

# Project Valuation Overview

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# Agenda

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- ◆ Purpose
- ◆ Basic Foundation
- ◆ Net Present Value (NPV)
- ◆ NPV Example
- ◆ Monte Carlo Simulation
- ◆ Decision Trees
- ◆ “Real Options” Approach

# Purpose

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- ◆ Competitive pressure forces companies to improve product development decision-making
- ◆ Proactive vs reactive decisions
- ◆ A method to make faster and better decisions which balance all functional issues in an unbiased way

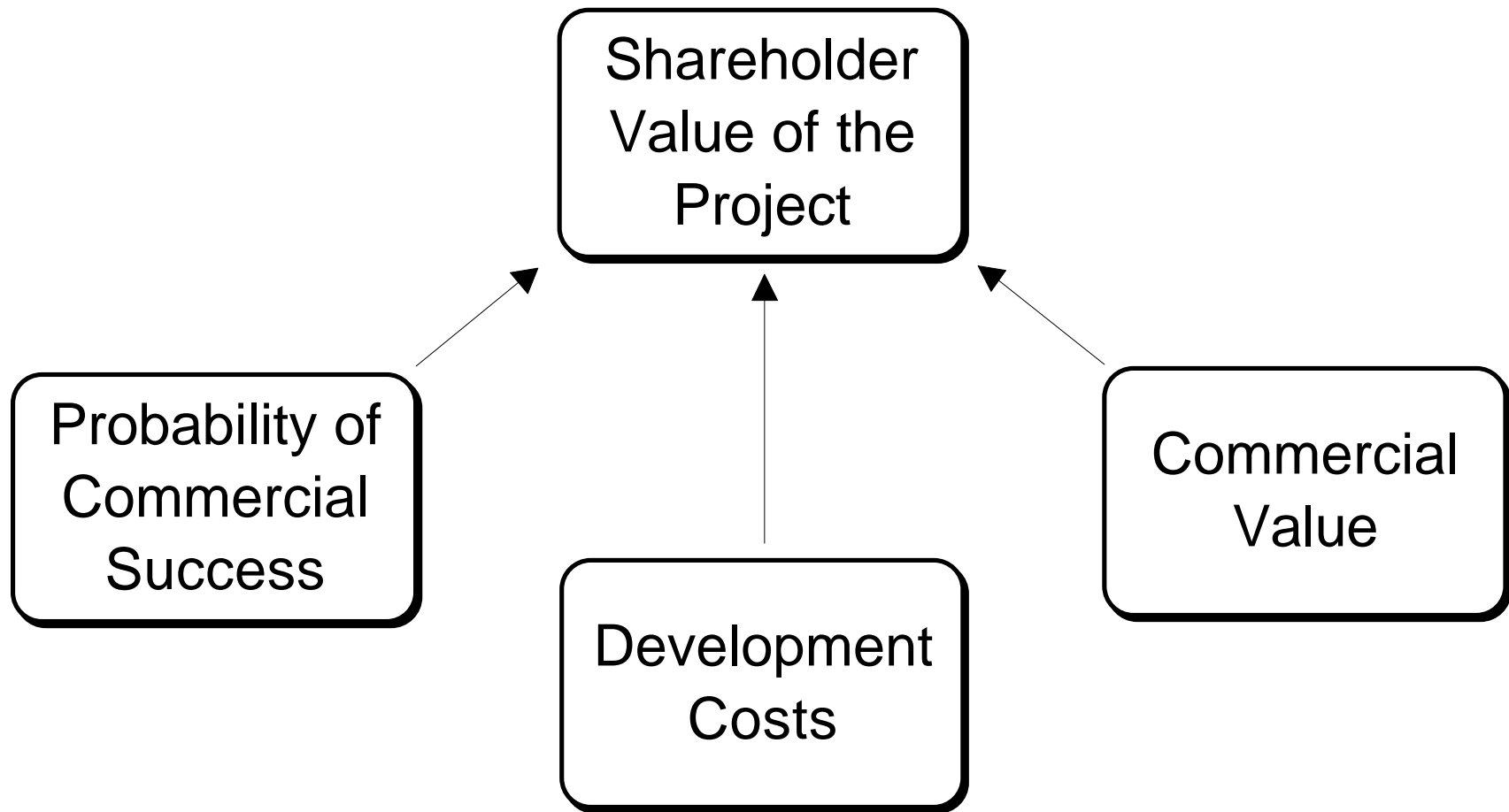
# Purpose

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- ◆ Objective method to prioritize projects
- ◆ Identify showstoppers earlier in the decision-making process
- ◆ Portfolio management
  - Balance high/low risk projects targeting large/small markets

# Basic Foundation: *Overall View*

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# Basic Foundation:

## *Overall View*

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- ◆ Analytic tools and models
  - Compare projects consistently
  - Track progress of individual projects
- ◆ Clear communication
  - Model assumptions must contain most accurate information possible
  - Balance all functional issues
  - Model must be easily understood

# Net Present Value: *Time Value of Money*

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\$20 Million Lotto Jackpot!

	1999	2000	2001	2002	2003	2018
	↓	↓	↓	↓	↓	↓
Cash Value	\$20.00	\$1.0	\$1.0	\$1.0	\$1.0	\$1.0
NPV @ 15%	\$6.26					

NPV = sum of PVs for life of project

$$PV = C_0 + \sum_{i=1}^t \frac{C_i}{(1+r)^i}$$

# Net Present Value: *Discount Rate*

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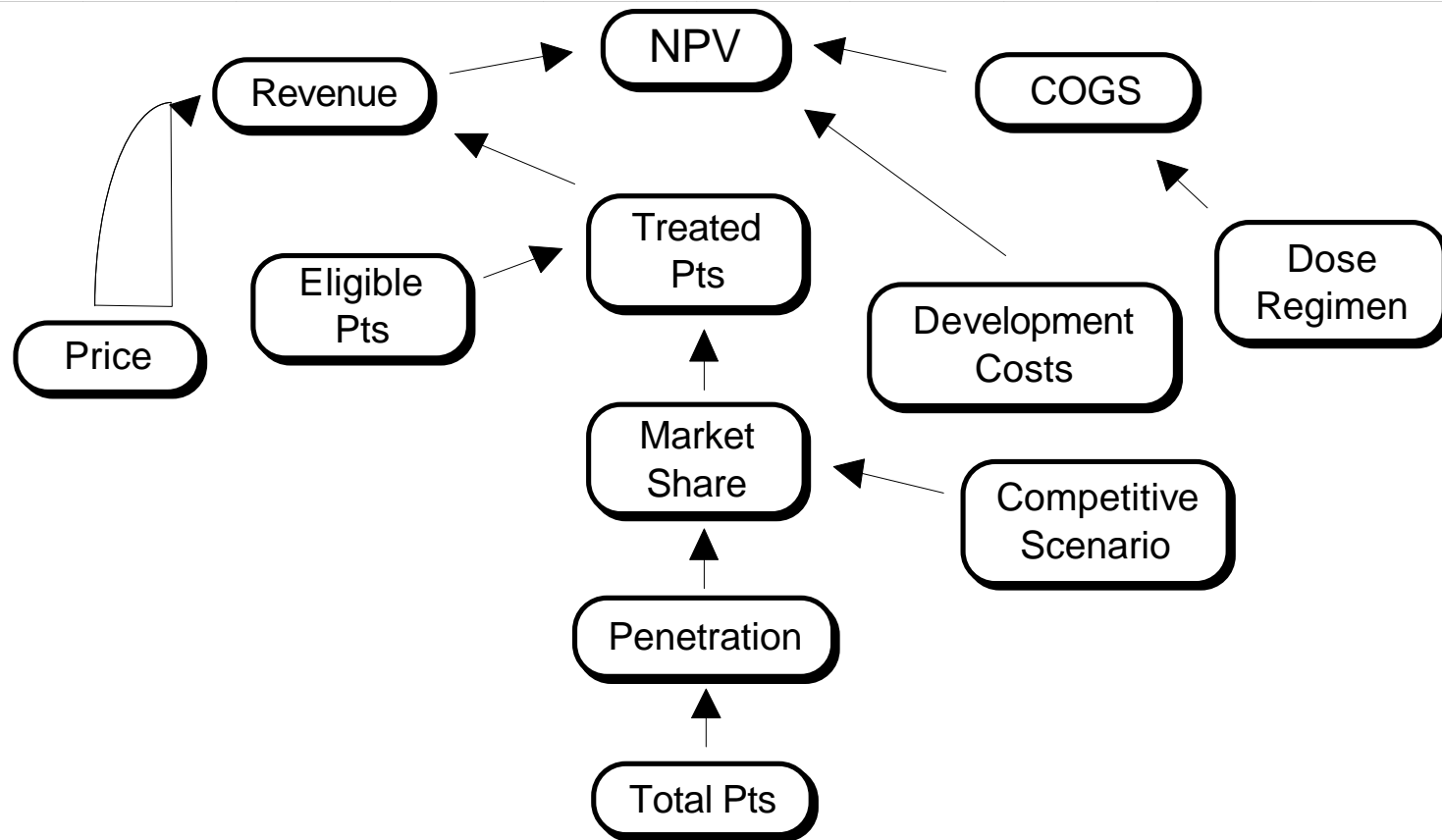
◆  $R_P = WACC + \text{Premium}$

## Typical Industry Discount Rates

Preclinical	75-55%
Phase I	40%
Phase II	35%
Phase III	20-25%
Phase IV	15%

# Net Present Value: *Factors Affecting NPV*

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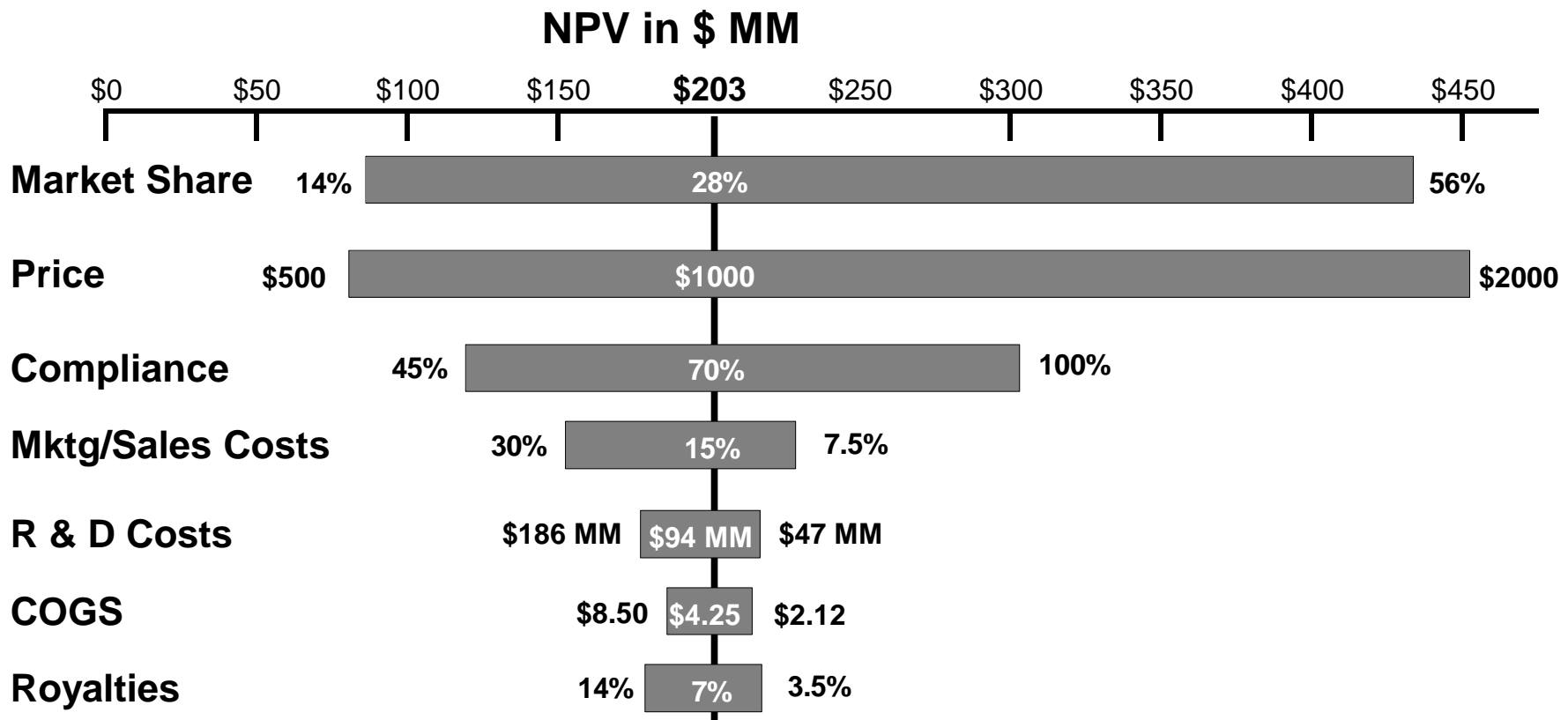
# NPV Example: *Model*

Parkinson's Disease						
				LAUNCH		
	<u>1998</u>	<u>1999</u>	←	<u>2004</u>	←	<u>2013</u>
<b>Total Patients (000s)</b>	55	56		62		74
<b>Product Revenue (\$MM)</b>	110	112		124		148
<b>Expenses (\$MM)</b>						
COGS	\$ -	\$ -		\$ 8		\$ 15
Royalties	\$ -	\$ -		\$ 6		\$ 11
Total R&D Expense	\$ 2	\$ 5		\$ 2		\$ -
G & A	\$ -	\$ -		\$ 3		\$ 6
Market Launch Costs	\$ -	\$ -		\$ -		\$ -
Mktg/Sales Exp	\$ -	\$ -		\$ 13		\$ 23
<b>Total Expenses</b>	<b>\$ 2</b>	<b>\$ 5</b>		<b>\$ 33</b>		<b>\$ 54</b>
<b>Net Profit Before Taxes</b>	<b>\$ (2)</b>	<b>\$ (5)</b>		<b>\$ 54</b>		<b>\$ 98</b>
After Tax Profit	\$ (1)	\$ (3)		\$ 32		\$ 58
Change in Working Capital		\$ -		\$ 16		\$ (11)
<b>Cash Flow</b>	<b>\$ (1)</b>	<b>\$ (3)</b>		<b>\$ 16</b>		<b>\$ 68</b>
<b>NPV (\$MM)</b>	<b>\$157</b>					

# NPV Example:

## *Sensitivity Analysis*

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# NPV Example:

## *Pros and Cons*

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### ◆ Pros

- Easy to understand
- Easy to modify assumptions
- Accurate valuation if assumptions are correct
- Industry standard

# NPV Example:

## *Pros and Cons*

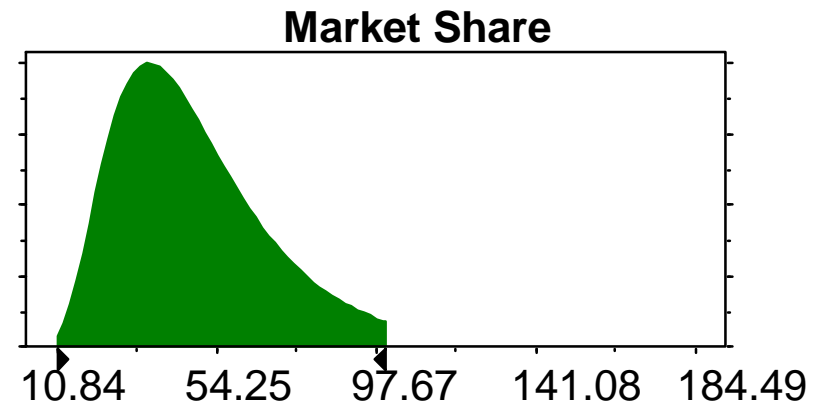
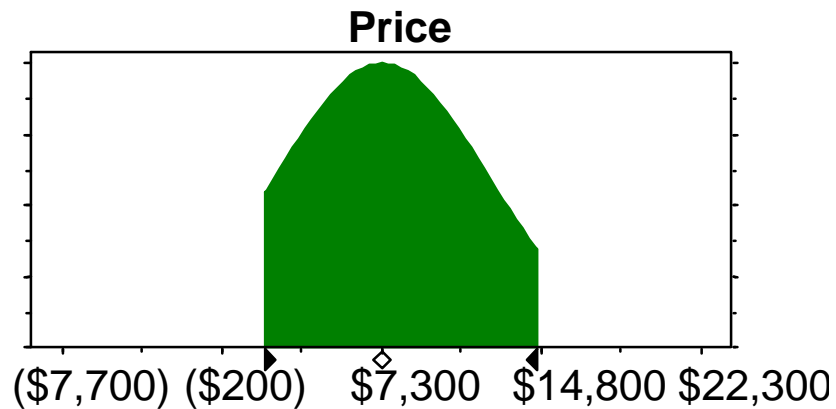
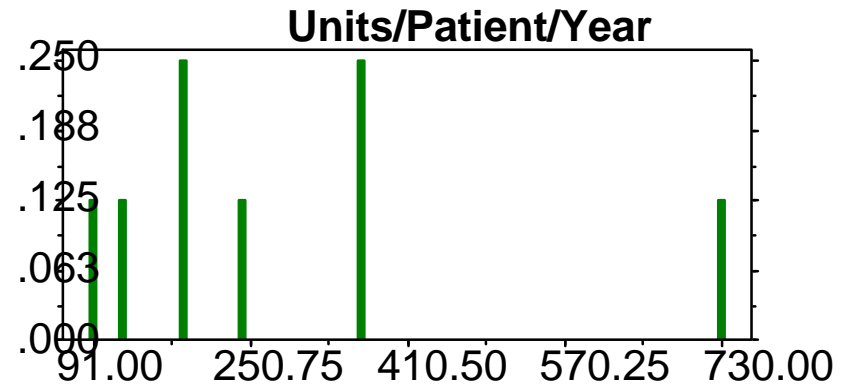
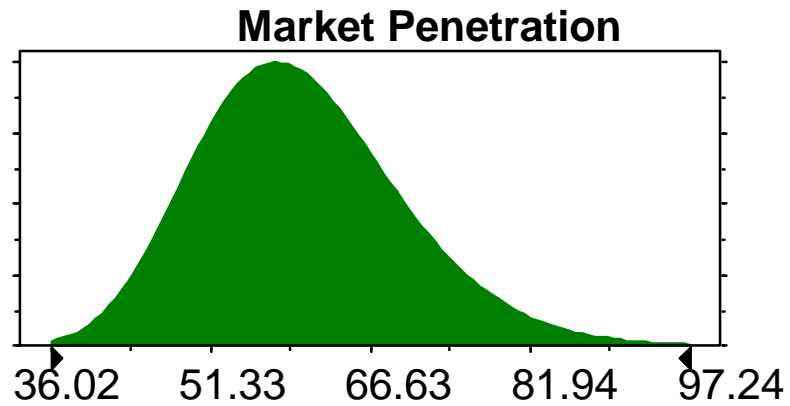
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### ◆ Cons

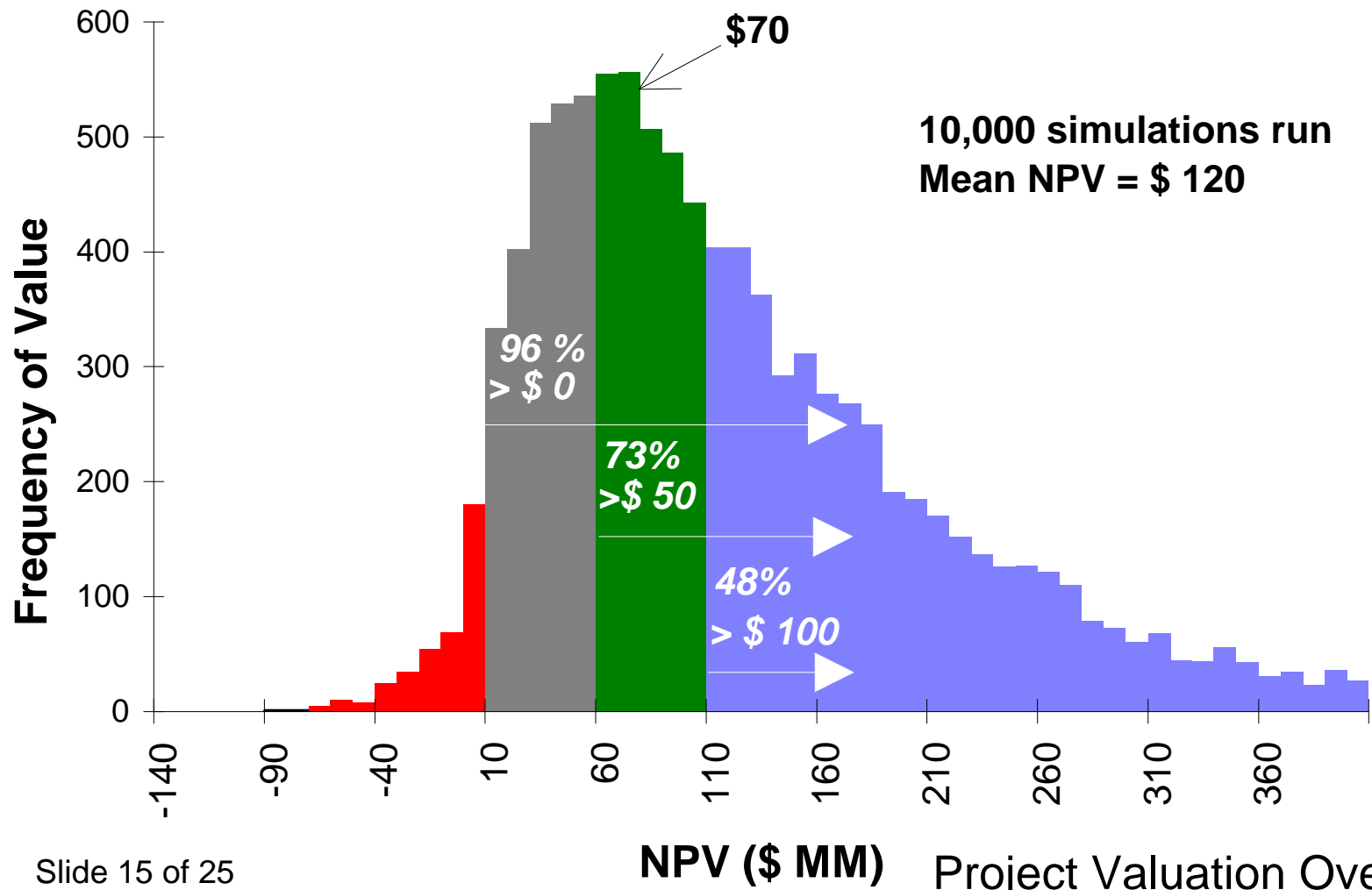
- Not accurate for projects early in the development phase
- Appropriate discount rate(s) may be difficult to estimate
- Sensitivity analysis can only change one or two variables simultaneously
- Project value due to managerial flexibility is not calculated

# Monte Carlo Simulation: *Basic Idea*

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# Monte Carlo Simulation: *NPV Distribution Curve*



# Monte Carlo Simulation:

## *Pros and Cons*

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### ◆ Pros

- A greater number of scenarios is analyzed
- Probabilities of NPV scenarios can be estimated

# Monte Carlo Simulation:

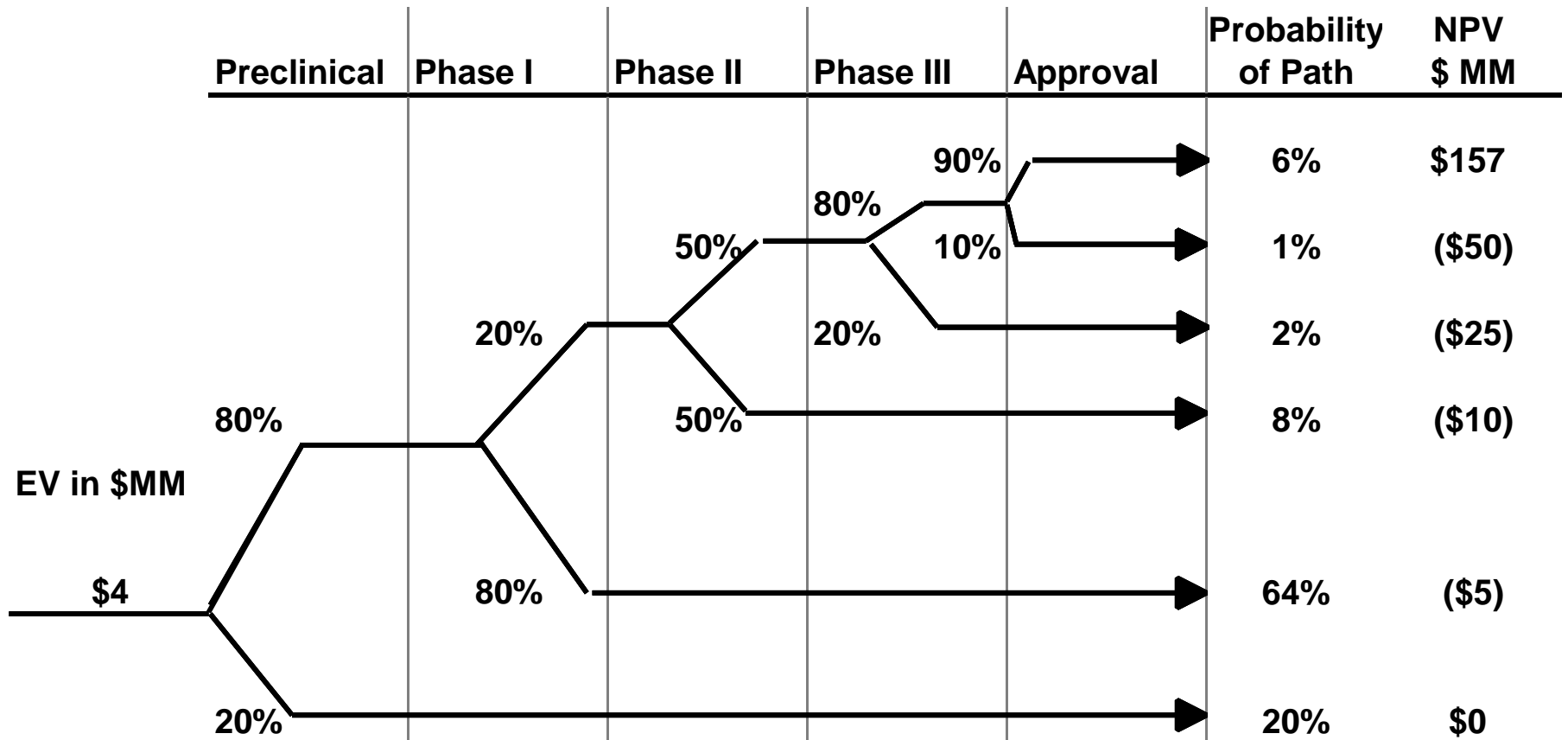
## *Pros and Cons*

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### ◆ Cons

- Probability distributions for individual variables may be difficult to calculate
- Variable correlation needs to be calculated
- Model is more complicated and difficult to understand
- Project value due to managerial flexibility is not calculated

# Decision Tree Analysis



# Decision Tree Analysis: *Pros and Cons*

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## ◆ Pros

- Model is easy to understand
- Risk is interpreted as probability and not as a discount rate

# Decision Tree Analysis:

## *Pros and Cons*

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### ◆ Cons

- Risk estimates easily biased and difficult to estimate accurately
- Model lacks flexibility
- Decision points occur continuously and not always at discrete junctions
- If too many possibilities are considered, then “tree” becomes a “bush”

# “Real Options” Approach:

## *Basic Idea*

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- ◆ Definition of a financial option:  
“the right to buy (*call*) or sell (*put*) an asset at a specific price on or before a specific date”
- ◆ Options have value even if not “in the money”

# “Real Options” Approach:

## *Types of Real Options*

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- ◆ Option to defer
- ◆ Time to build
- ◆ Option to expand
- ◆ Option to shut down and restart operations
- ◆ Option to abandon
- ◆ Growth option

# “Real Options” Approach: *Pros and Cons*

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## ◆ Pros

- Capture total value of project
- Projects with negative NPVs may be positive if “Real Option” value is added
- Can more accurately value biotech projects in preclinical phases where cash flows are difficult to predict

# “Real Options” Approach: *Pros and Cons*

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- ◆ Cons
  - Calculations non-trivial
  - Difficult to explain/understand concepts
  - Outside of Merck, not yet used in the industry

# For Further Information

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- ◆ Refer to Reading List
- ◆ Email [julio\\_gagne@cc.chiron.com](mailto:julio_gagne@cc.chiron.com)