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Show me the Value! Why Your Business Case Does Not Value Resilience

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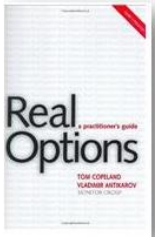
Presenter and Moderator

Vladimir Antikarov is a CFO of Epione Pharmaceuticals and a Principal at Verea Group LLC. With over 20 years of experience, Mr. Antikarov has served as a senior member of the corporate finance practice with the Monitor Group (1992-2005), now Monitor Deloitte, and as Senior Advisor to the CFO of Overseas Shipholding Group, Inc. (2005-2012). His client engagements have included work with AT&T, Merck, Lockheed Martin, Avaya, Thomson Reuters, Philips, Roche, Valle, Votorantim, Telefonica, Axel Johnson, World Bank.



Vladimir Antikarov is the co-author, with Tom Copeland, of the bestselling book, **Real Options, A Practitioner's Guide**, used by MIT, Harvard, The Wharton School and many other business schools. The book has been published in six languages and was the number one business book on Amazon UK.

PRMIA
The Professional Risk Managers' International Association

A member of numerous professional associations, Vladimir Antikarov is elected by his professional colleagues as Regional Director of the **Professional Risk Manager's International Association (PRMIA)** for the Washington DC area.

Presenter and Moderator

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AGENDA

The Challenge of Building a Business Case for Actionable Resilience

Resilience Through Contingent Capabilities

Real Options Analysis and Contingent Capabilities

Comparison of Valuation Methods for Contingent Capabilities

Key Takeaways

The Challenge of Building a Business Case for Actionable Resilience – I (*Executive Summary*)

- Resilience: ability to absorb negative impacts
  - Innate resilience: mobilize resources to respond
  - Actionable resilience: pre-planning responses and pre-positioning capabilities for negative impacts
- Benefits of actional resilience are uncertain
- Stress-testing alone is insufficient

The Challenge of Building a Business Case for Actionable Resilience – II (*Executive Summary*)

- Management challenge: to assess potential benefits of resilience-building projects, although costs are known
  - Contingent capabilities*:
- Most cost-benefit methodologies are ill-suited to capture the correct value
  - Fail to deal explicitly with the uncertainty of such projects
  - Fail to assess correctly the value of resilience benefits and provide a clear decision-making criterion
- We need
  - Net Present Value (NPV)-like methodology
  - To reflect the risk uncertainty
  - To provide a clear “go-no-go” decision rule consistent

* Contingent Capability – Capabilities which become available or useful only under certain conditions (contingencies)

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Caparison of Valuation Methods for Contingent Capabilities

Key Takeaways

Contingent Capabilities - Examples

- Creating a contingent capability requires an upfront investment, and the response if the risk occurs requires additional cost. Below we list a few familiar resilience capabilities:
  - **Building up additional sources of spare parts and materials** gives us the option to sustain operations during a failure of the traditional supply chain
  - **Maintaining spare capacity** gives us the option to use that capacity in case of production failure
  - **Cross-training employees** gives us the option for quick and effective substitution in case of a particular labor shortage
  - **Switching between gas and electricity** in hybrid cars gives us the option of flexibility in fuel use
  - **Securing revolver type financing** gives us the option to access additional funding in times of liquidity crunch

Deployment and Use of Contingent Capabilities

Build	Put in place the desired resilience capabilities and have them ready for use
Maintain	Maintain the built-in resilience capabilities in a stand-ready condition until needed
Detect and Signal	Detecting and signal the pending occurrence of the risk event
Activate	Activate resilience capabilities and make them ready for application
Apply and Mitigate	Apply resilience capabilities to achieve targeted risk mitigation
Learn and Improve	Capture lessons learned and use them to improve all previous steps
Rebuild	Rebuild the improved resilience capabilities

Resilience Capabilities Versus Operational Capabilities

Type of Investment Characteristics	Investments in Operations	Investments in Resilience
Required Investment	Upfront	Upfront
Supported Activities	Ongoing and predictable	Investments support contingent and unpredictable activities
Timing of the Benefit	Accrue as scheduled	Accrue only if risk occurs
Scale of the Benefit	Accrue within a limited range	Unknown, depending on the frequency and severity of the risks
Likelihood of Benefits	High level of certainty	Highly uncertain
Assessment of Value	Correctly valued through current tools	The traditional cost-benefit evaluation methods **cannot correctly capture the value** of these investments by predicting their average performance and benefits, discounting them back and comparing them to the required investments and costs

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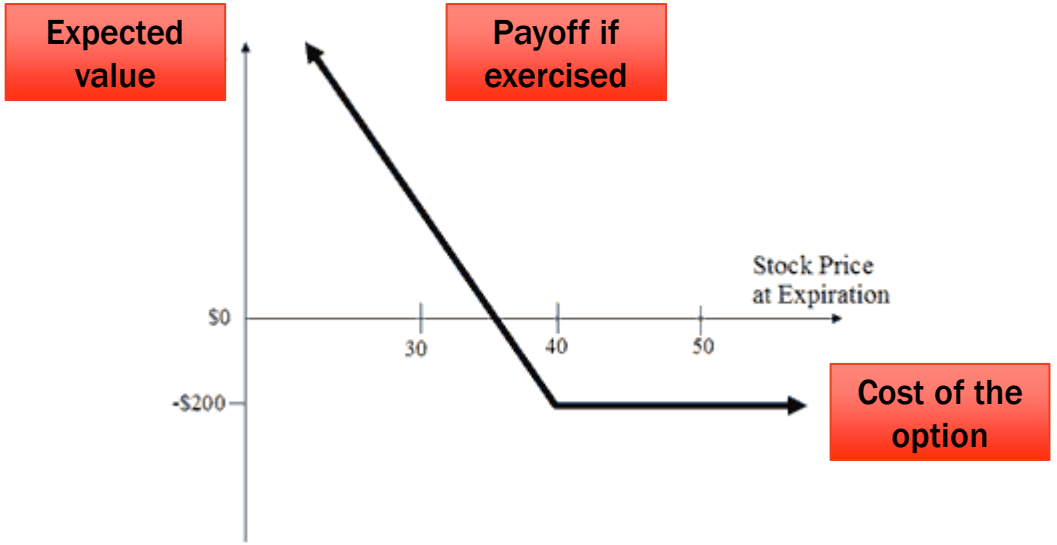
Option Pricing – Innovation for Accurate Valuation of Financial Options

- The value of contingent capabilities is analogous to the value of options where the owner of the option has the discretion to exercise it with maximum benefit.



What Is a Real Option?

Options

- Options are valuable
- Options provide a possible opportunity to create or protect value
- Options are the right, but not the obligation, to take an action (at a cost, called the exercise price) for a predetermined period of time (called the maturity of the option)
- Options capture the element of flexibility in management

Financial Option

- On 02/22./2021 Pfizer Inc. (PFE) – $34.27
- Put Option for 06/18/2021 at exercise price $32
- Option Price $0.62

Risk Management Capability

- The option is to respond if risk occurs and minimize its impact
- To create the option to respond requires a certain investment
- The response if the risk occurs requires additional cost

Real Options Analysis Is used in risk management

- **Real Options Analysis has been used increasingly to evaluate and optimize the risk management investments in a variety of settings**

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Long-term risk management of nuclear waste: a real options approach

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ORIGINAL PAPER

Bioeconomics of invasive species: using real options theory to integrate ecology, economics, and risk management

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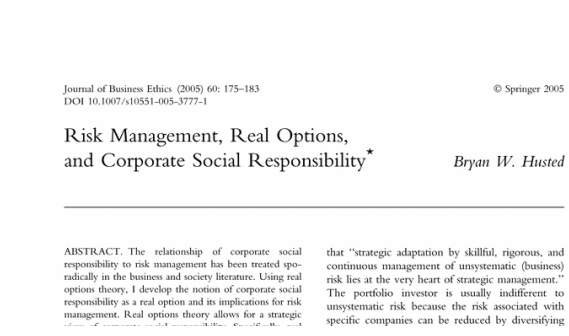

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Risk Management, Real Options, and Corporate Social Responsibility*

Bryan W. Husted

ABSTRACT. The relationship of corporate social responsibility to risk management has been treated sporadically in the business and society literature. Using real options theory, I develop the notion of corporate social responsibility as a real option and its implications for risk management. Real options theory allows for a strategic

that "strategic adaptation by skillful, rigorous, and continuous management of unsystematic (business) risk lies at the very heart of strategic management." The portfolio investor is usually indifferent to unsystematic risk because the risk associated with specific companies can be reduced by diversifying

The Real Option Value of Operational and Managerial Flexibility in Global Supply Chain Networks

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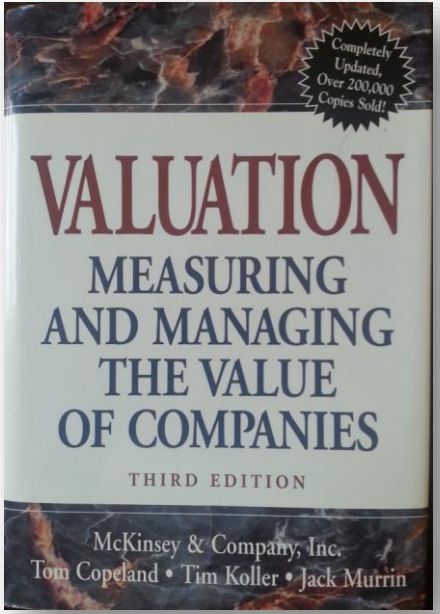
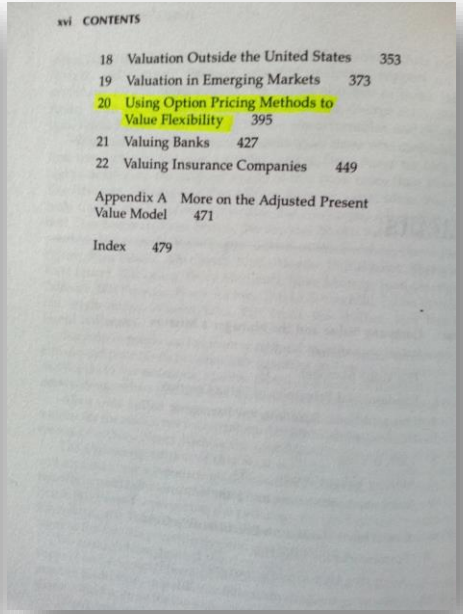
Real Options Analysis Is Used to Value Flexibility





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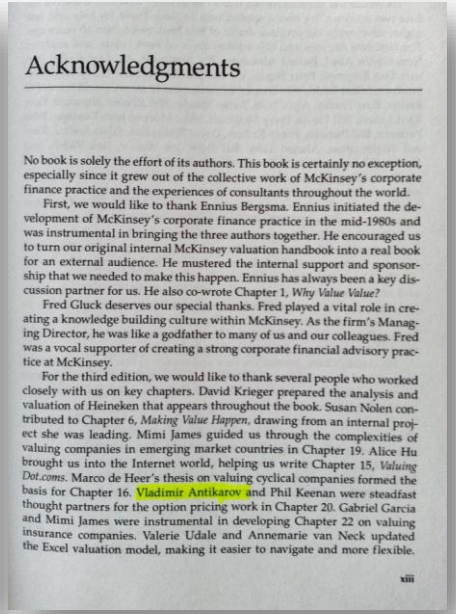

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No book is solely the effort of its authors. This book is certainly no exception, especially since it grew out of the collective work of McKinsey's corporate finance practice and the experiences of consultants throughout the world.

First, we would like to thank Ennius Bergsma. Ennius initiated the development of McKinsey's corporate finance practice in the mid-1980s and was instrumental in bringing the three authors together. He encouraged us to turn our original internal McKinsey valuation handbook into a real book for an external audience. He mustered the internal support and sponsorship that we needed to make this happen. Ennius has always been a key discussion partner for us. He also co-wrote Chapter 1, *Why Value Value?*

Fred Gluck deserves our special thanks. Fred played a vital role in creating a knowledge building culture within McKinsey. As the firm's Managing Director, he was like a godfather to many of us and our colleagues. Fred was a vocal supporter of creating a strong corporate financial advisory practice at McKinsey.

For the third edition, we would like to thank several people who worked closely with us on key chapters. David Krieger prepared the analysis and valuation of Heineken that appears throughout the book. Susan Nolen contributed to Chapter 6, *Making Value Happen*, drawing from an internal project she was leading. Mimi James guided us through the complexities of valuing companies in emerging market countries in Chapter 19. Alice Hu brought us into the Internet world, helping us write Chapter 15, *Valuing Dot.coms*. Marco de Heer's thesis on valuing cyclical companies formed the basis for Chapter 16. Vladimir Antikarov and Phil Keenan were steadfast thought partners for the option pricing work in Chapter 20. Gabriel Garcia and Mimi James were instrumental in developing Chapter 22 on valuing insurance companies. Valerie Udale and Annemarie van Neck updated the Excel valuation model, making it easier to navigate and more flexible.

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The Challenge of Building a Business Case for Actionable Resilience

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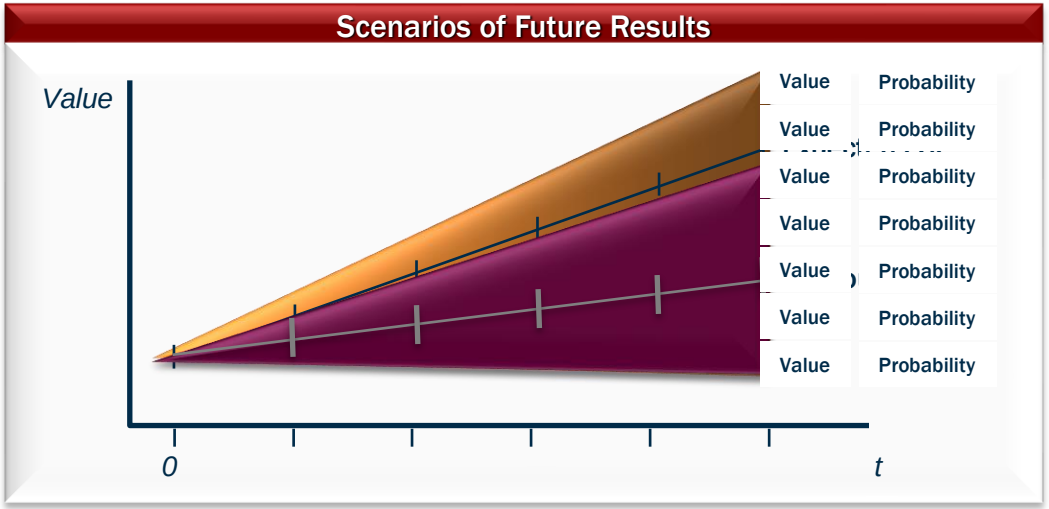
Key Takeaways

How do we Represent Risk in Finance?

- We build the base-case scenario and select the discount rate
- We build multiple scenarios with corresponding values and probabilities.
- We can see the scenarios with all values lower than the base-case scenario as expressions of the risk.



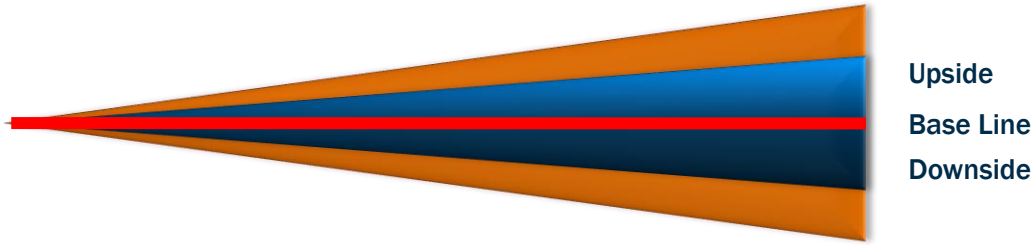
Comparison of valuation methodologies

- Different valuation methodologies capture the key elements of risk management with varying degrees of detail and correctness

	Net Present Value	Decision Tree Analysis	Real Options Analysis (ROA)
Uncertainty	Not Explicit	Explicit	Explicit
Decisions	Only "Go no Go"	Multiple Decision	Multiple Decision
Valuation Approach	Expected free cash flows discounted at WACC	Free cash flows along scenarios discounted at a chosen rate(s)	Cash flows along scenarios discounted with changing risk-adjusted rates
Valuation of Resilience	Not Valued	Valued Incorrectly	Valued Correctly

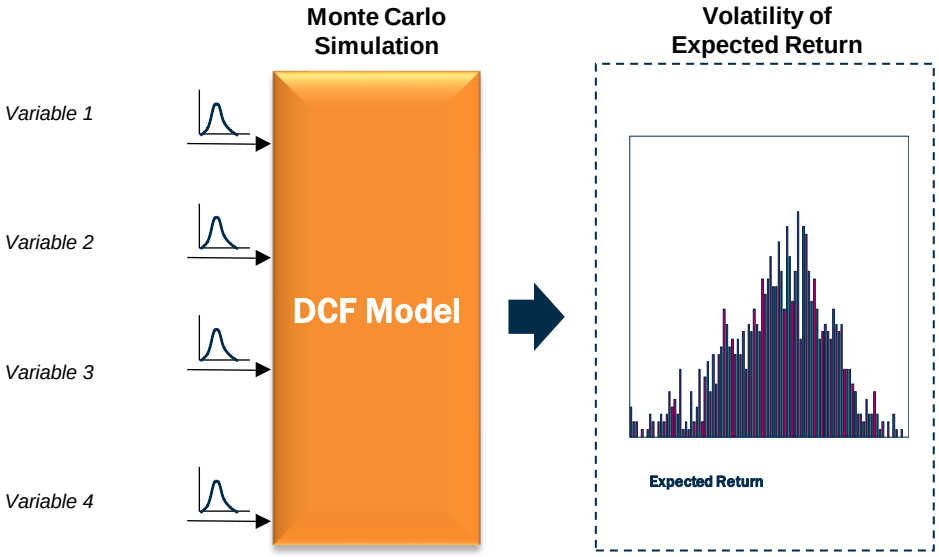
Risk Analysis with NPV Method - I

- The risks associated with the project could be reflected either in **lower expected cash flows** or a **higher discount rate**. There are not clear methodologies to reflect a specific set of risks into the expected cashflow or the discount rate for the project.
  - Different combinations of upside and downside potential could result in the same baseline scenario
  - According to finance theory to discount rate should reflect only the market -related risk (β)



Risk Analysis with NPV Method - II

Monte Carlo Simulations or Stress Testing are used to calculate the risk impact of NPV.



Using Monte Carlo simulation to combine multiple uncertainties by analyzing the overall effect they have on the project NPV

From the simulation the expected volatility of expected return is calculated

- As building contingent capabilities requires upfront investments and ongoing maintenance, these will reduce the expected cash flows of the project's base case.
- However, the continuing benefits could be reflected only in the improved NPV distributions under stress testing or Monte Carlo simulations.
- NPV methodology does not allow for a clear comparison of the certain costs but uncertain benefits of contingent capabilities and cannot be used as a Go/No-Go decision rule for such projects.

Valuing Options

- **There are three distinct methods to value options: Closed-form solutions, Numerical Models and Monte Carlo Simulations. All three methods are based on the same theoretical approach of assessing the expected future value of the option under different scenarios and then discount them to the present at a appropriate rate.**

- **No method is "better" than the other. The correctness of the final results depends on the correctness of the assumptions used.**

Closed Form Solutions

- Assumes a standard process for the asset.
- Uses a stochastic differential equations to find the value of a option (Black Scholes formula)

Numerical Models/Trees

- Can model a variety of random behaviors for the assets and interaction of different options
- Use event trees with decision notes

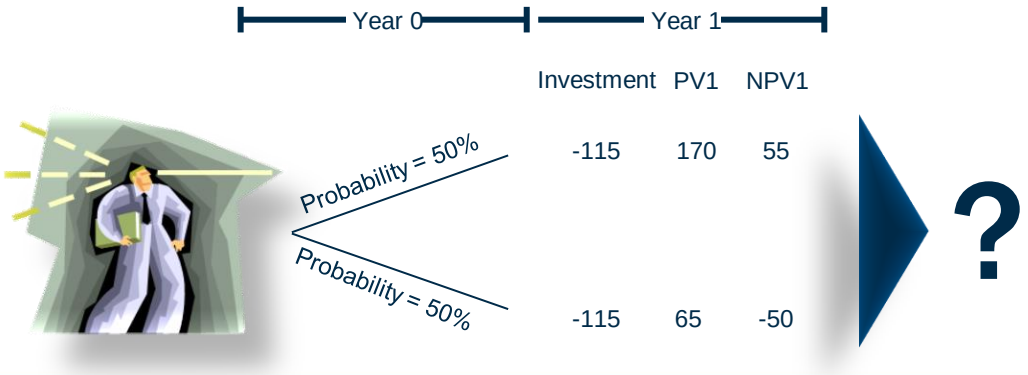
Monte Carlo Simulations

- Models a variety of random behaviors for the assets

Simple Investment Opportunity Example

- A Bank has the opportunity to make $115 million loan to a customer a year from now
- If the loan is repaid with interest, it's Present Value would be $170 million
- At current, the Bank has a limited capability to thoroughly screen the customer and bears a significant credit risk.
- The credit risk is represented by a two 50/50 repayment scenarios with corresponding Present Values of $170 million or $65 million a year from now.
- Bank's cost of capital is 17.5% and the risk-free rate is 8%

What is the value of improving customer screening?



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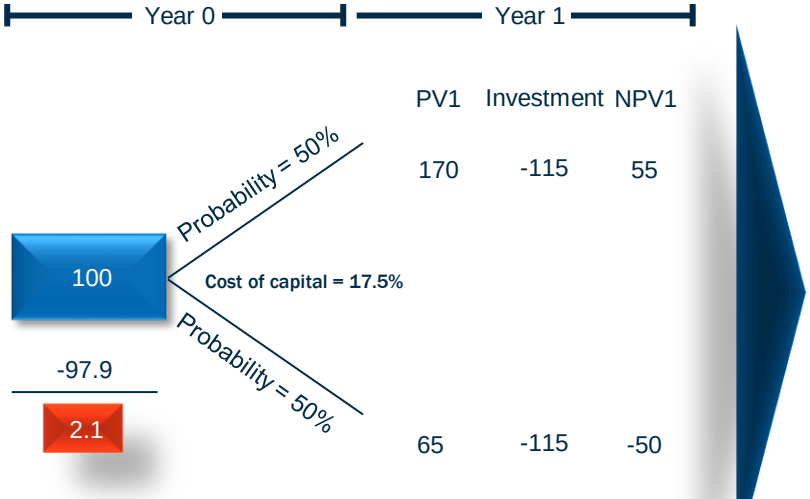
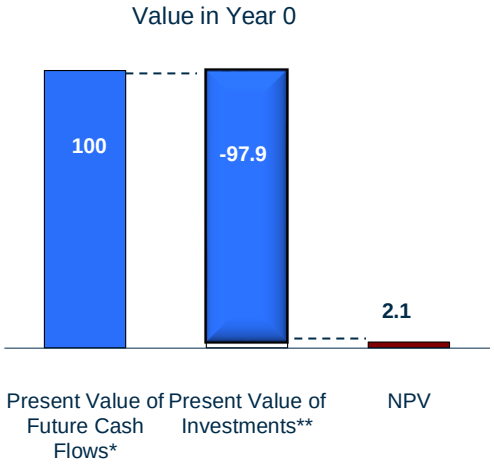
NPV / DCF Valuation — Without Risk Management

Using the NPV / DCF methodology to assess the value of the loan without client screening





* [(0.5) (170) + (0.5) (65)] / 1.175 = 100
**115 / 1.175 = 97.87

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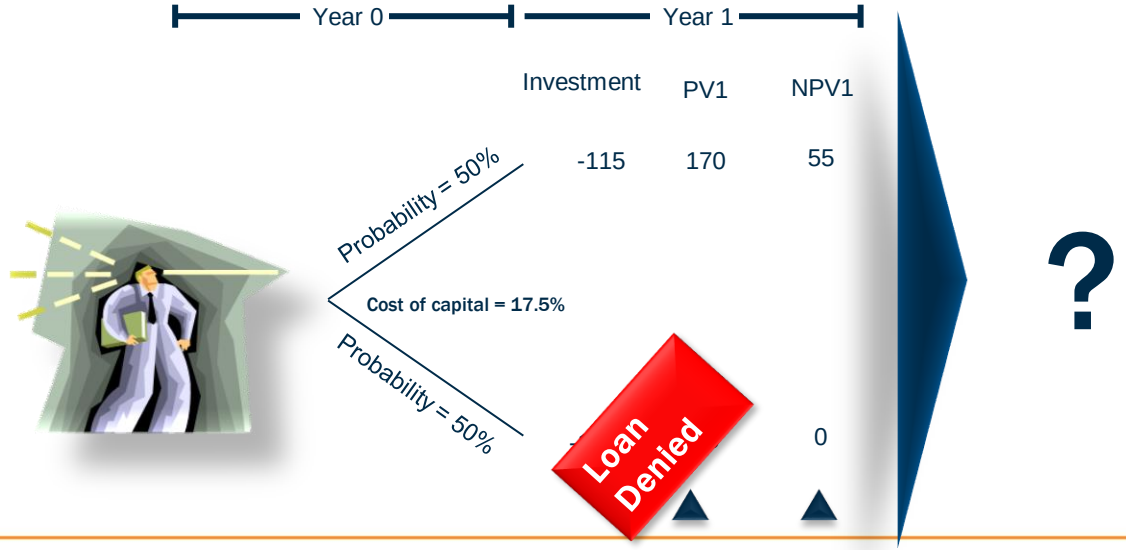
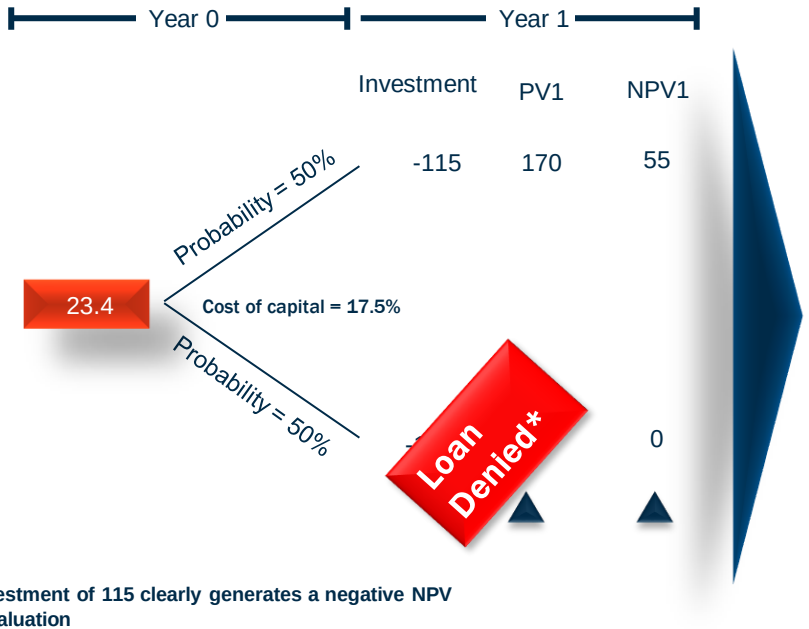
Client Screening to Deal with Credit Risk — Risk Management

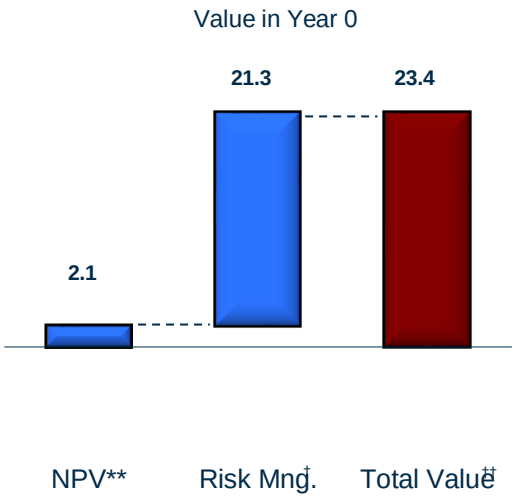
- Bank can invest in a thorough screening capability that would eliminate credit risk.
- With this contingent capability the Bank is acquiring the option to deny a loan if and when a client is identified as a repayment risk
- The Bank has to correctly assess the value of this risk management capability



Risk Management Valuation — Decision Tree Analysis (DTA)

The DTA approach values the total project, with Risk Management, at $23.4.





* PV of 65 and investment of 115 clearly generates a negative NPV
** See NPV / DCF valuation
† Total value less NPV; this could be valued separately
†† [(0.5) (55) + (0.5) (0)] / 1.175 = 23.4; the cost of investment is discounted at WACC because the decision to invest was made in Year 1

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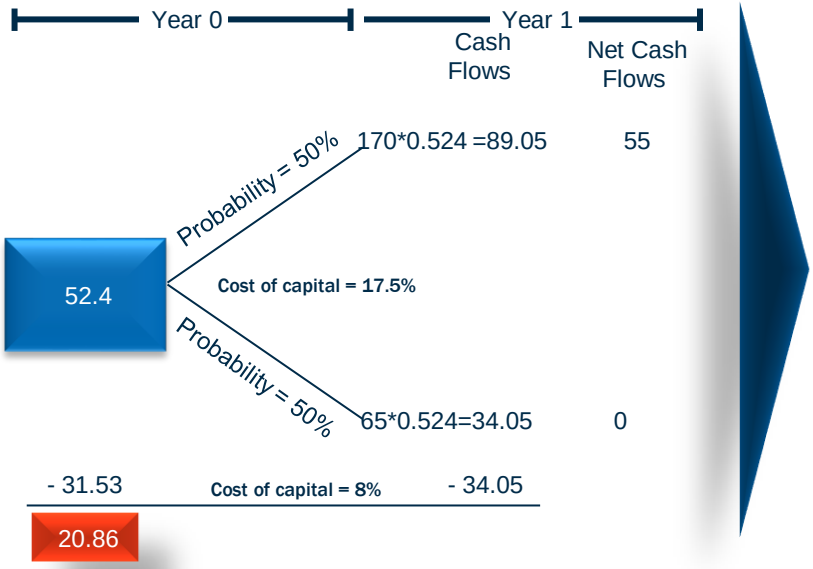
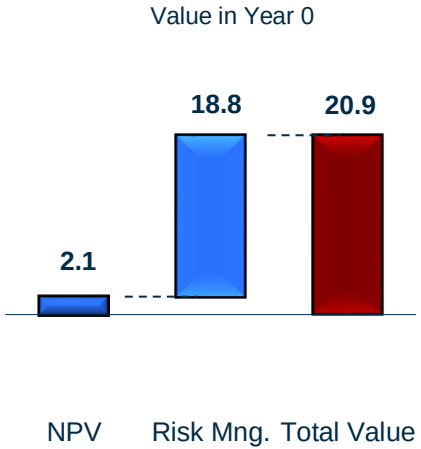
Risk Management Valuation - Real Option Analysis

The Cash Flows of the option can be replicated with a portfolio of the fraction of its twin asset and a risk-free bond. Each element of the portfolio is discounted at its appropriate rate.





Real Option Analysis — Valuation with Replicating Portfolio

Create a portfolio of long Δ of the asset (V) and short risk − free bond (B) so that it provides the same values as the option in both possible states a year later.

$\Delta V_u - B = f_u$

$\Delta V_d - B = f_d$

$$\Delta = \frac{f_u - f_d}{V_u - V_d} = \frac{55 - 0}{170 - 65} = 0.524$$

The future value of the risk−free bond is $34.05

$B = \Delta V_u - f_u = 0.524 * 170 - 55 = 34.05$

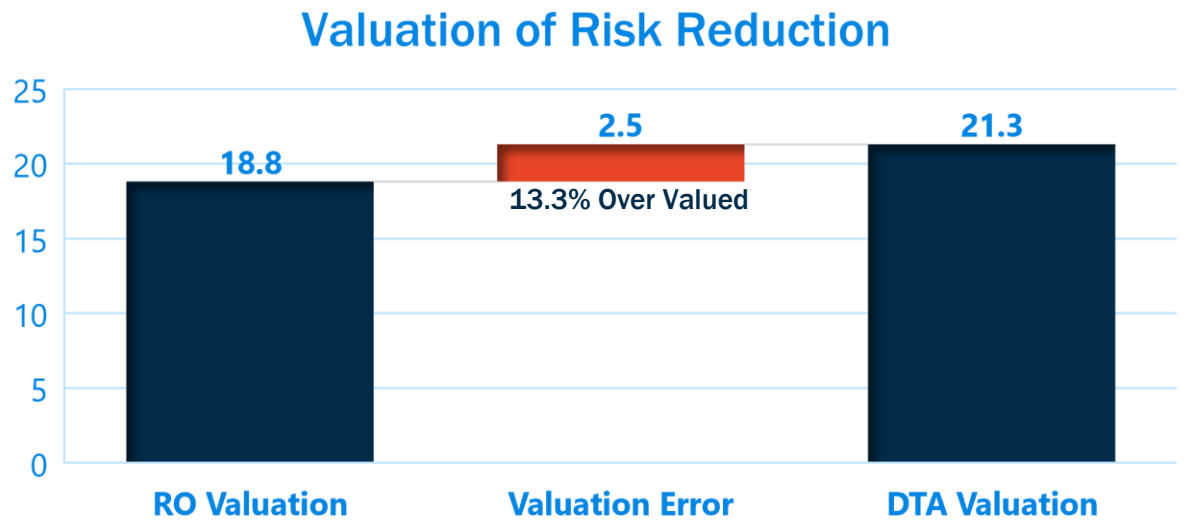
$B = \Delta V_d - f_d = 0.524 * 65 - 0 = 34.05$

Because the future values of the replicating portfolio are identical to the option the value of the option now should be equal to the present value of the portfolio.

$$f_0 = \Delta V_0 - \frac{B}{1 + r_f} = 52.4 - 31.53 = 20.86$$

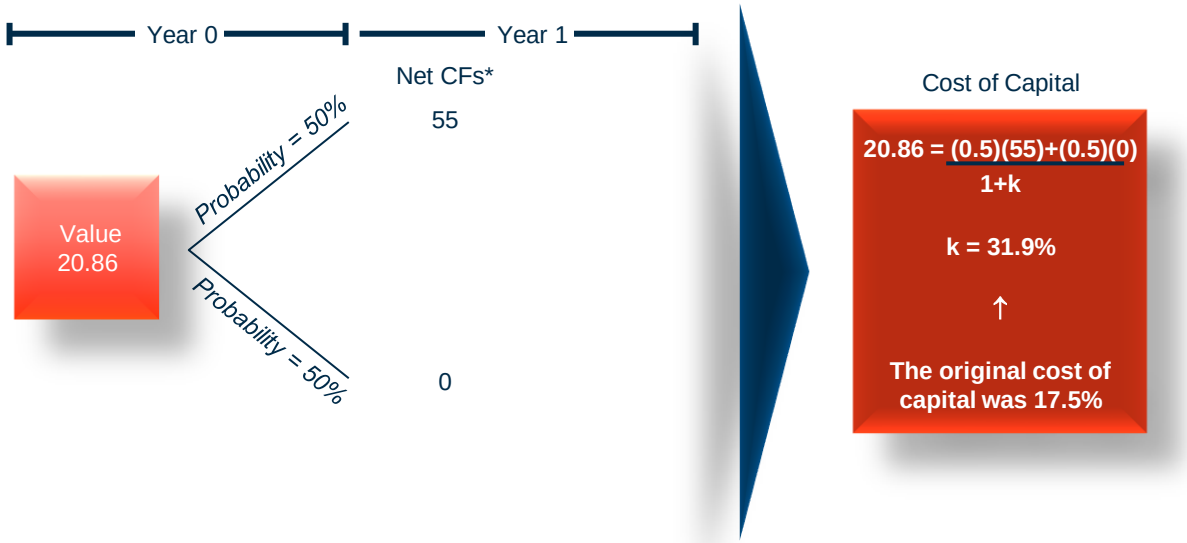
Valuation Error

- DTA valuation generate a significant error and an arbitrage opportunity.
- In more complex cases the errors could be even more more significant.



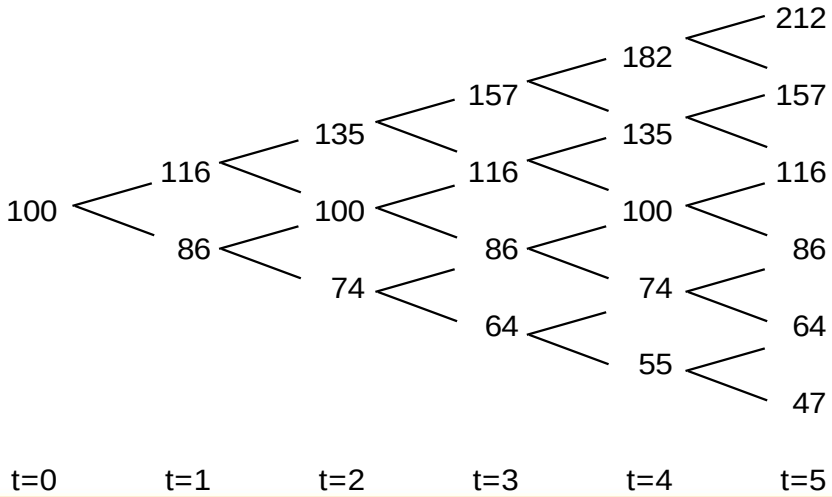
The Correct Cost of Capital

The cost of capital, as calculated from the correct option value is 31.9%. Since this differs from the original cost of capital for the project without flexibility (Risk Management) (17.5%), flexibility has therefore altered the project's riskiness



Real Options Multiple Outcomes Scenarios

- Monte Carlo simulations and other scenario techniques usually generate multiple scenarios each with its own values and probabilities.
- The scenarios can be represented with a binomial event three where the option values at every point can be evaluated with the above-described technology of replicating portfolios.



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Key Takeaways

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- As actionable resilience grows in importance, organizations will face a distinct set of cost-benefit challenges to determine the value-accretive amount of spending on the management of specific risks and the risk portfolio as a whole.

- Traditional valuation methodologies, even when they explicitly account for risk, often provide a dramatically inaccurate assessment of the value a particular resilience capability would create for the organization.

- Real Options Analysis uses advancements in modern finance to more accurately value the expected benefits from investments in resilience capabilities.

- Valuation of resilience projects with Real Options Analysis helps organizations not only to justify and secure sufficient funding, but also to optimize and prioritize the projects to be implemented.

For Further Information

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