

MACROECONOMIC DETERMINANTS OF AUTO SALES IN ASEAN: AN EMPIRICAL STUDY IN FIVE MAJOR ASEAN COUNTRIES

Suwinto Johan

Management Study, Faculty of Business, President University
Jababeka Education Park, Jl. Ki Hajar Dewantara,
Mekarmukti, North Cikarang, Bekasi, West Java 17530
suwintojohan@gmail.com

Received: 12th August 2020/ **Revised:** 08th September 2020/ **Accepted:** 14th October 2020

How to Cite: Johan, S. (2020). Macroeconomic determinants of auto sales in ASEAN: An empirical study in five major ASEAN countries. *Journal of ASEAN Studies*, 8(2), 95-110, <https://doi.org/10.21512/jas.v8i2.6621>

ABSTRACT

This research examines the determinants of car sales in ASEAN countries. The research concentrates on five macroeconomic variables (consumer price index, gross domestic product (GDP) per capita, changes in gross domestic product per capita, foreign exchange rate, and interest rate). The total sample is 12 years of automobile sales in five ASEAN countries from 2005 – 2016. The five ASEAN countries are Indonesia, Thailand, Malaysia, Singapore, and Vietnam. This paper used the multilinear regression method with Statistical Package for the Social Sciences (SPSS) software to test the research model. For interest-rate variables, we used a lag of one year. The empirical results show that the previous period for inflation, gross domestic product per capita, interest rate, and the foreign exchange rate significantly influenced on car sales in five ASEAN countries. The growth of GDP per capita does not influence car sales.

Keywords: automotive, exchange rate, gross domestic product, inflation, interest rate

INTRODUCTION

The Association of Southeast Asian Nations (ASEAN) is a territorial intergovernmental cooperation comprised of 10 countries in Southeast Asia that facilitates economic, security, political, educational, sociocultural, and military integration among its members and other Asia nations. As per stated in ASEAN official website (asean.org), the ASEAN members are Indonesia, Thailand, Malaysia, Singapore, Vietnam, The Philippines, Myanmar, Cambodia, Brunei, and Laos.

The total gross of all ASEAN countries' domestic products is USD 2,92 trillion, equal to 3,65% of the world's gross domestic product (GDP). The total ASEAN population of 647 billion people is equal to 8,4% of the world's population. Based on IMF estimates, ASEAN will have a population of 688 million by 2024. ASEAN's GDP will reach USD 4,37 trillion and become the fifth-largest GDP in the world. GDP per capita will reach USD 6.350 (ASEAN Secretariat and World Bank, 2015).

In line with GDP and population growth, the total number of vehicles sold in ASEAN countries was 3,56 million in 2018. Car sales are equal to 4,2% of total world automotive sales. All global brands have a presence in the ASEAN market. According to ASEAN Automotive Federation (AAF) report, ASEAN vehicle sales had achieved a growth rate of 7% from 2017 to 2018. Cars become the primary transportation tool for countries in ASEAN, while public transportation is still limited in big cities. The community uses car as the main transportation between cities to deliver agricultural products from villages to cities. With a population of 260 million in 2020, Indonesia does not have adequate connections between cities, similar to Vietnam. Meanwhile, Singapore already has public transportation connecting the entire country.

The automotive is the essential industries in enhancing the economic growth of a country. The industry contributes 10,16% to the total GDP in Indonesia ("Industri otomotif," 2018), 10% of total GDP in Thailand (Maikaew, 2019), and 4,3% of total GDP in Malaysia (Bernama, 2019). Hundreds support the automotive industry to thousands of small and medium enterprises in the value chain from spare parts to the seat leather producers. The automotive sector is linked to other major industries such as banking, insurance, consumer financing, infrastructure, and mining industries for steel. The automotive sector is the critical contributor to the country's budget on the income side. However, the sales of automotive are unpredictable from year to year, which consequently affect the budget income of the country as well as the realization of the annual government budget (Johan, 2019). Therefore, the government needs to be able to predict the determinant of automotive sales in their country.

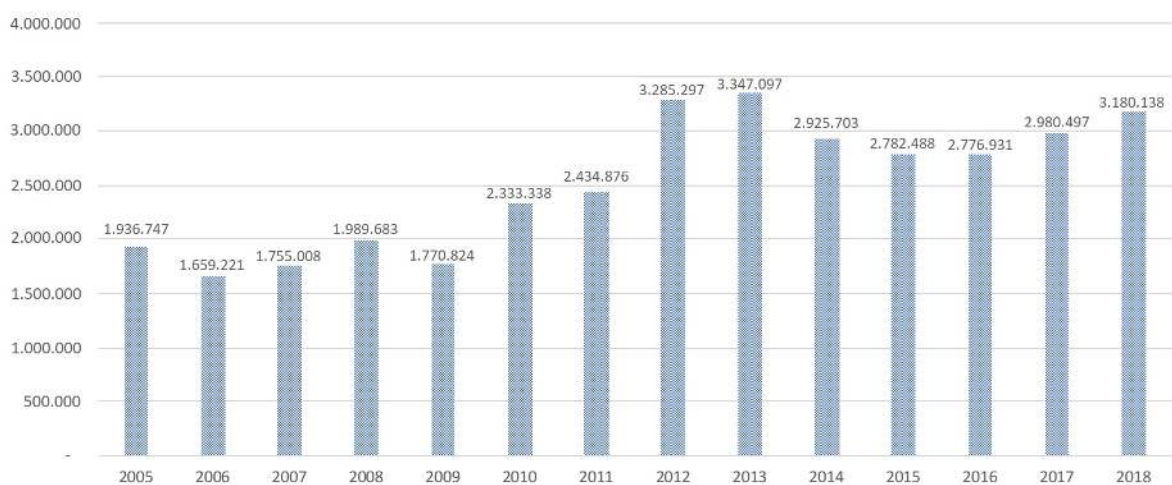


Figure 1. Total Car Sales in ASEAN Countries
Source: (ASEAN Secretariat and World Bank, 2015)

Car sales have trends that fluctuate in line with the economic climate. ASEAN countries have experienced several crisis as significant as countries in other parts of the world, including the 1998 Asian Crisis, the 2008 Global Crisis, and several other crisis. These crisis have reduced economic growth and GDP, resulting in a decline in car sales. Total vehicle sales exceeded 3,3 million units in 2013. On average, car sales in the ASEAN region have exceeded 2,5 million units over the last ten years, as described in Figure 1.

Given its market potential, many global automotive players have an urge to enter the ASEAN market. Banks and finance companies contribute to the provision of car sales, in which banks contribute less than consumer finance companies. This happens in major economies in ASEAN, such as Indonesia, Vietnam, and Thailand. Consumer finance companies finance most car sales, in which the financing demands depend on the charged interest rate and the actual interest rate. Whereas the interest rates charged by financing companies depend on the macro interest rate level and inflation. Higher the inflation leads to higher the interest rate. Moreover, car sales are related to the country's exchange rate versus the USD. Most of the vehicles remains having low local content. An adjustment in the exchange rate impacts the price of the vehicle, where an increase on the prices may reduce the consumer purchase intention.

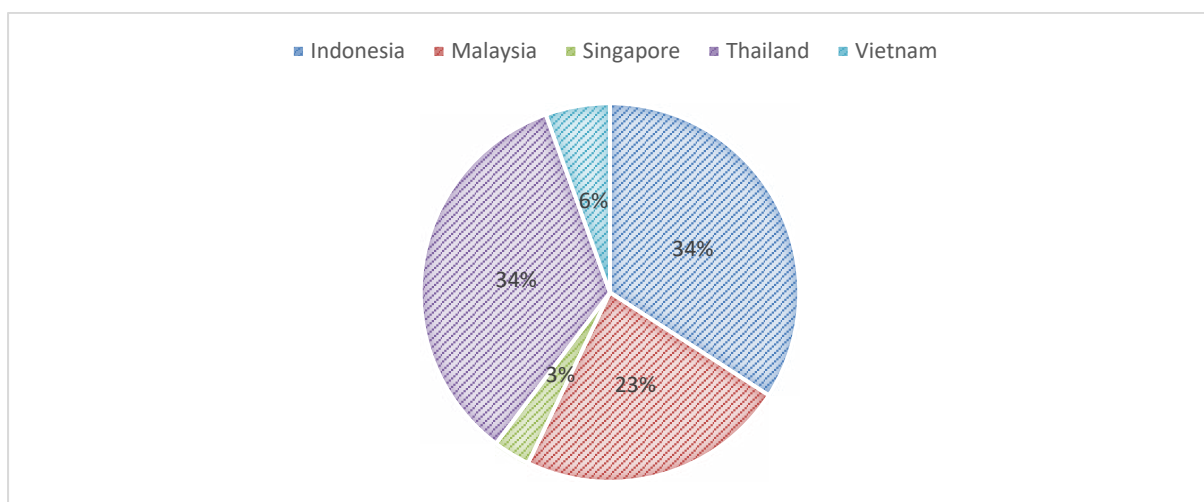


Figure 2. Four-Wheeler Sales in Five ASEAN Countries
Source: (ASEAN Secretariat and World Bank, 2015)

As shown in Figure 2, Indonesia and Thailand contribute 68% of the total ASEAN four-wheeler market. Malaysia has the third-largest market among the ASEAN countries since it contributes 23% of the total ASEAN four-wheeler market.

According to the macroeconomics theory, aggregate demand is influenced by macroeconomic variables and financial market instruments. Macroeconomic variables include gross domestic product, inflation, and foreign exchange rates, whereas the financial market instrument is interest rates.

This research contributes to the influence of macroeconomic variables on auto sales. By having the idea of macroeconomic variables, business owners will be able to prepare an appropriate work plan. Besides, the government will be able to arrange the annual budget planning, especially in terms of tax revenue on vehicle sales.

LITERATURE REVIEW

A number of researches focusing on automotive sales determinants have been conducted in developing countries, including Malaysia, South Africa, Turkey, China, India, Mexico, Pakistan, Indonesia, and Brazil. However, none of them has the same conclusions about the effect of macroeconomic variables on automotive sales. These research includes Chifurira et al. (2014), Lee and Kang (2015), Kemal et al. (2015), Wen and Noor (2015), Günşen (2015), and others.

Pant and Nidugala (2016) investigate and evaluate the impact of macroeconomic indicators on CAR for Indian banks. They find that real GDP growth, inflation rate, interest rate, and exchange rate substantially impact the CAR of Indian banking. Gross domestic product has a constructive effect to many car sales in Malaysia. The interest rate, unemployment rate, and inflation rate negatively affect many car sales in Malaysia (Islam et al., 2016).

Chifurira et al. (2014) examine the correlation between the consumer price index and new vehicle sales in South Africa. This research collects monthly data from the years 1960 – 2013. It comes up with results that inflation significantly influences new vehicle sales in South Africa, with a 5% significance rate. Patra and Rao (2017) find that GDP and car sales have a positive and long-term relationship, while the interest rate and fuel price have a negative relationship. Yagi and Managi (2016) show that a decrease in population and household size in Japan accelerate car ownership.

Lee and Kang (2015) conduct a research about the global crisis effect on auto sales in China. This research explores the key variables influencing motor auto sales in China, which are motor vehicle price, fuel price, interest rate, and individual income before the global crisis. While the global crisis occurs, automotive sales are influenced by motor vehicle sales, interest rates, and individual consumer income. Moreover, consumer income influences automotive sales in China after the global crisis.

Meanwhile, Kemal et al. (2015) conduct a determinant factor study, examining the factor that influences the light category commercial car-buying markets in developing countries. This research rely on a survey method. 408 respondents in Turkey are surveyed based on gender, age, monthly income, family size, driving license type, and fuel type, determining their influence on light commercial car demand.

Johan (2019) studies the macroeconomic determinants of car and motorcycle sales in Indonesia. It is found that the gross domestic product and changes in a gross domestic product have a significant influence on car and motorcycle sales in Indonesia.

Next, Zeng, Schmitz, and Madlener (2018) find that GDP and government incentives are individually stronger predictors on the macroeconomic level, while price and gasoline consumption affect automobile demand significantly on the microeconomic demand level. Gusev et al. (2018) examine those factors that directly impact the Russian automotive market's development. Macroeconomic climate, inflation, price of the car, and government support harm car sales. Delayed demand due to crisis, reduction of loan rates, and reduction of financing rates are the decisive factors that influence sales of cars in Russia.

Günşen (2015) studies the economic effects of foreign direct investments (FDIs) on the Turkish automotive industry between 1997 and 2010 regarding exports, productivity, and employment. The research revealed significant FDI contributions to the Turkish motor industry in all three areas considered. The results show that foreign direct investment to Turkish has significant positive effects on the economy. In addition, Pilat (2016) analyses foreign exchange exposure determinants based on 21 companies in the automotive industry. The results do not provide a clear explanation of the economic risks in the long run.

Kaya, Kaya and Cebi (2019) focus on factors that affect automobile sales and estimate automobile sales in Turkey by using an artificial neural network (ANN), Auto Regressive Integrated Moving Average (ARIMA), and time-series decomposition techniques. The dollar exchange rate, households' financial status, the industrial production index and the logarithmic form of automobile sales before one month are found to significantly affect automobile sales.

Altaf and Hashim (2016) investigate the key factors that influence intentions to purchase passenger vehicles among Pakistan consumers. Policymakers in Pakistan's auto sector would gain from this research insights when explaining the long-overdue auto policy. Analysis of the research data has disclosed that the three critical parameters identified from studies in other Asian nations are also relevant for Pakistan car consumers.

Additionally, Wen and Noor (2015) find that functional value, emotional value, and novelty value failed to demonstrate a significant relationship with consumers' intention to purchase hybrid cars. The research uses a 7-point Likert-scale survey.

Besides, Demiroglu & Yunculer (2016) estimate the trend level of light-vehicle sales to be roughly 7% of the existing stock. A remarkable out-of-sample forecast performance is obtained for horizons up to nearly a decade by a regression equation using only a cyclical gap measure, the time trend, and obvious policy dummies.

Gaddam (2016) investigates the automobile industry's export and output relationship, also focusing on the geographic concentration of the automobile industry exports from India to other countries.

Bach et al. (2017) examine the automotive retail industry's result, taking into deliberation the monetary policy implemented by the Brazilian government from 1994 to 2014.

They find that the sector's performance, represented by production and export levels, is connected to variables related to monetary policy. The critical success variables impact on sales forecasting is determined based on real-time primary data, and secondary data of the automobile firm situated at Pithampur, individually where the commercial vehicle segment research is conducted (Chouksey et al., 2017).

Meanwhile, Albors-Garrigos et al. (2017) explain the impact of national culture on after-sales service in the automotive sector. The research views that after-sales services have become of paramount importance in the auto industry. It shows a framework for how the entire process chain of after-sales services could be researched and successfully applied to Schwartz's the individual-level value theory.

Jayaraman et al. (2018) investigate the influencing variables in using of non-national cars in Malaysia. Based on the remarkable outcomes, non-national four wheelers are recognized as having certain salient quality, excellent fuel utilization, and commendable maintenance and after-sales repair services. The respondents state that manufacturers of non-national cars conduct regular research and development activities and continuously acknowledge market flavors and tastes, thus enhancing customers' propensity to buy non-national cars.

Chakraborty and Chattopadhyay (2019) confirm the validity of the structure-conduct-performance hypothesis. This finding emphasizes the debt-equity ratio, advertising intensity, and return on net worth as the key influencers of the concentrated market structure for the chosen automobile segment in India.

This research examines five macro-economic variables: inflation, gross domestic product per capita, changes in gross domestic product per capita, the foreign exchange rate, and the interest rate. The research is based on a regional economy that consists of five countries and on 12 years of historical performance. These factors render this research unique. The five countries from ASEAN members are Indonesia, Malaysia, Thailand, Singapore, and Vietnam. These five ASEAN countries have a GDP of USD 2,46 trillion, with a population of 462 billion. They contribute 83% of the total GDP ASEAN.

RESEARCH METHOD

The structure of research can be seen in Figure 3. This research tests the effects of macroeconomic variables on car sales in the ASEAN region. The macroeconomic variables are inflation, gross domestic product per capita, changes in gross domestic product per capita, the foreign exchange rate, and the interest rate. The macroeconomic data is based on World Bank publications. This research is performed using a regression statistics model, which is described as follows:

$$Y_{it} = \beta_0 + \beta_1 Infl_{it} + \beta_2 GDP/C_{it} + \beta_3 \Delta GDP/C_{it} + \beta_4 Exch_{it} + \beta_5 Inte_{it-1} + \varepsilon_{it} \quad (1)$$

Where:	
Y	= car sales
0	= constant
$\beta_1 \dots \beta_i$	= regression coefficient
$Infl_{it-1}$	= inflation rate
GDP/C_{it}	= gross domestic product per capita
$\Delta GDP/C_{it}$	= change in gross domestic product per capita
$Exch_{it}$	= exchange rate to USD
$Inte_{it-1}$	= interest rate
ε	= error term

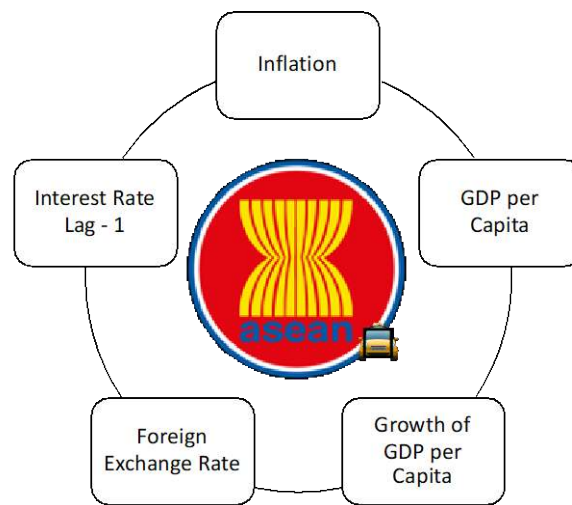


Figure 3. Research Framework

This research employs five macroeconomic variables: inflation, gross domestic product per capita, the growth rate of the gross domestic product per capita, the foreign exchange rate, and the interest rate. The explanation for each variable is delineated in Table 1. Car sales are the dependent variable that indicates the total car sales, including both passenger and commercial cars, in each country. Higher consumer price index leads to a lower demand for car sales. This is in line with the increase in inflation and interest rates. Car sales, through credit, will decrease in line with the increase in interest rates. Inflation variable indicates the inflation rate in each country during the year of research, which the hypothesis are:

- H_1 Inflation rate influences car sales in the ASEAN region.
 H_2 The interest rate lag-1 influences car sales in the ASEAN region.

Gross Domestic Product variable is the total value or market value of all the finished goods and services produced by the citizen within a country's borders in a specific time period. GDP per capita is the total gross domestic product of a country divided by the population's number within a country. More GDP per capita may increase the purchase probability in a society. Purchasing power depends on the GDP per capita. The demand of transportation will be evolved from two-wheeler to four-wheeler, in line with the GDP per capita rate. The hypothesis is developed as follows:

- H₃ Gross domestic product per capita influences car sales in the ASEAN region.
 H₄ Changes in gross domestic product per capita influence car sales in the ASEAN region.

The foreign exchange rate variable is the currency exchange rate against the United States of America dollar during a specific time. Higher import content will have an impact on the price of the vehicle. Currently, local content average is less than 50%, whereas the import content is more than 50%. Hence the hypothesis is developed to be:

- H₅ The foreign exchange rate influences car sales in the ASEAN region.

Interest rate variable is the interest rate charged by the financial institution to the borrower in a specific country during a specific time. Interest rate lag is the interest rate of the previous period. For instance, interest rate lag-1 is the interest rate of the previous year.

Additionally, regression method with the Statistical Package for Social Sciences Software (SPSS) is used to test the research model. This research uses secondary data from the World Bank's website. The data are cross-sectional data from an observed period spanning the years 2005 – 2016. The independent variables are five economic variables studied from 2005 to 2016. Dependent variables are car sales in a unit from 2005 to 2016. The samples are five ASEAN countries: Indonesia, Malaysia, Singapore, Vietnam, and Thailand. The data have been collected from several independent sources, one of which is the World Bank website.

Table 1. Research Variables

No	Variables	Symbols	Formulas	References
1	Car Sales	MOB	Car sales in year t	
2	Inflation	Inf _t	Inflation rate in year t	Nawi et al. (2013); Chifurira et al. (2014); Pant and Nidugala (2016)
3	Gross Domestic Product per Capita	GDP/C	GDP _t / Total Population _t	Nawi et al. (2013); Patra and Rao (2017)
4	Changes in Gross Domestic Product per Capita	ΔGDP/C	GDP/C _t – GDP/C _{t-1}	Pant and Nidugala (2016)
5	Foreign Exchange Rate USD/IDR	EXCH _{t-1}	Exchange rate USD/ country currency in year t	Nawi et al. (2013); Pant and Nidugala (2016); Kaya et al. (2019)
6	Interest Rate	INTE	The lending rate in year t	Nawi et al. (2013); Lee and Kang (2015); Pant and Nidugala (2016); Gusev et al. (2018); Patra and Rao (2017)
7	Interest Rate Lag -1	INTE _{t-1}	The interest rate in year t-1	

RESULTS AND DISCUSSIONS

The highest car sales, at 1,4 million units, occurs in Indonesia, while the smallest vehicle sales occurs in Singapore at 34.111 units. On average, vehicle sales of 500.000 units occurs in five countries during the period spanning 2005 - 2016. Indonesia has a population of 260 million in 2020, and Singapore has a population of 3,5 million. The total landmass in Indonesia is 1,9 million km², while the total landmass in Singapore is 721 km².

The highest inflation rate, 22,675%, occurs in Vietnam, and the lowest is a deflationary rate, at -5,99% in Singapore. On average, ASEAN countries experienced a 4,57% inflation rate over 11 years. Although most ASEAN countries had experienced the 1998 Asian Crisis, all ASEAN countries have recovered from it.

Table 2. Statistical Description

	N	Minimum	Maximum	Mean	Std Deviation
Car Sales	70	34.111,0000	1.423.580,0000	502.254.9714	385.876,2824
Inflation	70	-0,0599	0,2267	0,0457	0,0504
GDP Per Capita	70	687,4797	64.581,9440	13.663,5303	18.788,2216
GDP Per Capita Growth	70	-0,1395	0,5942	0,0795	0,1022
Foreign Exchange Rate	70	1,2497	22.602,0500	6.097,2191	8.098,2942
Interest Rate	70	0,0415	0,1695	0,0799	0,0393
Interest Rate Lag (-1)	70	0,0433	0,1695	0,0810	0,0399
Valid N (listwise)	70				

Sources: Research Data

GDP per capita reached an average of USD 13.663, with the lowest GDP of USD 687 in Vietnam, and the highest in Singapore at USD 64.582. The most significant GDP growth ever reached is 59,42%. In 1998, GDP declined at -13,95% in Indonesia due to the Asian Crisis, while GDP per capita has grown by 7,95% on average.

The average interest rate is 7,99%, with the highest interest rate in ASEAN countries at 16,95%, and the lowest interest rate at 4,15%. The interest rate is considered high in Indonesia and Vietnam due to the high inflation rate.

Regarding the exchange rate, the highest exchange rate is 22.602 for Vietnam's Dong against the US Dollar, and the lowest is 1,2 for the Singapore Dollar against the US Dollar. All combined, the five primary currency exchange rates in ASEAN countries is 6.097 against 1 US Dollar.

Singapore is the wealthiest country in ASEAN, with a population of around 6 million people. Singapore is also the country with the lowest interest rates and the lowest inflation. The Singapore Dollar is the currency with the lowest exchange rate comparison compared to the United State Dollar.

Indonesia is the nation with the largest population in ASEAN, having more than 267 million people in 2017. This population represents 45% of the total population in ASEAN. Indonesia has the largest GDP in ASEAN of USD 1,1 trillion in 2017. Indonesia's GDP is 33% of ASEAN's total GDP. Indonesia has a GDP per capita of USD 4.163.

Thailand has a population of 68 million which makes it the second largest GDP in ASEAN, with a total of USD 0,529 trillion. Thailand's GDP per capita is USD 7.791. Malaysia is the third-largest GDP in ASEAN, with USD 0,365 trillion with a population of 32,8 million people. Vietnam, with a total population of 95 million individuals, has a GDP per capita of USD 2.739 and a total GDP of 0,262 trillion.

Table 3. Test Results of Determinants of Car Sales

	Unstandardized Coefficients		Standardized Coefficients		
	B	Std Error	Beta	t	Sig
(Constant)	770219,669	100388,844		7,672	0,000
Inflation	-1972791,742	867954,346	-0,258	-2,273	0,026
GDP Per Capita	-15,227	2,051	-0,741	-7,425	0,000
GDP Per Capita Growth	-283174,454	361149,210	-0,075	-0,784	0,436
Foreign Exchange Rate	-28,935	6,160	-0,607	-4,697	0,000
Interest Rate Lag (-1)	2827049,012	1265783,243	0,292	2,233	0,029
R	0,724				
R Square	0,524				
Sig. F Change	0,000				

Sources: Research Data

The hypothesis test results establish that of the five variables, four had a significant effect on automobile sales, especially car sales in five ASEAN countries, namely, Indonesia, Thailand, Malaysia, Singapore, and Vietnam. The total model shows that the inflation rate, GDP per capita, GDP growth rate, foreign exchange rate, and interest rate influence car sales at 72,4%.

The inflation rate reached 0,000 in terms of statistical value, and below 0,05. This demonstrated that the inflation rate is significant. Inflation shows a negative effect on car sales. Higher consumer price index causes lower demand for car sales. This is in line with the increase in inflation and interest rates. Car sales, through credit, will decrease in line with the increase in interest rates. This also affects the ability of consumers to allocate costs in line with rising inflation. Under normal circumstances, high inflation will slow economic growth, which impacts the purchasing power of consumers. During 2005-2016, countries in ASEAN have dealt with several crisis as big as in 1998, an Asian crisis and in 2008, a Global crisis. The results are in line with the 1998 and 2008 crisis, where the car sales dropped significantly during the years. Indonesia's interest rate reaches 60% and the tight liquidity causes a drop in car sales. The Asian crisis have caused a correction in macroeconomic factors in Indonesia, Thailand, Malaysia, and Singapore, while the global crisis have causes the correction of

macroeconomic factors in Singapore, Malaysia, and Thailand. The results are supported by Nawi et al. (2013), Chifurira et al. (2014), and Pant and Nidugala (2016).

GDP per capita was 0,000 in terms of statistical value, below 0,05. The GDP per capita shows the effect on automotive sales since higher GDP per capita increases the society's purchase intention and probability, while the opposite will happen if the GDP is lower. Purchasing power depends on the GDP per capita. Most of the global automobile producers will enter a market depending on the GDP of the country. The demand for transportation will be evolved from two-wheeler to four-wheeler, in line with the GDP per capita rate. This research result shows the same condition with the decline in motorcycle sales in Indonesia and the growth of car sales in Indonesia since 2015. GDP per capita in Indonesia is growing, giving rise to the purchasing power of the population.

The research results are in line with Nawi et al. (2013), Islam et al. (2016), and Patra and Rao (2017). The statistical results demonstrate that GDP per capita is 0,436, which is above 0,00. GDP per capita growth does not affect the probability to buy automotive goods, especially cars. This explains why higher GDP per capita growth does not affect purchasing power if GDP per capita has reached a certain level. It shows that there is no direct effect on the growth of GDP compared to purchasing power. The purchase probability becomes more significant, the value of growth does not. Total GDP has no direct implications because total GDP does not reflect the individual population's purchasing power. GDP per capita is more likely to reflect the probability of purchasing power. Singapore has the largest GDP, but a small population and a small geographical area, and adequate public transportation, so Singapore residents do not need a car as a means of transportation. This result differs from what Pant and Nidugala (2016) have pointed out.

The exchange rate reached 0,00 in terms of statistical value. The results are below 0,05. Exchange rates affect the selling price of vehicles sold. This is due to the high number of vehicles from abroad, rendering vehicles sold sensitive to foreign exchange rates. If local content is low, the vehicle's selling price will not be sensitive to foreign exchange rates. Currently, local content averages less than 50%. The higher import content will have an impact on the price of the vehicle. The government imposes a tax rate on importing spare parts to protect the local automotive value chain industry. The tax rate will have an indirect impact on the price of a vehicle, so higher price of a vehicle will, in turn, affect the demand for vehicle sales.

Certain types, such as low-cost green carriers (LCGCs), have reached more than 80% of local content. The government targets more local content to support the automotive value chain's growth and increased exports over imports of spare parts. The government's challenge is to improve the quality of local spare parts. Thailand is the vehicle production hub for several Japanese brands for distribution with ASEAN countries such as Indonesia, Malaysia, and Vietnam. Moreover, ASEAN forms the ASEAN Free Trade Area, so that with the production center in the ASEAN country, vehicle prices become more competitive. Producers are trying to minimize the exchange rate effect by making factories closer to ASEAN countries. ASEAN countries have not yet had sufficient production capacity to reach a break-even point for

automotive factories, so that production is concentrated. These results are supported by Pant and Nidugala (2016) and Pilat (2016).

Interest rates (lag-1) affect motor vehicle sales. Higher the interest rate leads to fewer credit sales which is attributable to high-interest rates. It can be concluded that credit sales have a strong dominance in automotive sales.

Currently, the credit market consists of around 70% of vehicle sales in Indonesia and Thailand. For the lower-end segment, the credit market is higher; however, the credit market is lower than the cash market in the premium market segment. If sales are in cash, car sales are not influenced by interest rates. Lower interest rate causes higher vehicle's demand due to lower instalment amounts from the buyer. The resulting data is supported by the condition of most countries at the beginning of economic development. At the beginning of economic growth, most countries have a higher cost associated with the interest rate. The research results are in line with Nawi et al. (2013); Kaya (2019); Lee and Kang (2015); Pant and Nidugala (2016).

Automotive company management needs to consider interest rates, GDP, inflation, and foreign exchange rates in determining production and sales plans, including plant expansion or capacity expansion. The government also needs to control inflation, foreign exchange rates, and interest rates to spur economic growth. It is essential that global automotive companies and local governments improve the local value chain of automotive spare parts to negate the exchange rate impact on vehicle prices. The increase of local content is one of the solutions to reduce exposure to foreign exchange rates. This research also demonstrates the importance of controlling inflation, interest rates, and exchange rates in maintaining industrial growth.

This research proposes that the interest rate, gross domestic product, inflation, and exchange rate has a significant influence on automotive sales. The interest rate is considered having an impact on automotive sales after one year lag. Interest rates have a positive impact on automotive sales. The consumer price index, foreign currency exchange rate, and gross domestic product variables have negative influences in the same period.

It suggested that industry players pay attention to interest rates, inflation, and exchange rates in determining automotive work plans for the next period. Whereas, the government should pay attention to inflation, interest rates, exchange rates, and gross domestic product growth in determining the state budget.

CONCLUSIONS

This research studies the determinants of car sales in five ASEAN countries, which are Indonesia, Thailand, Malaysia, Singapore, and Vietnam. The research focuses on five macroeconomic variables (inflation, gross domestic product per capita, changes in gross domestic product per capita, foreign exchange rate, and interest rate). The results show that inflation, gross domestic product per capita, foreign exchange rate, and interest rate from the

previous period significantly influence car sales in five ASEAN countries. Local content is a critical issue relevant to the dependence of the foreign exchange rate. The effects of the interest rate are attributable to dependence on the credit market. The GDP growth per capita does not influence car sales; however, the interest rate and gross domestic product influence auto sales in ASEAN +5. The automotive industry in ASEAN can take the competitive advantage of each ASEAN country in terms of interest rates, exchange rates and inflation. It is considered that these variables increase the competitiveness of ASEAN automotive industry. Indonesia has a large market, Thailand has good infrastructure, and Singapore has low interest rates and inflation for funding.

Limitations of this research includes economic cycle factors. During the research period, the ASEAN countries have experienced two significant crises: the Asian Crisis in 1998, and the global crisis in 2008. Singapore, Thailand and Malaysia have suffered from global recession pressure in 2008. However, Indonesia went through with positive growth during the period. The limitations also include micro variables, such as new vehicle models and new technologies. It is suggested further research includes other micro variables, such as new technology, government deregulation, and others.

ABOUT THE AUTHOR

Dr. Suwinto Johan earned his doctor's degree in business management from IPB University, Indonesia. He authored over 40 publications. His current research interests: merger acquisition and restructuring, commerce and business law, sustainable and development, and animal law.

ACKNOWLEDGEMENTS

The author would like to thank Bapak Gunawan Geniusahardja (Director of Astra Group Indonesia, 2001-2016,) and Bapak Darmawan Widjaja (Director of Toyota Astra Motor, Indonesia) for sharing their knowledge on the automotive industry in Indonesia and ASEAN.

REFERENCES

- Albors-Garrigos, J., Frass, A., Schoeneberg, K. P., and Signes, A. P. (2017). Impact of national cultures on automotive after sales services perception: The case of German premium cars in China. *Management: Journal of Sustainable Business and Management Solutions in Emerging Economies*, 22(2), 13-27.
<https://doi.org/10.7595/management.fon.2017.0014>
- Altaf, S. N. and Hashim, N. A. (2016). Key factors influencing purchase intentions towards automobiles in Pakistan. *Paradigms*, 10(1), 14-22.

<https://doi.org/10.24312/paradigms100102>

ASEAN Secretariat and the World Bank. (2015). *ASEAN Services Integration Report: A Joint Report by the ASEAN Secretariat and the World Bank*.

<http://documents1.worldbank.org/curated/en/759841468178459585/pdf/100637-Revised-WP-PUBLIC-Box393257B-ASEAN-Report-web.pdf>

Bach, T. M., Machado, A. M., Kudlawicz-Franco, C., Martins, T. S. and Da Veiga, C. P. (2017). Monetary policy and the automotive retail performance in Brazil. *Journal of Business and Retail Management Research*, 11(2), 79-93.

Bernama. (March 3rd, 2019). Automotive industry contributed 4.3 pct to GDP in 2019 — MITI. *Malaysia Investment Development Authority*.

<https://www.mida.gov.my/home/10097/news/automotive-industry-contributed-4.3-pct-to-gdp-in-2019---miti/>

Chakraborty, M. S., and Chattopadhyay, A. (2019). Validating structure conduct performance model in passenger vehicle segment of Indian automobile industry. *Pramana Research Journal*, 9(4), 96-106. <https://www.pramanaresearch.org/gallery/prj-p663.pdf>

Chifurira, R., Mudhombo, I., Chikobvu, M., and Dubihlela, D. (2014). The impact of inflation on the automobile sales in South Africa. *Mediterranean Journal of Social Sciences*, 5(7), 200-207. <http://dx.doi.org/10.5901/mjss.2014.v5n7p200>

Chouksey, P., Deshpande, A., Agarwal, P. and Gupta, R. (2018). Sales forecasting study in an automobile company – A case study. *Industrial Engineering Journal*, 10(12), 35-40. <https://doi.org/10.26488/IEJ.10.12.85>

Demiroglu, U. and Yunculer, Ç. (2016). Estimating light-vehicle sales in Turkey. *Central Bank Review*, 16(3), 93-108. <https://doi.org/10.1016/j.cbrev.2016.08.003>

Gaddam, C. J. (2016). Analysis of growth of exports and geographic concentration of automobile industry in India. *Productivity*, 57(1), 59-67.

Günşen, İ. (2015). Automotive industry: Economic effects of foreign direct investments in Turkey. *Uludağ Journal of Economy and Society*, 34(2), 19-34.

http://www.uludag.edu.tr/dosyalar/iibfdergi/genel-dokuman/2015_2/ASL02.pdf

Gusev, A. S., Omelchenko V.S., Panova E.T. and Prokudin D.A. (2018). Analysis the prospects of the new cars sales market development in Russia. *International Transaction Journal of Engineering, Management, & Applied Sciences & Technologies*, 9(5), 393-400. https://doi.nrct.go.th/ListDoi/listDetail?Resolve_Doi=10.14456/itjemast.2018.35

Industri otomotif berkontribusi 10,16 persen kepada perekonomian nasional. (March 28th, 2018). *Ministry of Industry of The Republic of Indonesia*.

<https://kemenperin.go.id/artikel/19008/Industri-Otomotif-Berkontribusi-10,16-Persen-Kepada-Perekonomian-Nasional>

- Islam, R., Ghani, A. B. A., Kusuma, B. and Hong, E. T. Y. (2016). An analysis of factors that affecting the number of car sales in Malaysia. *International Review of Management and Marketing*, 6(4), 872-882.
- Jayaraman, K., Arumugam, S., Kumar, K. M., and Kiumarsi, S. (2018). Factors influencing the purchase decision of non-national cars in Malaysia: An empirical study. *Global Business and Management Research*, 10(1), 150-162.
- Johan, S. (2019). Macroeconomic Determinants of Automobile Sales in Indonesia: An Empirical study in 1986-2016. *Binus Business Review*, 10(3), 159-166.
<https://doi.org/10.21512/bbr.v10i3.5712>
- Kaya, A., Kaya G., and Cebi, F. (2019). Forecasting Automobile Sales in Turkey with Artificial Neural Networks. *International Journal of Business Analytics*, 6(4), 50-60.
- Kemal, Ç., Erkan, O., Muhsin, D. E. and Ömer, Ö. (2015). Factors influencing consumers' light commercial vehicle purchase intention in a developing country. *Management & Marketing*, 10(2), 148-162. <https://doi.org/10.1515/mmcks-2015-0012>
- Lee, H. Y, and Kang, H. H. (2015). The effects of the global financial crisis on automobile demand in China. *International Journal of Economics and Finance*, 7(9), 226-236.
<https://doi.org/10.5539/ijef.v7n9p226>
- Pant, A. and Nidugala. G. K. (2016). Macro determinants of car in Indian banking sector. *Journal of Developing Areas*, 51(2), 59-70. <https://doi.org/10.1353/jda.2017.0031>
- Patra, T. and Rao, M. J. (2017). Impact of macroeconomic factors on automobile demand in India. *Journal of International Economics*, 8(1) 97-113.
- Pilat, D. (2016). Determinants of exchange rate risks in the automotive industry. *Master Degree Project in International Business and Trade*, University of Gothenburg. Thesis.
- Maikaew, P. (January 7th, 2019). Automotive industry ata a turning point. *Bangkok Post*.
<https://www.bangkokpost.com/auto/news/1606570/automotive-industry-at-a-turning-point-dated-October-14>.
- Nawi, A. S., Ahmad, S. A. B., Mahmood, W. M. W., Nair, G. K. S., Nurathirah, A. S., and Hamid, B. A. (2013). Determinants of passenger car sales in Malaysia. *World Applied Sciences Journal*, 23, 67-73. [https://www.idosi.org/wasj/wasj23\(eemcge\)/13.pdf](https://www.idosi.org/wasj/wasj23(eemcge)/13.pdf)
- Wen, T. C. and Noor, N. A. M. (2015). What affects Malaysia consumers' intention to purchase hybrid car? *Asian Social Science*, 11(26). 52-63.
<http://dx.doi.org/10.5539/ass.v11n26p52>
- Yagi, M. and Managi, S. (2016). Demographic determinants of car ownership in Japan. *Transport Policy*, 50. 37-53. <https://doi.org/10.1016/j.tranpol.2016.05.011>
- Zeng, Y., Schmitz, H. and Madlener. R. (2018). An econometric analysis of the determinants

of passenger vehicle sales in Germany. Institute of Future Energy Consumer Needs and Behavior (FCN) 6/2018, School of Business and Economics/E.ON.