

REAL OPTIONS GROUP

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Lilly

Valuing Parallel or Sequential Marketing Expansion Strategy

Lilly

3-step Real Options Valuation Process



Introduction

- ▶ Problem Structuring
- ▶ Evaluation
- ▶ Action Plan

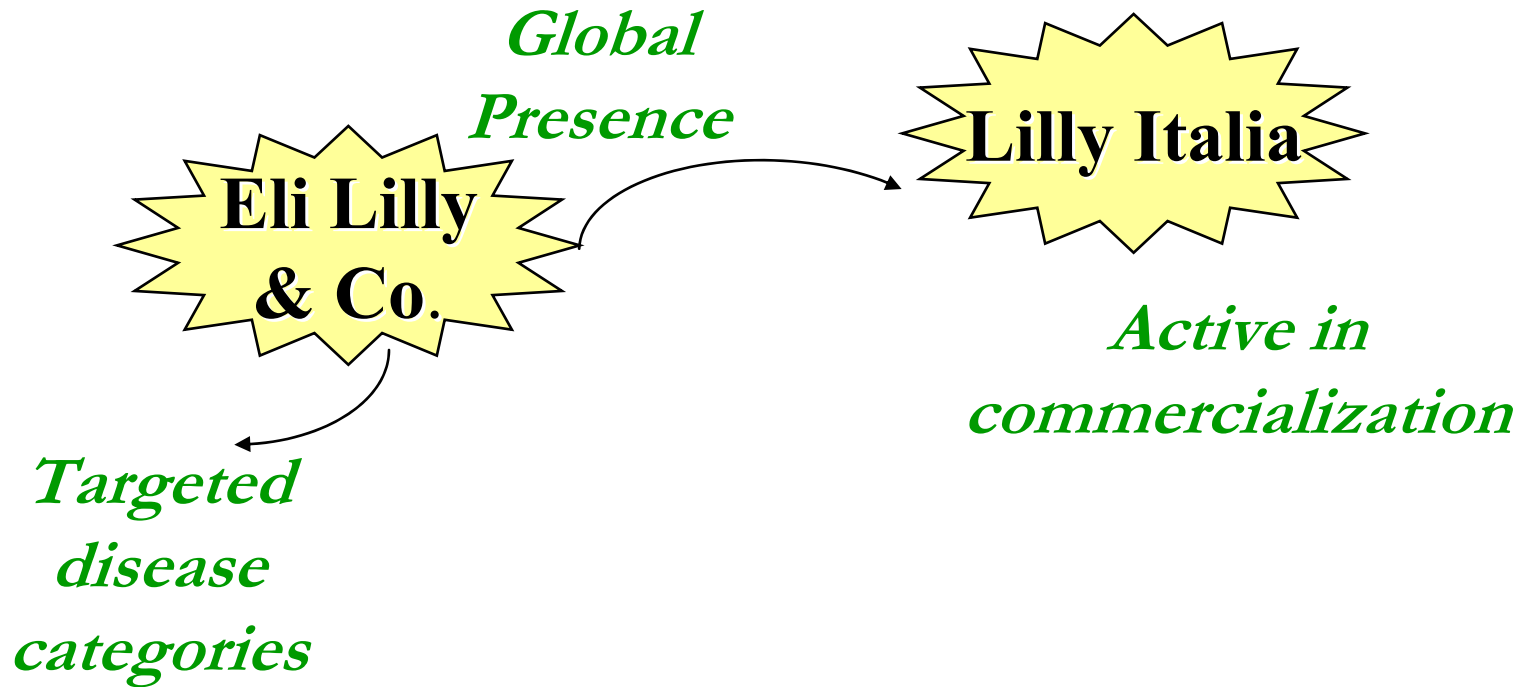
Introduction

- ▶ **The Problem**
- ▶ **Background: Company and Strategy**
- ▶ **Background: Therapeutic Problem/Drug**
- ▶ **Project Milestones**
- ▶ **Management Strategy/Concerns**
- ▶ **Main Alternatives**

The Problem

- ▶ Valuing purchase rights of a new drug (for anti-thrombotic treatment, e.g. in Angioplasty/PTCA) involving optimal marketing expansion strategy (parallel vs. sequential launch) of two follow-on related extensions (Angina and AMI)
- ▶ Purpose:
 - Value purchase rights
 - Assess optimal marketing expansion strategy
 - Understand synergies among expansion options

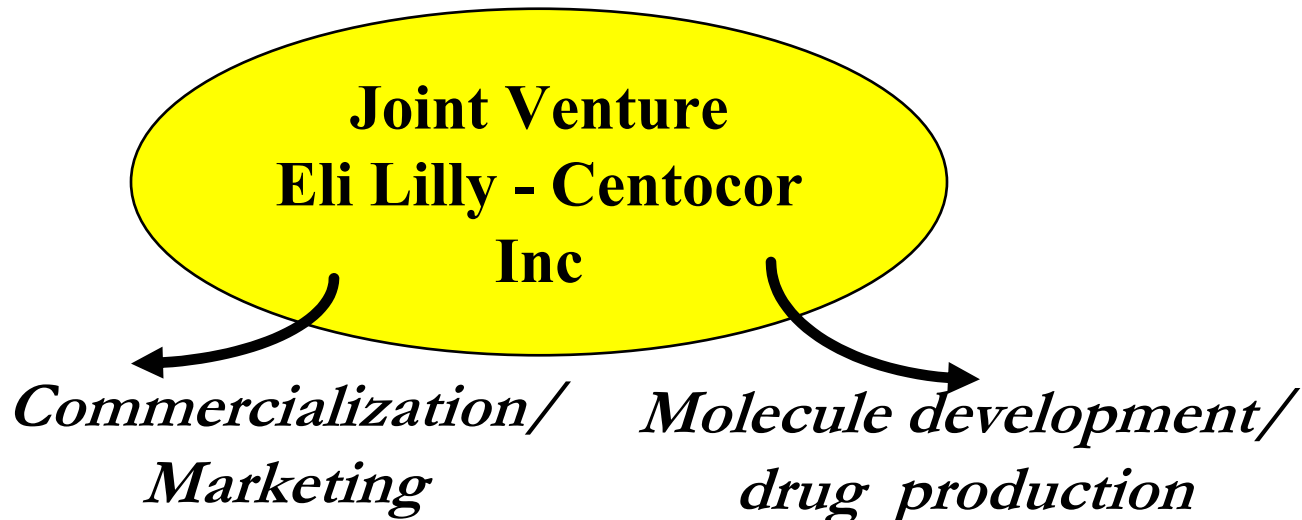
Background: the Company and its Strategy



- central nervous system
- endocrinology
- oncology
- infectious diseases
- cardiovascular diseases

Company Strategy

- ▶ Complete range (cardiovascular)
- ▶ Strengthen position in antithrombotics segment
- ▶ Launching an innovative product
- ▶ Enhance image



Therapeutic Problem/Drug

▶ Treatment in therapies to prevent formation of thrombi (resulting from blood clotting):

1. Angioplasty (PTCA)

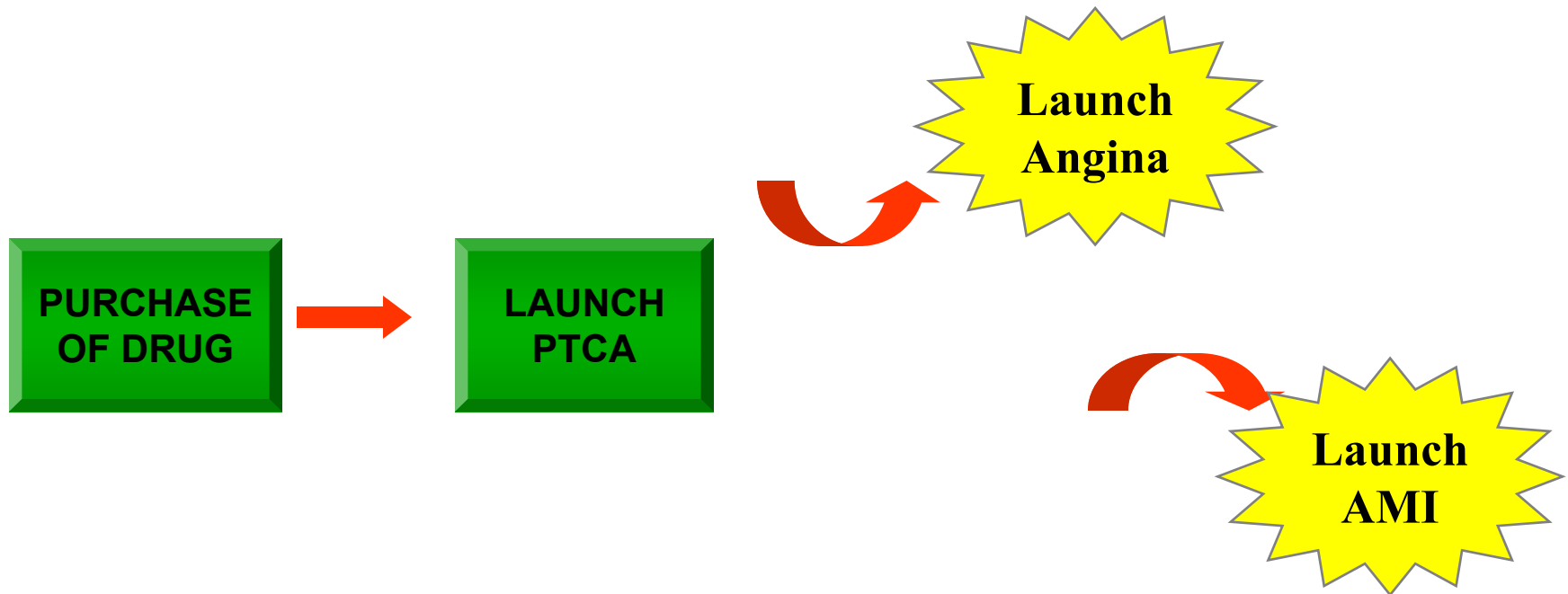
2. Angina pectoris

3. AMI (Acute Myocardial Infraction)

▶ *Heart* is innovative anti-thrombotic (inimitable -biological synthesis)

▶ For hospital use, by injection

Project Milestones



Management Comments/Concerns

Project Manager

- ▶ *“Projections of target patients for PTCA are highly uncertain”*
- ▶ *“Subsequent extensions depend on PTCA performance”*
- ▶ *“Overall assessment should account for the possibility of expanding the marketing of the drug into related applications (Angina and AMI)”*

Management Comments/Concerns

CEO

- ▶ *“Purchasing the drug and launching it on the market, we are acquiring at the same time an expansion option”*
- ▶ *“Within 2 years we can decide to exercise this expansion option, pay then the D-cost and proceed to the drug's extension to other applications, Angina and AMI. If we don't consider it worthwhile at that time, we can abandon the whole idea avoiding subsequent costs”*

Main Alternatives: Marketing Expansion Strategy



- ▶ **Sequential Strategy:**

Launch Angina first (by 2002) and then launch AMI (by 2004)

- ▶ **Parallel Strategy:**

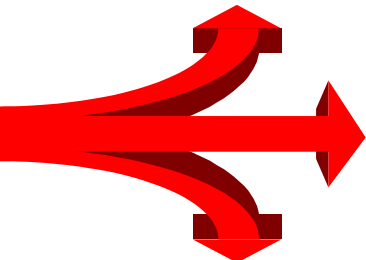
Launch AMI directly (between 2002-2004) independently of Angina

Phase I: Problem Structuring



- ▶ **Main Value Drivers**
- ▶ **Project Timeline**
- ▶ **Specifying Options**
- ▶ **Option Interaction**

I. Identify Main Value Drivers

- 
- ▶ Main risk driver is demand uncertainty (number of patients) for the PTCA market ($V1 = PV$ of cash inflows from PTCA launch)
 - ▶ Upside potential enhanced by two (American-type) expansion options (Angina and AMI)

I. Project Timeline (Milestones)

**Launch
PTCA
(base-case)**

**Expand into
Angina
(years 0-2)**

**Expand into
AMI
(years 2-4)**

2000

2002

2004

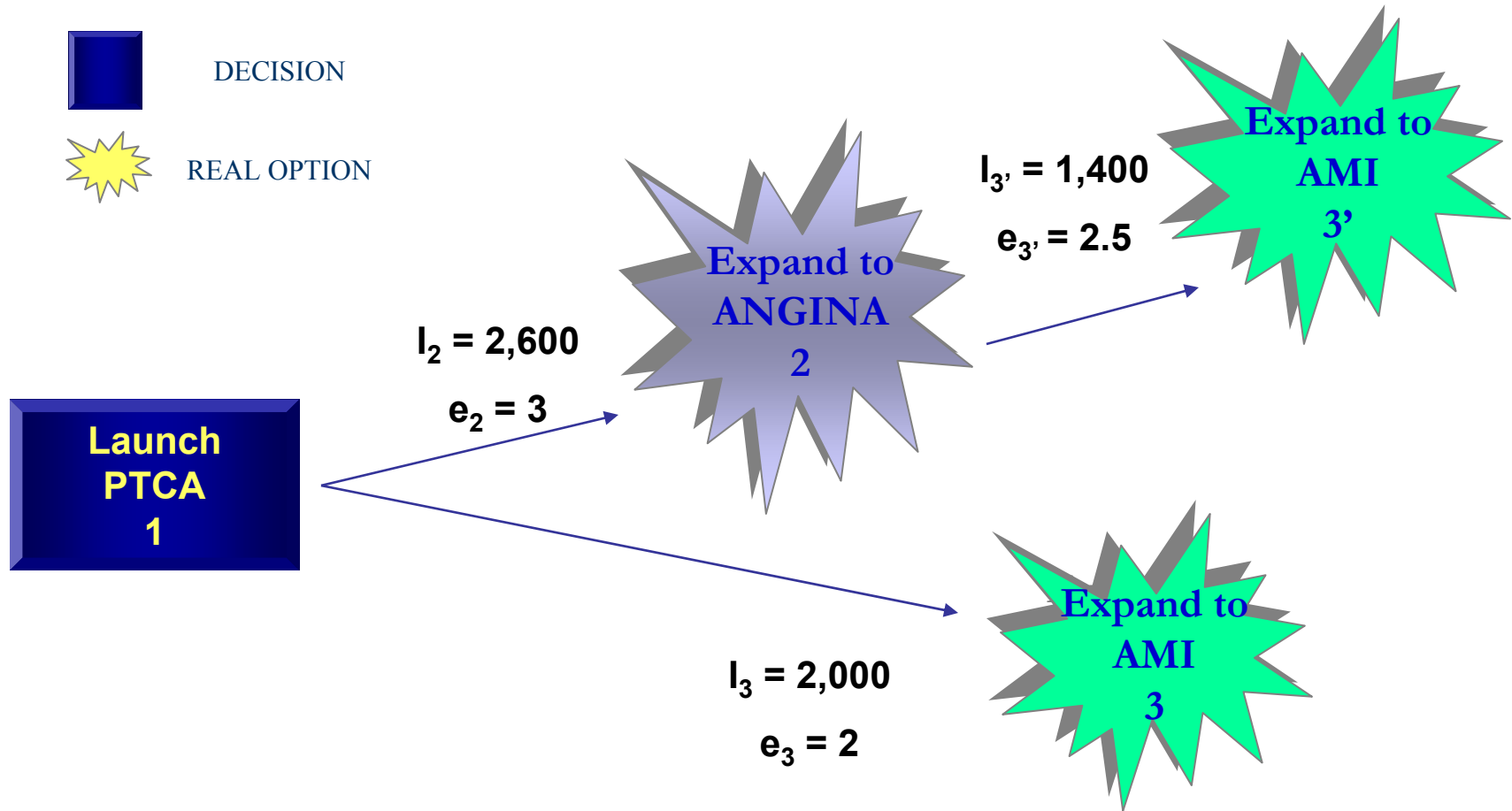
I. Project Structure



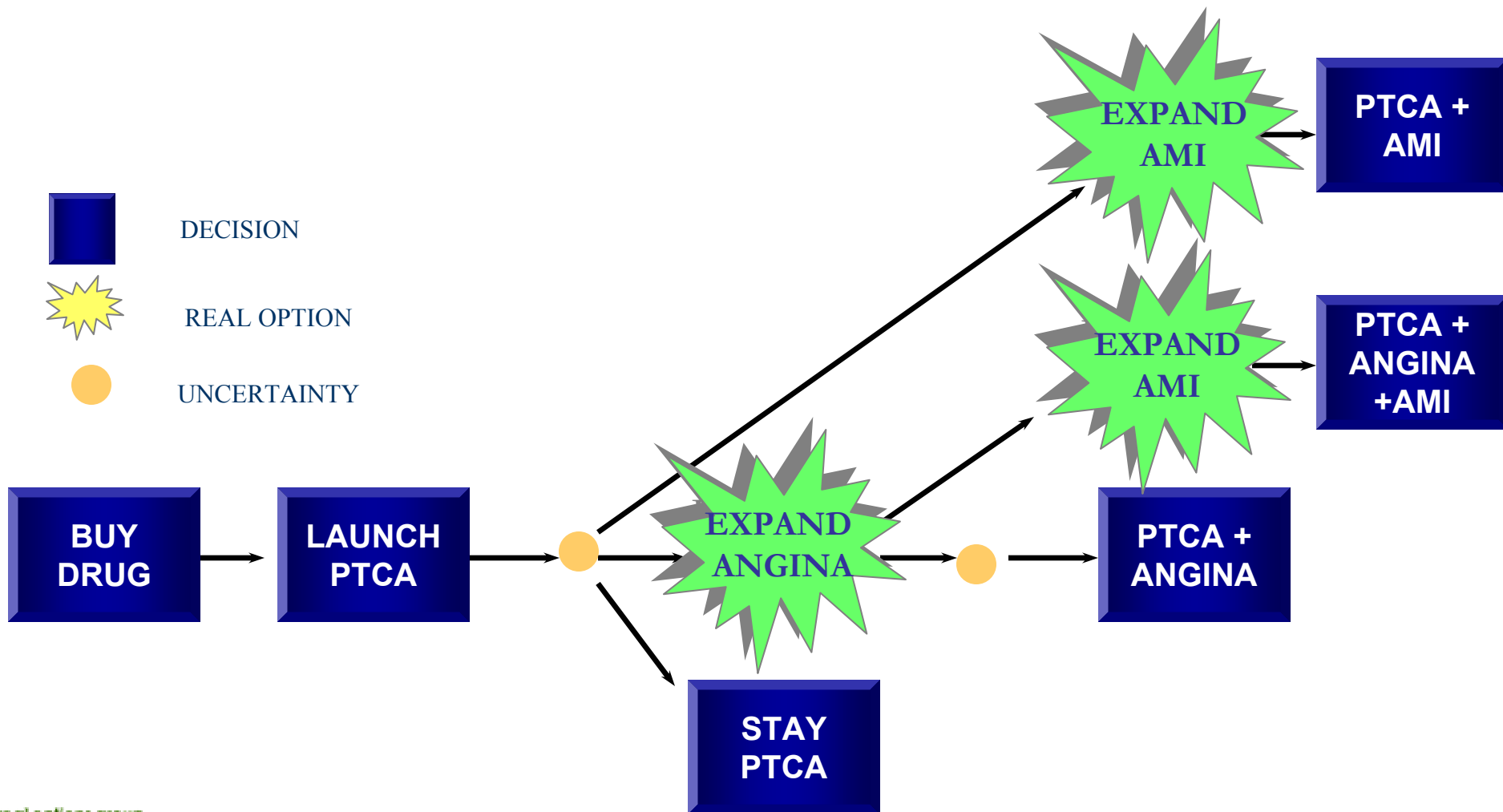
DECISION



REAL OPTION

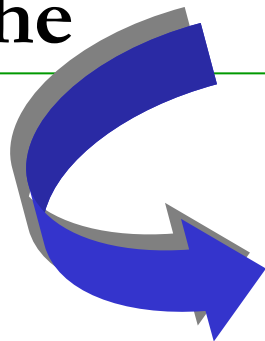


I. Decision Map



I. Specifying Options: Option to Expand into Angina

▶ Within next 2 years (by 2002) can expand into Angina if PV of expanded market (3 x PTCA) is higher than extra D-plan cost (2,600) to enter the Angina niche



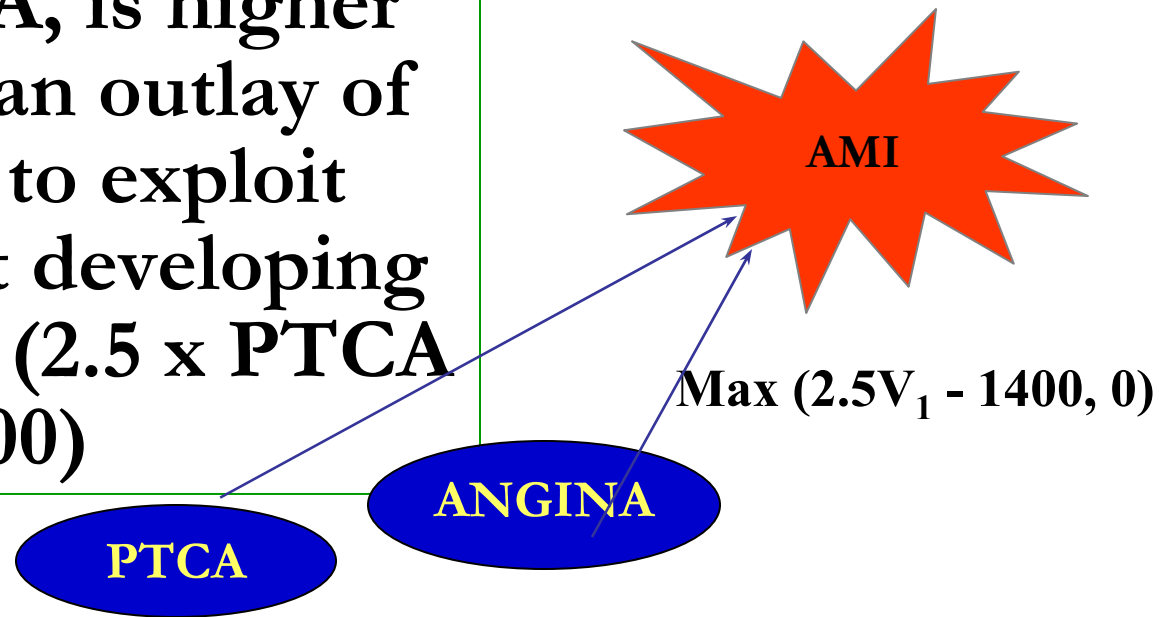
**BENEFITS
FROM
EXPANDING
TO ANGINA**

**Expand PTCA
market to capture
cash flows from
Angina niche**

**Option
to expand into
AMI niche**

I. Specifying Options: Option to Expand into AMI

▶ Between 2002-2004 (years 2-4) can expand into AMI either directly (if PV of expansion into AMI, $2 \times \text{PTCA}$, is higher than required D-plan outlay of 2,000) or indirectly to exploit synergies from first developing the Angina market ($2.5 \times \text{PTCA}$ at lower cost of 1,400)



$$\text{Max}(2V_1 - 2000, 0)$$

$$\text{Max}(2.5V_1 - 1400, 0)$$

I. Option Interactions/Synergy



- ▶ Expanding to AMI through Angina results in a higher expansion factor (2.5) than going directly to AMI (x 2). This is due to the developed credibility of the drug's effectiveness among surgeons. This credibility and promotion also reduces the extra D-plan cost needed for AMI.
- ▶ The value of Angina partly depends on the AMI option.

Phase II: Evaluation

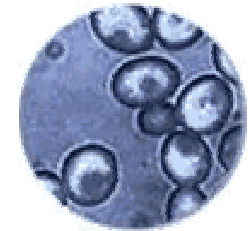
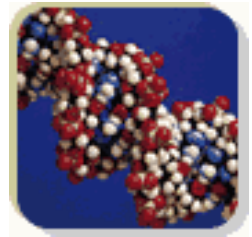
- ▶ **DCF Analysis**
- ▶ **Option Inputs**
- ▶ **Specifying Options**
- ▶ **Results**
- ▶ **Sensitivity**
- ▶ **Value Breakdown**



II. Primary Input Data (DCF) Estimates

PTCA Launch (Base-case)

- ▶ Unit price (P) = L 1,610 m
- ▶ Project life (T) = 7 years
- ▶ COPS = 65% of revenues
- ▶ G&A = 6% of revenues
- ▶ Tax rate = 50% (of EBIT)
- ▶ WACC = 8.75%
- ▶ PV of D-Plan cost = L 480 m:
 - L 250 m in 2000
 - L 250 m in 2001



II. DCF (NPV) for PTCA

Base-Case: NPV = -111 Reject?

PV OF CASH FLOWS FROM PTCA (BASE CASE)										
YEAR	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Total patients (Q)		7,000	7,600	8,200	8,700	9,300	10,000			
Market share		0.10	0.15	0.20	0.20	0.20	0.20			
REVENUES		1,127	1,835	2,640	2,801	2,995	3,220			
-COPS		-733	-1,193	-1,716	-1,821	-1,946	-2,093			
-Marketing costs		-1,000	-650	-500	-250	-250	-200			
-General & Administr. expenses		-68	-110	-158	-168	-180	-193			
EBIT		-673	-118	266	562	618	734			
-Taxes		337	59	-133	-281	-309	-367			
NET (FREE) CASH FLOWS		-337	-59	133	281	309	367			
Present value of cash inflows (Vo)	370									
D-Plan costs	-500	-500								
AFTER-TAX CAPITAL EXP.	-250	-250								
Present value of costs (Io)	-481									
NPV = Vo - Io	-111									

II. Angina NPV

Angina: NPV = -1,118

Reject?

PV OF CASH FLOWS FROM ANGINA										
YEAR	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Total patients (Q)				28,906	30,063	31,840	32,520			
Market share				0.10	0.15	0.20	0.20			
REVENUES				3,723	5,808	8,202	8,377			
-COPS				-2,420	-3,775	-5,331	-5,445			
-Marketing costs				-1,500	-1,250	-750	-500			
-General & Administr. expenses				-223	-348	-492	-503			
EBIT				-420	434	1,629	1,929			
-Taxes				210	-217	-814	-965			
NET (FREE) CASH FLOWS				-210	217	814	965			
<i>Present value of cash inflows (Vo)</i>	1,110									
D-Plan costs			-3,000	-2,375						
AFTER-TAX CAPITAL EXP.			-1,500	-1,188						
<i>Present value of costs (Io)</i>	-2,229		-2,600							
NPV = Vo - Io	-1,118									

II. AMI NPV

AMI: NPV = -730 Reject?

PV OF CASH FLOWS FROM AMI (DIRECT FROM PTCA)										
YEAR	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Total patients (Q)						16,025	17,026	18,048	19,129	20,031
Market share						10%	15%	20%	20%	20%
REVENUES						2,064	3,289	4,649	4,928	5,160
-COPS						-1,342	-2,138	-3,022	-3,203	-3,354
-Marketing costs						-1,000	-800	-500	-300	-215
-General & Administr. expenses						-124	-197	-279	-296	-310
EBIT						-401	154	848	1,129	1,281
-Taxes						201	-77	-424	-565	-641
NET (FREE) CASH FLOWS						-201	77	424	565	641
<i>Present value of cash inflows (Vo)</i>	740									
D-Plan costs					2,148	2,000				
AFTER-TAX CAPITAL EXP.					1,074	1,000				
<i>Present value of costs (Io)</i>	1,470		1,852		2,000					
NPV = Vo - Io	-730									

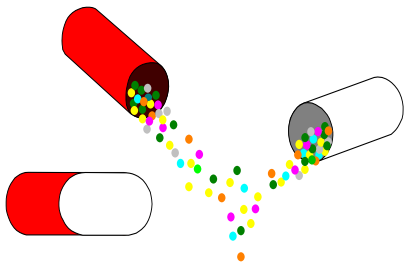
II. Additional (Option) Input Estimates



- Volatility (std dev) of % changes in PTCA value = 40%
- Riskless interest rate = 8%

II. Additional (Option) Input Estimates

Option to Expand to AMI



- ▶ Value of AMI (call) option:

$$\text{Option AMI} = \text{Max}(e^3 * V1 - I3, 0)$$

- ▶ Expanded project value at expiration (PTCA with AMI Option):

$$R = V1 + \text{Max}(e^3 * V1 - I3, 0)$$

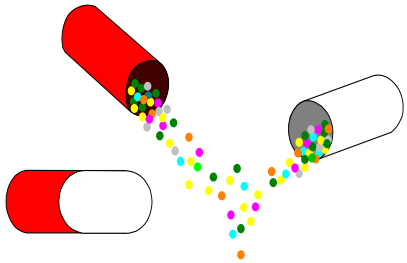
→ $V1$ = PV of expected cash flows from PTCA ($V1 = \text{L } 370 \text{ m}$)

→ $e^3 = 2$ (200% expansion rate), estimated by mktg department

→ $I3 = \text{L } 2,000 \text{ m}$ (AMI D-plan cost)

II. Additional (Option) Input Estimates

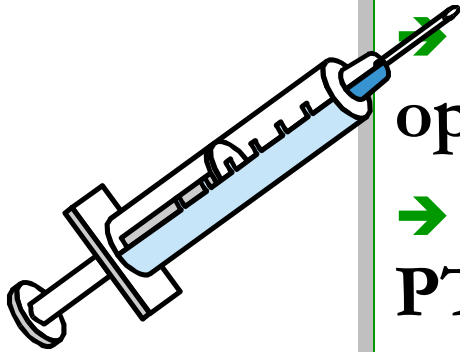
Option to Expand to AMI through Angina



- ▶ Value of AMI option through Angina:
$$\text{Option AMI} = \text{Max}(e^{3'} * V1 - I3', 0)$$
 - ▶ Expanded project value at expiration (PTCA plus AMI option through Angina):
$$R' = V1 + \text{Max}(e^{3'} * V1 - I3', 0)$$
- $e^{3'} = 2.5$ (due to synergy)
- $I3' = L 1,400 \text{ m}$ (30% lower D-plan cost)

II. Additional (Option) Input Estimates

Option to Expand to Angina



▶ Expanded project value with Angina (plus AMI Option) at its expiration ($t=2$):
$$R = V1 + \text{Max}(e2*V1 + \text{OptionAMI} - I2, 0)$$

➤ where OptionAMI is the value of AMI option (at time 2)

➤ $V1 = \text{PV}$ of expected cash inflows from PTCA ($V1 = \text{L } 370 \text{ m}$)

➤ $e2 = 3$ (300% expansion rate), estimated by Marketing department

➤ $I2 = \text{L } 2,600 \text{ m}$ (Angina D-plan cost)

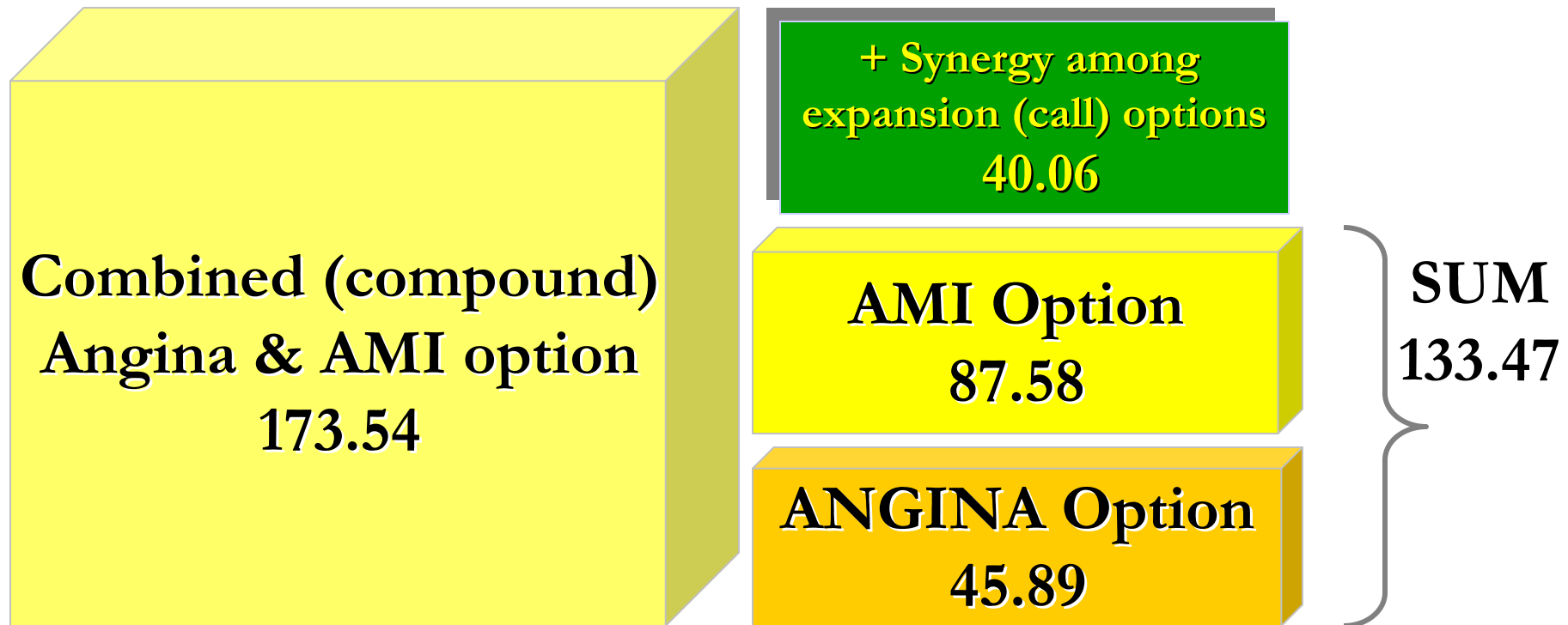
II. Questions

- ▶ Should Angina and AMI be launched in parallel (independently) or in sequence (staging the investment)?
- ▶ What is the total value of the investment opportunity when management can choose the best of the above expansion strategies (within the next 2 years)?
- ▶ How is the value of synergy and the opportunity affected if AMI is less correlated with Angina?
- ▶ What is the total value breakdown?
- ▶ Which input variables have the most significant impact on total value (E-NPV)? How sensitive is the E-NPV to the key value drivers?

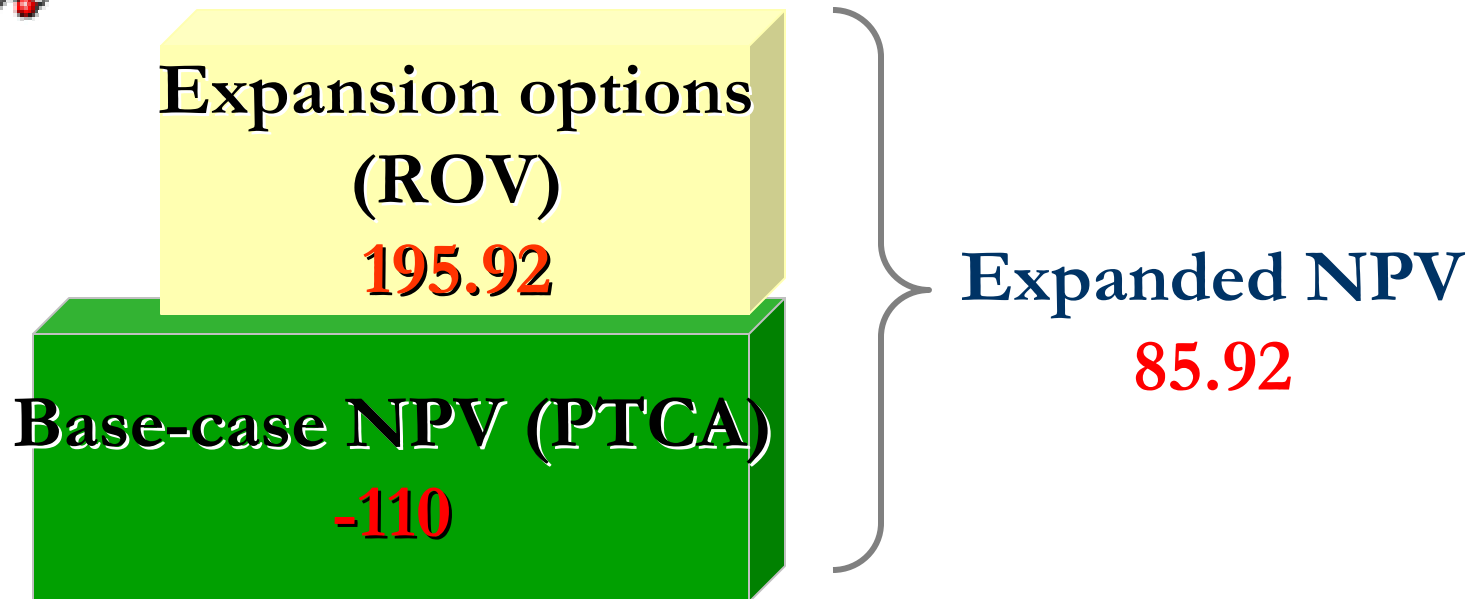
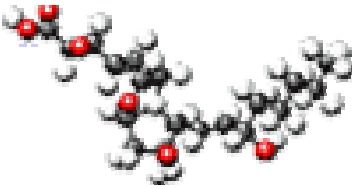


II. Sequential vs. Independent Expansion (Option Interaction/Synergy)

Sequential launching (compound option) is more valuable than independent (sum of separate options)



II. Results: Expanded NPV

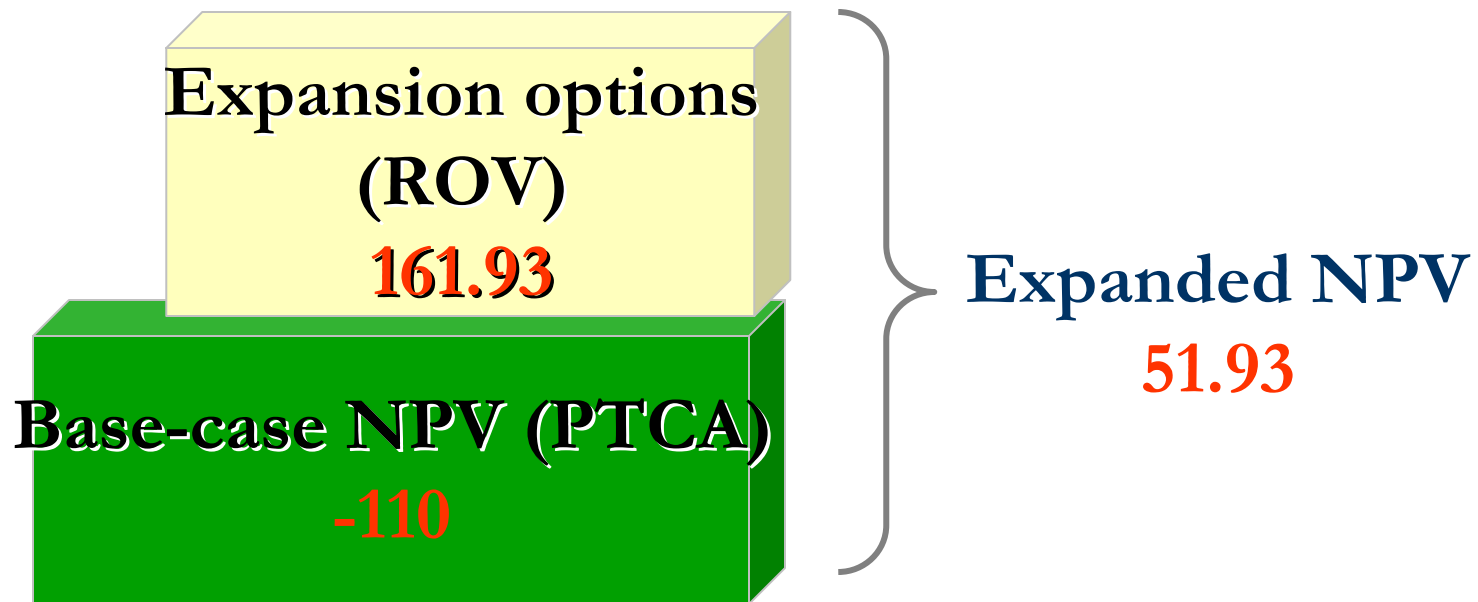


$$\text{E-NPV} = \text{Base-case (PTCA)} + \text{Expansion Options (ROV)} = +85.92$$

Expansion options (ROV) into Angina and AMI make the project worthwhile

II. Results: Expanded NPV

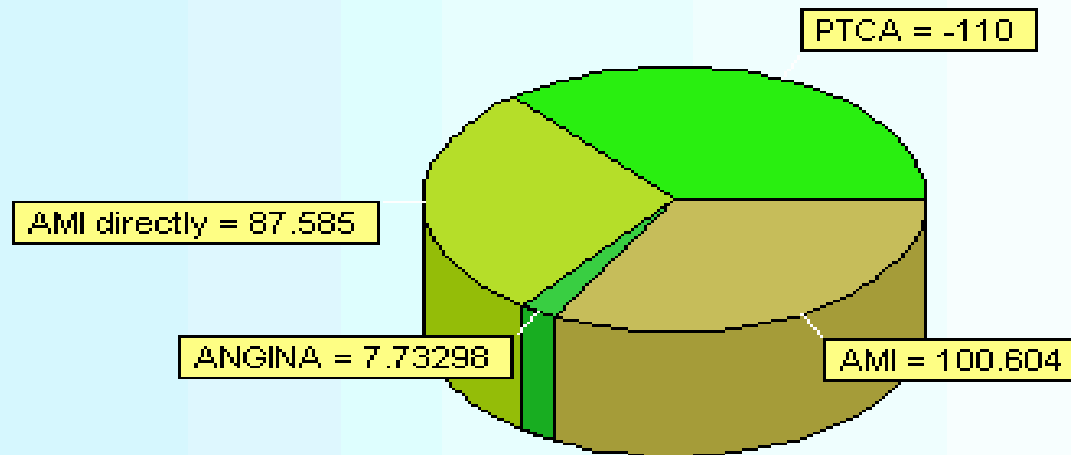
Less synergy if AMI is less correlated ($\rho=0.5$) with Angina



$$\text{E-NPV} = \text{Base-case (PTCA)} + \text{Expansion options (ROV)} = +51.93$$

II. Value Breakdown

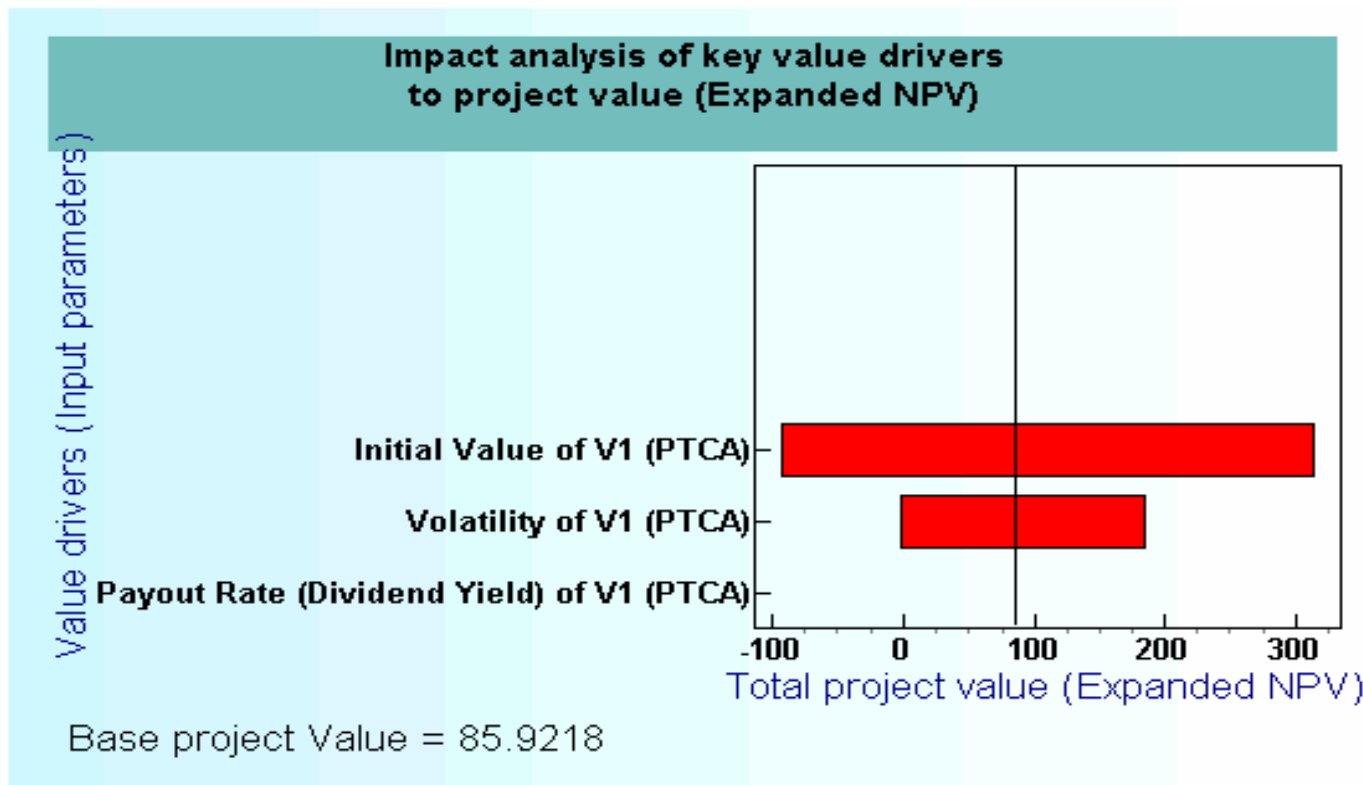
Value Breakdown
(Pie diagram)



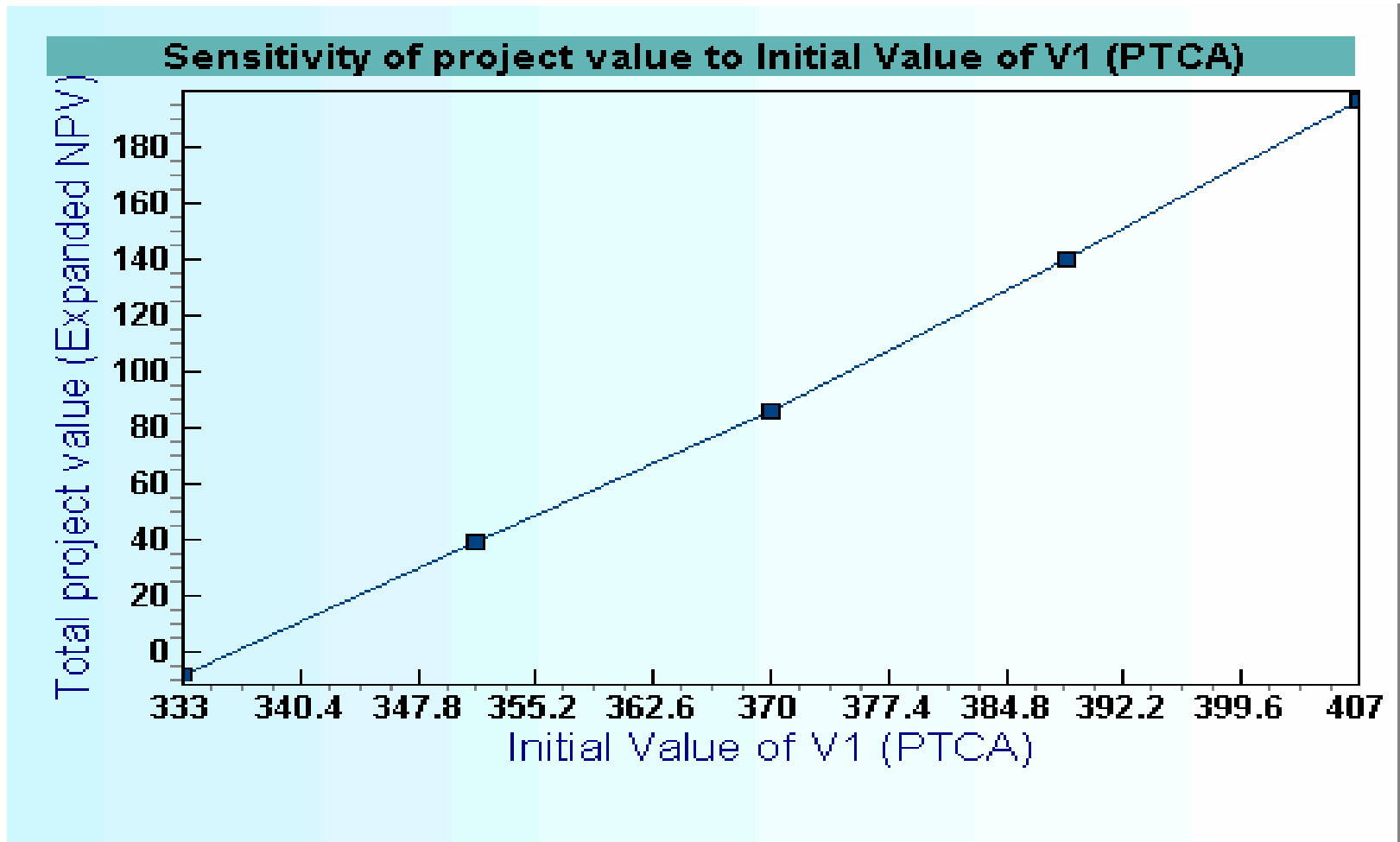
Total project Value = 85.9218

II. Impact Analysis

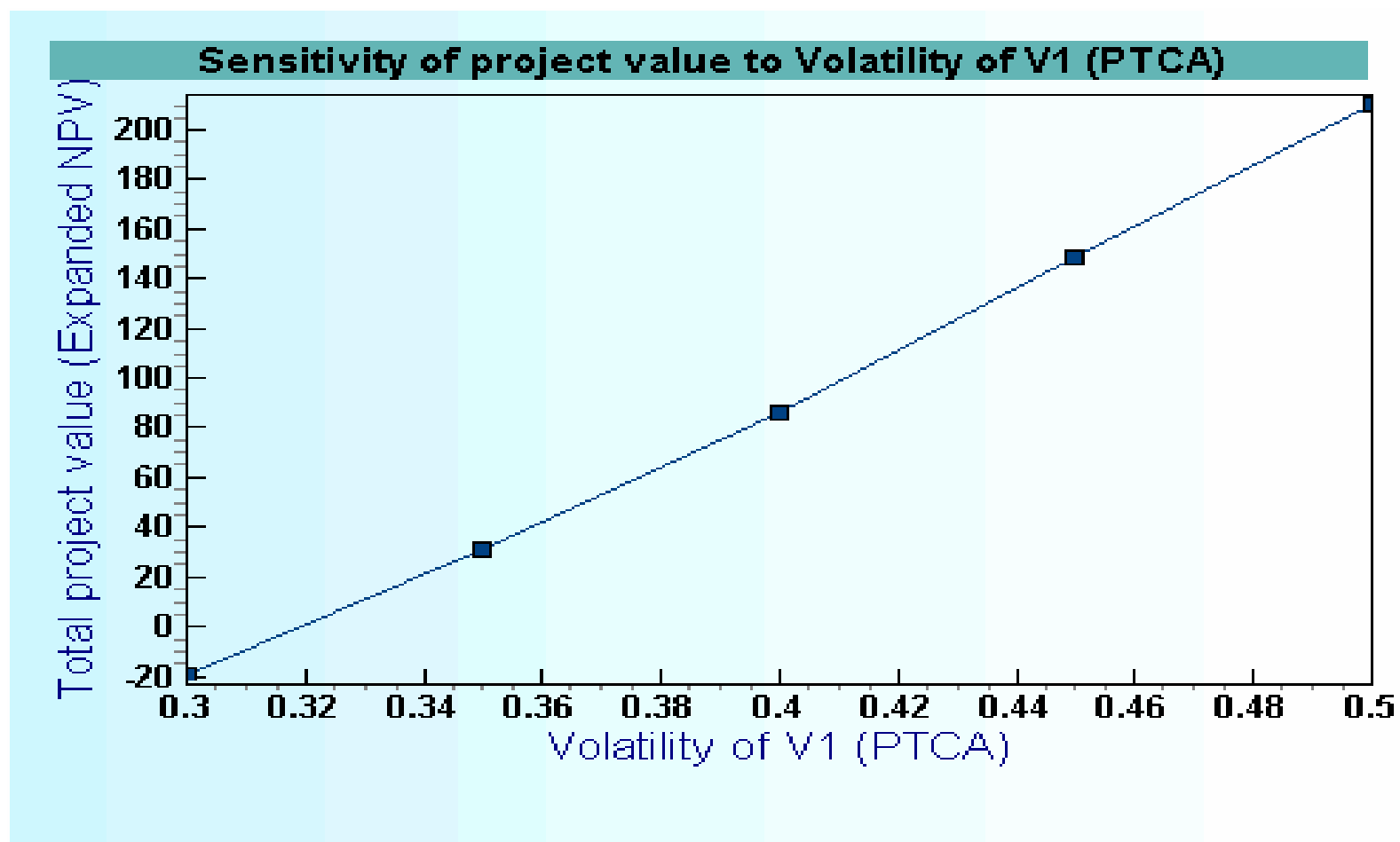
Most significant impact due to a 10% change in main value drivers



II. Sensitivity of E-NPV to Initial PTCA Project Value



II. Sensitivity of E-NPV to PTCA Value Volatility



Phase III: Implementation/Action Plan



- ▶ **Recommendations**
- ▶ **Contingent Expansion Plan**
- ▶ **Operating Policy**

III. Recommendations

- ▶ Eli Lilly should proceed with purchase of drug rights and launching of PTCA now due to the value of the expansion options (total E-NPV = L 85.92 m)
- ▶ Lilly should wait until year 2 to decide whether to launch Angina (and then potentially AMI) or just keep the AMI option
- ▶ Lilly should pursue a sequential rather than parallel expansion strategy to exploit the value of synergies (the greater the correlation between AMI and Angina)



III. Musts for Capturing Option Value

- ▶ **Assign management/team to monitor trigger decisions and exercise expansion options**
- ▶ **Reassess value at future critical milestones**
- ▶ **Align managerial incentives to support/ reward optimal exercise of expansion options**