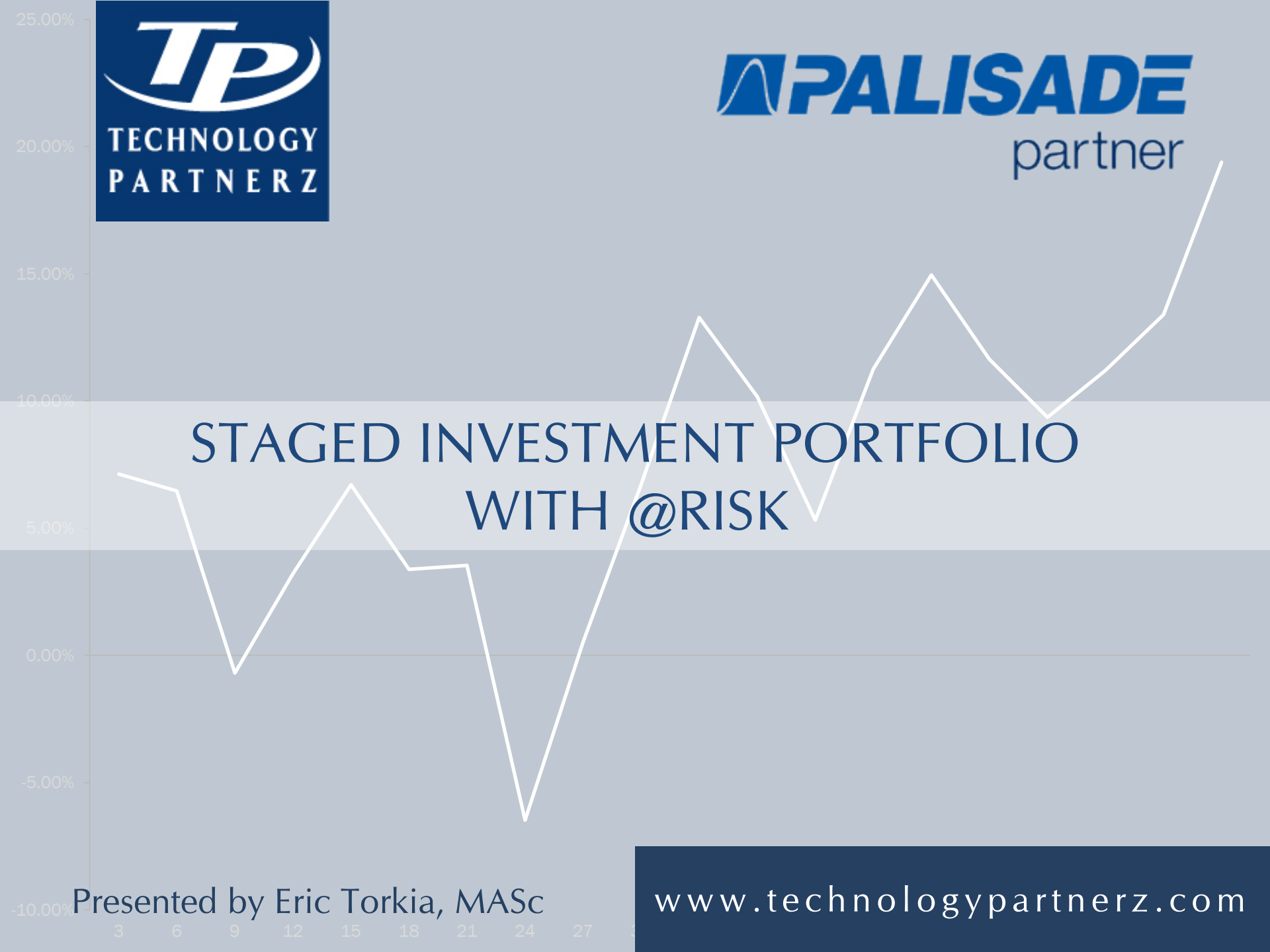

TECHNOLOGY PARTNERZ

PALISADE partner

STAGED INVESTMENT PORTFOLIO WITH @RISK

Presented by Eric Torkia, MASc

www.technologypartnerz.com

WHAT WE DO?

We support our clients in improving decisions and business outcomes by providing:

Success in analytics is more than just software and geeks…

Technology Partnerz Ltd. provides strategy, business analysis, solution selection and organizational change management support for the rapid adoption of predictive analytics tools and practices ***in a variety of business functions, sectors and industries.***

ORACLE Gold Partner

FRONTLINE solvers

PALISADE partner

Real Options Valuation

WHO WE DO IT FOR...

Schlumberger

MONSANTO

USGS
science for a changing world

VALE

Hydro Québec
TransÉnergie

DUPONT

xstrata

bhpbilliton

NOVA Chemicals®

BOMBARDIER

Logitech

ALBECK
We'll Get You Ready

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GOODYS
now that looks great on you!™

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WHAT WE DO IT WITH…

Each partner is selected based on the cutting edge and innovative nature of their products/services as well as their ability to add value to our customers.

ORACLE CRYSTAL BALL

ORACLE PRIMAVERA

ORACLE AUTOVUE

PALISADE

VOSE SOFTWARE
RISK SOFTWARE SPECIALISTS

Analyse-it

FRONTLINE solvers
The leader in spreadsheet optimization and simulation

Real Options Valuation

Minitab

ORACLE Gold Partner

MEET YOUR PRESENTER: ERIC TORKIA, MASc

SOME NOTABLE CLIENTS

VALE, xstrata, Logitech, Hydro Québec TransÉnergie, USGS science for a changing world, Pratt & Whitney A United Technologies Company, MONSANTO, PotashCorp Helping Nature Provide, PALISADE, Schlumberger

Eric Torkia MASc is a senior management consultant/trainer and business analyst. He has collaborated with some of the worlds most recognized organizations to ensure the optimal design and delivery of enterprise systems, analytics as well as new forecasting and decision making processes. His skills and expertise include:

- Project Risk Analysis, Project Feasibility and Financial Valuations for projects of over 1+ billion dollars.
- Project Feasibility and Financial Valuations
- Portfolio Optimization
- Supply Chain Modeling and Risk Analysis
- Organizational Change Management consulting, training and instructional design
- Time Series Forecasting
- Spreadsheet Modeling and VBA automation for simulation, forecasting and optimization
- Certified Monte Carlo Simulation and Optimization Trainer & Consultant for Oracle Crystal Ball, Vose ModelRisk, Palisade @Risk, Frontline Solver

ORACLE CRYSTAL BALL, PALISADE, FRONTLINE solvers, VOSE SOFTWARE RISK SOFTWARE SPECIALISTS

DESIGNING A MULTI-STAGED MODEL

This is not just about rock concerts!

WIFM – MULTI-STAGE ANALYSIS

- Applies basic Real Options principles for Conditional NPV or Profit
- Gives the full REAL range of portfolio values
- Incorporates several uncertainty components such as:
  - Stage Gates
  - Uncertain Investment Levels

MODEL RECIPE

- **Pipeline:**
  - IF () Statements
  - SUMPRODUCT ()
  - Survival & Cost Distributions
  - Correlation
- **Simple Discounted Cashflow Model**
  - NPV()
  - Cost and Sell Price Forecasts
- **@RISK + Risk Optimizer**

1 PART APPROVAL PIPELINE

R&D and Approval Pipeline for Product

	Survival	Rate	Logic Gate	Invest. In MM$	Min	ML	Max
PR1 - Stage 1	1	87%	1	2.33	1	2	4
PR1 - Stage 2	1	68%	1	14.00	10	12	20
PR1 - Stage 3	1	60%	1	68.33	50	75	80
PR1 - Stage 4	1	52%	1	143.33	120	150	160
PR1 - Stage 5	1	48%	1	350.00	250	300	500

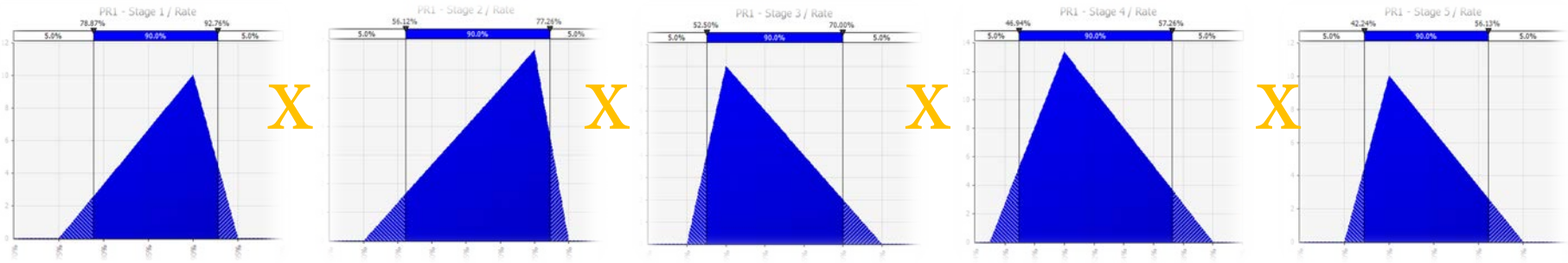
Survival Rates

Min	ML	Max
75%	90%	95%
50%	75%	80%
50%	55%	75%
45%	50%	60%
40%	45%	60%

Survival	Rate	Logic Gate	Invest. In MM$
=RiskBernoulli(D6,RiskName(B6)	=RiskTriang(L6,M6,N6,RiskCorrmat(NewMatrix1,1))	=C6	=RiskTriang(G6,H6,I6,RiskName($B6&" "&F$5),)
=RiskBernoulli(D7,RiskName(B7)	=RiskTriang(L7,M7,N7,RiskCorrmat(NewMatrix1,2))	=+E6*C7	=RiskTriang(G7,H7,I7,RiskName($B7&" "&F$5),)
=RiskBernoulli(D8,RiskName(B8)	=RiskTriang(L8,M8,N8,RiskCorrmat(NewMatrix1,3))	=+E7*C8	=RiskTriang(G8,H8,I8,RiskName($B8&" "&F$5),)
=RiskBernoulli(D9,RiskName(B9)	=RiskTriang(L9,M9,N9,RiskCorrmat(NewMatrix1,4))	=+E8*C9	=RiskTriang(G9,H9,I9,RiskName($B9&" "&F$5),)
=RiskBernoulli(D10,RiskName(B1	=RiskTriang(L10,M10,N10,RiskCorrmat(NewMatrix1,5))	=+E9*C10	=RiskTriang(G10,H10,I10,RiskName($B10&" "&F$5),)

- **Model Strategy:** If there is a failure, all the other stages are not executed
- Survival is a Binary (**Bernoulli Dist**) defined by a rate that is a Triangular
- The logic Gate is the combination of the model strategy and the survival distributions. This allows the partial assignment of development cost using **SUMPRODUCT() I.e. 0 * phase investment vs. 1* phase investment**

WHY IS THE PIPE IMPORTANT?



- Success is conditional on 5 events going well.
- 87% x 68% x 60% x 52% x 48%
  = **8.87% Calculated Success Rate**
- **Less than 1/10 chance of making money and 9/10 to spend it**
- **Correlation is KEY**

Rate
87%
68%
60%
52%
48%

Survival Rates

Min	ML	Max
75%	90%	95%
50%	75%	80%
50%	55%	75%
45%	50%	60%
40%	45%	60%

@RISK Correl	PR1 - Stage	PR1 - Stage	PR1 - Stage	PR1 - Stage	PR1 - Stage 5
PR1 - Stage 1	1				
PR1 - Stage 2	0.8	1			
PR1 - Stage 3	0.4	0.8	1		
PR1 - Stage 4	0.2	0.6	0.8	1	
PR1 - Stage 5	0.1	0.2	0.4	0.8	1

EXAMPLES OF CONDITIONAL INVESTMENTS

Clear 1 Stage = 0 NPV
Cost: 2.8M

	Survival	Rate	Logic Gate	Invest. In MM$
PR1 - Stage 1	1	87%	1	2.80
PR1 - Stage 2	0	70%	0	13.43
PR1 - Stage 3	1	59%	0	78.60
PR1 - Stage 4	0	50%	0	133.99
PR1 - Stage 5	1	47%	0	289.53

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6-15
PR1 Net Income	($2,237,103)	$0	$0	$0	$0	$0	$0

Clear 3 Stages = 0 NPV
Cost: 80.95M

	Survival	Rate	Logic Gate	Invest. In MM$
PR1 - Stage 1	1	89%	1	2.54
PR1 - Stage 2	1	71%	1	13.54
PR1 - Stage 3	1	70%	1	64.87
PR1 - Stage 4	0	49%	0	153.25
PR1 - Stage 5	1	43%	0	306.72

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6-15
PR1 Net Income	($2,237,103)	$0	$0	$0	$0	$0	$0

Clear 3 Stages = $759M NPV
Cost: 532M

	Survival	Rate	Logic Gate	Invest. In MM$
PR1 - Stage 1	1	90%	1	2.06
PR1 - Stage 2	1	76%	1	14.18
PR1 - Stage 3	1	58%	1	64.23
PR1 - Stage 4	1	55%	1	148.92
PR1 - Stage 5	1	58%	1	435.76

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6-15
PR1 Net Income	($532,328,728)	$22,433,507	$34,143,629	$36,376,500	$43,240,941	$50,437,659	$1,614,151,846

1 PART DCF MODEL

Discounted Cash Flow if Product is Released

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6-15
Sell Price		$58.44	$58.70	$57.79	$61.75	$68.33	$79.59
PR1 Units Sold		819,776	964,254	1,127,233	1,263,165	1,405,211	26,574,982
Mean		802,000	967,000	1,132,000	1,297,000	1,462,000	
Std. Dev		25,000	30,000	30,000	35,000	35,000	
Gross Revenues		$47,907,708	$56,600,732	$65,138,095	$78,002,091	$96,020,664	$2,152,909,372
Unit Cost		$20.74	$15.92	$11.23	$9.79	$8.98	$4.75
COGS		$17,002,979	$15,352,147	$12,661,551	$12,364,280	$12,623,649	$112,933,071
Gross Income		**$30,904,729**	**$41,248,585**	**$52,476,544**	**$65,637,811**	**$83,397,015**	$2,039,976,301
Operating Costs		$4,918,350	$6,564,528	$8,351,408	$10,445,965	$13,272,263	$324,653,133.61
Net Income Before Taxes		$25,986,379	$34,684,057	$44,125,136	$55,191,846	$70,124,752	$1,715,323,167
Taxes		$4,677,548	$6,243,130	$7,942,525	$9,934,532	$12,622,455	$308,758,170.14
Initial Investment	($1,208,208)						
PR1 Net Income	($1,208,208)	$0	$0	$0	$0	$0	$0

PR1 Full NPV **-$1,208,208**

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SALES AND VARIABLE COSTS

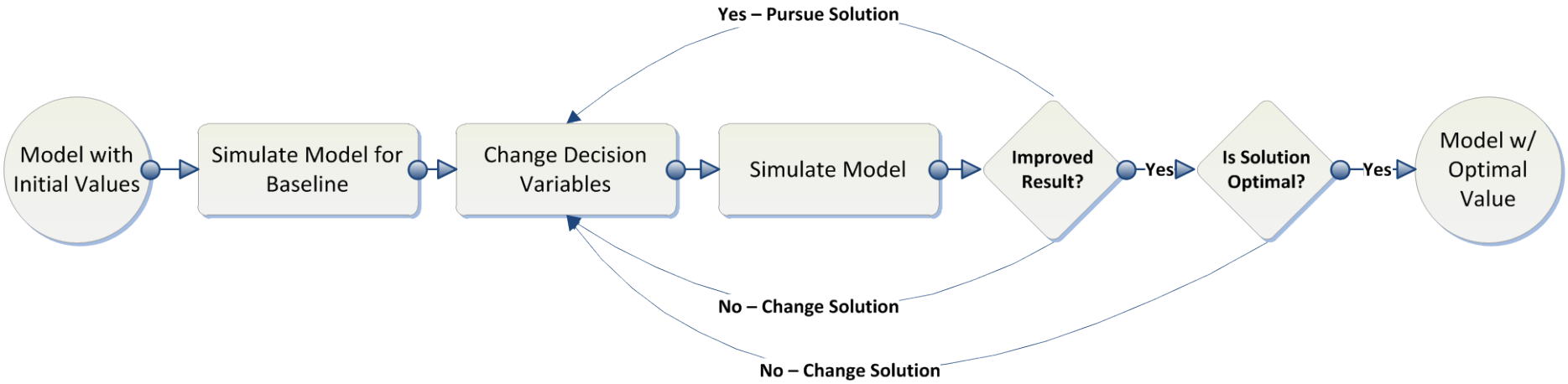
PR1 Prod. 86% 90% 4%

Wrights Learning Curve to estimate production Efficiencies

Estimated Unit Sales Years 6-		Unit Costs Years				Sell Price			
		Sim	Min	ML	Max	Sim	Mean	Std. dev.	
Year 1	819,776	$20.74	$13.50	$18.00	$27.00	$58.44	$60.00	$3.00	5%
Year 2	964,254	$15.92	$11.57	$15.42	$23.13	$58.70	$61.39	$3.68	6%
Year 3	1,127,233	$11.23	$9.91	$13.21	$19.82	$57.79	$62.81	$4.40	7%
Year 4	1,263,165	$9.79	$8.49	$11.32	$16.98	$61.75	$64.27	$5.14	8%
Year 5	1,405,211	$8.98	$7.27	$9.70	$14.55	$68.33	$65.76	$5.92	9%
Year 6	1,564,378	$7.06	$6.23	$8.31	$12.46	$78.96	$67.28	$6.73	10%
Year 7	1,741,574	$7.38	$5.34	$7.12	$10.68	$65.59	$68.84	$7.57	11%
Year 8	1,938,842	$5.02	$4.57	$6.10	$9.15	$63.25	$70.44	$8.45	12%
Year 9	2,158,453	$6.78	$3.92	$5.23	$7.84	$76.33	$72.07	$9.37	13%
Year 10	2,402,940	$4.59	$3.36	$4.48	$6.72	$72.42	$73.74	$10.32	14%
Year 11	2,675,120	$4.62	$2.88	$3.84	$5.75	$83.56	$75.45	$11.32	15%
Year 12	2,978,130	$4.38	$2.46	$3.29	$4.93	$103.09	$77.20	$12.35	16%
Year 13	3,315,461	$2.92	$2.11	$2.82	$4.22	$108.25	$78.99	$13.43	17%
Year 14	3,691,002	$2.24	$1.81	$2.41	$3.62	$70.36	$80.82	$14.55	18%
Year 15	4,109,080	$2.51	$1.55	$2.07	$3.10	$74.13	$82.70	$15.71	19%

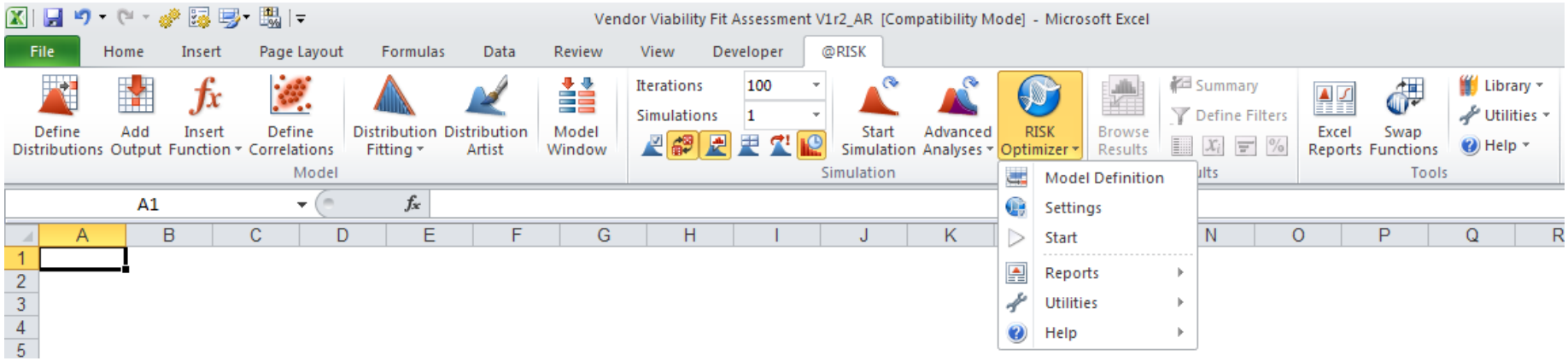
OPTIMIZATION OVERVIEW

WHAT IS STOCHASTIC OPTIMIZATION?



- Simulation is "What If" → Optimization is "What's Best"
- Allows non-linear problems to be solved
- Requires Simulation

RISK OPTIMIZER



- Can optimize a wide variety of statistics on any output cell in the model
- Allows you to define multiple constraints using simple logic
- Build in Macros and special processing
- Can run as long as you need it to

BUILDING THE OPTIMIZATION MODEL

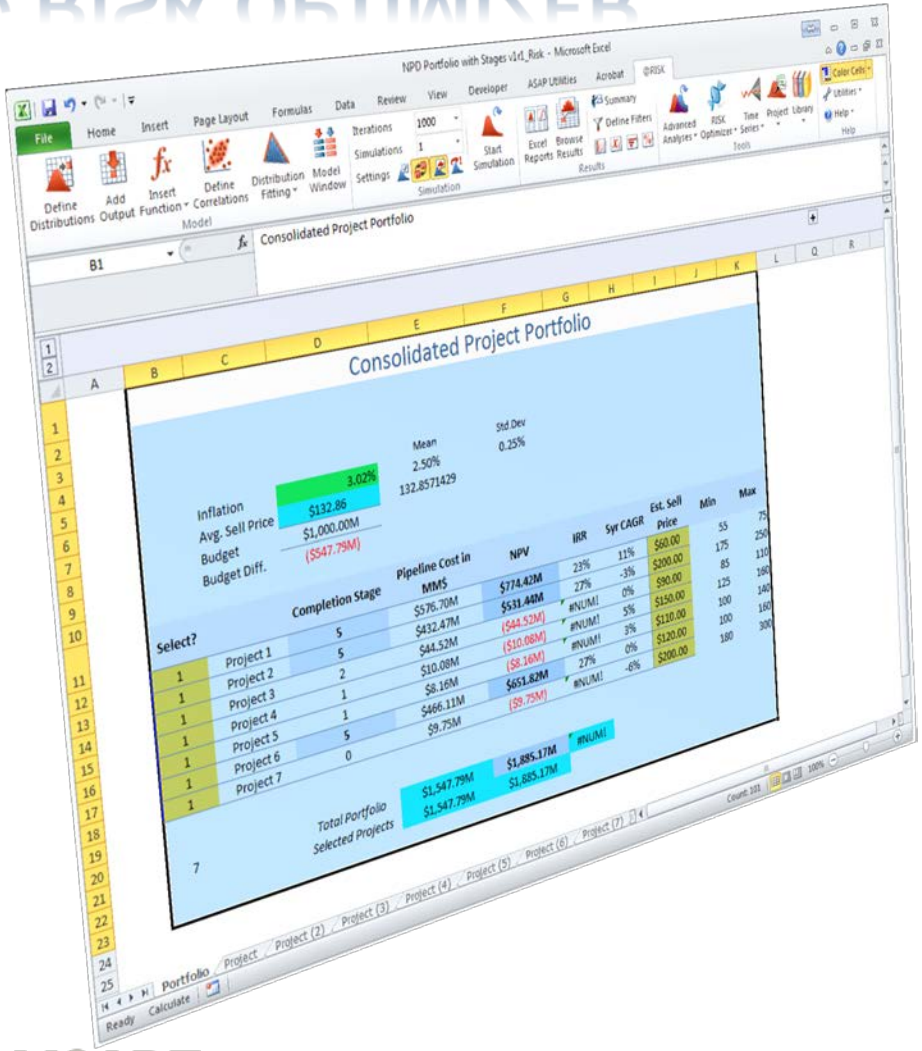
Model was built by…

- Consolidating Prices and Project Performance
- Using SUMPRODUCT() and Decision Variables
- Ran the model with Decision Optimizer

- **Maximize NPV**
- **Minimize Loss**

- **Constrain**
  - **Project spend**
  - **Pricing**

OPTIMIZING THE PORTFOLIO VALUE WITH @RISK & RISK OPTIMIZER



Mgmt. Questions

- What is the best project combination for high returns?
- What is the best combination given my resources?
- This portfolio needs to be aligned with my needs

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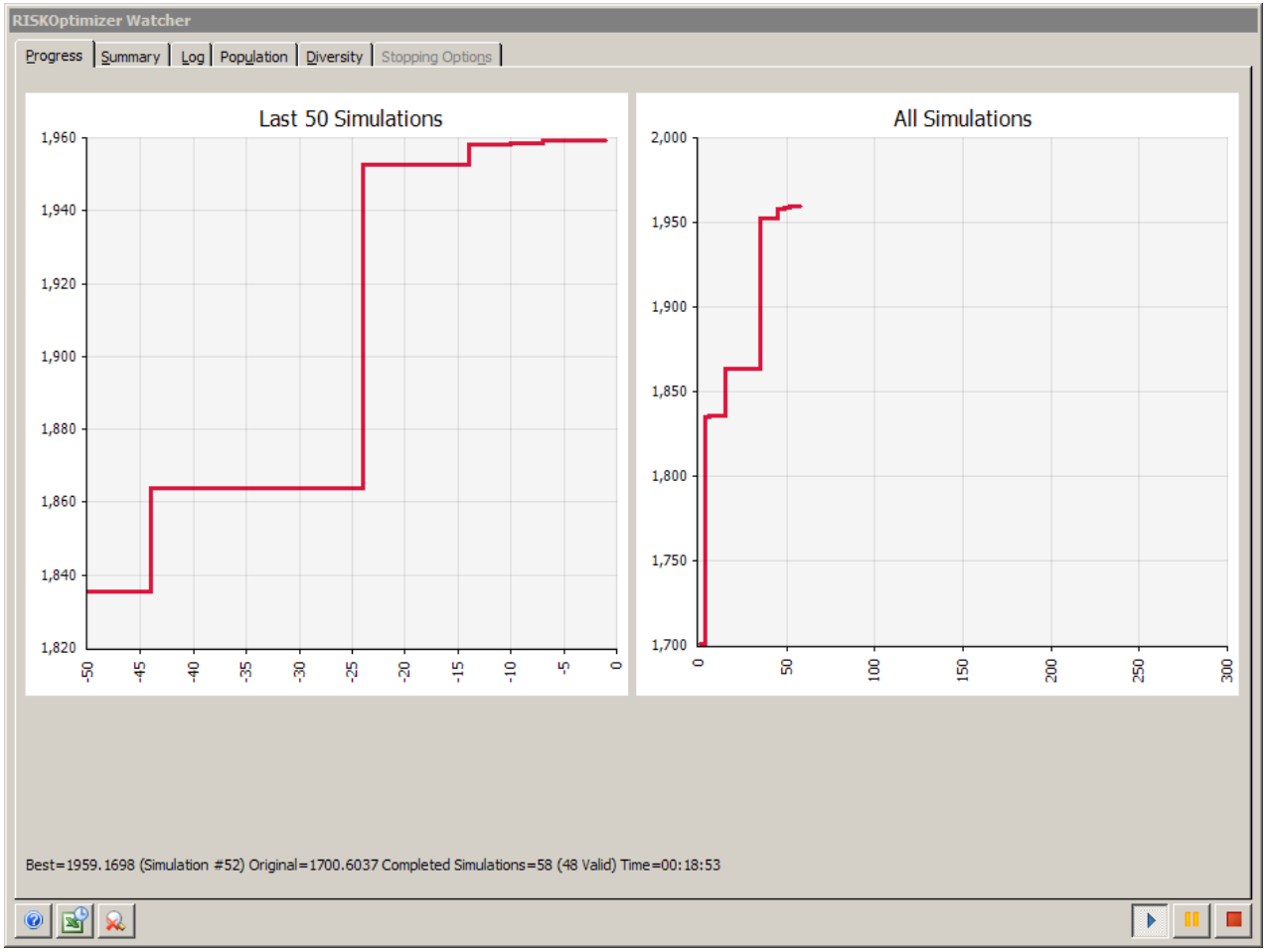
OPTIMIZATION CHART



LOOKING AT THE SOLUTIONS

RISKOptimizer Watcher

Progress | Summary | Log | Population | Diversity | Stopping Options

Show: All Simulations

Simul.	Elapsed Time	Iters	Result	Output Mean	Output Std Dev	Output Min	Output Max	B31	B32	B33	B34	B35
1	00:00:14	1000	1700.6037	1700.6037	10.6854	1657.6212	1736.9698	0	1	0	1	1
2	00:00:30	1000	1548.4197	1548.4197	10.6737	1513.6945	1579.2885	0	1	0	1	1
3	00:00:43	1000	1564.1307	1564.1307	10.4799	1527.9834	1594.9930	0	0	0	1	1
4	00:01:28	1000	1835.0907	1835.0907	12.0423	1779.2712	1869.6089	0	1	0	1	1
5	00:02:18	1000	N/A	1789.1166	11.0156	1739.7649	1821.0489	0	1	0	1	1
6	00:02:32	1000	1835.3344	1835.3344	12.3410	1779.3172	1871.8197	0	1	0	1	1
7	00:02:46	1000	1583.1632	1583.1632	10.5984	1545.9624	1618.4863	0	1	0	1	1
8	00:03:20	1000	1700.1801	1700.1801	11.9405	1663.4222	1741.1179	1	1	0	1	1
9	00:03:34	1000	1529.0077	1529.0077	11.0208	1485.1663	1559.0259	0	1	0	1	0
10	00:03:58	1000	N/A	1620.6942	11.0593	1579.4388	1658.6913	0	1	0	1	0
11	00:04:27	1000	1834.7341	1834.7341	12.1993	1791.4623	1876.1510	0	1	0	1	1
12	00:04:41	1000	1703.0350	1703.0350	11.9044	1657.5678	1740.4091	0	0	0	1	1
13	00:04:54	1000	1531.7542	1531.7542	11.8402	1485.2187	1570.1854	0	0	0	1	0
14	00:05:08	1000	1663.8750	1663.8750	12.0152	1627.1979	1704.8985	0	1	0	1	0
15	00:05:22	1000	1863.7008	1863.7008	11.3660	1825.7779	1900.7167	0	1	0	1	1
16	00:05:36	1000	1841.3324	1841.3324	10.7940	1809.0157	1872.1657	0	1	0	1	1
17	00:05:51	1000	1843.7875	1843.7875	11.5978	1807.0648	1879.7177	0	1	0	1	1
18	00:06:05	1000	1568.5484	1568.5484	10.0891	1533.5034	1598.7395	0	1	0	1	1
19	00:06:20	1000	1706.5882	1706.5882	10.8100	1665.9429	1738.1248	0	1	0	1	1
20	00:06:34	1000	1568.8305	1568.8305	10.2623	1527.9093	1598.1743	0	0	0	1	1
21	00:06:53	1000	1532.8010	1532.8010	10.0699	1504.9701	1562.0044	0	1	0	1	1
22	00:07:07	1000	1817.9598	1817.9598	11.0325	1778.9780	1854.1964	0	1	1	1	1
23	00:07:21	1000	1843.9636	1843.9636	11.5842	1801.8668	1876.0763	1	1	0	1	1
24	00:07:35	1000	1713.5368	1713.5368	11.5292	1669.2200	1746.6488	0	1	0	0	1
25	00:07:49	1000	1542.7280	1542.7280	10.5915	1502.9920	1576.9226	0	1	0	1	1
26	00:08:04	1000	1380.0649	1380.0649	9.4608	1350.3614	1408.9023	0	1	0	1	1
27	00:08:17	1000	1733.1221	1733.1221	11.3374	1693.6025	1766.5428	0	1	0	0	1
28	00:08:32	1000	N/A	1792.0797	10.6267	1755.9306	1829.8677	0	1	0	1	1
29	00:08:46	1000	1863.5332	1863.5332	11.2357	1822.3025	1896.7065	0	1	0	1	1
30	00:09:32	1000	1417.7107	1417.7107	10.3541	1382.3717	1447.9214	0	1	0	0	1
31	00:09:47	1000	N/A	1624.4384	9.8636	1595.9891	1656.4975	0	1	0	1	1
32	00:10:25	1000	1863.8782	1863.8782	10.9779	1821.4177	1898.3089	0	1	0	1	1

QUESTIONS AND ANSWERS

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