Periodic Data Analysis and Forecasting As An Overview of Future Management Economics

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Abstract

In economics management is needed periodic data (time series) from production effort in predicting continuation of a situation is action which at one time must be done. For economic or political experts, it seems to be an obligation that must be carried out when they find a situation say just the economic crisis that befell a country with great, to provide predictive reviews about how the impact will be on the continuation of the existence of that country. So from that the aim of this research is to discuss about conceptual and conceptual aspects about periodic data, calculation of straight line trends through free method, half moving average, half average and least number of squares, non linear trend calculation which is trend parabola and exponential trends, calculations for changing trend equations into quarterly and monthly trends, calculations for changing trend equations into average trends, calculating seasonal variation values through simple average methods, ratio to trend, ratio of moving averages and relative berangkai, and calculation of cyclic variation values for annual and quarterly data. The method used during this study took place, namely using a literature study method which functions so that in research, researchers continue to add insight.

Keywords*: Economic Management, Periodic Data, Forecasting*

1. Introduction

In management economics, time series from production and fishing efforts are needed to estimate biological parameters and technological parameters of the bioeconomic model. At this time management economics requires fundamental conceptual aspects related to periodic data described in detail in order to build initial understanding. After that, the calculation procedure that must be carried out to determine the value of each component of periodic data, namely secular trends, seasonal variations, cyclic variations, and irregular variations is explained in full through various sample illustrations in each sub-section. Secular trends and seasonal variations have a broad proportion of discussion in this chapter. Some questions and exercises regarding periodic data analysis and summaries are expected to strengthen your understanding of data, especially those related to economic data.

Thus, it is important to consider the conceptual aspects, the method and context aspects in providing a number of notes for research [1]. and forecasting is needed as an effort to anticipate the situation in the future so that the risk of failure can be minimized, no less important with accurate data so forecasting will save costs, not only that forecasting can evaluate management policy and see the extent of its influence in the future and the last Forecasting can be used as a decision making because the forecasting results contain underlying information at the level of company management [2].

In fact, the reviews they convey are always looked forward to by other groups such as management business people. On the basis of predictions regarding the economic situation of management now associated with the possibility of future conditions which are a continuation, a relevant anticipatory step can be taken to respond to it. Predictive analysis delivered is often multidimensional in that predictive meaning is a research method used to predict or predict what

will happen in the future through current studies [3]. In the sense that the analysis submitted must pay attention to considerations from various aspects of the management economy. Predictions about the state of the Indonesian economy will not be wise next year without being based on an analysis of the situation and dynamics of Indonesian politics.

By analyzing periodic data we can find out the development of one or several conditions and the relationship or influence on other circumstances. This means that whether a situation or event has a relationship (influence) to another situation, and if there is a relationship how big or how strong the relationship, for example:

1. Will an increase in the value of exports affect the state's income and expenditure budget?
2. Will the price of oil on the world market affect the government's ability to pay off foreign debt?
3. Will the cost of advertising have a positive impact on company profits?
4. Will the increase in household income be followed by an increase in demand for certain products?
5. Does the amount of money in circulation affect the inflation rate?

Decision making is a systematic approach to the nature of a problem, gathering facts, determining the mature of the alternatives faced, and taking actions which according to calculations are the most appropriate actions [4] and for forecasting management decisions is one a tool that makes the resulting decision more precise and has a higher weight of validity. For example, a marketing manager for soft drink products who wants to launch a new product reflects on past experience regarding the level of consumer acceptance of some of the products it has launched.

This means that he must see whether based on the past experience of shrimp farming, the construction of housing complexes, the purchase of securities and the possibility of other alternatives able to provide an adequate level of profit, as well as what the risk level is. Indeed, not every form of economic investment management in a business that is able to provide a large level of profit in the past will certainly be able to also provide a greater number of economic benefits of management than others [5]. Likewise, the type of business that creates losses now is not necessarily prospective later on. However, at least this description can be used as one of the considerations.

From the explanation above, the author intends to provide an understanding of periodic data and forecasting in management, in order to be able to consider and minimize existing errors or losses, therefore the researcher takes the title of this research "**Periodic Data Analysis and Forecasting As Future Management Economic Overview"**

2. Research Methods

In the management research process, the researcher takes place using the Library Study method which has a definition of a method used to collect relevant information in accordance with the topics and problems that are the object of research [6] Or other understanding According to Rahardja, U. (2009), Literature Review is written material both in the form of books and sources from previous research, discussing the subject matter of a journal or scientific work with a topic to be researched that is relevant to the topic of previous research or that already exists. [7]

Basically the research method means a way to collect data or information needed which will then be analyzed [8], which will be used to discuss existing problems [9] and with the existence of research methods researchers can collect information or data and conduct investigations on information that has been obtained [10]. The following are some literature studies related to this management research:

1. This research was conducted by Winarno, W. W., & Amborowati, A. (2017) entitled THE FORECASTING SYSTEM OF THE NEEDS OF STOCK GOODS USING A TREND MOMENT METHOD ". In the study said that one that can be done by the distributor management is to do sales forecasting. The benefits of sales forecasting can be the basis for calculating the purchase budgeting in the next period, making plans, and tools to measure the level of achievement of the target. This study designed a forecasting system per day and per month using the trend moment forecasting method. Monthly forecasting results, especially daily, are expected to be able to support companies in planning strategies in the future in more detail based on changes every day [11].

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2. This research was conducted by Sinaga, B., Sagala, J. R., & Sijabat, S. (2017). "Designing Mobile Sales Forecasting Applications with Triple Exponential Smoothing Method" This study discusses about being able to sell efficiently, there is a need for sales forecasting, so that there is no excess or lack in supply and the sales process can run smoothly. Human limitation in solving forecasting problems without using tools is one of the obstacles in finding the right and fast forecasting value [12]
3. This research was conducted by Rahardja, U., Harahap, E. P., & Pratiwi, D. I. (2018). entitled "Utilization of RinfoSheet as a Media for Information on Goods Sales Reports at Raharja Internet Cafe", this study says that the function of the report is information that is very much needed for fluency in any field to provide this research report to the concerned as the lecturer is directed to correct the results of reports made and the lecturer can provide comments to correct the error report that has been made. So that the lecturer concerned knows the existing developments [13].
4. This research was conducted by Motahar, W. E. E., & Sulistijanti, W. (2017). Forecasting Mango Harvests with Seasonal Autoregressive Integrated Moving Average Method Approach "This study discusses periodic data and forecasting which according to the study periodic data there are four patterns (principal components) namely trend (T), seasonal (S) sikli (C) and horizontal (H). and explained also about forecasting where forecasting is almost done by everyone, both government, businessmen, and ordinary people. Predicted problems also vary, such as estimates of rainfall, total production and so on [14]
5. This research was conducted by Nurlifa, A., & Kusumadewi, S. (2017). Sales Total Forecasting System Using the Moving Average Method at Zaky Hijab House. INOVTEK Polbeng-Seri Informatika, 2 (1), 18-25. "Which says that forecasting on management functions to help users, especially management, who have management in decision making, besides taking decisions in managers, they can also be helped by the forecasting in management information system. In addition to data storage and reporting, managers can also be helped by the existing forecasting in management information systems. Forecasting is used to forecast the number of sales of goods for the next month, so that managers are easier to forecast used to forecast the number of sales of goods for the following month, so managers are easier to [15].
6. This research was conducted by Rachman, R. (2018). with the title "Application of Moving Average and Exponential Smoothing Method in Garment Industry Production Forecasting." This study reviews the forecasting is very influential on management decisions to determine the amount of production of goods that must be provided by the company, general business and economic conditions, reactions and actions of competitors, government actions, market trends, product life cycles, styles and fashions, changing demands and consumers of technological innovation. To do forecasting, the more data used for forecasting, the more accurate the results of the forecasting will be. The results of this study have succeeded in making a garment production forecasting system. So it is easier to determine the amount of garment production in the period of the following years. [16].

Of the 6 (six) literature studies that have been described above, it can be concluded that periodic data and forecasting are currently needed by or with any field, especially in economic management is needed because with the presence of periodic data and forecasting will be able to minimize errors that exist or that experienced at this time.

3. Results and Analysis

At this time the management economy needs to be forecasting and also periodic data because with the existence of forecasting and periodic data can be able to minimize the problems that exist in the future. but sometimes forecasting is often not in accordance with the actual reality. however, as discussed earlier, forecasting is a way to minimize or minimize the level of risk that might occur. It's better to do it than nothing.

Not only that but forecasting is also an attempt to provide a basic management decision in determining the right amount [17].

A. Data Periodically As A Platform Forecasting

Periodic data is statistical data arranged in a time sequence. Appropriate analysis of it will make forecasting of future conditions more accurate. One important element that must first be known if we want to do forecasting with the help of statistical analysis is periodic data or time series.

Periodic series are part of a stochastic process which is a sequence of random variables based on time sequences which aim to predict the future carried out based on past values and past errors of a variable [18]. About this series of periodicals, we can provide illustrations of examples of data on the number of motorbikes successfully marketed by PT XYZ, a company engaged in the business of selling various brands of motorized vehicles in Tangerang. Data regarding the number of motorcycle sales was compiled in a coherent manner from 2007 to 2017.

Table 1. Number of successful motorbikes marketed from 2007-2017

Tahun	Jumlah Sepeda Motor Terjual
2007	126
2008	129
2009	148
2010	136
2011	149
2012	154
2013	160
2014	153
2015	157
2016	120
2017	195

Experience with examples of periodic data shows that there are certain distinctive movements or variations that some of them or all are found in different levels. The management analysis of these movements is very important in many ways, one of which is forecasing future movements. Therefore, it is not surprising that many industries and government institutions are very interested in analyzing the movements of this periodic data.

C. Components - Periodic Data Components

1. Secular Trends (Secular Trends)

Secular trends are a situation in the long run. Graphically, this trend shows a slow, long movement or tendency towards one direction. Based on the definition of this understanding, movements in secular trends may increase and may also decrease, even constant. If the movement of secular trend shows a rising symptom, it is called a positive secular trend.

Where long-term trends or secular trends (Secular Trend) is a pattern of the movement of data over a long period of time which shows a general trend toward direction [19]. We can give a real example for the three trends above. For example, the cost of living at the family and community level aggregate may be in some time rise, then decrease at other times. But in general the cost of living will show an upward trend over time. While the mortality rate of the world population, thanks to the advancement of science and technology tends to show symptoms of decline. Secular trends generally include movements that last for ten years or even more. It can be said that secular trends are relatively stable variable. The time dimension

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in this case will be to distinguish between secular trends and seasonal variations. According to the pattern of movement, secular trends can be divided into three forms, namely:

a. Trends that show Symptoms of Increase (Upward Trends)

From the calculation of trends that show symptoms of increase [20]. As explained earlier, the development of the level of living costs over time shows symptoms to increase. In addition, the prices of manufactured products also tend to increase because these products are made from materials that are increasingly scarce or the production costs are increasing.

b. Trends That Reveal Constant Symptoms (Constant Trends)

As with the cost of living or the cost of producing manufactured goods, the capacity of tertiary institutions in the aggregate tends to be fixed, although perhaps the capacity of a university or study program increases while in other places the capacity of a university or study program is decreased.

c. Trends that Appear Decreased Symptoms (Downward Trends)

In addition to the trend that shows a tendency to rise and be constant, there is also a trend that actually shows symptoms of decline as well as the death rate of the population or the number of workforce willing to pursue agricultural business.

2. Seasonal Variation

The need for accurate information is indeed needed especially for everyday life [21], Seasonal variation is data fluctuations that repeat every few days, weeks or months due to weather, holidays and other factors [22].

The value of this seasonal variation is expressed in the form of a percentage called the seasonal index. If the seasonal index for clothing sales ahead of the Eid-ul-Fitr celebration is 1.75, it means that the number of requests for clothing before Eid is 75% greater than normal. Under normal circumstances, the seasonal index is 1 or 100%. Talking about this seasonal variation, we can make a record of the number of apparel sales at PT Argo Pantes, an export-oriented garment company located in Tangerang during 2014 to 2017 for example. The entire production of the company is sold to several Middle Eastern countries such as Bahrain, Qatar, Oman, Saudi Arabia, Dubai and the United Arab Emirates. Based on the records carried out by the marketing department's administrative staff, the data on the number of garments and the calculation of the season's motion patterns are as in the table below:

Table 2. Development of Number of Fruits in 2014-2017 (Bal Unit)

Kuartal	Jumlah Penjualan Tiap Kuartal				Pergerakan Musiman Pesifik				Pola Gerak Musiman (%)
	2014	2015	2016	2017	2014	2015	2016	2017	
I	70	75	68	78	83	88	85	92	87
II	85	80	87	85	101	94	109	101	101
III	88	88	85	93	104	103	107	110	106
IV	95	98	79	82	112	115	99	97	106
Rata-Rata	84,50	85,25	79,75	84,50				100	

Then, if depicted in graphical form. then data about the number of garments produced by PT. XYZ, which has been successfully marketed overseas will look like the following picture.

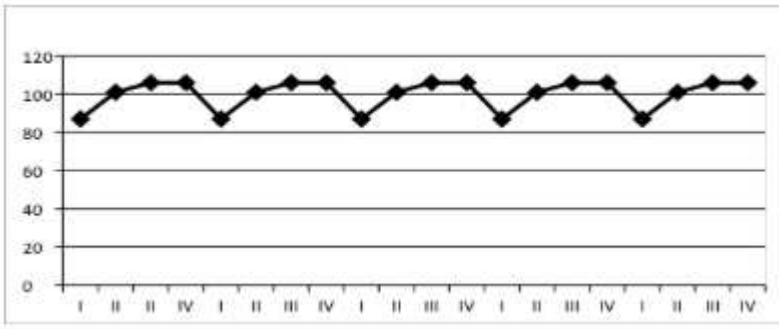

Figure 1. Seasonal Motion Patterns Development of Number of Fruit Sales in 2014 to 2017

3. Cyclical Variation

Cyclical movements or cyclical variations refer to the up and down movements in the long run of a trend line or curve. Such cyclics can occur periodically or not, which can or cannot follow the exact same pattern after the same time intervals. In business and economic activities, movements are only considered cyclical when they arise again after an interval of more than one year [23].

The emergence of cyclical movement trends is caused by the dynamics of aggregate activities such as the development of the level of prices, goods as a whole, the number of goods produced in total, the level of national savings, the tendency to engage in consumer activities, and so forth. Sometimes also, cyclical variations or business cycles are caused by culture, as well as political dynamics. In connection with the manifestation of the cyclic variation movement, experts have two different opinions. Most management economists claim that cyclical variation creates regular movement. And to find out the best quality and ranking, parameters are needed [24]. For example, climate cyclical variation creates a regular trend movement in the field of agricultural production for five years or ten years. Some other experts claim that cyclical variation creates irregular and unpredictable movements.

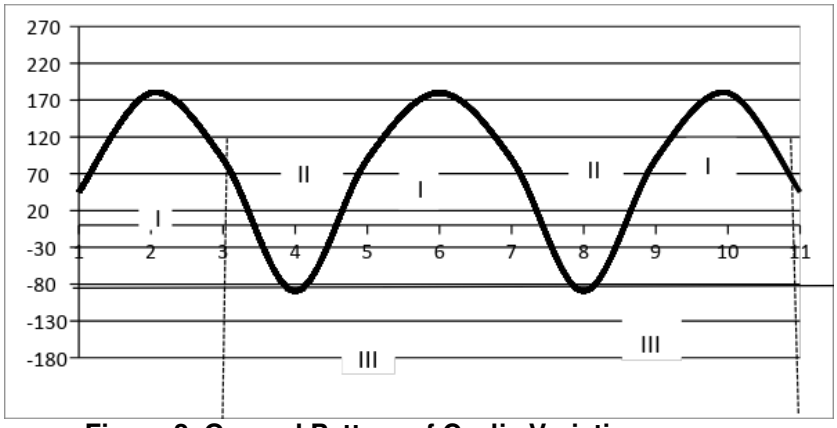

Figure 2. General Pattern of Cyclic Variations

In picture 2. Of course we still remember, the second world war that took place in less than five years has changed the economic conditions of some developed countries on the European continent, such as Germany, Italy, France and Britain from the debt-giving country to the debtor countries must be assisted by the Marshall Plan economic recovery program. division of the business cycle period can be measured from one peak to the other or from one stage to the next.

4. Irregular Variation

In general, irregular variations are caused by chance factors such as floods, earthquakes, mass strikes that occur immediately unexpectedly, major riots, etc. [25].

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If we want to do a management economic analysis of changes related to time, we must separate each component, both secular trends, seasonal variations in cyclical variation, and irregular variations [26]. Separation of each component of the time series needs to consider and adjust to several things. The things to consider include:

1. Variation in the number of days in the calendar system that makes the number of days in each month not the same. For example, because the number of days in February is less than the other months, then the level of business activity or production that continues continues to be lower. For this reason, adjustments need to be made. This can be done by calculating the average activity every day as a basis for comparing it with other months.
2. Impact of price changes that can have certain implications for the business cycle or economy. This situation can be overcome by making adjustments through the process of deflation.
3. Population changes that might affect the number of requests for various products. Adjustment for this situation is done by calculating the national income per capita.

5. Straight Line Trends (Linear Trends)

As previously explained, the discussion of variations in the periodic component and secular trends is a movement in the long run, slow [27]. shows a tendency to go in one direction where the tendency can go up or down [28].
Secular trends are efforts to simplify forecasting because trends that occur in the past have the possibility of being able to repeat themselves [29]. If so, the equation to find the straight-line trend value is formulated as:

$$\hat{Y} = a + bt$$

Where
$\hat{Y}$ which is read Y hat, is the value projected from the variable Y for a selected value of t.
A is the cut value with the Y axis. This is the estimated value of Y when t = 0. In other words, a is the approximate value Y when the line crosses the Y axis, when t = 0.
b is the degree of slope of the trend line or change in the average in $\hat{Y}$ for each change in t by one unit.
T is the selected time value.
When graphically illustrated, the trend pattern of a straight line is as below:

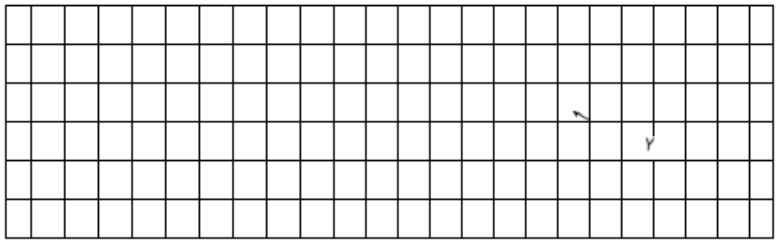

Figure 3. Straight Line Trend Pattern

To do calculations and depict straight-line trends. There are several ways, namely:
Free Method (Free Hand Method)

1. Half Average Method
2. Smallest Square Method (Least Square)
3. Mathematical Method

E. Change the Form of Trend Equations
1. Average Trend
a. The average trend equation every month is

$$Y = a12 + b12\ X$$

b. the average trend equation every quarter is

$$Y = a4 + b4\ X$$

Example
The annual motor sales trend is made quarterly.
Annual trend equation: $Y = 158 + 37X$

Equation of the quarterly average trend $Y = \frac{158}{4} + \frac{37}{4}X$

$$= 39{,}5 + 9{,}25X$$

So, the average motorcycle sales trend every quarter Y = 39,5 + 9,25X.

2. Monthly Trend and Quarterly Trend

Monthly trend is an inter-month trend, namely the trend from month to month, for example from January to February and from March to April [30]. To change the annual trend equation (unit X one year) becomes a monthly trend

(unit X is one month) then the value of a is divided by 12 and the value of b divided by 122 or 144. If the annual trend equation is $Y = a + bX$ then the monthly trend equation is $Y = \frac{\square}{12} + \frac{\square}{144}X$

3. Shifting the Base Year

Changing the base year of the trend equation is changing the starting point for calculating trend values. In changing the base year, what changes is only the value of a, while the value of b is fixed (not affected by the shift of the base year). Therefore, wherever the starting point starts, the trend line always has the same b (slop) value.

F. Nonlinear Trend

Non-linear trend calculations are parabolic trends and exponential trends, calculations for changing trend equations into quarterly and monthly trends, calculations for changing trend equations into average trends, calculating seasonal variation values through simple average methods, ratio to trends.

1. Parabolic Trend or Free Trend

Parabolic trends, also called quadratic trends, are one form of non-linear trends, that is, the variable X has the highest rank 2.
The general form of parabolic trend equations is

$$Y = a + bX + cX^2$$

Information :

Y = periodic data or trend values for a certain period
X = time period
a, b, c = constant number

Trend (trend line) can be made by first determining the value of a, b, c. With normal equations, the values of a, b and c can be determined.

Exponential Trend

The general form of exponential trend equations is

$$\hat{Y} = a\ (1 + b)^x$$

Information:

$\hat{Y}$ = trend value for a certain period
X = time period
a, b = constant number

Trend (trend line) can be created by first determining the value of a and By applying logarithmic properties, the values a and b can be determined

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$$\hat{Y} = a(1 + b)^X$$
$$\text{Ln } \hat{Y} = \text{Ln } a + X \text{ Ln } (1 + b)$$
$$a = \text{anti Ln } \frac{\square\square\square\square}{\square}$$
$$b = \text{anti Ln } \frac{\square(\square\square\square\square)}{\square(\square)^2} - 1$$
$$= \text{anti Ln } \frac{3{,}069}{10} - 1$$

4. Conclusion

One important element that must first be known if we want to do forecasting with the help of statistical analysis is periodic data or time series. Appropriate analysis of it will make forecasting of future conditions more accurate. Periodic data is statistical data arranged in a time sequence. The periodic data analysis is a tool that can be used to determine the tendency of a value from time to time, and analysis that can be applied to predict the value of a variable at a certain time period. Typical movements of periodic data can be classified into four main groups, which are often called periodic data components, namely: (1) long-term trend movements (T), (2) cyclical movements (C), (3) movements of seasonal variations (S), and (4) irregular movements or random movements (I). In general, changes that occur in statistical data in a certain time series can take the form of secular trends, cyclical variations, seasonal variations, and variations in residues called periodic data components.

The classical equation assumes that periodic data Y is the product of multiplication of components: long-term movement (T), cyclic movement (C), season motion (S), and irregular movement (I). Namely: Y = T x C x S x I. However, there are also statistics that assume that periodic data Y is the sum of these components, namely: Y = T + C + S + I. Analysis of periodic data consists of a research on the factors of T, C, S, and I which are often referred to as the periodic decomposition of data into the movements of the principal components. To determine the trend value, several methods can be used, namely: the free hand method, the half-average method, the moving average method, and the least squares method.

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