

Determinants of Passenger Car Sales in Malaysia

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Abstract: The sales of passenger cars in Malaysia are influenced by various macroeconomic factors such as gross domestic product (GDP), interest rate (ITR), consumer price index (CPI), exchange rate (EXC) and unemployment rate (UR). Using data for the past 30 years starting from year 1981 till 2010, the results showed that all the identifiable constructs correlated very significantly with passenger car sales. The findings are in accordance with the hypotheses formulated based on previous studies and can be a useful tools in boosting passenger car sales in Malaysia.

Key words: Passenger car sales • Growth Domestic Product • Consumer Price Index • Exchange and Interest Rate • Unemployment Rate

INTRODUCTION

In Malaysia, the passenger car can be considered as the most common sold every year. Passenger cars can be defined as a road motor vehicle, other than a motor cycle, intended for the carriage of passengers and designed to seat no more than nine persons including the driver. Therefore, it covers micro cars (need no permit for driving), taxis and hired passenger cars, provided that they have fewer than ten seats¹. The Passenger Vehicle industry was reclassified in January 2007 and includes all passenger carrying vehicles such as Passenger Cars, 4WD/SUV, Window Van and MPV models².

According to Smusin and Makayeva [1], the links between most macroeconomic variables (exchange rate, GDP, interest rate, inflation etc) and the car sales in Belarus, Russia and Ukraine proved to be only of medium strength. However, a previous studies by Babatsou and Zervas [2] show that there is a very good correlation between socio-economic indicators and the car market in European Union countries. Taking into consideration the conflicting results reported above, the study take further steps by examining whether the macroeconomic variables have any impact on the passenger car sales in Malaysia. Hopefully, the findings can provide information on which determinant has a

substantial bearing on passenger car sales in Malaysia leading to increased car sales in light of the knowledge. Therefore, the present paper is to investigate the determinants of passenger car sales in Malaysia. The study will also examine the co integration relationship between all the variables in this study.

The Malaysian national automotive industry is not only a major industry in our country but also a source of national pride. The sector ranks amongst the top 20 in the world and disposes the largest number of passenger cars in the ASEAN region. The total registration of new passenger vehicles in 2010 was 543,594 units which is an increase of 57,252 units or 11.8% compared to the sales in 2009. Within the passenger vehicle category, passenger cars continue to form the biggest segment in 2010 with 76.3% share³ of the total passenger vehicle market. With an annual average of 20% export surplus, Malaysia is one of the 20 largest passenger car exporting nations worldwide. According to the "Global Enabling Trade Report 2009", it has been continuously improving its performance from year to year.

The rest of this paper is organized as follows. Section 2 reviews the prior literatures. Section 3 presents the data and research methodology while Section 4 shows the empirical results. Finally, conclusion is presented in section 5.

¹Glossary for Transport Statistics

²Malaysian Automotive Association (MAA)

³Press Conference by The Malaysian Automotive Association (MAA) (19 January 2011)

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Table 1: 2010/2009 passenger vehicles sub-segment performance

Sub segment	2010	2009	Variance	
			Units	%
Passenger car	414,539	407,004	7,535	1.9
Mpv	107,714	63,757	43,957	68.9
4x4 / suv	15,416	10,475	4,941	47.2
Window van	5,925	5,106	819	16.0
Total passenger cars	543,594	486,342	57,252	11.8

Source: Malaysian Automotive Association

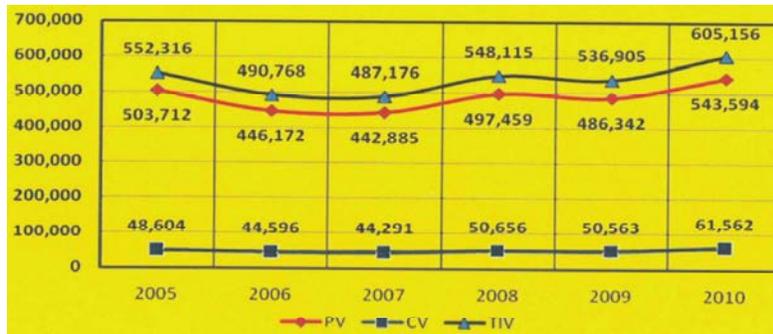


Fig. 1: TIV TREND 2005-2010 Source: Malaysian Automotive Association

Literature Review: A few empirical studies have been conducted to examine the relationship between passenger car sales and various macroeconomic variables and the findings are generally mixed. Firstly, let us have some overview on the dependent variable which is passenger car sales. According to Domansky [3], passenger cars are defined as four-wheeled vehicles made primarily for use on public streets, roads and highways and denoted by an unloaded gross vehicle weight. The sales of passenger cars usually recorded the highest statistics rather than other types of vehicles. The researcher believes that some of the determinants of passenger car sales include the macroeconomic factors such as GDP, interest rate, CPI, exchange rate and also unemployment rate. All the factors will be discussed in further detail in this paper.

Dynaquest [4] finds that there is also a strong relationship between new car sales and the nominal GDP just as there is a relationship between the total number of cars in use and the nominal GDP. However, the correlation between the sale of new cars and nominal GDP is not as strong as the relationship between the total number of cars in use and GDP. Based on Automotive Research [5], a historical correlation between annualized GDP and vehicle sales growth in US indicates that positive vehicle sales growth depends on three percent or higher GDP growth. Thus, vehicle sales can be expected to fall if the annualized GDP growth rate is below 1.0 percent. Generally only a GDP above 3.0 is associated with



Fig. 2: Global GDP Growth and Car Sales Source: Kongsberg Automotive

growing sales. These findings show that there is a significant relationship between GDP and car sales in the US. According to Babatsou and Zervas [2], it is clear that a good correlation exists between GDP with passenger car sales in the European Union countries. The results of this study clearly show that the number of passenger cars increases with GDP indicating a very good linear correlation ($r^2=0.95$). It clearly indicates that a regression in GDP will lead to a decrease of total passenger cars in use. Kongsberg [6] analyzed the relationship between global car sales and global GDP from 1998 until 2008. The results show that there is a high correlation between global car sales and global GDP. Figure 2 clearly show the movement of GDP and car sales which indicate that car sales improve when the global economy improves.

According to the Automotive Institute (2011), one of the major characteristics of the domestic auto market is that car buyers are price sensitive with hire purchase rate playing a major role in the decision making process as it will have an impact on their monthly repayment capabilities. Interest rate movements and stringent bank approval criteria will impact the low-middle income bracket customers of the national car companies as they are responsible for more than 60 per cent of the total vehicle sales in Malaysia. On the contrary, a previous study done by Beck [7] states that consumers respond to price changes rather than interest rate changes when purchasing a new automobile. One of the reasons is because consumers only respond to interest rate changes that result in extremely low interest rates. Bernama [8] reported that a hike on interest rate would have a significant impact on car sales in Malaysia. This is because the consumer can decide to buy a smaller car which gives more fuel-economy. An increase of interest rates will give a negative impact on the sales of cars in Malaysia. Mohile [9] stated that automobile sales in India grew at a much slower pace when fuel price increase, interest rates and higher car prices discouraged buyers from purchasing new vehicles. Monthly sales data released by auto makers showed that sales at most car makers either remained flat or declined from the previous year as they dispatched fewer vehicles in an effort aimed at clearing dealer-level inventories. And The Star [10] reported that the sales of car are only slightly affected by the rise in interest rates. On the contrary, the director of Nasim Sdn. Bhd. (Distributor of Peugeot cars), Mr. Samson George said that he was unperturbed by the hike of interest rates as it was unlikely to have any impact on the company's sales.

Economy Watch [11] stated that a rise in CPI indicates inflation. The CPI or the consumer price index is used as an index for determining salaries, wages, contracted prices and pensions. This is done to enable adjustment with the effects of inflation. It is an important economic indicator. Guonason and Jonsdottir [12], found that household purchases of private cars had a weight of 7% in the CPI when car sales came to a stop as this is the component in the index which is most easily affected by changes in economic conditions. According to Dominion Service [13], the conclusion that inflation is creeping up may be exaggerated. If one considers new car sales and the actual selling price as opposed to the sticker price, the CPI would be a tick lower. Smusin and Makayeva [1] tested the relationship between inflation and car sales by

making use of the CPI index in Belarus, Russia and Ukraine and they obtained results of 54%, 28% and 4% respectively. This shows that CPI is considered weak in explaining car sales and there is no evidence that the CPI causes price fluctuation of cars as the correlation coefficients averaging only 28%.

Based on the previous studies done by Turkcan and Keskinel [14], the exchange rate volatility has generally positive but insignificant impact on the US auto-industry exports using both the nominal and real exchange rate volatility. These findings could be due to the transfer pricing between the US auto-makers and their affiliates who comprise their trading partners. Smusin and Makayeva [1] conducted a study on the relationship between exchange rate and car sales in 3 countries, namely, Belarus, Russia and Ukraine. The study took into consideration two types of currency which are Dollar and Euro. They found a negative correlation between dollar exchange rate and car sales in Belarus, Russia and Ukraine which proves the hypothesis those car sales will decline if dollars become more expensive. On the contrary, the relationship between Euro exchange rates and car sales in all the three countries was positive. The positive correlation might be a sign that exchange rate fluctuations accounted only for a small portion of car sales fluctuations during the period of the study. Barumwete and Rao [15] conducted a study on exchange rate risk in the automobile industry in Sweden, France and Germany. In Sweden, they used two types of exchange rates which are SEK/USD and SEK/EURO on two companies (Volvo and SAAB). The results show that there is insignificant relationship between stock returns with both explanatory variables. Volvo stock returns are negatively related to movements in SEK/USD whereas it is positively related to SEK/EURO. On the contrary, Saab stock return is positively related with both currencies. In France, companies such as Peugeot and Renault also have insignificant relationship with EURO/USD exchange rate. In Germany, the results indicated that there is an insignificant relationship between Audi stock returns with EURO/USD exchange rate. On the other hand, BMW has a significant relationship with EURO/USD exchange rate.

According to Babatsou and Zervas [2], the sales of the number of passenger cars decreased when unemployment increases in European Union countries as displayed in Figure 3 below. Badkar [16] also stated that one of the important indicators of auto sales was unemployment. Over time there has been a strong inverse relationship between unemployment and auto sales.

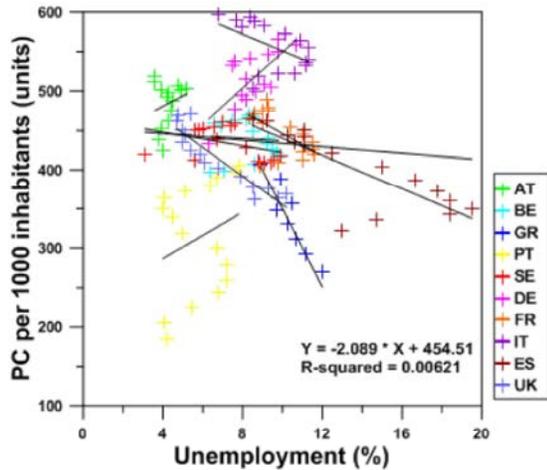


Fig. 3: Passenger car/1000 inhabitants and unemployment (1993 – 2006)

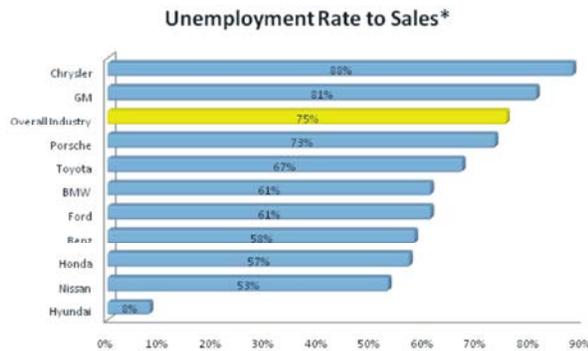


Fig. 4: U.S. Unemployment vs. Sales
Source: TrueCar.com April 2010

True Car [17] previously conducted a study which examined data back to Jun 2007 to find out the correlation between some of the most commonly followed macro-economic trends and new vehicle sales in the U.S. The results led to the conclusion that U.S car sales have an inverse correlation of 75% with unemployment rate besides other factors that have also been analyzed. This can be seen in Figure 4:

According to Automotive Research (2009), the unemployment rate highly correlated with sales. However, starting in 2001, as unemployment grew from around 4 percent to 6.5 percent, car sales hit a plateau but did not fall further due to both increasing home prices and the availability of sub-prime loans. Sales also rose only slightly as the unemployment rate began to drop, from late 2003 through 2006. Cooke [18] analyzed the relationship between new car sales and unemployment in United Kingdom (UK) from the year 1990 until 2010. Similar to previous studies, there was an inverse correlation

between new car sales and unemployment rate as indicated in Figure 5 below. The implications do not hold well for new car sales in UK in the foreseeable future as unemployment is predicted to grow and there is a parallel growth in terms of part time jobs.

Data and Methodology: The data pertaining to the dependent variable consists of passenger car sales in Malaysia. Whereas, the independent variables include Gross Domestic Product (GDP), Interest rate, Consumer Price Index (CPI), Exchange rate and also Unemployment rate. The sample time series are collected for 30 years from the year 1981 until 2010. The data was obtained from various sources. Passenger Car Sales in unit is taken from Malaysian Automotive Association (MAA) while GDP and Unemployment rate are taken from Economy Watch Website. The interest rate is taken from the Department of Statistics Malaysia and finally, exchange rate is obtained from the World Bank and it represents the exchange rate of Malaysia against the US Dollar.

In order to ascertain whether Malaysia's passenger car sales are tied to the macro-level variables, a three-step process was employed. First, because time-series variables are non-stationary, augmented Dickey-Fuller (ADF) and Philip-Perron tests were used to identify whether Malaysia's passenger car sales and the macro-level variables have unit roots, i.e., are integrated as one (1) variable. Analyses combining stationary and non-stationary variables, or variables integrated of differing orders, were not conducted because of the potential for spurious regression problems.

The second step utilized the Johansen test to determine the number of co-integration vectors using the Maximum Eigenvalue test and the Trace test. The Maximum Eigenvalue statistic tests the null hypothesis of r co-integrating relations against the alternative of $r+1$ co-integrating relations for $r = 0, 1, 2, \dots, n-1$ while Trace statistics investigate the null hypothesis of r co-integrating relations against the alternative of n co-integrating relations, where n is the number of variables in the system for $r = 0, 1, 2, \dots, n-1$. In some cases Trace and Maximum Eigenvalue statistics may yield different results and Alexander, C. [19] stated that in such cases the results of trace test should be preferred.

The last step was conducted to analyze the existence of the long run correlation relationship between two variables using Vector Error Correction Model (VECM). Even if the co-integration has been detected between the series that support the evidence of the existence of a

Table 2: Results of Unit Root Test

FORM	VARIABLES	P-VALUE			
		ADF	RESULT	PP	RESULT
LEVEL	SALES	0.8912	Insignificant	0.9056	Insignificant
	GDP	0.7946	Insignificant	0.8025	Insignificant
	ITR	0.5469	Insignificant	0.4908	Insignificant
	CPI	0.7873	Insignificant	0.8189	Insignificant
	EXC	0.4315	Insignificant	0.4451	Insignificant
1 ST DIFFERENCE	UR	0.6487	Insignificant	0.4276	Insignificant
	DIFSALES	0.0000	Significant	0.0000	Significant
	DIFGDP	0.0004	Significant	0.0004	Significant
	DIFITR	0.0006	Significant	0.0009	Significant
	DIFCPI	0.0006	Significant	0.0006	Significant
	DIFEXC	0.0000	Significant	0.0000	Significant
	DIFUR	0.0074	Significant	0.0067	Significant

* Significant if $P < 0.05$ at 95% level of confidence

Table 3: Results of Johansen Test Statistic

Johansen tests for cointegration						
Trend: constant			Number of obs = 28			
Sample: 1983 - 2010			Lags = 2			
maximum rank	parms	LL	eigenvalue	trace statistic	5% critical value	
0	42	253.27749	.	141.7085	94.15	
1	53	281.84682	0.87006	84.5698	68.52	
2	62	303.14923	0.78164	41.9650*	47.21	
3	69	313.95329	0.53778	20.3569	29.68	
4	74	320.78636	0.38619	6.6907	15.41	
5	77	324.09714	0.21060	0.0692	3.76	
6	78	324.13172	0.00247			

long-run relationship, VECM is still applied in order to evaluate the short run properties of the co-integrated series.

Empirical Results

Unit Root Test: The study used two methods known as Augmented Dickey-Fuller (ADF) test and Philip-Perron (PP) test. There are three stages of stationary tests known as First Stage (Level), Second Stage (First Difference) and also Third Stage (Second Difference). Below are the results generated from both the ADF and PP tests:

Initially, the study proceeded to the first stage of unit root test. If the data is non-stationary, then the study proceeds to the second stage. The study will only move to the third stage if the second stage also generates the non-stationary result. Based on the result in Table 3 above, both ADF test and PP test show that all the data appear to be insignificant which means that the data is not stationary data at the level test. Therefore the null

hypothesis cannot be rejected. Then, the researcher proceeded to the 1st Difference test. From the table, we can see that all variables from the second stage are significant and stationary for both ADF test and PP test as the value is below 0.05. The data is considered significant only if the value of the test is below 0.05.

As a conclusion, both Augmented Dickey-Fuller (ADF) and Philip-Perron (PP) test are significant at 95% level of confidence whereby all values of the variables are smaller than the critical value which is 0.05. It means that all the data was already in unit root and stationary.

Johansen Test Statistic: Table 3 shows the result obtained from Johansen Test Statistic. The trace statistic either rejects the null hypothesis of no co-integration among the variables or does not reject the null hypothesis that there is one co-integration relation between the variables. As the results show that the trace statistics values are smaller than the 5% critical value from

Table 4: Results of VECM Estimation

cointegrating equations						
Equation	Parms	chi2	P>chi2			
_ce1	5	1833.313	0.0000			
Identification: beta is exactly identified Johansen normalization restriction imposed						
beta	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
_ce1						
lsales	1	.	.	.	.	.
lgdp	1.609818	.8121149	-1.98	0.047	-3.201534	-.0181017
litr	3.217523	.2724098	11.81	0.000	2.68361	3.751437
lcpi	3.466067	1.967737	1.76	0.078	-.390628	7.322761
lexc	1.165504	.2775278	4.20	0.000	.6215592	1.709448
lur	1.527893	.1314507	11.62	0.000	1.270255	1.785532
_cons	28.79925	.	.	.	.	.

rank 1 until rank 5, it implies that the value of passenger car sales and other explanatory variables in the model are closely moved to achieve the long run equilibrium. Here, the null hypothesis of having rank in the model ($r=2$) is rejected. Since, the rank is equal to 2 which are more than zero and less than the number of variables; the series appear to co-integrating among the variables. This means there is no co-integration existing between all variables examined at lags (2).

Vector Error Collection Model (VECM) Estimation: Since there embodying the co-integration among the variables that suggesting a long run relationship, VECM model is applied. The long run relationship result obtained from table 4 between passenger car sales and independent variables are displayed as below:

$$LSALES = 28.79925 + 1.609818LGDP - 3.217523LITR - 3.466067LCPI - 1.165504LEXC - 1.527893LUR$$

Result found that all the findings were supported by the theories of the analysis. GDP have a positive relationship with passenger car sales whereby the remaining independent variables have the inverse relationship with passenger car sales. As we can clearly see, the higher GDP indicates that passenger car sales are doing well. Higher income leads to higher volume of passenger car sales. Similar with exchange rate, when ringgit appreciate again US dollar, more car are sold. However, for interest rate, a 1% increase will decline the passenger car sales by 3.21%. Similar results go for the consumer price index (CPI), exchange rates and unemployment which has a negative relationship with passenger car sales and parallel with theoretical and most of the previous studies.

CONCLUSION

The present study analyses the determinants of passenger car sales in Malaysia. Several macroeconomic variables have been chosen to gauge their influence on the sales of passenger cars. Using a 30-year sample period from 1981 until 2010 of passenger car sales, GDP, interest rate, CPI, exchange rate and unemployment rate, the study found that all variables were insignificant at level stage for both ADF and PP test. However, after running the first difference stage, the results obtained was significant for all the variables for both ADF and PP test. Results from VECM found that variables chosen are significant in explaining the passenger car sales and in line with theory and most of the studies conducted before.

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