

LCGC Car Demand Forecast Analysis with Two Forecasting Method (case studies of consumer in Indonesia)

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Abstract— The economy of a country is basically supported by many sectors, one of which is the automotive industry sector with the designation as a provider of transportation facilities. The policy regarding transportation facilities is supported by the ministry of industry which issued a policy on environmentally friendly cars or low cost green cars (LCGC). Apart from being environmentally friendly, the car also has an affordable price in the community. Forecasting sales of LCGC cars is important for many companies that use past sales data to predict the amount of production that must be done so that goods continue to sell according to company targets. This will have an impact on the life and death of the automotive industry sector in the region. Important forecasting is done by many companies that use past sales data to predict the amount of production that must be done so that goods continue to sell according to the company's target. The data used in this research is secondary data. The secondary data needed in this study is the data on LCGC car sales in Indonesia from December 2019 to November 2020 obtained from secondary data sources. The data analysis method used in this research is exponential smoothing and trend analysis using POM QM software for Windows. The results also show that a good method to use as a sales forecasting method is the exponential smoothing method. This is because this method has a smaller MAPE value than the MAPE value in the trend analysis method. The MAPE figure for exponential smoothing is 4.9%, while the MAPE figure on the trend analysis method is 6.69%. In the exponential smoothing method, it is predicted that the sales of LCGC type cars in the next period are approximately 8448 units, while according to the trend analysis method, the sales forecast for the next period is 3894 units.

Keywords—Automotive LCGC Car, Demand, Forecasting

I. INTRODUCTION

The development of a country can be reflected in the development of the means of transportation which is used as an economic aid for the region. Good means of transportation in an area will facilitate mobility and distribution. The era of globalization demands transportation that aims to facilitate, accelerate and ease access. However, the important essence of transportation is a means of support and an element of the economy so as to support the social life of the region and even the state. The automotive industry has its own role, for

example to regulate the supply of goods with speed of distribution, stabilization of prices with land, sea and air transportation will make it easier for goods to arrive in several different areas. In addition to these two elements, the industry also plays a role in increasing the value of the existing land so that there is division or spatialization of the area, of course, this will have an impact on the direction of business development in two different areas, growing even up to large scale businesses. Human mobility to the occurrence of urbanisation and ruralization, of course, is also determined by the development of the automotive and transportation industry in the two targeted areas so that it will affect the number of human populations living in that area.

The economy of a country is basically supported by many sectors, one of which is the automotive industry sector with the designation as a provider of transportation facilities. This certainly has an effect on the means of transportation for the public so that the distribution of goods is in an effort to support economic growth and has an impact on technological developments for the country. So Indonesia needs to see the importance of developing the automotive industry. In its development, the growth of the automotive industry in Indonesia is increasing from year to year.

Foreign investment in the state in producing automotive products will lead to better industrial growth. This will also trigger the development of creative industries that are starting to emerge, such as accessories and additions to support automotive products. Companies engaged in the transportation sector have taken various ways to develop their businesses. Of course, this is supported by product innovations that are carried out to strengthen the competitiveness of existing products. In addition to this, marketing must penetrate various areas that have not been used as market segmentation so that market expansion occurs. Increasing human resources who work at the company must also be increased as an effort to overcome the intense competition between several competitor companies. This certainly supports the company's existence in order to survive and develop amidst intense competition so that the company can survive into the future.

Forecasting is important for many existing companies to use sales data in the past to predict the amount of production that must be done so that goods can still be sold according to the company's target [1]. The use of causal assumptions is used to evaluate past sales so that the relationship can be written in statistical modeling [2]. The existing assumptions will more easily describe sales patterns from the past to the present and even the future as a sales forecasting tool so that they can change sales records from a cause-and-effect picture to make it better. Many companies are engaged in automotive sales, especially cars. Sales of cars certainly have segmentation and market share so that the company has a strategic market position so that it is able to maintain its presence in the market. Of course, the company must implement the right strategy and method to develop its company into a better domain [3].

The policy regarding cheap cars that has been given by the Ministry of Industry stipulates the existence of environmentally friendly cars or low cost green cars (LCGC) which is contained in the regulation of the Minister of Industry No. 33 / M-IND / PER / 7/2013. The regulation contains the development of energy-efficient and affordable four-wheeled motorized production. The purpose of this regulation is aimed at driving and developing industrial independence so that it is able to create four wheels that are competitive and of course energy efficient and adapted to the market share of Indonesians who, on average, want a car at an affordable price. The development of LCGC car manufacturing is a four-wheeled motorized production development program with additional facilities in the form of reducing the Value Added Tax on Luxury Goods (PPnBM) on the price of the car. There are three criteria found in the low cost green car (LCGC), such as prices ranging from 50 to 85 million, of course the highest price is for general users while the lowest price is in rural areas. In addition to this, LCGC has a mineral fuel efficiency with an allotment of 20 Km / liter then a local content of at least 65% of all components. This policy will encourage public interest and purchasing power as well as make it easier for lower-class economic people to own private vehicles at a more affordable price [4]. Istiyanto and Nugroho [5] stated that the price of a cheaper LCGC car has a significant influence on the decision to purchase an LCGC car and according to the quality of the product.

The company certainly has indicators in its business development, one of the indicators referred to is the sales side of the company so that it is the support for the company's existence. If the sales of a company's products in a certain period have increased, the profits earned by the company will also be greater so that the company can survive the tight competition that exists. Sales prediction / sales forecasting is an effective way to increase company profits. Sales data and information are very important for companies to plan future sales, for example: customer data, number of vehicles, car prices, spare parts, types of vehicles and what is no less important is government policies in providing vehicle taxes and vehicle fuel subsidies [6]. The application using the forecasting method can be used in the field of artificial neural networks by using data that is from time to time by inputting input and output data as a process [7].

In the last few decades, the science of transportation has emerged as a support for the physical limitations of humans in carrying out their daily activities for social, economic, political, science and technology, culture and other activities. The support provided by the means of transportation will cut even close distances so that humans can physically move more freely. For example, how easy it is to achieve something, humans need objects that are needed, especially in the movement of moving places outside the distance so that it can help the physical human being to achieve this. For example, humans want to get something they need and want by walking, then humans must be assisted by a device that is able to support this movement called transportation.

An important aspect in supporting daily life is because in fact humans must have mobility so that this support can be realized by the presence of transportation. As time develops, it will be accompanied by the development of technology followed by car manufacturers producing a car that is a combination of advanced and cutting-edge technology. Exhaust gas and fuel are points that experience improvement over time because they will have an impact if not handled properly. Transportation currently offers Low Cost Green Car products as an innovation created by ATPM (Sole Agent Brand Holder). This idea emerged along with the large amount of air pollution in Indonesia and the high level of fuel consumption so that the product became attractive to consumers, followed by the purchase of the car in big cities [8]. This LCGC is one of the answers to the pollution problems that exist in Indonesia. Air quality in each major city is increasing and the government is increasingly overwhelmed in dealing with air quality which then becomes a polluting which disturbs or can no longer be said to be feasible based on air quality [9].

The era of globalization demands private vehicles as an inevitable necessity for the general public. This will have an impact on the increased production of LCGC vehicles especially for four-wheelers that are energy efficient and at a relatively lower price, thus encouraging many companies to try to produce these cars. Famous brands such as Toyota, Daihatsu, Honda, Nissan and Datsun began marketing LCGC cars. The sales of this type of car get attention and a place in the community when compared to other cars so that sales of this type increase from year to year. As a result of this, LCGC cars dominate the car market share in Indonesia. Sales in 2018 were dominated by the Toyota Calya car brand and followed by another brand, namely Daihatsu Siga [10]. However, there are still other cars purchased by the community besides Calya and Siga.

The LCGC type car is a new breakthrough in the automotive industry, especially in Indonesia. This car presents an environmentally friendly concept as an alternative that is more suited to the needs of consumers in Indonesia, of course, matched with the income of the general public. Toyota, Honda, Daihatsu and Suzuki are competing to produce LCGC cars with their respective advantages. The existence of this makes consumers have many choices in determining which car from which brand to buy, of course, consumers always choose which car is the most suitable to have [11]. It must also be considered by company

management to sell its products that are adjusted to consumer demand for a certain period of time. This study aims to determine the demand forecast analysis for LCGC cars using two forecasting methods. This study also aims to determine which forecasting method is better and more appropriate to use in predicting sales of LCGC cars in Indonesia.

II. METHOD

Descriptive method is a data analysis method used in this study. Statistical data analysis used can describe and describe the data collected as intended in the study and then make general or general conclusions [12]. The location of this research is in the country of Indonesia purposively. This is because Indonesia is a large consumer market for LCGC cars. The data used in this research is secondary data. The secondary data needed in this study is the data on LCGC car sales in Indonesia from December 2019 to November 2020 obtained from secondary data sources. The quantitative analysis technique in this study uses the exponential smoothing method and trend analysis.

Exponential weighting is the use of the exponential method for past observations. The parameters used in this study are explicitly defined and more than one, and the results of this selection determine the weight imposed on the observed value. The use of this method requires a minimum of two pieces of data to be used so that forecasting can be done in the future. Forecasting method Exponential Smoothing (exponential smoothing) is actually a moving average method that gives stronger weight to the latest data than the initial data. This is especially useful when recent changes to the data are the result of actual changes (such as seasonal patterns) rather than random fluctuations where a forecasting moving average is sufficient. Determine exponential smoothing with the formula used, namely:

$$F_{t+1} = \alpha X_t + (1 - \alpha) F_t$$

Information:

- F_{t+1} = The value of the forecast at time t
- X_t = Previous data at time t
- F_t = Forecast for the t -period
- α = Weight indicating the smoothing constant

Method Separating the three components is three separate components from the archetype that tends to characterize economic and business data series. These components are trend, cyclical and seasonal factors. Matching a straight line to stationary (horizontal) data can be done by minimizing MSE using:

$$\bar{X} = \frac{\sum_{t=1}^T X_t}{n}$$

Linear trend line for periodic series data:

$$X_t = a + bt$$

The values of a and b that minimize MSE can be obtained using the following equation

$$b = \frac{n \sum tX - \sum t \sum X}{n \sum t^2 - (\sum t)^2}$$

$$a = \frac{\sum X}{n} - b \frac{\sum t}{n}$$

Where:

- a = Intercept
- b = slope

III. RESULT

The LCGC car is an environmentally friendly car. Apart from this, people prefer to choose this car because the price is very affordable. Several well-known brands also produce this type of car such as Toyota, Daihatsu, Suzuki, and Datsun. The sales of LCGC cars in the period December 2019 to November 2020 will be explained in table 1 below.

Table 1. LCGC Car Sales for the Period December 2019 - November 2020

Periode	Bulan	Jumlah Penjualan
2019	December	18,991
2020	January	17,056
	February	16,122
	March	18,057
	April	1,454
	Mei	154
	June	1,455
	July	2,745
	August	6,481
	September	13,892
	October	11,239
	November	7,244

Source: Secondary Data Sources, 2020

Based on table 1, we can see that LCGC car sales in the period December 2019 to November 2020 have fluctuated. From December to March, sales of LCGC cars tended to be stable with an average sales of 17,556 units per month. However, in April it decreased very drastically until August. The least amount of LCGC car sales occurred in June, which recorded only 154 cars sold. In September, the sales figure has started to increase with the difference in sales of 7,411 units of LCGC cars sold. However, there was another decline in October which was only able to sell 11,239 LCGC cars until November, still experiencing a decline of 3,995 units when compared to the previous month. The sluggish purchasing power of the Indonesian people for LCGC-type cars is caused by various things such as the pandemic so that the priority of the community is to buy staples rather than LCGC cars. The pandemic also seems to reduce people's income. Some people even get fired from their jobs so that the poverty rate increases in both urban and rural areas so that it weakens people's purchasing power, especially to buy LCGC cars. Another thing that affects is the stay at home policy during the pandemic so that people are required to stay at home frequently so that mobility is also disturbed so that this will indirectly affect the sales figures of LCGC cars.

Sales of low cost green cars (LCGC) in early 2020 still have their own segment. Many people want this car at an affordable price even though the price of the car is not as cheap as the previous year. It is noted that the price of LCGC cars is at a level above 100 million, but this car is still in great

demand by the public. Data obtained from the Association of Indonesian Automotive Industries (Gaikindo) states that LCGC sales in January 2020 are not as good as sales in the previous period, namely December with sales of 18,991. There are two brands that still dominate the sales of LCGC-type cars, namely Toyota Calya and Honda Brio Satya. Sales of Toyota Calya were able to sell 4,579 units. This is possible because this car already has a seven seater while other LCGC cars have not. Another reason is because this car is the output of the Toyota brand that is familiar to the public. Honda Brio recorded sales of 4,427 units in January 2020. This car has a market segmentation, namely young people. Daihatsu Siga also ranked third in LCGC sales in January 2020 with sales of 3,705 units. In addition to the three car brands, there are other brands that have LCGC cars such as Daihatsu Ayla which sold 2,054 units, Toyota Agya with 1,745 units, Suzuki Karimun Wagon R with 320 units and Daihatsu Go with 214 units.

The most extreme sales value occurred from April to June 2021. The corona virus (COVID-19) pandemic has hit the automotive industry badly. As is known, car sales in Indonesia have stalled due to the Corona virus (COVID-19) pandemic. Several automotive factories also went off production during Large-Scale Social Restrictions (PSBB). Even from that month there were several LCGC cars from certain brands that did not record sales at all. This of course will weaken the development of the automotive and transportation industry in Indonesia so that this should be a concern for the Indonesian government. Forecasting needs to be carried out by the management of the company that produces LCGC cars to determine how many cars must be produced and must be sold in a certain time period. Table 2 is a forecast of LCGC car sales using the exponential smoothing method.

Table 2. Calculation Results With QM for Windows Exponential Smoothing Method

Measure	Value
Error Measures	
Bias (Mean Error)	1369.198
MAD (Mean Absolute Deviation)	4153.744
MSE (Mean Squared Error)	37812960
Standard Error (denom=n-2=9)	6798.223
MAPE (Mean Absolute Percent Error)	4.9%
Forecast	
Next Period	8448.173

Source: Data processed in 2020

Based on table 2, we can know the forecasting of LCGC car sales using the exponential smoothing method. This model is well tolerated because it contains a relatively low MAPE (Mean Absolute Percent Error) value of 4.9%. The exponential smoothing method is able to predict sales of LCGC cars in the period of December 2020 as many as 8448 units sold. This figure is certainly an increase when compared to the previous period which only recorded sales of 7244 units of LCGC cars. This is due to the public interest in buying a car at the end of the year. Usually at the end of the year there are many discounts given by car manufacturers to cover the annual sales target that is usually set by the company. In addition, there is an issue that there will be PPnBM relaxation provided by the government to boost the growth rate in the

auto industrial sector so that it is hoped that this will increase car sales in Indonesia. Forecasting can also be done by other methods besides exponential smoothing, namely trend analysis which can be explained in table 3.

Table 3. Calculation Results With QM for Windows Trend Analysis Method

Measure	Value	Future Period	Forecast
Error Measures		13	3894.939
Bias (Mean Error)	0.01	14	3021.212
MAD (Mean Absolute Deviation)	5566.252	15	2147.484
MSE (Mean Squared Error)	37812960	16	1273.757
Standard Error (denom=n-2=10)	6737.721	17	400.029
MAPE (Mean Absolute Percent Error)	6.69%	18	473.698
Regression Line		19	1347.425
Demand (y) = 15253.4		20	2221.153
-873.727*Time		21	3094.88
Statistics		22	3968.608
Correlation Coefficient	.44	23	4842.335
Coefficient of Determination (r ²)	.194	24	5716.063
		25	6589.79
		26	7436.518

Source: Data processed in 2020

Based on table 3 regarding the forecasting model using trend analysis, the MAPE value is 6.69%. This figure tends to be low so that the model is still feasible to use. The trend analysis method predicts that sales in the following month period amount to 3894 units of LCGC cars sold. This is because when seen in table 1 the sales trend tends to decline, even in May 2020 there were extreme sales figures of 154 LCGC cars sold. When compared between the two models used in this study, it can be seen that the exponential smoothing method looks better with the MAPE number which tends to underestimate when compared to the trend analysis method. In the exponential smoothing method, the MAPE value is 4.9%, while the MAPE value in the trend analysis method is 6.69%. The declining purchasing power of the people for LCGC cars has made the automotive industry sector not develop. This was then responded well by the government, which then decided to relax the PPnBM. With this, which is planned to be ratified in March 2021, it will bring changes to car sales in Indonesia. Not all cars are subject to this rule, only a few cars but this may also affect the sales of LCGC cars which are still below the price of non-LCGC cars which are subject to PPnBM relaxation. This will make consumers have two choices to buy a car due to the relaxation of PPnBM or to keep buying LCGC cars, which tend to be cheaper than other cars. Another effort that can be done is penetrating market segmentation. The fact is that the LCGC car has a market share in big cities. The marketing management of the company should also promote more aggressively in the buffer zone areas of the big city. This is because many people living in the buffer zone work in this big city so that their income is good enough and they can afford to buy a minimum of an LCGC type car.

IV.

CONCLUSION

Based on the research results, it can be seen that sales of LCGC type cars in the period December 2019 to November 2020 experienced fluctuating sales. The rise and fall of car sales is of course influenced by several factors such as decreased purchasing power due to the pandemic. The results also show that a good method to use as a sales forecasting method is the exponential smoothing method. This is because this method has a smaller MAPE value than the MAPE value in the trend analysis method. The MAPE figure for exponential smoothing is 4.9%, while the MAPE figure on the trend analysis method is 6.69%. In the exponential smoothing method, it is predicted that the sales of LCGC type cars in the next period are approximately 8448 units, while according to the trend analysis method, the sales forecast for the next period is 3894 units. We recommend that the transportation or automotive industry that is engaged in selling LCGC-type cars must penetrate its market segmentation not only in big cities but also in the buffer areas or areas of these big cities. This is because many residents who live in the buffer zone work in this big city, so that their income makes it possible to buy an LCGC car as a means of personal transportation when working or doing mobility.

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REFERENCES

- [1] Aditi, Bunga dan H.M Hermansyur. 2018. Pengaruh Atribut , Kualitas Produk dan Promosi, Terhadap Keputusan Pembelian Mobil Merek Honda di Kota Medan. Jurnal Ilmiah Manajemen dan Bisnis, Vol 19 No. 1. Diakses pada : 20 Agustus 2020.
- [2] Kodu, Sarini. 2013. Harga, Kualitas Produk dan Kualitas Pelayanan Pengaruhnya terhadap Keputusan Pembelian Mobil Toyota Avanza. E-Jurnal EMBA Fakultas Ekonomi dan Bisnis, Jurusan Manajemen Universitas Sam Ratulangi Manado. Vol 1, No. 3. Diakses pada : 25 Agustus 2020.
- [3] Iwan. Rahayu, EIH. Yulianto, A. 2018. Analisa Peramalan Permintaan Mobil Mitsubishi Xpander dengan Tiga Metode Forecasting. Cakrawala. 18 (2). 249-256.
- [4] Sari, PIP. Elfiswandi. 2019. Analisis Kontribusi Pajak Mobil LCGC Terhadap Penerimaan Pajak Kendaraan Bermotor Sumatera Barat. Jurnal Akuntansi Aktual. 6 (2)., hlm. 280-344
- [5] Istiyanto, B., dan L. Nugroho. 2017. "Analisis Pengaruh Brand Image, Harga, Dan Kualitas Produk Terhadap Keputusan Pembelian Mobil (Studi Kasus Mobil LCGC di Surakarta)". Eksis: Jurnal Riset Ekonomi dan Bisnis, Vol. 12, No. 1,
- [6] Iwan. Rahayu, EIH. Yulianto, A. 2018. Analisa Peramalan Permintaan Mobil Mitsubishi Xpander dengan Tiga Metode Forecasting. Cakrawala. 18 (2). 249-256.
- [7] Sari, PIP. Elfiswandi. 2019. Analisis Kontribusi Pajak Mobil LCGC Terhadap Penerimaan Pajak Kendaraan Bermotor Sumatera Barat. Jurnal Akuntansi Aktual. 6 (2)., hlm. 280-344
- [8] Istiyanto, B., dan L. Nugroho. 2017. "Analisis Pengaruh Brand Image, Harga, Dan Kualitas Produk Terhadap Keputusan Pembelian Mobil (Studi Kasus Mobil LCGC di Surakarta)". Eksis: Jurnal Riset Ekonomi dan Bisnis, Vol. 12, No. 1,
- [9] Jati Waskito dan Mugi Harsono, 2012, Green Consumer: Deskripsi Tingkat Kesadaran dan Kepedulian Masyarakat Joglosemar terhadap Kelestarian Lingkungan, Jurnal Dinamika Manajemen, Vol. 3, No. 1, 2012, pp: 29-39
- [10] Putra, YD. Sianto, ME. Mulyono, J. 2019. Analisis Faktor Terhadap Minat Beli Mobil Low Cost Green Car (Lcgc) Merek Toyota Dan Daihatsu. Widya Teknik. 18 (2). 90-95.
- [11] Swara, GY. Anisya. 2018. Pengembangan Sistem Pakar Pemilihan Mobil Murah Ramah Lingkungan (Low Cost Green Car). Jurnal TEKNOIF. 6 (1). 42-47
- [12] Sugiyono. 2014. Metode Penelitian Kuantitatif Kualitatif dan R&D. Bandung: Alfabeta.