

Investment Decision Analysis: Dante Inc. — EV Battery Plant Expansion Case Study

Scenario Overview:

Dante Inc., a rapidly expanding electric vehicle (EV) battery manufacturer, is evaluating two strategic investment options to meet rising global EV market demand. The company seeks a comprehensive financial and risk-based comparison of the following two alternatives:

- Strategy A: Constructing a new \$250 million battery production facility in Texas, and an operational assumption that each battery requires 10kg of lithium and 5kg of cobalt.
- Strategy B: Partnering with a third-party manufacturer in Asia, involving a \$50 million partnership fee, annual service contracts.

Objective:

Develop a detailed investment model using Excel that calculates and compares the financial viability and risk profile of both strategies over a 10-year horizon, under uncertainty due to fluctuating EV market growth rates, raw material prices (lithium, cobalt), operating/service costs, and global trade risks.

Data and Distributions:

Variable	Distribution	Mean/Expected Value	Std. Dev	Notes
Initial Investment (A)	Fixed	\$250,000,000	N/A	Construction cost
Initial Investment (B)	Fixed	\$50,000,000	N/A	Partnership fee
EV Market Growth Rate (%)	Triangular	Mode: 15%	Low: 8%, High: 25%	Demand growth uncertainty
Lithium Price per Metric Ton (\$)	Normal	\$30,000	\$6,000	Commodity price
Cobalt Price per Metric Ton (\$)	Normal	\$55,000	\$9,000	Commodity price
Battery Sales Price per Unit (\$)	Normal	\$8,500	\$1,000	Sales revenue variability
Annual Fixed Operating Costs (A)	Normal	\$60,000,000	\$10,000,000	For the Texas facility
Annual Service Cost (B)	Normal	\$70,000,000	\$8,000,000	Outsourcing service fee
Annual Units Sold	Triangular	Mode: 450,000	Low: 300,000, High: 600,000	Market demand
Discount Rate	Fixed	10%	N/A	Cost of capital
Project Lifetime	Fixed	10 years	N/A	Strategic time horizon

Specific Assumption for Strategy A:

- Each battery produced requires:
 - 10 kg of lithium
 - 5 kg of cobalt
- The total variable cost for lithium and cobalt is calculated yearly based on these quantities and the simulated annual prices.

Tasks:

1. Build a Monte Carlo Simulation
Simulate 10,000 iterations for both Strategy A and B to reflect market and price uncertainties.
2. Calculate Yearly Cash Flows:
 - Strategy A:
Total Revenue = Units Sold * Battery Price
 - Material Cost = (Units Sold * 10 kg * Lithium Price) + (Units Sold * 5 kg * Cobalt Price)
 - Total Costs = Material costs+ Fixed Operating Costs
 - Net Cash Flow = Total Revenue - Total Costs

- Strategy B:
Total Revenue = Units Sold * Battery Price
Total Costs = Annual Service Cost
Net Cash Flow = Total Revenue - Total Costs
- 3. Calculate and Compare Key Metrics:
 - Net Present Value (NPV)
 - Internal Rate of Return (IRR)
 - Profitability Index (PI)
 - Probability of Negative NPV
 - Value at Risk (5% Percentile)
 - Standard Deviation of NPV
- 4. Data Visualization:
 - Plot histograms for NPV distributions.
 - Plot IRR and Profitability Index comparisons.
- 5. Qualitative Analysis:
Evaluate both strategies in light of:
 - Tariff and global trade risk exposure.
 - Supply chain volatility.
 - Internal factors: organizational readiness, labor skills, cultural alignment, operational control.

Final Task:

Recommend the most financially sound and risk-balanced strategy for Dante Inc., supported by both quantitative simulations and qualitative reasoning.