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Uncertainty in Mineral Asset Valuation

From an Independent Expert Viewpoint

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All figures quoted in Australian Dollars

BDO

Independent Expert Reports in the Australian Context

Independent Expert Reports (IERs) provide crucial independent analysis for shareholders, determining whether transactions are fair and reasonable.

IERs for mining and exploration companies typically engage qualified Independent Technical Specialists to value mineral assets in accordance with Australian and international standards.



ASX Listing Rules and Corporations Act 2001 (Cth)

IERs are required for control transactions, such as takeovers, schemes of arrangement, related-party transactions and significant equity raisings, which are common for exploration companies



VALMIN and JORC Code Compliance

In Australia, IERs are required to follow the VALMIN Code—founded on Competence, Materiality, and Transparency—which complements the JORC Code (2012) for public disclosure standards



International Codes

Similar codes exist internationally such as SAMVAL Code in South Africa, CIMVAL Code in Canada and the IMVAL template which aims to harmonise valuation standards



Challenges in Mineral Asset Valuations

Regulatory Scrutiny

- Independent Expert has an AFSL and provides an opinion on the value of a company's securities
- Technical Specialist is a competent person under VALMIN to value assets outside the Independent Expert's area of expertise.
- ASIC requires experts to follow guidance such as ASIC Regulatory Guide 111 and codes such as the VALMIN Code
- ASIC reviews IERs and Independent Technical Specialist Reports (before and after public release).
- Interventions by regulators highlight the need for transparent, rigorous and compliant valuations that are capable of withstanding regulatory review

Inherent Uncertainty and Limited Data

- Valuations of early exploration projects can be challenging due to the lack of comprehensive data such as reliable future cash flows or resource estimates
- This results in experts relying on indirect methods and professional judgement in their assessments
- As a result, we experience differing market practice amid increased regulatory scrutiny
- Value ranges can be too wide to be meaningful to users of valuation reports

Guidance on Valuation Ranges

Value ranges

- RG 111.95 An expert should usually give a range of values. The value of securities is typically subject to uncertainty and volatility. Placing a precise dollar value on them is likely to imply a misleading accuracy to a valuation.
- RG 111.96 Nevertheless, the range of values should be as narrow as possible. If an expert cannot give a narrow range because of uncertainty (e.g. start-up companies), the expert should prominently explain in its report what factors create this uncertainty and how the expert is able to justify its findings despite the uncertainty. In our view, a broad range of values undermines the usefulness of the report.

ASIC Regulatory Guide 111 Content of Expert Reports

VALMIN CODE

8.6. Range

A range of values (high/most likely/low) **must** be determined and stated in a Public Report to reflect any uncertainties in the data and the interaction of the various assumptions made; however, the range should not be so wide as to render the conclusion of the Public Report meaningless.

A Public Report should also include a sensitivity analysis showing the effects of changing the most significant assumptions. In all cases, a most likely outcome should be identified. Any reasons for not doing so **must** be stated in the Public Report.

Methodologies Used in Technical Specialist Reports

The appropriate methodology depends on the project's stage of development and available data

VALMIN Paragraph 8.2 sets out common valuation approaches:

- Market-based
- Income-based
- Cost-based

TABLE 1

Valuation Approach	Exploration Projects	Pre-development Projects	Development Projects	Production Projects
Market	Yes	Yes	Yes	Yes
Income	No	In some cases	Yes	Yes
Cost	Yes	In some cases	No	No

Source: VALMIN Code 2015

Common methods for valuing early-stage projects include:

- Comparable Transactions – finding prices paid for similar mineral properties (per area or per inferred resource unit) and extrapolating a value
- Geoscientific (Prospectivity) Methods – a method where geological experts score the property's features (e.g. geology, mineralisation, drill results) to derive a value
- Multiples of Exploration Expenditure (MEE) – a cost approach where past exploration spending is multiplied by a factor reflecting prospectivity
- “Yardstick” rules – simple heuristics (often a percentage of in-situ metal value) sometimes used as a secondary check for resource-stage projects.

BDO Analysis Approach

We examined how Practitioners (Independent experts and Technical specialists) have tackled these challenges based on a study of public IERs from 2015 to 2024 for companies with mineral assets, analysing their:

- Valuation methodologies adopted
- Technical specialist valuation ranges
- Independent expert valuation ranges
- Commodity focus

We distinguished between:

Pre-MRE

Projects without a JORC-compliant Mineral Resource Estimate

Pre-Development

Projects with a defined resource but not yet in production and excluding ore reserves

Mining stage of development



Dataset overview

The Pre-MRE Projects dataset includes:

- 57 Independent Expert Reports
- 77 Technical Specialist valuations
- Total of 171 primary methodologies used by the Technical Specialists to derive a valuation range.

The Pre-Development dataset includes:

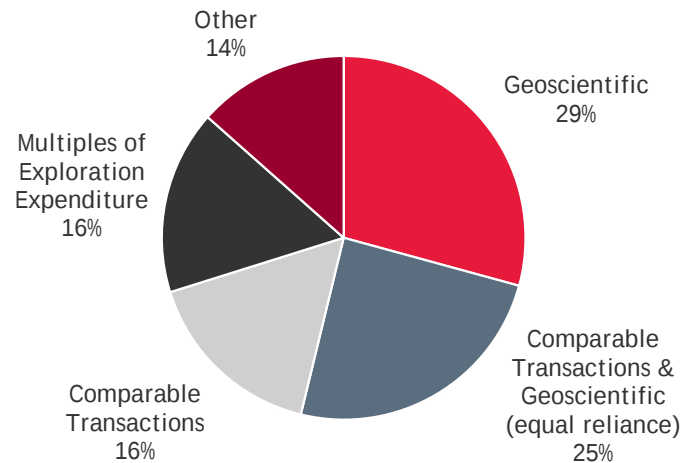
- 25 Independent Expert Reports
- 25 Technical Specialist valuations
- Total of 102 primary methodologies used by the Technical Specialists
- Valuation range analysis for Pre-Development projects is yet to be completed, and this is the next stage of our research.



Primary Methodologies Used

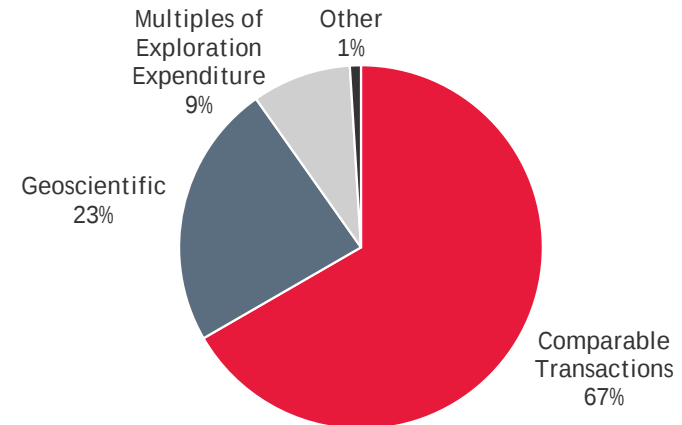
The transition from Pre-MRE to Pre-development stages shows a clear shift towards market-based approaches as resource definition improves data quality and enables better benchmarking.

Pre-MRE Projects – Primary Methods Used



- Geoscientific method was the most used primary valuation approach for early-stage projects lacking JORC resources.
- Dual-method valuations combining Geoscientific and Comparable Transactions were common to balance qualitative and market-based insights.
- Valuation strategies varied, with Comparable Transactions, MEE, and tailored methods used depending on project specifics.

Pre-Development Projects – Primary Methods Used



- Comparable Transactions is the dominant method for Pre-development projects with defined resources (67% of cases).
- Method choice depends on data availability, with Geoscientific and MEE used when market benchmarks and market data are lacking.
- Multi-method valuations are common, with 79% using at least two approaches to ensure robustness and regulatory alignment.

Valuation Ranges for Independent Experts

Valuation of the XYZ Project	Low (\$)	Preferred (\$)	High (\$)
Value of the Company's Mineral Assets	1,800,000	3,200,000	4,800,000
Value of the Company's other assets and liabilities	2,000,000	2,250,000	2,500,000
Total Value of the Company	3,800,000	5,450,000	7,300,000

Independent Experts Effects on Valuation Ranges

- Technical Specialist Range is 167%
- Add the company's other assets and liabilities
- Independent Experts' final valuation range was 92% after including the company's other assets and liabilities

Valuation Range Analysis: Pre-MRE Projects

125%

Average TS Range

Technical Specialists'
average valuation range as
percentage of low value

95%

Median TS Range

Technical Specialists'
median valuation range as a
percentage of low value

\$3.5

million

Average TS Range

Technical Specialists'
average absolute valuation
range

\$1.8

million

Median TS Range

Middle ground of Technical
Specialists' absolute
valuation range

52%

Most Likely Value Position

Technical Specialists
typically select the mid-
point as most likely outcome

88%

Average IE Range

Independent Experts' refined
average range in final
reports

62%

Median IE Range

Middle ground showing typical
uncertainty levels for
shareholders

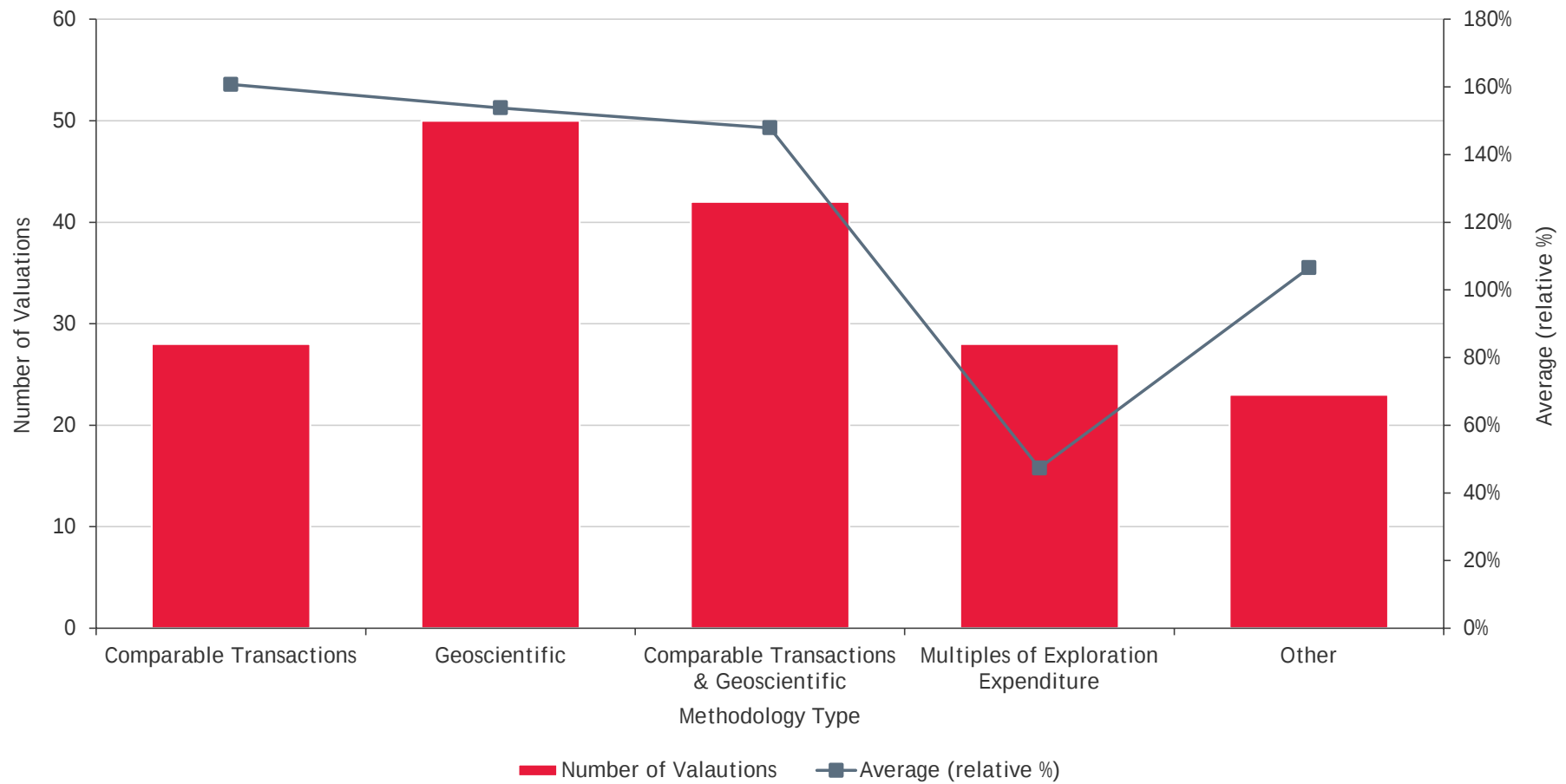
55%

Most Likely Value Position

Independent Experts
typically select the mid-
point as most likely outcome

Technical Specialist Valuation Ranges by Methodology

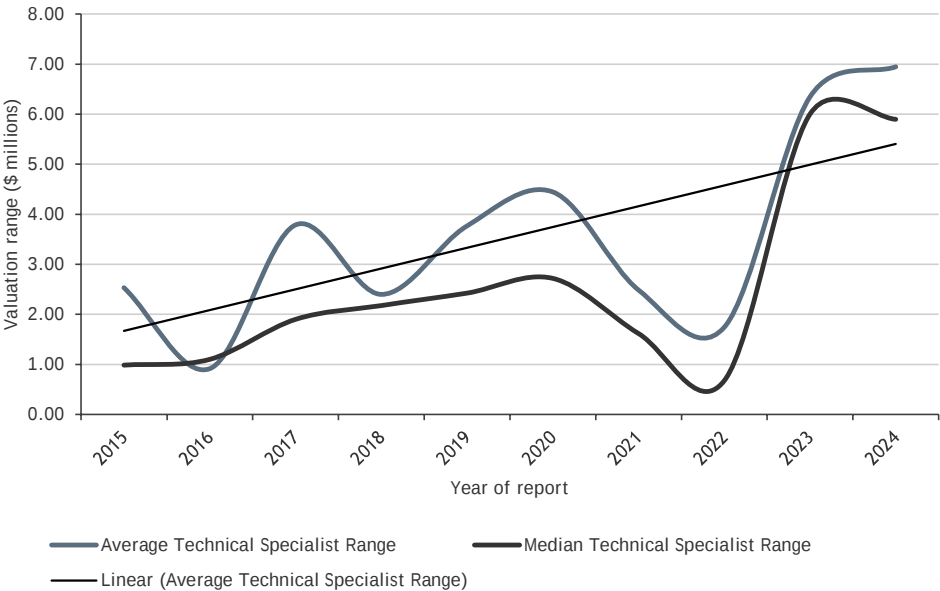
Average Valuation Ranges among Methodologies used by Technical Specialists



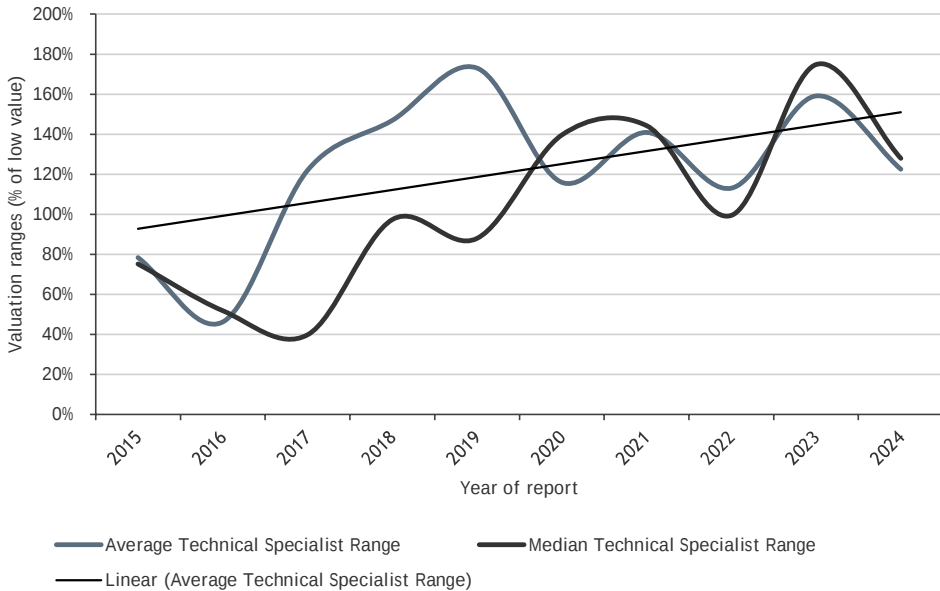
Market Cycles Impact on Valuation Ranges

Cyclical trends demonstrate how market context affects valuation judgement. During boom times, market value can far exceed technical value, forcing high-end ranges upward. Also ranges are increasing over time.

Average and Median TS Valuation Ranges (Absolute Terms)



Average and Median TS Valuation Ranges (Relative Terms)





Commodity Trends

Battery metals posed greatest valuation challenges during recent market cycles, whilst traditional commodities like gold maintain consistent data availability but significant dollar-term variations between expert opinions.

Gold

28 valuations - Most frequently assessed commodity
Average range: 123% of low value
Abundant market data creates both high interest and variability

Copper-Gold

12 valuations - Polymetallic complexity
Average range: 94% of low value
Multiple commodities provide some valuation stability

Nickel

9 valuations - Highest uncertainty
Average range: 215% of low value
Battery metals boom-bust cycles create extreme valuation challenges

Lithium

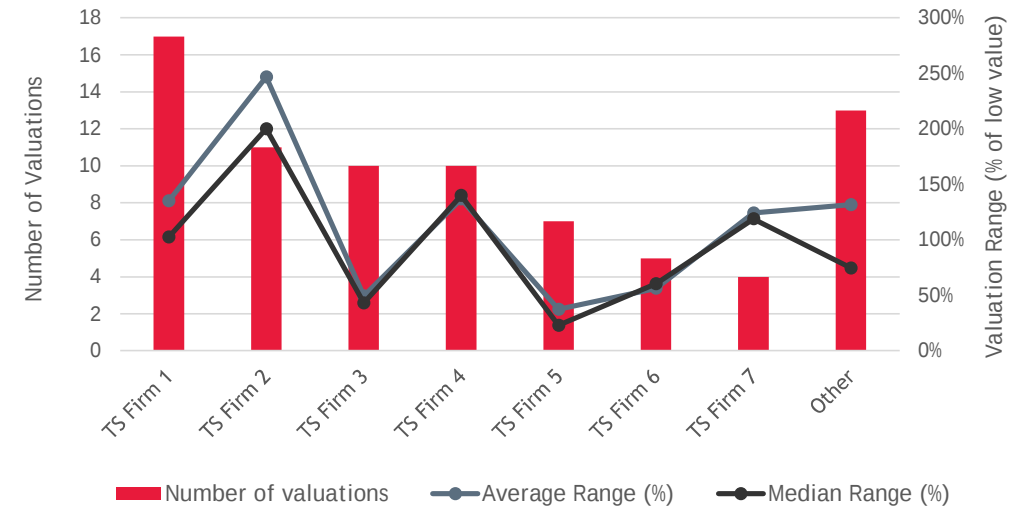
6 valuations - Second highest uncertainty
Average range: 156% of low value
Post-COVID demand surge led to wildly differing transaction metrics

Technical Specialist Firm Variations

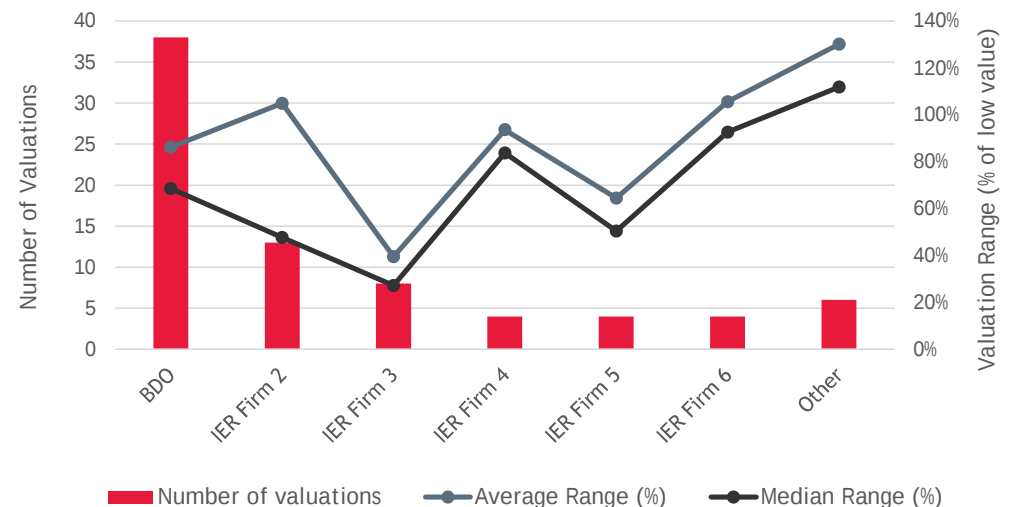
Insights

- Independent Experts can only narrow their valuation ranges to the extent that Technical Specialists provide well-defined inputs.
- Most Independent Experts published tighter ranges than the Technical Expert inputs received, often due to including non-mineral assets in a sum-of-parts valuation
- Wide variation in median TS valuation ranges
- Firms showed consistent approaches with some having more conservative, narrow ranges while others have more liberal, wider ranges

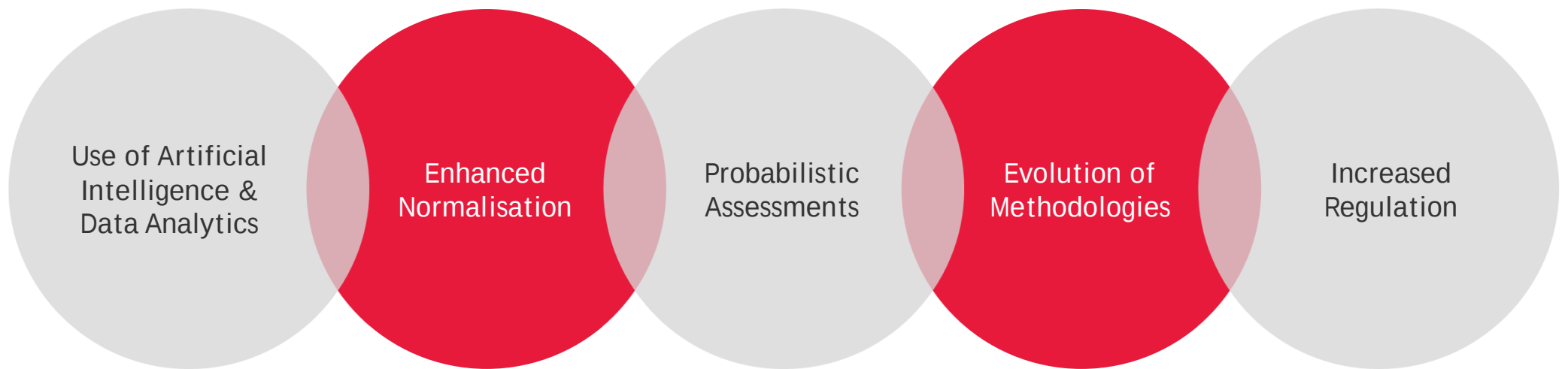
Firm Variations among Technical Specialists



Firm Variations among Independent Experts



Where do we go from here?



Future Directions and Key Implications

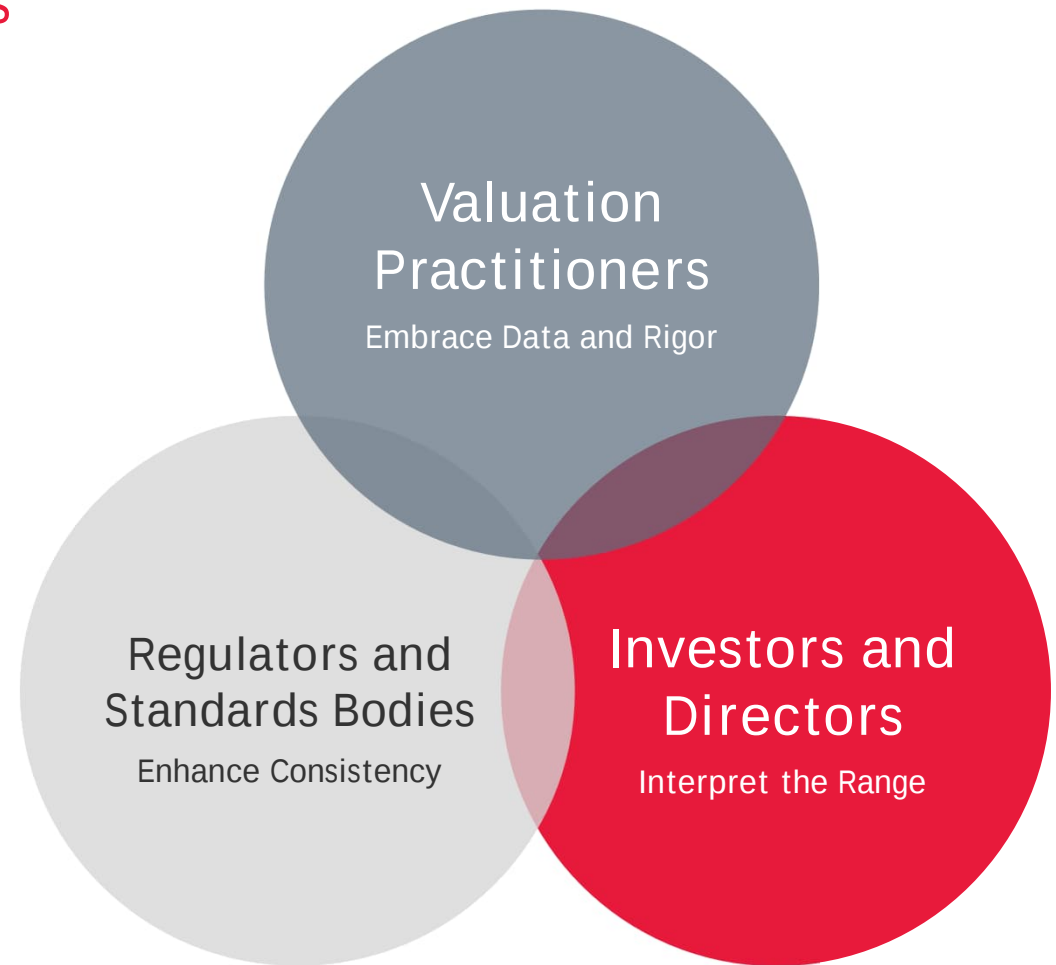
Evolution Ahead

Mineral asset valuation continues evolving through advances in data analytics, increased industry information sharing and probabilistic frameworks.

Valuation Practitioners: Embrace data analytics and artificial intelligence to enhance comparable databases and improve valuation certainty.

Investors and Directors: Recognise that a broad valuation range may reflect market uncertainty. Focus on understanding the assumptions behind valuation ranges and market conditions.

Regulators and Standards Bodies: Continue monitoring adherence to standard, consistency and transparency. Enhance guidance on preferred value selection.



Possible solutions to narrow the range

Technical Specialist's range heavily influences the Independent Expert's valuation range, as such, Independent Experts can only produce narrow ranges when the Technical Specialist provides a well-defined estimate. To help achieve this, we recommend some possible future approaches:

- Better comparable normalisation: Adjusting for commodity cycles, jurisdiction, project stage and deal structure to make comparisons more meaningful.
- Probabilistic frameworks: Possibility of applying Monte Carlo simulations to geoscientific or Comparable transaction multiples to generate data-driven low, most-likely and high valuation outcomes.
- Utilising Artificial Intelligence to enhance databases: AI and machine learning can expand analysis of global transaction and resource databases, improve similarity scoring, reduce subjectivity and support more precise estimates

