Predictive Analytics in Pork Production

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Agenda

An Innovative Predictive Analytic Model

1. What is Predictive Analytics?
2. Application to the Pork Industry
3. Why is this Different?
4. Hogistics, What is it and How does it work?
5. Producer Experiences
6. Questions & Answers

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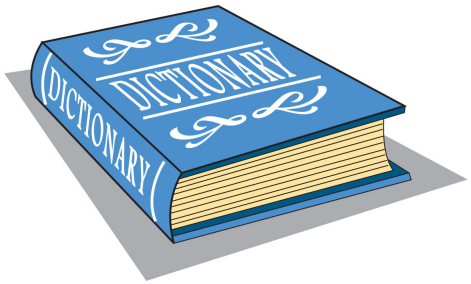
Predictive Analytics by Definition

Predictive Analytics…



Encompasses a variety of statistical techniques from modeling, machine learning, and data mining that analyze current and historical facts to **make predictions about future events**.

In business, predictive models exploit patterns found in historical and transactional data to **identify risks and opportunities**.

Models capture relationships among many factors to allow assessment of risk or potential associated with a particular set of conditions, **guiding decision making transactions**.

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So What is Computer Simulation Modeling

Computer Simulation Modeling…

The imitation of a dynamic and variable system using a computer model in order to evaluate and improve system performance.

In a field of simulation, a discrete event simulation (**DES**), models the operation of a system as a discrete sequence of events in time.

- Each event occurs at a particular instant in time and marks a change of state in the system.

- Between consecutive events, no change in the system is assumed to occur, thus the simulation can directly jump in time from one event to the next

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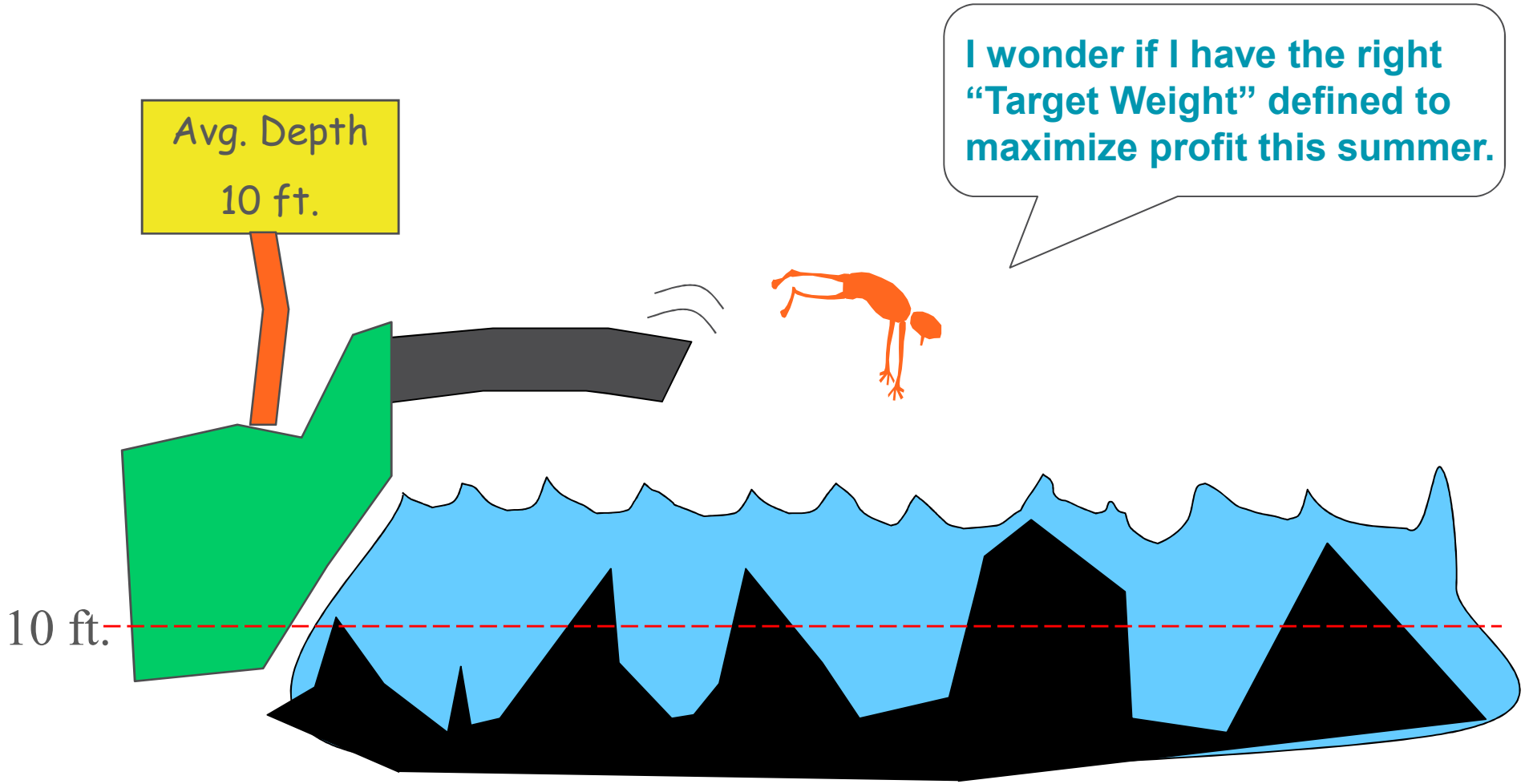
Why Do We Simulate?

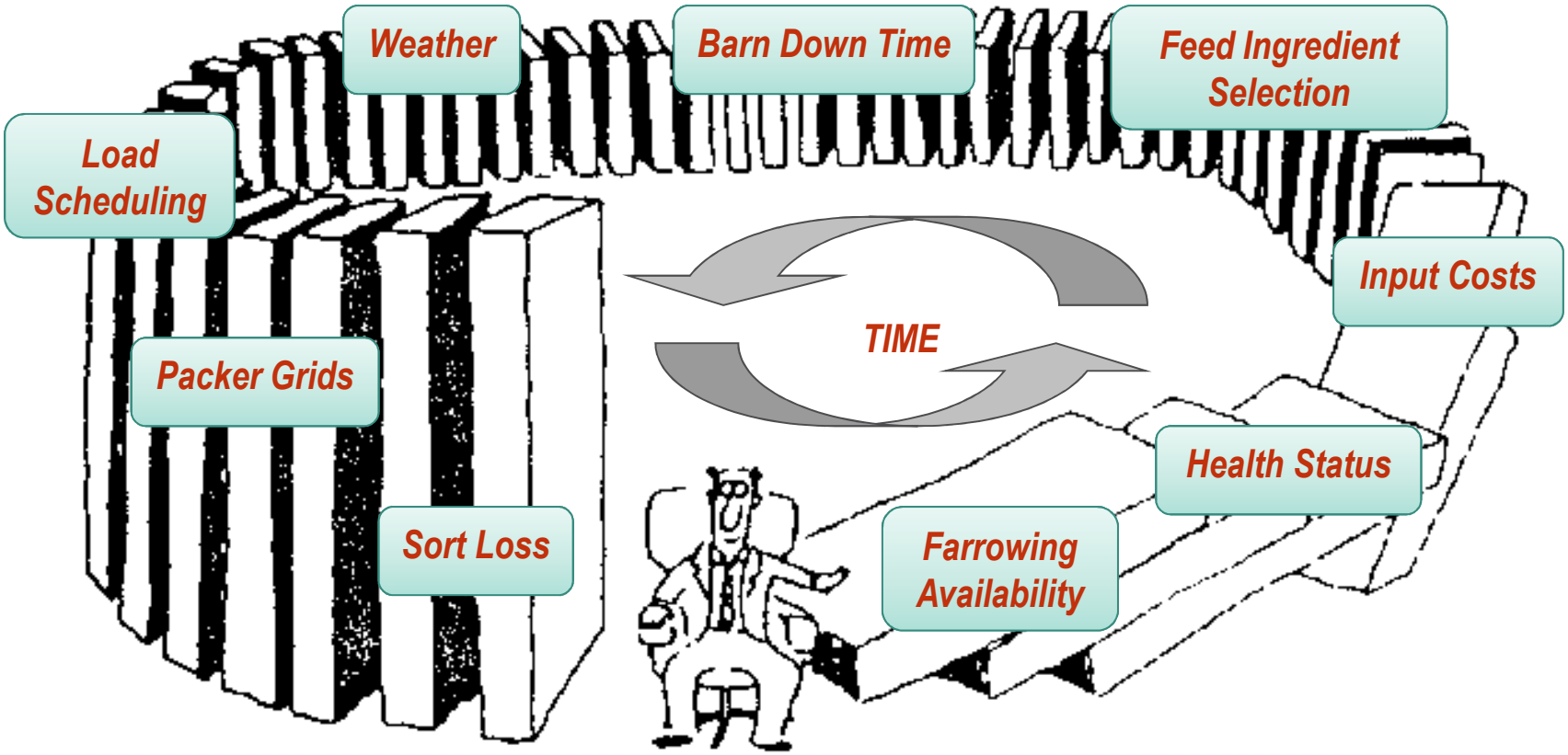
…to avoid the risk in the error of averages



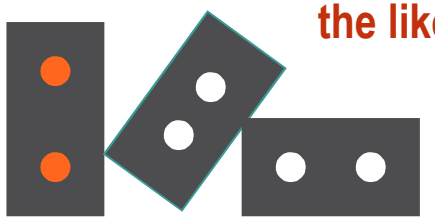
Danger of basing decisions on averages

Pork Production Applicability

Complex dependencies can lead to unintended consequences



Systemic interdependencies and "Real World" variability will INCREASE the likelihood that decisions produce unintended consequences



Whiteboard and Brute Force

- Can't answer complex questions

or

- Help make strategic decisions

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Current Pork Production Analytics

Commercial & Customized

Numerous and commercial and home-grown database systems used to collect, organize and utilize data, yet **none use** sophisticated discrete event simulation (**DES**) modeling

No broadly accepted standard solutions to accurately, effectively or dynamically predict growth, mortality and weight distribution in wean-grow-finish phase

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Challenges with Current Practices

- Excel spreadsheets **do not deal with variability** or **change** with respect to time

- Monte Carlo/Excel simulation deals with variability, yet **neglects** the effect of time-based effects

- **Lack of confidence** in the "static" nature of current tools for both operational and strategic purposes
- DES does not exist in current pork production modeling systems…**Until now!**

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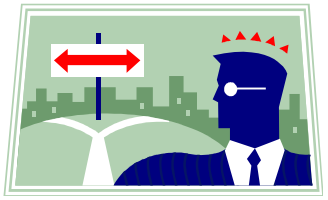
Hogistics – What is it?

An automated, data-driven, predictive analytic model that:

- Acts like a pork producer's **own production system**
- Takes into account **historical** and **behavioral** aspects of the producer's finishing operation
- **More accurately** predicts weight, pig flow, mortality and weight distribution by week on feed
- Enables **precise** and **faster** marketing **decision-making**



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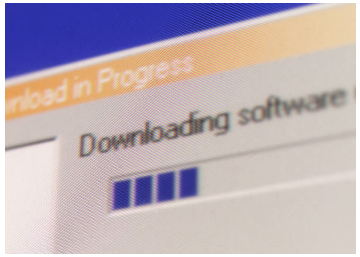
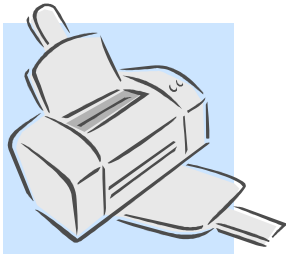
Producer Subscribes to a Weekly Report

The initial deliverable of Hogistics is the Weight Prediction Report

- Predicts dynamic pig weight over time
- Identifies the high probability “Top Out” week
- Aids Marketing Specialists by informing them of what pigs in what quantities will be available
- Provides the spread of weights of all other pigs so producers can plan follow on cuts
- Web Enabled (downloadable and printable)





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Daily/Weekly Weight Prediction Report

(Not Selling tab)

WEIGHT BY WOF

WEIGHT 'BUCKETS' How many pigs in what buckets

Weight Prediction Report													Average Weight … If You Sold This Many …					Predicted Weight Buckets						
Group	Pig Flow	Start Date Prod Wk	Prod Wk	WOF	Deaths	Mkt Hog Sales	Avg Wt Sold	Avg MIN Wt	Avg MAX Wt	STD DEV	Pig Count	Feed per Pig	160	180	360	540	Avg Wt Entire Group	221 240	241 260	261 270	271 280	281 290	291 300	Guide
Group Not Selling 1	Flow 3	05/01/14	18	0							981													Start
		07/23/14	30	13	5		ACTUAL →				902	364.1												Actual
		07/30/14	31	14	2						902	378.2	230	**229.2**	222.4	217.6	210.1	173	17					Predict
		08/06/14	32	15	1						900	421.3	244.1	**243.1**	236.3	231.4	223.8	394	94	10				Predict
		08/13/14	33	16	2						899	462.2	256.8	**255.8**	248.8	243.8	236	412	267	26	12	2		Predict
		08/20/14	34	17	2		PREDICTED →				897	504.0	269.2	**268.1**	261.2	256	248.2	273	402	120	31	12	5	Predict
		08/27/14	35	18	2						895	542.8	280.4	**279.6**	272.4	267.3	259.2	123	383	188	124	42	12	First
		09/03/14	36	19	2						893	584.6	292	**291**	283.8	278.6	270.5	41	236	210	195	128	56	First
		09/10/14	37	20	1						891	622.5	302.5	**301.4**	294.1	288.8	280.6	14	111	153	207	193	128	Predict
Group Not Selling 2	Flow 4	05/01/14	18	0							1,032													Start
		07/23/14	30	13	1						994	435.3												Actual
		07/30/14	31	14	2						994	435.3	255.6	**254.7**	248.1	243.4	234.4	470	264	23	13			Predict
		08/06/14	32	15	2						992	464.6	265	**264.1**	257.3	252.7	243.5	355	421	83	21	12		Predict
		08/13/14	33	16	2						990	509.1	278.8	**277.5**	270.9	265.8	256.6	169	446	195	113	30	14	First
		08/20/14	34	17	2						988	549.2	290.3	**289.4**	282.5	277.6	268.3	55	300	237	202	133	36	First
		08/27/14	35	18	2						986	585.9	301.1	**300.1**	293.1	288.2	278.7	18	145	189	234	202	133	Predict
		09/03/14	36	19	1						984	629.8	313.8	**312.5**	305.3	300.2	290.5	3	48	92	169	228	213	Predict
		09/10/14	37	20							982	668.7	323.8	**322.6**	315.5	310.3	300.7		15	34	90	166	226	Predict
		09/17/14	38	21							981	713.6	334.7	**333.9**	327	321.8	312.2		1	12	28	82	128	Predict
		09/24/14	39	22							981	757.5	343.6	**343**	337	332.4	322.7			1	12	25	77	Predict

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Daily/Weekly Weight Prediction Report

(Selling tab)

WEIGHT BY WOF

WEIGHT 'BUCKETS' How many pigs in what buckets

ACTUAL

PREDICTED

Weight Prediction Report

Group	Pig Flow	Start Date Prod Wk	Prod Wk	WOF	Deaths	Mkt Hog Sales	Avg Wt Sold	Avg MIN Wt	Avg MAX Wt	STD DEV	Pig Count	Feed per Pig	Average Weight … If You Sold This Many … 160	180	360	540	Avg Wt Entire Group	Predicted Weight Buckets 221 240	241 260	261 270	271 280	281 290	291 300	Guide
Group Selling 1	Flow 1	03/20/14	12	0							1,015													Start
		07/08/14	28	17	2	365	282.8	224.6	327.5	19.1	592	631.1												Actual
		07/16/14	29	18	2	139	275.2	249.9	310.4	15.1	450	649.6												Actual
		07/23/14	30	19	2	119	261.0	231.5	283.9	14.6	329	670.8												Actual
		07/30/14	31	20							329	670.8	293.1	**291.4**			282	4	37	46	81	73	50	Predict
		08/06/14	32	21							328	709.2	303.1	**301.3**			291.7	1	14	28	47	78	72	Predict
		08/13/14	33	22							328	749.0	313.5	**311.7**			301.8		5	10	29	47	78	Predict
		08/20/14	34	23		328	310.8	176.5	349.0	7.2		786.7					310.8		1	4	11	30	53	Predict
Group Selling 2	Flow 2	03/20/14	12	0							996													Start
		07/09/14	28	17	2	183	279.7	253.7	305.5	16.9	703	559.7												Actual
		07/16/14	29	18	3	185	274.3	238.2	297.7	13.1	515	595.6												Actual
		07/23/14	30	19	2						513	622.1												Actual
		07/30/14	31	20	1						513	622.1	271.5	**270.1**	260.9		255.1	101	229	92	53	15	6	Predict
		08/06/14	32	21	1						512	661.9	283	**281.9**	272.4		266.8	34	165	119	98	63	17	Predict
		08/13/14	33	22	1						510	700.5	294	**292.7**	283.2		277.6	10	86	99	118	100	66	Predict
		08/20/14	34	23							509	737.4	303.8	**302.5**	292.9		287.3	4	34	60	99	116	98	Predict
		08/27/14	35	24		508	298.8	176.5	349.0	17.2		774.2					298.8		8	18	46	83	113	Predict

WOF	Deaths	Mkt Hog Sales	All Other Outs	Avg Wt Sold	Avg MIN Wt	Avg MAX Wt	STD DEV	ACTUAL Sales Data
17	2	365		282.8	224.6	327.5	19.1	First Cut
18	2	139		275.2	249.9	310.4	15.1	2nd Cut
19	2	119		261.0	231.5	283.9	14.6	3rd Cut

Customer Experiences

Advanced warning of market weight

"If you get your timing right, you're going to hit those packer grids more consistently."

Hitting the grid more often

"For me, putting the most amount of pigs in the grid is the primary objective. Everything else revolves around that."

Efficient use of manpower

"Right now, you could be scheduling them before you mark them."

Reduces guess work

"If I can eliminate trial and error by having more accurate information, that would help us a lot to make improvements."

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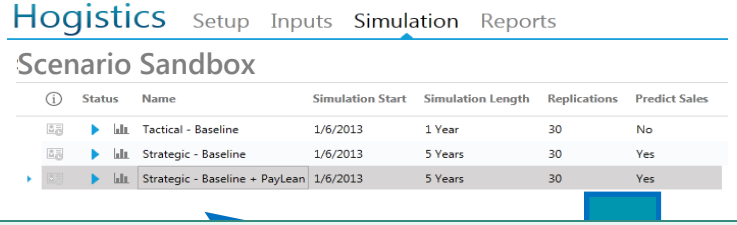
How Does Hogistics Work?

1

Scenario Sandbox



Use Steps

Loads automatically integrated (web based) inputs
1) Behavioral flow data
2) Integrated status data
3) Site based data

It is the integration of these historically relevant data sets with status data and true predictive modeling that has not been tried.

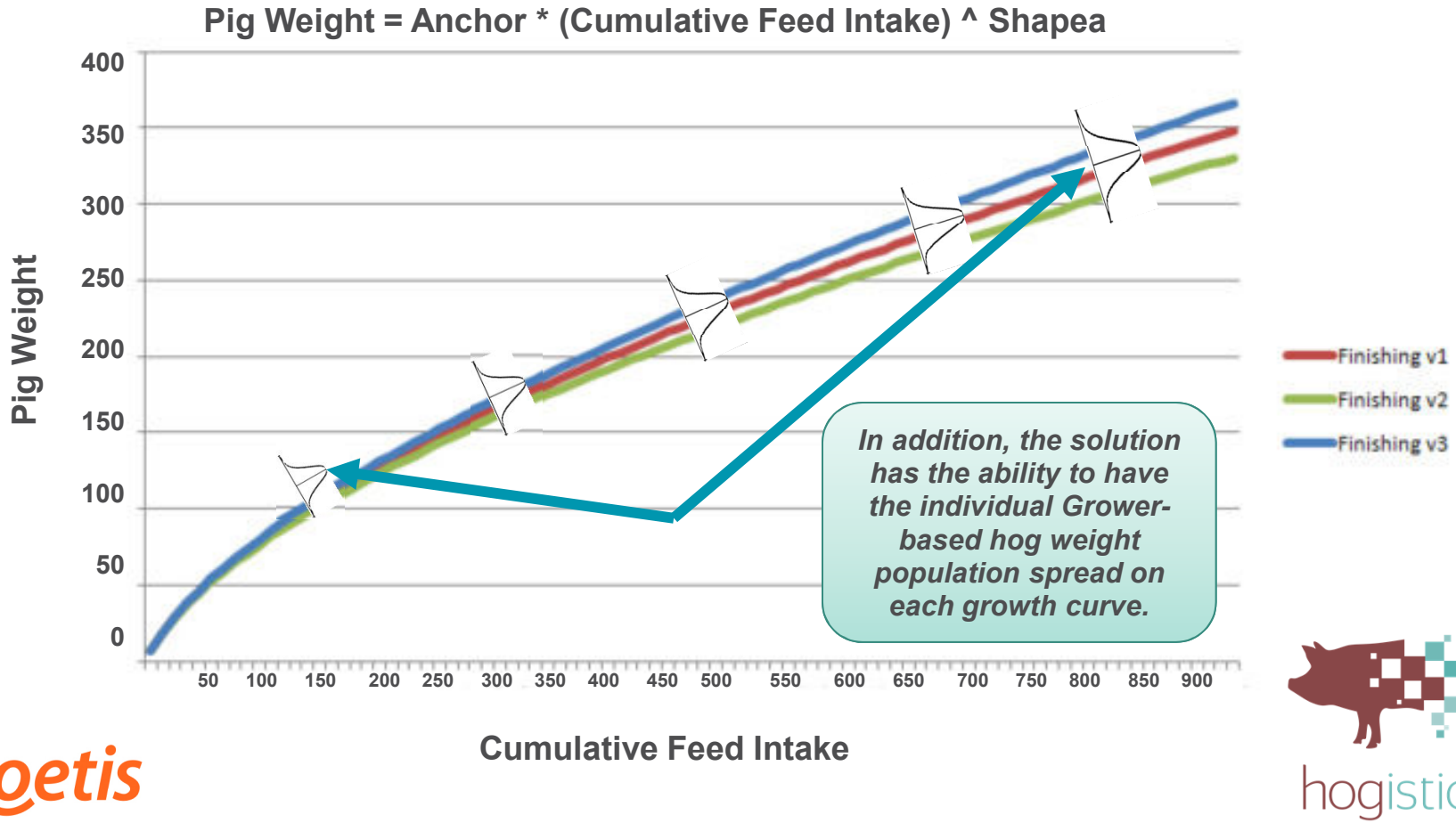
And what will make this a robust and repeatable process.

			02/10/13	7	16	2	1102	498.8	290.8	289.3	280.1	273.5	258.1	52	182	398	184	134	79	35	16	First
			02/17/13	8	16	2	1099	498.8	290.8	289.3	280.1	273.5	258.1	52	182	398	184	134	79	35	16	Predict
			02/24/13	9	17	2	1096	533.9	302.8	301.2	291.6	284.8	268.6	26	115	288	194	177	133	89	41	Predict
			03/03/13	10	17	2	1093	533.9	302.8	301.2	291.6	284.8	268.6	26	115	288	194	177	133	89	41	Predict
			03/10/13	11	18	2	1090	561.8	310.1	308.7	299.2	292.6	276.6	14	61	197	179	213	172	124	79	Predict
			03/17/13	12	18	2	1087	561.8	310.1	308.7	299.2	292.6	276.6	14	61	197	179	213	172	124	79	Predict
Kalona Pork	11	BPI-G	10/15/12	42	0		1123	40.7														Start
			01/06/13	2	13		1110	409.9														Actual
			01/13/13	3	14	2	1108	403.0	260.1	258.7	249.8	243.5	228.3	302	397	221	32	14	9	3		Predict
			01/20/13	4	14	2	1106	403.0	260.1	258.7	249.8	243.5	228.3	302	397	221	32	14	9	3		Predict
			01/27/13	5	15	2	1104	443.0	271.3	269.9	261.3	255.5	241.3	161	383	361	99	38	15	9	3	Predict
			02/03/13	6	15	2	1102	443.0	271.3	269.9	261.3	255.5	241.3	161	383	361	99	38	15	9	3	First
			02/10/13	7	16	2	1100	482.9	285.3	283.8	275.0	268.7	253.6	70	239	407	165	114	57	21	11	First
			02/17/13	8	16	2	1098	482.9	285.3	283.8	275.0	268.7	253.6	70	239	407	165	114	57	21	11	Predict
			02/24/13	9	17	2	1095	522.2	298.0	296.6	287.2	280.8	265.5	27	130	301	233	174	120	68	25	Predict

airs of Opportunity

Hogistics Uses Feed to Produce Weights

Utilizing cumulative feed intake tuned with producer historical growth, we have a robust way to more accurately predict pig weight over time



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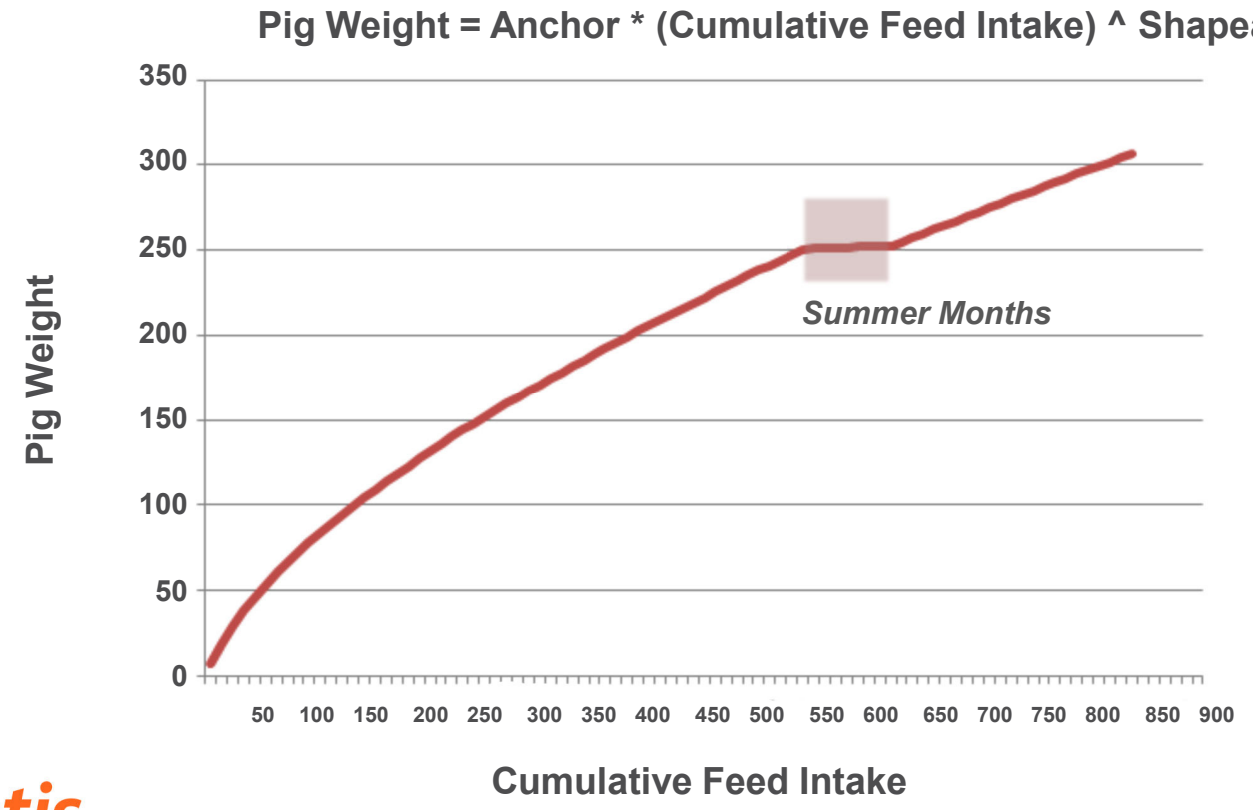
Hogistics Accounts for Reality

Realistic effects can then be layered on top of the growth curve over time

- Seasonality (summer heat)
- Virtually any other initiative may be modeled (disease outbreaks, etc)



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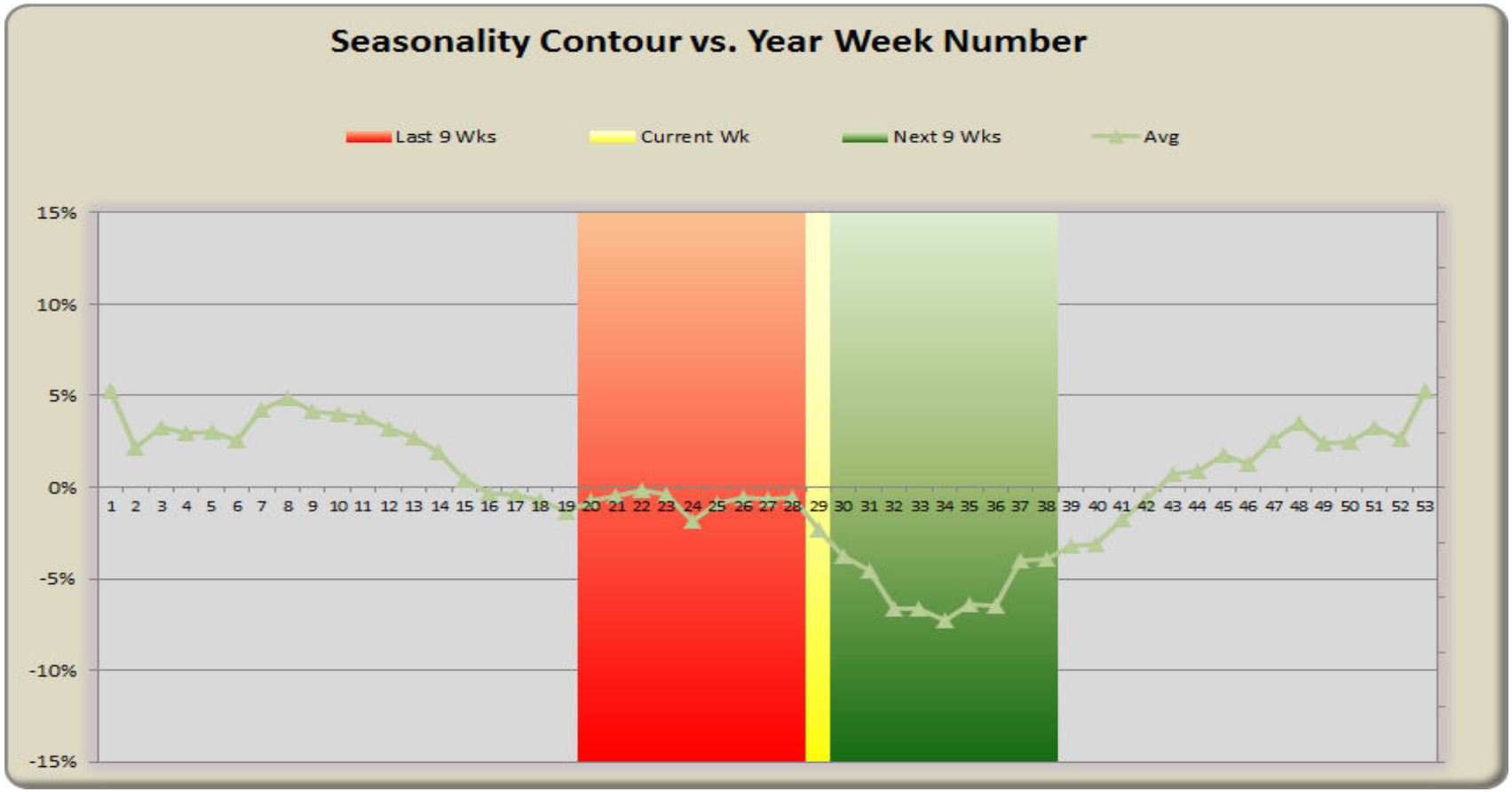
Hogistics Accounts for Reality

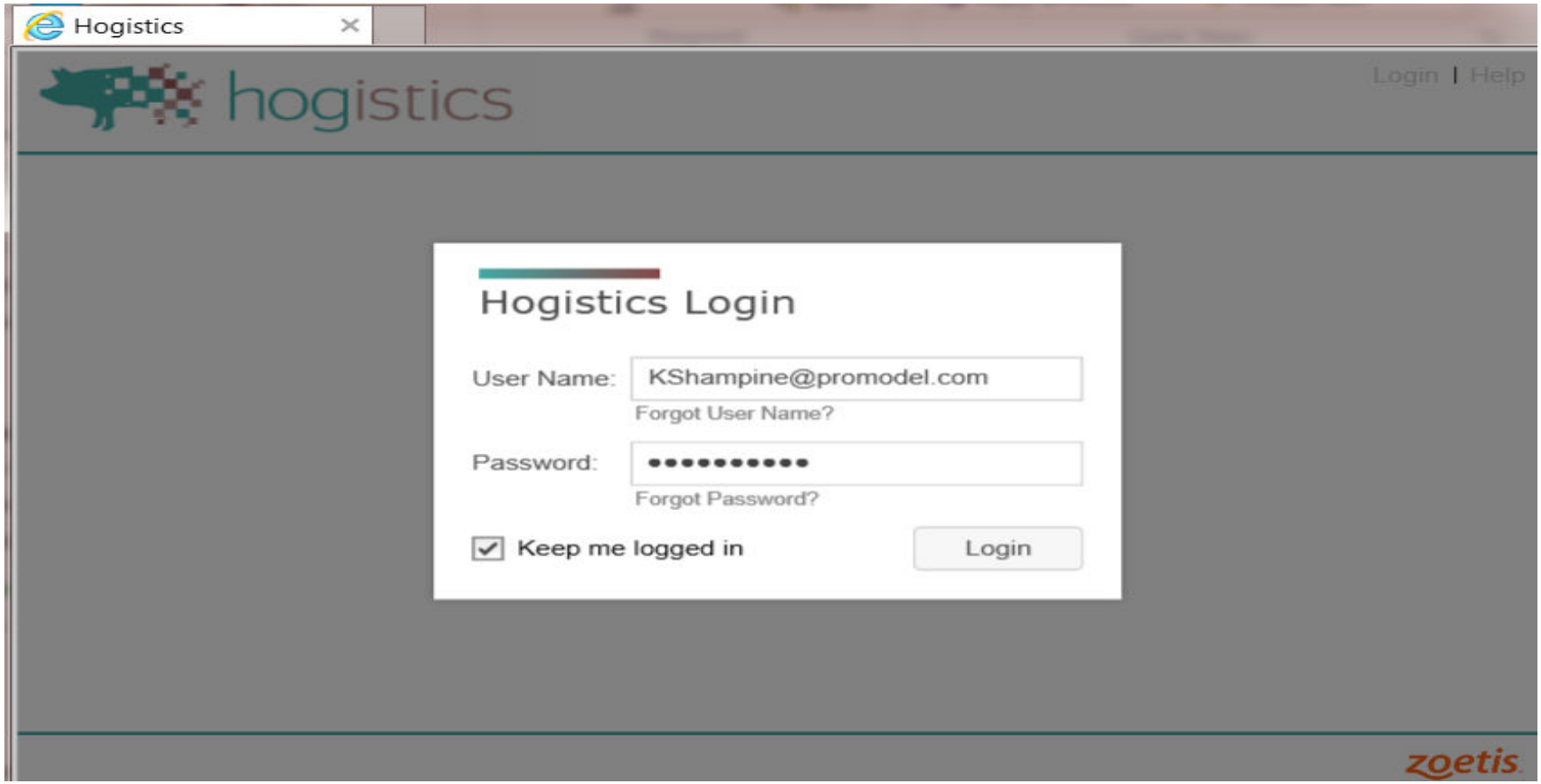
Seasonality Effect Sample

- Weekly effect of seasonality represented as a % of feed intake above or below the average across any year



Hogistics Demo

Web Portal Sign-In



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Questions & Answers