analysis is an approach to predict future values and their movements on the basis of the identifications of patterns, volumes and various metrics. Moving Average performs well for the synthesis of predictions.

II. VARIATION OF MOVING AVERAGE

Moving Average is performed with various factors. If we are having simple data points which can directly converge to the predictions for future decisions then we don't need to use any more metrics other than two depended variable.

A. Simple Moving Average

It may be possible that sometimes we are having very proportionate data values like number of vehicles sold within a year, thickness of rings in tree which is exponential, etc...excluding the factors affecting them like rainfall in case of tree, average cost of vehicles.

In this method we generate subsets and find out means of the subsets and plot them to find out the movement of the line segment generated by connecting points plotted at averages. But the subset must have minimum three values to find mean. As data from a new time period is added, data from an earlier time period is dropped from the average calculation.

For example, here we are using data achieved from Transport department, Ahmedabad. Here, a segment is consist of the records for five years. For this kind of data, general equations for simple moving average is as follows:

$$SMA = \frac{v_x + v_{x-1} + \dots + v_{x-(n-1)}}{n} \dots (i)$$

Where, $v_x = Value\ for\ metric\ x$
$n = no.of\ spans\ in\ subset.$
$here\ n = 5\ for\ example.$

Year	Vehicles Population	Subset	Average Vehicles Population
2000	826046	2000 - 2004	910307
2001	858113	2001 - 2005	967615.8
2002	899284	2002 - 2006	1040119.6
2003	951943	2003 - 2007	1123062.2
2004	1016149	2004 - 2008	1212311.4
2005	1112590	2005 - 2009	1308659.6
2006	1220632	2006 - 2010	1410513
2007	1313997	2007 - 2011	1521981.4
2008	1398189	2008 - 2012	1573977.5
2009	1497890		
2010	1621857		
2011	1777974		

Table. I Vehicles population in Ahmedabad

As per the data represented in table 1, if we calculate averages and represent the data points as a chart we will get graph as shown in fig. 1. If we stretch the line as per the line equation, We can get the next point where the line will converge. And we can predict the value of the sale in upcoming years

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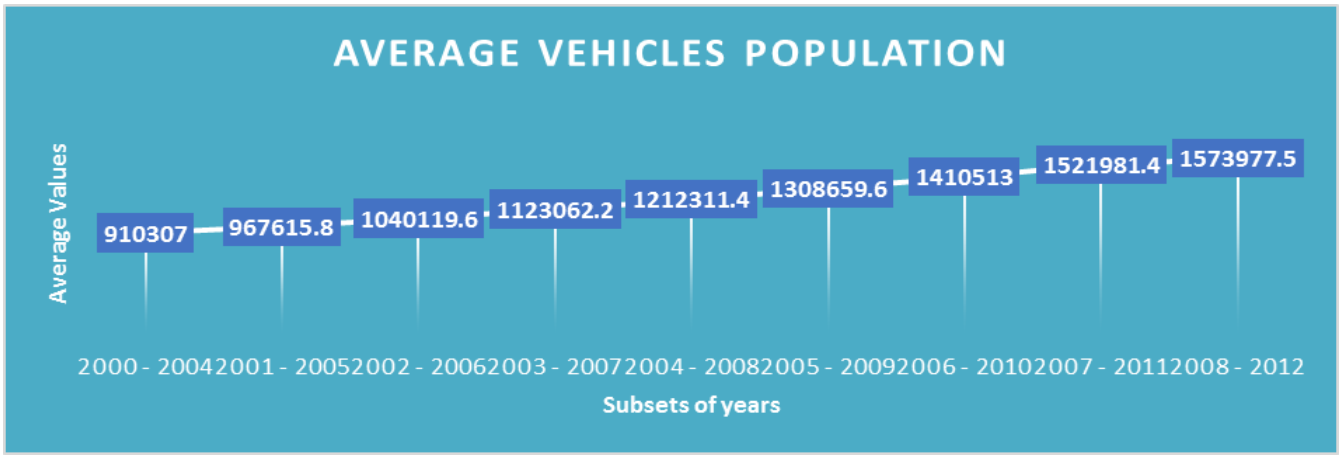

Fig. 1 Moving Average population of data received from table. 1

Step 1: Calculate Moving Averages
Step 2: Plot line chart and get equation of line
Step 3: Get data Details for last subset, predict next converging point, and calculate, using both the details, the upcoming metric value.

Simple Moving Average Method is only used when we have data which are intrinsically simple and easily available.

B. Cumulative Moving Average

In some cases where data are needed to be analyzed on the basis of their availability. In such applications we can't use simple moving average as it requires to have data in subsets before processing them.
Applications like whether forecast, live stock price predictions, etc... need to process and analyze data instantaneously. This can be achieved using ***Cumulative Moving Average***.
Step 1: In this method as and when new transaction or data availability occurs, the average price at the time of the transaction can be calculated to get the latest average.

$$CMA = \frac{v_1 + v_2 + \ldots + v_n}{n} \ldots (i)$$

Cumulative Moving Average For n data points.
Step 2: As soon as next value is achieved we can find out new value for $n+1^{th}$ data point.

$$CMA_{n+1} = \frac{v_{n+1} + n.CMA_n}{n+1} \ldots (iii)$$

Where CMA_0 can be taken as 0.

From $eq.(i)$ $For\ n$
$n.CMA = v_1 + v_2 + \ldots + v_n \ldots . (iv)$

From $eq.(i)$ $For\ n+1$
$v_{n+1} = (v_1 + \ldots + v_{n+1}) - (v_1 + \cdots v_n) .. (v)$
Hence,
$v_{n+1} = (n+1).CMA - n.CMA .. (vi)$

Solving for $n+1$ value,

$$CMA_{n+1} = \frac{v_{n+1} + n.CMA_n}{n+1}$$

$$= CMA_n + \frac{v_{n+1} - CMA_n}{n+1} \ldots (vii)$$

C. Weighted Moving Average

Whenever we need to add some weighted to the averages of the data points, we can use this method. It simply adds weighted by multiplying the value.
One of the application of weighted moving average is pixelisation from and image, signal processing, pass filters etc...

III. Conclusion

Moving Average can be the best data analytic tool for any kind of application. From simple velocity increment of a vehicle and distance covered to a big application like data analytics for SEO we can use moving average with variants of the basic method. Here I have represented only three method but we can generate as many variations as we want. Exponential, Liner Equations and even one can find out a way to molt this into another format or convert another format to the simple method.

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