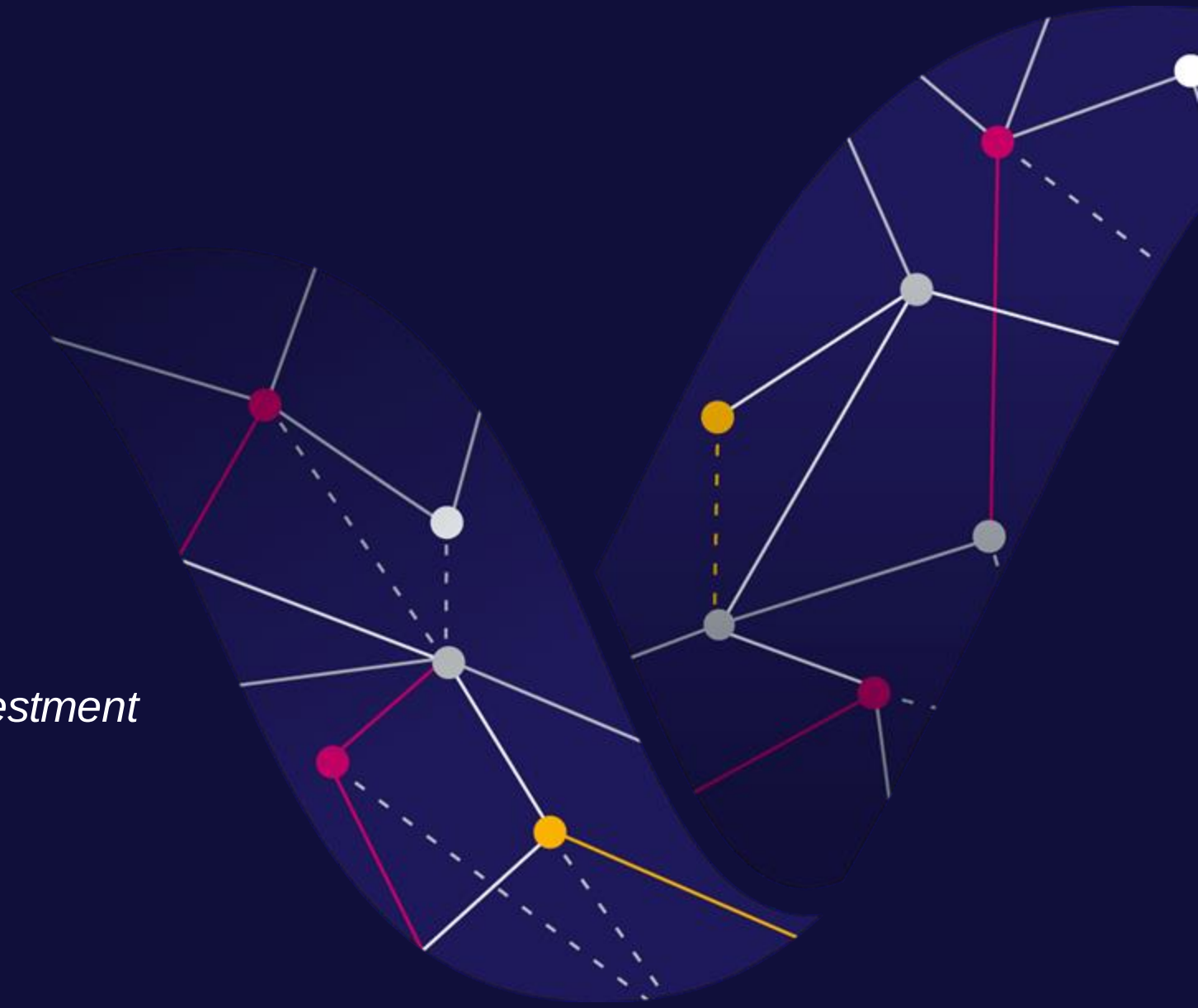
CONFIDENTIAL

Introduction to

VALLORII

Data-driven products for infrastructure investment

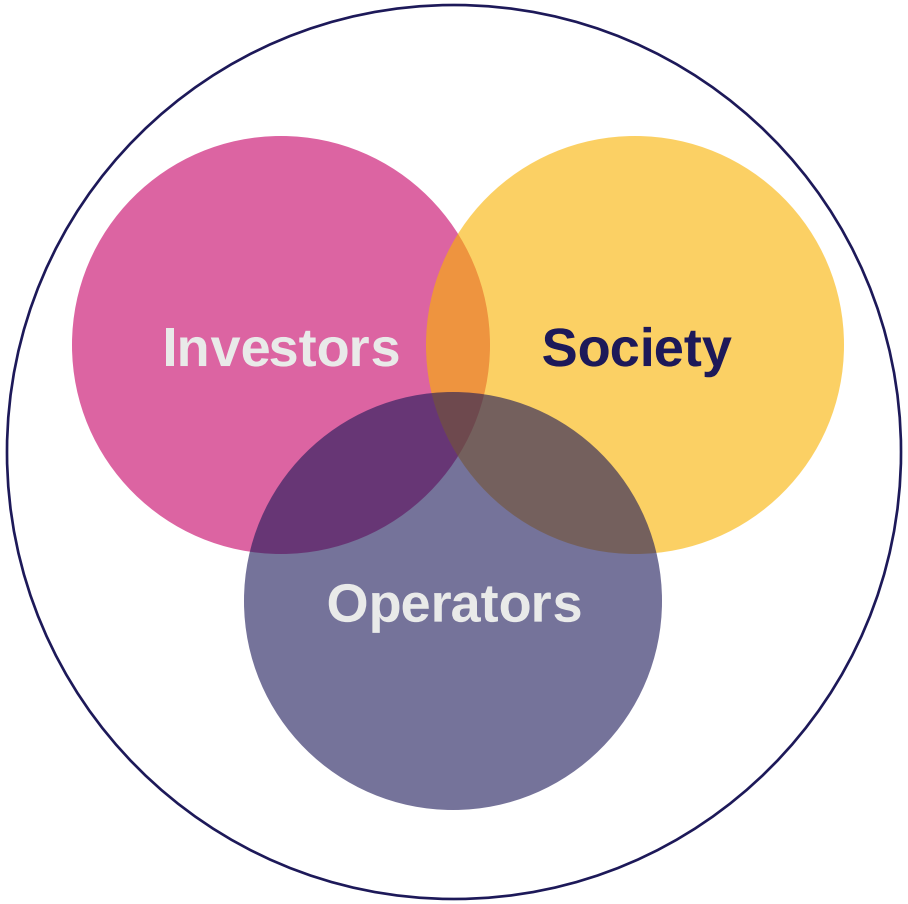
23rd October 2024



Agenda

1. **Who we are**
2. A pivotal moment of change in the infrastructure sector
3. Will the current regulatory model be fit for purpose?
4. The Vallorii approach and your guidance

The Vallorii Mission



The world needs critical infrastructure that supports economic prosperity, social equity, and a sustainable environment.

We help investors, utilities, and regulators understand investment needs, risks, and returns.

Data-driven intelligence for sustainable and inclusive infrastructure investments.

We are building a team with AI, big data, economics and financial analytics

Sandy Arbuthnott
Oxford/LBS, ex-Bain, engineering, sustainability & program management

Lennart Baumgärtner
Oxford, ex-McKinsey, complexity economics & physics

Anita Bharucha
Cambridge, ex-Whitehall, public sector NED, ops leadership

Cassian Burger
Bocconi/Cass, ex-investment banking

Jorgé Cardenas
KIT, ex-Quantum Black, AI product leader

Cassandra Etter-Wenzel
Oxford, ex-OECD, regulatory specialist

Dieter Helm
NED, Oxford Prof of Economic Policy

Cameron Hepburn
NED, Oxford Prof of Environmental Economics

Ranjita Rajan
NED, start-up leadership, PE and sustainability expert

Robert Ritz
Cambridge/Ofgem, ex-Vivid/McKinsey, financial economics

Jennifer Vaughan
Order from chaos

Henry Tian
LSE, Queens, ex-McKinsey data scientist

Fit-for-purpose infrastructure must be based on fit-for-purpose economics, data and models

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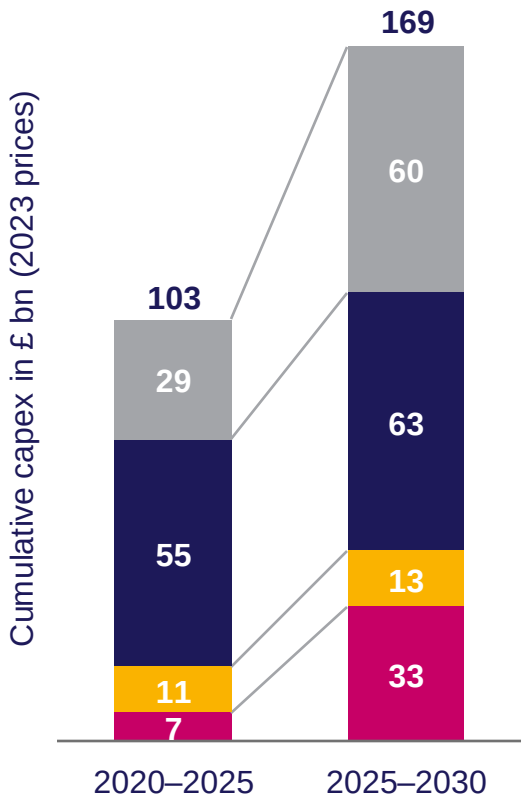
Capex in key infrastructure sectors is projected to rise more than 38% over the next five-year period

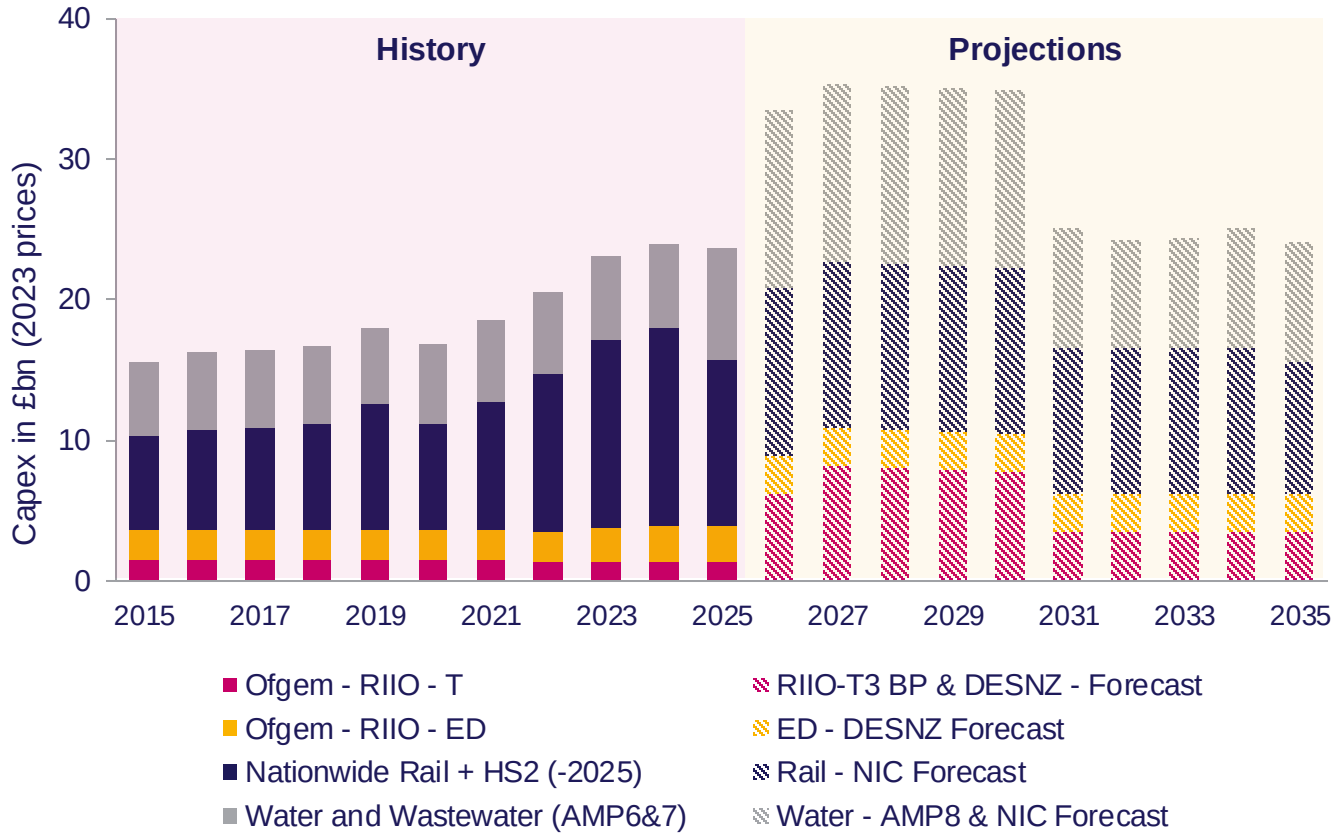
Key sectors

- Water and Wastewater
- Rail
- Electricity Distribution
- Electricity Transmission

Projection: > 38% capex growth



Infrastructure investment: stagnant past, present growth and elevated future



Sources: Electricity Transmission: Ofgem: RFPRs & RIIO-T3 Business Plans, DESNZ: Appendix I: Electricity Networks Modelling; Electricity Distribution: Ofgem: RFPRs & DESNZ: Appendix I: Electricity Networks Modelling; Water: Ofwat APRs & PR24 FD, 2nd National Infrastructure Assessment ; Rail: Annual Reports (Network Rail & HS2 Ltd.) & NIC: 2nd National Infrastructure Assessment

But there is limited capacity for debt with exhausted balance sheets – the UK water sector provides an example

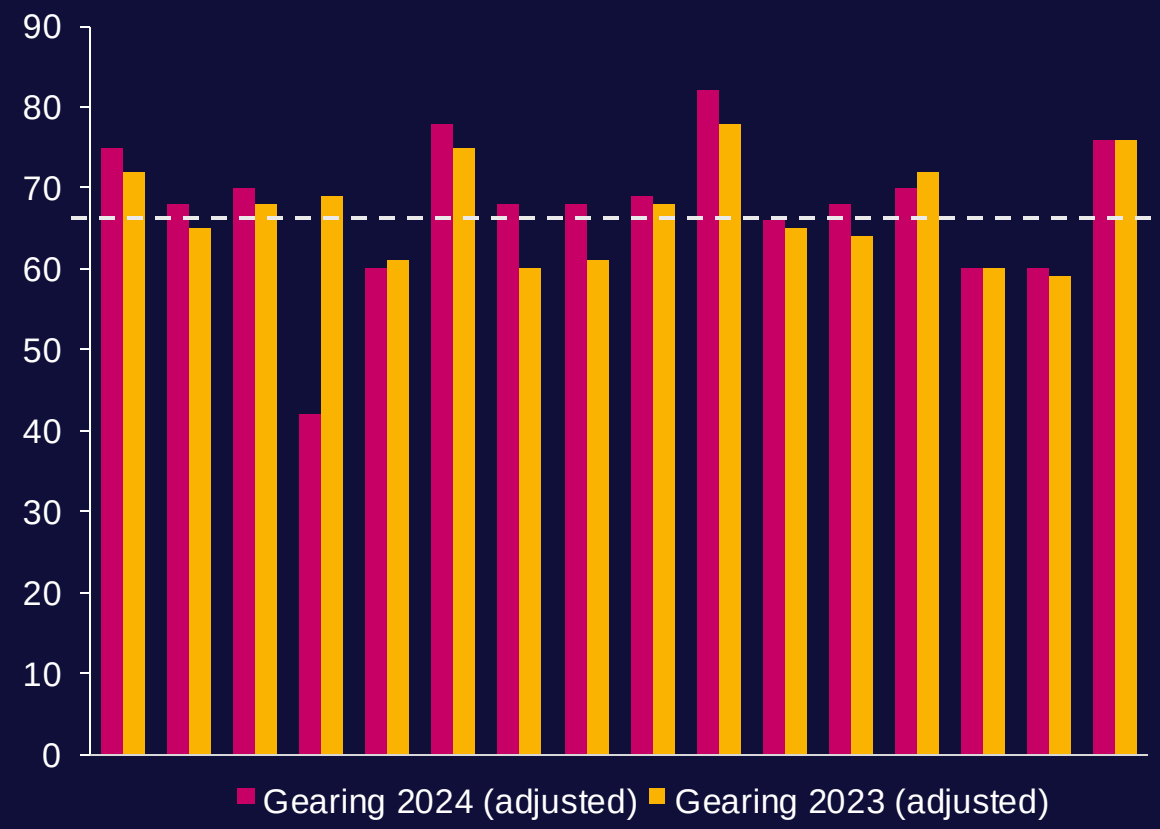
The sector is over-geared

- Total net debt (adj.) of regulated companies in 2024: **£69 billion**
- Total regulatory capital value of regulated companies in 2024: **£99 billion**
- Gearing ratio across regulated companies in 2024: 70%

Gearing Examples

- **Low:** Portsmouth Water **(42%)**
- **Mid:** Severn Treat Water **(59%)**
- **High:** Thames Water **(81%)**

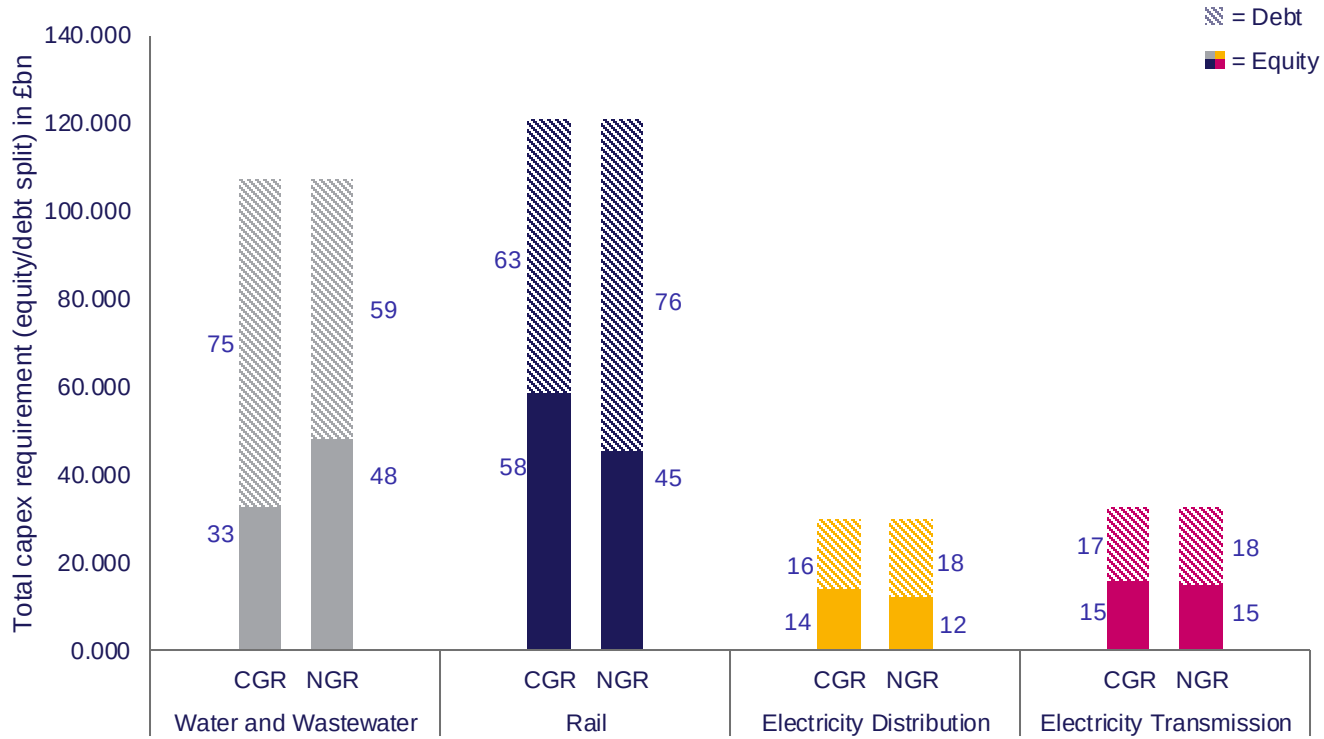
Source: Annual Performance Reports (Ofwat regulated companies)



So equity must do some heavy lifting – total equity need is estimated at more than £120bn over the next decade

Key sectors	Current Gearing Ratio	Notional Gearing Ratio
Water and Wastewater	70%	55%
Rail	52%	63%
Electricity Distribution	53%	60%
Electricity Transmission	52%	55%

Debt/Equity requirement in 4 key sectors (2025–2035)*



➔ **Cumulative equity need to surpass £120bn, based on notional gearing**

Sources: Ofgem: Regulatory Financial Performance Reports; Ofwat: Annual Performance Reports; ORR: Annual Efficiency and Finance Assessment of Network Rail; HS2: Annual Report 2024 ,

* Equity need calculated based on notional (NGR) and current (CGR) gearing ratios

But is the UK regulated infrastructure investable?
Equity investors need a fine-grained understanding of the risks

Common risks, typically accounted for in today's risk analysis

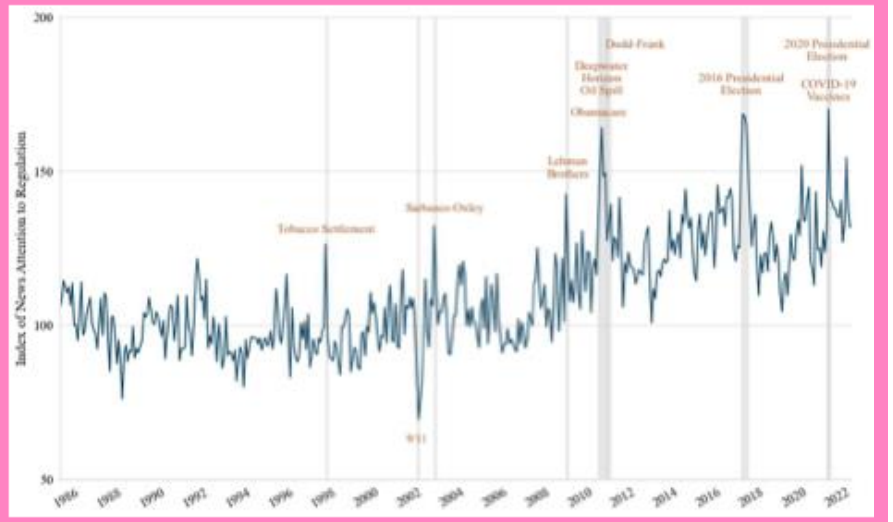
Elevated and new types of risks, often underrepresented in today's risk analysis

VALLORII

Focus using AI and advanced analytics

- Construction/development risks
- Operational risk
- Interest rate and financial risks
- Currency and market risks
- Counterparty risks
- **Regulatory/political risks**
- Geopolitical risks
- Natural disaster and climate change risk
- Terror-related risks
- Cyber risks

Case example:
US media shows increasing attention to regulation



Sources: Federal Reserve Bank of St, Louis, George Washington University, Vallorii team

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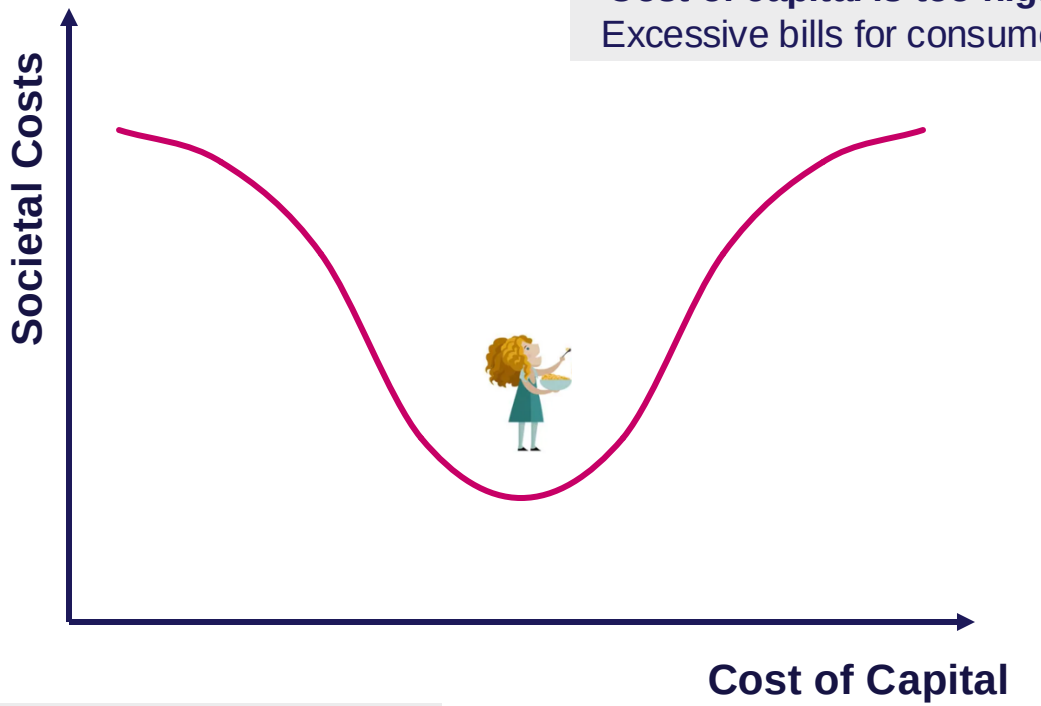
From a societal perspective, we want regulators to steer us to the 'Goldilocks' cost of capital that minimises net costs to society

Cost of capital is too high?
Excessive bills for consumers



Cost of capital is too low?
Under-investment or bail-outs

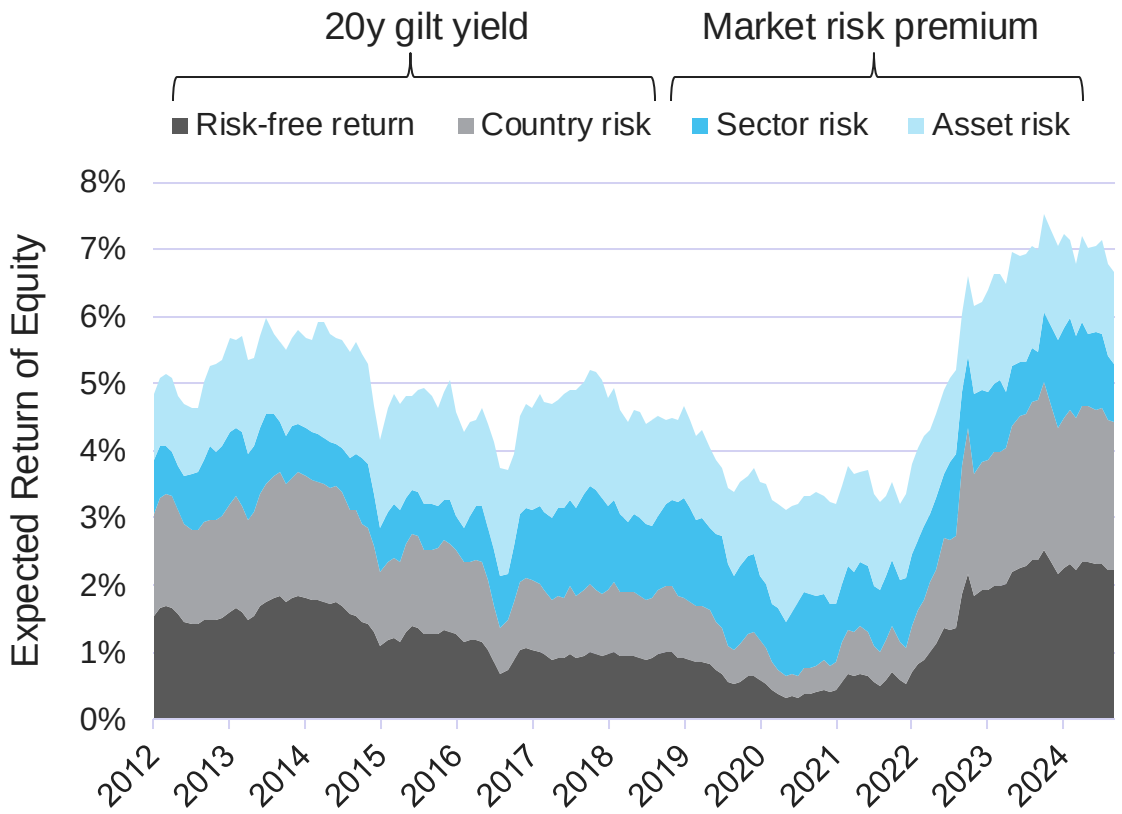
Increasing the return on the 2025-2030 capex across the 4 key sectors by 1% results in additional costs to UK consumers of:

~£230m/year

Sources: Vallorii analysis, assuming 55% notional gearing, GBP 169bn in Capex investment in 2025-30, and allowed return on RAB accounts for ~30% of allowed revenues

The Goldilocks cost of equity can be determined by the risk-free rate and several risk premia

ILLUSTRATIVE



$$R = R_F + R_P$$

Expected return on equity | Risk-free return | Risk premium

Q1 What is the risk-free return?

Q2 What are the underlying risks? (Country, Sector, Asset, …)

Q3 What is a fair compensation for those risks?

The regulatory framework needs the right incentives for investability and operational excellence

Risk model	**Risk assessment**	**CAPM** is currently used for both risk assessment and compensation
	Return compensation	
Application of risk model	**Assets**	**No differentiation** between different assets or investor (risk) preferences
	Investors	
	Timeline	• **In-period assessment** of CoC • Out-of-period assessment of CoC methods

What incentives are given by…

Q1 … a CoD that is too high and CoE that is too low?

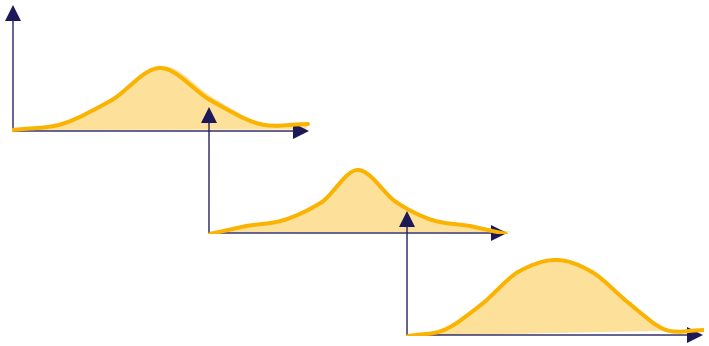
Q2 … applying a wrong CoC to the RAB vs. the true CAPEX?

Q3 … a single CoC that is applied to multiple investments with different risk profiles?

Q4 … a single CoC is applied over the lifetime of an asset?

CAPM (Sharpe, 1964) is a key intellectual tool to find Goldilocks… We can now also bring to bear large data sets and novel granular methods

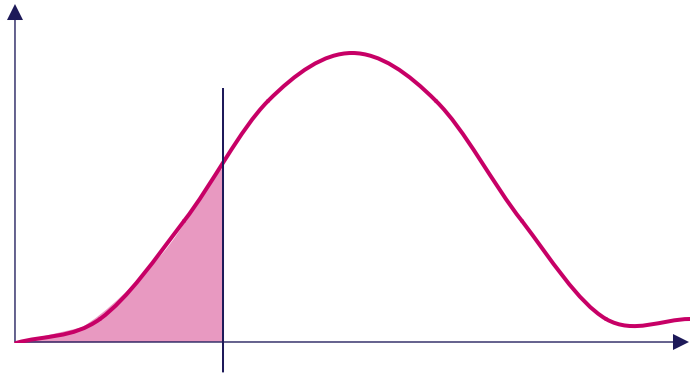
Granular risk profiles



Different assets and investments will have different risk profiles.

e.g., capital maintenance vs. new projects

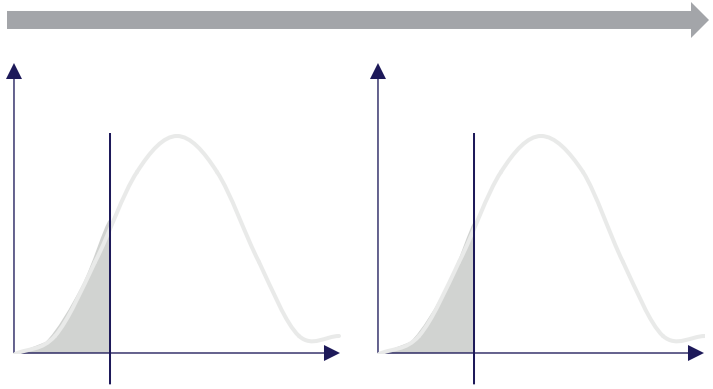
Heterogeneous risk aversion



Different investors will assess and value risk differently

e.g., pension funds vs. private equity vs. asset managers

Varying investment timelines



Investments and investors both have different timelines and changing risks

e.g., long-term nuclear investment vs. short-term solar PV project

Risk-return modelling:
There are a number of different approaches to estimate the cost of equity

		Advantages	Disadvantages
Financial market	CAPM	• Simple to implement, widely established benchmark	• Well-known shortcomings in underlying assumptions and limited ability to explain asset returns
	GARCH modelling (Robertson)	• Explanatory power typically outperforms CAPM • Captures time-varying/cyclical nature of beta estimates	• Significantly more technical than other CoC approaches • Unclear to what extent GARCH is simply picking up CAPM model misspecification
	Multi-factor model (Fama-French)	• Based on granular company-level risk factors • Explanatory power for asset pricing “anomalies” backed by finance literature	• More complex to implement than CAPM, including access to data • Unclear to what extent MFM is simply picking up CAPM model misspecification
	Dividend discount model (Gordon)	• Simple and well-established finance theory • Explicitly forward-looking based on market expectations	• Very sensitive to modelling assumptions • Less suited to estimating CoD than CAPM
	Debt risk premium	• Relatively innovative in terms of application to regulation	• Highly sensitive to modelling assumptions • By design yields bounds rather than point estimates • Limited practical experience in implementation
	Market-to-asset ratio (MAR)	• EV/RAB is widely followed by infrastructure specialists • Clear theoretical foundation that directly captures regulatory regime via the RAB, unlike other approaches	• Known to usually have weak predictive power • Unclear how to directly translate MAR into a CoC estimate
Cash flow	Discounted cash flow	• Clear theoretical foundation at the company level • Explicitly forward-looking	• Highly sensitive to modelling assumptions including growth rates • Sensitive to unknown price of risk aversion
	Real options valuation	• Clear theoretical foundation as financial instrument • Explicitly forward-looking	• Highly sensitive to modelling assumptions including growth rates • Complex implementation that requires modern mathematical tools
Insurance	Default probability	• Widely used in the insurance and banking industry • Existing regulatory standard in the financial sector	• Unclear how to apply to long-term infrastructure investments • Sensitive to unknown price of risk aversion

Risk-return modelling:
Taking CAPM into regulatory practice relies on strong assumptions

Explicit assumptions
- Mean-variance preferences
- Normal return distributions
- Risk-free rate for borrowing and lending
- Well-diversified, optimizing, investors
- Representative market portfolio

Implicit assumptions
- No market inefficiencies
- No environmental externalities
- No system coordination
- No regulatory failure or political uncertainty
- No structural change on radical uncertainty

Regulatory Practice
- Single business-wide WACC
- Single model to estimate WACC
- Constant β
- Notional gearing level
- Constant WACC over regulatory period

Neoclassical economies

No market failure

Static regulation

Risk-return modelling:
A balanced set of criteria can be used to evaluate modelling approaches

FOR DISCUSSION

Criterion		Description	Most important to?
1 IMPLEMENTABLE	 **Empirically implementable**	• Readily usable by stakeholders and based on widely available data	Investors, regulators, utilities
2 REPRESENTATIVE	 **(A) Realities of regulatory framework**	• Represents how regulation shapes returns and risks, with mandates on net zero and social objectives	Regulators, utilities, society
	 **(B) Realities of capital markets**	• Captures investor concerns such as political risk and institutional factors such as limited diversification	Investors, utilities
3 DEFENSIBLE	 **(A) Theoretically defensible**	• Represents economic and financial mechanisms that have plausible causal interpretations	Regulators, society
	 **(B) Empirically defensible**	• Can be implemented with limited user discretion and yields results that are sufficiently robust and stable	Investors, utilities, regulators

Source: Vallorii team, Wright, Burns, Mason & Pickford 2018 for criteria 1 and 3b

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We will advance risk-return modelling using modern data and financial tools, and develop an interactive and transparent user platform

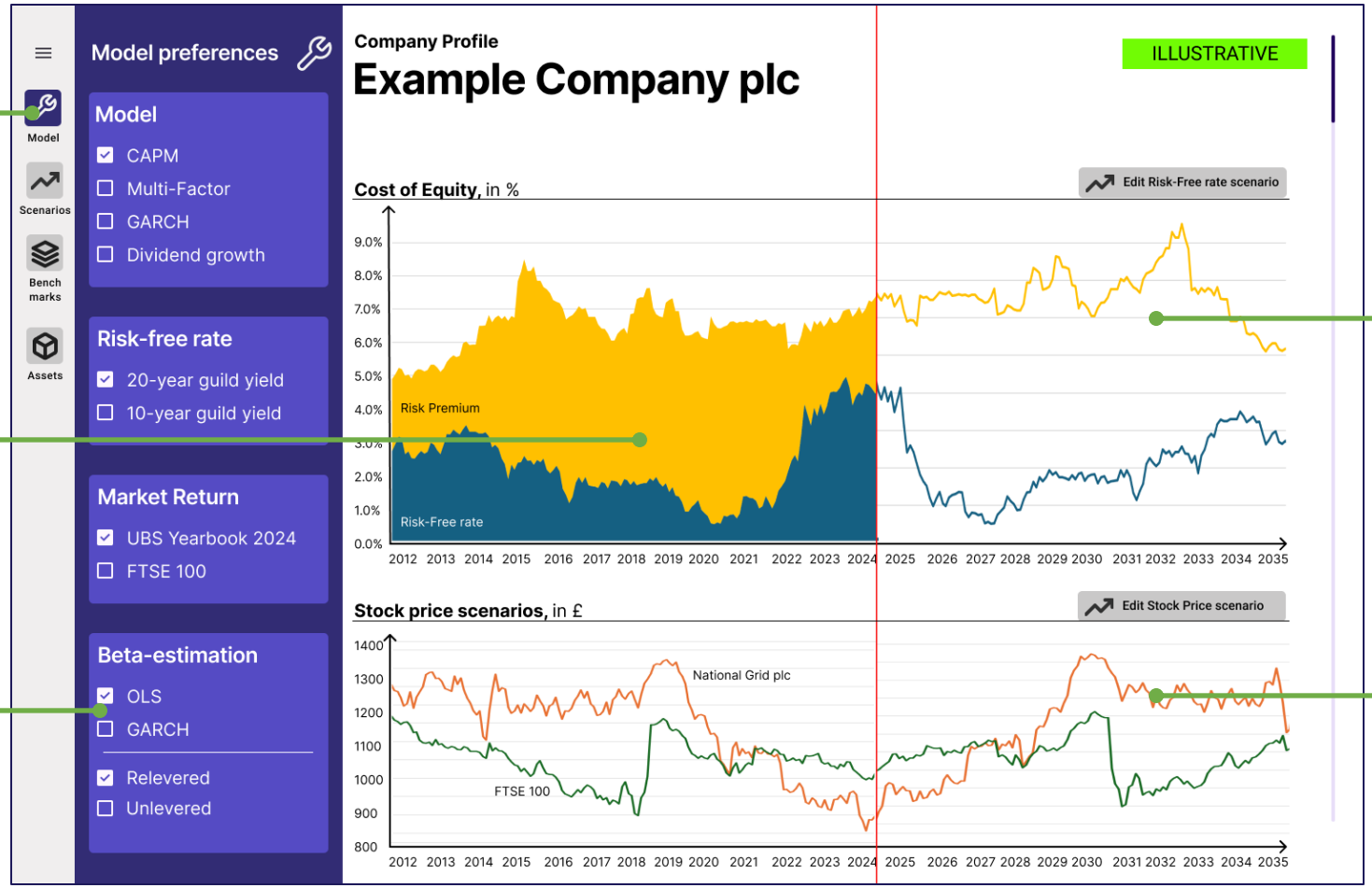
	Today: Universal CAPM	Tomorrow: CAPM+	New normal: Big data and AI
Infrastructure ecosystem	• Established regulatory process • ~5-year frameworks	+ Increased emphasis on climate risks, system change, societal costs, and investability	+ **Rich ecosystem interactions** under a refreshed regulatory regime
Risk-return modelling	• Universal CAPM base model • Sector-specific implementation • Company-specific adjustments	+ Detailed understanding of risk factors and risk premia + Application of modern financial tools + Real-world implications for investability and cash-flow analysis	+ **Granular data** and **AI techniques** for bottom-up risk and valuation analysis
User access	• Highly specialized reports • Academic commentary	+ Platform-based with transparency over data and modelling decisions + Interactive scenario design and exploration + Academic rigour and accessible reports	+ **Highly interactive user interface** as single point of access to data ecosystem with modern human-machine interfaces

Model interaction:
Interactive and intuitive user interface

Change model preferences, scenarios, view benchmarks and switch assets

View historic data, including historic cost of equity estimates, risk-free rates and risk premia

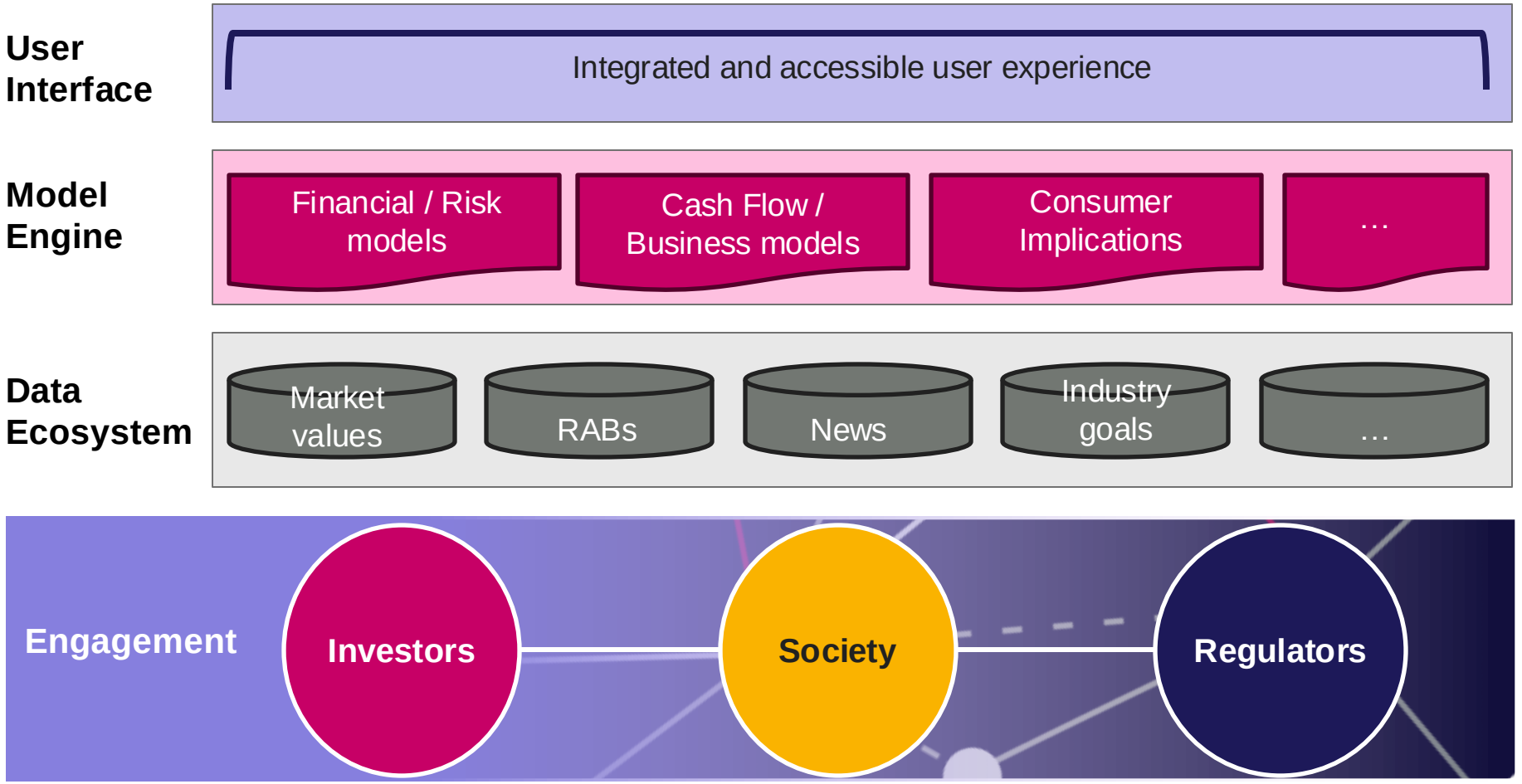
Select modelling preferences or compare different alternatives



Analyse forward-looking projections, conditional on different input assumptions, such as risk-free rates or stock prices

Make changes to scenarios and update conditional forward-looking projections

Model interaction:
Vallorii's approach is based on an accessible data ecosystem and interface



Transparent access
Standardized view on risks, simple visualization of technical concepts

Common data
Standardized datasets, Historical decisions, Investment needs and goals

Risk catalogue and taxonomy
Universal risk description and model, compensation benchmarks, joint understanding of investment needs and risk portfolios

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