

Investment Economics



NPD in a Downturn



Finance for New Products



John Farnbach

Silver Streak Partners LLC

john@silverstreakpartners.com

Constellation Systems, Inc.

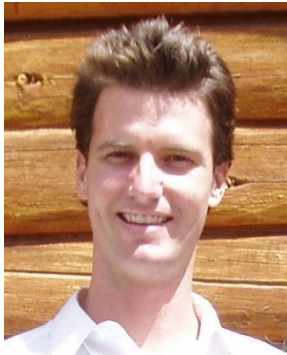
- ◆ Executives: Maximize financial returns

- All projects $> 16\%$ return **MAR** Hurdle rate
cost of capital
- Select portfolio to optimize returns

- ◆ Laboratory Analytics Division

- 2 ongoing projects
- 4 new projects to consider

- ◆ Planning meeting in 2 months



Dan –
marketing



Amy –
engineering

Investment Metrics

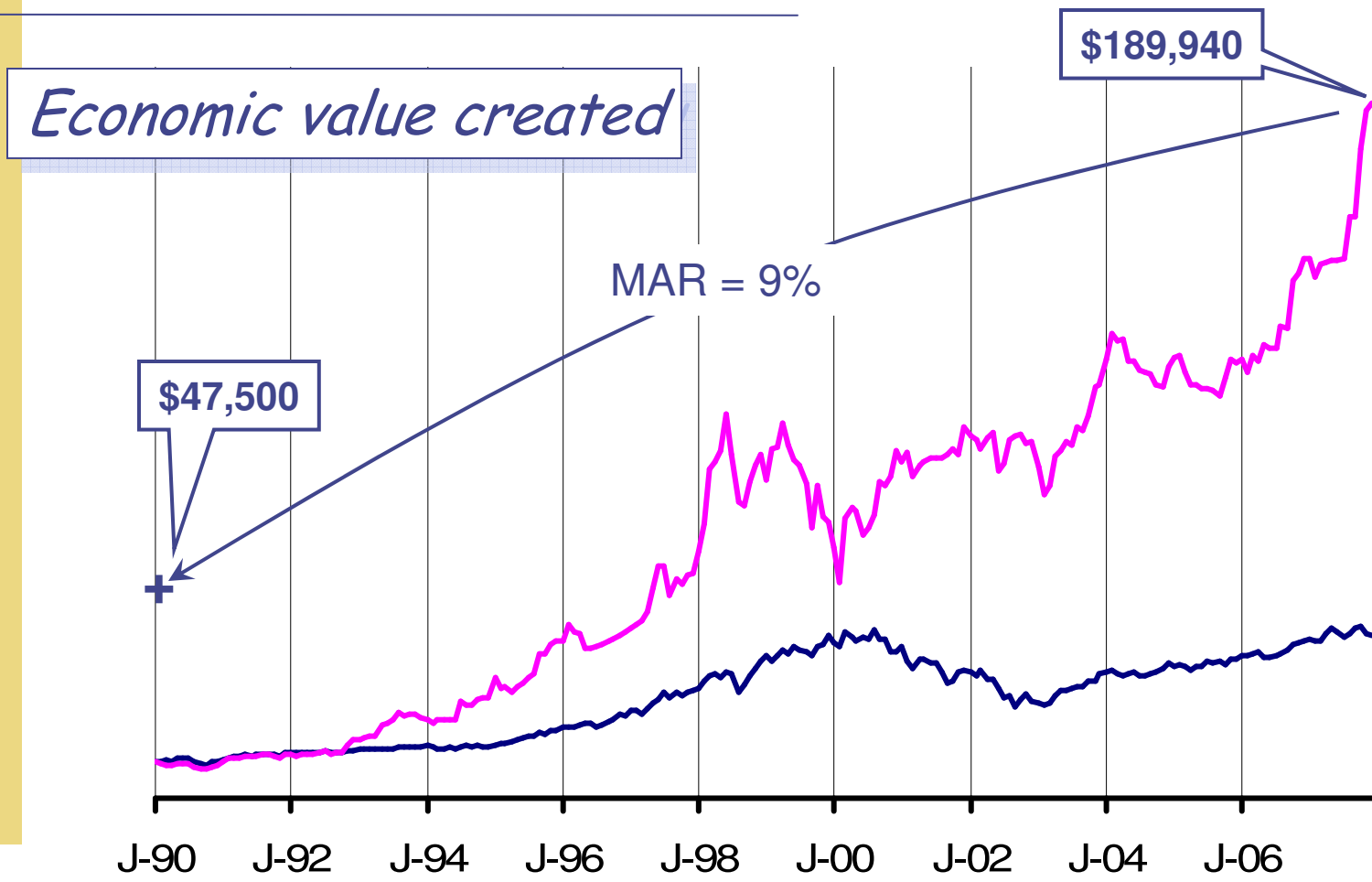


Comparing Investments

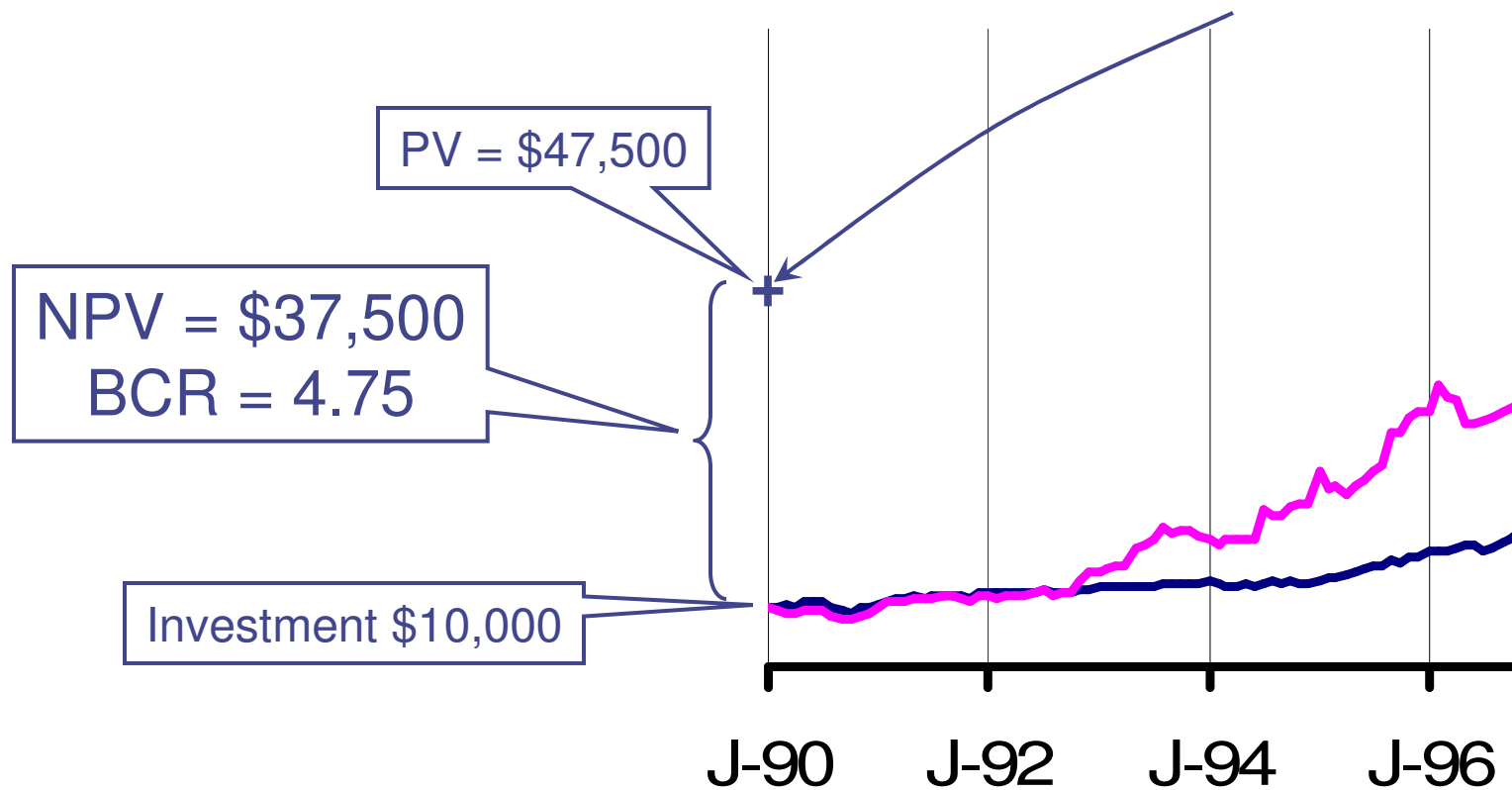
- ◆ Make a \$1,000 loan to Ann or Bob
 - Ann: repay \$1,300
 - Bob: repay \$1,600



Present Value

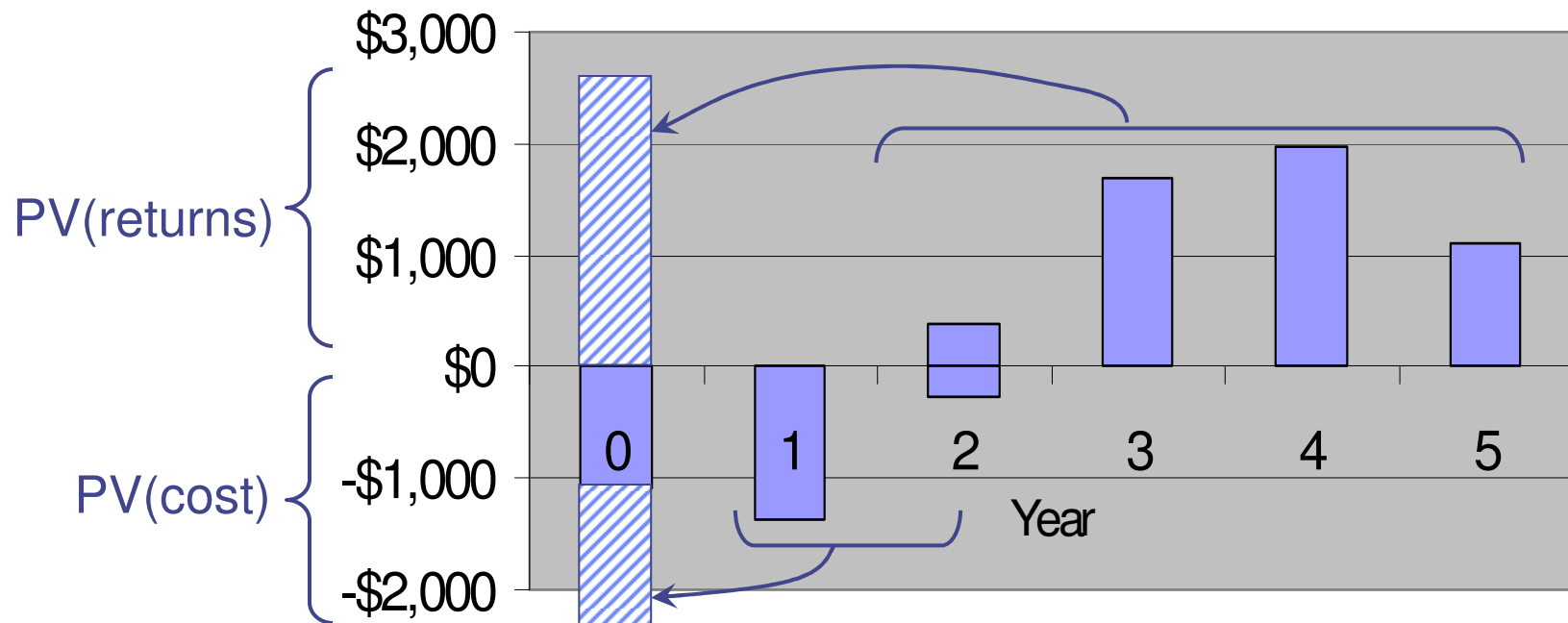


Present Value Metrics



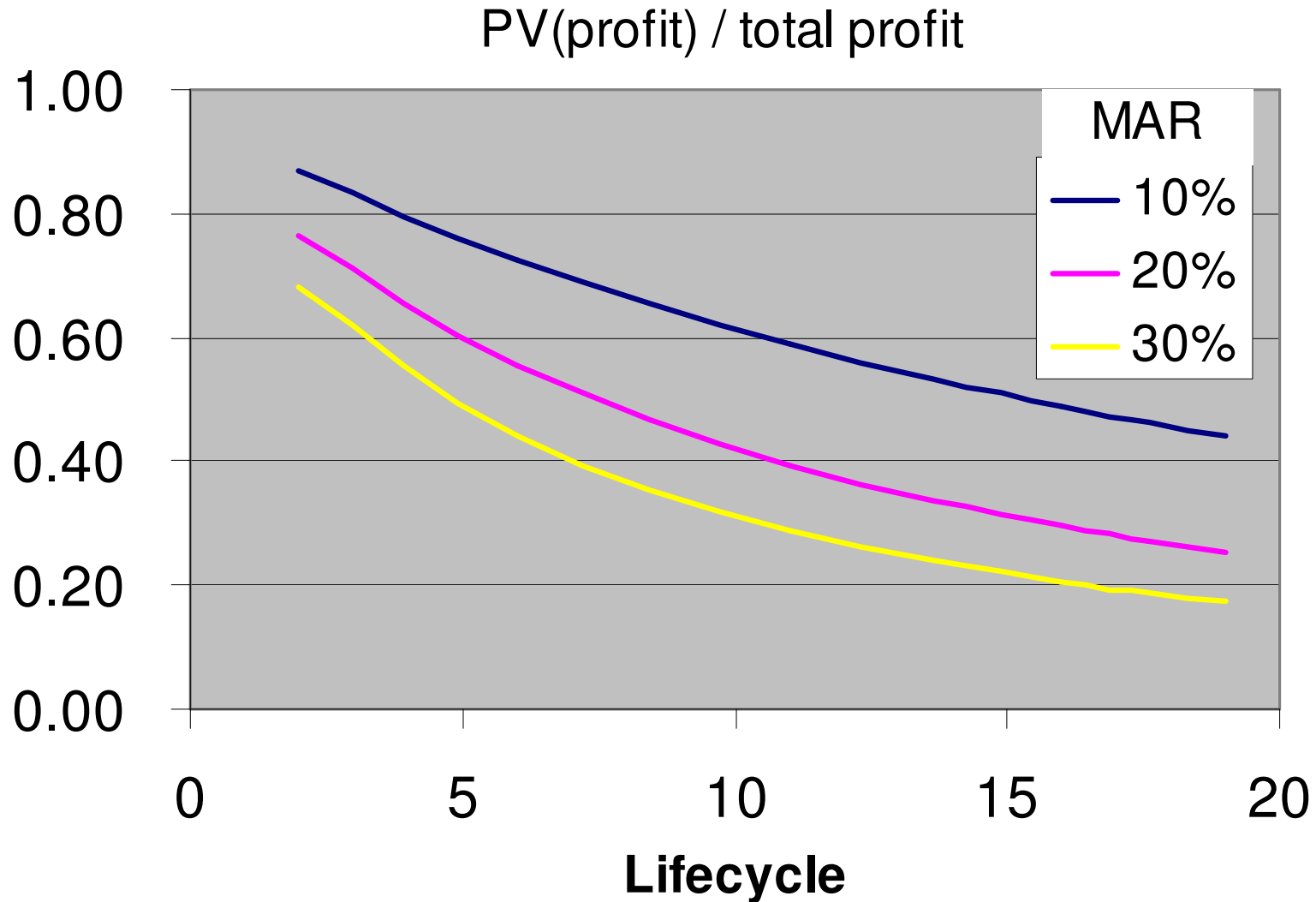
BCR > 1: Investment value > cost

PV - Multiple Cash Flows



$$\text{BCR} = \text{PV(returns)} / \text{PV(cost)}$$

PV vs. Lifecycle

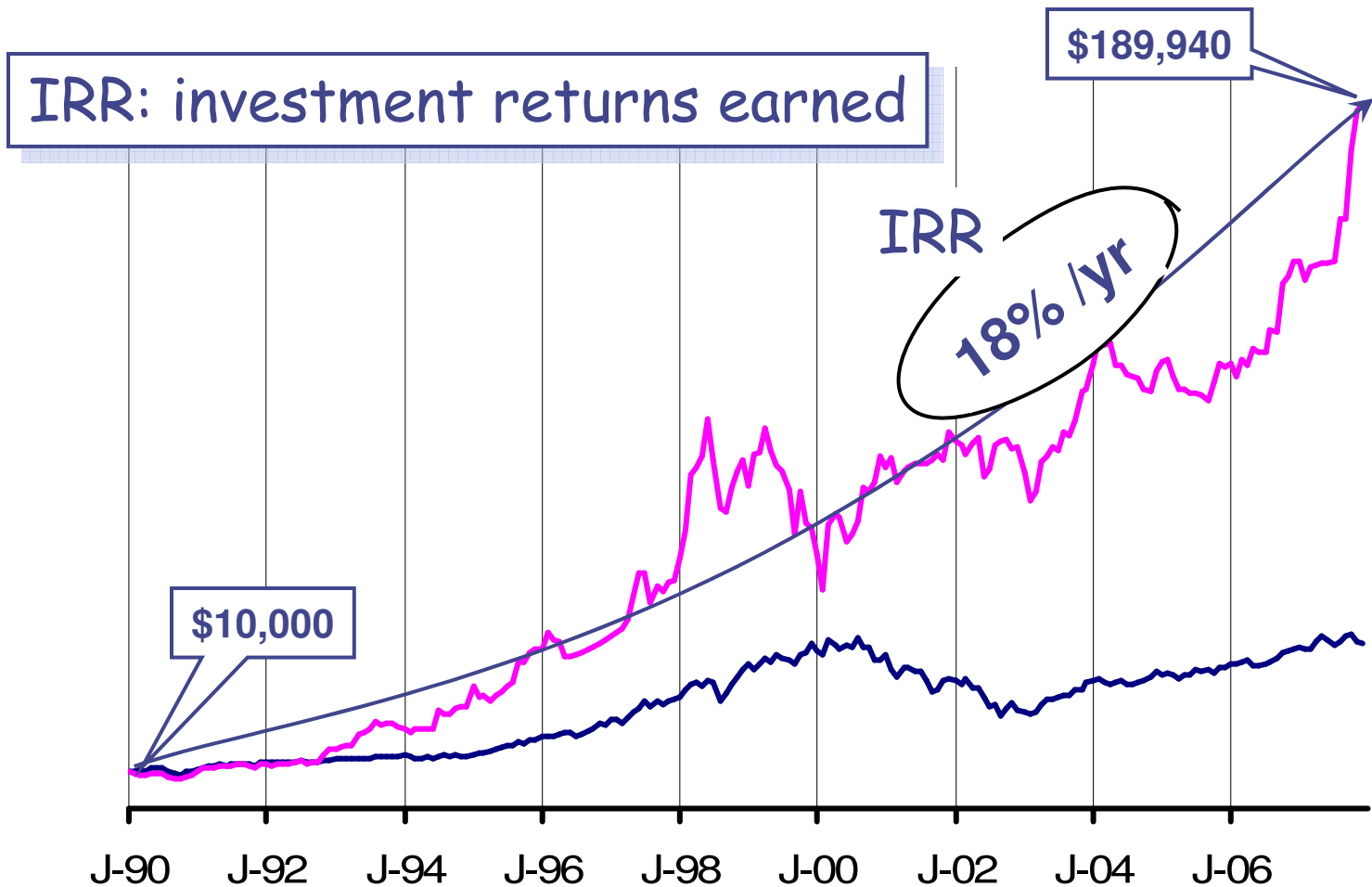


Case Study - BCR

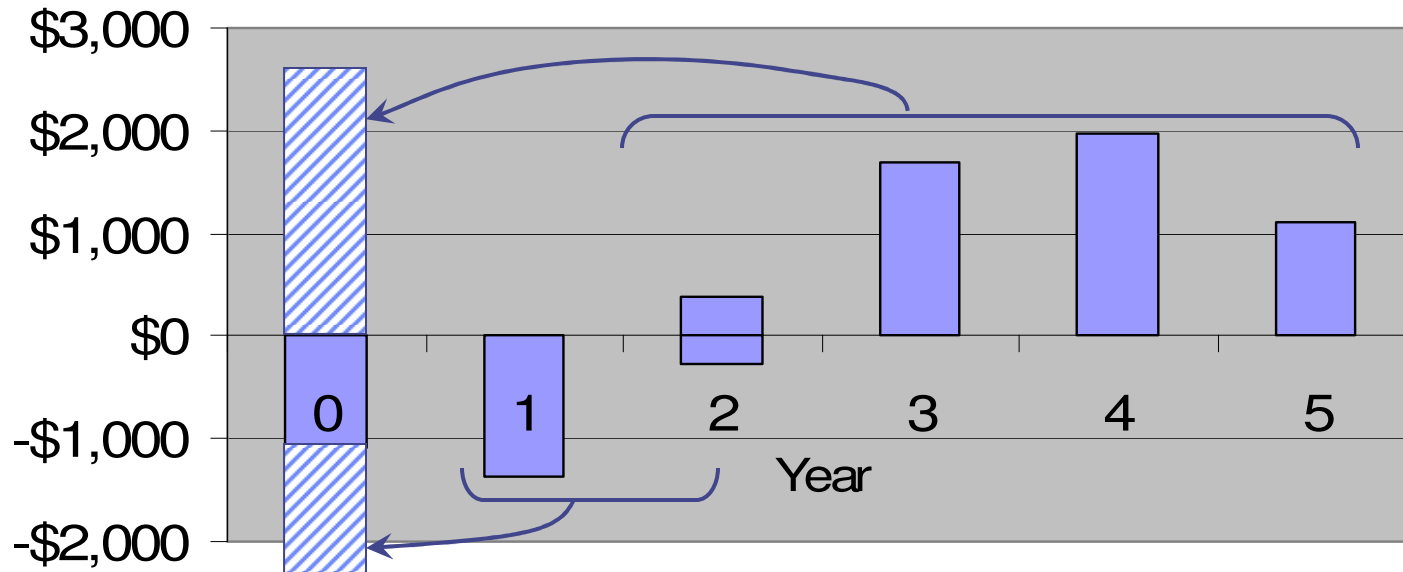
(\$000)	Charlie	Delta	Zulu
Cost	1,000	2,000	3,000
Tot. Profit	3,000	3,500	4,500
Lifecycle	15 y	5 y	10 y
Disc factor?			
PV(profit)?			
BCR?			

MAR = 10%

Return Rate Metric

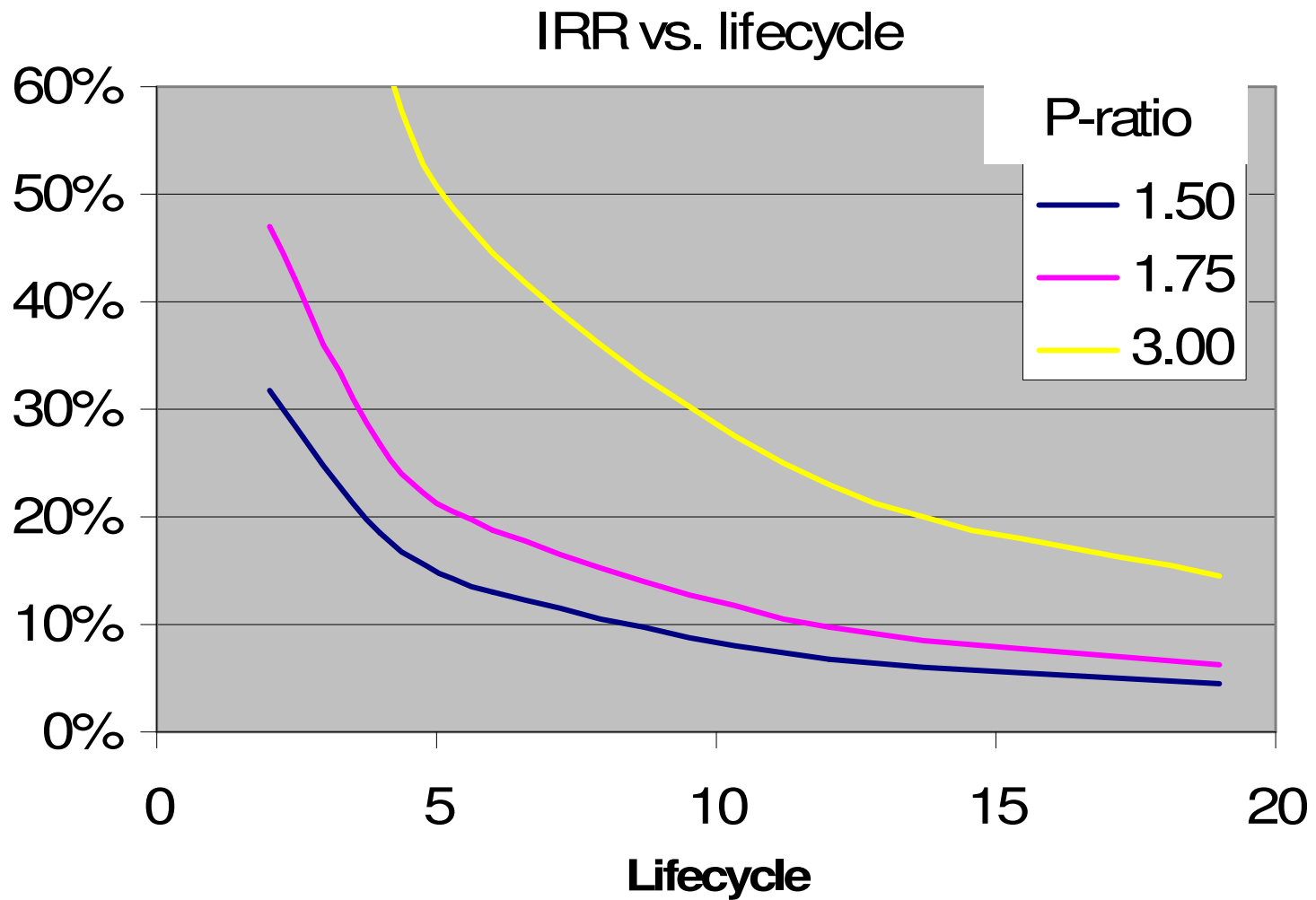


IRR - Multiple Cash Flows



IRR = discount rate to make BCR = 1

IRR vs. Lifecycle



Case Study - IRR

(\$000)	Charlie	Delta	Zulu
Cost	1,000	2,000	3,000
Tot. Profit	3,000	3,500	4,500
Lifecycle	15 y	5 y	10 y
Profit ratio?			
IRR?			

Decisions, Decisions...

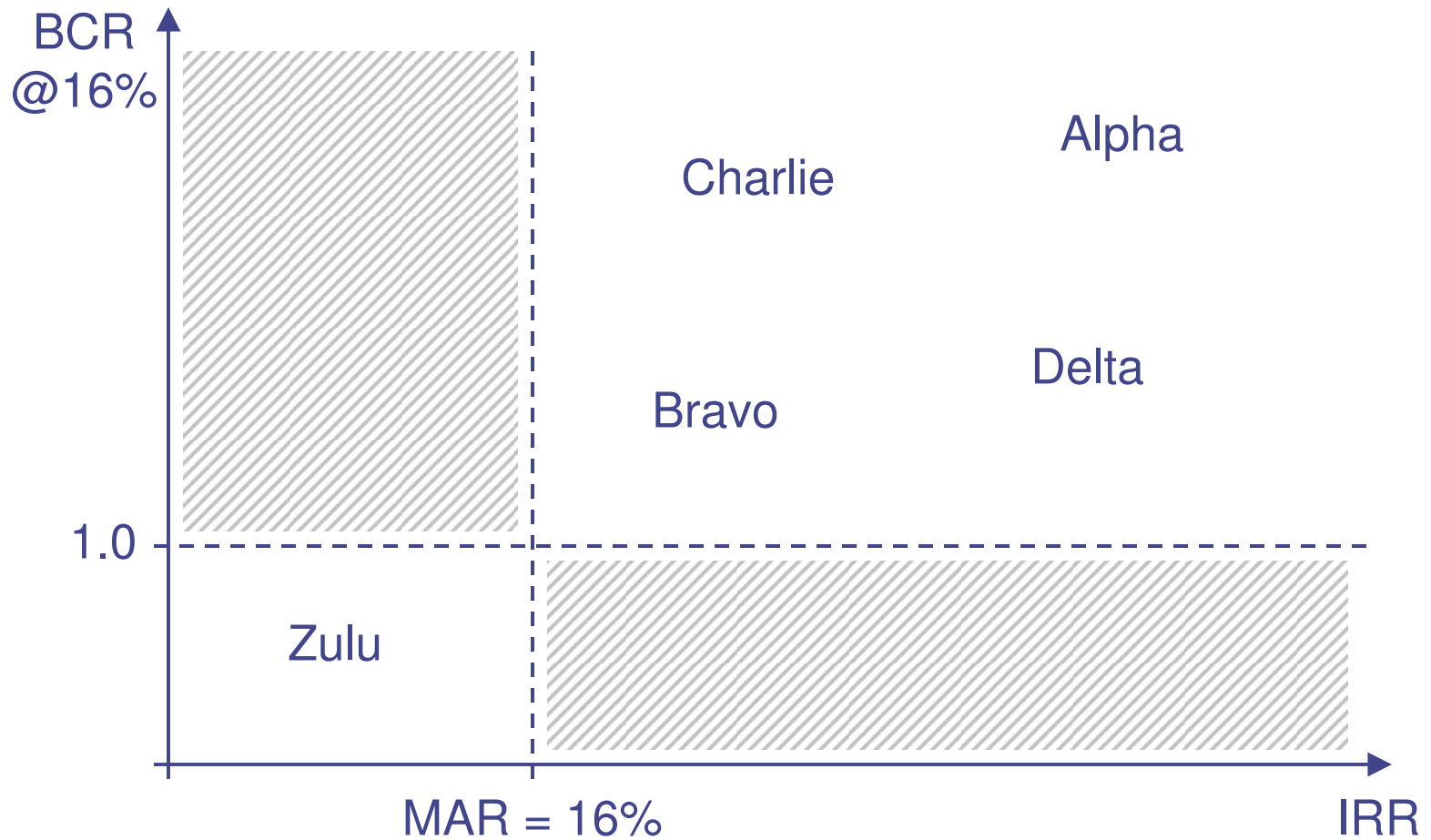
◆ Accept/reject

- Is economic value created?
- $BCR(@MAR) > 1.0$
- $IRR > MAR$

◆ Ranking

- Which opportunity is better?
- Optimize portfolio returns
- Rank by BCR or IRR?

BCR or IRR?



Portfolio Management



Accept/reject decisions

Sunk costs

Project List



R&D budget:
\$5,000

	2009 Yr0 cost	Tot cost	Tot retrns	Tot profit	
Pegasus	1,500	3,000	3,545	545	Ongoing
Phoenix	1,300	3,940	4,218	278	Ongoing
Canis Major	2,200	5,000	8,500	3,500	} Alternatives
Aquarius	2,500	3,000	5,728	2,728	
Aquarius Lite	2,000	2,000	4,011	2,011	
Centaurus	1,000	1,000	1,820	820	

Business Case

Year	0	1	2	3	4
Selling price			6.820	6.138	5.524
Unit sales			167	926	1,440
Revenue			1,136	5,682	7,955
Unit cost			3.40	3.33	3.27
COGS			567	3,085	4,702
Gross Profit			570	2,598	3,253
Alloc expns (16%)			182	909	1,273
Profit from sales	0	0	388	1,688	1,980
R&D	1,100	1,375	275		
Pretax profit (OPBT)	-1,100	-1,375	113	1,688	1,980
Taxes (35%)	-385	-481	40	591	693
After tax profit	-715	-894	73	1,098	1,287

Returns



Cost

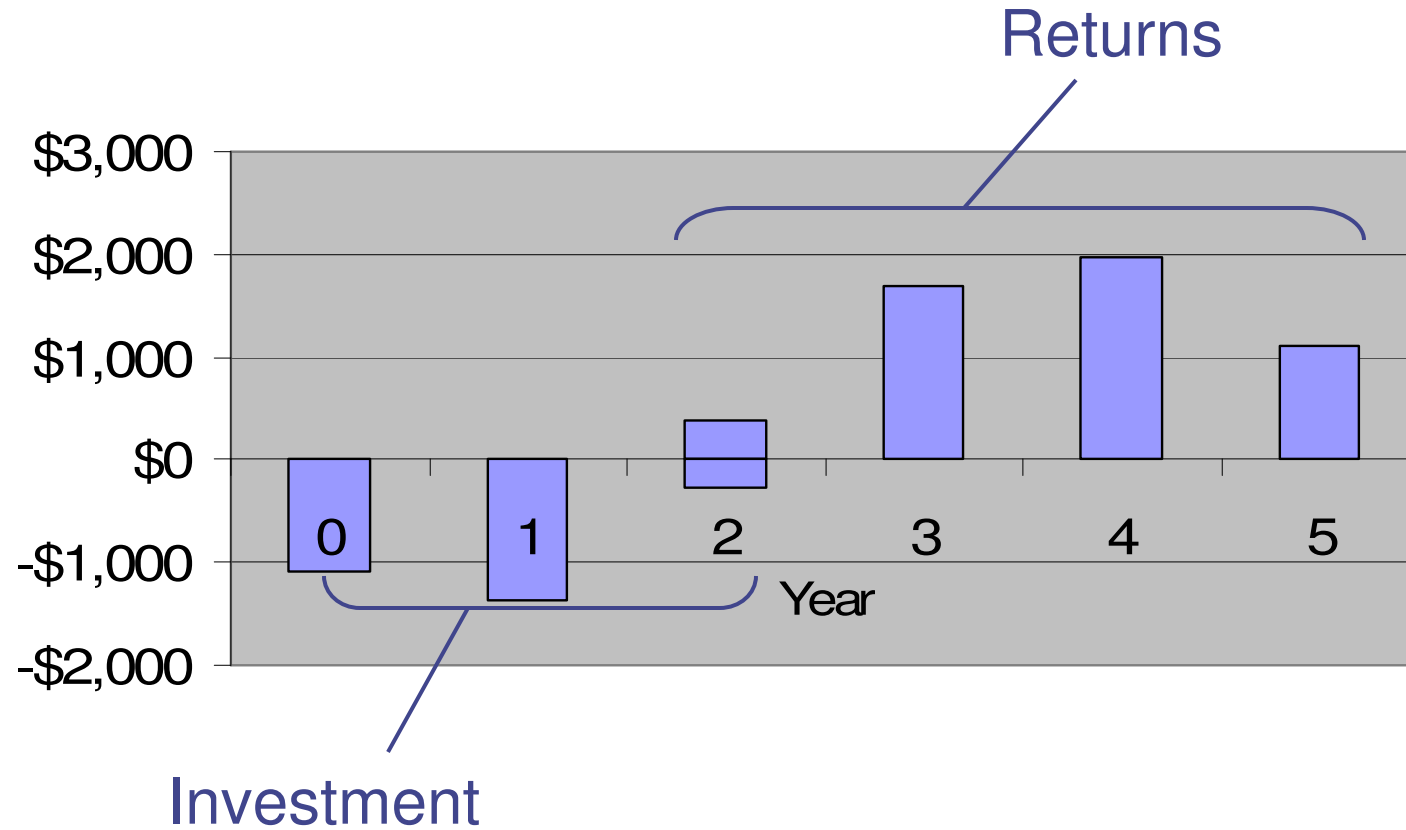


Net returns



Capitalized expenses??

Typical Cash Flows

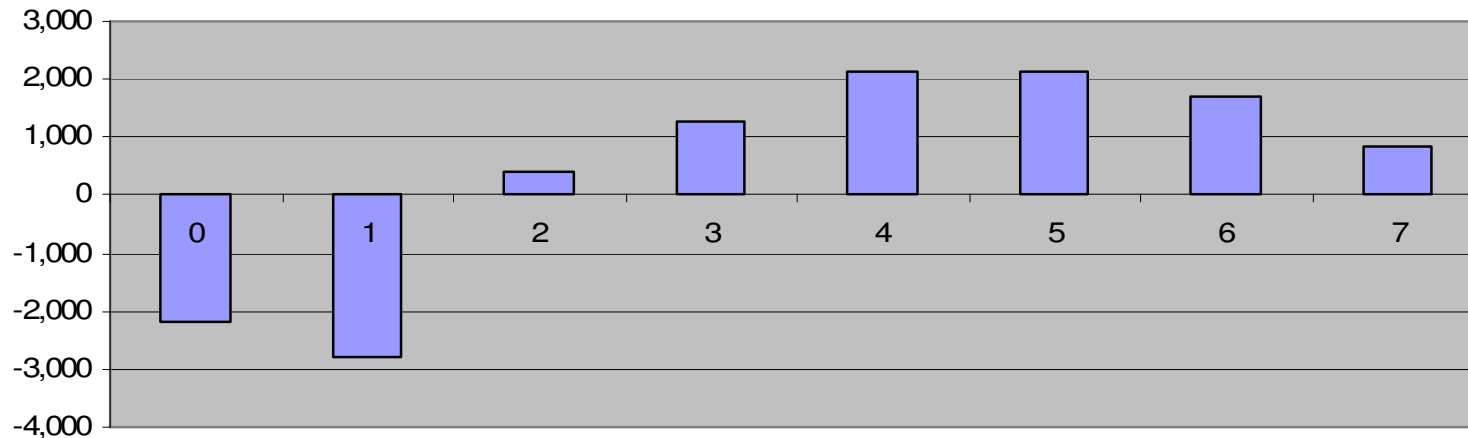


Project List v1.5



	↓ Tot profit	BCR@16%	IRR
Pegasus	545	0.74	5% !
Phoenix	278	0.65	2% !
Canis Major	3,500	0.94	14% !
Aquarius	2,728	1.16	21%
Aquarius Lite	2,011	1.21	23%
Centaurus	820	1.15	22%

Canis Major



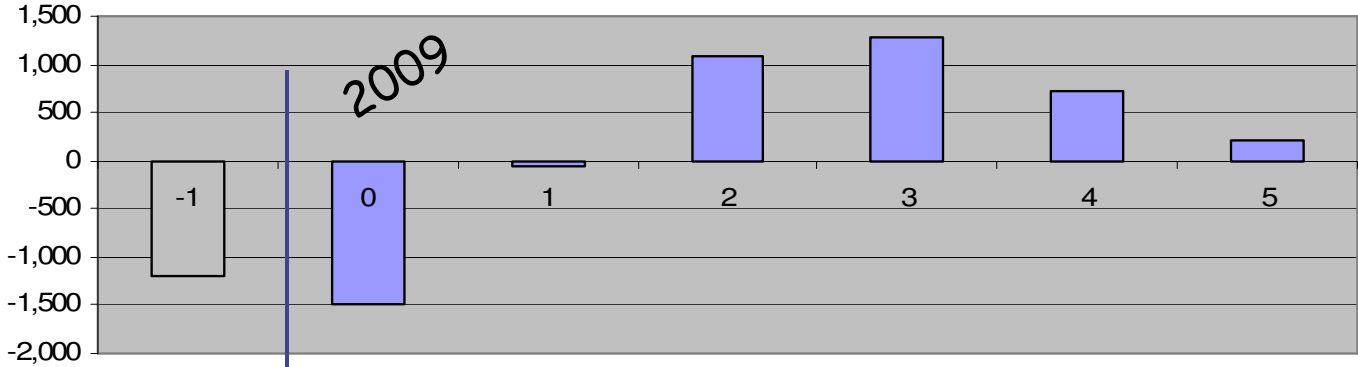
MAR	16%
PV(cost)	3,977
PV(returns)	3,721
IRR	14%
BCR	0.94

$PV(\text{cost}) > PV(\text{returns})$

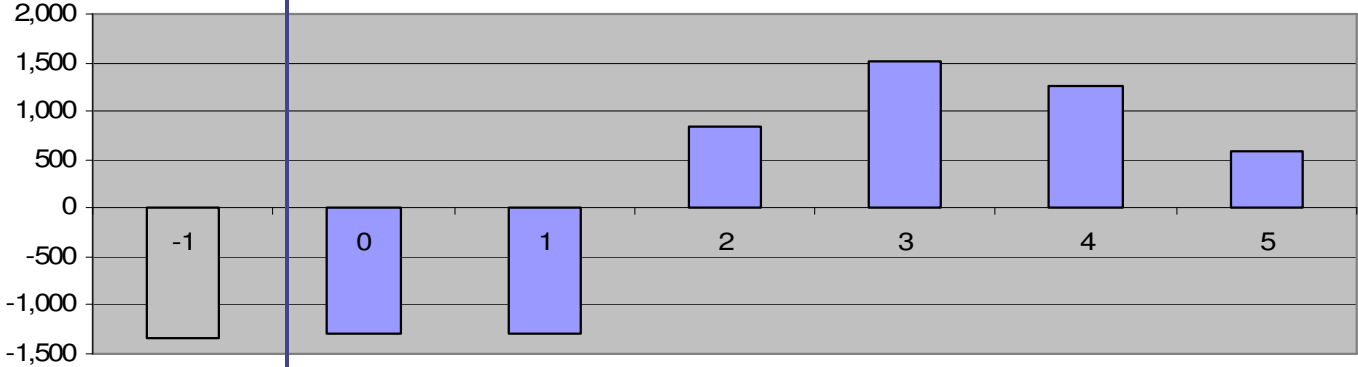
BCR < 1 and IRR < MAR: reject the project

Ongoing Projects

Pegasus



Phoenix



← Sunk Future →

“sunk costs”

Future Costs Only

Pegasus

MAR	16%	
	Including sunk	Future only
IRR	5%	30%
BCR	0.74	1.33

Handsome returns

Phoenix

MAR	16%	
	Including sunk	Future only
IRR	2%	19%
BCR	0.65	1.07

Acceptable returns

*As investments, ignore sunk costs
... but correct forecasting process!*

Project List v2.0



	↓			
	Tot profit	BCR@16%	IRR	
Pegasus	545	1.33	30%	} Future cost only
Phoenix	278	1.07	19%	
Aquarius	2,728	1.16	21%	
Aquarius Lite	2,011	1.21	23%	
Centaurus	820	1.15	22%	
Capricorn	415	1.10	26%	
Canis Major	3,500	0.94	14%	

Portfolio Management



Ranking decisions

Project List v2.0

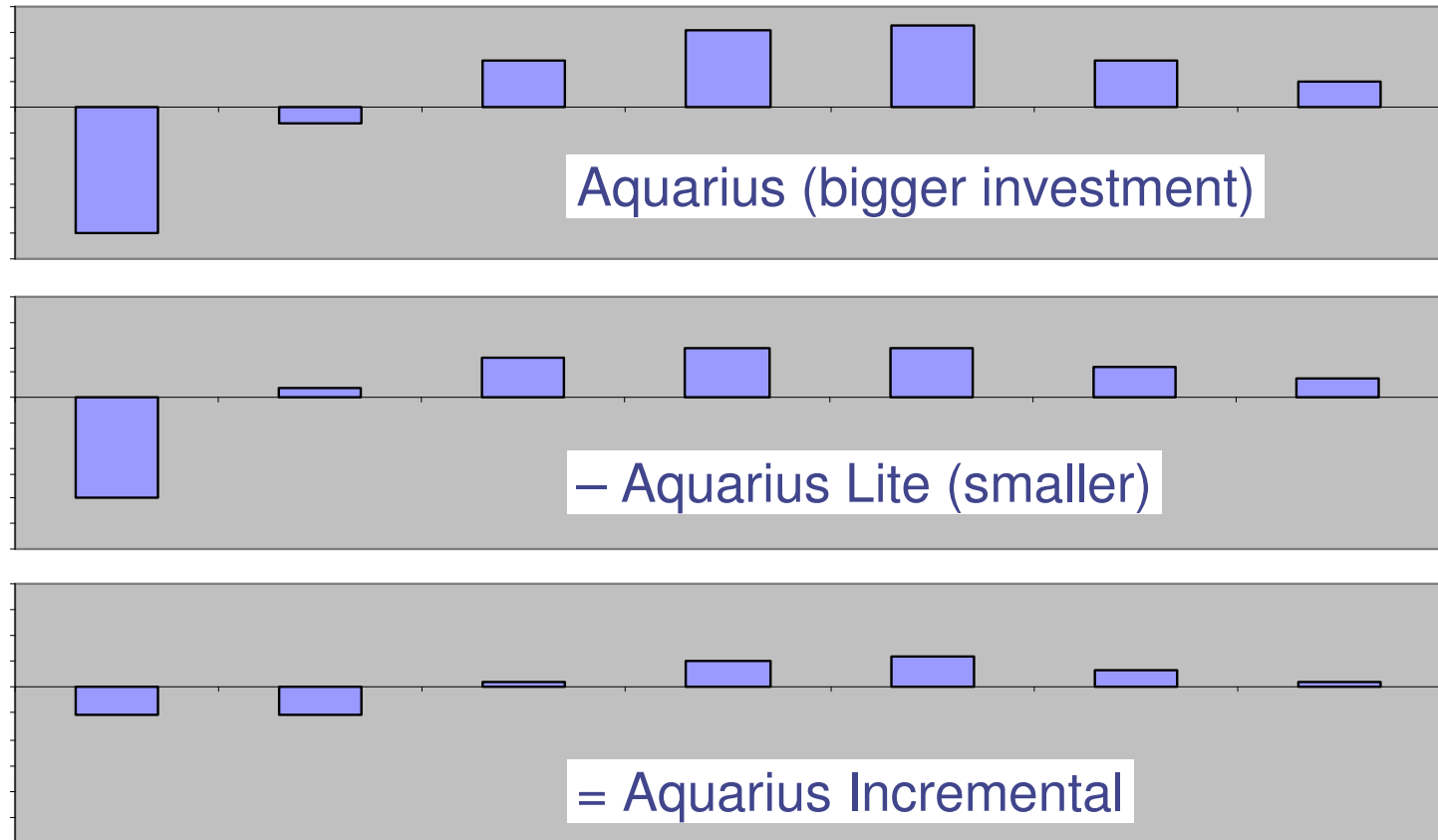


	Tot profit	BCR@16%	IRR
Pegasus	545	1.33	30%
Capricorn	415	1.10	26%
Aquarius Lite	2,011	1.21	23%
Centaurus	820	1.15	22%
Aquarius	2,728	1.16	21%
Phoenix	278	1.07	19%

Aquarius or Aquarius Lite?

Investments: "Mutually Exclusive Alternatives"

Incremental Investments



Arithmetic difference, not a real project

Project List v2.5



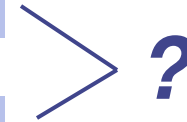
	Tot profit	BCR@16%	IRR
Pegasus	545	1.33	30%
Capricorn	415	1.10	26%
Aquarius Lite	2,011	1.21	23%
Centaurus	820	1.15	22%
Phoenix	278	1.07	19%
Aquarius incr	717	1.05	18%
Aquarius	2,728	1.16	21%

*Incremental investment analysis
Clarifies portfolio decisions
Can improve resource use*

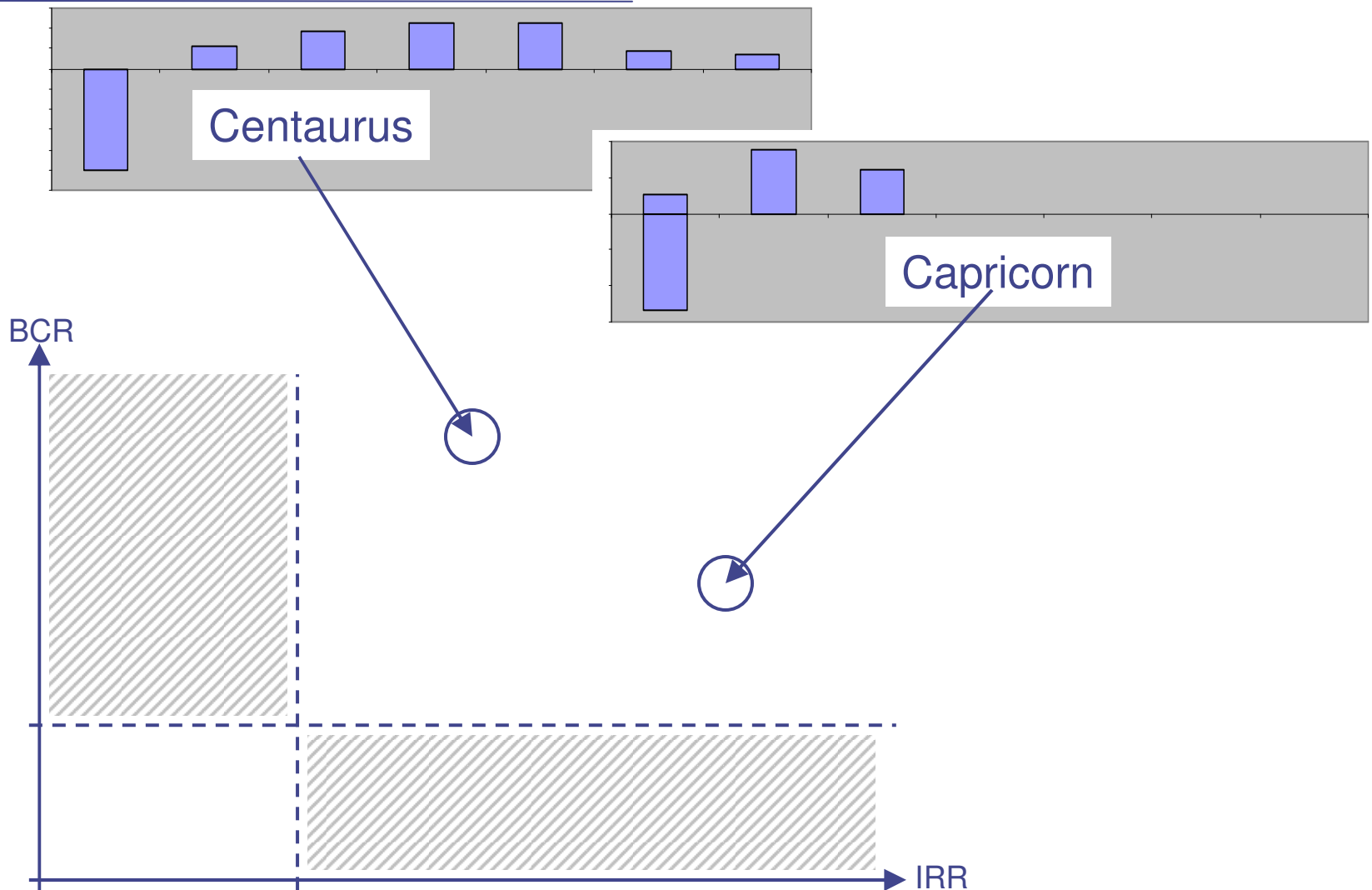
Project List v2.5



	Yr0 cost	BCR@16%	IRR
Pegasus	1,500	1.33	30%
Capricorn	1,350	1.10	26%
Aquarius Lite	2,000	1.21	23%
Centaurus	1,000	1.15	22%
Phoenix	1,300	1.07	19%
Aquarius incr	500	1.05	18%



BCR or IRR?



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The Portfolio Decision



Budget = \$5,000



	Yr0 cost	BCR@16%	IRR
Pegasus	1,500	1.33	30%
Capricorn	1,350	1.10	26%
Aquarius Lite	2,000	1.21	23%
Centaurus	1,000	1.15	22%
Phoenix	1,300	1.07	19%
Aquarius incr	500	1.05	18%



Plan vs. budget: \$4850 vs. \$5000

At the Planning Meeting



Final:

	Yr0 cost	Fut profit	BCR	IRR
Pegasus	1,500	1,745	1.33	30%
Capricorn	1,350	415	1.10	26%
Aqu LT	2,000	2,011	1.21	23%
Final portfolio	4,850	4,171	1.22	26%

Original plan:

	Yr0 cost	Fut profit	BCR	IRR
Pegasus	1,500	1,745	1.33	30%
Phoenix	1,300	1,618	1.07	19%
Canis Major	2,200	3,500	0.94	14%
Orig. portfolio	5,000	6,863	1.05	18%



Questions? Comments?

John Farnbach
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john@silverstreakpartners.com