This integrated techno-economic analysis process offers a framework for undertaking complex valuation to guide strategic decision making and to refine strategy. The method integrates Net Present Value (NPV), Monte Carlo simulation, and Real Options Analysis (ROA) to extrapolate the value of an innovation, particularly when new and uncertain markets are involved.

Keyworks: techno-economic analysis, valuation, innovation, strategy, management of uncertainty, optimization, IF, R&D, NPV, ROA

### OVERVIEW

Integrated financial modeling & simulation for high-risk / high-reward innovation valuation

### SCOPE

Identifying business objectives, model artifacts, data & structure

### MODEL

Providing insight into risks / opportunities via integrating probability & scenario analysis

### RANGES

Static variables are extended to "ranges" (i.e. min, max, average; historical probability distributions) based upon historical data and experts. Key variables are enhanced according to an understanding of their probabilistic behavior, bringing insight to variable factors affecting capital/operating costs, revenue, economic factors, etc.

### SCENARIOS

Gross and uncertain factors (both risks & opportunities) are added to the NPV model via a branching Decision Tree. Such factors could include: chance and cost of legal suit, chance of subsidy/grant, market size, R&D success/failure, chance of competitor entering, alternate strategies for commercialization (timing, scale, offering, licensing, partnering, sell). Decision Tree analysis allows for advanced like-to-like introspection regarding macro-level risks and opportunities.

### SIMULATE

Integrated simulation gives direct insight into volatility & sensitivity

### OPTIMIZE

Refine comparative scenarios by optimizing structure, planning, timing...

### ITERATE

Review and validate: refine model via refined information and understandings

Static Net Present Value (NPV) analysis presents a highly linear and selective view of a prospect, often overlooking key opportunities and risks. The techno-economic model framework extends traditional Net Present Value (NPV) analysis via integrated Monte Carlo (probability) and Real Options Analysis (scenarios) to facilitate robust analysis of risks and opportunities. Continuously and iteratively refined, the model is an organizational artifact, bringing together diverse experts and stakeholders into a unified, structured conversation. Economy and transparency are key: the model must be as simple as possible with a clear audit path concerning key assumptions.

Combined, Monte Carlo simulation and Decision Tree results show expected ranges & sensitivities via risk-adjusted NPV outcomes. The highly-segmented model provides both roll-up and deep-dive insights into integrated strategic factors: Financial (granular): uncertainties, price variability, revenues, CAPEX/OPEX, market price elasticity, currency & interest rates, etc... Scenario-based (gross): investment, timing, scaling, POC cost/savings, risk strategies, commercialization/revenue strategies, financing, market, key risks, etc...