The New Corporate Finance Playbook

Enhanced decision-making using probabilistic modeling with @RISK

Discover a dynamic approach to mergers and acquisitions, capital raising, and risk analysis that will sharpen your insights and drive more successful outcomes.

LUMIVERO

4-D RESOURCES
ADVISORY LLC

Introduction

Uncertainty is the one constant in business. Yet, despite its critical impact, inadequate risk assessment continues to plague financial analyses and decisions, largely due to the primary reliance on outdated deterministic models created in Microsoft Excel; models that oversimplify the future and fail to account for real-world variability.

For the dynamic analyses required in today's world, Excel is sub-optimal at best, broken at worst. Built 30 years ago for a different era of finance, its 2-D form means it cannot fully help us understand the variability of most model inputs, their interrelationships, and the likelihood (or probability) of different outcomes.

Fortunately, there's a powerful way to upgrade financial Excel models: @RISK. This add-in converts static models into a dynamic version that handles Big Data efficiently, reduces modeling cycle-time while lessening bias and errors, and delivers valuable insights into the critical metrics driving decisions.

In this eBook, you'll learn practical strategies for applying probabilistic thinking to core areas of corporate finance - how to build more realistic forecasts, evaluate M&A scenarios under uncertainty, improve capital raising decisions with better risk-adjusted insights, and strengthen overall risk and sensitivity analysis.

For corporate finance professionals seeking to make smarter, value-driving decisions, turn the finance function into a competitive advantage, and future-proof their careers, this eBook shows how @RISK makes all three goals possible - right now.

About the author

Lachlan Hughson, the founder of 4-D Resources Advisory LLC, has over 30 years' experience in corporate finance as an investment banker and energy industry executive. It was his realization that static, 2-D Excel models often facilitate sub-optimal or value-destructive decisions that led him to embrace dynamic modeling with @RISK and build an advisory firm to help facilitate its broad application within the finance function.

He works with Boards, executives, and investors to help build more successful companies through making better strategic and financial decisions using dynamic financial modeling. Whether for M&A, capital raising, budgeting, risk analysis, or Governance, dynamic financial models will enhance the key decision metrics and risk/return insights required to navigate the challenges and opportunities ahead.

He has delivered multiple Lumivero webinars and spoken at a variety of conferences, highlighting how @RISK can fundamentally enhance corporate finance models. He has also authored numerous articles and papers related to the benefits of dynamic financial modeling across its wide range of corporate finance and industry applications.

A range of Lachlan's papers, articles, and videos can be found on the 4-D Resources Advisory website.

Table of contents

Deterministic vs. probabilistic modeling

Traditional Excel models, described as static or deterministic, only allow one input value per cell, meaning the output metric is also a single value. These static models oversimplify complex financial realities, producing results that don't properly account for real-world uncertainty. As a result, decisions based on static models often lead to unexpected losses, missed opportunities, and failed corporate strategies.

Dynamic or probabilistic models incorporate real-world data variability and present a range of possible outcomes and their likelihood. Using Monte Carlo simulation in @RISK, these models generate thousands of possible iterations, providing a more nuanced view of future outcomes and greater insight for enhanced decision-making.

@RISK can be used across all financial models where variability exists in an input or output. Whether dealing with uncertainty around M&A valuation and accretion, the possibility of breaching a debt covenant, or the return from an equity investment, dynamic financial modeling will provide greater insight in an unpredictable world and help Boards, executives, and investors more successfully execute their business plans.

Dynamic model inputs: Probability distribution function

Problem:

Traditional Excel models only allow for one value per cell. To develop a dynamic financial model, the user needs to incorporate a range of values per cell to run the Monte Carlo simulation. It is using this real-world dataset that facilitates enhanced model outputs.

How do we include this range of values (for prices, production, costs, inflation rates, and other inputs) into a single Excel cell without having to run a different model for each iteration?

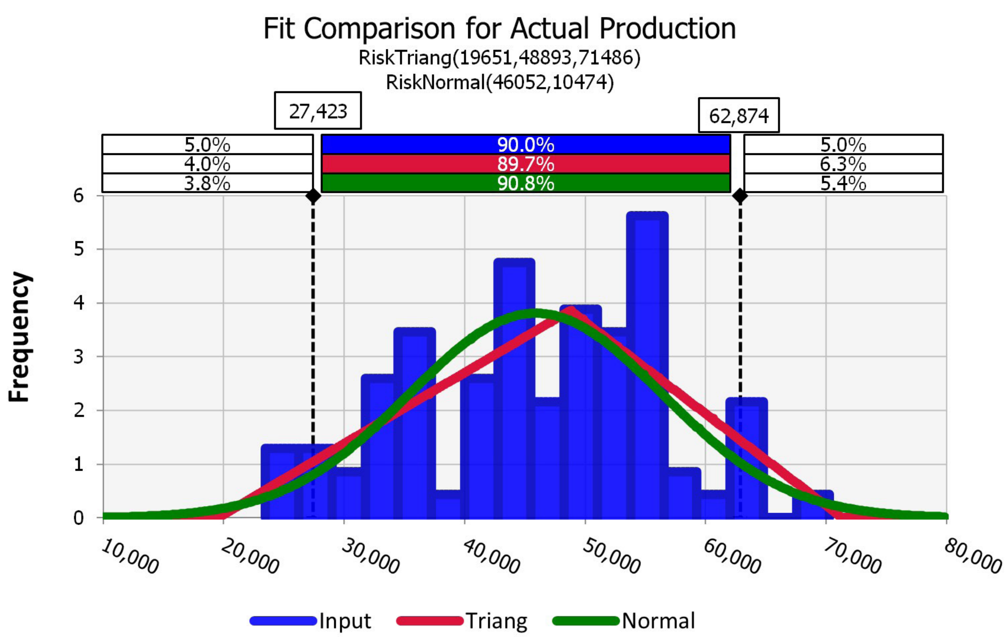
Solution:

@RISK enables you to incorporate the range of values into a cell, where they do not have a defined relationship over time, in the form of a probability distribution function (PDF), such as a normal, log normal, pert, triangular, or uniform distribution.

The PDF graph below highlights how actual, real-world data could be represented by a triangular or normal distribution function.

Key insights:

The PDF includes all the information contained in the dataset rather than having to select certain points as representative of that data. It also ensures a sensitivity analysis based on a realistic, real-world dataset rather than a "guesstimate" of what the data range should be.



Dynamic model inputs: Time-series function

Problem:

Where data points over time are related, a PDF is not an appropriate function on which to base a financial model as the data points are not independent in each iteration. Using a time-series function (TSF) enables you to reflect this defined relationship, and its variability, which we typically see in commodity price, inflation, exchange rate, and seasonal model inputs.

How do we include a commodity price forecast, for example, in a way that best reflects its direction and variability, rather than having to use multiple models to show the impact of its future range?

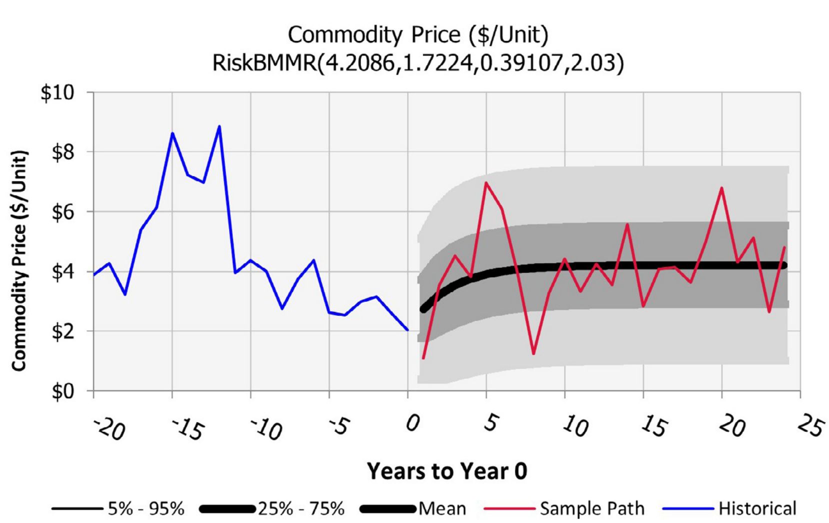
Solution:

@RISK enables you to incorporate this range of values into a single cell, based on the use of historical pricing data, in the form of a time-series function using a Brownian motion, moving average, or autoregressive-derived function.

The TSF graph below highlights how an annual commodity price forecast could be generated using a Brownian Motion with Mean Regression function.

Key insights:

The TSF includes all the information contained in the historic dataset rather than having to select certain points as representative of that data. It also ensures the sensitivity analysis is grounded in a realistic, real-world data range - not just guesses or assumptions.



Forecasts: Cash flow variability

Problem:

Understanding cash flow variability is critical to the valuation process underpinning corporate finance. As most financial model inputs have variability, it is important to understand how this will impact a prime component of the NPV calculation; annual net cash flow.

How do we understand the range of likely cash flow values and their probability; something an Excel model cannot provide in its sensitivity table format, where only two inputs can be changed at any one time?

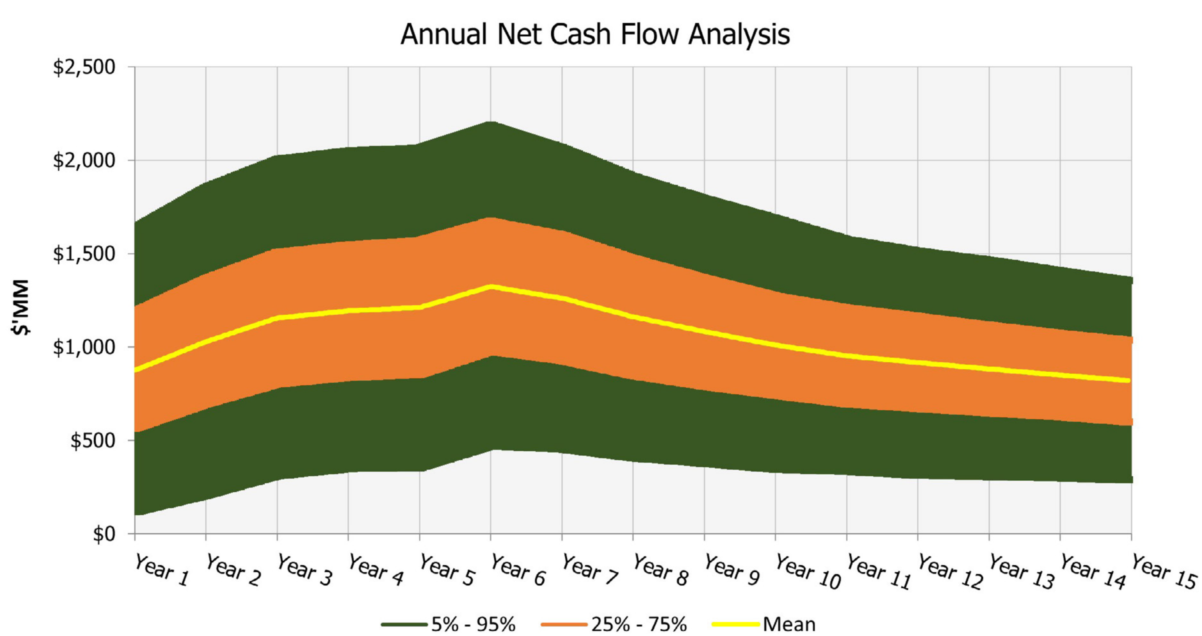
Solution:

@RISK allows you to incorporate a range of values for each model input, in the form of a probability distribution function or a time series function, to calculate the output – here, annual net cash flow.

The summary trend graph below highlights the mean value, the 25%-75% value range, and the 5%-95% value range, allowing you to quantify the probability of a particular value or value range.

Key insights:

The Annual Net Cash Flow graph exhibits significant variability in the early years, after which it declines. There is a 50% probability of cash flows being within the brown range and a 20% probability of cash flows being within the green ranges, relative to the mean value.



Forecasts: Discount rate variability

Problem:

Discount rates, whether WACC or R_{eq}, are also based on assumptions that include uncertainty around critical inputs; the 10-year Bond rate, beta estimates, and the degree of leverage – all of which exhibit variability over the investment time frame.

How do we understand the likely range of discount rate values and incorporate them in our financial models? Additionally, how do we ensure the right discount rates are applied to cash flows based on their level of risk?

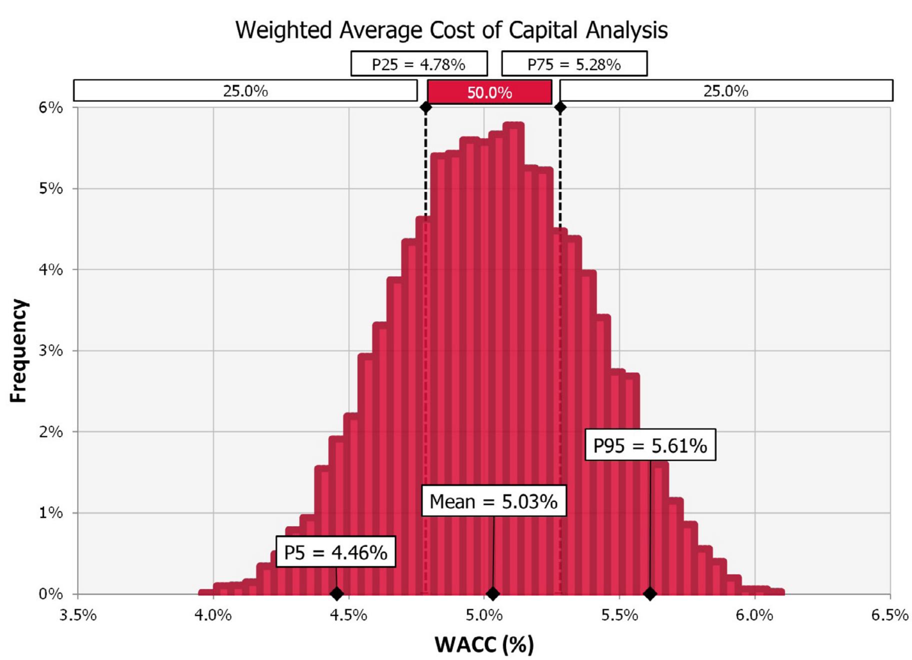
Solution:

@RISK enables you to incorporate the variability of the critical WACC inputs and calculate the likely range of values. Through using a correlation or copula function, it also defines the relationship between the cash flow risk and the WACC applied in that iteration.

The relative frequency graph below highlights the mean value, the 25%-75% value range, and the 5%-95% value range for the WACC based on the real-world variability of its inputs.

Key insights:

The WACC frequency distribution highlights that a range of 4.0% to 6.0% will capture almost all the variability of the inputs impacting its value. It also provides a meaningful range against which to compare a hurdle rate or an IRR.



Forecasts: NPV valuation

Problem:

The net present value (NPV) of an investment is a key decision-making metric in corporate finance. Multiple inputs are included in its calculation, with each contributing a different impact to its overall variability.

How do we understand the likely NPV range reflecting the impact of all inputs (and their individual variability) and their relationship to each other – an output Excel alone cannot provide?

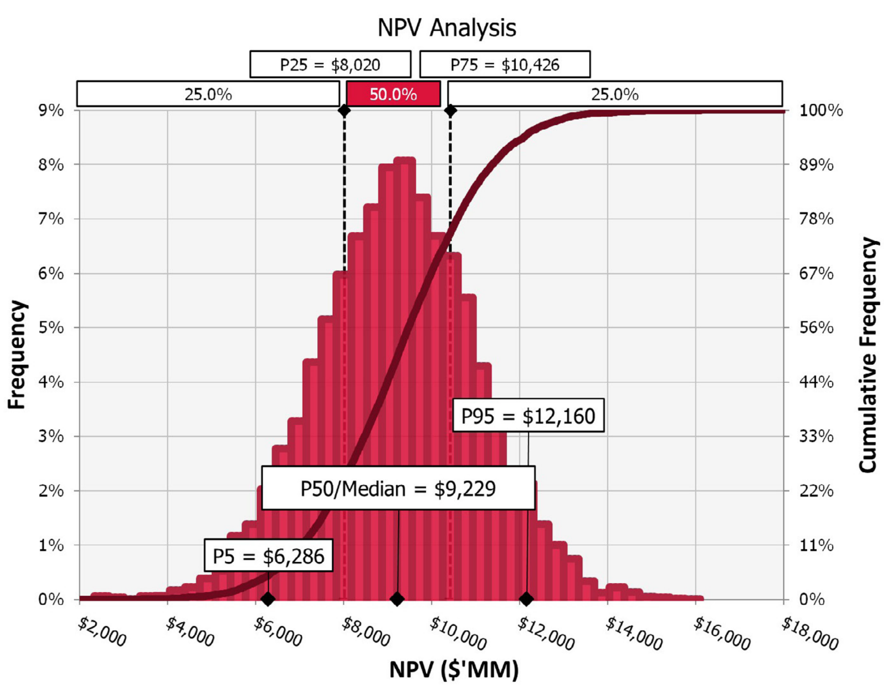
Solution:

@RISK allows you to incorporate the variability of all model inputs, no matter how many, and define their relationship with each other. The output range comes from one model, with no need for multiple sensitivity analyses with different 2-input combinations per Excel.

The relative frequency graph below highlights the median value, the 25%-75% value range, and the 5%-95% value range for the NPV based on the real-world variability of all its inputs.

Key insights:

The NPV frequency distribution highlights the range of values and their associated probabilities. The NPV distribution can be shown in multiple ways as a histogram or a cumulative plot, depending on your needs.



Mergers and acquisitions: Exchange ratio

Problem:

When undertaking a merger, the exchange ratio is a critical metric to determine if the agreed price is fair. Often the analyses use “rules of thumb” and “guesstimates” for the range of model input values such that the resulting output is not fully objective.

How can we calculate the most objective exchange ratio range by incorporating the impact of all inputs and their variability, and their correlation to each other?

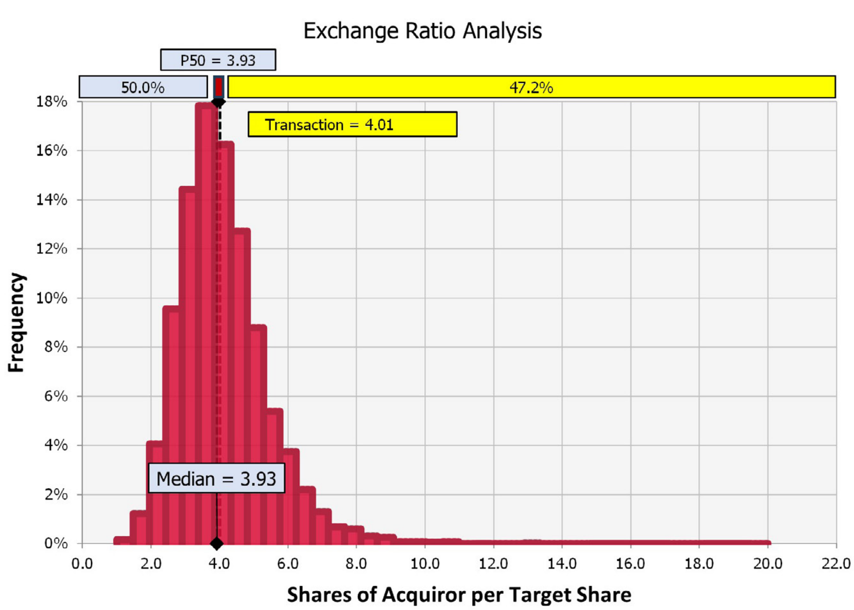
Solution:

@RISK enables you to incorporate the variability of all inputs, no matter how many, and define their relationship with each other. The output range comes from one model, with no need for multiple sensitivity analyses with different 2-input combinations per Excel.

The relative frequency graph below highlights the median transaction value (light blue) and compares it to the agreed transaction value (yellow) to provide a far more objective comparison.

Key insights:

The transaction value of 4.01 is only 2% different to the P50/median exchange ratio value. This objectively highlights that the merger is fair, given how closely the agreed ratio reflects the median value calculated using the full range of available, relevant data.



Mergers and acquisitions: Accretion/dilution

Problem:

The level of accretion highlights the value creation upside in a merger – the higher the value, the more likely shareholders will be rewarded. However, often only a single value, or range of values, is provided with no sense for their likelihood of occurring.

How can we calculate a range of values to understand the probability of a given value occurring – an output Excel alone cannot provide?

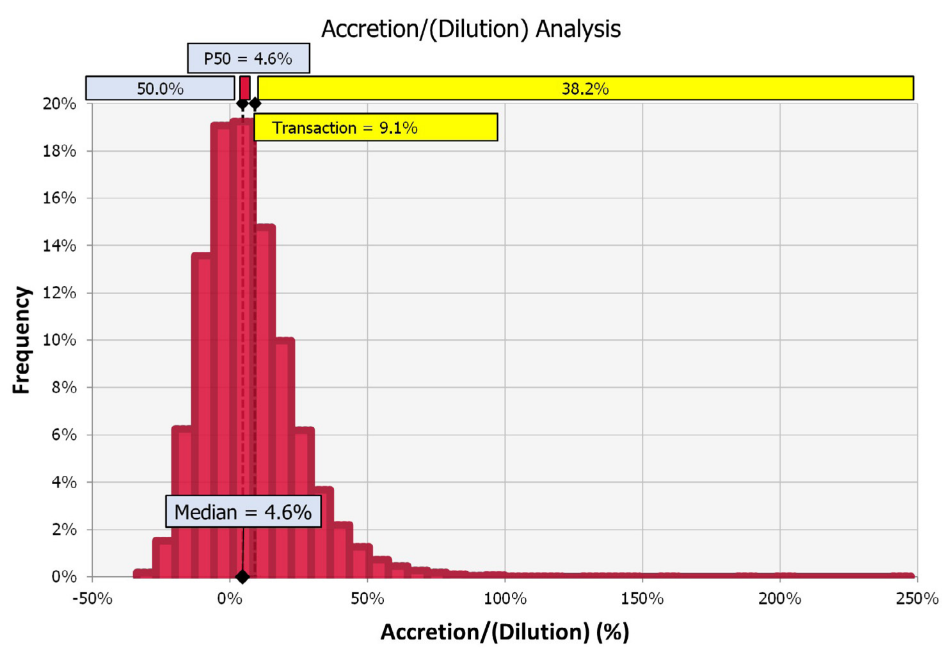
Solution:

@RISK enables you to incorporate the variability of all inputs on which accretion is based, no matter how many, and define their relationship with each other. It provides an objective range, including the probability a transaction may be dilutive to shareholders.

The relative frequency graph below highlights the P50/median value and compares it to the transaction value provided by an advisor, such as an investment bank, to assess the reliability of the advisor's estimate.

Key insights:

The transaction advisor indicated a 9.1% level of accretion. The @RISK analysis shows this is twice what the median value is expected to be, and there is only a 38% probability this value or higher will be achieved; insights a Board needs when making its decision.



Mergers and acquisitions: Sensitivity analysis

Problem:

In a merger, it is critical to understand which model inputs will have the greatest impact on value creation and which are less significant – this ranking helps management understand the most appropriate strategic, operational, and financial decisions to make.

Using Excel alone, we cannot get this critical insight as it only permits two inputs to be analyzed in any sensitivity analysis. How can we understand the ranking and impact of all financial model inputs and their effect on transaction success?

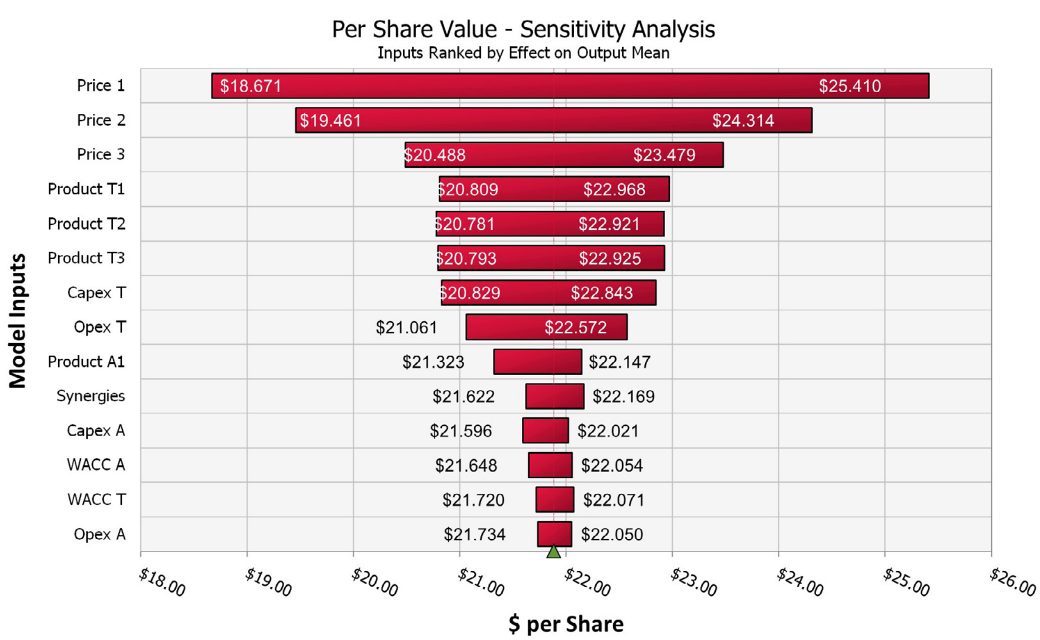
Solution:

@RISK allows you to quickly review a comprehensive sensitivity analysis, highlighting the impact of all input variables on the metric being reviewed.

The tornado graph below ranks the inputs from those having the greatest impact to the least and quantifies the P5 and P95 values of each input for its effect on the decision metric.

Key insights:

The sensitivity analysis highlights that per share value is most sensitive to Price 1, 2, and 3, and the product volumes sold for the target (T) company. It also shows the acquiror (A) inputs have less of an impact on transaction success.



Capital raising: Debt coverage

Problem:

When raising debt capital, a company is subject to the risk of default on principal and/or interest payments. Understanding the probability of default, or breaching a debt covenant, is critical to determining the appropriate capital structure.

Using Excel alone, we cannot get the required insight into possible credit metric ranges. How can we calculate the risk of default in a manner that helps optimize debt levels?

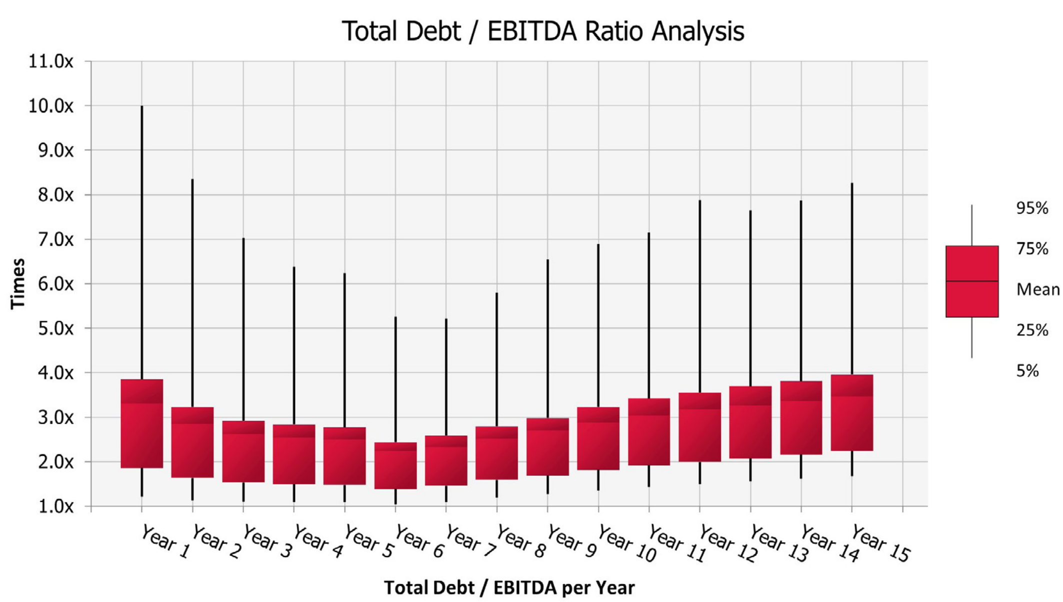
Solution:

@RISK allows you to include the variability of all inputs on which credit metrics are based and define their relationships. It generates an objective range to compare to loan covenants to understand the likelihood of breaching those covenants.

The box plot graph below highlights the annual range of potential values for the Total Debt/EBITDA ratio, an important leverage multiple, allowing the user to understand the probability of default.

Key insights:

The analysis highlights a maximum probability of 25% of breaching a specific debt ratio of 4.0x in any one year. However, there is a small probability each year of a default, which management can now work to mitigate or accept if it meets their threshold for risk.



Capital raising: Multiple of invested capital (MOIC)

Problem:

Equity investors use two critical metrics to determine their investment approach; the projected IRR (Internal Rate of Return) and the MOIC (Multiple of Invested Capital). Achieving these return rates are fundamental to successful investing.

How can we calculate a range of likely values for different investment opportunities to understand the probability of achieving a minimum outcome – an output Excel alone cannot provide?

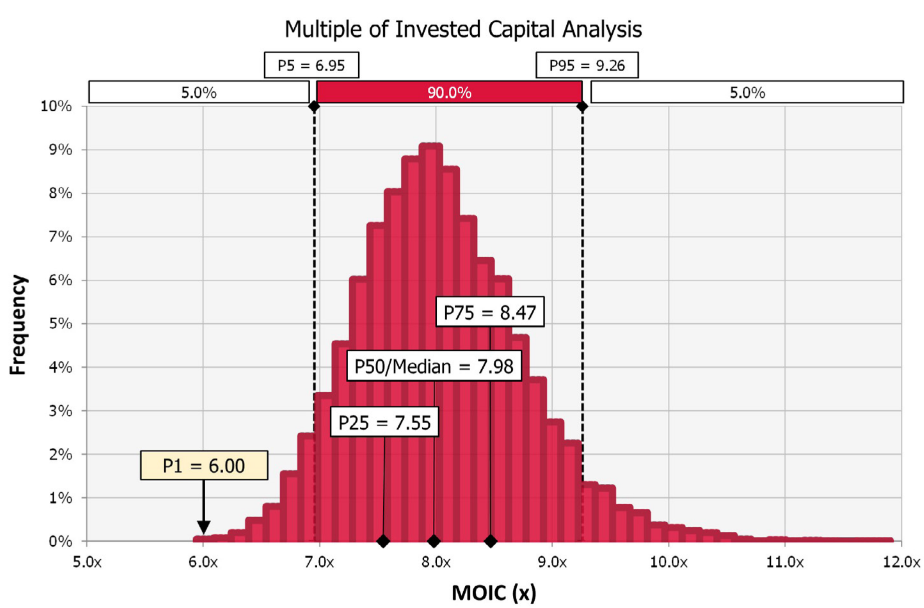
Solution:

@RISK enables you to incorporate the variability of all inputs on which MOIC is based, no matter how many, and define their relationship with each other. It provides the objective range against which hurdle rates can be objectively compared.

The relative frequency graph below highlights the probability of achieving different levels of return from an investment and whether it is skewed to the upside or the downside.

Key insights:

The analysis highlights a P50/median MOIC of 8.0x, while showing there is only a 5% probability it could be less than 7.0x or higher than 9.3x. Assuming a hurdle rate of 6.0x, there is a 99% probability this investment will achieve that rate.



Capital raising: Sensitivity analysis

Problem:

For an investment, it is critical to understand which model inputs will have the greatest impact and those which are less significant. This ranking helps management understand the investment parameters that will most impact the investment's returns.

Using Excel, we cannot get this critical insight as it only permits two inputs to be analyzed in any sensitivity. How can we understand the ranking and impact of all financial model inputs as they affect the future value of the investment?

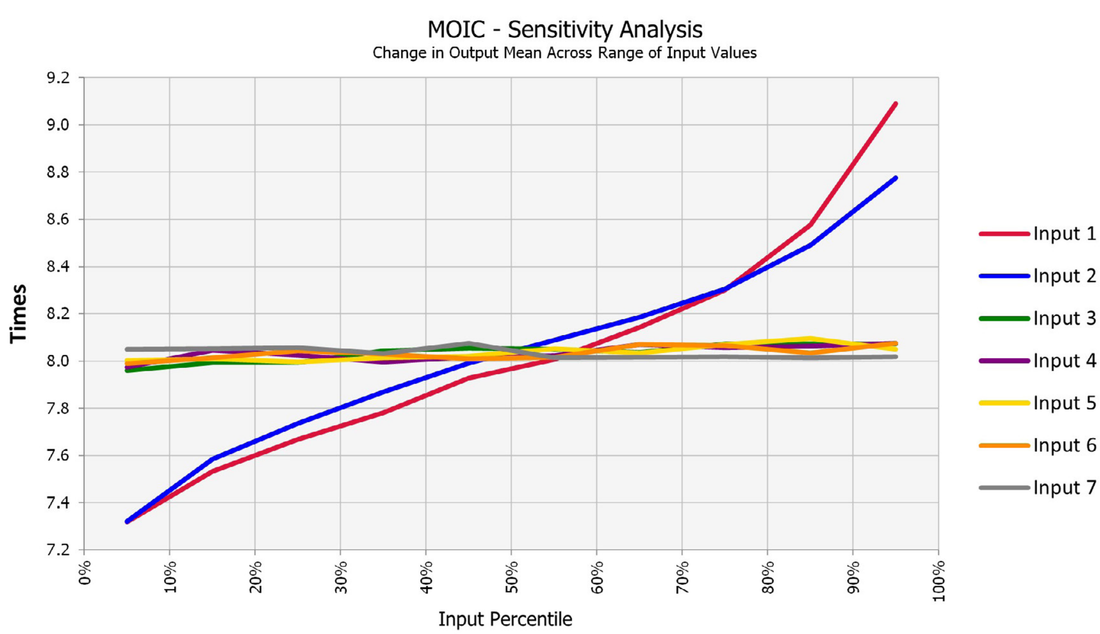
Solution:

@RISK allows you to quickly conduct a comprehensive sensitivity analysis highlighting the impact of all input variables on the metric being reviewed.

The spider chart below ranks the inputs from those having the greatest impact to the least, and quantifies the effect of each input on the decision metric across the input P5 to P95 range.

Key insights:

The spider chart ranks each input to show which will have the greatest impact on the investment returns (Input 1 and 2), while also quantifying for each input what the MOIC impact will be for different levels of input probability from P5 to P95.



Risk analysis: Statistics-based

Problem:

Risk analysis requires understanding the actual metric variability, which requires a Monte Carlo simulation. With this data, the absolute and relative risk of a decision can be quantified to provide unique insights that were not previously possible.

Using Excel alone, we cannot get this critical insight as the output data is not sufficient to generate the number of different iterations required. How can we generate the data to reflect the impact of all financial model inputs, and have it presented in an easy-to-understand form?

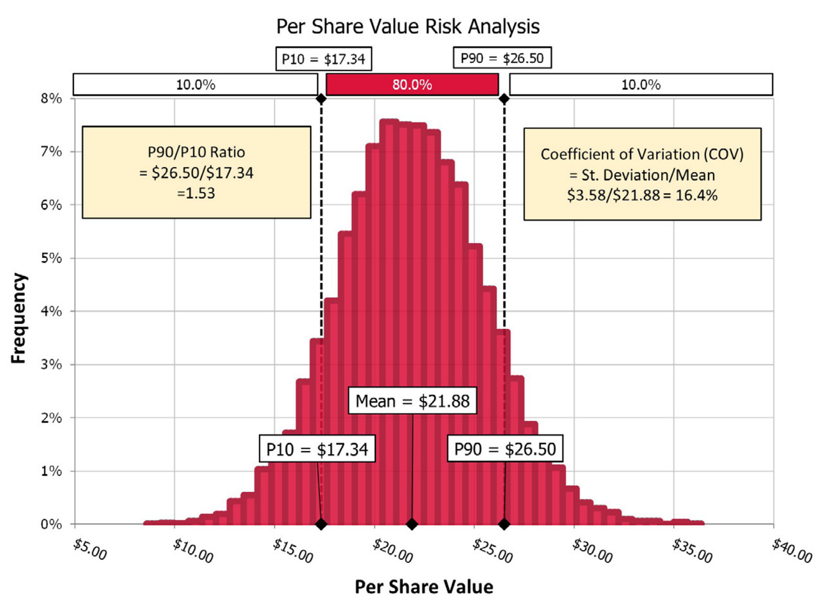
Solution:

@RISK enables you to incorporate the variability of all inputs through running tens of thousands of iterations to generate the statistical data required.

The relative frequency graph below highlights two dynamic risk metrics, the P90/P10 value and the Coefficient of Variation (standard deviation/mean), generated from the Monte Carlo simulation.

Key insights:

When comparing alternatives or seeking a risk value to create an efficient frontier, the P90/P10 and COV values quantify the per share value risk and show how risk changes as strategic, operational, or financial inputs are changed.



Risk analysis: Relative comparison

Problem:

Risk analysis can also be undertaken by comparing output graphs of one project to another. However, this requires separate project simulations to calculate the range of outcomes for each project.

Using Excel alone, we cannot get this comparison as the sensitivity analyses are shown in a 2-D form. How can we generate the data to reflect the impact of all financial model inputs for each individual project and present it in an easy-to-understand form?

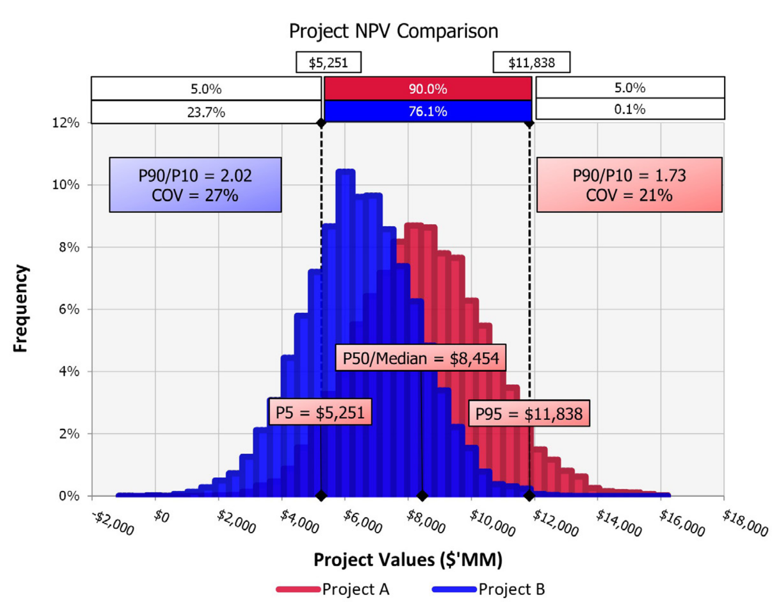
Solution:

@RISK allows you to overlay the output profiles for two or more projects for an objective comparison between different choices. It also facilitates a better understanding of comparative risk and return given the statistical insights generated.

The relative frequency graphs below highlight the distinct NPV profiles for two projects. The P90/P10 and COV metrics can also be calculated to determine their relative risk profiles.

Key insights:

Project A (red) has a higher NPV range and limits downside risk – with it having a 95% probability of a value greater than $5,251 million while Project B (blue) only has a 76% probability. Project A is also less risky, reflecting its P90/P10 value of 1.73 vs. 2.02 for Project B.



Smarter models. Better decisions. Real results.

In corporate finance, uncertainty is unavoidable – but with the right tools and methods, it becomes a source of insight to uncover opportunities.

Whether you're evaluating an exchange ratio, estimating accretion probabilities in an M&A transaction, determining the most appropriate capital structure, or calculating the return on an equity investment, @RISK can help you create dynamic financial models to provide the value-added insight required.

For corporate finance professionals seeking to minimize the risk and maximize the upside of their decisions, reduce the cycle time and time/dollar cost of the modeling process, and turn the finance function into a competitive advantage, dynamic modeling with @RISK is the upgrade that makes it all possible.

Request a demo to see how @RISK can empower your organization to enhance the corporate finance function today.

Request demo

4-D RESOURCES
ADVISORY LLC