Short Run Macroeconomic Factors Affecting Car Sales in Proton

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Abstract

Malaysia had committed to be an automotive-producing country through the establishment of Proton in the year 1983. Since then, Proton has been quite a significant contributor to the Malaysian economy. People are influenced to purchase cars due to a number of factors; and these factors are studied in this research. This paper aims to identify the relationship between the macroeconomic indicators and the sales volume of cars in Malaysia. In achieving the objective, the study used secondary data gathered from Internet search, journals, and government agencies, which were then analyzed using descriptive statistic, correlation analysis, and multiple regression statistic. The result of the study shows that inflation and unemployment contribute significantly to the volume of car sales for Proton. On the other hand, gross domestic product (GDP) and interest rate do not have significant impact on the sales volume. These findings will provide Proton with valuable insights about which factors are the most influential, so they could strategize accordingly.

Keywords: Car sales in Proton, GDP, interest rate, inflation rate and unemployment.

1. Introduction

Transportation is essential in everyday life, as it ensures mobility of people and enables products to be delivered and distributed effectively. Thus, it is for certain that the automotive industry in Malaysia hugely contributes to the economy of the country. Malaysia started to get involved in the automotive industry around 1960s when the assembly plant was built, creating job opportunities for many. Before the assembly plant was built, most of the cars that the Malaysians bought were imported in completely built up (CBU) form. Two decades after that, the government decided to get more committed in the automotive industry, hence the Prime Minister established Proton; the first national car project. To protect Malaysian automotive market, the government put effort in implementing high tariffs on imported cars, which led to reduced number of foreign cars. However, although with such effort, Proton still had some challenging years where the sales volume for Proton cars kept decreasing. In 2017 for example, Proton sold 70,991 cars which is 1,300 units less than the previous year. If the sales continue to plummet, this will obviously bring a huge negative impact on Proton's financial performance, which will then affect the economy as well. Despite the importance of Proton as Malaysia's first national car project, limited studies have been found focusing on macroeconomic factors affecting number of car sales of Proton. A research done by Muhammad, Mohd Hussin, Abd Razak, Rambeli, & Gan (2013) studied the relationship between macroeconomic factors and number of car sales in Malaysia. Another researcher studied the determinants of car sales in the context of passenger vehicles (Nawi, Basyir Ahmad, W. Mahmood, Sekharan Nair, A., & Abdul Hamid, 2013) Although there are numerous studies on the relationship between the macroeconomic factors and the number of car sales, the studies either focused on the automotive industry in Malaysia in general (without focusing on Proton), or focused only on passenger cars. This research studies the macroeconomic factors that influence the number of car sales for Proton specifically; therefore, this study will provide valuable information for Proton on how they can improve their sales and maximize profit. Besides, this study will provide new insights to existing studies.

2. Literature Review

Car Sales

The automotive industry in Malaysia contributes greatly to the country's economy. According to Khamis & Abdullah, (2014), there had been a steady growth rate in Malaysia's automobile industry. Based on the data from the Malaysian Automotive Association (MAA), the overall total industry volume of automobiles for 2018 ended at 598,714 vehicles, which is an increase of 22,089 vehicles from the 576,625 units achieved in 2017. For Proton itself, the total volume sold in 2018 was 64,744 units, which is lower compared to the 70,991 units sold the previous year. The contribution of the automotive industry to our economy shows the importance of studying the factors that could affect the number of car sales. This study is especially useful for Proton, in order to find out what are the possible factors that may have impact on their sales volume. There are a number of studies conducted by previous researchers that examine the relationship between various macroeconomic variables and car sales; however, studies that focus on Malaysian market is limited. Different researchers studied different macroeconomic factors, such as gross domestic product (GDP), interest rate, oil prices, employment or unemployment rate, inflation rate, and income level, among others. Some of these macroeconomic factors will be discussed in this paper.

Growth domestic product (GDP)

Growth domestic product (GDP) is a significant indicator of the economic performance of a country. According to a study conducted by Sivak & Tsimhoni, (2008), GDP and car sales are highly correlated to each other. This finding is supported by another study conducted by Muhammad et al., (2012), which stated that there is a positive relationship between GDP and car sales. This means that the higher the GDP, the higher the demand for cars among the citizens. Another research that studied the relationship between macroeconomic factors and passenger car sales also had the same result; GDP significantly influences the sales of passenger cars in the respective country (Nawi et al., 2013). However, the finding from a study conducted by Shahabuddin, (2009) shows that the relationship of GDP and the sales of national cars is weaker compared to the sales of foreign cars. Although the relationship is weaker with national car sales, it does not change the fact that there is a positive relationship between these two variables.

Interest Rate

The next independent variable that will be discussed in this paper is interest rate. Interest rate is the rate charged annually by a creditor to a borrower for the loan received. A high interest rate means that the cost of debt for the borrower is high, hence will discourage people from borrowing. This will then result in lower sales. Nawi et al, (2013) had examined the relationship of interest rate and car sales in their study. The finding showed that there is a negative relationship between interest rate and passenger car sales, where a 1 percent increase in interest rate will make the passenger car sales decline by 3.21 percent. The study by Muhammad et al. (2012) also implied the same thing – that the correlation between interest rate and car sales is negative. On the other hand, a study conducted by Beck, (2003), found that changes in interest rate is less significant compared to changes in price. It was indicated that the customers only respond to changes in interest rate if it results in a very low rate. Shahabuddin, (2009), found in his study that it is evident that interest rate and car sales are negatively related. When the interest rate on car loans increases, the sales of car will decrease.

Inflation Rate

Inflation is the third variable that will be discussed in this study. Inflation happens when there is a consistent increase in the price of goods and services in the economy, and it is a serious issue feared by many; not just businesses, but also government and consumers. Inflation caused serious problems to many industries, and the car industry is no exception. The increase in price of raw materials leads to increased cost for manufacturers and producers, which means that this increased cost would have to be covered by increasing the price of goods as well. As price of goods increases, people will be more reluctant to make purchases, and therefore, demand will decrease. A study by Beck, (2003), where it was found that people tend to respond to changes in price. This means that people would more likely purchase cars if the price of cars is reduced and would less likely make purchases if the price of cars is increased. A finding by Nawi, et al. (2013), found that there is a negative relationship between inflation and car sales, where an increase in inflation rate causes a decrease in car sales. This is supported by another study with the same finding; there is a negative relationship between inflation and car sales. According to the author, when the inflation increases by 1 unit, the automobile sales decrease by 7.23 percent (Pehlivanoglu & Riyanti, 2018). Furthermore, a study by Mohamad Rusli and Ali, (2014), also stated that based on the long-run equation, it was found that there is a positive relationship between inflation and fuel price with sales. Therefore, from this, the author concluded that it is possible that the increase in inflation rate have an impact on Proton sales revenue.

Unemployment Rate

Unemployment is indeed a matter of concern in many countries including Malaysia. The incline of unemployment rate imposes significant costs on the individuals, the society, and also the country. To the individuals, the cost of unemployment is rather straightforward: when the individuals lose their jobs, it mostly cause a drop in income, hence result in reduced spending (Ganong & Noel, 2016). To the society, the cost of unemployment is a bit more indirect. Elevated unemployment often correlates with higher number of crimes (Ajimotokin, Haskins, & Wade, 2015). This makes sense because, with the absence of a paying job, people may resort to crime to meet their monetary needs or simply to alleviate boredom. On the other hand, the cost of unemployment to the country is that the rising unemployment is seen as a sign of a weak economy, with slow growth and little spending. According to the study by Nawi, et al. (2013), unemployment rate has a negative relationship with car sales. From their finding, when the unemployment rate increased by 1 percent, the car sales decreased by 1.52 percent. This is supported by the study conducted by Islam, et al. (2016), with the same finding: the unemployment rate has negative relationship with the car sales in Malaysia. This means that when unemployment increase, the car sales in Malaysia will decrease. Another study by Muhammad et al. (2013) found that unemployment rate has significant long-term correlation with car sales in five ASEAN countries, including Malaysia.

3. Methodology

This study investigated the link between different types of independent variables consisting of GDP, interest rate (IR), inflation (INF), and unemployment rate (UR) to the dependent variable; number of car sales for Proton. The research framework is shown in Figure 1 below.
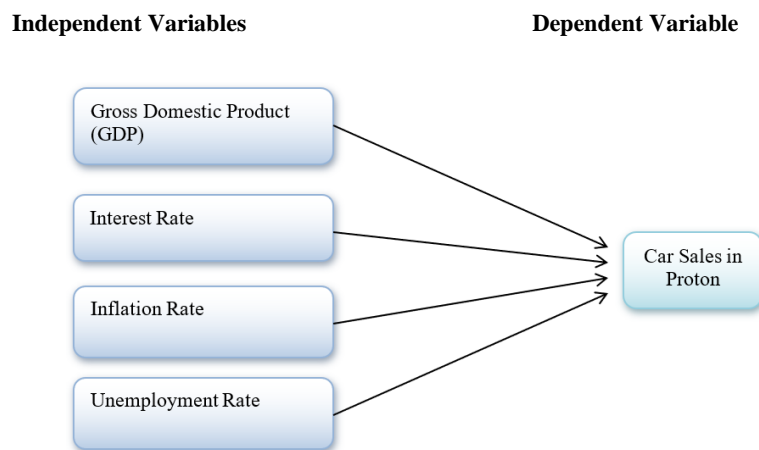

Figure 1: Theoretical Framework

This study requires the researcher to perform a trend analysis on the number of car sales for Proton between the year 2001 and 2016. For the number of car sales, the data gathered is a secondary data, obtained from Malaysian Automotive Association, whereas data of the independent variables are obtained from World Bank Open Data. To analyze the relationship between dependent variables and independent variables in this study, multiple linear regression is used. Besides that, the researcher also conducted a normality test to determine whether the data sample fits a standard normal distribution. Then, the researcher measures how close the data are to the fitted regression line by using the coefficient of determination (R^2). This method is also used to test the strength of the linear association between dependent and independent variables.

Analysis and Findings

The trends were analyzed based on the report from Malaysian Automotive Association. Figure 2 shows the trends of car sales in Proton in terms of quantity for 16 years starting 2001 to 2016.
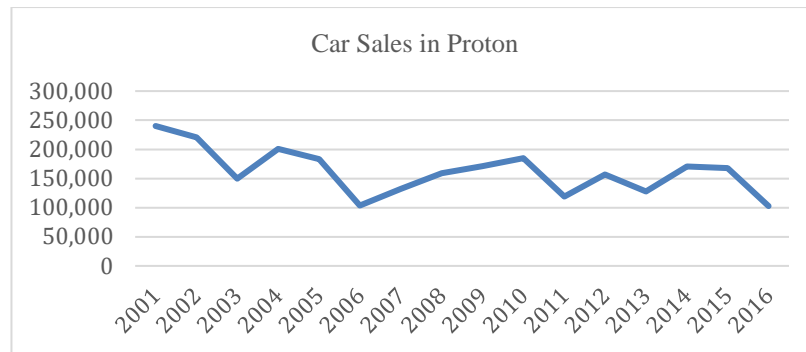

Figure 2: Trend Analysis in Proton

Based on the figure, it shows that the level of car sales in Proton are not consistent since 2001 to 2016. According to the Proton's Annual Report, Proton made $2.48 billion dollars in sales in 2003, followed by 2004; $1.72 billion dollars, 2005; $2.3 billion dollars, 2006; $1.4 billion dollars, and 2007; $1.69 billion dollars. From the graph, the overall trend has shown some decline in the car sales from 155,000 units to 120,000 units. In year 2006, the sales of the Proton keep increasing until year 2011. This is because Proton launched various type of cars in that period of time to make sure that the customer do not bored with the same design. Between 2011 to 2016, the overall unit sales of the domestic share were declining from 50 percent to 24 percent.

Regression Analysis

Table 1: Regression Analysis

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3.034052	0.284131	10.67837	0.0000
GDP	0.003208	0.015719	0.204071	0.8398
INTEREST_RATE	-0.010797	0.018104	-0.596382	0.5559
INFLATION	-0.135318	0.051490	-2.628031	0.0140
UNEMPLOYMENT	-0.337351	0.044719	-7.543794	0.0000
R-squared	0.690526	Mean dependent var		1.347319
Adjusted R-squared	0.644678	S.D. dependent var		0.579494
S.E. of regression	0.345430	Akaike info criterion		0.854547
Sum squared resid	3.221688	Schwarz criterion		1.083568
Log likelihood	-8.672746	Hannan-Quinn criter.		0.930461
F-statistic	15.06119	Durbin-Watson stat		1.478283
Prob(F-statistic)	0.000001			

Based on the results generated above, the multiple linear regression equation for hypothesis this research paper could be used to analyze the relationship between the car sales, gross domestic product (GDP), interest rate (IR), inflation (INF) and unemployment Rate (UR). The equation can be derived as follow:

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + e$$

Car Sales = 3.0341 + 0.0032 GDP – 0.0108 IR – 0.1353 INF – 0.3374 UR + e

Where:

CS	= Car Sales in Proton
GDP	= Gross Domestic Product
IR	= Interest Rate
INF	= Inflation
UR	= Unemployment Rate
e	= random error term
α	= Constant

Gross Domestic Product has positive and insignificant relationship with car sales in Proton. The coefficient for GDP is 0.0032. An increase in 1% of GDP will increase the car sales in Proton by 0.32%. This shows that there is a positive relationship between GDP and the dependent variable. The positive relationship of GDP and car sales of this research is further supported by a study from Dynaquest that founds there is also a strong relationship between new car sales and the nominal GDP.

The coefficient for interest rate is 0.0108. An increase in 1% of interest rate will decrease the car sales in Proton by 1.08%. This shows that there is a negative relationship between interest rate and the dependent variable. The negative relationship of interest rate and car sales of this research can be supported by a study by Eastwood and Anderson (1976) which stated that consumer credits influence the demand for automobiles. Consumers will take installment credit into their consideration when they want to purchase durable goods.

Inflation has a negative and significant relationship towards car sales in Proton. The coefficient is -0.1353. An increase in 1% of inflation will decrease the car sales in Proton by 13.53%. This shows that there is a negative relationship between inflation and dependent variable. The relationship of inflation and car sales of this research is in line with a study done by Guonason and Jonsdottir (2009) which found that inflation rate does influence the car sales.

Unemployment has a negative and significant relationship towards car sales in Proton. The coffectient is -0.3374. Hence, 1 unit increase in unemployment will lead to 33.74% decrease in car sales in Proton. The negative relationship can be supported by Muhammad et. al. (2012) which stated the car sales and unemployment rate have significant relationship with car sales in the long term.

Coefficient of determination (R^2) is 0.6905. This means that 69.05% of the total car sales in Proton can be explained by all of the independent variables which are Gross Domestic Product, Inflation Rate, Interest Rate and Unemployment Rate. Another 30.95% of the total variation in the dependent variable cannot be explained by the change in the independent variables.

Adjusted R^2 is 0.6447 which means that 64.74% of the total variation in car sales in Proton can be explained by all of the independent variable. Another 35.53% in the dependent variable cannot be explained by the change in the independent variables, after adjusting the degree of freedom.

Diagnostic Check

Variance Inflation Factor (VIF)
By conducting the variance inflation factor test, it is to prove that there is no severe presence of multicollinearity in the regression model. The rule of thumb is used to measure the severeness of the multicollinearity. If the value is more than 5, it indicates that the multicollinearity is severe.

Table 2: Variance Inflation Factors

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
GDP	0.000247	3.209289	1.040348
INFLATION	0.002651	5.835281	1.246161
INTEREST RATE	0.000328	2.360319	1.066739
UNEMPLOYMENT	0.002000	9.436356	1.226723
C	0.080730	21.65042	NA

As shown in table 2, the centered VIF for GDP, Interest rate, Inflation and Unemployment rate are 1.0403, 1.2462, 1.0667 and 1.2267 respectively. As all the centered variance inflation factor for all explanatory variables are lower than 5 which is used as the common rule of thumb, thus, it shows that there is no presence of severe multicollinearity.

Simple Correlation Coefficient

Table 3: Correlation Coefficient

	CAR SALES	GDP	INF	IR	UR
CAR_SALES	1.000000				
GDP	0.091317	1.000000			
INFLATION	0.071118	0.173278	1.000000		
INTEREST RATE	-0.180260	-0.109708	-0.206864	1.000000	
UNEMPLOYMENT	-0.781353	-0.129926	-0.411056	0.197694	1.000000

The correlation coefficient could be defined as the correlation between two variables measuring the degree of linear association between one independent variable and other independent variables. Multicollinearity may exist if the correlation between two variables is too high. Therefore, all the independent variables should not have high correlation with one another. Multicollinearity is one of the assumptions in the regression analysis that independent variables are closely related. Besides, multicollinearity will affect the ability to estimates the coefficients because the two variables cannot be distinguished from one another.

As shown in table 3, the correlation between inflation and GDP is 0.1733. While for interest rate and unemployment, the correlation is 0.1977 which is both correlation is a positive linear correlation. However, the correlation between GDP and interest rate, GDP and unemployment, inflation and interest rate, and inflation and unemployment are -0.1097, 0.1299, -0.2069 and -0.4111 respectively. This shows the correlation between independent variable have a negative linear correlation. All the correlations between independent variable on the table 3 are not considered to have severe multicollinearity since the values are less than 0.5.

Serial Correlation
Based on the regression result, with 32 observations (n) with 4 independents variables (k), the value of Durbin-Watson statistic is equal to 1.4783. The lower d-value (d L) and upper d-value (dU) are 0.978 and 1.509 respectively. Reject the Ho since d-statistic fall in the inconclusive zone and Breusch-Godfrey test need to be tested.

Breusch-Godfrey Test
The Breusch-Godfrey Test is a test for autocorrelation in the errors in a regression model. This test is more general than Durbin-Watson statistic, which is only valid for non-stochastic regressors and for testing the possibility of a first-order autoregressive model.

Table 4: Breusch-Godfrey Test

Breusch-Godfrey Serial Correlation LM Test			
F-statistic	0.441988	Prob. F(2,25)	0.6477
Obs*R-squared	1.092847	Prob. Chi-Square(2)	0.5790

Based on the result, the value of chi-square 0.5790 is not significant at 5% level of significance. Thus, Ho is not rejected and there is no serial correlation.

4. Conclusion

This research examined the relationship between macroeconomic indicators that affect car sales in Proton. There are four independent variables that are chosen such as GDP, interest rate, inflation and unemployment rate based on previous research. This study examined the trend analysis of number of car sales in Proton from year 2001 to 2016 and also to investigate the relationship between macroeconomic indicators and car sales in Proton.

Time series data were used in this research. Data is collected for 32 years from the year 1985 to 2016. After collected from several sources were obtained, the data is then analyzed by using Ordinary Least Square (OLS) method with help of Eviews software. Based on the result in multiple regression models, it shows that independent variables GDP have a positive relationship with car sales in Proton. It means that higher economic growth will raise the demand of car sales. This enables consumers to enjoy more goods and services and enjoy better standards of living. Meanwhile, independent variables interest rate, inflation and unemployment rate show an inverse relationship with car sales in Proton.

According to the results in the regression analysis, independent variables such as inflation and unemployment rate are statistically significant in affecting car sales in Malaysia. Inflation is as serious economic problem to businesses because it has an effect on the loss of consumer buying power. This indicates that higher inflation makes the consumer think twice before purchasing a new car due to the continuous rise in prices of the cars. Meanwhile, GDP and interest rate show an insignificant result in affecting the car sales. It means that these two macroeconomic indicators do not statistically influence the number of car sales in Proton. The results also show that unemployment is the most significant variable in determining the number of car sales in Proton.

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