



Strategic Capital Allocation in the Circular Economy

A Comprehensive Analysis of Hindalco Industries using
AI-Driven Governance & Quantitative Risk Modelling

Project Context: Financial Management | MBA-BA'27 | Working With AI Project
Submitted to Prof. Anand

Submitted by Pritish Priyam (B71-25)

The Industry Shift: From Extraction to Circularity

Context:

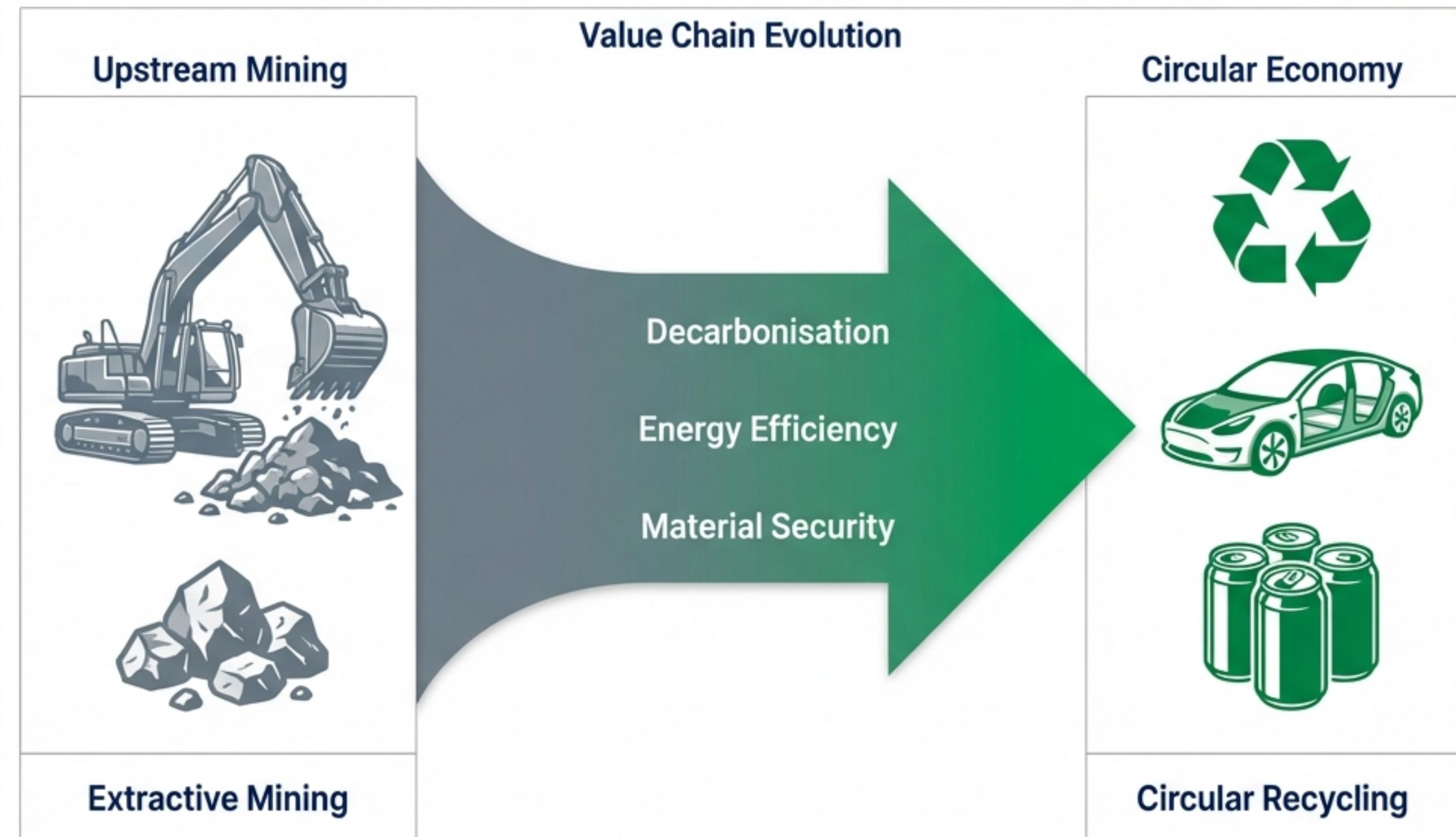
Hindalco is pivoting from upstream extractive mining to downstream value-added recycling.

Drivers of Change:

- Geopolitics: 'China Plus One' supply chain disruption.
- ESG Mandates: Global pressure for decarbonisation.
- Economics: Rising energy costs impacting primary smelting.

Key Insight:

Survival requires balancing cyclical dominance with a sustainable pivot.



The Managerial Problem: Pricing Risk in a Dual Economy

The Core Tension:
How to evaluate
greenfield investments
in the circular
economy without
penalising them with
the legacy risks of
mining operations.



The Gap: Traditional Static CAPM fails to capture specific risk premiums for circular projects.

Risk: Misallocation of capital—rejecting value-accretive green projects or over-leveraging the firm.

Bottom Line: Hindalco must determine the accurate project-specific cost of capital to avoid under-investment in its future.

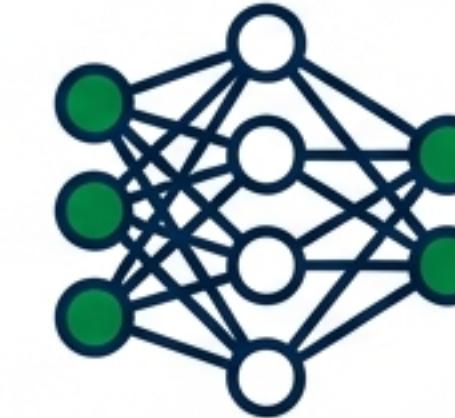
Why AI is Essential for Modern Corporate Finance

Traditional Approaches



- Relies on historical data and linear assumptions.
- Misses real-time volatility and qualitative nuance.
- Static CAPM fails to capture tail risks.

AI-Enhanced Analysis



- Unstructured Data: Extracts governance quality from 400+ page reports.
- Bias Mitigation: Objectively verifies management sentiment.
- Dynamic Modelling: Moves beyond static NPV to data-driven forecasting.

AI bridges the gap between ‘soft’ governance data and ‘hard’ market volatility.

Methodology: A Human-in-the-Loop Protocol



LLMs for synthesis;
Python for
Beta/Financial modelling.

Structured Prompting to
mitigate hallucinations.
Parsing Annual Report
2024–25.

Mandatory validation
of all financial figures
(WACC, CAPM).

Unlevered/Re-levered
betas and sensitivity
matrices.

Quote: "We strictly avoided asking AI to forecast prices. We used it to process logic and extract facts."

Firm-Level Governance: Validating the 'Trusteeship'



AI-Extracted Evidence (FY 2024–25)

- Board Independence: Balanced structure (Strategy vs. Operations).
- Impact: Strong independent oversight reduces Agency Costs, lowering the perceived risk premium.

Firm Risk & Return Profile (FY 2024–25)

Key Metrics

54.5%

1-Year Return

30.3%

Annualised
Volatility

0.87

Long-Term
Beta



Hindalco exhibits significant outperformance vs. market, but with higher cyclical volatility.

Firm-Level Cost of Capital (WACC)

Equity Component

Weight: 76.1%

Cost of Equity (Ke):
12.09%

(Rf 6.0% + Beta 0.87 ×
MRP 7.0%)



Debt Component

Weight: 23.9%

Cost of Debt (Kd):
7.5%

(AA+ Rating spreads
~0.86% over G-Sec)

= **10.48%**

**Firm-Wide WACC
(Hurdle Rate)**

This 10.48% is the hurdle rate for existing cyclical operations.

The Opportunity: 100 KTPA Integrated Recycling Facility

Inputs

- Aluminium Scrap
- Used Beverage Cans (UBCs)
- Automotive Scrap



Outputs

- High-Grade Ingots
- Alloys for EVs



Project Specs



Gujarat,
India



100 KTPA
Capacity



₹600 Cr
Capex



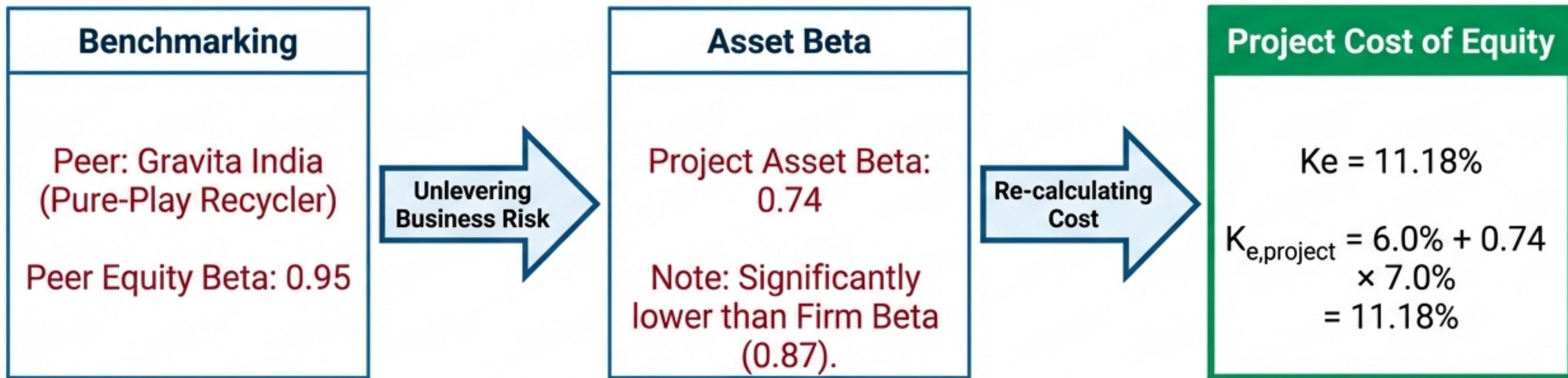
Energy: 5% of
Primary Smelting

Strategic Rationale

Reduces dependency on volatile bauxite mining and secures raw material for the EV revolution.

Project Valuation: Uncovering the 'Green Premium'

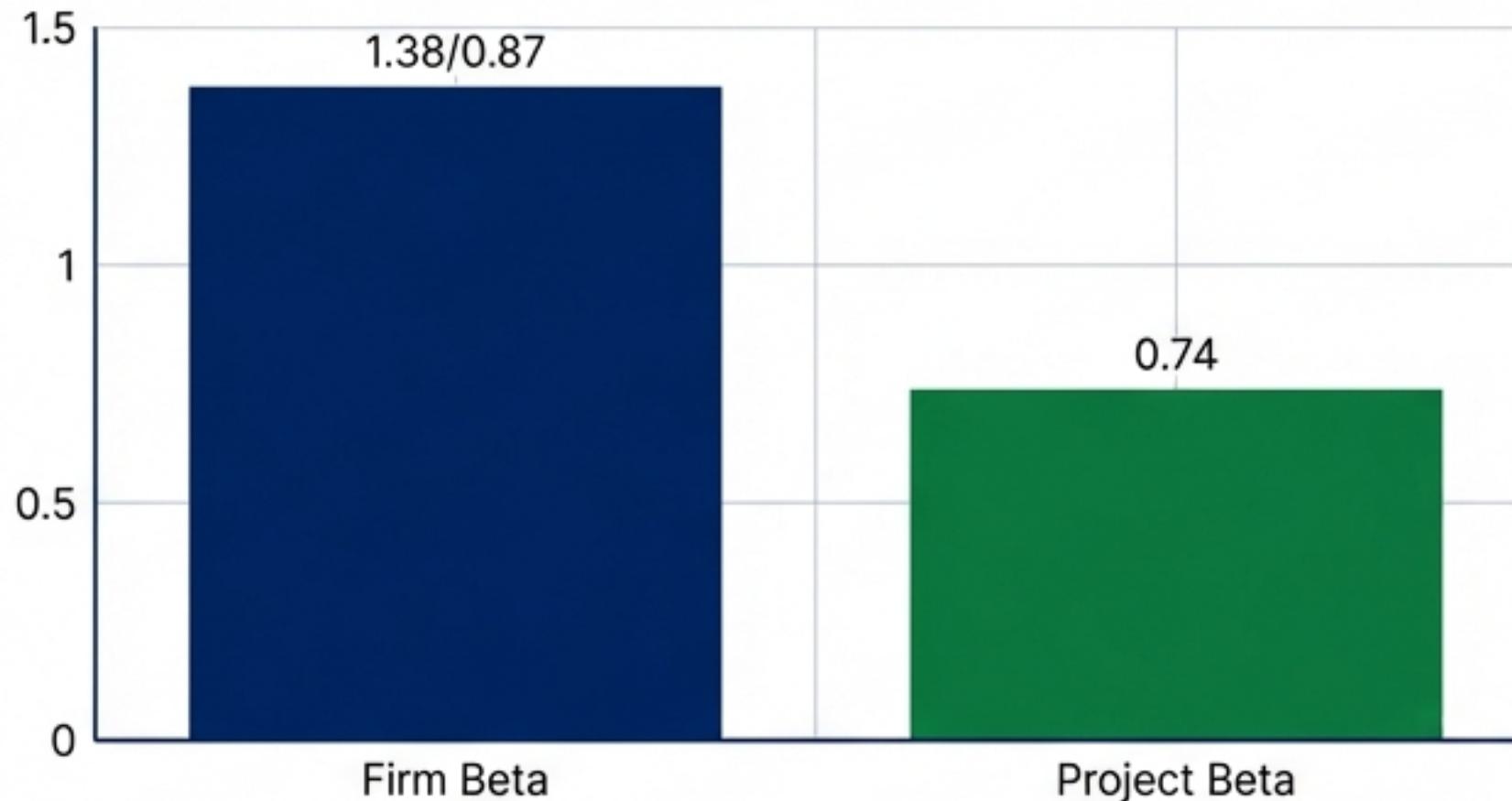
Unlevering → Relevering



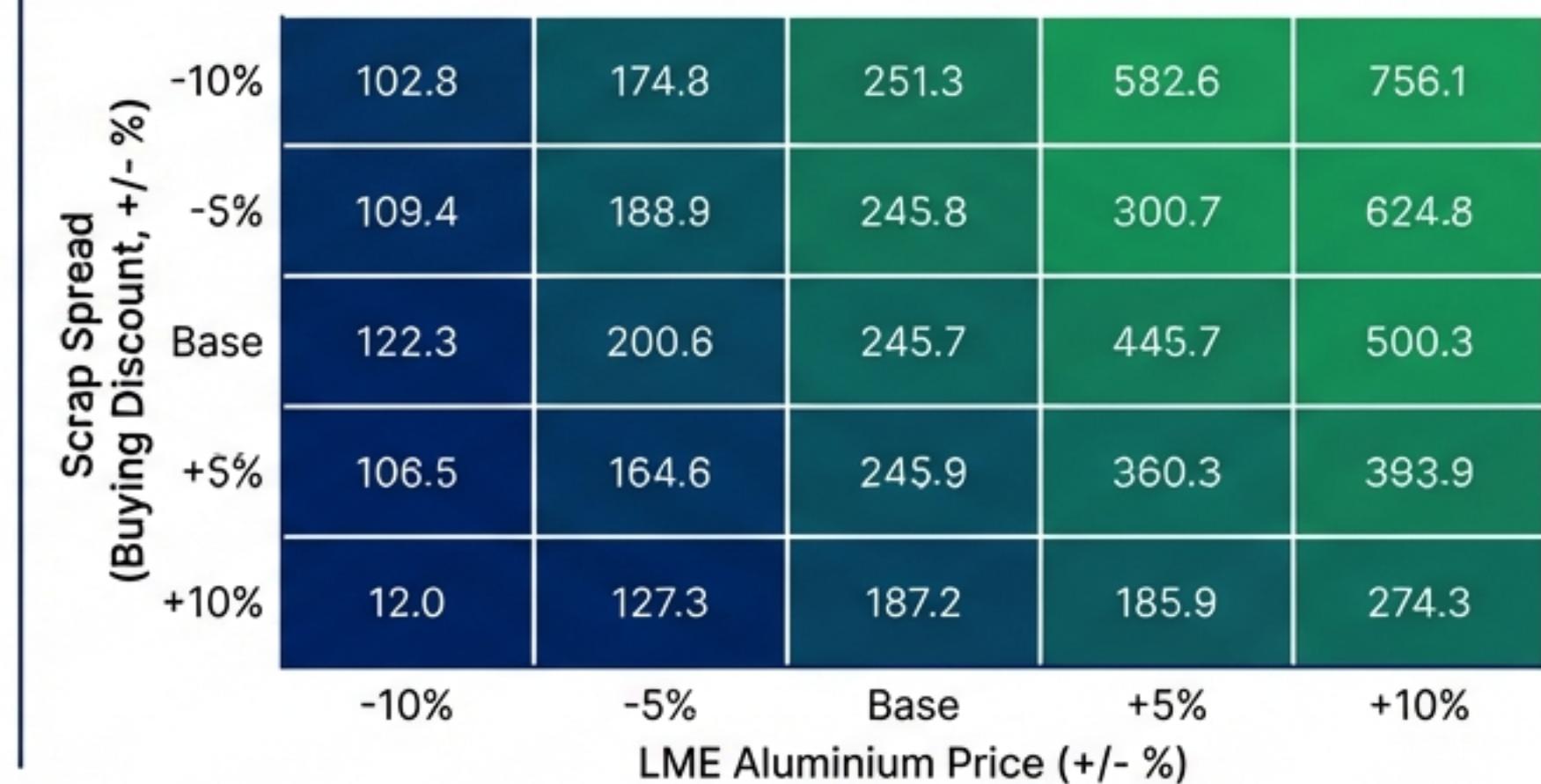
**The project is significantly less risky than the parent firm.
Using the firm-level rate (12.09%) would destroy value.**

AI Scenario Analysis & Sensitivity

Firm vs Project Beta



EBITDA Sensitivity



Counter-Intuitive Insight: AI simulation reveals project **EBITDA is less sensitive to absolute LME Aluminium prices, but highly sensitive to the Scrap Spread (buying discount).**

Steady State Financials (Year 3):

- Revenue: ₹1,890 Cr
- EBITDA: ₹245.7 Cr (13% Margin)
- NOPAT: ₹154.3 Cr

Strategic Implication: Focus on securing long-term scrap supply contracts.

Strategic Recommendations & Conclusions



Approve the Project

- The Project is value-accretive. Project Cost of Equity (11.18%) is lower than the Firm's (12.09%).



Optimise Capital Structure

- Firm Level: Maintain current efficient structure (WACC 10.48%). Preserve flexibility.
- Project Level: Maximise debt (60-70%) for this specific asset to leverage lower risk.



Governance Evolution

- Establish a 'Technology & AI Committee' to oversee digital integration and data privacy.

Questions?

References: Integrated Annual Report 2024–25, NSE Market Data, RBI Bond Yields.