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Strategic and Financial Evaluation of Spin-Off Structures in a State-Owned Aerospace Enterprise: A Case-Based Simulation Study

Kevin Rizky Hidayat[1*], Taufik Faturohman[2]

[1,2]School of Business and Management, Institut Teknologi Bandung

*Email: 29123444@mahasiswa.itb.ac.id

Abstract

This study assesses the financial feasibility and strategic implications of corporate spin-offs within state-owned enterprises (SOEs) in emerging markets, focusing on a capital-intensive aerostructure division within a national aerospace firm. Despite the extensive literature on corporate restructuring in developed economies, ex-ante quantitative analysis of SOE spin-offs remains limited, particularly in the aerospace sector. This research addresses that gap by evaluating two ownership structures—a wholly-owned subsidiary (Scenario 1) and a 60/40 joint venture (Scenario 2)—through a five-year Discounted Cash Flow (DCF) valuation complemented by Monte Carlo simulation. The results indicate that while both models are financially viable, the joint venture structure yields a superior intrinsic equity value of 1.30 times the initial capital, offering a 14.4% premium over the subsidiary model. This advantage is attributed to operational synergies that raise the division's Return on Invested Capital (ROIC) to an average of 16.05%, surpassing the Weighted Average Cost of Capital (WACC) benchmark. Monte Carlo simulations confirm the robustness of this scenario, with a mean expected equity value 29% higher than the base case. Theoretically, the study contributes to corporate finance and restructuring literature by integrating Agency Theory, the Resource-Based View, and Trade-Off Theory to explain how joint ventures can mitigate agency costs, enhance resource access, and optimize capital structure in SOEs. These findings offer empirical insights into the design of spin-off strategies under ownership constraints typical of emerging market institutions.

Keywords: Corporate Spin-off, State-Owned Enterprise, Discounted Cash Flow, Monte Carlo Simulation, Joint Venture, Aerospace Sector.

A. INTRODUCTION

The global aerospace industry has demonstrated sustained resilience and growth, generating approximately USD 829 billion in revenue in 2023, with continued expansion expected across both civil and defense segments (PwC, 2024). In alignment with this momentum, Indonesia has prioritized the development of domestic aerospace capabilities to increase value-added manufacturing and reduce import reliance, as articulated in the national industrial roadmap (Harsudiono et al., 2022). Within this context, a specialized aerostructure division under a state-owned aerospace enterprise was established to focus on component production. However, realizing these ambitions within a centralized State-Owned Enterprise (SOE) structure has posed persistent challenges—particularly in terms of capital flexibility, responsiveness to market dynamics, and the ability to transition toward a Make-to-Stock production model.

Although the literature on corporate restructuring is well-developed, particularly in the context of private firms in developed economies, a significant research gap persists in understanding the financial mechanics and strategic implications of spin-offs within SOEs in emerging markets. Most existing empirical studies emphasize stock price reactions and ex-post analyses using secondary market data (e.g., Veld & Veld-Merkoulova, 2009), with limited focus on ex-ante internal valuation approaches—particularly in capital-intensive, state-regulated industries such as aerospace. This study addresses this gap by applying a Discounted Cash Flow (DCF) valuation and probabilistic risk analysis via Monte Carlo simulation to evaluate two competing ownership structures: a 100% wholly-owned subsidiary (Scenario 1) and a 60/40 joint venture with a strategic partner (Scenario 2).

Beyond its empirical scope, the study is grounded in the theoretical premise that spin-offs can reduce the "diversification discount" and streamline strategic focus in complex organizations. Theoretical literature posits that corporate spin-offs improve transparency and reduce information asymmetry, thereby enabling more accurate

* Corresponding author

valuation of distinct business units (Desai & Jain, 1999; Krishnaswami & Subramaniam, 1999). Empirical findings further support this claim, especially in cases where the divested unit operates in a differentiated sector (Bergh et al., 2008; Veld & Veld-Merkoulova, 2009).

In evaluating such divestiture strategies, robust financial modeling plays a central role. Pro forma financial statements, constructed using the percent-of-sales method, enable forward-looking analysis of revenue, cost structures, and capital requirements (Gitman & Zutter, 2015). These forecasts are further embedded into an integrated three-statement model to ensure consistency and traceability (Titman & Wessels, 1988), with common-size analysis facilitating cross-firm benchmarking (Palepu & Healy, 2013). The DCF methodology is then applied to estimate intrinsic value, capturing the firm's capacity to generate free cash flows over time (Damodaran, 2012; Penman, 2010).

From a capital structure perspective, the ownership decision reflects fundamental trade-offs. While the Pecking Order Theory suggests that firms initially prefer internal equity financing to avoid adverse market signaling (Myers & Majluf, 1984), the Trade-Off Theory emphasizes the need to balance debt benefits with financial distress costs (Kraus & Litzenberger, 1973). Joint ventures, in particular, offer additional strategic advantages through risk sharing, access to proprietary technology, and expanded market channels (Megginson & Netter, 2001). Given the high degree of uncertainty in aerospace manufacturing, deterministic models are insufficient; thus, this study incorporates Monte Carlo simulation to capture outcome distributions and tail risks in strategic decision-making (Rachev & Fabozzi, 2023; Saltelli et al., 2007).

This study seeks to contribute both empirically and theoretically to the literature on SOE restructuring by constructing an investment-grade financial model for an aerospace division undergoing structural transformation. Specifically, it compares the valuation and risk implications of two ownership strategies, integrating corporate finance theories into a simulation-based analysis. To that end, the research draws upon three foundational theoretical perspectives—Agency Theory, the Resource-Based View (RBV), and Trade-Off Theory—to explain the mechanisms through which spin-off structures may create or erode value within state-controlled enterprises.

B. LITERATURE REVIEW

This study is anchored in three core theoretical perspectives that underpin the strategic and financial rationale for corporate spin-offs, particularly within state-owned enterprises operating in capital-intensive sectors: Agency Theory, the Resource-Based View (RBV), and Trade-Off Theory. Each of these frameworks provides a distinct lens to analyze the value creation mechanisms associated with different ownership structures—specifically, a wholly-owned subsidiary versus a joint venture with a strategic partner.

Agency Theory and Corporate Focus

Agency Theory posits that managerial behavior in multi-business organizations may deviate from shareholder interests due to misaligned incentives and information asymmetry (Jensen & Meckling, 1976). In SOEs, these agency conflicts are often amplified by bureaucratic constraints, limited performance-based accountability, and centralized capital allocation. Spin-offs are theorized to reduce these inefficiencies by unbundling unrelated or underperforming units, thus enhancing managerial focus and enabling more accurate external valuation (Desai & Jain, 1999; Krishnaswami & Subramaniam, 1999). In the context of this study, the spin-off of the aerostructure division is expected to reduce intra-organizational frictions and allow the new entity to pursue autonomous operational goals. By comparing a fully retained subsidiary model with a partially divested joint venture, this research tests the extent to which separation and partial ownership mitigate agency costs and improve capital productivity.

Resource-Based View (RBV) and Strategic Partnerships

The Resource-Based View argues that sustainable competitive advantage stems from access to valuable, rare, inimitable, and non-substitutable (VRIN) resources (Barney, 1991). When internal resource development is limited—due to budget constraints, technology gaps, or market inaccessibility—strategic alliances, including joint ventures, become critical mechanisms to access complementary assets (Teece, 1986; Kogut, 1988). In this study, the joint venture scenario assumes access to advanced manufacturing technology, global distribution networks, and lean production expertise provided by a potential strategic partner. These synergistic resources are expected to enhance operational efficiency and accelerate revenue growth beyond the capacity of a wholly-owned

subsidiary operating independently. Thus, RBV supports the hypothesis that partial divestment through a JV structure leads to superior value creation in technology-intensive spin-offs.

Trade-Off Theory and Capital Structure Optimization

The Trade-Off Theory provides a framework for understanding the balance between the benefits of debt (e.g., tax shields) and its associated costs (e.g., financial distress), asserting that firms aim to reach an optimal capital structure to maximize firm value (Kraus & Litzenberger, 1973). Within SOEs, capital structures are often equity-heavy due to risk aversion and regulatory constraints. However, this may result in a higher Weighted Average Cost of Capital (WACC) and lower Return on Equity (ROE), particularly in capital-intensive industries where leverage can be used strategically to enhance returns (Modigliani & Miller, 1963). This framework is applied to evaluate the two spin-off scenarios under review. The wholly-owned subsidiary reflects a conservative, equity-only structure aligned with Pecking Order Theory (Myers & Majluf, 1984), while the joint venture structure represents a hybrid form of capitalization, potentially unlocking future financing flexibility. The valuation model further incorporates probabilistic risk analysis to assess how capital structure decisions affect risk-adjusted returns over time.

C. METHODS

This study employs a quantitative, simulation-based case study design to evaluate alternative ownership structures for a spin-off initiative within a capital-intensive aerospace division of a state-owned enterprise. The single-case approach is justified on theoretical grounds, as the subject represents a critical instance of strategic restructuring in an emerging market context, where centralized ownership and regulatory constraints often inhibit agile financial decision-making. According to Yin (2018), such a design is appropriate when the case offers unique insight into underexplored or complex phenomena—in this instance, the intersection of ownership design, capital efficiency, and spin-off performance in state-controlled industrial entities.

The research focuses on a comparative assessment of two scenarios: a wholly-owned subsidiary structure and a joint venture with 60/40 equity sharing. Financial data were collected from both primary and secondary sources to enhance reliability. Primary data included internal historical financial statements and medium-term operational forecasts, which were validated through semi-structured interviews with managerial personnel. Secondary data were obtained from publicly available annual reports of peer aerospace component manufacturers operating as Tier-2 suppliers in the global market. These sources provided relevant benchmarks for cost structures, capital expenditure norms, and operating margins. To complement these internal projections, macroeconomic indicators—including risk-free interest rates, equity market risk premiums, and industry-specific beta coefficients—were sourced from government bond databases and financial modeling resources such as Damodaran's datasets.

To ensure confidentiality, all nominal financial figures in the analysis were anonymized using a constant scalar multiplier. This anonymization technique preserves the mathematical integrity of the model, ensuring that ratios, growth trends, and valuation outputs remain valid without disclosing proprietary figures. Such an approach aligns with ethical standards in academic research involving commercially sensitive data and has precedent in valuation literature (e.g., Penman, 2010; Damodaran, 2012).

The financial projections were built using the percent-of-sales forecasting method, a widely used approach that maintains proportional consistency between revenue and cost accounts over time. Revenue was projected to grow at a conservative compound annual growth rate of 7%, while the cost of goods sold (COGS) was set at 80% of revenue in the base scenario and 75% under the joint venture scenario to reflect assumed operational synergies. Operating expenses were modeled at 9% of revenue, and capital expenditures ranged between $500,000 and $1.3 million annually, based on benchmarks from comparable firms. Depreciation was calculated using the straight-line method over a 16-year asset life, in accordance with manufacturing sector norms.

Valuation was conducted using a Discounted Cash Flow (DCF) framework based on Free Cash Flow to the Firm (FCFF). The discount rate, or Weighted Average Cost of Capital (WACC), was computed using the Capital Asset Pricing Model (CAPM), incorporating a 4.23% risk-free rate, country-specific risk premiums, and an unlevered beta of 0.91 consistent with the aerospace/defense sector. Terminal value estimation applied the Gordon Growth Model with a perpetual growth assumption of 2.5%, consistent with long-term GDP forecasts.

To account for the high level of uncertainty inherent in strategic aerospace investments, two types of risk analysis were applied. First, a deterministic sensitivity analysis was used to identify the most influential variables

affecting valuation, such as revenue growth and COGS. Second, a Monte Carlo simulation was conducted using 10,000 iterations, applying triangular distributions to model variability in key input variables. This probabilistic approach enabled a more nuanced understanding of potential downside risks and upside opportunities, thereby strengthening the robustness of the ownership structure comparison.

D. RESULTS AND DISCUSSIONS

The comparative financial analysis reveals distinct trajectories for the two proposed ownership structures—Scenario 1 (wholly-owned subsidiary) and Scenario 2 (joint venture with a 60/40 equity split). The joint venture scenario consistently outperforms the wholly-owned subsidiary in terms of operational efficiency and value creation. As presented in Table 1, Scenario 2 achieves a stable gross profit margin of 25.32%, which is 500 basis points higher than Scenario 1's 20.32%. This improvement is attributed to assumed operational synergies, including access to partner-driven lean manufacturing systems and integrated procurement capabilities.

Table 1. Comparative Operational Performance (2026–2030)

Metric	Scenario	2026	2027	2028	2029	2030
Gross Profit Margin	Scenario 1	20.32%	20.32%	20.32%	20.32%	20.32%
	Scenario 2	25.32%	25.32%	25.32%	25.32%	25.32%
EBITDA Margin	Scenario 1	11.19%	11.19%	11.19%	11.19%	11.19%
	Scenario 2	13.19%	13.19%	13.19%	13.19%	13.19%
Net Profit Margin	Scenario 1	8.43%	8.82%	9.02%	9.25%	9.25%
	Scenario 2	10.56%	10.97%	11.20%	11.45%	11.56%
ROIC (WACC: 12.37%)	Scenario 1	9.85%	11.33%	12.22%	13.39%	13.39%
	Scenario 2	12.87%	14.86%	16.15%	17.79%	18.59%

Source: Research data, 2025

The Return on Invested Capital (ROIC) under Scenario 2 averages 16.05%, consistently exceeding the Weighted Average Cost of Capital (WACC) of 12.37%. This positive economic spread aligns with value creation principles outlined by Koller et al. (2020), reinforcing the argument that value is only created when returns exceed capital costs. In contrast, Scenario 1 marginally underperforms during the early forecast years, with ROIC values below the WACC until year three, indicating limited economic value generation in the short term. From a valuation perspective, both scenarios yield positive net present values (NPV), confirming their financial feasibility. However, the joint venture structure delivers superior returns. As shown in Table 2, the equity value multiple for Scenario 2 is 1.30x the initial capital investment, compared to 1.14x in Scenario 1—resulting in a 14.4% valuation premium.

Table 2. DCF Valuation Summary

Valuation Component	Scenario 1 (Subsidiary)	Scenario 2 (Joint Venture)
PV of Explicit Cash Flows	$10.21 Million	$18.12 Million
PV of Terminal Value	$32.50 Million	$45.90 Million
Enterprise Value	$42.71 Million	$64.01 Million
Equity Value Multiple	1.14x Initial Capital	1.30x Initial Capital

Source: Research data, 2025

The findings support the theoretical hypothesis that partial divestment through joint ventures can unlock latent value in state-controlled enterprises. This supports both the Resource-Based View and the Trade-Off Theory, as the JV model allows access to strategic resources (technology, market channels) while improving capital structure dynamics. Further insight is provided through sensitivity analysis, which reveals the model's valuation is highly sensitive to two operational inputs: revenue growth and cost of goods sold (COGS). As summarized in Table 3, these two variables alone account for nearly 98% of valuation variance, underscoring the importance of market access and procurement efficiency.

Table 3. Sensitivity Analysis of Key Value Drivers

Input Variable	% Range Sensitivity (>20%)	Implication
Revenue Growth (%)	182.04%	Access to partner's sales channels is critical
COGS (% of revenue)	144.10%	Procurement & technology synergy required
Weighted Avg Cost of Capital (WACC)	23.16%	Indicates need for future capital structure optimization
SG&A (% of revenue)	22.76%	Importance of back-office efficiency and integration

Source: Research data, 2025

Finally, the results from the Monte Carlo simulation offer a probabilistic validation of the JV scenario. As presented in Table 4, the mean equity value under the simulation is $241.75 million—approximately 38% higher

than the static base case. The simulation exhibits positive skewness (+0.30), indicating a higher likelihood of upside potential, while the minimum projected value remains well above break-even, reflecting robust downside protection.

Table 4. Monte Carlo Simulation Summary (Scenario 2)

Statistic	Value	Interpretation
Mean Equity Value	$241.75 Million	37.85% higher than the static base case
Standard Deviation	$80.29 Million	Reflects volatility consistent with a high-growth strategy
Skewness	+0.30	Indicates upside potential outweighs downside risk
Probability of Loss	<1%	Minimum projected equity remains positive ($54.06M)

Source: Research data, 2025

The joint venture structure is demonstrated to be both financially superior and strategically robust. The integration of discounted cash flow valuation with simulation-based risk analysis offers empirical evidence that a partially divested structure not only enhances value creation but also mitigates downside risks inherent in capital-intensive spin-offs. These findings build upon and extend the privatization and restructuring literature, particularly in the context of emerging-market SOEs.

Discussion

The empirical findings of this study substantiate several core propositions within the corporate restructuring and spin-off literature, particularly in the context of state-owned enterprises (SOEs) operating in capital-intensive sectors. The superior performance of the joint venture (JV) scenario over the wholly-owned subsidiary model reflects both theoretical expectations and previous empirical findings, while offering novel insights into how spin-off design affects value creation under institutional constraints typical of emerging markets. First, the valuation premium of 14.4% in the JV scenario reinforces the privatization efficiency hypothesis articulated by Megginson and Netter (2001), which posits that partial or full divestment often leads to performance improvements by mitigating bureaucratic inefficiencies inherent in SOEs. In this case, the spin-off through a strategic partnership enables the newly formed entity to bypass legacy governance frictions and operate with enhanced autonomy—an outcome consistent with Agency Theory (Jensen & Meckling, 1976). By separating the business unit from centralized oversight, the JV structure reduces agency costs through clearer accountability, more targeted incentive alignment, and better transparency for external stakeholders (Desai & Jain, 1999; Krishnaswami & Subramaniam, 1999).

Second, the operational outperformance of the JV structure—reflected in gross profit margins and ROIC consistently above the WACC—offers strong support for the Resource-Based View (RBV). This theoretical lens suggests that firms derive sustainable competitive advantage not solely from structural changes, but from access to valuable, rare, and inimitable resources (Barney, 1991). The assumed benefits in the JV scenario—namely, access to lean manufacturing practices, proprietary technologies, and global sales networks—represent the type of resource complementarities discussed in alliance literature (Teece, 1986; Kogut, 1988). These findings suggest that strategic alliances are not merely financial constructs, but enablers of operational transformation, particularly in sectors where state ownership models constrain internal capability development.

Third, the findings regarding capital structure inefficiencies in both scenarios resonate with the Trade-Off Theory of capital structure. Although both spin-off models initially adopt conservative, equity-heavy funding strategies to preserve financial stability, simulation results indicate that such structures lead to uncompetitive return on equity (ROE) and elevated WACC over the long term. This outcome reflects the theoretical tension between financial slack (as preferred in Pecking Order Theory, Myers & Majluf, 1984) and the efficiency gains available through leverage (Modigliani & Miller, 1963; Kraus & Litzenberger, 1973). The simulation results thus imply that a phased recapitalization strategy, possibly through bond issuance or hybrid financing instruments, would be necessary to optimize firm value in later operational stages fully.

Importantly, this study expands upon the empirical base by incorporating ex-ante internal valuation and simulation, in contrast to the dominant ex-post event-study methodologies used in prior spin-off research (Veld & Veld-Merkoulova, 2009; Bergh et al., 2008). By integrating deterministic and probabilistic modeling, the research offers a more nuanced understanding of how ownership and structural design interact with risk in strategic investment contexts. The positive skewness and limited downside risk observed in the JV simulation affirm the theoretical claim that strategic partnerships can offer asymmetric value potential, a key characteristic of high-growth ventures under uncertainty (Courtney et al., 2005; Rachev & Fabozzi, 2023). Finally, the findings have broader implications for policymakers and enterprise reformers in emerging economies. The study demonstrates that spin-offs, when designed with both operational and capital structure considerations, can serve

as practical mechanisms to improve performance and reduce fiscal dependency in SOEs—without requiring full-scale privatization. This insight is particularly relevant in strategic industries, such as aerospace, where national interest must be balanced with commercial viability.

E. CONCLUSION

This study contributes to the literature on corporate restructuring by developing a quantitative framework to evaluate spin-off strategies within state-owned enterprises (SOEs), particularly in capital-intensive and strategically regulated sectors. Through a comparative analysis of two ownership structures—a wholly-owned subsidiary and a joint venture—the research integrates Discounted Cash Flow (DCF) valuation with Monte Carlo simulation to assess intrinsic equity value, operational performance, and risk-adjusted returns under uncertainty. The results confirm that while both ownership models are financially viable, the joint venture structure offers superior value creation potential. It achieves a 14.4% higher intrinsic equity value compared to the subsidiary scenario, driven by operational synergies that improve return on invested capital (ROIC) and reduce cost of goods sold (COGS). These findings validate theoretical propositions from Agency Theory, the Resource-Based View, and Trade-Off Theory. Specifically, the joint venture is shown to reduce agency costs through decentralized governance, enhance strategic capabilities through access to complementary resources, and offer more flexibility in future capital structure optimization.

Beyond practical implications for SOE managers and policymakers, this study advances academic understanding of spin-off design by applying ex-ante valuation methodologies, in contrast to the predominantly ex-post approaches used in the literature. The integration of deterministic and probabilistic analysis allows for a more robust assessment of asymmetric risks and upside potential—elements that are particularly salient in high-uncertainty environments such as aerospace manufacturing. However, several limitations create opportunities for future research. First, the current model assumes a conservative, equity-based capital structure during the initial launch phase. Subsequent studies could explore optimal timing and instruments for Phase II recapitalization, including comparative analysis between debt and sukuk financing in SOE contexts. Second, while operational synergies were modeled through efficiency assumptions, future work should investigate the organizational integration mechanisms—such as governance structure, cultural alignment, and performance incentives—that enable those synergies to materialize in joint ventures. Lastly, a longitudinal ex-post empirical study measuring actual post-spin-off performance would provide valuable validation of the ex-ante projections developed here.

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