



aliveasart
art is a way of life

Decision Models Final Project (Fall 2010)

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Agenda



- 1 About Aliveasart
- 2 Managerial definition and preview of conclusions
- 3 Formulation and approach
- 4 Solution methodology
- 5 Proposed improvements

About Aliveasart



Aliveasart is an arts-focused website that began as a hobby. Over the past few months, site traffic has increased significantly, and the owner wants to improve the business model to maximize value capture.

Sources of revenue

- 1** Pay per click advertising
- 2** Photography sales
 - Three sizes offered
 - Photographs arrive framed
 - One week delivery guarantee
- 3** Direct-pay advertising



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Managerial Definition & Conclusions



There are two primary questions that the owner would like to answer

1

What is the optimal seasonal mix of PPC and direct pay ads to maximize ad revenue?



Winter

Summer

Spring

Fall

Top

Middle

Bottom

DP

DP

PPC

DP

2

What is the optimal quantity of finished goods to produce seasonally?



Winter

Summer

Spring

Fall

Finished products

100

70

30

50



\$1239

\$862

\$175

\$512

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Optimal ad mix: formulation and approach



1

Optimal ad mix

Decision variables

- Top (most expensive ad): DP or PPC
- Middle (average ad): DP or PPC
- Bottom (least expensive): DP or PPC

Formulas

- $\text{PPC revenue} = \text{Traffic} * \text{click rate} * \0.06
- Direct seasonal revenue = \$135 (top), \$60 (middle), \$30 (bottom)
- Total ads = 1 top, 4 middle, 3 bottom

Objective function

- Choice = Direct revenue – PPC revenue
 - If positive → Direct
 - If negative → PPC

Approach

- Crystal ball
- Simulate seasonal traffic
- Difference between projected ad revenue

Logarithmic random variable

- Mean = expected seasonal demand
- Std dev = 1 month demand by season

The screenshot shows the aliveasart website with a navigation bar at the top. The main content area features several articles and images. A red dashed line is drawn across the middle of the page, separating the top section from the bottom section. To the right of the screenshot, there are three labels with brackets indicating the value of different ad positions: 'Top (\$135)' for the top section, 'Middle (\$60)' for the middle section, and 'Bottom (\$30)' for the bottom section. The label 'Fold' is placed near the red dashed line.

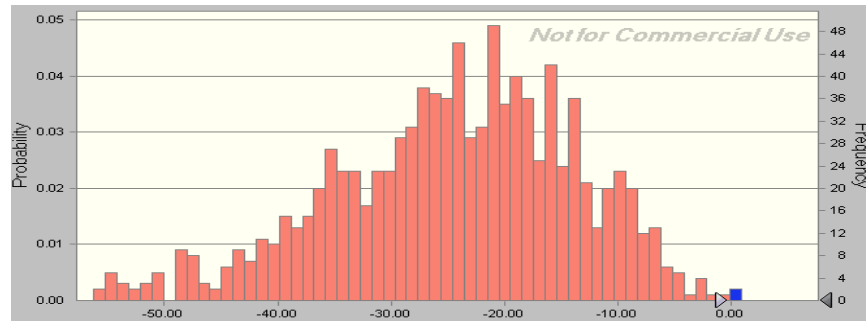
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Optimal ad mix: solution methodology

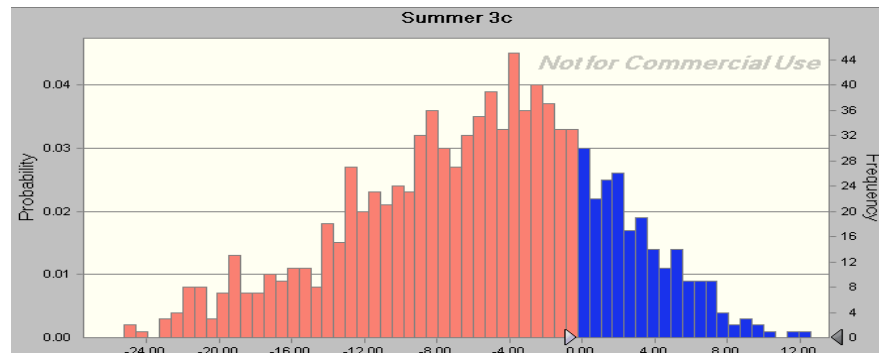


Management should only feature pay-per-click advertising “below the fold” during the seasons with the highest expected traffic (winter and summer). Above the fold, however, should always feature direct-pay ads, even in the highest traffic seasons

Winter – cheapest below the fold

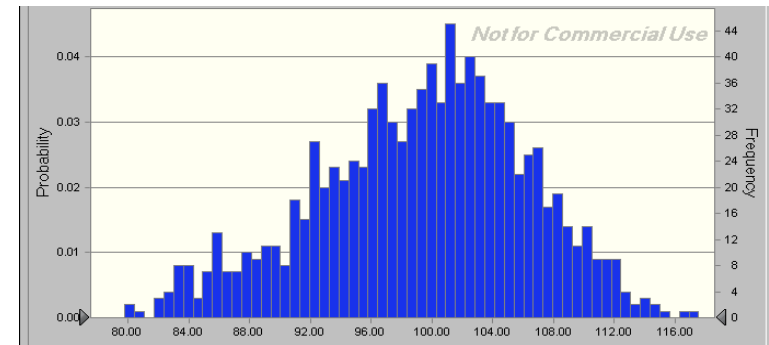


Summer – cheapest below the fold



- % of simulations in which DP is optimal choice
- % of simulations in which PPC is optimal choice

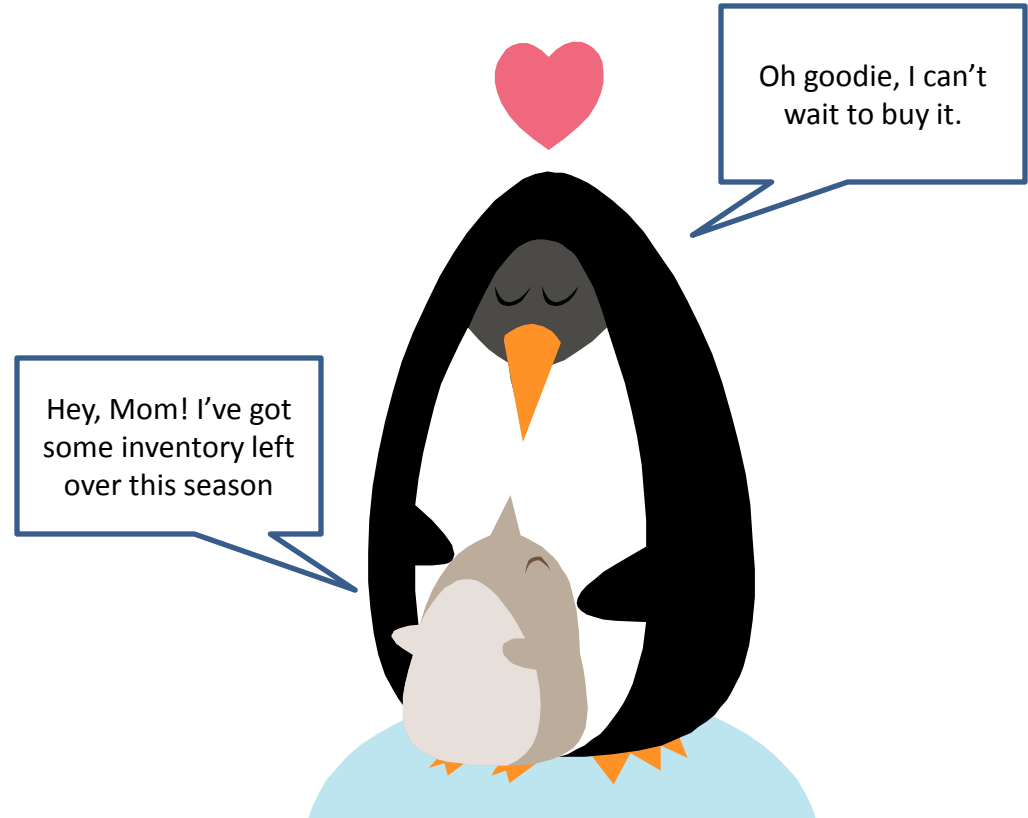
Winter – top most expensive



Optimal production quantity: additional Info



- **Aliveasart features a new selection of photographs each season**
- **At the end of each season, Aliveasart liquidates inventory in a blow-out sale**
- **The owner's mother is very proud and loves to give photos to her friends as gifts, so she guarantees that 100% of remaining inventory is liquidated seasonally**



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Production quantity: formulation and approach



2

Optimal production quantity and expected profit

Decision variables

- Quantity to produce by season

Inputs

- Forecasted demand
 - Spring (mean) = 30; (stdev) = 30
 - Summer (mean) = 60; (stdev) = 60
 - Fall (mean) = 45; (stdev) = 45
 - Winter (mean) = 90; (stdev) = 90
- Price Information
 - Retail Price: \$69; Sale Price: \$10
 - Fixed Costs: \$500; Variable Costs: \$28

Objective function

- Maximize expected profit

Approach

- Monte Carlo Simulation (via Crystal Ball)
- Simulate variability in seasonal demand

Logarithmic random variable

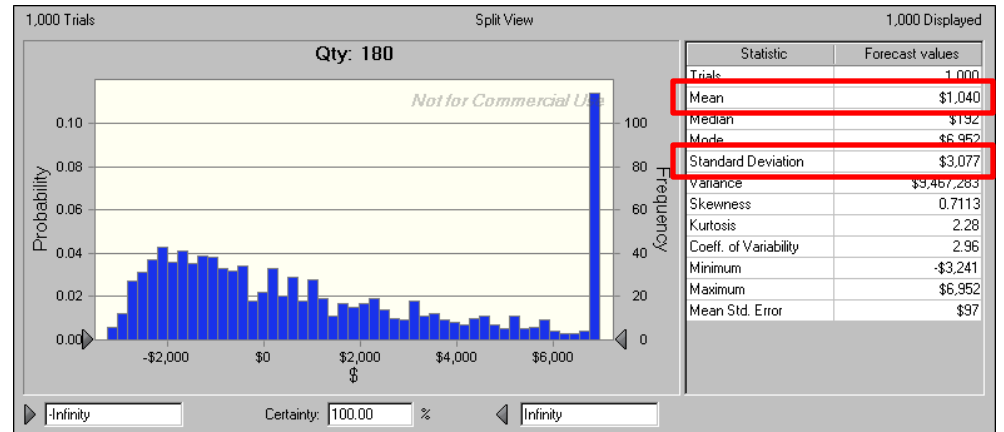
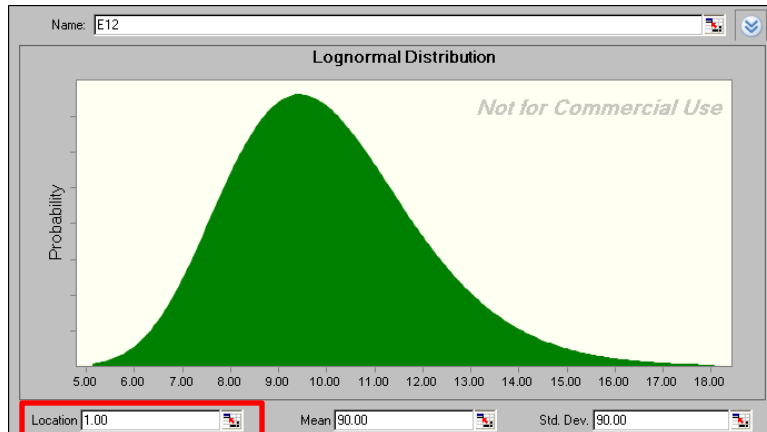
- Location = 1 (because of the mother)
- Mean = expected seasonal demand
- Std dev = same as seasonal demand

Solution methodology



Monte Carlo Simulation

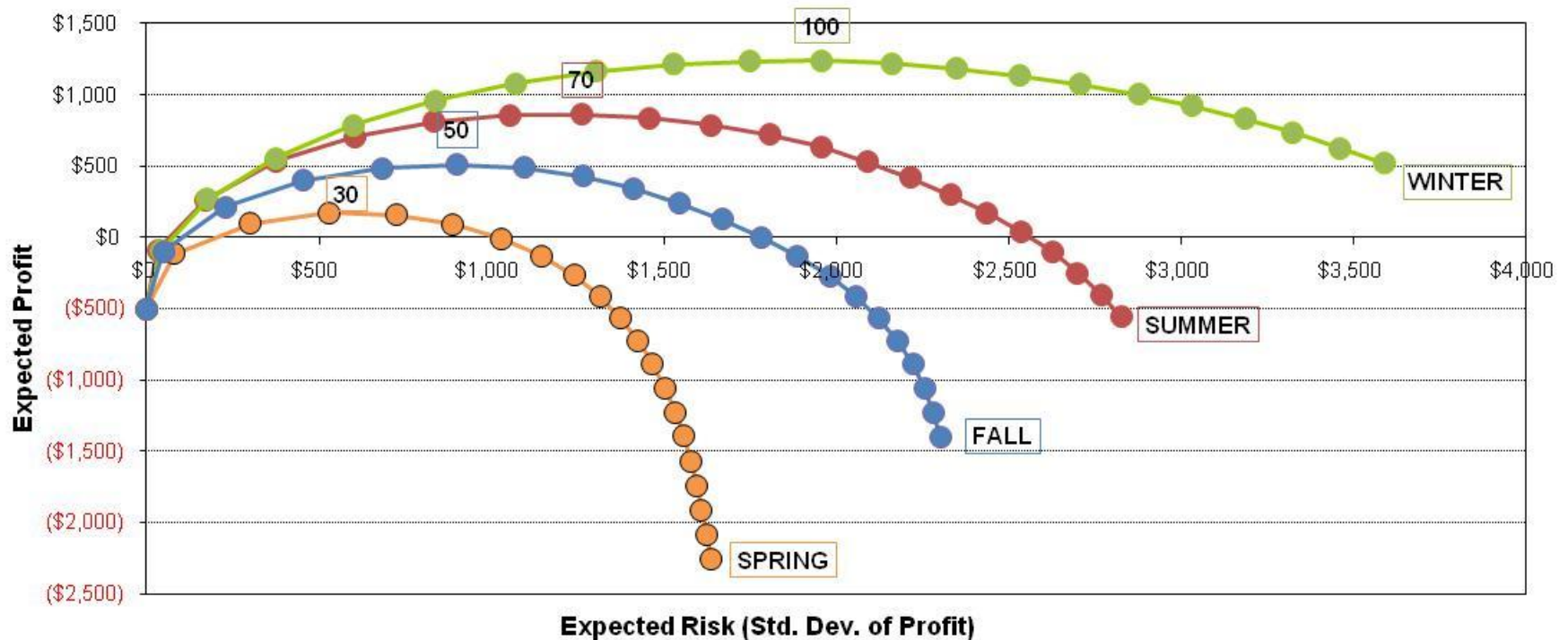
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V
2	Qty Produced	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200
3	Demand	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90
4	Qty Sold at S	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200
5	Qty Sold at V	0	0	0	0	0	0	0	0	0	0	10	20	30	40	50	60	70	80	90	100	110
6	Fixed cost	\$500	\$500	\$500	\$500	\$500	\$500	\$500	\$500	\$500	\$500	\$500	\$500	\$500	\$500	\$500	\$500	\$500	\$500	\$500	\$500	\$500
7	Variable cost	\$0	\$276	\$552	\$828	\$1,104	\$1,380	\$1,656	\$1,932	\$2,208	\$2,484	\$2,760	\$3,036	\$3,312	\$3,588	\$3,864	\$4,140	\$4,416	\$4,692	\$4,968	\$5,244	\$5,520
8	Revenue	\$0	\$690	\$1,380	\$2,070	\$2,760	\$3,450	\$4,140	\$4,830	\$5,520	\$6,210	\$6,900	\$7,590	\$8,280	\$8,970	\$9,660	\$10,350	\$11,040	\$11,730	\$12,420	\$13,110	\$13,800
9	Profit	-\$500	-\$86	\$328	\$742	\$1,156	\$1,570	\$1,984	\$2,398	\$2,812	\$3,226	\$3,640	\$4,054	\$4,468	\$4,882	\$5,296	\$5,710	\$6,124	\$6,538	\$6,952	\$7,366	\$7,780
10																						
11	Probability distribution of demand (lognormal)																					
12	Location (minimum)		1																			
13	Mean		90																			
14	Standard Deviation		90																			



Optimal order quantity: expected case



Efficient Frontier: Optimal Order Qty



Optimal order quantity: expected case



Are we done? Heck no!



WWJD?

A good question,
rightly asked → + 1

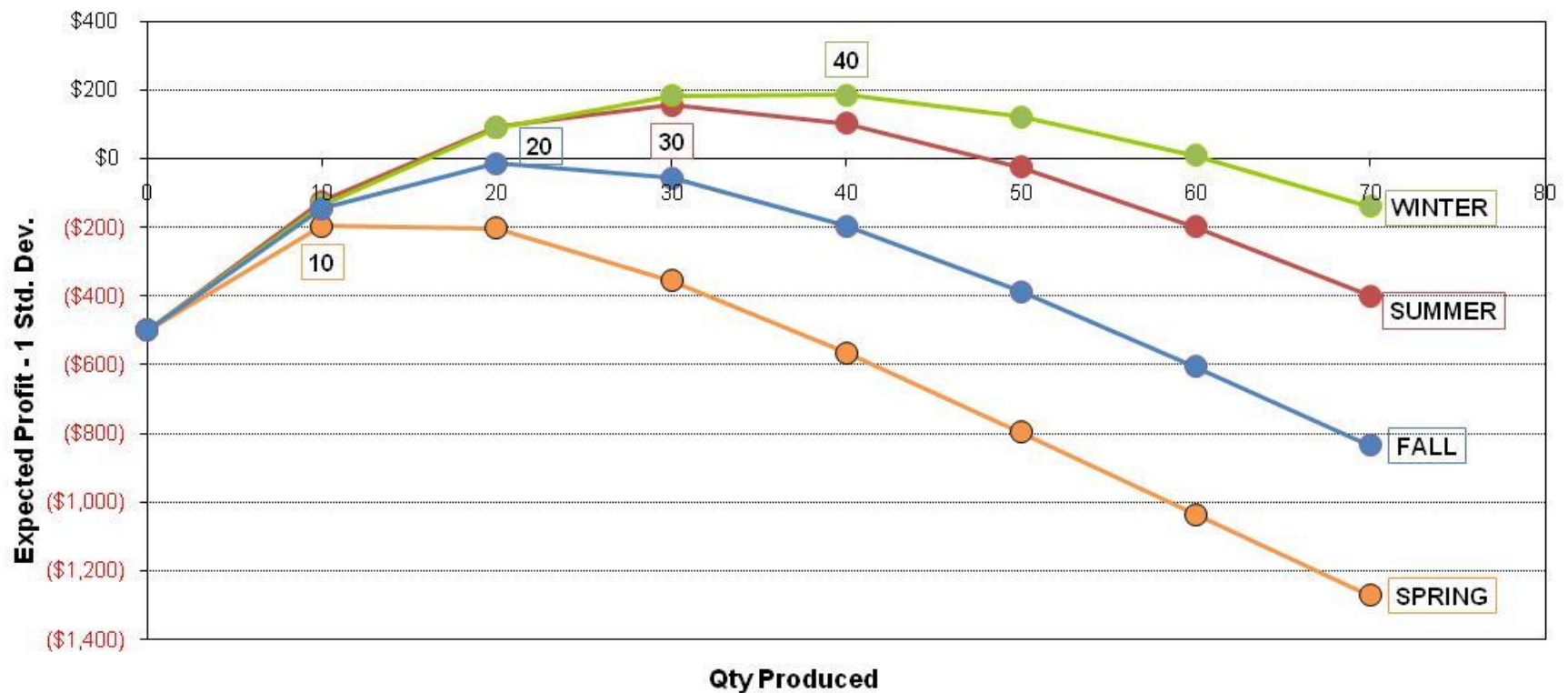


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Optimal order quantity: downside protection



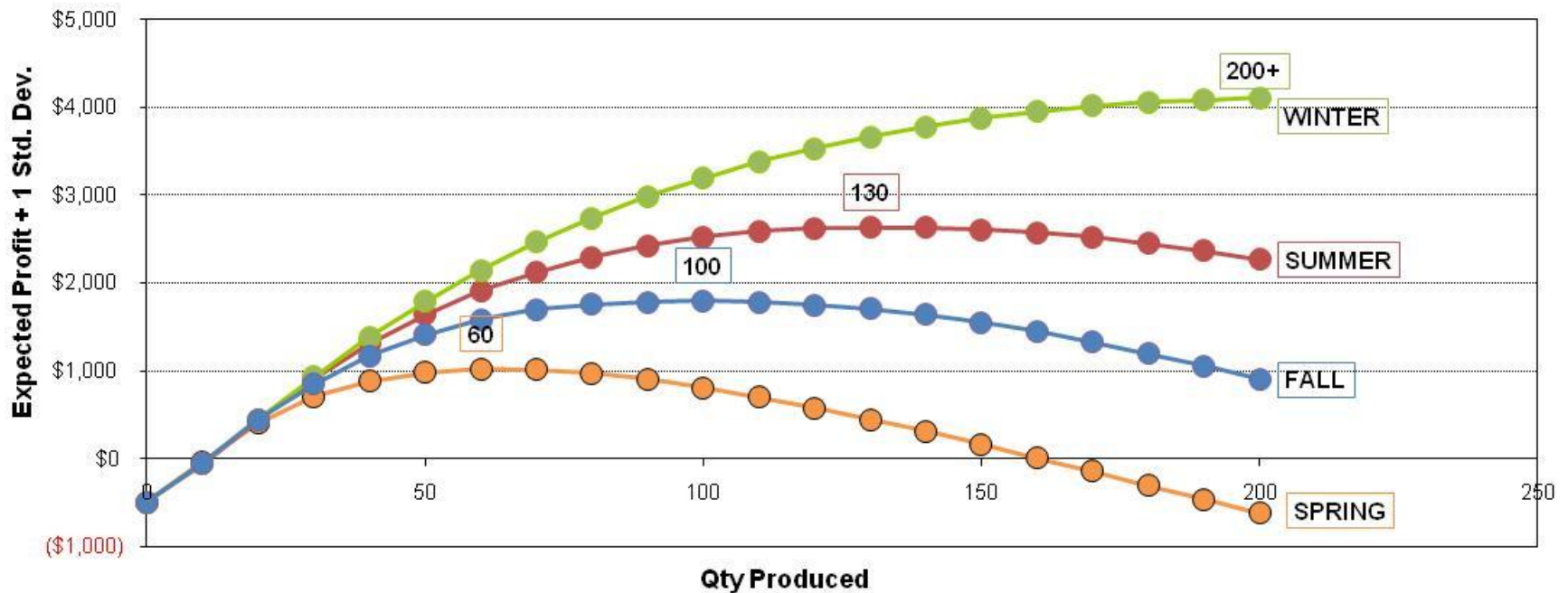
Optimal Quantities if Profit = Exp. Profit - 1 Std. Dev.



Optimal order quantity: go for broke!



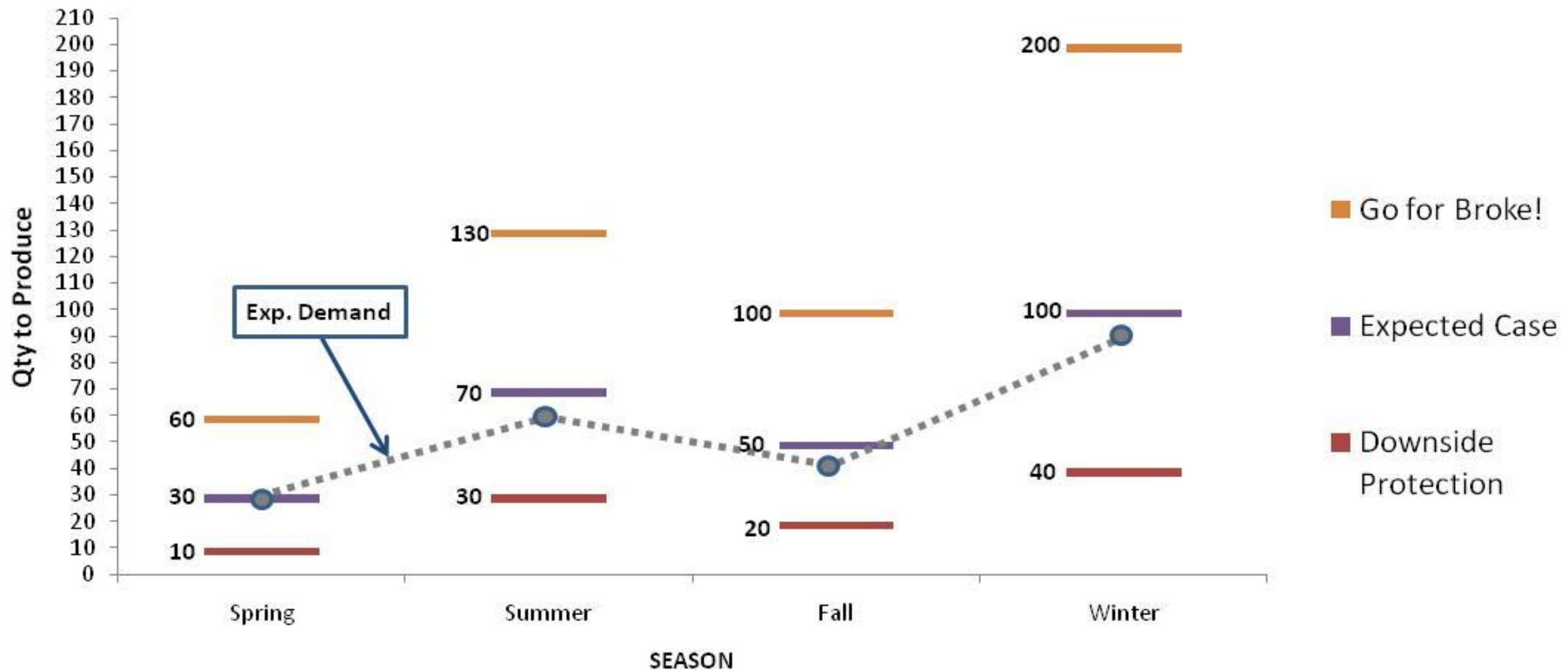
Optimal Quantities if Profit = Exp. Profit + 1 Std. Dev.



Optimal order quantity: conclusion



Optimal Order Quantity depends on Management's objectives!



Proposed improvements



General improvement

1

Add more random variables

2

Account for additional costs

3

Change the timeframe

4

Use data based forecasting

4

Use data based forecasting

5

Account size of product

Details

- Click-through rates
- Price per click

- Sales costs for direct pay
- Recoding the site

- Allow monthly changes in ad mix

- Track historical data for sales
- Forecast demand: regression or Winter's

- Track historical data for sales
- Forecast demand: regression or Winter's

- Introduce three new sizes of inputs