FORECASTING AUTOMOTIVE INDUSTRY: THE CASE OF PROTON COMPANY IN MALAYSIA

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Abstract
This paper investigates the correlation between the hike in fuel prices and the sales volume by the largest Malaysian automobile manufacturing company (Proton). Being the pillar of Malaysian automotive industry, with the support by the government either financially and market wise, Proton seems to be formidable. Nevertheless, Proton has recently reported in suffering from shrinking sales over the years. This recent decline has been attributed to a number of factors, including mainly the rise in fuel prices. For the purpose of forecasting Proton sales in successive year, casual method, or in other words, Linear Regression method is chosen in this study on forecasting the sales unit for the successive year. The results signalling that there was a negative correlation between the two variables, as the price of petrol per litre increase the sales volume will decreased. Meanwhile, the second variable (GDP-per Capita) insignificantly justify that income level was not solely a good indicator in measuring the decline of Proton sales.

Keywords: Malaysian automotive industry; Proton; fuel prices; GDP-per capita; Malaysian.

JEL Classification Codes: C53; E23.

1. Introduction
Industry background
The history of Malaysian automotive industry can be stretched back to the 1960s. However, the manufacturing of Malaysian automotive industry was only visualized in the 1980s. It was a giant leap for the Malaysian automobile industry (considering to the amount of investment involves) to manufacture the first Malaysian car, the Saga. The project was called the Malaysian National Car project and the company entrusted to undertake this project, Proton, was incorporated on 7 May 1983, under the name 'Perusahaan Otomobil Nasional Berhad'.

Established in 1983, Proton was the brain-child of Malaysia former Prime Minister. It is an ambition to turn Malaysia into Southeast Asia's new auto-making powerhouse. A shift intended by the government vying to be a high-tech player. Proton began its first operation in September 1985 at its first manufacturing plant in Shah Alam, Selangor. Initially the components of the car were entirely manufactured by Mitsubishi but slowly local parts were being used as technologies were transferred and skills were gained.

As the pillar for Malaysian automotive industry, with the support by the government either financially and market wise, Proton seems to be formidable. Sales rose tremendously, and by 2002 Proton held over 60 percent of the domestic market share. To date, there were at least 16 other manufacturing and assemblers companies operating in Malaysia—and almost identically competing for the same market. Despite being dominant, Proton is dubbed to be lacking in quality. Cheap materials, poor handling are among listed contributing to these factor.

Proton exports cars to many other countries, and 14,706 Proton cars were exported in 2006, for instance, United Kingdom, South Africa, and Australia and in several other countries including the Middle East. Besides that, Proton cars has also been exporting a small volume of cars to Brunei, Indonesia, Nepal, Sri Lanka, Pakistan, Bangladesh, Taiwan, Cyprus and Mauritius.
Capacity-wise, Proton is believed to be the largest and most modern automobile manufacturer in Southeast Asia, covering 862,000m2 employing 4,400 people (of which 2,400 are direct workers) with a production capacity of 150,000 units per year (two shift operation) at a production rate of 36 units per hour (Simpson et al., 1998). Nevertheless, Proton has recently reported suffering from shrinking sales over the years (Abdullah, 2006). This recent decline has been attributed to a number of factors, including mainly the rise in fuel prices, tighter credit policies leading to less loans being approved as well as the fall in used car values which have affected trade-ins (Proton Annual Report, 2006).

Social
Malaysia is a unique mix of some of the world’s oldest civilisations. The population is ethnically mixed, with just over 50 percent being ethnic Malays (or Bumiputera), 30 percent Chinese, and 10 percent of Indian origin and various minorities such as Dayaks. Being dubbed as ‘economic miracles’ with double-digit growth, Malaysian economy with strong support by the government has been rapidly growing. This is evident by external trade breached 1 trillion ringgit (270.27 billion U.S. dollars) in 2006—a major milestone in the history of Malaysia’s external trade. Reflecting the Malaysian economic stature, the purchasing power of Malaysian consumer also recorded series of increment since 2003. Table 1 shows the Gross Domestic Product (GDP-Per Capita (PPP)).

<table>
<thead>
<tr>
<th>Year</th>
<th>GDP - per capita (PPP)</th>
<th>Percent Change</th>
<th>Date of Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003</td>
<td>$9,300</td>
<td></td>
<td>2002 est.</td>
</tr>
<tr>
<td>2004</td>
<td>$9,000</td>
<td>-3.23%</td>
<td>2003 est.</td>
</tr>
<tr>
<td>2005</td>
<td>$9,700</td>
<td>7.78%</td>
<td>2004 est.</td>
</tr>
<tr>
<td>2006</td>
<td>$12,000</td>
<td>23.71%</td>
<td>2005 est.</td>
</tr>
<tr>
<td>2007</td>
<td>$12,900</td>
<td>7.50%</td>
<td>2006 est.</td>
</tr>
</tbody>
</table>

![GDP-Per Capita (PPP)](image)

**Figure 1: Malaysian GDP-per capita (PPP)**

Noteworthy, the full implementation of AFTA (ASEAN Free Trade Area) would subsequently push forward for more market liberalization. Currently, Malaysian market imposed a high tariff for vehicles crossing its boarders or CBU (complete built unit). Nonetheless, many manufactures and assembler opt for CKD (complete knocked-down) on making easy access to the Malaysian market. Reduction on taxes for imported cars combined with increase on consumer buying power might pose a threat for Proton prominence.

2. Research objectives and hypotheses
The overall objective of this research is to identify the strength of correlation between Proton sales with both the petrol price and also the GDP-per capita. The primary objective of this study is to investigate the correlation between the hike in fuel prices and the sales volume by the largest Malaysian automobile manufacturing company (Proton)—thus providing an insight for researcher on forecasting the sales on the successive years for Proton. Second, develop an insight on justifying the possibility of increase in income would result in demand for more Proton cars. The second objective would relatively answer the question of ‘Malaysian consumer preference on quality’.
In line with the objectives of the study, the null hypotheses were verified:

_Hypothesis 1_: There is strong correlation between escalations in fuel prices and on Proton sales.

_Hypothesis 2_: There is strong correlation between the increase in income and on Proton sales.

![Figure 2: Research model](image)

According to the figure above, it shows and explains “car demand in sales unit” is independently measured. This element has been identified as dependent variables (DVs) and will be used in the study in order to discover “escalation in fuel prices”, “increase in income”, which are identified as independent variables (IVs).

3. Literature review

**Escalation in fuel prices affect on car demand in sales unit**

Cheng and Tan (2002) mentioned the sharp oil price is one of the external factors which have a significant influence on Malaysian inflation in 1973 and 1974; the substantial price increases in 1973 were brought about mainly by the shortages of food and raw materials arising from bad weather and increased aggregate demand.

Besides, upon studying on “Why do car prices differ across European countries?”, it points out that in the situation of cars market in the European, the income tax, oil price, wage and the standard of livings will affect the willingness of people buying a cars and the ability to buy a car. For instance, the fuel price will affect the demand of cars in the car markets in countries. Higher price of fuel, lower the demand of cars in the market. People will prefer using public transportation rather than using their own cars. And new car buyers will need to think more to decide buying cars, because high fuel price increase the cost of driving cars on their own. So price of fuel can affect the demand of car in market directly. On the other way, countries with high fuel price will lower the people wants to buy a car.

**Increase in income has influence on car demand and car consumption**

Dargay (2001) studies the effect of income on car ownership, and the results indicate that rising income leads to higher car ownership. Rising income makes it easier for households to own cars. Again Dargay (2007) continues to examine the effect of prices and income on car travel in the UK. It analyses the factors determining household car travel, and specifically the effects of household income and the prices of cars and motor fuels. The data shows the diffusion process: motoring has become more prevalent in successive generations. Car travel is more affected by car purchase costs than by fuel prices, implying that once obtained, cars are used despite rising variable costs for their use. On the other hand, car ownership is more sensitive to car purchase costs than to fuel prices as expected. Thus, car use responds more rapidly to changes in income and prices than car ownership.

In a study on car demand in European countries also shows that the incomes of people will the main factor that affects the demand of cars in the market. The main income of people is wages, so high wages people with higher purchasing powers; they have higher demand for luxury goods, like cars, sport cars and houses.

Graham and Glaister (2002) in survey about the response of motorists to fuel price changes and an assessment of the orders of magnitude of the relevant income and price effects. It means that the effect of price on fuel consumption and on motorists’ demand for road travel, and the demand for owning cars in heavily dependent on income. Also Eltony (1993) uses household data to quantify the behavioral responses that give rise to negative price elasticity of demand for gasoline. The result
recognizes three main behavioral responses of households in Canada to changes in gasoline prices: drive fewer miles, purchase fewer cars and buy more efficient vehicles.

Wetzel and Hoffer (1982) mentioned factors such as gasoline prices, styling changes, and demographic changes influenced the price elasticity of demand in each submarket differently using the disaggregated model. The models suggest that motor fuel price increases have a significant but temporary impact on consumer demand for the largest American car. Furthermore, as higher income individuals took delivery of previously ordered cars early in the model year.

4. Methodology
For the purpose of forecasting Proton sales, the methodology chosen for this study is the Linear Regression. It is a causal method in which one variable, called a dependent variable, is related to one or more independent variables by a linear regression. The case study of Proton is seen to be corresponding with the method employed, bearing only two elements for computation, the fuel prices (petrol price—in Ringgit Malaysia) and unit sales. The GDP-Per Capita (PPP) was also used for the study, associated with answering the second objective of this study “burgeoning awareness of Malaysian consumer on quality”. In other words, sales is dependent variable which the manager wants to forecast, and petrol price, GDP per capita are independent variables, assumed to affect the dependent variable. Collection of secondary data was obtained via numerous resources over the WWW and the company’s annual report, company newsletters, and local literature. It is also worth noting, the data collected concerning the annual unit of sales were varied from one resource to another. Nonetheless, for the sake of the study, the annual report published by Proton mainly will be used for its credibility. Microsoft excel are used for the linear regression computation.

5. Results
Answer to hypotheses no.1:
Table 3 shows the data of two variables, the petrol price per litre representing the $X$, and sales made by Proton identified as $Y$. Data was taken from the year 2002 until 2007 to validate its credible. As shown, the $r$ values represented, or also known as the Pearson’s Correlation Coefficient compute a negative value ($r = -0.87$). Thus, indicating a negative correlation between the two variables: unit sales and petrol price. Nevertheless, there is still a strong correlation between the two variables, as $r$ close to the value of -1/+1. For the coefficient of determination, or $r^2$, which indicates how close the points are to the line, represent a value of $r^2 = 0.755$—thus H1 is accepted. This value of $r^2$ implies 75 percent of variation in sales is explained by the petrol price. This is also illustrated via figure 3 which shows the regression line for the two variables. The results indicating that there was a negative correlation between the two variables, as the price of petrol per litre increase the sales volume will decreased.

With speculation on the petrol price, justified by the government earlier indicator on reducing on fuels subsidies, the price of petrol per litre is expected to be RM2.50 per litre. Bearing with this information, and using the linear regression of $Y = a + bX$;

$Y = a + bX$

Assuming $X = RM2.50$;

$Y = a + bX$  
$Y = 467.77 + (-196.98)(X)$

<table>
<thead>
<tr>
<th>Year</th>
<th>$X$ (RM/litre)</th>
<th>$Y$ (Sales, thousands of units)</th>
<th>$XY$</th>
<th>$X^2$</th>
<th>$Y^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002</td>
<td>1.33</td>
<td>227.3</td>
<td>302.31</td>
<td>1.77</td>
<td>51,665.29</td>
</tr>
<tr>
<td>2003</td>
<td>1.35</td>
<td>205.5</td>
<td>277.43</td>
<td>1.82</td>
<td>42,230.25</td>
</tr>
<tr>
<td>2004</td>
<td>1.4</td>
<td>146.3</td>
<td>204.82</td>
<td>1.96</td>
<td>21,403.69</td>
</tr>
<tr>
<td>2005</td>
<td>1.5</td>
<td>183</td>
<td>274.5</td>
<td>2.25</td>
<td>33,489.00</td>
</tr>
<tr>
<td>2006</td>
<td>1.6</td>
<td>167</td>
<td>267.2</td>
<td>2.56</td>
<td>27,889.00</td>
</tr>
<tr>
<td>2007</td>
<td>1.9</td>
<td>89</td>
<td>169.1</td>
<td>3.61</td>
<td>7,921.00</td>
</tr>
</tbody>
</table>
Sales: dependent variable, $Y$
Petrol price: independent variable, $X$

$a = 467.77$, $Y$-intercept of the line
$b = -196.98$, slope of the line

$r = -0.87$
$r^2 = 0.755$

$Y = 467.77 + (-196.98) (2.50) = 24.680$ unit
Should the fuel price escalate to a new level by the next year, the number of unit demanded for Proton cars (for domestic market) for the successive year of 2008 is forecasted to be at 24,680 units—a 72 percent drop from the present sales.

Answer to Hypotheses no.2:
Interestingly, the correlation between the increases in Malaysian GDP-Per Capita (PPP) with Proton sales was merely significant than expected. As shown;

<table>
<thead>
<tr>
<th>Year</th>
<th>X</th>
<th>Y</th>
<th>XY</th>
<th>X²</th>
<th>Y²</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003</td>
<td>9,300</td>
<td>205.5</td>
<td>1,911,150.00</td>
<td>86,490,000.00</td>
<td>42,230.25</td>
</tr>
<tr>
<td>2004</td>
<td>9000</td>
<td>146.3</td>
<td>1,316,700.00</td>
<td>81,000,000.00</td>
<td>21,403.69</td>
</tr>
<tr>
<td>2005</td>
<td>9700</td>
<td>183</td>
<td>1,775,100.00</td>
<td>94,090,000.00</td>
<td>33,489.00</td>
</tr>
<tr>
<td>2006</td>
<td>12000</td>
<td>167</td>
<td>2,004,000.00</td>
<td>144,000,000.00</td>
<td>27,889.00</td>
</tr>
<tr>
<td>2007</td>
<td>12900</td>
<td>89</td>
<td>1,148,100.00</td>
<td>166,410,000.00</td>
<td>7,921.00</td>
</tr>
</tbody>
</table>

Sales: dependent variable, Y
GDP-per capita (PPP): independent variable, X
\[ a = 340.06, \] Y-intercept of the line
\[ b = -0.017, \] slope of the line
\[ r = -0.68, \] correlation coefficient
\[ r^2 = 0.463, \] coefficient of determination

The GDP-per Capita marked by X, and Proton sales as Y produce an interesting outcome. Although there was a reduction on Proton demand as the consumer income increase, the correlation was nevertheless less congruent. The correlation coefficient and coefficient of determination which respectively resulted with \( r = -0.68 \) and \( r^2 = 0.463 \) implies that GDP-per Capita was somewhat not a good indicator for calculating the sales volume made by Proton. Nevertheless, the result also indicate, the consumers are opting for others manufacturer as their income increase. Moreover, only 46 percent of the variation in sales by Proton is explained by the GDP-per Capita increment—thus, H2 is rejected.
6. Conclusion
As shown, the first variable (petrol price/litre) resulted in a more congruent result, with $r^2 = 0.755$. Meanwhile, the second variable (GDP-per Capita) insignificantly justify that income level was not solely a good indicator in measuring the decline of Proton sales.

Noteworthy, GDP-per Capita was initially chosen for the compelling notion of; increase in income would result in demand for a more of Proton cars. As in the case for most Malaysians, the Proton brand name is perceived as of moderate quality and far cheaper in comparison with other carmakers. The findings nevertheless clearly stated the contrary, for this case, income is not entirely a reliable indicator.

With the speculation on the rise on the petrol price, estimated to be RM2.50 per litre in the coming years, the management should restructure its operation to be more cost-effective. The management should reconsider on expanding and venturing in new markets besides the domestic. In addition, with the implementation of Free Trade Area almost taking its full swing, Proton, instead of vying for large-scale production, should reposition itself in producing a better quality product. Being optimistic, the drop in volume of sales (as previously forecasted) should be seen as a ‘blessing in disguise’ as it would provide Proton an ample room for improvements.

To conclude, more research was needed for the research title. The paper sheer focusing on petrol price was rather empirical than justifying. The paper is not without limitation. To date, fuel prices has been identify to be influencing others consumer price. Nonetheless, assuming the petrol price would solely be use as predictor on the sales volume of Proton would not suffice as the whole related industry was affected by the hike in the fuel price, resulting in expensive raw materials. There also should be more methods used on testing the validity of the outcome, as besides the petrol price and income, another attributes such as the consumer satisfaction (a basket of performance measurement on service quality, problems experienced, user-friendly service, in-service experience, service advisor, service initiation and service delivery) also played an important role. Market research using respond from the potential and actual customer would deem feasible.

References