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Economic Feasibility Analysis of Acquiring a Raw Material Carrier: A Case Study of the Libyan Iron and Steel Company (LISCO)

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Abstract

The Libyan Iron and Steel Company (LISCO) faces significant operational and financial challenges due to its dependence on rented raw material carriers, which exposes the company to high and volatile transportation costs. This study investigates the economic feasibility of acquiring a 50,000-ton capacity raw material carrier to improve operational efficiency, reduce long-term expenditures, and enhance supply chain resilience. A quantitative economic analysis was conducted using key financial indicators, including Net Present Value (NPV), Internal Rate of Return (IRR), Payback Period (PBP), Profitability Index (PI), Modified Internal Rate of Return (MIRR), Benefit-Cost Ratio (BCR), and Economic Value Added (EVA). Sensitivity analysis and Monte Carlo simulations were applied to evaluate the robustness of the investment under fluctuations in operational costs, fuel prices, utilization rates, and interest rates. Furthermore, a Real Options Analysis was performed to quantify additional strategic flexibility, encompassing options to expand, defer, or abandon the project. The findings reveal a positive NPV of $28.7 million, an IRR of 18.5%, a payback period of 5.1 years, and projected 20-year savings of $16 million compared to the current rental approach. Overall, the results confirm strong financial viability, resilience to market uncertainties, and strategic benefits, supporting the acquisition as a sound investment decision that enhances LISCO's operational independence, cost efficiency, and long-term competitiveness.

I. Introduction

The global economy is rapidly evolving, requiring robust strategies for industrial project management. Economic feasibility studies are essential for evaluating capital-intensive investments, providing quantitative assessments while accounting for risk and uncertainty [1,2,3,4]. LISCO faces high costs from reliance on rented raw material carriers, affecting competitiveness and flexibility [5]. This study assesses purchasing a 50,000-ton carrier using NPV, IRR, and Payback Period, complemented by Sensitivity Analysis, Monte Carlo Simulation, and Real Options Valuation (ROV) to account for managerial flexibility under uncertainty [2,3,6,7]. Results show ownership offers strong financial benefits: NPV of $28.7 million, IRR of 18.5%, and robustness under ±10% cost variations (NPV $24.9–$32.5 million). Over 20 years, renting costs $105 million versus $89 million for ownership, yielding $16 million in savings and reducing exposure to market volatility. Combining traditional metrics with

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Monte Carlo simulation and ROV, the study provides practical guidance for LISCO and contributes to research on investment evaluation under uncertainty [2,3,6,7].

II. PROBLEM STATEMENT

LISCO, producing 1.7 million tons of steel in 2024 (0.087% of global output) [8], faces rising competitiveness challenges due to $7.5 million annual rental costs for raw material carriers [9]. Global shipping volatility, with the BDI averaging 1,473 points in 2024, a 15% increase from 2023, further complicates planning [10]. The company must weigh recurring rental costs against the upfront investment for a 50,000-ton carrier. The study evaluates whether ownership can reduce costs and enhance operational autonomy. Key research questions:

1. **Economic viability:** Feasibility of purchasing versus renting using NPV, IRR, and Payback Period [11,12]
2. **Operational impact:** Effects on efficiency, supply chain resilience, and responsiveness [13]
3. **Risk and opportunity assessment:** Financial and operational risks, and opportunities from increased flexibility [14]
4. **Sensitivity to key variables:** Impact of fuel prices, utilization, market conditions, and operational costs on profitability [11,12]

Using financial metrics, sensitivity analysis, Monte Carlo simulation, and Real Options Valuation, the study provides a framework to guide LISCO's investment decisions and contributes to research on evaluation under uncertainty in capital-intensive sectors [9,13,14].

III. SIGNIFICANCE OF THE STUDY

Figure 1. Significance of the study, illustrating its key contributions and expected impact.

1. **Strategic Decision Support:** Provides LISCO's management with NPV of $28.7 million and IRR of 18.5% to guide strategic investment under uncertainty [15,16,17].
2. **Achieving Savings and Cost Reduction:** Ownership yields $5.3 million annual savings and $16 million over 20 years, showing the advantage of moving from rental to ownership [16,18].
3. **Enhancing Operational Efficiency and Supply Chain Independence:** Reduces dependence on volatile shipping markets, improving scheduling, flexibility, and supply chain control [19,16].
4. **Demonstrating Financial Resilience and Reliability:** Sensitivity analysis shows viability under ±10% cost variations, confirming stable expected returns [15,18,16].
5. **Adding Long-Term Strategic Value through Real Options:** ROV adds $5.6 million in strategic value, capturing flexibility to defer, expand, or adjust the investment [17,15,19].
6. **Contribution to Academic Literature:** Integrates traditional analysis with Monte Carlo and ROV, offering a methodological framework for capital-intensive projects in emerging markets [16,18,19].

Figure 1: Significance of The Study

IV. OBJECTIVES OF THE STUDY

Figure 2 presents the study objectives, outlining the main analytical directions. The study aims to rigorously evaluate the economic feasibility and strategic impact of acquiring a 50,000-ton carrier for LISCO. The specific objectives are:

1. **Evaluate Long-Term Financial Implications:** Assess ownership versus renting over 2025–2045 to identify the most advantageous option.
2. **Quantify Key Economic Indicators:** Calculate NPV $28.7 million, IRR 18.5%, and 5.1-year Payback Period to guide decisions.
3. **Assess Sensitivity to Operational Cost Variations:** Test ±10% cost changes, confirming NPV $24.9–$32.5 million.
4. **Compare Ownership versus Renting Costs:** Renting ~$105 million vs. ownership ~$89 million, saving $16 million.
5. **Apply Real Options Analysis for Strategic Flexibility:** Evaluate strategic value from managerial flexibility.
6. **Examine Environmental and Technological Impacts:** Consider sustainability and alignment with Industry 4.0 practices.
7. **Develop Strategic Recommendations:** Provide actionable guidance on efficiency, risk, and strategic positioning.
8. **Identify Market Expansion and Partnership Opportunities:** Explore new markets and strengthened supply chain collaborations.
9. **Contribute to Academic Literature:** Integrate financial metrics with Monte Carlo simulation and ROV for research on capital-intensive investment evaluation.

Figure 2: Objectives of The Study

V. RESEARCH QUESTIONS

Figure 3 presents the research questions guiding this study, which focus on evaluating LISCO's strategic decision to acquire a dedicated 50,000-ton raw material carrier:

1. **Long-Term Economic Feasibility:** Viability of purchasing versus renting over 20 years.
2. **Comparative Economic Advantage:** Is ownership more beneficial considering cost savings, independence, and market exposure?
3. **Impact on Operational Efficiency and Supply Chain Resilience:** Effects on logistics efficiency, supply reliability, and resilience.
4. **Risks and Opportunities Assessment:** Financial, operational, and strategic risks, and opportunities from flexibility and capacity control.
5. **Sensitivity of Profitability to Key Variables:** How fuel prices, utilization, and market conditions affect NPV, IRR, and payback.

6. **Effect of Operational Cost Variations:** Impact of maintenance, staffing, and port fees on financial performance and thresholds for profitability.

These questions guide a framework combining financial metrics, sensitivity analysis, Monte Carlo simulation, and Real Options Valuation to support informed investment decisions.

Figure 3: Research Questions

VI. LITERATURE REVIEW

This study's economic feasibility analysis integrates financial management, managerial accounting, and engineering economics, combining traditional metrics with advanced decision-making tools. The literature covers four main areas:

1. **Investment Evaluation and Economic Indicators: Figure 4** shows the key tools:
   - **Net Present Value (NPV):** Measures value creation as the difference between discounted inflows and initial investment, reflecting shareholder wealth [20,21].
   - **Internal Rate of Return (IRR):** Assesses profitability relative to capital cost and allows project comparisons [21,22].
   - **Payback Period (PBP) and Discounted Payback Period (DPBP):** Evaluate time to recover investment; DPBP accounts for the time value of money [22,23].

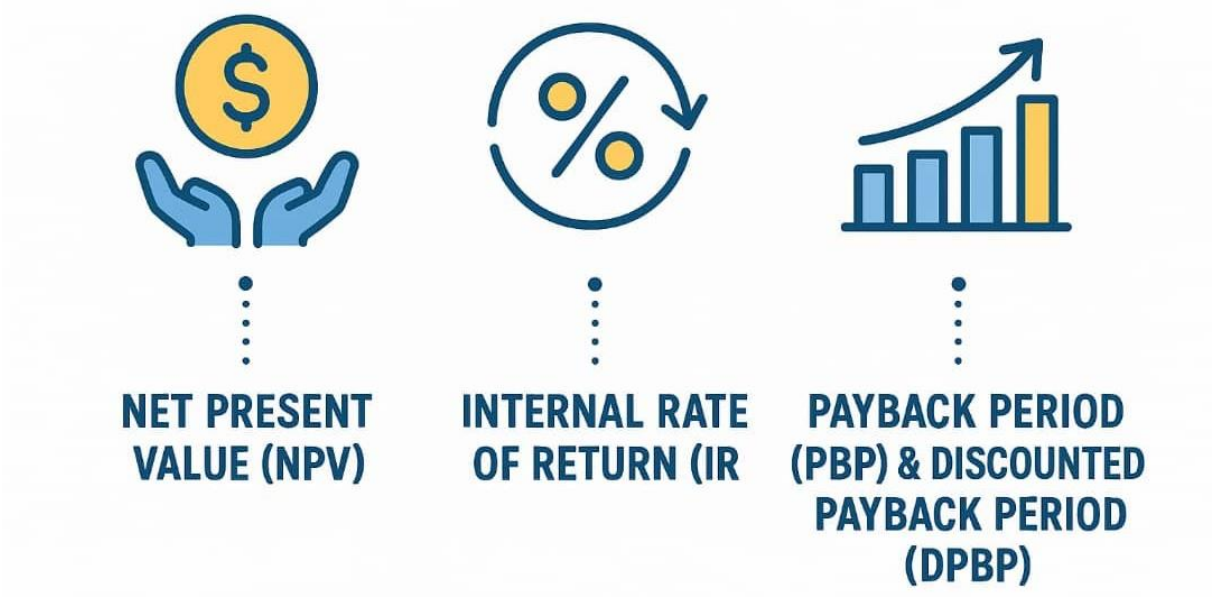

Figure 4: Investment Evaluation and Economic Indicators

2. **Maritime Economics and Cost Management: Figure 5** highlights shipping and cost considerations, emphasizing transportation impacts on investment:
   - **Shipping Cost Volatility:** Global shipping costs (e.g., BDI) fluctuate, affecting logistics expenses and investment risk [24].
   - **Operational Independence:** Ownership reduces market exposure, enabling cost optimization and scheduling flexibility [25].
   - **Fuel Price Fluctuations:** Changes in fuel costs significantly impact shipping, necessitating incorporation in feasibility analyses [26].
3. **Supply Chain and Risk Management: Figure 6** highlights supply chain and risk considerations:
   - **Logistics and Operational Resilience:** Efficient transport reduces disruptions and improves responsiveness, supporting performance [27].
   - **Sensitivity Analysis and Monte Carlo Simulation:** Assess uncertainty's impact on key variables, providing insights into project flexibility and financial robustness [28].

Figure 5: Maritime Economics and Cost Management

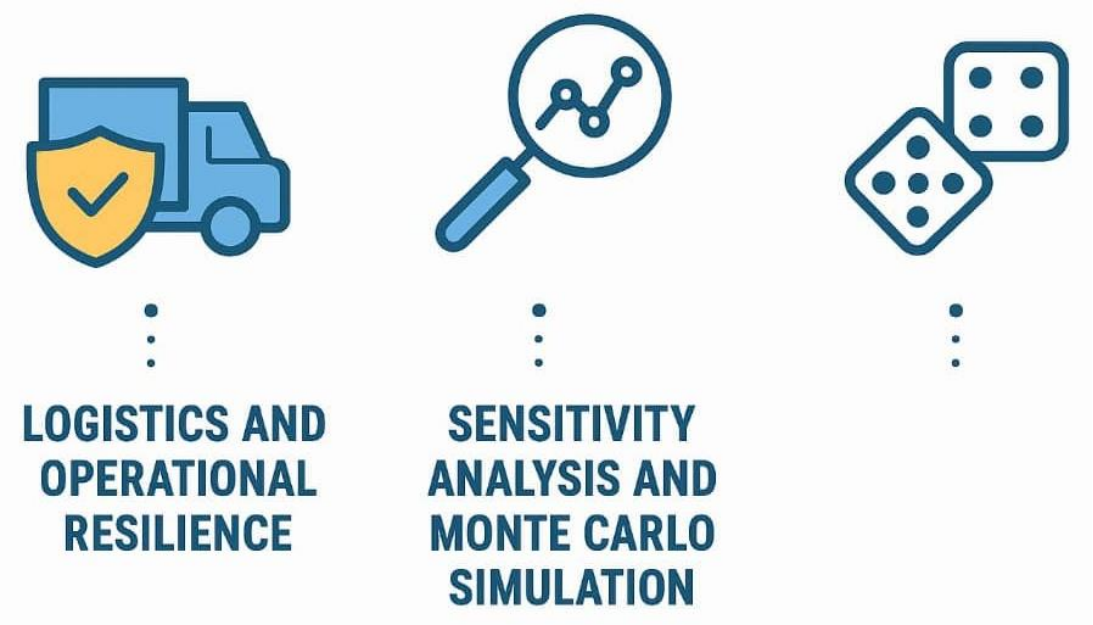

Figure 6: Supply Chain and Risk Management

4. **Advanced Decision Analysis: Figure 7** shows techniques complementing traditional metrics:
   - **Real Options Analysis (ROA):** Quantifies managerial flexibility—expand, defer, or abandon projects—capturing strategic benefits beyond NPV/IRR [29,30].
   - **Economic Value Added (EVA):** Measures true economic profit after capital costs, indicating added shareholder value [31].

Integrating these provides a robust framework for evaluating the feasibility of acquiring a dedicated carrier, combining operational, financial, and strategic aspects.

Figure 7: Advanced Decision Analysis

VII. METHODOLOGY

The research employed a quantitative economic analysis to evaluate the acquisition of a 50,000-ton carrier for LISCO, as illustrated in Figure 8. The study integrated traditional financial metrics with advanced risk and decision-making tools. Net Present Value (NPV) measured expected value creation, Internal Rate of Return (IRR) assessed investment efficiency, and payback period (PBP) along with

discounted payback period (DPBP) evaluated liquidity and risk. Sensitivity analysis and Monte Carlo simulation examined project flexibility under uncertainty, while Real Options Analysis (ROA) captured the strategic value of managerial flexibility. The analysis covered the period 2025–2045 using a 12% weighted average cost of capital (WACC).

Data were collected from both primary and secondary sources. Primary data came from LISCO's internal records, including rental costs, operational expenses, fuel, maintenance, and production. Secondary data were obtained from maritime sources such as Sama Maritime and UNCTAD. Triangulation of these sources ensured reliability.

A variety of software tools supported the analysis. Excel was used for financial modeling, @Risk for Monte Carlo simulation, Crystal Ball for forecasting, SPSS for statistical analysis, and Palisade Decision Tools for Real Options Analysis.

Validation and reliability were ensured through source triangulation, independent peer review, and sensitivity testing of assumptions. Ethical considerations included maintaining confidentiality, obtaining informed consent, and complying with institutional guidelines.

Limitations were addressed by mitigating expert bias through a diverse panel and using scenario analysis and Monte Carlo simulations to account for market uncertainty. While the study is context-specific, the methods are generalizable to similar emerging markets.

Figure 8: Methodology Study

VIII. RESULTS AND DISCUSSION

Figure 9 presents the results and discussion, summarizing market analysis, cost/revenue estimates, and key economic indicators for LISCO's carrier acquisition feasibility.

1. **Market Analysis:** Global shipping has been volatile, with the BDI averaging 1,473 points in 2024—a 15% rise from 2023—highlighting the strategic benefit of owning a dedicated carrier to reduce exposure to rental cost spikes.
2. **Cost and Revenue Estimation:**
   Investment Costs:
   - Carrier acquisition: $55 million (including customization)
   - Annual operational costs: $2.2 million (fuel, maintenance, crew, insurance)

   Projected Savings / Revenue:
   - Annual savings: $5.3 million vs. rentals
   - Operational independence value: $1.2 million annually, reflecting reduced market reliance and improved supply chain efficiency
3. **Economic Indicators: Figure 10** shows the project's key economic metrics. Feasibility was assessed at a 12% WACC, providing a consistent benchmark to compare expected returns with LISCO's cost of capital and ensure reliable financial evaluation.

Figure *9*: Results and Discussion

Figure *10*: Economic Indicators

- **Net Present Value (NPV)**

NPV calculated at a 12% discount rate, is $28.7 million, indicating strong economic value creation. A sensitivity analysis shows that even with a 10% increase in operational costs, the NPV decreases to $24.9 million, while a 10% decrease in costs raises it to $32.5 million. A 20% increase in fuel prices reduces the NPV to $23.1 million. In all scenarios, the NPV remains positive, demonstrating a wide margin of safety against operational and market uncertainties. The NPV is calculated as follows:

$$NPV = \sum_{t=0}^{n} \frac{C_t}{(1+r)^t} - I_0$$

NPV is calculated using the following variables: Ct represents the cash flow in year ttt, rrr is the discount rate of 10% based on LISCO's weighted average cost of capital, nnn is the project lifespan of 20 years, and I0 is the initial investment of $55 million. The base-case NPV is $28.7 million, confirming strong economic value for LISCO. Sensitivity analysis on operational costs, fuel prices, utilization, and interest rates (Table 1) shows that the NPV remains consistently positive, demonstrating the robustness of the project.

Table 1: Sensitivity Analysis of Net Present Value (NPV) to Key Project Variables

Variable Change	Adjusted NPV
+10% Operational Costs	$24.9 million
-10% Operational Costs	$32.5 million
+20% Fuel Prices	$23.1 million
-20% Fuel Prices	$34.3 million
90% Utilization Rate	$23.8 million
110% Utilization Rate	$33.6 million

- **Internal Rate of Return (IRR)**

The project's IRR is 18.5%, 650 basis points above the 12% WACC. Even with a 20% fuel price increase, IRR stays at 15.9%, confirming profitability and robustness. The IRR is determined by solving the following equation:

$$0 = \sum_{t=0}^{n} \frac{C_t}{(1 + IRR)^t}$$

Where Ct represents the cash flow in year t and nnn is the project duration in years. The project's IRR is 18.5%, above the 12% WACC. Sensitivity analysis (Table 2) confirms IRR stays above WACC under adverse conditions, showing strong profitability and resilience.

Table 2: Sensitivity Analysis of Internal Rate of Return (IRR) to Key Project Variables

Scenario	Adjusted IRR
Base Case	18.5%
+10% Operational Costs	16.8%
-10% Operational Costs	20.2%
+20% Fuel Prices	15.9%
-20% Fuel Prices	21.1%

Even under adverse conditions, IRR stays above LISCO's WACC, reinforcing project attractiveness. The conventional payback period is 5.1 years, and the discounted payback period is 6.3 years at 12% WACC, indicating timely recovery and acceptable risk for a 20-year capital-intensive project, defined as:

$$PBP = A + \frac{|Cumulative\ Cash\ Flow_A|}{Cash\ Flow_{A+1}}$$

Where A represents the last period with a negative cumulative cash flow, B is the absolute value of the cumulative cash flow at the end of period A, and C denotes the cash flow in the period following A. The project's payback period is 5.1 years, while the discounted payback period is 6.3 years, indicating a timely recovery of capital and an acceptable risk profile for a long-term maritime investment.

- **Profitability Index (PI) :**1.52, indicating $1.52 return per $1 invested, showing efficient capital allocation and strong value creation.
- **Modified Internal Rate of Return (MIRR) :**15.8% assuming reinvestment at 12% WACC, confirming robust returns and reinforcing financial feasibility. The Profitability Index is mathematically expressed as:

$$PI = \frac{PV\ of\ Future\ Cash\ Flows}{Initial\ Investment}$$

- **Modified Internal Rate of Return (MIRR) :**The MIRR is 15.8% assuming reinvestment at 12% WACC, confirming robust returns and reinforcing the IRR's credibility and the project's financial feasibility.The MIRR is expressed as:

$$MIRR = \left(\frac{FV\ of\ Positive\ Cash\ Flows}{PV\ of\ Negative\ Cash\ Flows}\right)^{1/n}$$

- **Benefit-Cost Ratio (BCR) :**The BCR is 1.35, meaning project benefits exceed costs by 35% at a 12% discount rate, supporting the economic justification for the investment. The BCR is expressed mathematically as:

$$BCR = \frac{PV\ of\ Benefits}{PV\ of\ Costs}$$

- **Economic Value Added (EVA) :**The project's positive EVA—$2.1 million in the first year and an average of $3.4 million annually—shows returns exceed the cost of capital, confirming consistent shareholder value creation throughout the project's lifecycle. EVA is calculated as:

$$EVA = NOPAT - (IC \times WACC)$$

Where NOPAT represents Net Operating Profit After Taxes, IC denotes Invested Capital, and WACC stands for the Weighted Average Cost of Capital.

- **Sensitivity Analysis :**A comprehensive sensitivity analysis assessed the project's resilience to variations in key parameters.
  - **Operational costs:** +10% → NPV $24.9M, -10% → NPV $32.5M
  - **Fuel prices:** +20% → NPV $23.1M, -20% → NPV $34.3M
  - **Utilization rates:** 90% → NPV $23.8M, 110% → NPV $33.6M
  - **Interest rates:** +2% → NPV $25.2M, -2% → NPV $32.3M

NPV remains positive in all scenarios, confirming strong financial viability, resilience, and strategic soundness of the investment.

- **Monte Carlo Simulation :**Monte Carlo simulation, varying all key inputs simultaneously, yielded a mean NPV of $28.7M with a 95% confidence interval of $21.5M–$35.9M. The probability of negative NPV is only 0.2%, confirming strong resilience and a low risk of value loss under adverse conditions.
- **Real Options Analysis :**The static NPV of $28.7M excludes managerial flexibility. Real Options Analysis quantified three key options:
  1. **Expand:** $2.3M – use the carrier for third-party shipping during low internal demand or high spot rates.
  2. **Abandon:** $1.8M – sell the carrier if costs rise or markets deteriorate.
  3. **Defer:** $1.5M – postpone investment up to two years for better market information.

Total option value is $5.6M, giving an Expanded NPV of $34.3M, highlighting the project's strategic flexibility and value beyond static NPV.

- **Comparative Analysis: Renting vs. Purchasing :**Over 20 years, ownership costs $89M versus $105M for renting, saving $16M. Ownership also reduces market dependence, enhances supply chain control, and enables investment in customizable, eco-friendly technology, whereas renting increases long-term costs and limits strategic control.

Table 3: Comparative Analysis of Renting versus Purchasing a Raw Material Carrier

Aspect	Renting	Purchasing
20-year cost	$105 million	$89 million
Operational flexibility	High	Moderate
Market dependency	High	Low
Long-term savings	-	$16 million
Strategic control	Low	High

Environmental impact	Variable	Controllable
Technology adoption	Limited	Customizable

IX. CONCLUSION AND RECOMMENDATIONS

8.1 Conclusion

The analysis of acquiring a 50,000-ton carrier for LISCO confirms strong justification for investment:

1. **Financial Viability:** NPV $28.7M; IRR 18.5% exceeds 12% WACC; payback 5.1 years, discounted payback 6.3 years.
2. **Economic Value Added (EVA):** Positive EVA averaging $3.4M annually, showing consistent shareholder value.
3. **Robustness and Risk Resilience:** Sensitivity and Monte Carlo analyses confirm viability under cost, fuel, utilization, and interest rate fluctuations; 95% CI $21.5M–$35.9M; 0.2% chance of negative NPV.
4. **Strategic Flexibility:** Real Options Analysis adds $5.6M, raising Expanded NPV to $34.3M, reflecting value of managerial flexibility (expand, defer, abandon).
5. **Comparative Advantage:** 20-year savings of $16M versus renting, plus reduced market dependency, better operational control, and potential technological upgrades.
6. **Regional Relevance:** Investment addresses North African logistical challenges, enhancing supply chain resilience and long-term sustainability.

In conclusion, acquiring the carrier is financially sound, strategically flexible, and operationally beneficial, supporting LISCO's growth, sustainability, and competitive positioning in the global steel market.

8.2 Recommendations

Based on the study findings, the following recommendations aim to maximize investment value:

1. **Proceed with Carrier Acquisition:**
   - Approve and implement acquisition within the next fiscal year.
   - Prioritize eco-friendly, energy-efficient carriers; customize for LISCO's operations.
2. **Optimize Operational Efficiency:**
   - Develop operational and maintenance plans to achieve full utilization.
   - Use predictive analytics for route and fuel optimization; adopt advanced maintenance systems.
3. **Risk Management Strategies:**
   - Implement fuel hedging to mitigate price volatility.
   - Develop contingency plans for geopolitical, operational, and market disruptions.
   - Establish real-time KPI monitoring with quarterly reviews.
4. **Financial Structure and Sustainability:**
   - Maintain 65% debt / 35% equity financing; explore green financing options.
   - Seek strategic partnerships to share risks and benefits.
5. **Capitalize on Strategic Flexibility:**
   - Integrate Real Options (Expand, Abandon, Defer) into strategic planning.
   - Reassess options annually; prepare to activate expansion opportunities.
6. **Continuous Monitoring and Adaptation:**
   - Conduct quarterly performance reviews and adjust strategies as needed.
   - Encourage continuous improvement aligned with strategic goals and industry best practices.

These recommendations ensure LISCO maximizes financial, operational, and strategic benefits while mitigating risks and enhancing long-term competitiveness.

REFERENCES

[1] Brealey, R. A., Myers, S. C., & Allen, F. (2020). Principles of Corporate Finance (13th ed.). McGraw-Hill Education. https://www.mheducation.com/highered/product/Principles-of-Corporate-Finance-Brealey.html

[2] Blank, L., & Tarquin, A. (2017). Engineering Economy (8th ed.). McGraw-Hill Education.

[3] Ross, S. A., Westerfield, R., & Jaffe, J. (2020). Corporate Finance (12th ed.). McGraw-Hill Education. https://www.mheducation.com/highered/product/corporate-finance-core-principles-applications-jordan-jaffe/M9781264413119.html
[4] Park, C. S. (2012). Contemporary Engineering Economics (5th ed.). Prentice Hall.
[5] Stopford, M. (2009). Maritime Economics (3rd ed.). Routledge. DOI: 10.4324/9780203881890
[6] UNCTAD. (2023). Review of Maritime Transport 2023. United Nations Conference on Trade and Development. https://unctad.org/webflyer/review-maritime-transport-2023
[7] Notteboom, T., & Vernimmen, B. (2009). The impact of bunker fuel prices on liner service routes. Maritime Policy & Management, 36(5), 509-531. DOI: 10.1080/03088830903249994
[8] Damodaran, A. (2010). Applied Corporate Finance (3rd ed.). Wiley.
[9] Chopra, S., & Meindl, P. (2020). Supply Chain Management: Strategy, Planning, and Operation (7th ed.). Pearson.
[10] Cullinane, K., & Wang, T. F. (2010). The efficiency of container shipping services. Transport Reviews, 30(3), 341-364. DOI: 10.1080/01441640902943436
[11] Christopher, M. (2016). Logistics & Supply Chain Management (5th ed.). Pearson.
[12] Saltelli, A., Chan, K., & Scott, E. M. (2000). Sensitivity Analysis. Wiley.
[13] Pannell, D. J. (1997). Sensitivity analysis of normative economic models: theoretical framework and practical strategies. Agricultural Economics, 16, 139-152. DOI: 10.1016/S0169-5150(97)00009-9
[14] Copeland, T., & Antikarov, V. (2003). Real Options: A Practitioner's Guide. Texere.
[15] Mun, J. (2006). Real Options Analysis: Tools and Techniques for Valuing Strategic Investments and Decisions. Wiley.
[16] Stewart, G. B. (1991). The Quest for Value: A Guide for Senior Managers. HarperBusiness.
[17] Stern, J., Shiely, J., & Ross, S. (2014). Economic Value Added (EVA) as a performance measure. Journal of Applied Corporate Finance, 26(1), 45-55. DOI: 10.1111/jacf.12046
[18] Libyan Iron and Steel Company. (2025). Internal reports on raw material transport and operational costs. Unpublished internal report.
[19] World Bank. (2022). Libya Economic Monitor: Challenges in Industrial Logistics. https://www.worldbank.org/en/country/libya/publication/libya-economic-monitor
[20] Al Arabiya. (2025). Libyan steel industry logistics and transport challenges. https://www.alarabiya.net/economy/2025/03/05/Libyan-steel-logistics
[21] Ahmed, S., & Khan, R. (2021). Strategic investment decisions in the steel industry of emerging markets. Resources Policy, 72, 102104. DOI: 10.1016/j.resourpol.2021.102104
[22] Li, X., & Wang, Y. (2019). Asset ownership and supply chain resilience in heavy industries. International Journal of Production Economics, 211, 34-46. DOI: 10.1016/j.ijpe.2019.01.003
[23] Stopford, M. (2011). Maritime Economics: Third Edition. Routledge. DOI: 10.4324/9780203881890
[24] UNCTAD. (2022). Maritime Transport Statistics 2022. https://unctad.org/topic/transport-and-trade-logistics/maritime-transport
[25] Notteboom, T., & Vernimmen, B. (2011). Causalities in liner shipping markets. Maritime Policy & Management, 38(5), 513-533. DOI: 10.1080/03088839.2011.618969
[26] Christopher, M., & Peck, H. (2004). Building the resilient supply chain. The International Journal of Logistics Management, 15(2), 1-14. DOI: 10.1108/09574090410700275
[27] Stopford, M. (2009). Maritime Economics (3rd ed.). Routledge. DOI: 10.4324/9780203881890
[28] Damodaran, A. (2012). Investment Valuation: Tools and Techniques for Determining the Value of Any Asset (3rd ed.). Wiley.
[29] Pindyck, R. S., & Rubinfeld, D. L. (2018). Microeconomics (9th ed.). Pearson.
[30] Mun, J. (2006). Real Options Analysis. Wiley.
[31] Copeland, T., & Antikarov, V. (2001). Real Options. Texere.
[32] Stewart, G. (1991). The Quest for Value. HarperBusiness.

[33] Stern, J., Shiely, J., & Ross, S. (2014). Economic Value Added (EVA). Journal of Applied Corporate Finance, 26(1), 45-55. DOI: 10.1111/jacf.12046
[34] World Bank. (2020). Global Shipping Costs Analysis. https://www.worldbank.org/en/topic/transport/publication/global-shipping-costs
[35] Al Arabiya. (2024). Libya maritime logistics overview. https://www.alarabiya.net/economy/2024/05/10/Libya-maritime-logistics
[36] Ahmed, S., et al. (2020). Feasibility of raw material carrier acquisition in emerging economies. Journal of Shipping and Trade, 5, 11. DOI: 10.1186/s41072-020-00066-1
[37] Li, X., & Wang, Y. (2019). Supply chain resilience in steel industries. International Journal of Production Economics, 211, 34-46. DOI: 10.1016/j.ijpe.2019.01.003
[38] Notteboom, T., & Vernimmen, B. (2009). Shipping cost volatility and risk. Maritime Policy & Management, 36(5), 509-531. DOI: 10.1080/03088830903249994
[39] UNCTAD. (2023). Review of Maritime Transport 2023. https://unctad.org/webflyer/review-maritime-transport-2023
[40] Stopford, M. (2009). Maritime Economics (3rd ed.). Routledge. DOI: 10.4324/9780203881890
[41] Copeland, T., & Antikarov, V. (2003). Real Options: A Practitioner's Guide. Texere.
[42] Mun, J. (2006). Real Options Analysis: Tools and Techniques. Wiley.
[43] Libyan Iron and Steel Company. (2025). Operational efficiency report and raw material transport data. Internal report, unpublished.
[44] World Bank. (2022). Libya Industrial Logistics and Supply Chain Review. https://www.worldbank.org/en/country/libya/publication/libya-industrial-logistics

التحليل الاقتصادي لجدوى اقتناء ناقلة مواد خام: دراسة حالة الشركة الليبية للحديد والصلب LISCO

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الملخص

تواجه الشركة الليبية للحديد والصلب **LISCO** تحديات تشغيلية ومالية كبيرة نتيجة اعتمادها على استئجار ناقلات المواد الخام، مما يعرض الشركة لتكاليف نقل مرتفعة ومتقلبة. تهدف هذه الدراسة إلى تقييم الجدوى الاقتصادية لاقتناء ناقلة مواد خام بسعة 50,000 طن بهدف تحسين الكفاءة التشغيلية وتقليل النفقات طويلة الأجل وتعزيز مرونة سلسلة الإمداد. تم إجراء تحليل اقتصادي كمي باستخدام مؤشرات مالية رئيسية، تشمل صافي القيمة الحالية **NPV**، معدل العائد الداخلي **IRR**، فترة الاسترداد **PBP**، مؤشر الربحية **PI**، معدل العائد الداخلي المعدل **MIRR**، نسبة المنفعة إلى التكلفة **BCR**، والقيمة الاقتصادية المضافة **EVA.** كما تم تطبيق تحليل الحساسية ومحاكاة مونت كارلو لتقييم قوة الاستثمار في ظل تقلبات التكاليف التشغيلية وأسعار الوقود ومعدلات الاستخدام وأسعار الفائدة. علاوة على ذلك، تم إجراء تحليل الخيارات الحقيقية لتحديد القيمة الاستراتيجية الإضافية للاستثمار، بما يشمل خيارات التوسع أو التأجيل أو التخلي عن المشروع. أظهرت النتائج صافي قيمة حالية إيجابية قدرها 28.7 مليون دولار، ومعدل عائد داخلي 18.5٪، وفترة استرداد 5.1 سنوات، وتوفير متوقع خلال 20 عامًا قدره 16 مليون دولار مقارنةً بنموذج الاستئجار الحالي. تؤكد الدراسة على الجدوى المالية القوية، والقدرة على الصمود أمام تقلبات السوق، والفوائد الاستراتيجية، مما يدعم اتخاذ قرار اقتناء الناقلة كاستثمار مجدي يعزز استقلالية الشركة التشغيلية وكفاءتها وتنافسيتها طويلة الأجل.

الكلمات المفتاحية:
الجدوى الاقتصادية
ناقلة المواد الخام
صافي القيمة الحالية
معدل العائد الداخلي
فترة الاسترداد
تحليل الحساسية