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RESEARCH ARTICLE

Optimal Financing Structure For A Coal Hauling Road Project: A Comparative Analysis Of Corporate Finance And Project Finance At Pt Atlas Resources Tbk

Vinsensius Paul Goodman [1)], Ana Noveria [2)]

Abstract

The thesis discusses the strategic financing dilemma of the H3 Segment Hauling Road Project at PT Atlas Resources Tbk, which is considered vital to eliminate dependence on third-party roads. The issue lies in deciding between funding the project using internal resources under Corporate Finance or using external resources through the implementation of Project Finance with a Build-Operate-Transfer (BOT) scheme in a private-to-private partnership. Accordingly, this research applies the financial valuation and risk analysis, and then compares the results to determine which scenario is better at providing a superior risk-adjusted value to the company. The study applies a quantitative method, with capital budgeting techniques as the main analytical tool. The analysis is made on the foundation of Discounted Cash Flow (DCF) valuation, which is complemented by sensitivity analysis, scenario analysis, and Monte Carlo simulation. The results confirm the financial feasibility of both scenarios. Corporate Finance scenario gives a higher Net Present Value (NPV) of Rp 1,243 billion and an Internal Rate of Return (IRR) of 48,33%. On the other side, Project Finance (BOT) scenario offers a slightly lower NPV of Rp 1,183 billion, but provides risk isolation by managing construction and operational risks to the SPV. The research concludes that the Project Finance (BOT) system is the best option. The difference in financial value (about 4,8%) is considered as a trade-off for the benefits of risk segregation at the project level, which enhances the parent company's financial flexibility and limits its exposure to project-specific risks. It is therefore recommended that PT Atlas Resources Tbk proceed with the BOT model as there should be a properly organized concession agreement on transfer of the assets.

Keyword: Project Finance, Corporate Finance, Build-Operate-Transfer, Financing Structure, Risk Analysis.

Introduction

The coal mining industry of Indonesia is a capital-intensive industry that plays a strategic role in boosting the growth of the nation's economy. Nevertheless, the industry is challenged by issues that involve global commodity price volatility and volatility in logistics costs, especially in transport and coal hauling activities that are extremely sensitive to infrastructure quality and distance to ports (Chopra & Meindl, 2020; Humphreys, 2019). In the case of mining companies like PT Atlas Resources Tbk, vertical integration through the direct operation of coal hauling and port services requires a massive capital investment. Historically, PT Atlas has navigated this capital requirement by working with other companies to implement project financing under a Build Operate Transfer (BOT) structure under a private-to-private arrangement. In this scheme, the infrastructure assets were developed and operated by a Special Purpose Vehicle (SPV) and were transferred back to the company at the end of the concession period (Yescombe, 2014). For the upcoming project, known as Project H3, the company is considering to reapply this established BOT scheme. However, the management also wants to evaluate other alternatives, specifically corporate finance, to identify whether pursuing a self-funded approach is a more optimal solution. This situation is related to an academic debate on the most optimal financing choice for large scale infrastructure in emerging markets such as Indonesia, namely, whether it should use project finance or corporate finance. Project finance and corporate finance are fundamentally different in the way that they allocate risks, leverage and structure financing as described by Esty (2004). Project finance allows for ring fencing of project risks because of special purpose vehicles that are based on project cash flows and helps limit potential exposure of sponsors and allows for greater leverage based on off balance sheet facilities. This method particularly is good for capital-intensive and risky projects, but is also linked to more structural complexity and transaction costs. By contrast, corporate finance is a practice that concentrates risk within the company and finances investments on the balance sheet using the group's credit standing, which may offer cheaper financing and more operational flexibility, but puts all corporate assets at risk (Esty, 2004; Gatti, 2024; Yescombe, 2014). The financial feasibility of Atlas's hauling road investment therefore depends on estimating its intrinsic value using discounted cash flow analysis, and its associated risk through risk analysis (Damodaran, 2025). While the technical and social aspects of the project have been covered, the business issue now lies in choosing a financing scheme that matches the company's strategic objectives and risk profile. This case study will address this dilemma, contributing to Atlas's financial strategic decision-making and providing recommendation into capital structure decisions in resource-based industries.

Method

The analytical framework applys a comparative Discounted Cash Flow (DCF) methodology, and supplemented by risk assessment tools. This section provides the details of the formulas, valuation logic, and risk analysis procedures used to compare the two financing scenarios.

Discount Rate Determination (WACC)

This study needs a discount rate which properly reflects the risk profile of the cash flows being valued. The Weighted Average Cost of Capital (WACC) is calculated using the standard formula (Damodaran, 2025).

$$WACC = (K_e \times W_e) + (K_d (1-t) \times W_d) \quad 1)$$

where:

K_e (Cost of Equity) = The expected rate of return for shareholders, estimated using the CAPM

K_d (Cost of Debt) = The pre-tax cost of borrowing for the firm.

Institut Teknologi Bandung

*) corresponding author

Vinsensius Paul Goodman
Email: vinsensiuspg@gmail.com

We & Wd (Weights) = The ratio of equity and debt in the capital structure, based on market value.

t (Tax Rate) = The statutory corporate income tax rate, to captures the tax shield benefit.

To ensure a fair comparison between the two financing structures, two distinct discount rates are calculated using this approach.

Corporate WACC

Applied to the Corporate Finance scenario. This rate utilizes the consolidated capital structure and beta of PT Atlas Resources Tbk, reflecting the diversified risk profile of the parent entity.

Project WACC

Applied to the SPV's standalone leverage and non-recourse nature as a single-asset company. In project finance valuation, this discount rate represents the project's cost of capital required to fund the project while reflecting the higher leverage typical of SPV structures (Gatti, 2024).

Financial Projection and Valuation

The financial models calculate Net Present Value (NPV) for each of the scenarios, following these two principles.

Incremental Cash Flow Principle

Consistent with the conceptual framework, the cash flows for valuation are defined on an incremental basis. In line with the capital budgeting literature discussed in Chapter II, only cash flows that change as a direct result of the investment decision are considered relevant for NPV calculation. The analysis therefore compares the firm's projected cash flows if Project H3 is implemented with the cash flows under the status quo in which H3 segment is not built and PT Atlas Resources Tbk continues to use the existing third-party road. Using the principle outlined by Damodaran (2025), the incremental cash flow is measured by the following formula.

$$CF_{Incremental} = CF_{WithProject} - CF_{WithoutProject} \quad 2)$$

where:

$CF_{Incremental}$ = The relevant net cash flow attributable specifically to the investment decision, used for NPV calculation.

$CF_{WithProject}$ = Projected consolidated cash flows assuming the H3 Hauling Road is constructed and operational.

$CF_{WithoutProject}$ = Baseline cash flows (Status Quo) assuming continued reliance on the existing hauling road.

Modeling Approach by Scenario

Separate financial projections are developed for each financing structure to ensure an accurate comparison.

Corporate Finance Scenario

The project is integrated into PT MMJ's operations. Free Cash Flow to Firm (FCFF) is projected and discounted at the Group WACC to reflect consolidated risk exposure at PT Atlas level.

Project Finance (BOT) Scenario

In the project finance scenario, the H3 Segment Hauling Road Project is developed and operated by a Special Purpose Vehicle (SPV) under a private-to-private BOT concession. The analysis is conducted in two stages.

Stage 1 SPV Bankability Analysis

A standalone project finance model is first built at the SPV level, with its own capital structure, cost of debt, and project-level WACC. In this model, the SPV's share of the road usage fee is treated as a decision variable. It is iteratively solved to achieve:

- the minimum DSCR covenant required by lenders (typically ≥ 1,20×), and
- the target equity IRR required by investors.

DSCR is defined as cash flow available for debt service divided by total debt service, is the key covenant used by lenders to determine the maximum amount of project debt that can be raised and to assess whether the SPV is "bankable" under non-recourse financing (Gatti, 2024).

Stage 2 Sponsor Incremental Valuation

The road usage fee structure that makes the SPV bankable is then taken as an input in PT Atlas Resources Tbk's incremental cash flow model. Using this fee, the BOT scenario is valued from the sponsor's perspective by comparing cash flows with and without Project H3 and discounting them at the sponsor discount rate. This ensures that the project finance scenario is evaluated on the same perspective as the corporate finance scenario, in terms of value creation for PT Atlas Resources Tbk. Finally, for both financing scenarios, Net Present Value (NPV), is calculated based on the discounted cash flow model defined by Damodaran (2025) as follows:

$$NPV = \sum_{t=1}^{n} \frac{FCFt}{(1+r)^t} - Initial\ Investment \quad 3)$$

where:

FCF_t = Free Cash Flow at time *t*

r = Discount Rate (WACC)

n = Number of periods

Risk Analysis Methodology

According to the complexity and high uncertainty in long-term infrastructure projects, the Discounted Cash Flow (DCF) analysis in this thesis is supplemented with a three-layer quantitative risk assessment framework. This multi step approach is consistent with current best practices for dealing with dynamic uncertainties and interactions among input variables in project evaluation (Kodukula & Papudesu, 2006; Borgonovo & Plischke, 2016).

Sensitivity Analysis

Sensitivity analysis is used to quantify the impact of changes in individual critical input variables, such as capital expenditure (CAPEX), volume of production and operational expenditure (OPEX) on the PT MMJ's valuation, typically measured by the Net Present Value (NPV). This one-at-a-time (OAT) approach simply requires the flexing of one variable over a predetermined and plausible range (e.g. ± 10% or 20%) while keeping other variables constant, thereby isolating its marginal effect. The results will show the ranking of the selected variables based on their influence to the NPV. This analysis is very useful for identifying the most important value drivers and for prioritizing management focus and risk mitigation efforts (Saltelli et al., 2019; Borgonovo & Plischke, 2016).

Scenario Analysis

Scenario analysis goes deeper, not only testing one variable, but by modeling coherent and internally consistent narratives about plausible states of the future of the world. This method is used to determine project resilience by simultaneously varying several input variables based on a specified storyline (Schoemaker, 1995). For this project, three different scenarios are created:

1. Base Case, represents the most likely condition, based on the current data and assumptions.
2. Best Case, represents the favorable condition, such as higher volume of production, lower operating costs, or beneficial market conditions.
3. Worst Case, represents the adverse condition, such as lower volume of production, higher operating cost or unfavourable market conditions.

This approach gives useful insight and information on how PT MMJ's business may perform under systematically different economic and operational environments and hence gives a more holistic overview of possible value ranges than sensitivity analysis alone.

Monte Carlo Simulation

Monte Carlo simulation is used to model the combination of the uncertainty of many inputs in a probabilistic way. Following the statistical principles outlined by Robert and Casella (2013), the simulation creates repeated random sampling from specific probability distributions to create a comprehensive distribution of possible NPV outcomes. Selected variables (for example, volume of production, operating cost) are given probability distributions and the model is run for a large number of iterations (e.g., 10.000). Each iteration takes some random values from the given distributions

and generates an NPV outcome. The resulting distribution of NPV gives a quantitative picture of the probability of different value outcomes, and makes it possible to calculate risk measures such as the probability of having a negative NPV and Value at Risk (VaR) in each financing scenario. In line with Selto (2020), this approach addresses the limitation of sensitivity and scenario analysis, which are only able to test a few separate what-if cases. Monte Carlo performs the analysis by quantifying how likely it is that key financial indicators in this study for example, NPV, under each financing scenario will fall below critical thresholds, so that downside risk for the H3 Hauling Road Project can be viewed more clearly.

Results and Discussion

Acomparative financial and risk assessment shows different results for each financing scenario. The Corporate Finance structure has a higher Net Present Value (NPV) since it keeps all the project cash flows, yet fully exposes PT Atlas Resources Tbk's balance sheet to associated risks. Conversely, under the Project Finance (BOT) model, the NPV is somewhat lower, but this model effectively separates project risks in a Special Purpose Vehicle (SPV). In addition, risk analysis shows strong viability of the two options under stress. This chapter summarizes these findings, analyzes the strategic tradeoff between value capture and risk containment, and makes the optimal financing recommendation.

Analysis

This section evaluates the incremental value by comparing the baseline "Without Project" status quo with the "With Project" scenario. The findings are then interpreted into statements that guide the selection of the optimal financing scenario. Ultimately, this analysis determines which financing structure offers the best risk-adjusted value while remaining aligned with the company's long-term strategic objectives.

Operational and Financial Input Parameters

The financial models for Project H3 are built based on a set of operational and financial assumptions taken from PT Musi Mitra Jaya's internal records and official disclosures of PT Atlas Resources Tbk. These parameters are required to calculate incremental cash flows that define the value of the project.

PT MMJ Hauling Road Operational and Project H3

PT MMJ operates a hauling road with total length 128 km that consist of two segments, H1 and H2. Currently, Project H3 is designed as a replacement for the H2 road segment, which is owned by a third party, PT BPP. By relocating the hauling road entirely within PT MMJ's concession area, this project aims to eliminate external dependencies and financial leakages while at the same time reducing opportunity loss. As presented in Table IV.1, the construction of the H3 segment shorten the total hauling distance to 112 km, and the resulting improvement in road design and operating conditions is reflected in an operational expenditure (Opex) efficiency target of 14,3%.

Table 1 Hauling Road configuration with and without H3

Component	Without H3 Hauling Road	With H3 Hauling Road
Hauling Road	H1 Segment 60 km H2 Segment 68 km Total 128 km	H1 Segment 60 km H3 Segment 52 km Total 112 km
OPEX Efficiency	Not Applied	14,3%
Road Usage Fee to PT BPP	Applied	Not Applied
Production Achievement Target	85%	100%

Target achievement is also projected to increase by 15% following the improvement in road quality from H2 to H3. Accordingly, the annual production target, which has previously been capped at a maximum of 12.500.000 ton, is projected to increase as shown in Table IV.2.

Table 2 Projected hauled volume with and without H3

Year	Without H3 Hauling Road (ton)	With H3 Hauling Road (ton)
1	12.500.000	12.500.000
2	12.500.000	12.500.000
3	12.500.000	17.500.000
4	12.500.000	20.000.000
5	12.500.000	24.000.000
6	12.500.000	24.000.000
7	12.500.000	20.000.000
8	12.500.000	20.000.000
9	12.500.000	16.500.000
10	12.500.000	12.500.000

The operational expenditures and fee structures detailed in Table IV.3 serve as the primary financial inputs for constructing the cash flow model in both financing scenarios. These parameters define the baseline costs and the revenue drivers used in the incremental "with H3 versus without H3" analysis.

Table 1 Cost and tariff parameters for the existing MMJ haulin road

Component	Rp
Annual OPEX	Rp 277.243.521
Road Usage Fee paid to PT BPP H2 Road Fee (if <= 400.000 ton/month) H2 Road Fee (if > 400.000 ton/month)	 Rp 16 Rp 8
PT MMJ Road Usage Fee per Ton	Rp 48

Project H3 is planned for completion over a two-year construction period, with a total investment requirement of Rp 800.000.000 These investment costs, alongside the operational parameters mentioned above, form the foundation for evaluating the Net Present Value (NPV) and Internal Rate of Return (IRR) for the Corporate Finance and Project Finance structures.

Valuation Parameters and Cost of Capital (WACC)

The discounted cash flow comparison between the Corporate Finance and Project Finance structures requires the use of discount rates that are consistent with the financing logic of each scenario. The way WACC is derived is differentiated between the consolidated corporate case and the project-level SPV so that each reflects its own risk profile and financing structure, in line with the theoretical discussion in the previous chapter.

Corporate Finance Scenario

In the Corporate Finance scenario, Project H3 is treated as an on-balance-sheet investment of PT Atlas Resources Tbk. The

discount rate therefore follows the conventional WACC framework as set out by Damodaran (2025), where:

- The cost of equity is estimated using Capital Asset Pricing Model (CAPM), based on the risk-free rate, the equity risk premium, and a sector unlevered beta that is relevered using the firm's market D/E ratio.
- The cost of debt reflects the company's observed borrowing cost.
- The weights are based on the market values of debt and equity, adjusted for the tax shield.

Using these inputs, the corporate WACC for PT Atlas is calculated at 14,35%. In the corporate finance model, this WACC will be used to discount the incremental cash flows.

Table 2 WACC Calculation – Corporate Finance Scenario

Variable	Value	Source / Methodology
Risk-Free Rate (R_f)	6,12%	IDX (10-Year Indonesia Government Bond Yield, Dec 2025)
Equity Risk Premium (ERP)	7,03%	Damodaran – Indonesia data (July 2025)
Unlevered Beta (β_u)	1,10	Damodaran (Coal & Related Energy)
Tax Rate (t)	22%	Indonesian corporate income tax law (UU HPP)
Market D/E Ratio	1,87	Calculated from PT Atlas Resources Annual Report 2024 (Debt USD 93.7M divided by Market Equity USD 50.1M).
Pre-tax Cost of Debt (K*d*)	11,00%	PT Atlas Resources Annual Report 2024
WACC	**14,35%**	

Project Finance Scenario

In the Project Finance scenario, Project H3 is developed under a BOT structure by using a Special Purpose Vehicle (SPV). Furthermore, SPVs are typically private and non listed entities, thus, they can not provide market price history which required to estimate the beta, as highlighted by Gatti (2024). Instead, the valuation is focused on contracted project cash flows, high leverage, and return requirements of project investors.

Table 3 WACC Calculation – Project Finance Scenario

Variable	Value	Source / Methodology
Debt Weight ($W_{d,p}$)	70,00%	Esty (2004) - Standard Project Finance structure.
Equity Weight ($W_{e,p}$)	30,00%	Esty (2004) - Standard Project Finance structure.
Target Equity IRR / Cost of Equity ($K_{e,p}$)	16,90%	EDHECinfra (2018) - Benchmark for unlisted private infrastructure equity.
Pre-tax Cost of Debt ($K_{d,p}$)	13,73%	Calculated. Sum of Base Rate 8,49% (OJK) and Risk Spread 5,24% due to rating B1/B+ (Damodaran)
Tax Rate (t)	22%	Indonesian corporate income tax law (UU HPP)
WACC$_{,p}$	**12,57%**	

Following the methodology proposed by Gatti (2024) and the high-leverage logic described by Esty (2004):

a. The cost of equity ($K_{e,p}$) is defined to be the target equity IRR demanded by the infrastructure investors.
b. The capital structure is fixed at 70% debt and 30% equity, which is high leverage norms of project finance.
c. The cost of debt ($K_{d,p}$) is obtained using a synthetic rating method (base rate + project spread) giving us 13,73%.

Given the inputs specified in Table IV.5, the Project Finance WACC comes out to be 12.57%. The detailed step-by-step WACC calculation for each finance scenario is provided in Appendix A.

Project H3 Feasibility

Before comparing the two financing structures, it is needed to confirm the economic feasibility of Project H3 first. This step ensures that the project creates intrinsic value from an operational perspective, independent of how it is financed. To accommodate that objective, the study calculates the Free Cash Flow to the Firm (FCFF). The FCFF itself represents the cash generated by Project H3's operations after covering all the operating expenses and taxes, but before any payments to debt or equity holders. Since the project is a replacement, the analysis focuses on the incremental differences in revenues and costs between the "With Project" and "Without Project" scenarios. The incremental itself comes from these three primary value generators:

1. The bottlenecks in H2 segment hauling road are removed and the production is able to rise from 12,5 million tons to a peak of 24,0 million tons per year.
2. PT MMJ's hauling road operating efficiency of 14,3% reduces the annual OPEX.
3. Cost avoidance by eliminating the road usage fee which previously paid to PT BPP for the usage of the H2 segment.

Collectively, these factors address the critical gaps of financial leakage and production limitations identified in the business issue. This ensures that the project is not merely a cost-saving initiative, but a strategic enabler for the group's vertical integration. This model uses a straight-line depreciation over an assumption of a eight-year useful period, reflecting the effective operational period after the two-year construction phase. During the two-year construction phase, the analysis recognizes zero incremental revenue, because the H3 segment is not yet in operation. The measuring of incremental impact only begins once the construction phase is completed, and the H3 segment is already fully commissioned. The detailed projection of these cash flows is shown under Table IV.6. The project generates positive Free Cash Flows immediately following the construction phase. The project generates a substantial jump in Earnings Before Interest and Taxes (EBIT), reaching Rp 396 million in Year 3 and peaking at Rp 712 million in Year 6. Even after accounting for taxes and CAPEX, the Incremental FCFF turns positive starting in Year 3 (Rp 409 million) and remains robust throughout the project lifecycle, reaching a high of Rp 655 million in Year 6. The projections show that the project generates positive cash flow as soon as the construction ends. This confirms that Project H3 is economically feasible, as it produces enough operational income to support itself and pay returns to investors.

Corporate Finance Scenario Results

In the Corporate Finance scenario, Project H3 is treated as an on-balance-sheet investment funded directly by the consolidated resources of PT Atlas Resources Tbk. Since the operational feasibility and cash flow projections have been established, this section focuses on the valuation of those cash flows from the

perspective of the corporate parent. The incremental FCFF is discounted using the Corporate WACC of 14,35%, which reflects the diversified risk profile of PT Atlas Resources Tbk. The result of the financial valuation is summarized in Table IV.7.

Table 6 Corporate Finance Valuation Summary

Metric	Value
Discount Rate (WACC)	14,35%
Net Present Value (NPV)	Rp 1.243.104.302
Internal Rate of Return (IRR)	48,33%
Payback Period	4,26 years

The result from the financial valuation at Table IV.7 indicates that under the Corporate Finance structure, Project H3 is economically feasible. The project itself has a positive Net Present Value (NPV) of Rp 1,24 billion, which is able to recover the capital expenditure of Rp 800 million, and to create major additional shareholder value. The Internal Rate of Return (IRR) of 48,33% gives a substantial margin of safety over the corporate hurdle rate of 14,35%. This is indicating a good margin of safety against potential operational risks. Furthermore, with a Payback Period of 4,26 years, the H3 project is considered able to recover its investment capital in the first half of the 10-year analysis horizon, reducing the exposure of long-term liquidity for the group.

Project Finance (BOT) Scenario Results

While PT Atlas Resources Tbk has previously implemented Build-Operate-Transfer (BOT) schemes, there is currently no established contract for Project H3. Consequently, to evaluate this scenario, it is necessary first to structure a hypothetical but bankable agreement that satisfies the requirements of a potential Special Purpose Vehicle (SPV) investor, as outlined by Gatti (2024).

Step 1: Determining the Revenue Sharing Scheme (SPV Perspective)

A preliminary financial model was constructed from the perspective of the SPV to determine a feasibility of the project. The goal was to find the minimum revenue share required to make the project attractive to SPV which is its private equity investors and lenders. The simulation was constrained by two key "bankability" parameters Target Equity IRR ($K_{e,p}$) of 16,90% and Debt Service Coverage Ratio (DSCR) with a minimum target of approximately 1,2x. Based on the simulation results in Table IV.8, a Revenue Sharing split of 60% (allocated to the SPV) is feasible. The IRR of 23% provides a clear premium over the required return of 16,90%, and the positive NPV of Rp 36,9 million confirms value creation for the investors. Moreover, The Debt Service Coverage Ratio (DSCR) starts at 1,18x in the first year of operation, which closely approximates the 1,2x threshold, and improves significantly up to 1,96x in the following years, indicating a strong capacity to repay the principal and interest of the loan.

Table 7 SPV Financial Feasibility Simulation

Variable	Value
Concession Period	3 Years (Operational)
Proposed Revenue Share (SPV)	60% (Rp 29 per ton)
NPV	Rp 36.882.676
IRR	23,00%
DSCR	1,18x (Operational Year 1) increasing to 1,96x

Step 2: Valuation of Project H3 under BOT Structure

Once the revenue-sharing terms were established as feasible, the final valuation was conducted from the perspective of PT Atlas Resources Tbk to allow for a direct comparison with the Corporate Finance scenario. This valuation then proceeds by constructing the incremental Free Cash Flow to the Firm (FCFF). Within this model, the impacts of cash flows for PT Atlas Resources Tbk are as follows:

1. PT Atlas gets 40% of the road usage fee (Rp 19 per ton), but does not have to provide any amount of CAPEX and OPEX for the H3 segment during the three-year BOT period. Yet, once the asset ownership goes to PT Atlas Resources Tbk, then the company will get back its 100% of road usage fee (Rp 48 per ton), and also the OPEX responsibility.
2. PT Atlas Resources Tbk can not record any depreciation.

The cash flows to PT Atlas Resources Tbk are then discounted using the same Corporate WACC of 14,35%, in order to have a consistent comparison and perspective with the previous scenario. The valuation is shown in Table IV.9.

Table 8 Project Finance (BOT) Valuation Summary – Atlas Perspective

Metric	Value
Discount Rate (WACC)	14,35%
Net Present Value (NPV)	Rp 1.183.240.376
Internal Rate of Return (IRR)	Not Applicable (N/A)

Under the BOT structure Project H3 is still able to generate a positive Net Present Value (NPV) of approximately Rp 1,18 billion. This positive NPV shows the net gain of the revenue share, without any capital expenditure incurred by the company. It is important to add also that Internal Rate of Return (IRR) is not calculated for this scenario as PT Atlas Resources Tbk does not contribute to any capital expenditure. According to the basic principles of corporate finance (Brealey et al., 2020), the IRR is only meaningful for a project that has an initial investment outflow which the return can be measured. If such an investment is not provided, the calculation is mathematically undefined. The detailed cash flow projection for PT Atlas under this scenario is as shown in Table IV.10.

Risk Analysis Results

Following the financial valuation, it is also important to evaluate the effect of uncertainty on the feasibility of the project. While the financial models make both scenarios show positive NPV, the actual implementation in the real situation is vulnerable to the volatility of markets and operational risks.

Sensitivity Analysis

The sensitivity analysis is performed in order to identify the critical variables that mostly influence the NPV of the project, by varying the key variables within a range of ± 20% from the base case. The selection of these variables is based on their relevance to both Corporate Finance and Project Finance structures. Road Usage Volume is selected as one of the variables since it is the main source of revenue for PT MMJ. It is also important to achieve a sufficient throughput to meet the economies of scale for recovering the capital investments. Furthermore, the Weighted Average Cost of Capital (WACC) is also included to measure the vulnerability of the project within macroeconomic's volatility. For example, the changes in interest rates or market risk premiums can have a significant effect on the present value of long-term infrastructure cash flows. In the context of the BOT scheme, the SPV Road Usage Fee is included to assess the commercial risk and potential erosion of value between the sponsor and the SPV. Additionally, the Capital Expenditure (CAPEX) is also included to capture the construction-related risks, whereas annual Operating Expense (OPEX) is monitored to reflect the efficiency risks, especially those associated with the cost of fuel and maintenance.

Corporate Finance Scenario

In this scenario, four key variables are tested namely Road Usage Volume, WACC, OPEX and CAPEX. The size of the impact of each variable is summarized in Table IV.11.

Table 9 Sensitivity Analysis Summary – Corporate Finance

Road Usage Volume	NPV	
+ 20%	Rp	1.836.392.480
+ 10%	Rp	1.539.748.391
Baseline	Rp	1.243.104.302
- 10%	Rp	946.460.212
- 20%	Rp	649.816.123

CAPEX	NPV	
+ 20%	Rp	1.093.142.046
+ 10%	Rp	1.168.123.174
Baseline	Rp	1.243.104.302
- 10%	Rp	1.318.085.429
- 20%	Rp	1.393.066.557

OPEX Post-H3 Project	NPV	
+ 20%	Rp	1.066.222.277
+ 10%	Rp	1.154.663.289
Baseline	Rp	1.243.104.302
- 10%	Rp	1.331.545.314
- 20%	Rp	1.419.986.326

WACC	NPV	
+ 20%	Rp	1.037.026.252
+ 10%	Rp	1.135.853.085
Baseline	Rp	1.243.104.302
- 10%	Rp	1.359.674.959
- 20%	Rp	1.486.573.715

As presented in Table IV.11, the project is most sensitive to changes in Road Usage Volume. A 20% drop in volume, considerably lowers the NPV to about Rp 649 million. This result confirms that the economic viability is primarily coming from the road usage volume. Conversely, the project has high resilience to the cost escalations. Even in a worst-case scenario where CAPEX or OPEX increases by 20%, we can see that the NPV is still robust above Rp 1 billion.

Project Finance (BOT) Scenario

In this scenario, the analysis also tests four key variables namely Road Usage Volume, SPV Road Usage Fee Percentage, WACC, and OPEX Post-H3 Project. The difference from the first scenario is the H3 Project CAPEX is not included again, because it is funded by the SPV. Instead, the SPV Road Usage Fee Percentage is included as one of the variables.

Table 10 Sensitivity Analysis Summary – Project Finance (BOT)

Road Usage Volume	NPV	
+ 20%	Rp	1.776.528.554
+ 10%	Rp	1.479.884.465
Baseline	Rp	1.183.240.376
- 10%	Rp	886.596.286
- 20%	Rp	589.952.197

SPV Road Usage Fee Percentage	NPV	
+ 20%	Rp	999.939.485
+ 10%	Rp	1.091.589.930
Baseline	Rp	1.183.240.376
- 10%	Rp	1.274.890.821
- 20%	Rp	1.366.541.266

OPEX Post-H3 Project	NPV	
+ 20%	Rp	1.045.368.101
+ 10%	Rp	1.114.304.238
Baseline	Rp	1.183.240.376
- 10%	Rp	1.252.176.513
- 20%	Rp	1.321.112.650

WACC	NPV	
+ 20%	Rp	1.030.602.862
+ 10%	Rp	1.103.549.752
Baseline	Rp	1.183.240.376
- 10%	Rp	1.270.431.943
- 20%	Rp	1.365.981.156

As can be seen from Table IV.12, Road Usage Volume is still the most important risk variable, confirming that the value of the project is very much dependent on the tons of coal hauling production. The second most important variable is the SPV Road Usage Fee Percentage, where a higher road usage fee paid to the SPV could directly erodes the value creation for PT Atlas Resources Tbk. Interestingly, the project under this BOT structure is least sensitive to OPEX (Rank 4), since the company is protected from operating cost during the first 3 years of concession period.

Scenario Analysis

While Sensitivity Analysis helps to identify which variable that mostly influence the NPV, Scenario Analysis wants to evaluates deeper the performance of the project under certain combinations of variables. This approach provides a more holistic view of risk by simulating realistic scenarios, such as "best-case" (optimistic) and "worst-case" (pessimistic) scenarios where multiple variables fluctuate simultaneously. Following the principles outlined by Gatti (2024), these analysis enables the management to measure resilience of the project in response to the market volatility, rather than single variable changes.

Corporate Finance Scenario

The Optimistic Scenario is based on a 20% volume increase and a 5% to 10% reduction in cost related variables and WACC. On the other hand, the Pessimistic Scenario shows a 15% decrease in volume and a 15% to 20% increase in cost related variables and WACC. The NPV for PT Atlas Resources Tbk under the Corporate Finance structure is summarized in Table IV.13. The analysis proves that Corporate Finance structure is financially strong. Under the Optimistic Scenario, the project has the potential to generate a NPV of over Rp 2,03 billion under the influence of higher hauling volumes and efficiency improvements. More importantly, under Pessimistic Scenario, the project is still profitable with positive NPV of Rp 407 million.

Table 11 Scenario Analysis Results – Corporate Finance

Scenario	Assumption	NPV	% Change from Base
Optimistic	Vol +20% CAPEX -10% OPEX -5% WACC -5%	Rp 2.032.109.588	+ 63,47%
Base Case	Standard	Rp 1.243.104.302	0
Pessimistic	Vol -15% Capex +20% Opex +15% WACC +15%	Rp 407.723.074	- 67,20%

Project Finance (BOT) Scenario

Similar scenarios are applied to the BOT structure. In the Optimistic Scenario the cost-related variables and WACC are reduced by around 4% to 5%, combined with a 20% increase of volume. In the Pessimistic Scenario, the cost-related variables and WACC increase by about 15% to 20%, with volume production declines to 15%. The results can be seen in Table IV.14. The Scenario Analysis confirms that the Project Finance (BOT) structure remains financially viable even in severe conditions. In the Optimistic Scenario, the NPV value increases to almost Rp 1,91 billion due to the combination of higher volumes of production and a better revenue sharing split (road usage fee to SPV). On the other side, the Pessimistic Scenario, the project value is still positive with an NPV of Rp 391 million. Despite a "worst-case" combination where the revenue drops and the road usage fee paid to the SPV increases significantly to 20%, the project still does not destroy the NPV value. This resilience indicates that the BOT structure provides a safe buffer against market volatility, although the downside NPV is slightly less than the Corporate Finance scenario (Rp 407 million vs Rp 391 million) due to the leverage effect of the SPV fee.

Table 12 Scenario Analysis Results – Project Finance (BOT)

Scenario	Assumption	NPV	% Change from Base
Optimistic	Vol +20% SPV Fee -4% OPEX -5% WACC -5%	Rp 1.910.019.677	+ 61,42%
Base Case	Standard	Rp 1.183.240.376	0
Pessimistic	Vol -15% SPV Fee +20% Opex +15% WACC +15%	Rp 391.638.846	- 66,90%

Monte Carlo Simulation

To overcome the limitations of the previous risk analysis tools (Sensitivity and Scenario Analysis) a probabilistic risk assessment then performed using Monte Carlo Simulation. This method is implemented through Microsoft Excel and coupled with Vose Software's ModelRisk, a specialization of risk analysis add-in software. This simulation consisted of 10.000 iterations. For the input variables (Volume, CAPEX, OPEX and WACC/SPV Fee), the PERT (Program Evaluation and Review Technique) distribution is selected. According to Vose Software, the PERT distribution is suitable for modeling expert estimates when the historical data are limited. Unlike the Triangular distribution which gives equal weight to the tails, the PERT distribution creates a smoother curve (a transformation of the Beta distribution) that gives the "Most Likely" value greater weight than the extreme "Minimum" and "Maximum" scenarios. This characteristic of distribution makes the project finance parameters become more realistic in representing the variation of project finance variables.

Conclusion

The research generates two major conclusions in relation to the research questions stated in the first chapter:

1. Financial performance and risk profiles. Both structures are found to be feasible and value-creating. Under the Corporate Finance scenario by using consolidated WACC of 14,35%, the NPV of the project is approximately Rp 1,24 billion, the IRR of the project is 48,33%, and payback period is approximately 4,26 years. In contrast, under the Project Finance (BOT) structure, given that the road usage fee (SPV gets 60%) percentage is fixed to meet the standard DSCR and equity investors' IRR requirements, is able to generate a positive NPV of Rp 1,18 billion, which is only about 4,8% less than the Corporate Finance scenario. Furthermore, the risk analysis indicates that both structures are robust under the downside conditions. Road usage volume is identified as the most sensitive value driver. In 'Pessimistic Scenario', both structures have positive NPV (Rp 408 million for Corporate Finance and Rp 392 million for Project Finance). Monte Carlo simulations with 10.000 iterations also indicate positive NPV for both (minimum NPVs are Rp 469,7 million and Rp 457,3 million, respectively) with zero probability of negative value.. Under Corporate Finance, all the risks are solely on PT Atlas Resources Tbk's balance sheet whereas, under Project Finance, the risks are ring-fenced within the SPV and are managed through project contracts. This positioning results in a better risk profile for the Project Finance scenario from PT Atlas Resources Tbk's perspective.
2. The optimal choice. This study concludes Project Finance. (BOT) has superior risk-adjusted financial value. This conclusion is drawn through the tradeoff assessment that combines the quantitative valuation with the strategic constraints of the company. The NPV in the Project Finance structure is only 4,8% lower than the Corporate Finance scenario. This difference is not seen as a loss of value but can rather be seen as a cost-effective "insurance premium." By accepting this marginal decrease in NPV, PT Atlas Resources Tbk basically transfers the project risks to the SPV. Both Corporate Finance and Project Finance structures both generate positive value, but differ in terms of concentration of risk and implication for the sponsor's capital structure. Considering the current focus of the company on strengthening equity, enhancing liquidity and protecting flexibility in the balance sheet, the Project Finance (BOT) structure proves to be the most optimal option. It provides risk-adjusted value while illustrating a safer approach to finance that is in line with the company's strategic goals and risk profile. Moreover, the risk analysis provides further support to this decision. Even in the 'Pessimistic Scenario', where production volume is projected to decline and costs increase, the Project Finance structure is still profitable with NPV equal to Rp 392 million. This confirms that the transfer of the risk is effective in protecting the value of shareholders and is justified to have a slightly lower return in the effort to have a greater financial security.

Recommendation

To wrap up this research, here are several recommendations for PT Atlas Resources Tbk in particular, and for other academics and practitioners in general:

1. It is recommended that PT Atlas Resources Tbk adopts the Project Finance (BOT) structure for the H3 Segment Hauling Road project. This structure offers a good balance between financial feasibility and risk sharing, and it also fits the company's current strategic goals.
2. PT Atlas Resources Tbk should leverage its historical track record in managing BOT concessions. The management can significantly reduce the administrative complexity associated with project finance. This strategic advantage should be benefitted to accelerate the tender and financial close processes.
3. The recommendation is to maintain a maximum 60:40 revenue-sharing split (60% to SPV, 40% to Atlas). Any significant deviation from this ratio could make this project less interesting in tender as it would shift the project's risk-return attractiveness for both parties.
4. To extend the findings of this study, future research could enrich the analysis by applying the Adjusted Present Value (APV) method. The APV method would allow for a mathematical separation of the project's operating cash flows from the value created specifically by financing side effects. This would offer a more granular understanding of exactly how much value is being created by the financial engineering of the BOT structure versus the fundamental project operations.

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