

GOVERNMENT CITY COLLEGE, HYDERABAD

(AUTONOMOUS)

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DEPARTMENT OF STATISTICS



CERTIFICATE

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Internal Examiner

External Examiner

Principal

Time series Analysis

Project report submitted in partial fulfillment of the degree of
Bachelor of science In MSCS

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Introduction:

- A time series is a data set that tracks a sample over time.
- In particular, a time series allows one to see what factors influence certain variables from period to period.
- Time series analysis can be useful to see how a given asset, security, or economic variable changes over time.
- Forecasting methods using time series are used in both fundamental and technical analysis.
- Although cross-sectional data is seen as the opposite of time series, the two are often used together in practice.

A time series can be taken on any variable that changes over time. In investing, it is common to use a time series to track the price of a security over time. This can be tracked over the short term, such as the price of a security on the hour over the course of a business day, or the long term, such as the price of a security at close on the last day of every month over the course of five years

Time series is also used in several non-financial contexts, such as measuring the change in population over time. The figure below depicts such a time series for the growth of the U.S. population over the century from 1900-2000.

Applications of Time series:

- **Financial Analysis** – It includes sales forecasting, inventory analysis, stock market analysis, price estimation.
- **Weather Analysis** – It includes temperature estimation, climate change, seasonal shift recognition, weather forecasting.
- **Network Data Analysis** – It includes network usage prediction, anomaly or intrusion detection, predictive maintenance.
- **Healthcare Analysis** – It includes census prediction, insurance benefits prediction, patient monitoring.

Other application are in [Data mining](#), [Pattern recognition](#) and [Machine learning](#), where time series analysis can be used for [clustering](#), [classification](#), query by content, [anomaly detection](#) as well as [Fore casting](#)

Collection of Data: The dataset is taken from a Website called “macrotrends”. It consists of the data about the profits of a car company called as “***Tata Motors***”.

The collected data looks like:

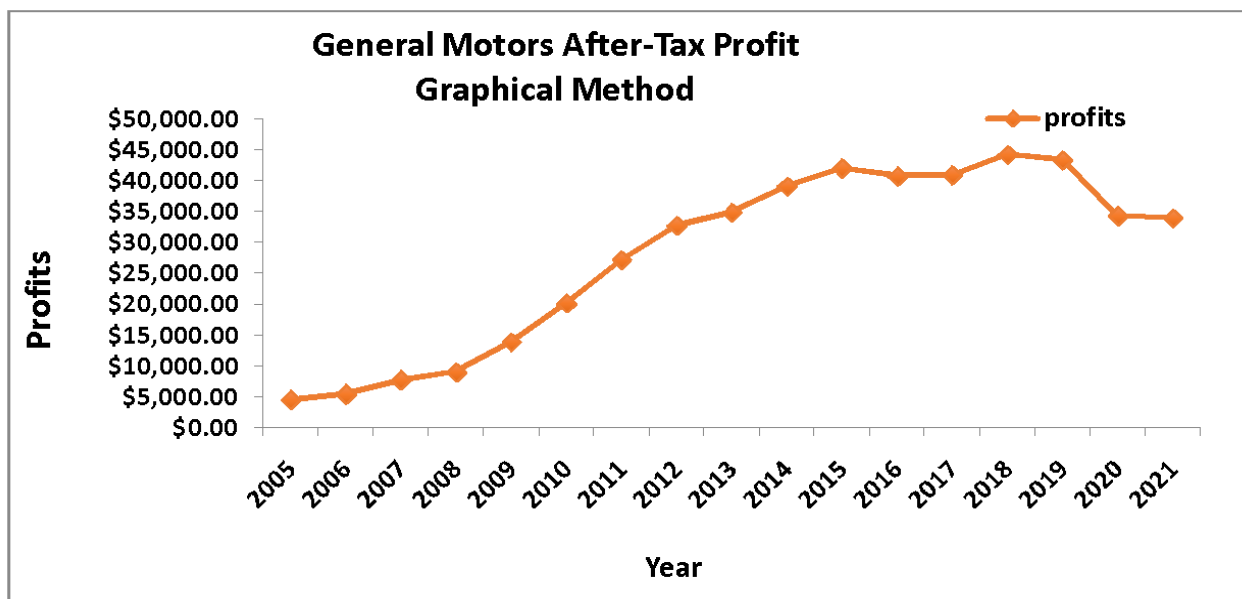
year	profits
2005	\$4,511.00
2006	\$5,410.00
2007	\$7,692.00
2008	\$8,980.00
2009	\$13,853.00
2010	\$20,144.00
2011	\$27,131.00
2012	\$32,724.00
2013	\$34,814.00
2014	\$39,085.00
2015	\$42,004.00
2016	\$40,713.00
2017	\$40,964.00
2018	\$44,234.00
2019	\$43,289.00
2020	\$34,286.00
2021	\$33,944.00

Now we will perform Time series analysis on this data.

We will forecast the **Trend** of the data using the following methods:

- The Graphical Method
- The Semi Averages Method
- The Moving Averages Method

The Graphical Method:



This basic graph shows us the ups and downs of the profits over all the years.

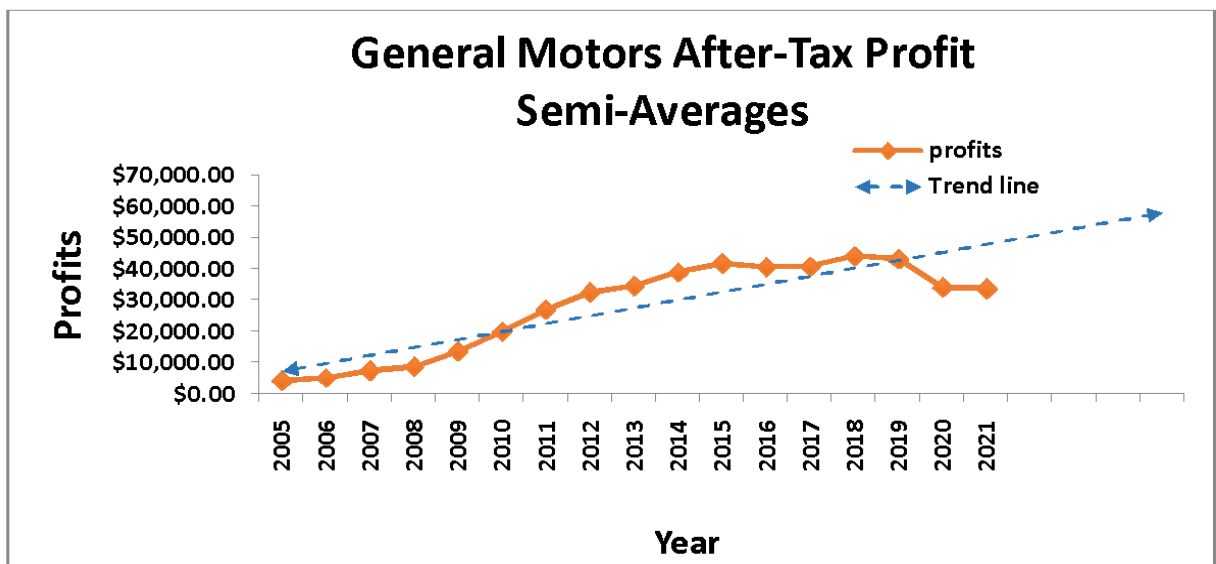
The Semi Averages Method:

- Here number of observations is odd so we neglect the middle value and split the remaining data into two parts.
- Part-1: 2005-2012 and part-2 : 2014-2021
- Now we calculate the averages of the two parts and plot them against their respective mid-values.
- The line which joins those two values will be the trend of the data and we extend the trend line to predict the future values

Calculations:

$$\begin{aligned}\text{Average of part-1: } & 4511 + 5410 + 7692 + 8980 + 13853 + 20144 + 27131 + \\ & = \$15,056\end{aligned}$$

$$\begin{aligned}\text{Average of part-2 : } & 39085 + 42004 + 40713 + 40964 + 44234 + 43289 + \\ & 34286 + 33944 = \$39,815\end{aligned}$$

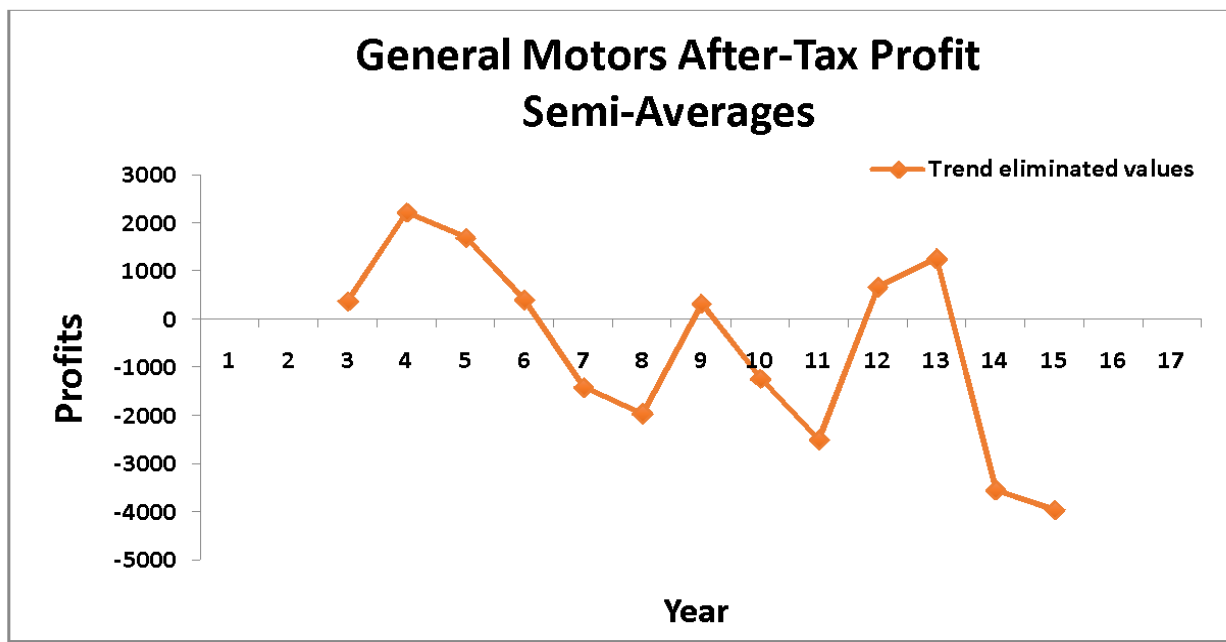


The Moving Averages Method:

- ➔ First we need to select number of years to calculate moving averages.
- ➔ In our experiment we have selected 5 years
- ➔ And then we calculate the 5 year totals and averages
- ➔ Later we centralize those values and calculate the trend eliminated values by subtracting original values from moving averages

Calculations:

year	profits	5 - year moving total	5 - year moving average	Trend eliminated values
2005	\$4,511.00			
2006	\$5,410.00			
2007	\$7,692.00	\$40,446.00	\$8,089.20	\$397.20
2008	\$8,980.00	\$56,079.00	\$11,215.80	\$2,235.80
2009	\$13,853.00	\$77,800.00	\$15,560.00	\$1,707.00
2010	\$20,144.00	\$102,832.00	\$20,566.40	\$422.40
2011	\$27,131.00	\$128,666.00	\$25,733.20	-\$1,397.80
2012	\$32,724.00	\$153,898.00	\$30,779.60	-\$1,944.40
2013	\$34,814.00	\$175,758.00	\$35,151.60	\$337.60
2014	\$39,085.00	\$189,340.00	\$37,868.00	-\$1,217.00
2015	\$42,004.00	\$197,580.00	\$39,516.00	-\$2,488.00
2016	\$40,713.00	\$207,000.00	\$41,400.00	\$687.00
2017	\$40,964.00	\$211,204.00	\$42,240.80	\$1,276.80
2018	\$44,234.00	\$203,486.00	\$40,697.20	-\$3,536.80
2019	\$43,289.00	\$196,717.00	\$39,343.40	-\$3,945.60
2020	\$34,286.00			
2021	\$33,944.00			



Analysis:

From the above calculated data we can make some observations like :

- The overall graph of Semi Averages Method follows an upward trend.
- The profits of this company were high during the period 2011 - 2019
- And the profits of this company were high during the period 2005 - 2010
- We can extend the trend line and calculate the estimated profits for the next coming years
- Profits in 2022 are approximately \$45,000

Inference:

- ❖ The Time series analysis is performed on the given data using Graphical Method, Semi Averages Method and Moving Averages Method
- ❖ Profits of the **Tata Motors** in 2022 are expected to be around **\$45,000**