Enrichment: Journal of Management, 12 (4) (2022)

Published by: Instiute of Computer Science (IOCS)

Enrichment: Journal of Management

Journal homepage: www.enrichment.iocspublisher.org

Sensitivity Analysis of Feasibility Investment of Electric Motorcycle in Online Drivers in DKI Jakarta

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ARTICLE INFO

Article history:

Received Sept 9, 2022
Revised Sept 20, 2022
Accepted Okt 11, 2022

Keywords:

Investment Feasibility
Sensitivity Analysis
Electric Motorcycle
Net Present Value (NPV)
Internal Rate of Return (IRR)

ABSTRACT

The high number of motorcycle users in DKI Jakarta in 2022 as many as 16,734,986 units causes poor air quality in DKI Jakarta with an AQI US value of 145. The mobility of online motorcycle drivers with an average daily distance of 230 km/day also contributes to the level of air pollution in DKI Jakarta. Through the COP26 World Climate Change Conference in Glasgow in 2021, The Indonesian government is targeting a 29% reduction in Greenhouse Gas (GHG) emissions independently and 41% with international assistance by 2030. One way is through the conversion of electric motorcycles for online motorcycle drivers, with the conversion of electric motors, it is expected to reduce air pollution in DKI Jakarta and support the achievement of 13 million electric motor units by 2030. Based on the results of the analysis, it is known that the investment in electric motorbikes made by online motorcycle drivers is said to be feasible because it provides an NPV of Rp. 2,757,262,- and IRR of 14,05%. By performing sensitivity on several variables, the maximum limit of change for each variable is 5% for the increase in the IRR of motorcycle installments, 9% for the increase in the IRR of battery installments and 10% for the increase in the price of the battery. If there is a simultaneous increase in the three variables, the maximum limit for the increase is 1% for the increase in the IRR for motorcycle installments, 1% for the increase in the IRR for battery installments and 10% so that the NPV can be Rp. 340.108,- and IRR of 10.48%.

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INTRODUCTION

DKI Jakarta is one of the cities with a fairly high number of motorized vehicles with the number of vehicles in 2022 as many as 21,034,054 units of which 80% is dominated by motorcycles (Kompas, March 13, 2022). The high number of motorized vehicles causes poor air quality in DKI Jakarta.

The Jakarta air quality index (AQI) forecast on September 29, 2022 has a value of 145 US AQI with unhealthy pollution levels for sensitive groups. Air pollution is the cause of poor air quality in DKI Jakarta. 75% of air pollution in DKI Jakarta comes from land transportation, 9% comes from power plants, 8% comes from domestic combustion and 8% comes from industrial combustion (Hartini, Augst 7, 2019). From data released by the Komite Penghapusan Bensin Bertimbal (KPBB),

the vehicles that produce the highest amount of pollutants are motorcycles (45%), buses (21%), trucks (18%), gasoline cars (14%) and diesel cars (2 %) (Priyantoro, Augst 19, 2019).

Based on the data above, it is known that motorcycles are the largest contributor to pollution in DKI Jakarta, where the highest mobility of motorcycle users is online motorcycle drivers with an average distance of 230 km/day for online motorcycle drivers. Based on kontan.id sources, there are about 4 (four) million online motorcycle taxi drivers with 1 (one) million drivers in the Greater Jakarta area (Kontan, April 27, 2020).

At the COP26 World Climate Change Conference in Glasgow in 2021, Indonesia is committed to preventing an increase in the average temperature of the earth's surface exceeding 1.5 degrees Celsius by 2100 (Syukra, April 22, 2022). In the Nationally Determined Contribution (NDC), Indonesia targets to reduce greenhouse gas (GHG) emissions by 29% independently and 41% with international assistance by 2030, then achieve the net zero emission target by 2060 (Syukra, April 22, 2022).

One strategy to support the emission reduction target is through the conversion of conventional oil-fueled motors into electric motors. This strategy is in line with the government program as outlined in the Presidential Regulation of the Republic of Indonesia Number. 55 of 2019 regarding Percepatan Program Kendaraan Bermotor Listrik Berbasis Baterai (Battery Electric Vehicle) Untuk Transportasi Jalan. However, until 2022 the number of electric vehicles in Indonesia is still very minimal, this can be seen from the total electric vehicles which only reached 22,671 units with 86% or around 19,698 electric motorcycles (Dananjaya, Augst 1, 2022). This value is still very far from the target set by the government of 13 million electric motor units by 2030 (Anshori, Augst 18, 2022).

Converting electric motors to online motorcycle drivers can be a solution to support pollution reduction in DKI Jakarta, given the driver mobility is quite high and supports the target of electric vehicles set by the government. Therefore, it is necessary to analyze the sensitivity of electric motor investment to see the feasibility of the investment made by online motorcycle drivers. In this study, will use the Net Present Value (NPV) and Internal Rate of Return (IRR) methods to analyze investment feasibility and sensitivity analysis to changes in parameters in the calculation to see changes in the feasibility of changes in parameters that occur.

RESEARCH METHOD

The analytical method used in this study is divided into 3: 1) Net Present Value (NPV); 2) Internal Rate of Return (IRR); and 3) Sensitivity Analysis

1) Net Present Value (NPV)

   Net present value can be interpreted as the present value of the income stream generated by investment (Khotimah, 2014). NPV is the result of subtracting income with discounted costs. Mathematically, the NPV calculation can be formulated as follows:

$$NPV = \sum_{t=0}^{n} \frac{B_t - C_t}{(1+i)^t} \quad (1)$$

   Information:

   NPV = Net Present Value (Rp)

   Bt = Benefit or benefit in year-t

   Ct = Cost or cost in year-t

   i = interest rate used

   t = year-t

   The feasibility indicator is: if the NPV is positive (NPV> 0) then the business is feasible to run. Conversely, if the NPV is negative (NPV < 0) then the business is not feasible to run.

2) Internal Rate of Return (IRR)

Internal Rate of Return (IRR) is the maximum interest rate that can return the costs invested (Khotimah, 2014). Mathematically the IRR calculation can be formulated as follows:

$$IRR = i_1 + \frac{NPV_1}{NPV_1 - NPV_2} \text{ x } (i_1 - i_2) \quad (2)$$

Information:

IRR = Internal Rate of Return

i1 = interest rate that produces a positive NPV

i2 = interest rate that produces negative NPV

NPV1 = positive NPV

NPV2 = negative NPV

The feasibility indicators are: if the IRR is greater than the prevailing bank interest rate (IRR>DR), then the business is feasible to run. On the other hand, if the IRR is less than the prevailing interest rate (IRR<DR), the business is not feasible.

3) Sensitivity Analysis

Sensitivity analysis is a way to measure how much influence the interrelated variables have if the values of those variables change, increase or decrease continuously. Sensitivity analysis does not determine whether a project is feasible or not, but is used to find out how sensitive the elements in question are to changes that may occur in the investment to be made.

RESULTS AND DISCUSSIONS

In conducting the calculation analysis, the parameters that are used as reference in the feasibility calculation are determined, then the investment feasibility is calculated in terms of Net Present Value (NPV) and Internal Rate of Return (IRR). Furthermore, sensitivity analysis will be carried out to examine changes in variables in the calculation so that changes in investment feasibility occur in terms of Net Present Value (NPV) and Internal Rate of Return (IRR).

1) Calculation Parameters

The parameters used in this study are used as information in calculating investment feasibility, including:

Table 1. Calculation Parameters

Parameters	Value
Electric Motor Investment	Rp. 27.000.000,-
Battery Investment	Rp. 6.500.000,-
Battery Lifetime	3 years
Battery Mileage	65 km
Investment Lifetime	10 years
Electricity Tariff	Rp. 1.444,70/kWh
Pertalite fuel price	Rp. 10.000,-/L
Consumer Credit Bank Interest (Non KPR)	8,75 %
Deposit Interest	2,50%
Electric Motorcycle Annual Tax	Rp. 125.000,-
5 Years Electric Motor Tax	Rp. 335.000,-

2) Investment Feasibility Analysis

To support investment in electric motorcycles by online motorcycle drivers, it is necessary to have support from application providers (applicators) in providing easy funding through installment payment schemes that can be done by online motorcycle drivers. Where online motorcycle drivers will make daily installment payments deducted from the driver's daily income. By using

this scheme, the application provider gets an NPV of Rp. 540,000,- with an IRR of 11.25% and a daily installment to be paid by the driver of Rp. 30,401,-.

Table 2. Electric Motorcycle Installment Payment Scheme

Year	Investment	Instalment
0	Rp. 27.000.000,-	
1		Rp. 11.096.389,-
2		Rp. 11.096.389,-
3		Rp. 11.096.389,-
	TOTAL	**Rp. 33.298.168,-**

Installment payment schemes can also be provided for the purchase of batteries where the return is made for 3 years with an NPV received by the application provider of Rp. 135,745, - and an IRR of 11.30% with a daily installment that must be paid by the driver of Rp. 7.325,-. So that the total installments that must be paid by the driver every day to the application provider is Rp. 37,727,-.

Table 3. Electric Motor Battery Installment Payment Scheme

Year	Investment	Instalment
0	Rp. 6.500.000,-	
1		Rp. 2.673.790,-
2		Rp. 2.673.790,-
3		Rp. 2.673.790,-
	TOTAL	**Rp. 8.021.370,-**

The investment feasibility analysis in this study looks at the cost of fuel oil (BBM) that must be paid by the driver compared to the cost of charging an electric motor and the cost of investing in motors and batteries as well as other routine costs. So that a positive NPV value is obtained which is Rp. 2,757,262,- and an IRR of 14.05%, which is higher than the interest rate for Consumer Credit Banks (Non Mortgages) which is 8.50%. Therefore, investment in electric motorbikes can be said to be feasible for online motorcycle drivers.

Table 4. Electric Motor Investment Analysis

Information	Unit	1	2	3	4	5
Motorcycle Installment	Rp	11.096	11.096	11.096		
Installment Battery	Rp	2.674	2.674	2.674	2.674	2.674
Taxes and Others	Rp	2.305	2.305	2.305	2.305	2.640
Battery Charging Fee	Rp	3.098	3.098	3.098	3.098	3.098
Gasoline Purchase Fee	Rp	13.072	13.072	13.072	13.072	13.072
Cashflow	**Rp**	**(6.102)**	**(6.102)**	**(6.102)**	**4.995**	**4.660**
Information	**Unit**	**1**	**2**	**3**	**4**	**5**
Motorcycle Installment	Rp					
Installment Battery	Rp	2.674	2.674	2.674	2.674	2.674
Taxes and Others	Rp	2.305	2.305	2.305	2.305	2.640
Battery Charging Fee	Rp	3.098	3.098	3.098	3.098	3.098
Gasoline Purchase Fee	Rp	13.072	13.072	13.072	13.072	13.072

Cashflow	**Rp**	**4.995**	**4.995**	**4.995**	**4.995**	**4.660**

** in thousands of rupiah*

3) Analisis Sensitivitas

The variables tested in the sensitivity analysis to measure changes that occur in the sensitivity analysis, include: 1) Motor Installment IRR; 2) Battery Installment IRR; 3) Increase in Battery Prices and 4) Combination of the three variables.

Table 5. Sensitivity Analysis Parameters

No	Parameter	Basis Nilai	Increase
1	Motorcycle Installment IRR	IRR 11,25%	+1% s.d +6%
2	Battery Installment IRR	IRR 11,30%	+1% s.d 10%
3	Battery Price	Rp. 6.500.000,-	+10% dan +17%
4	Combined Variables	IRR 11,25%	Motorcycle Installment IRR 1% - 2%
		IRR 11,30%	Battery Installment IRR 1% - 2%
		Rp. 6.500.000,-	Battery Price +10%

With changes to the motorcycle installment variable, it is found that the investment is said to be unfeasible when there is an increase in IRR of up to 6% where the resulting NPV value is Rp. -158,437,- with an IRR Investment of 9.79%.

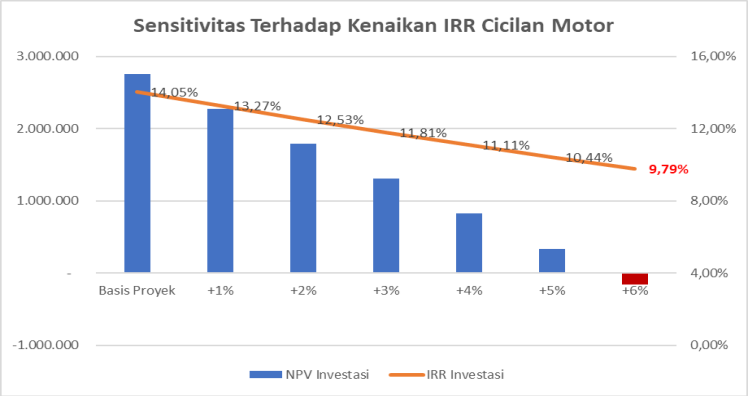

Figure 1. Motor Installment IRR Increase Sensitivity Analysis

With changes to the battery installment variable, it is found that the investment is said to be unfeasible when there is an increase in IRR of up to 10% where the resulting NPV value is Rp. -145.753,- with an IRR Investment of 9.79%.

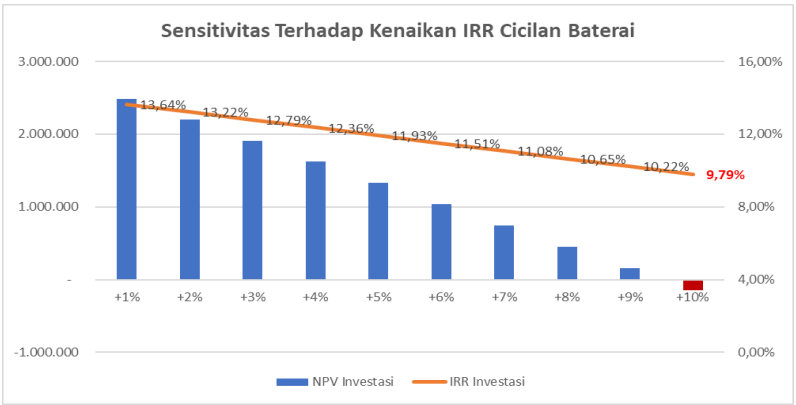

Figure 2. Sensitivity Analysis of Battery Installment IRR Increase

With changes to the battery price variable, it is found that the investment is said to be not feasible when there is an increase in battery prices up to 17% where the resulting NPV value is Rp. -19008,- with an IRR Investment value of 9.97%.

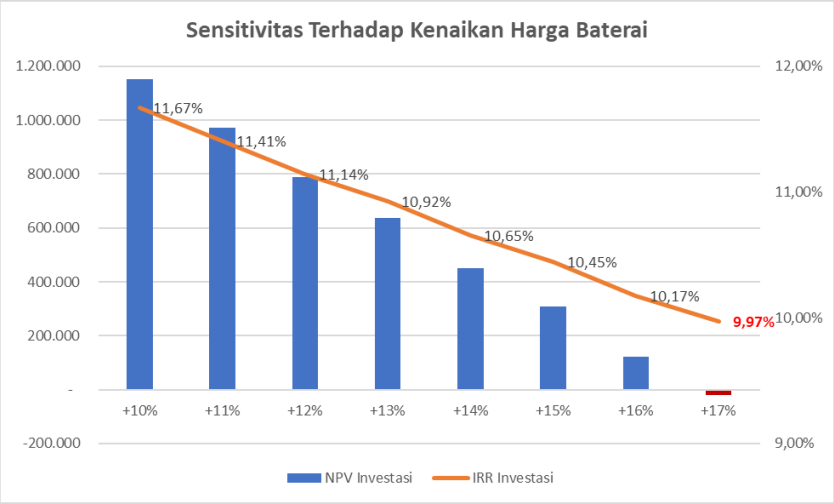

Figure 3. Battery Price Increase Sensitivity Analysis

With changes to the three battery price variables, it is found that the investment is said to be inappropriate when there is an increase in Motor Installment IRR +2%, Battery Installment IRR +2% and an increase in battery price +10% where the resulting NPV value is Rp. -461,592,- with an IRR Investment of 9.36%.

Table 6. Sensitivity Analysis of Three Variables

No	Parameter	NPV	IRR
1	Motor IRR +1%, Battery IRR +1%, Battery +10%	Rp. 340.108	10,48%
2	Motor IRR +2%, Battery IRR +2%, Battery +10%	Rp. (461.592),-	9,36%

Based on the results of the above calculations, it can be seen that the Net Present Value (NPV) and Internal Rate of Return (IRR) can provide an overview of the feasibility of investing in electric motorcycles for online motorcycle drivers as well as the sensitivity of increasing variables to the feasibility of electric motorcycle investment that will be carried out by online motorcycle drivers. This research is also supported by several previous studies that show the feasibility of investment seen from the value of Net Present Value (NPV) and Internal Rate of Return (IRR).

Based on the results of research conducted by Purnatiyo, where the investment of DNA Real Time Thermal Cycler (RT-PCR) provides investment feasibility with an NPV value > 0 which is Rp. 2,016,255,444, the IRR > MARR (8.50 %) is 73%, the Profitability Index > 1 is 4.48. and the Payback Period is 1.34 years. After a sensitivity analysis has been carried out, the investment can be feasible with a 50% increase in total cost and a 30% decrease in total revenue. Based on the results of Manullang's research (2019), it was concluded that with the Net Present Value, Payback Period and Internal Rate of Return methods that the fixed asset investment carried out by Cincau Jo, Blencho and Brownice was feasible. And based on Khotimah's research (2014), where the bamboo cultivation business is financially feasible, this can be seen from the results of the study showing that the NPV value (Rp 36,644,364.08) is greater than zero, Net B/C (2.56) is greater than

one, the IRR (11%) is greater than the interest rate of 6%, and the payback period in the 9th year of the project is 15 years.

CONCLUSION

Converting electric motorbikes to online motorcycle drivers is one solution to reduce pollution levels in DKI Jakarta and supports the achievement of fulfilling electric motorbikes by 2030 which has been set by the government. Therefore, based on the calculation of electric motor investment carried out by online motorcycle drivers, it provides feasibility in investing in electric motorcycles where the NPV is Rp. 2,757,262,- and IRR of 14,05%. And from the results of the sensitivity analysis, it is known that the maximum limit for increasing the IRR for motorbike installments is 5% so that it is able to provide an NPV of Rp. 333,379,- and IRR of 10.44%. The maximum limit for increasing the IRR for Battery Installments is 9% so that it can provide an NPV of Rp. 152.140,- and IRR of 10.22%. The maximum limit for increasing the battery price is 16% capable of providing an NPV of Rp. 120,524,- and IRR of 10.17%. If the three variables increase, the maximum limit for the increase is an increase in the IRR of motorcycle installments by 1%, an increase in the IRR of battery installments by 1% and an increase in the battery installment of 10% so as to be able to provide an NPV of Rp. 340.108,- and IRR of 10.48%.

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