



Investment Sensitivity Analysis of Transjatim Corridor I Luxury Sidoarjo-Surabaya-Gresik Route

Kiki Devita Novalia^{1*}, Haris Muhammadun², Risma Marleno³

¹⁻³ Master of Civil Engineering Study Program, Faculty of Engineering, Universitas 17 Agustus 1945 Surabaya, Indonesia

E-mail: ¹⁾ dheta_novalia@yahoo.com

ARTICLE INFO

Article History

Received : 13.05.2024

Revised : 30.05.2024

Accepted : 16.06.2024

Article Type: Research

Article

*Corresponding author:

Kiki Devita Novalia

dheta_novalia@yahoo.com



ABSTRACT

Based on the recapitulation of Transjatim Corridor I passengers in 2023, the average load factor is 120%, with an average of 5-6 thousand passengers per day, leading to the addition of a fleet with luxury services. This study aims to analyze the financial feasibility of investment in the Transjatim Luxury Bus Corridor I by comparing income and expenditure variables using the Net Present Value (NPV), Benefit-Cost Ratio (BCR), Internal Rate of Return (IRR), and Payback Period (PP) methods. With a 6% discount rate, the analysis yielded NPV values > 0 (Rp. 5,204,972,631 for alternative 1, Rp. 2,466,479,592 for alternative 2, and Rp. 640,817,566 for alternative 3), IRR values > 6% (19.42% for alternative 1, 12.54% for alternative 2, and 7.74% for alternative 3), and BCR values > 1 (1.30 for alternative 1, 1.19 for alternative 2, and 1.11 for alternative 3). The PP values were 4 years for alternative 1, 5 years for alternative 2, and 6 years for alternative 3, indicating that all three alternatives are financially feasible. Sensitivity analysis confirmed the financial feasibility of all three alternatives, considering the effect of the discount rate on NPV.

Keywords: Investment, Sensibility Level, Transjatim Luxury

1. Introduction

The transportation sector is vital in meeting the needs of the activities carried out by the community. all aspects of the nation's life depend on the transportation sector. transportation functions as a driver, supporter, and driver of economic growth. currently, proper and effective transportation has become a very important part of everyday life. One aspect of transportation that concerns the lives of many people is public transportation. Until now, land transportation is still the most widely used mode of society in traveling, buses are still a favorite mode of society in activities, because buses can provide flexible transportation services that are not owned by other modes.

Transjatim is the beginning of the operation of the Road-Based Mass Transportation Program in East Java Province on Corridor I route Sidoarjo - Surabaya - Gresik which is included in the Gerbangkertasusila Agglomeration Area. It is expected that with Transjatim Corridor I route Sidoarjo - Surabaya - Gresik as a Pioneer program that supports all aspects in East Java, Providing services that are safe, fast, comfortable, and affordable to people whose mobility is increasing, Reducing Exhaust Emissions or Global warming in East Java, Reducing Road Traffic Accident Rates in East Java, Unraveling Urban Area Congestion in East Java, and able to boost the movement of people and mobility of people so that Economic growth in East Java grows quickly.

In the growth of a city is inseparable from the role of the government, the Government is one of the owners of power which will ultimately form a regime that is able to influence various political decisions and policy directions that will be taken by the Government to encourage economic growth by turning on industrial

machines in the region so that new centers of economic growth can be created, which in turn can trigger a faster economic turnover and make the income of the community increase. One of the indicators that can be seen related to the growth of a city is how they are able to mobilize industrial machines in their area so that they can open up land for capital owners to invest and encourage faster growth in their area. Transportation is one of the new commodities that can be managed in obtaining sources of power and economic benefits so as to bring in revenue and open up new opportunities for capital owners to invest.

An important determining factor in any financial investment is profitability (Azim et al., 2020). The methods used to ensure this are the Net Present Value (NPV) method and the Internal Rate of Return (IRR) method. The NPV method is basically a mathematical model used to calculate the present value of the expected cash flows of an investment, discounted at a certain rate, minus the initial investment (Astuti et al., 2017). Unlike other measures of investment profitability, the NPV rule takes into account the time value of money. The Internal Rate of Return (IRR) method is another investment valuation tool that is often compared to NPV. IRR is the discount rate that results in a net present value of zero. The IRR method is that an investment is considered profitable if the IRR is higher than the stated discount rate or cost of capital. If the IRR is lower than the discount rate, it is a sign that the investment may not generate sufficient returns (Aditrio & Oetomo, 2023).

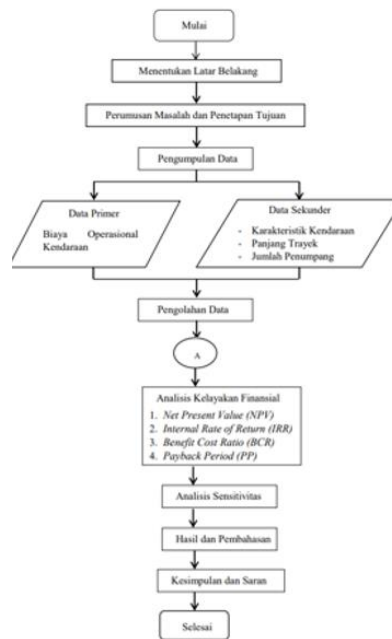
In such cases, using a combination of IRR and NPV as well as other reliable financial rules, such as Profitability Index and Discounted Repayment Period, can lead to a robust decision-making process. Despite their differences, both rules are integral to the structure of financial investment analysis, and their strategic use can make a big difference to the projected profitability of your investment. It is important to know these tools, understand their strengths and limitations, and learn when to apply them appropriately. Investment in the transportation sector is one way to support industries that provide services or products related to the movement of people or goods. Based on the recapitulation of passengers and revenue Transjati corridor I in 2023 obtained an average load factor of 120% with an average passenger of 5-6 thousand passengers per day, this is the reason for the addition of a fleet with Luxury services, it is necessary to conduct an in-depth study of financial feasibility. Therefore, researchers conducted a study with the title "Financial Feasibility Analysis of Transjati Corridor I Luxury route Sidoarjo-Surabaya-Gresik" (Priyandono et al., 2021). This study aims to analyze the level of financial feasibility of investment in Transjati Luxury corridor I buses (Sarimi et al., 2021; Suthanaya & Lestari, 2016; Suweda & Putra, 2019).

The feasibility of investment can be obtained by comparing the variable income and expenditure of Transjati bus corridor I Luxury route Sidoarjo-Surabaya-Gresik every year (Tapa, Ariawan, et al., 2022). The feasibility level analysis was carried out using the Net Present Value (NPV), Internal Rate Return (IRR), Benefit Cost Ratio (BCR), and Payback Period (PP) methods, in this study a Sensitivity analysis was also carried out. With sensitivity analysis, it will provide an overview of the extent to which the consequences of changes in these parameters can affect as a prevention so that there are no losses in the project to be planned (Tenawaheng, Utomo, and Wiguna 2021). From this research, it is expected that the development of Transjati services can be carried out.

The study aims to assess the financial feasibility of investing in luxury buses for the Transjati Corridor I route by comparing income and expenses using NPV, BCR, IRR, and PP methods, as well as conducting a sensitivity analysis to determine the impact of discount rate changes on investment viability.

2. Methodology

2.1. Research Flow Chart



Source: Processed by Researcher, 2024

Figure 1. Research Flow Chart

2.2. Research Subjects

The subject of this research is Transjatim Corridor I Luxury Sidoarjo-Surabaya-Gresik Route whose office is located at Jl. A. Yani No. 268 Surabaya. Transjatim Corridor I Luxury Sidoarjo-Surabaya-Gresik Route is managed by the East Java Provincial Government through the East Java Provincial Transportation Office and for which Transjatim Corridor I was inaugurated on August 19, 2022 with 20 operational fleet units and 2 spare fleet units. The selection of this study was based on several aspects, since the launch of Transjatim Corridor I until the end of 2022 the load factor reached 105%. And the load factor in 2023 starting from January to December reached 120% with an average of 5-6 thousand passengers per day, of course this can be a consideration related to policy making in development, especially in terms of investment (Waruwu, 2023).

2.3. Research Object

The objects of this research are as follows:

- Various kinds of costs that can affect the feasibility of investment, including investment costs, operational / management costs and income from the operation of Transjatim Corridor I Luxury Sidoarjo-Surabaya-Gresik Route.
- Sensitivity of factors affecting investment in Transjatim Corridor I Luxury Sidoarjo-Surabaya-Gresik Route, namely service tariffs, operating costs and subsidies from local governments.

2.4. Research Instruments

The instruments used in this research are interview guidelines and observation sheets or observation guides as data collection instruments.

2.5. Data Collection Procedure

In this study, data collection was obtained from interviews with parties involved in the operation of Transjatim Corridor I on the Sidoarjo-Surabaya-Gresik route, then documented as data used in the process of conducting research later.

2.6. Primary Data

The data collection process in supporting this research was obtained by interviewing the Transjatim Corridor I bus operator company regarding component costs and the price of each component used in vehicle operations.

2.7. Secondary Data

Secondary data collection was obtained from relevant agencies, namely the East Java Provincial Transportation Office, with the following data details:

- a. Vehicle characteristics
- b. Route length
- c. Number of passengers

2.8. Data Analysis Technique

Data analysis is the process of systematically searching and compiling data obtained from interviews, field observations, information documentation and literature studies, then sorting according to what the research will do.

2.9. Investment Evaluation Analysis

From the results of primary and secondary data collection related to the investment feasibility factors of the Transjatim Corridor I Luxury bus route Sidoarjo-Surabaya-Gresik, then a sensitivity analysis is carried out so that it can be known changes in factors that are most influential in the success or failure during the implementation of the Transjatim Corridor I Luxury bus investment Sidoarjo-Surabaya-Gresik route (Abimanyu, 2018; Arsyad et al., 2016). Sensitivity analysis takes into account the effect of changes in each factor reviewed on the performance of investment revenue determined by indicators of Net Present Value (NPV), Internal Rate of Return (IRR), Benefit Cost Ratio (BCR) and Payback Period (PP) (Yan & Zhang, 2022).

2.10. Sensitivity Analysis

The parameter values that have been calculated in the financial feasibility analysis certainly cannot be separated from the error factor in both predictions and external factors that cannot be predicted in advance (Oktavia, 2021). So the realized value of benefits and costs may be greater or less than what has been estimated, resulting in changes to the feasibility analysis that has been carried out (Meilasari et al., 2023). Therefore, after the investment evaluation is carried out using the method determined in the previous stage, a sensitivity analysis is then carried out by calculating the effect of changes in each parameter reviewed on the performance of investment revenue. The sensitivity parameters reviewed in this analysis are as follows:

- a. Transportation service fare
- b. Transjatim management fee
- c. Discount Rate

3. Results and Discussion

3.1. Overview of Transjatim

Transjatim is a public transportation service system in the form of transit buses on an intercity and/or district network within the scope of an urban agglomeration area in East Java such as Gerbangkertosusila (Mangara, 2023). This service adopts a service purchase scheme (buy the service) as well as the scheme in the Teman Bus service. The service was initiated by the East Java Provincial Transportation Office. Corridor I on the Sidoarjo-Surabaya-Gresik route will be the first corridor to be operated since August 19, 2022. A total of 22 units of medium buses with a high-deck design are used to serve the 72 km route. The corridor will be connected to many other modes of public transportation such as regular city buses, Suroboyo Bus, Trans Semanggi Suroboyo and Wirawiri Suroboyo feeder.

Based on the recapitulation of passengers and revenue Transjatim corridor I in 2023 obtained an average load factor of 120% with an average passenger 5-6 thousand passengers per day, this is the reason for the

addition of a fleet with Luxury service. The difference between Transjatin buses operating today and those that will be luxury is the comfort of passengers. At this time the passenger capacity on the Transjatin bus is 20 sitting and 14 standing, but in the luxury service there are no standing passengers, all sitting.

3.2. Research Results

The results of the investment evaluation of Transjatin Bus corridor I Luxury against the predetermined parameters are presented in the following table:

Table 1. Transjatin Luxury Investment Evaluation Results

Alternative Service Tariff	NPV (Rp)	IRR	BCR	PP	Result
Alternative 1	5.204.972.631	19,42%	1,30	4	Worth
Alternative 2	2.466.479.592	12,54%	1,19	5	Worth
Alternative 3	640.817.566	7,74%	1,11	6	Worth

Source: Processed by Researcher, 2024

Based on the investment evaluation results presented in table 1, it can be concluded that:

- Alternative scheme 1 produces an NPV value of Rp. 5,204,972,631, an IRR value of 19.42%, a BCR value of 1.30 and a PP value of 4 years, meaning that the investment is feasible to implement;
- Alternative scheme 2 produces an NPV value of Rp. 2,466,479,592, an IRR value of 12.54%, a BCR value of 1.19 and a PP value of 5 years, meaning that the investment is feasible to implement;
- Alternative scheme 3 produces an NPV value of Rp. 640,817,566, an IRR value of 7.74%, a BCR value of 1.11 and a PP value of 6 years, meaning that the investment is feasible to be implemented.

Based on the results of the investment evaluation that has been done, it shows that the Transjatin Bus corridor I Luxury is feasible to invest. However, it is necessary to anticipate if the scheme is forced to run, for that in order to prepare the strategy, it is necessary to conduct a sensitivity analysis. Sensitivity analysis is used to determine how much the components of the investment that have been set before can be affected due to fluctuations in conditions throughout the life of the investment. This is very useful for project owners in order to establish and formulate policies by considering fluctuations in conditions for the continuity of the Transjatin Bus investment corridor I Luxury to be carried out. In this study, sensitivity analysis was reviewed based on Net Present Value with an increase in Discount Rate. Sensitivity analysis was conducted using the effect of a possible increase in Discount Rate (DR) on the value of Net Present Value (NPV) (Yusup, 2018). The calculation analysis is done tableatically using a trial and error system as follows:

a. Sensitivity Analysis of The Service Tariff of Rp. 17,500

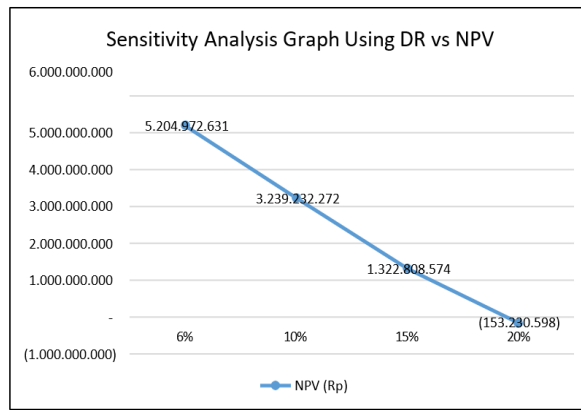
Sensitivity analysis of the service tariff of Rp. 17,500 can be seen in the following table:

Table 2. Sensitivity Analysis of Service Tariff Rp. 17,500

DR Level	NPV (Rp)
6%	5.204.972.631
10%	3.239.232.272
15%	1.322.808.574
20%	- 153.230.598

Source: Processed by Researcher, 2024

The following can be described the sensitivity of the increase in Discount Rate to the value of Net Present Value to changes in the amount of management costs of Transjatin Bus corridor I Luxury can be presented in the following graph:



Source: Processed by Researcher, 2024

Figure 2. Tariff Sensitivity Analysis Chart Rp. 17,500

Based on the results of the sensitivity of the Transjatim Bus corridor I Luxury route Sidoarjo-Surabaya-Gresik, the results show that it is sensitive to changes because if the Discount Rate is 19.42% it produces a Net Present Value of 0, meaning that the results of the sensitivity analysis show that this investment is also financially feasible and sensitive to changes (Tapa, Kumara, et al., 2022).

b. Sensitivity analysis of the service tariff of Rp. 16,000

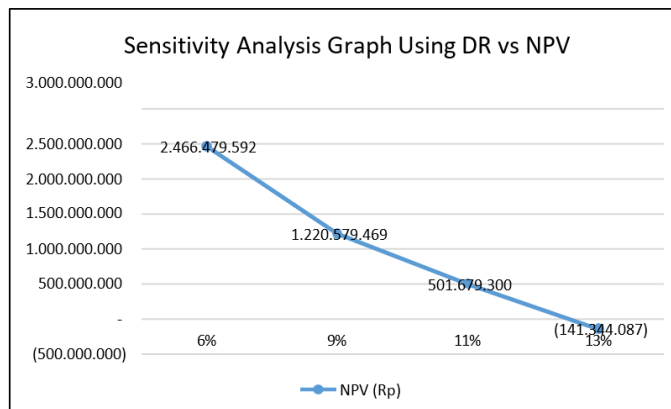
Sensitivity analysis of the service tariff of Rp. 16,000 can be seen in the following table:

Table 3. Sensitivity Analysis of Service Tariff Rp. 16,000

DR Level	NPV (Rp)
6%	2.466.479.592
9%	1.220.579.469
11%	501.679.300
13%	- 141.344.087

Source: Processed by Researcher, 2024

The following can be described the sensitivity of the increase in Discount Rate to the value of Net Present Value to changes in the amount of management costs of Transjatim Bus corridor I Luxury can be presented in the following graph:



Source: Processed by Researcher, 2024

Figure 3. Tariff Sensitivity Analysis Chart Rp. 16,000

Based on the results of the sensitivity of the Transjatim Bus corridor I Luxury route Sidoarjo-Surabaya-Gresik, the results show that it is sensitive to changes because if the Discount Rate is 12.55% it produces a Net Present Value of 0, meaning that the results of the sensitivity analysis show that this investment is also financially feasible and sensitive to changes.

c. Sensitivity analysis of the service tariff of Rp. 15,000

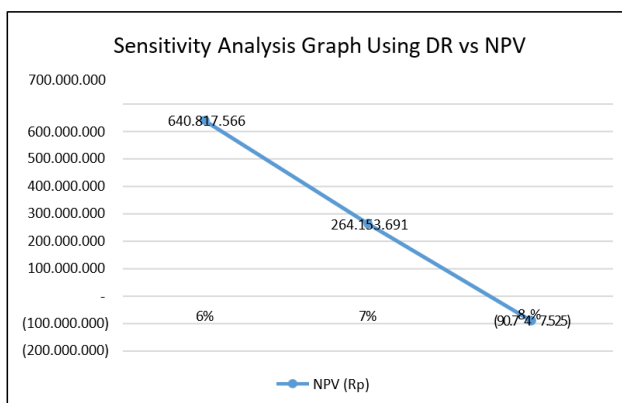
Sensitivity analysis of the service tariff of Rp. 15,000 can be seen in the following table:

Table 4. Sensitivity Analysis of The Service Tariff of IDR 15,000

DR Level	NPV (Rp)
6%	640.817.566
7%	264.153.691
8%	- 90.747.525
9%	- 425.397.427

Source: Processed by Researcher, 2024

The following can be described the sensitivity of the increase in Discount Rate to the value of Net Present Value to changes in the amount of management costs of Transjatim Bus corridor I Luxury can be presented in the following graph:



Source: Processed by Researcher, 2024

Figure 4. Tariff Sensitivity Analysis Chart Rp. 15,000

Based on the results of the sensitivity of the Transjatim Bus corridor I Luxury route Sidoarjo-Surabaya-Gresik, the results show that it is sensitive to changes because if the Discount Rate is 7.74% it produces a Net Present Value of 0, meaning that the results of the sensitivity analysis show that this investment is also financially feasible and sensitive to changes.

4. Conclusion

Based on the results of the sensitivity analysis using the effect of a possible increase in Discount Rate (DR) on the value of Net Present Value (NPV), there are several conclusions that can be drawn. First, Alternative 1 is feasible to implement but will be very sensitive to an increase in DR. If the DR reaches 19.42%, the NPV value will be 0. Second, Alternative 2 is also feasible to implement, but will be sensitive to an increase in DR. At a DR level of 12.55%, the NPV value will be 0. Third, Alternative 3 is feasible to implement but will be sensitive to an increase in DR. If the DR reaches 7.74%, the NPV value will be 0.

5. References

Abimanyu, A. (2018). *Analisis Investasi Pada Proyek Pembangunan Jalan Tol Pasuruan-Probolinggo*. Untag Surabaya.

Aditrio, M. S., & Oetomo, W. (2023). Analisis Investasi Pembangunan Proyek Rumah Sakit Al-Arafah Kota Kediri. *Jurnal Ilmiah Teknik Dan Manajemen Industri*, 3(1), 802–814.

Arsyad, N., Purnawan, P., & Kurniati, T. (2016). Analisa Kelayakan Investasi Angkutan Umum (Angkot) Kota Pariaman. *Jurnal Rekayasa Sipil*, 12(2), 85–94.

Astuti, M., Handayani, F. S., & Sugiyarto, S. (2017). Studi Kelayakan Investasi Proyek Pembangunan Tower 5 Karawaci Tangerang Selatan. *Matriks Teknik Sipil*, 5(3).

- Azim, R., Taufik, H., & Djuniati, S. (2020). Analisis Kelayakan Finansial Bus Trans Metro Pekanbaru Koridor II. *SAINSTEK*, 8(1), 24–28.
- Mangara, T. H. (2023). Pengaruh Optimalisasi Rute terhadap Kelayakan Finansial Angkutan Umum. *Jurnal Ekonomi-Qu*, 13(1), 1–12.
- Meilasari, S. K., Oetomo, W., & Witjaksana, B. (2023). Value Engineering Analysis On The Architectural Work Of The Arjosari Malang Type A Terminal Revitalization Project. *Jurnal Ekonomi Teknologi Dan Bisnis (JETBIS)*, 2(8), 556–570.
- Oktavia, N. (2021). Analisis Kelayakan Finansial Pengoperasian Transportasi Pariwisata: Studi Kasus: CV. Aishah Perdana Travel. *JURESI: JURNAL REKAYASA SIPIL*, 1(1), 38–43.
- Priyandono, T. R., Herijanto, W., & Kartika, A. A. G. (2021). Analisis Kelayakan Dari Segi Ekonomi dan Finansial Teman Bus dengan Program Buy the Service Rute Terminal Purabaya-Kenjeran. *Jurnal Teknik ITS*, 10(2), E273–E280.
- Sarimi, N. W., Tuloli, M. Y., & Kadir, Y. (2021). Analisis Kelayakan Finansial Brt (Bus Rapid Transit) Koridor Ii Rute Kota Gorontalo-Limboto. *Composite Journal*, 1(2), 73–80.
- Suthanaya, P. A., & Lestari, D. A. (2016). Kajian Kelayakan Finansial Pengembangan Angkutan Wisata Di Kota Denpasar.
- Suweda, I. W., & Putra, I. (2019). Analisis Kelayakan Finansial Angkutan Tirtayatra Bali-Jawa Timur. *Jurnal Spektran*, 7(1), 1–8.
- Tapa, I. G. F. S., Ariawan, P., & Nuraga, I. K. (2022). Analisis Kelayakan Finansial dan Kerugian Akibat Adanya Pandemi Covid-19 pada Angkutan Wisata dan Angkutan Antar Jemput. *Jurnal Ilmiah Telsinas Elektro, Sipil Dan Teknik Informasi*, 5(1), 54–64.
- Tapa, I. G. F. S., Kumara, I. N. I., Sutapa, I. K., & Wijaya, I. K. S. (2022). Analisis Kelayakan Finansial Pengoperasian Bus Trans Metro Dewata di Provinsi Bali. *Jurnal Ilmiah Poli Rekayasa*, 18(1), 7–14.
- Waruwu, M. (2023). Pendekatan penelitian pendidikan: metode penelitian kualitatif, metode penelitian kuantitatif dan metode penelitian kombinasi (Mixed Method). *Jurnal Pendidikan Tambusai*, 7(1), 2896–2910.
- Yan, R., & Zhang, Y. (2022). The Introduction of NPV and IRR. *2022 7th International Conference on Financial Innovation and Economic Development (ICFIED 2022)*, 1472–1476.
- Yusup, F. (2018). Uji Validitas dan Reliabilitas Instrumen Penelitian Kuantitatif. *Jurnal Tarbiyah : Jurnal Ilmiah Kependidikan*. <https://doi.org/10.18592/tarbiyah.v7i1.2100>

Copyrights

Copyright for this article is retained by the author(s), with first publication rights granted to the journal.

This is an open-access article distributed under the terms and conditions of the Creative Commons Attribution license (<http://creativecommons.org/licenses/by/4.0/>).