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Risk Assessment using Stochastic Modelling in today's dynamic environment

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Contents



Deterministic Modelling and its Drawbacks

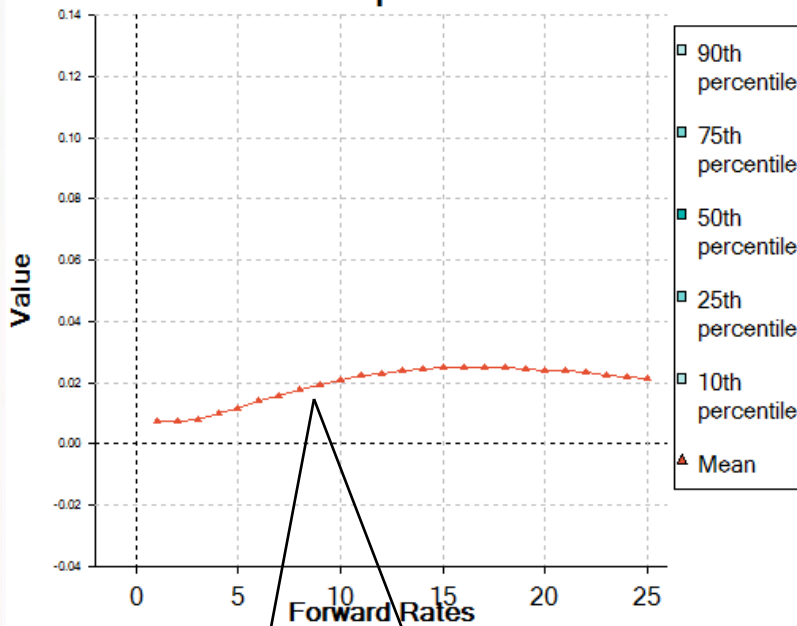
An introduction to Stochastic Modelling

Stochastic Modelling and Risk Measurement

Drawbacks of Stochastic Modelling

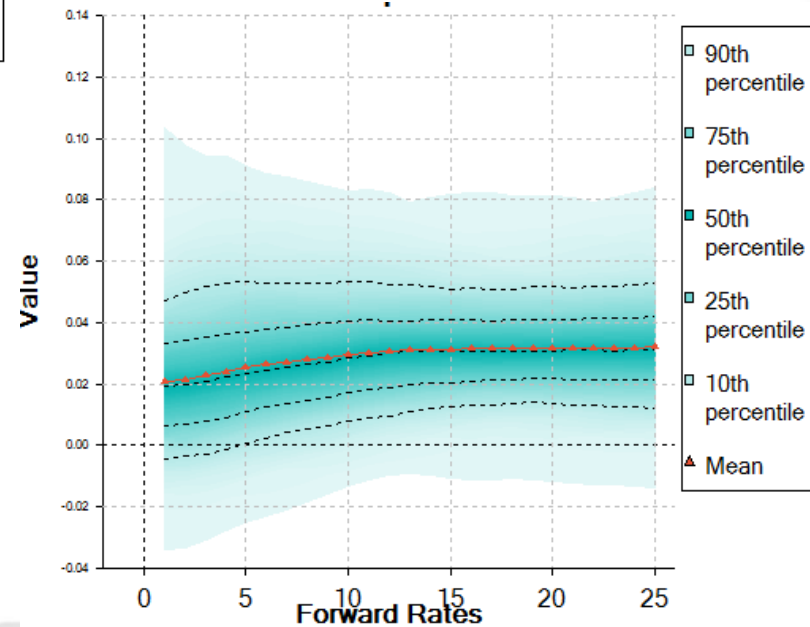
Relevance for an Emerging Economy like India

Deterministic vs Stochastic Modelling



No room for random variation

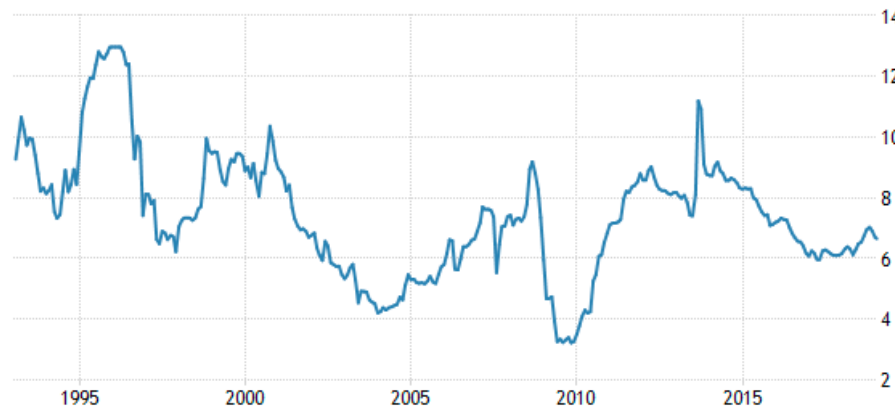
Fixed set of inputs, assumptions



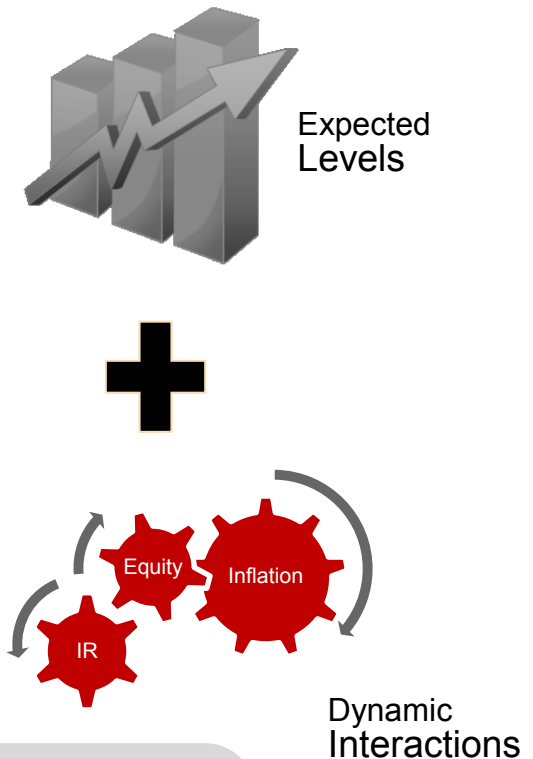
Is History a poor guide to the Future?



Indian Treasury Yields

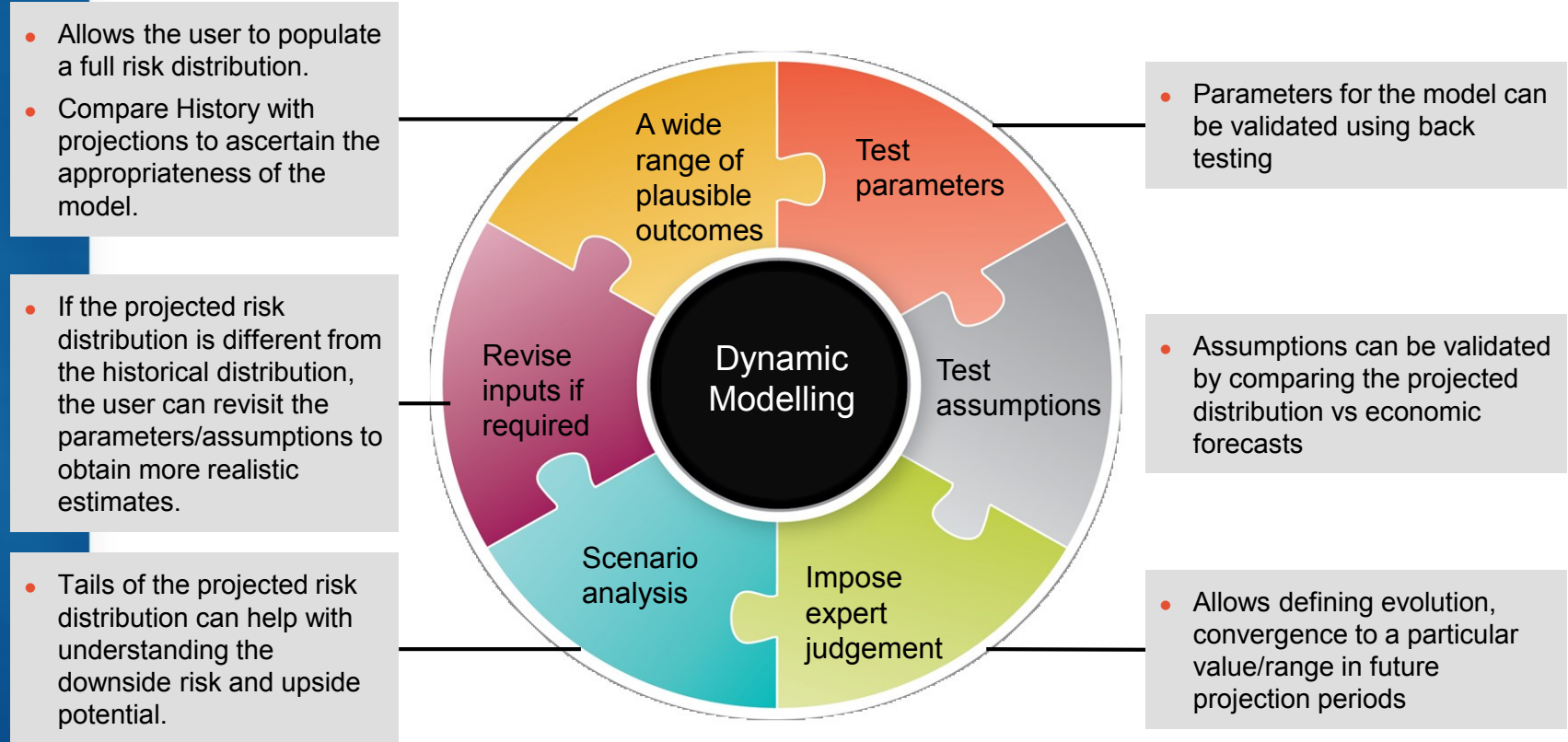


SOURCE: TRADINGECONOMICS.COM | RESERVE BANK OF INDIA



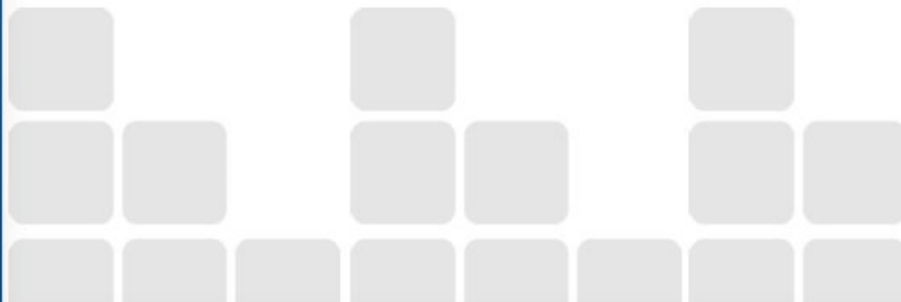
India Treasury Bill 91 Day Yield was quoted at 6.65 percent on Friday January 18. Interbank Rate in India averaged 7.45 percent from 1993 until 2019, reaching an all time high of 12.97 percent in July of 1995 and a record low of 3.10 percent in July of 2009.

Stochastic Modelling for Financial Series



The results will depend significantly on the choice of model, dataset, parameters and assumptions.

Stochastic Modelling: Real World Probability Measures



Stochastic Modelling: Approach



Choice of Inputs | Data Source, Data Windows, Models, Assumptions

Validation of initial results

Imposing own views | Risk Distribution, Evolution, Means, SDs

Reassess output | Changes to any Parameters, Methodology, Data Windows

Interpret the final output | Current Market Conditions vs Future Expectations

Using Real World ESGs | Data

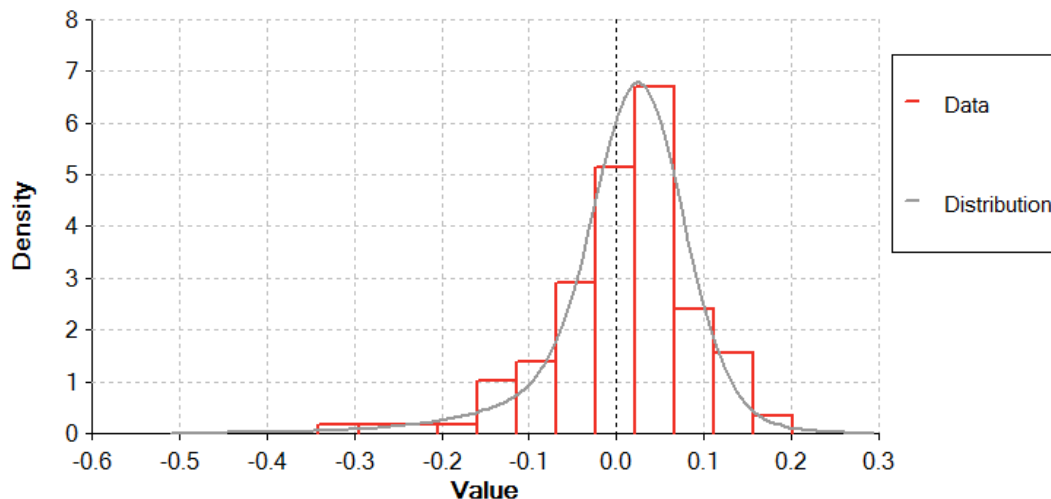


A real world economic scenario generator will allow the user to construct multiple plausible paths for the series being modelled based on the historical dataset and the assumptions about the future expectations.

Choice of different models for modelling econometric series (example : interest rates, inflation, equity) based on the properties of the series being modelled.

Interest Rates	Equity
<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Mean Reverting Models	<input type="checkbox"/> Jump Diffusion Models

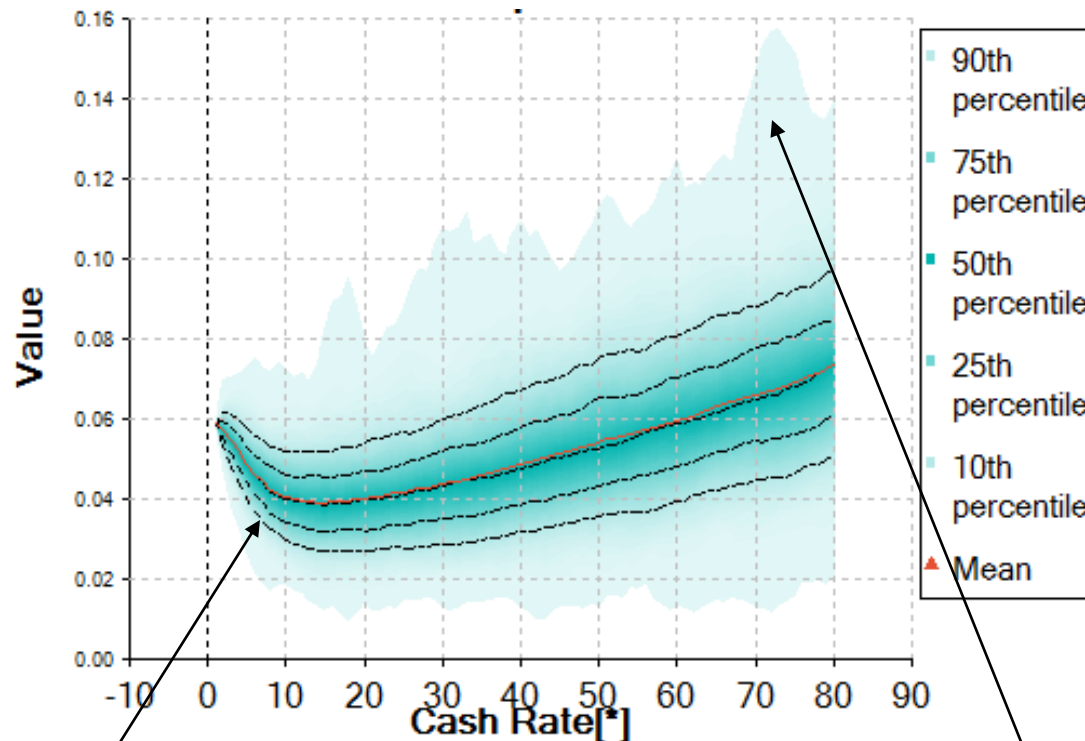
Identifying the properties of risk distribution available in the historic dataset



Using Real World ESGs | Calibration & Projections



Parameterize the historical data using a suitable model to obtain a set of projections at the required simulation level



Short term evolution driven from market movements

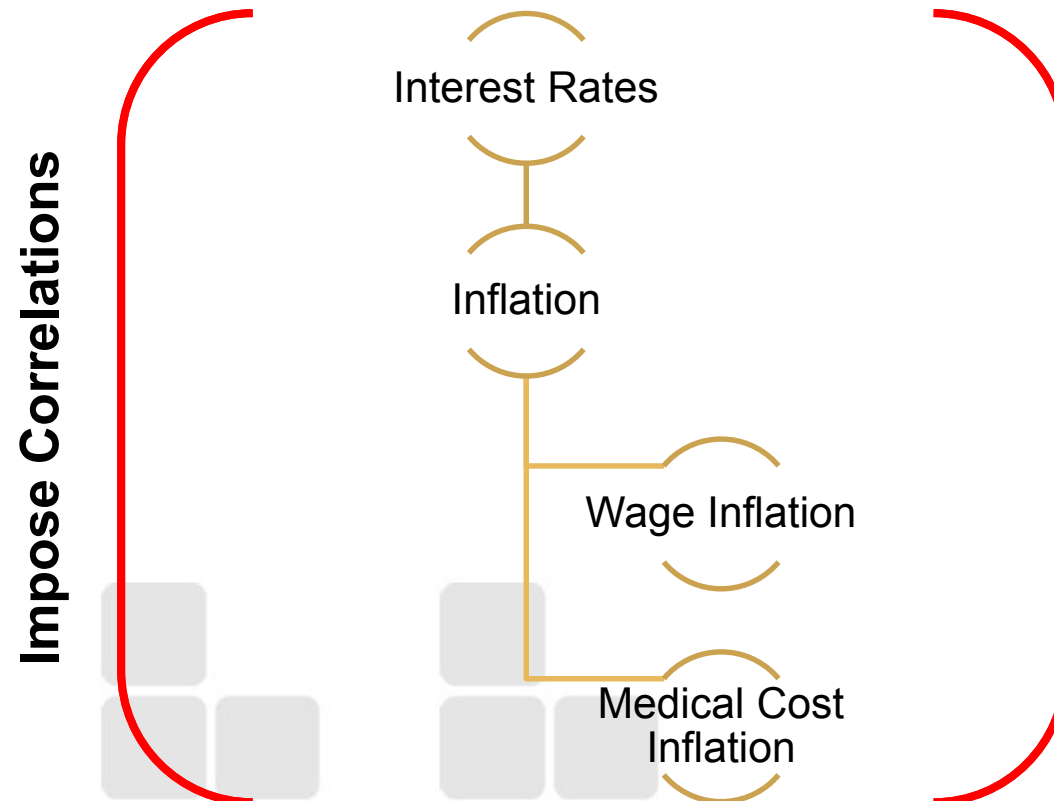
Tails driven by historical distribution

Using Real World ESGs | Imposing Judgements



Impose expert judgement on the projections along with interactions (correlations) with multiple variables

- ❑ Define long term and short term means, SDs
- ❑ Set a target evolution
- ❑ Provide direct vs indirect links to other economic series (example : imposing links through a cascade or adopting a more complex copula approach or a combination of both)



Using Real World ESGs | Validations

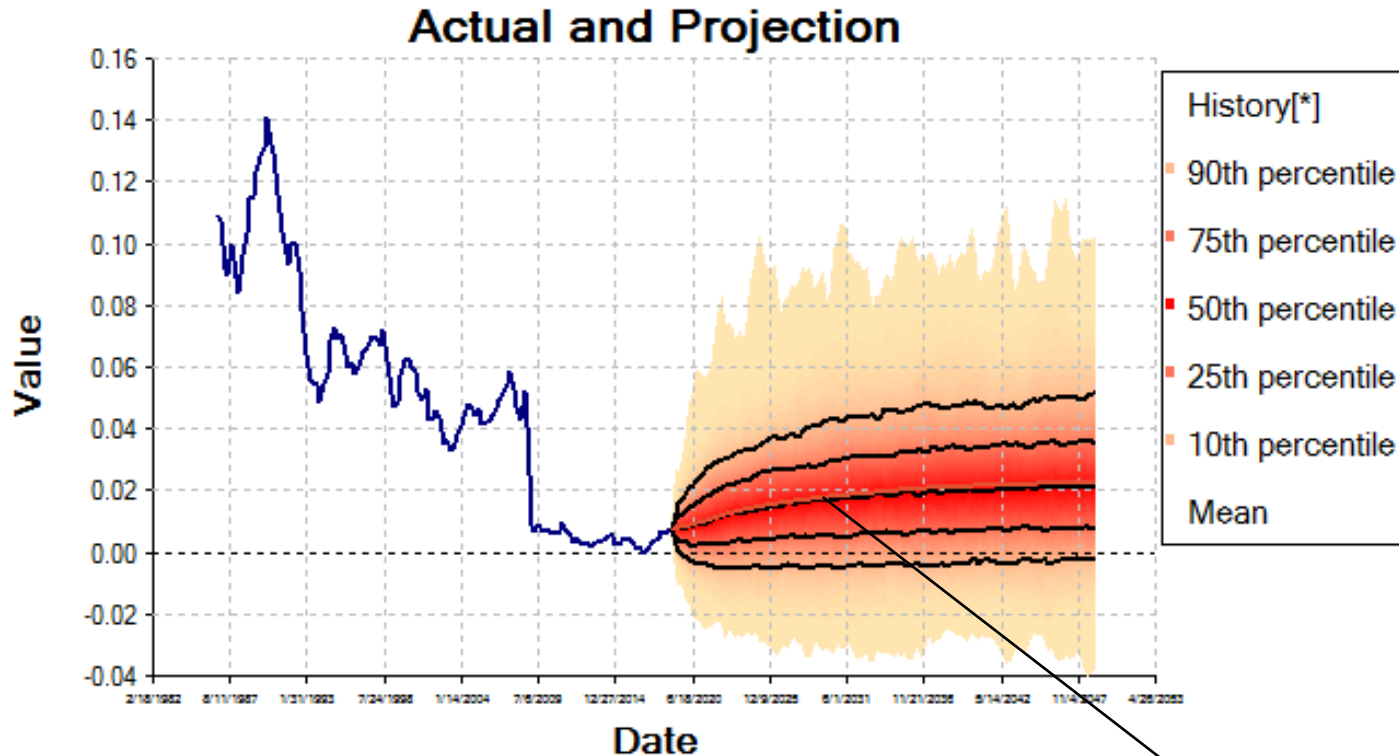


Validate the projections using a variety of quantitative and qualitative tools

- Statistical checks
- Comparing projection evolution against defined targets
- Validating the assumptions against credible sources like economic research reports, views from Investment banks etc.

An Example

A percentile fan of projections allows the user to look at the best and the worst possible outcome given the set of assumptions and inputs used



In the above example, there is an apparent regime switch in historical data, which is why the projections do not include all historical rates

Mean return

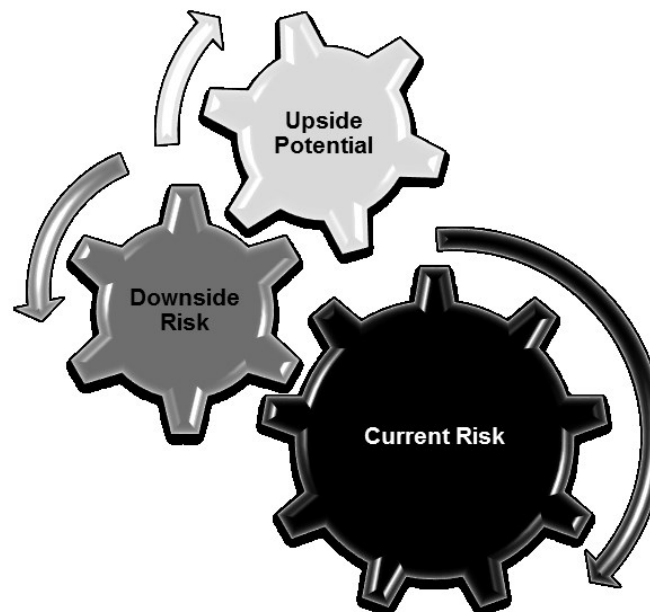
Assessing Own Risk....

Results driven by data, assumptions and choice of models

Stochastic modelling results will vary based on many factors and will provide a universe of plausible scenarios.

If the deterministic modelling gave the user say X as the amount of required return on equity, the value of X can be compared with the corresponding percentile on the simulated return graph.

The results from the stochastic modelling exercise can be compared with the industry benchmarks to assess own position.



Stochastic Modelling: Considerations



Results dependent on choice of data/models/assumptions

High level of complexity

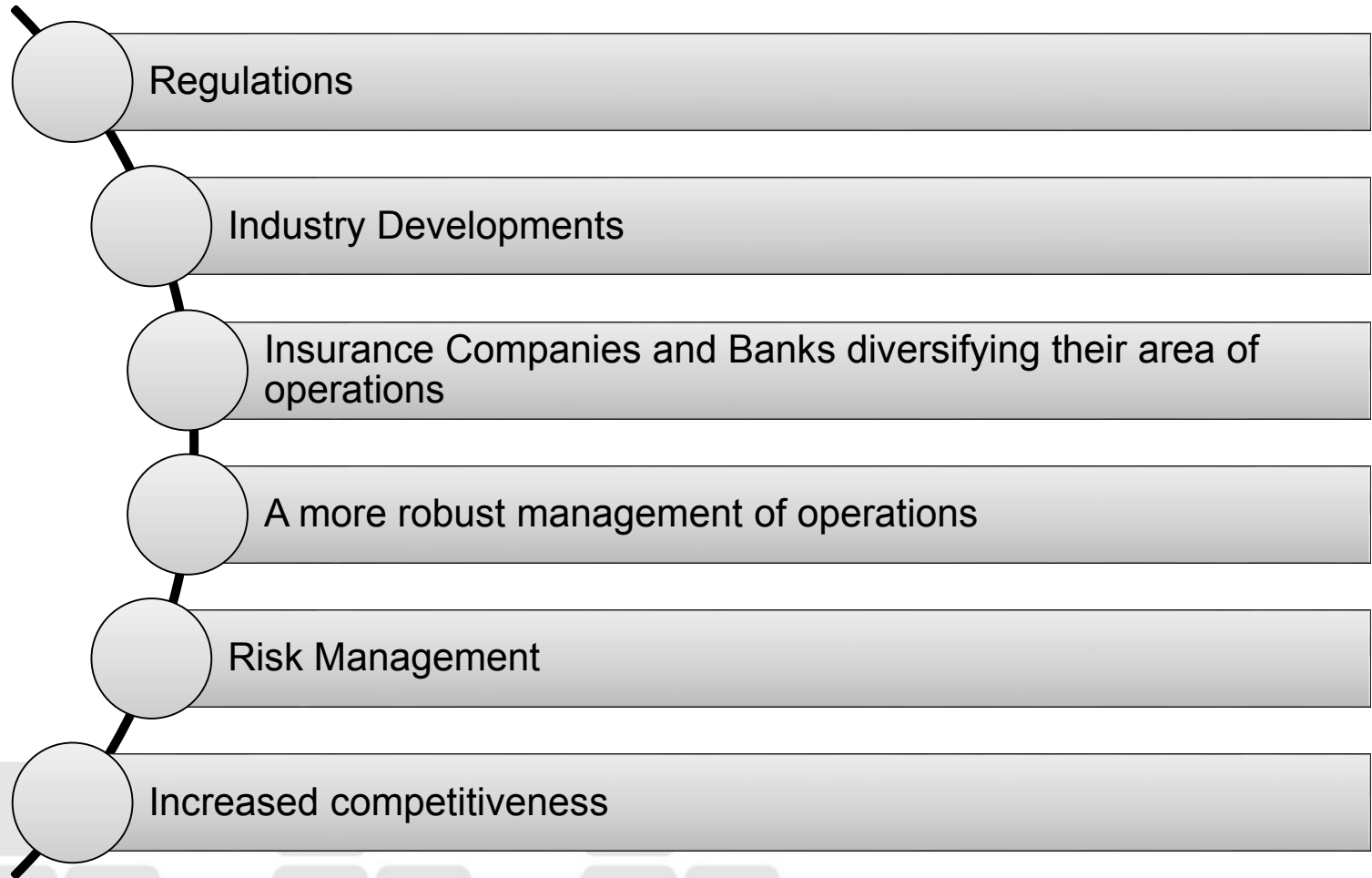
Results subject to change with changes to the current market conditions

Expert level of technical and economic knowledge required

Significant costs of implementation

Why use Stochastic Modelling?

The Indian Context...





Thank You