



Things Change: *Immediate vs. Ultimate Aiming*

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- **Things Change Over Time**

- **Physical Aiming**

- Immediate
 - Ultimate

- **Market Aiming**

- Immediate – Current Market
 - Ultimate – Future Market
 - Demand
 - Value
 - Cost
 - Market Aiming Implications
 - Buying
 - Selling
 - Entering Market

- **Summary**

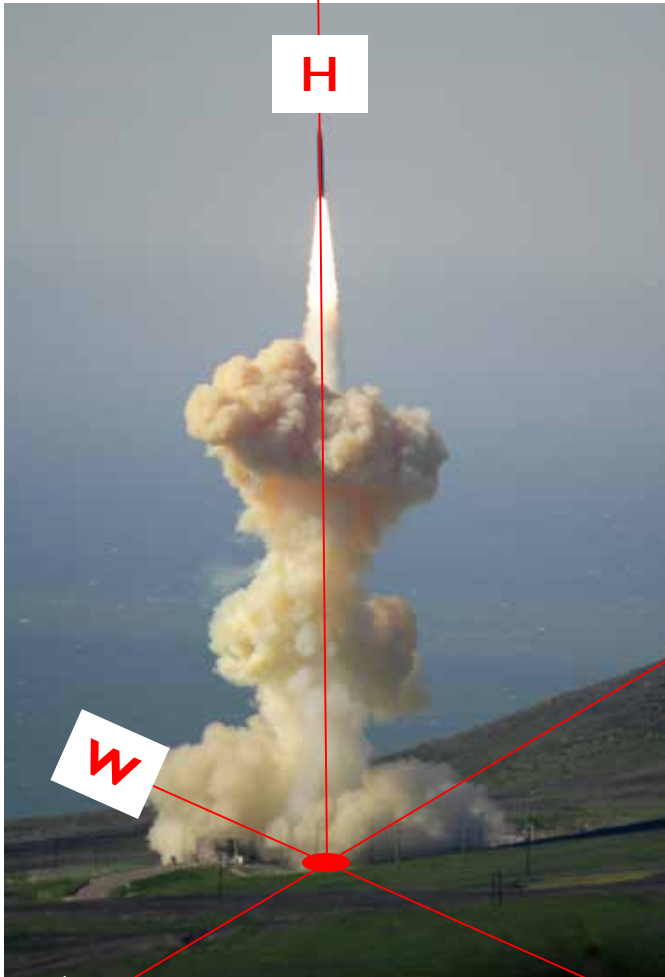
- **Analogous To, But Different from, Market Aiming**
 - Surfaces
 - Spaces
 - Lines
 - Dots
- **Immediate Aiming**
 - Short Time Frames
 - More Predictable
- **Ultimate Aiming**
 - Longer Time Frames
 - Less Predictable

The Light Arrives in Nanoseconds, the Bullet in Milliseconds

The Target is Dot on a Piece of Paper, on a 2-Dimensional, Physical Plane

The Closer the Target, the Greater the Chance for Accuracy

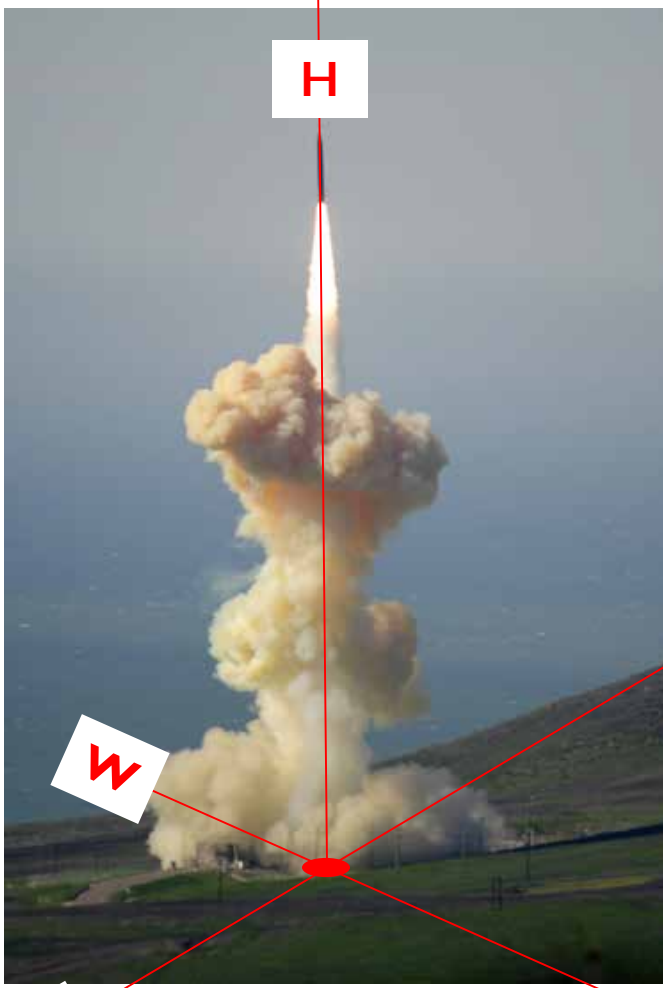




The Missile Takes Seconds to Minutes to Hit its Moving Target, a 3D Dot in Physical Space

The Closer the Target and the More Predictable its Trajectory, the Greater the Chance for Accuracy

Clearly, the Shooter in the 2D Example Could be Anywhere in this 3D Space



Presented at the 14 December 2016 ICEAA SoCal Workshop **E**

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- Analogous To, But Different from, Physical Aiming
 - Surfaces
 - Spaces
 - Lines
 - Dots
- Immediate Aiming
- Ultimate Aiming
- We will Examine a Market at 4 Times Over 5 Years



Chevrolet Spark EV, \$27,495



Nissan Leaf, \$37,288



Tesla Model S Ludicrous (P100D), \$134,500



Commuter Cars Tango T600, \$240K

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We'll Study the Electric Car Market: Here it is in 2011



Manufacturer	Model	Horse-Power	City Range Miles	Est. 5 Yr Vehicle Price	Est. 2011 Sales Qty
Commuter Cars	Tango T600	805	120	\$108,000	80
Tesla	Roadster	275	288	\$108,000	500
Think Global	Think City	46	99	\$38,000	300
Mitsubishi	i-MiEV	63	82	\$33,891	5,000
Smart	ED	74	87	\$28,750	550
Nissan	Leaf	110	75	\$35,340	12,000
Chevrolet	Spark EV	130	82	\$27,495	100
Ford	Focus Electric	143	76	\$39,995	20
Honda	Fit EV	134	100	\$36,625	100
Wheego	Whip	60	100	\$32,995	15
Bolloré	Bluecar	67	160	\$31,416	500
BYD Auto	e6	215	122	\$35,000	300
Renault	Fluence Z.E.	94	115	\$36,307	700

13 Models, 20K Units Sold, \$743M in Revenue

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Manufacturer	Model	Horse-power	City Range miles	5 Year Vehicle Price	2012 Sales Qty
Commuter Cars	Tango T600	805	120	\$108,000	90
Tesla	Roadster	275	288	\$108,000	250
Think Global	Think City	46	99	\$38,000	150
Mitsubishi	i-MiEV	63	82	\$33,891	8,000
Smart	ED	74	87	\$28,750	1,200
Nissan	Leaf	110	75	\$35,340	25,000
Chevrolet	Spark EV	130	82	\$27,495	800
Ford	Focus Electric	143	76	\$39,995	685
Honda	Fit EV	134	100	\$36,625	300
Wheego	Whip	60	100	\$32,995	30
Bolloré	Bluecar	67	160	\$31,416	1,000
BYD Auto	e6	215	122	\$35,000	800
Renault	Fluence Z.E.	94	115	\$36,307	1,200
Renault	Zoe	87	130	\$33,490	2,000
Tesla	Model S	302	208	\$57,400	1,200
Tesla	Model S Sig	362	265	\$95,400	700
Tesla	Model S Sig Perf	416	265	\$105,400	600
Toyota	RAV4 EV	154	103	\$49,800	500
Roewe	E50	63	110	\$37,589	500

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19 Models, 45K Units Sold, \$1.7B in Revenue

Manufacturer	Model	Horse-power	City Range miles	5 Year Vehicle Price	2013 Sales Qty
Commuter Cars	Tango T600	805	120	\$108,000	100
Mitsubishi	i-MiEV	63	82	\$33,891	11,000
Smart	ED	74	87	\$28,750	2,100
Nissan	Leaf	110	75	\$35,340	50,000
Chevrolet	Spark EV	130	82	\$27,495	1,560
Ford	Focus Electric	143	76	\$39,995	2,100
Honda	Fit EV	134	100	\$36,625	700
Wheego	Whip	60	100	\$32,995	40
Bolloré	Bluecar	67	160	\$31,416	1,600
BYD Auto	e6	215	122	\$35,000	1,700
Renault	Fluence Z.E.	94	115	\$36,307	2,000
Renault	Zoe	87	130	\$33,490	6,900
Tesla	Model S	302	208	\$57,400	7,000
Tesla	Model S Sig	362	265	\$95,400	7,000
Tesla	Model S Sig Perf	416	265	\$105,400	7,000
Toyota	RAV4 EV	154	103	\$49,800	1,400
Roewe	E50	63	110	\$37,589	1,000
Fiat	500e	111	100	\$32,500	1,100

18 Models, 104K Units Sold, \$4.73B in Revenue

Electric Car Market 2015



32 Models, 224K Units Sold, \$10.3B in Revenue

Manufacturer	Model	HP	Range miles	5 Year Vehicle Price	2015 Sales Qty
Commuter Cars	Tango T600	805	120	\$240,000	3
Mitsubishi	i-MiEV	63	82	\$33,891	5,892
Smart	ED	74	87	\$28,750	3,696
Nissan	Leaf	110	84	\$37,288	43,651
Chevrolet	Spark EV	130	82	\$27,495	3,564
Ford	Focus Electric	143	76	\$39,995	1,458
Honda	Fit EV	123	82	\$36,625	1,070
Bolloré	Bluecar	67	160	\$31,416	1,116
BYD Auto	e6	215	122	\$35,000	7,092
Renault	Zoe	87	130	\$33,490	18,931
Toyota	RAV4 EV	154	103	\$49,800	320
Roewe	E50	63	110	\$37,589	412
Fiat	500e	111	100	\$31,800	29,312
BMW	i3	168	81	\$46,400	24,057
Volkswagen	E-Golf	114	93	\$46,000	14,753
Kia	Soul E/V	109	93	\$33,700	9,200
Mercedes	B-Class	177	80	\$41,450	9,034
Tesla	60 RWD	382	210	\$66,000	9,883
Tesla	60 AWD	518	218	\$71,000	6,737
Tesla	70 RWD	382	230	\$70,000	7,258
Tesla	70 AWD	518	240	\$75,000	5,053
Tesla	75 RWD	382	249	\$74,500	5,234
Tesla	75 AWD	518	259	\$79,500	3,722
Tesla	85 RWD	382	265	\$79,900	3,625
Tesla	85 AWD	518	270	\$84,900	2,636
Tesla	85 RWD Perf	470	265	\$93,400	1,598
Tesla	85 AWD Perf	691	253	\$105,000	864
Tesla	85 Ludicrous	762	253	\$115,000	536
Tesla	90 AWD	518	294	\$89,500	1,999
Tesla	90 AWD Perf	691	270	\$112,000	616
Tesla	90 AWD Ludicrous	762	270	\$119,000	448
Tesla	100 Ludicrous	812	315	\$134,500	236

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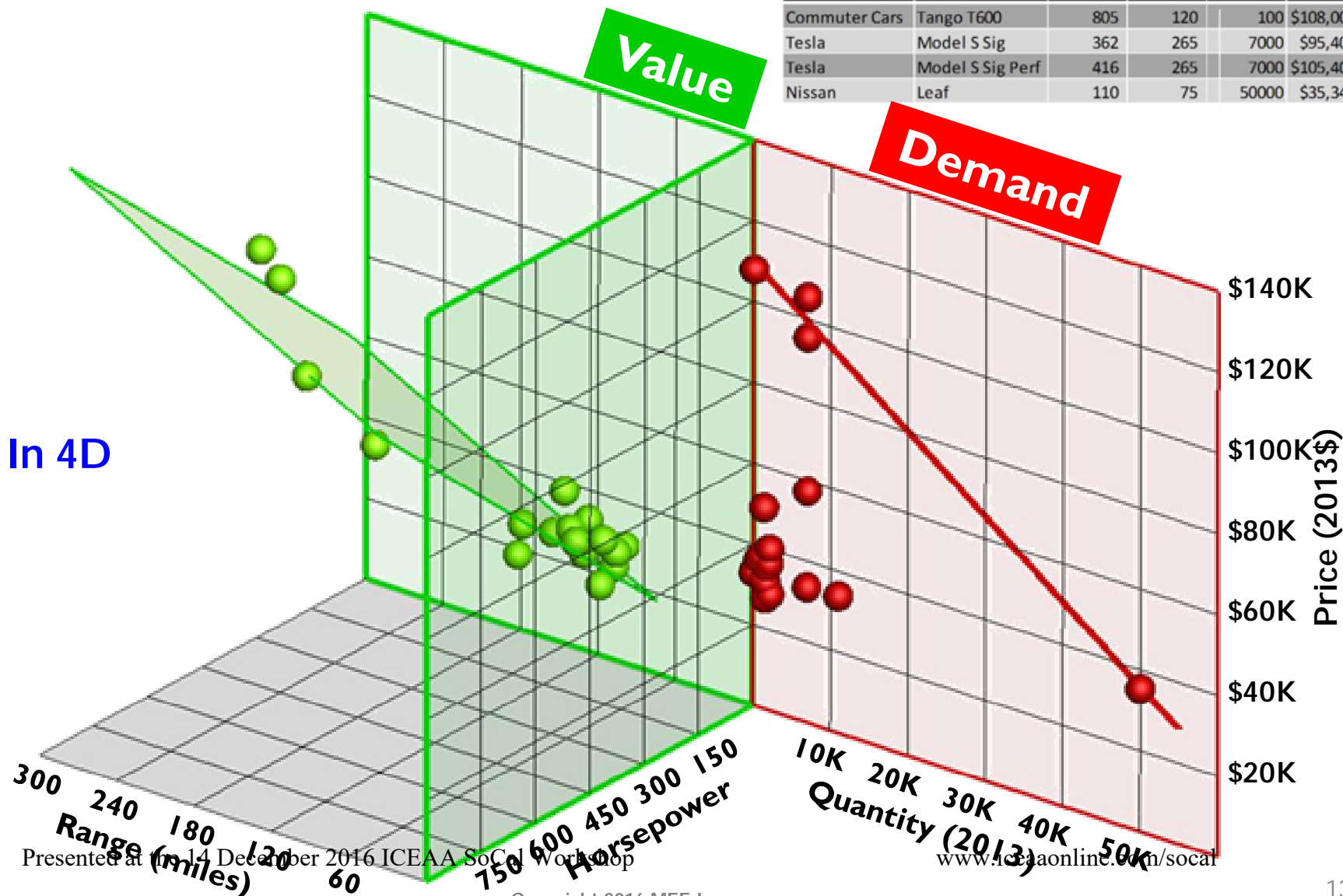
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Consider the 2013 Database

What's the Best Way to Plot this Data?

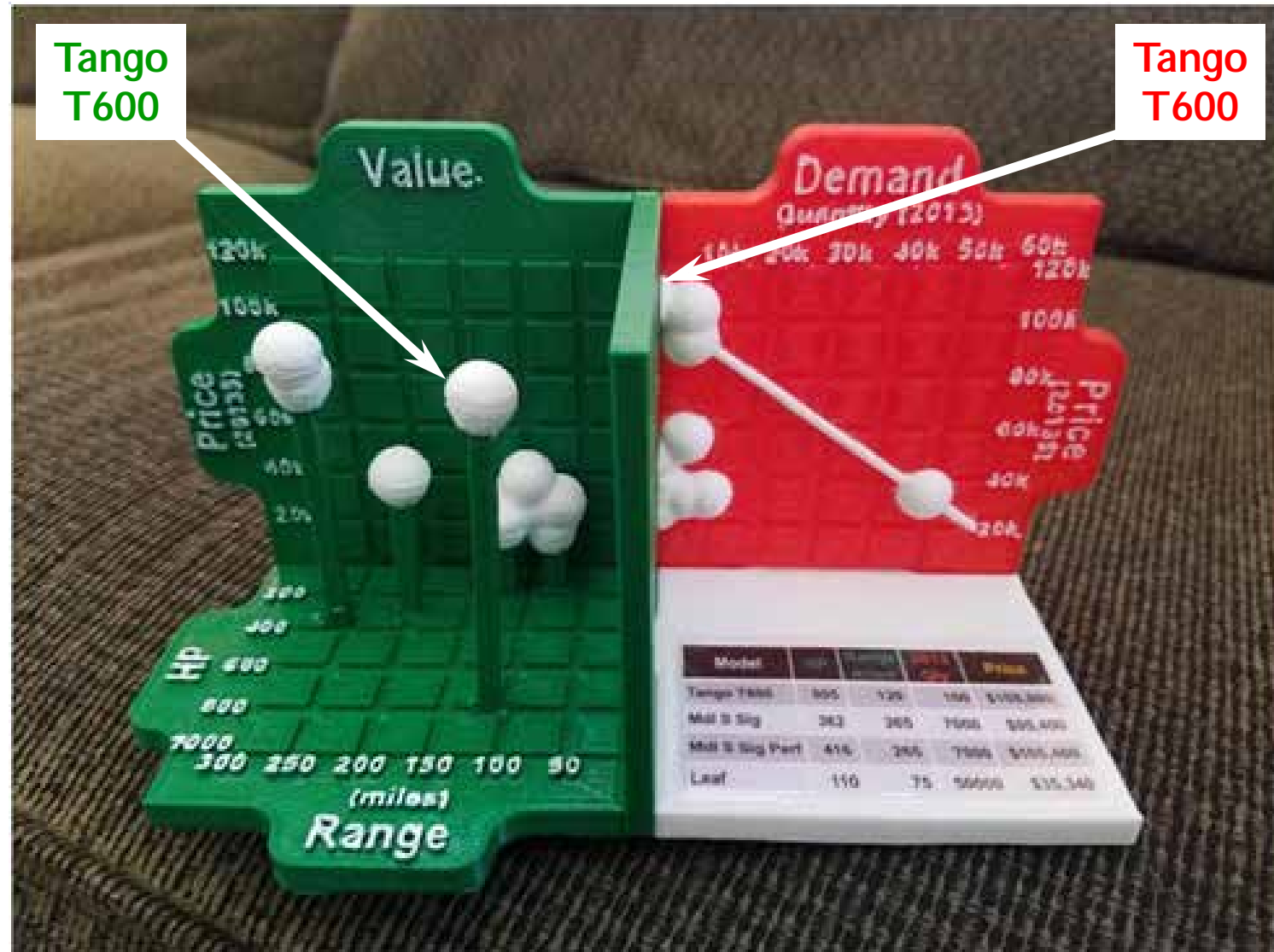


Manufacturer	Model	HP	Range miles	2013 Qty	Price
Commuter Cars	Tango T600	805	120	100	\$108,000
Tesla	Model S Sig	362	265	7000	\$95,400
Tesla	Model S Sig Perf	416	265	7000	\$105,400
Nissan	Leaf	110	75	50000	\$35,340



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4D Solid Model from a 3D Printer



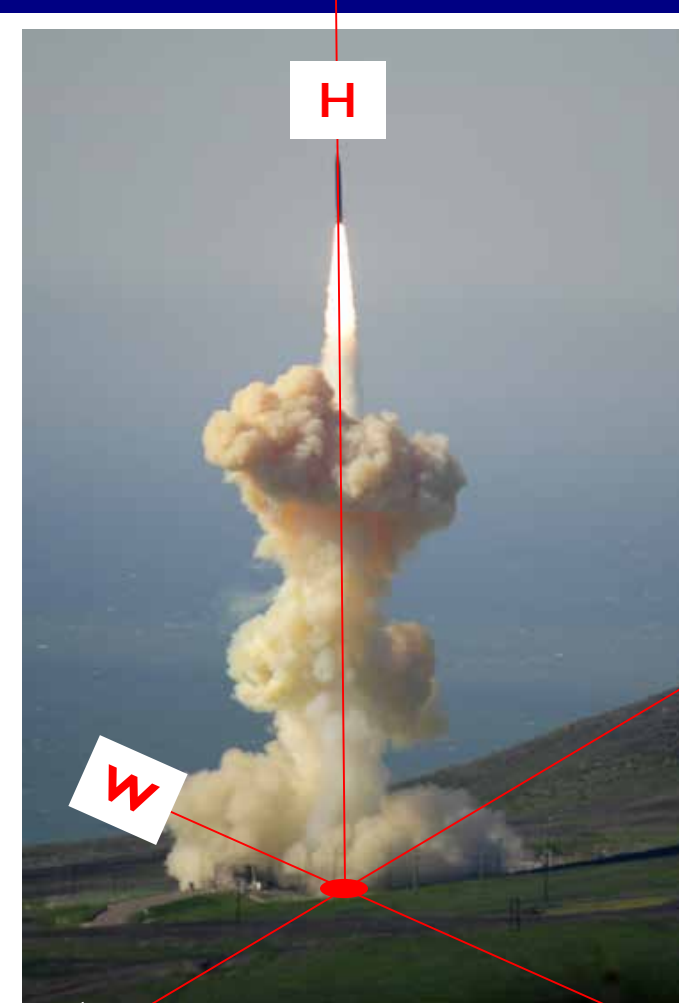
Tango
T600

Tango
T600

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Market Data is Always in 2 States – Value and Demand

Mathematical Axes Do Not Have to be Tied to Physical Axes



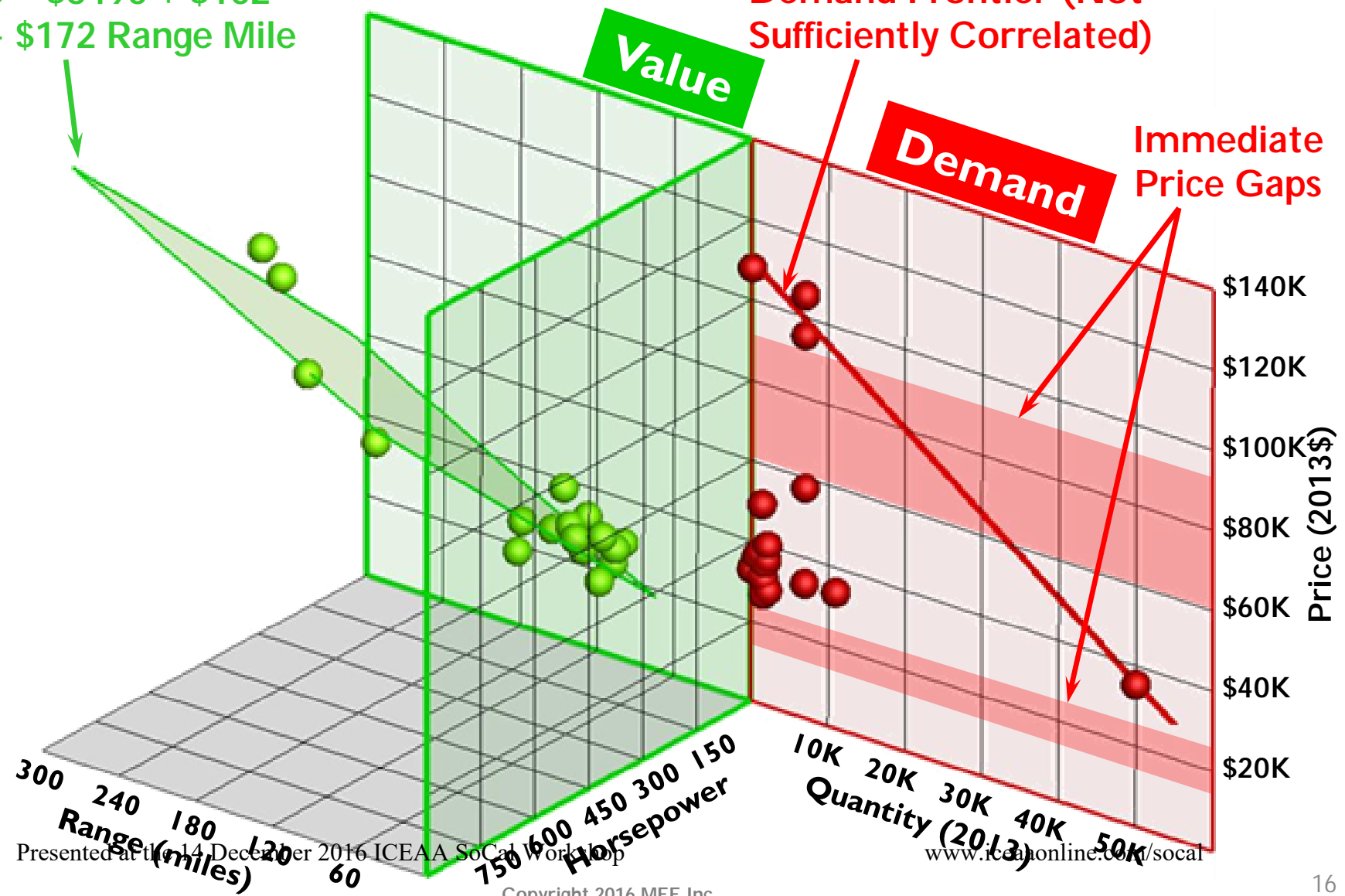
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For What Purposes can We Use This?

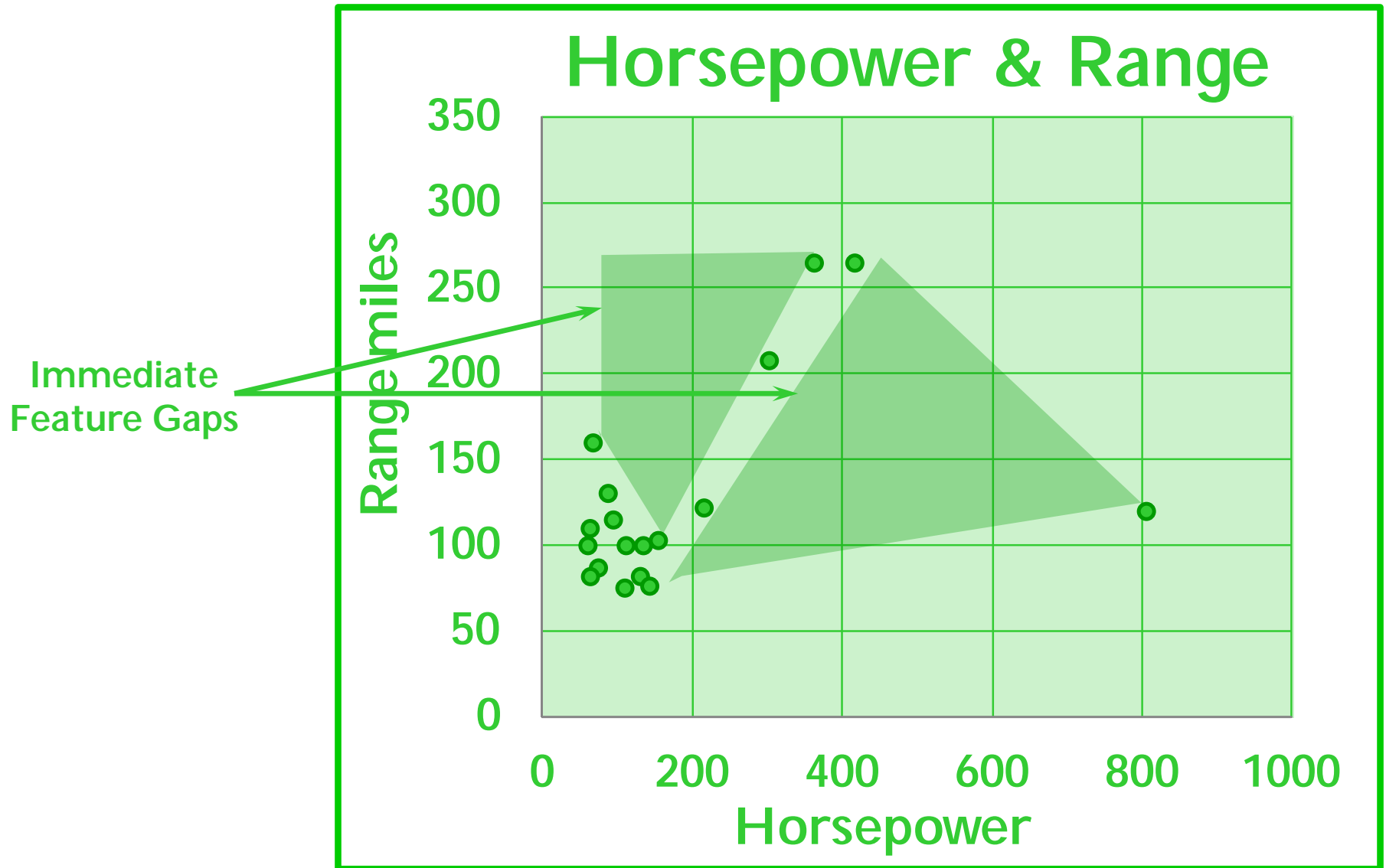


Value = \$6490 + \$102 * H/P + \$172 Range Mile

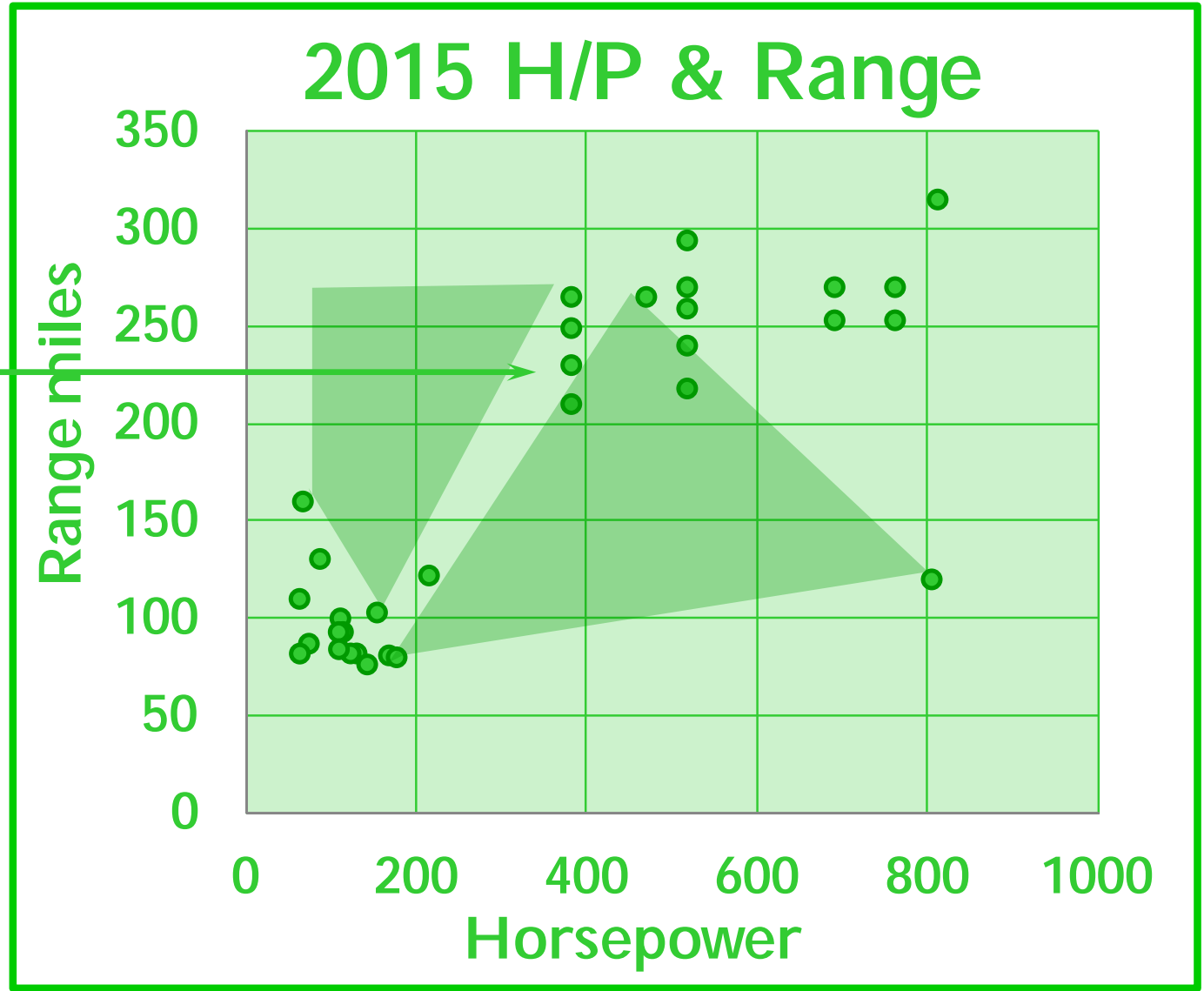


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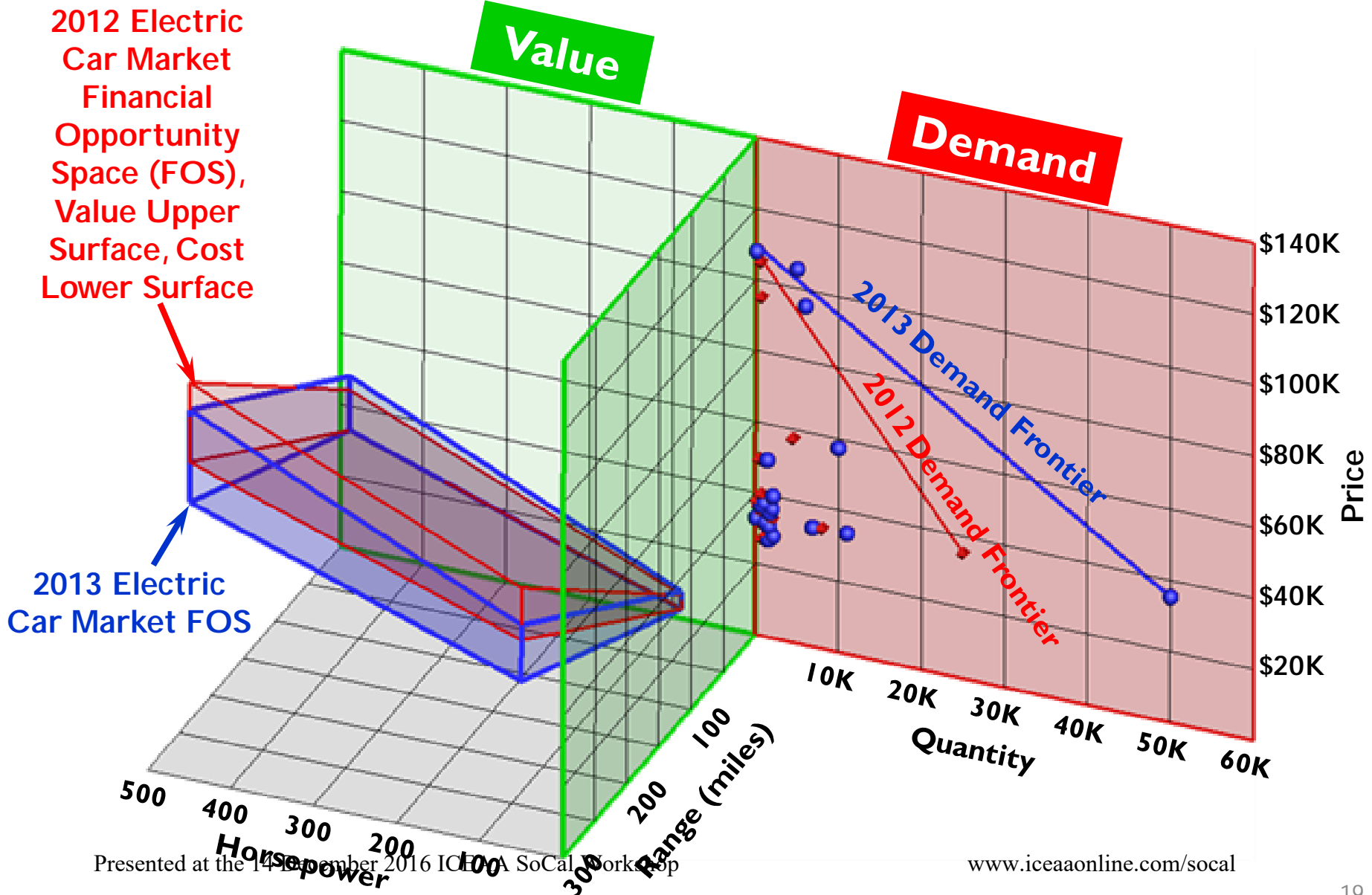
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Tesla Added Many Models



Financial Opportunity Spaces (FOS) are Profitable Regions & Change over Time



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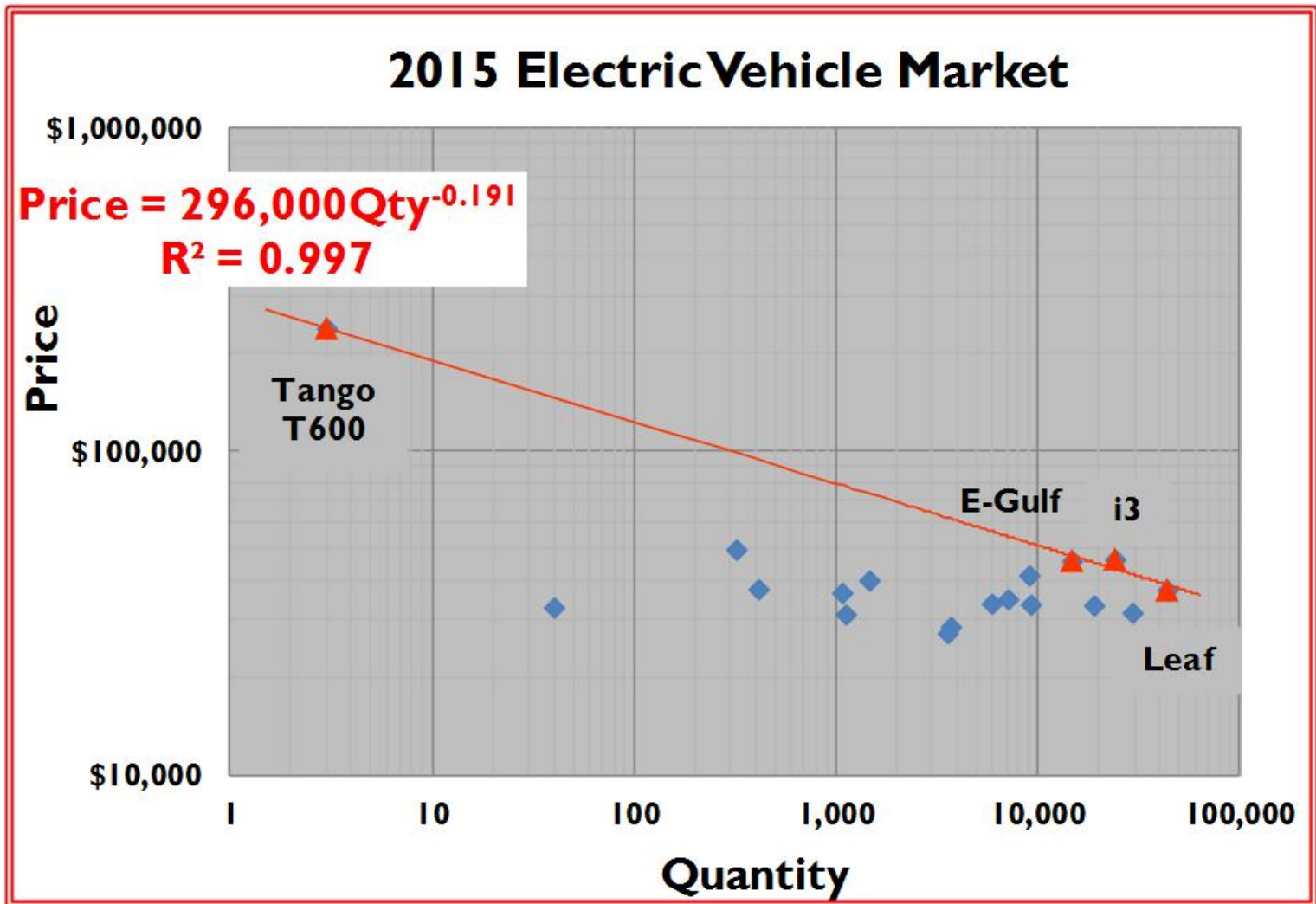
2015 Demand is Tricky: We Don't Know Tesla Model Sales, have Their Total Sales



Here is the Market without Tesla

These are the Outermost Points

They Form a Demand Frontier



We'll Use This Equation to Project Tesla Model Quantities

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In 2015, Tesla Sold 50,445 Cars Spread Over 15 Models



Rearranging the Previous Equation:

$$\text{\$} = 296,000 \text{Qty}^{-0.191}$$

$$\text{\$/296,000} = \text{Qty}^{-0.191}$$

$$\text{Ln}(\text{\$/296,000}) / -0.191 = \text{Ln Qty}$$

$$\text{Exp}(\text{Ln}(\text{\$/296,000}) / -0.191) = \text{Qty}$$

When We Use the Tesla Prices, We Get This

Since we Are Below Tesla Sales, We "Ratio up" to the Correct Total

Model	Price	Back Eqn	Ratio to 2015
60 RWD	\$66,000	2,634	9,883
60 AWD	\$71,000	1,795	6,737
70 RWD	\$70,000	1,934	7,258
70 AWD	\$75,000	1,347	5,053
75 RWD	\$74,500	1,395	5,234
75 AWD	\$79,500	992	3,722
85 RWD	\$79,900	966	3,625
85 AWD	\$84,900	703	2,636
85 RWD Perf	\$93,400	426	1,598
85 AWD Perf	\$105,000	230	864
85 Ludicrous	\$115,000	143	536
90 AWD	\$89,500	533	1,999
90 AWD Perf	\$112,000	164	616
90 AWD Ludicrous	\$119,000	119	448
100 Ludicrous	\$134,500	63	236
			50,445

In 2015, Range Fails as a Feature, due to Cross-Correlation from Tesla H/P



Multidimensional Economic Evaluators MEE4D

File View About

Database Model Analyze 4D Plot

Saved Equations

Delete Current Eqn

Unsaved Model

Dependent Variable Selection

5 Year Vehicle Price

Equation Form Selection

Linear [Y = mX + b]

Include Ping Factor

Sneak Peek

Equation: 5 Year Vehicle Price = +108.1 *HP+53.2 *Range mile+18284.3

Equation Statistics

R²: 95.3% Adj R²: 95.0% Pearsons²: 95.3% CV: 11.1% MAPE: 9.9% F-Test: ok

Regression Term P-Value Test Results

HP: ok Range mile: not significant

Num Observations: 31 **Residual Degrees of Freedom:** 28

Residuals

Unit Space Residuals Standardized Residuals

Data Filtering

Filtering Enabled	Plot Highlight	Variable	Filter	Value	Delete?
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Manufacturer	Computer Cars		<input type="checkbox"/>

File: Electric Car Database R10.xism Using 31 data points out of a possible 32

INDEP VAR CHOICES

Var Name	DV Correl
IN	80%
Length*	77%
Height*	-75%
Appearance	74%
SAFI	72%
Width*	70%
Seats	60%
2015 Sales Qty	-41%
*Model	-Not Numeric
*Manufacturer	-Not Numeric

INDEP VAR SELECTIONS

Variable Name	DV Correl
HP	97%
Range miles	91%

CLEAR SELECTIONS SAVE EQUATION VIEW FULL REGRESSION RESULTS

HP & Range mile highly corr'd (90%)

Copy Equation

Apply New Filter

This is the Model Tab in MEE4D

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H/P and Appearance Do Better



Multidimensional Economic Evaluators MEE4D

File View About

Database Model Analyze 4D Plot

Saved Equations

Delete Current Eqn

Unsaved Model

Dependent Variable Selection

5 Year Vehicle Price

Equation Form Selection

Linear [Y = mX + b]

Include Ping Factor

INDEP VAR CHOICES

Var Name	DV Correl
Range miles	91%
LW	80%
Length*	77%
Height*	-75%
LWR	-73%
Width*	70%
Seats	60%
2015 Sales Qty	-41%
*Model	-Not Numeric
*Manufacturer	-Not Numeric

CLEAR SELECTIONS SAVE EQUATION

INDEP VAR SELECTIONS

Variable Name	DV Correl
HP	97%
Appearance	74%

VIEW FULL REGRESSION RESULTS

Sneak Peek

Equation: 5 Year Vehicle Price = +111.9 *HP + 2354.4 *Appearance + 11175.8

Copy Equation

Equation Statistics

R²: 96.1% Adj R²: 95.8% Pearson's²: 96.1% CV: 10.2% MAPE: 7.5% F-Test: ok

Regression Term P-Value Test Results

HP: ok Appearance: ok

Num Observations: 31 Residual Degrees of Freedom: 28

Residuals

Unit Space Residuals Standardized Residuals

Data Filtering

Filtering Enabled: Plot Highlight:

Variable	Filter	Value	Delete?
Manufacturer	>=	Compass Cars	<input type="checkbox"/>

Apply New Filter

File: Electric Car Database R10.xism Using 31 data points out of a possible 32

Each H/P Adds \$112, Each Appearance Point Adds \$2,350

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H/P, Appearance and Quantity Sold in a Power Form Equation



Multidimensional Economic Evaluators: MEE4D

File View About

Database Model Analyze 4D Plot

Saved Equations

Delete Current Eqn

Unsaved Model

Dependent Variable Selection

5 Year Vehicle Price

Equation Form Selection

Power [Y = aX^b]

Include Ping Factor

Sneak Peek

Equation: 5 Year Vehicle Price = 4270.35 *HP^{0.4158} *Appearance^{+0.3742} *2015 Sales^{-0.0460} (incl Ping Factor)

Equation Statistics

R²: 96.6% Adj R²: 96.2% Pearsons²: 96.6% CV: 9.4% MAPE: 7.7% F-Test: ok

Regression Term P-Value Test Results

HP: ok 2015 Sales: ok
Appearance: ok

Num Observations: 31 Residual Degrees of Freedom: 27

Residuals

Unit Space Residuals Standardized Residuals

Data Filtering

Filtering Enabled Plot Highlight

Variable	Filter	Value	Delete?
Manufacturer	>=	Commodor Cars	<input type="checkbox"/>

Apply New Filter

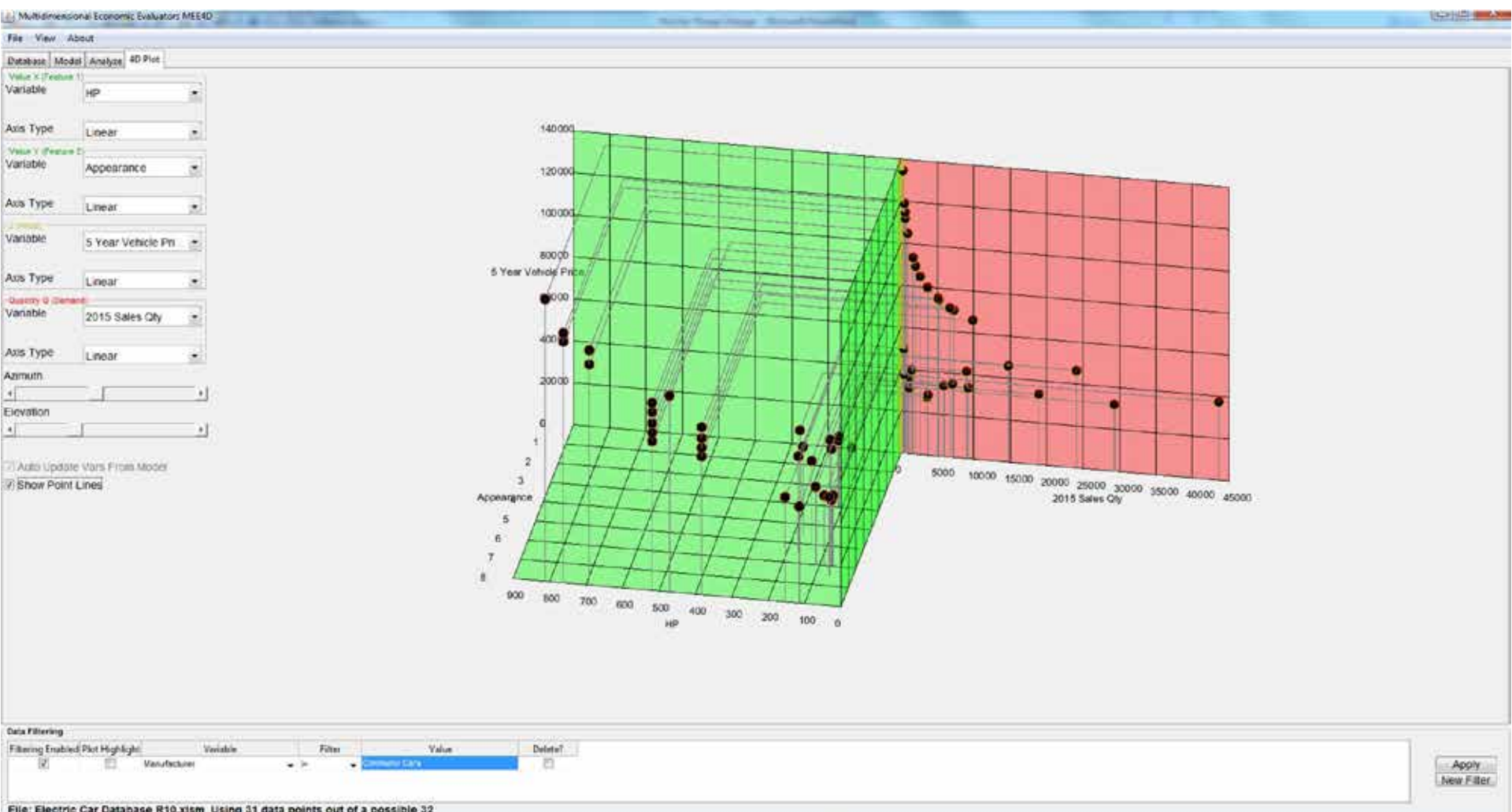
File: Electric Car Database R10.xism Using 31 data points out of a possible 32

The Quantity Term forms a Product Demand Curve

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Markets Self-Organize into 4D Systems



The "Point Lines" Reveal the Dual States for Every Observation

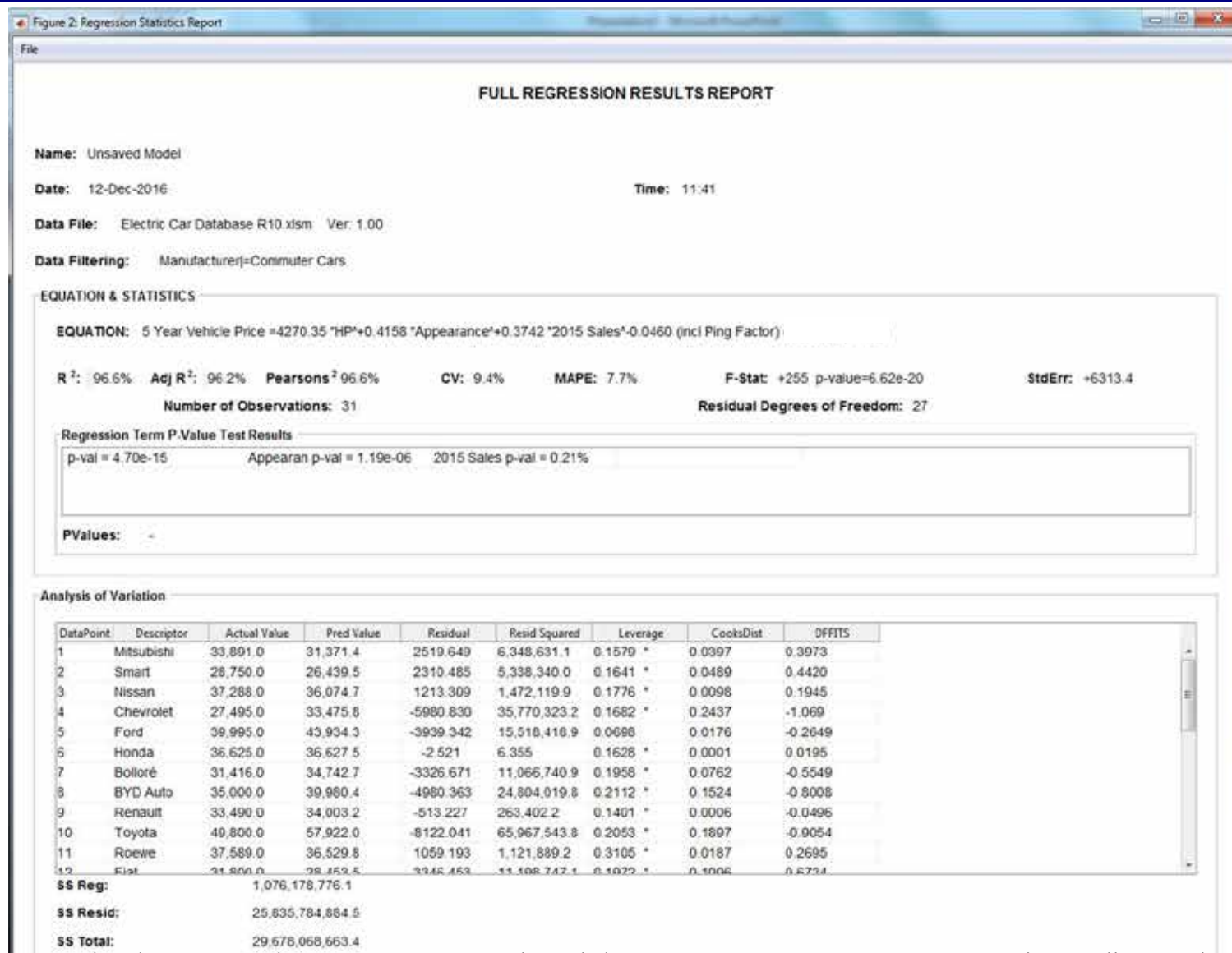
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This is the 4D Plot Tab in MEE4D

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The Residuals Give Buyers Insight Into the Best Deals – Immediate Aiming



Looking at the Residuals from an Immediate Buyer's Point of View



Model	Actual Price	Predicted Price	Residuals
60 AWD	\$71,000	\$83,381	-\$12,381
70 AWD	\$75,000	\$84,491	-\$9,491
RAV4 EV	\$49,800	\$57,922	-\$8,122
75 AWD	\$79,500	\$85,686	-\$6,186
60 RWD	\$66,000	\$72,181	-\$6,181
Spark EV	\$27,495	\$33,476	-\$5,981
e6	\$35,000	\$39,980	-\$4,980
Focus Electric	\$39,995	\$43,934	-\$3,939
Bluecar	\$31,416	\$34,743	-\$3,327
70 RWD	\$70,000	\$73,212	-\$3,212
85 AWD	\$84,900	\$87,056	-\$2,156
B-Class	\$41,450	\$42,442	-\$991
Zoe	\$33,490	\$34,003	-\$513
Fit EV	\$36,625	\$36,628	-\$3

These are Good Buys on the High End

This is a Good Buy at the Low End

Looking at the Residuals from a Manufacturer's Immediate Point of View



Model	Actual Price	Predicted Price	Residuals
100 Ludicrous	\$134,500	\$117,259	\$17,241
90 AWD Ludicrous	\$119,000	\$110,886	\$8,114
85 RWD Perf	\$93,400	\$85,552	\$7,848
90 AWD Perf	\$112,000	\$104,920	\$7,081
85 Ludicrous	\$115,000	\$109,975	\$5,025
85 RWD	\$79,900	\$75,586	\$4,314
Soul E/V	\$33,700	\$29,784	\$3,916
i3	\$46,400	\$42,799	\$3,602
500e	\$31,800	\$28,454	\$3,346
E-Gulf	\$46,000	\$42,861	\$3,139
i-MiEV	\$33,891	\$31,371	\$2,520
ED	\$28,750	\$26,440	\$2,310
85 AWD Perf	\$105,000	\$103,301	\$1,699
90 AWD	\$89,500	\$88,170	\$1,330
Leaf	\$37,288	\$36,075	\$1,213
E50	\$37,589	\$36,530	\$1,059
75 RWD	\$74,500	\$74,321	\$179
Fit EV	\$36,625	\$36,628	-\$3

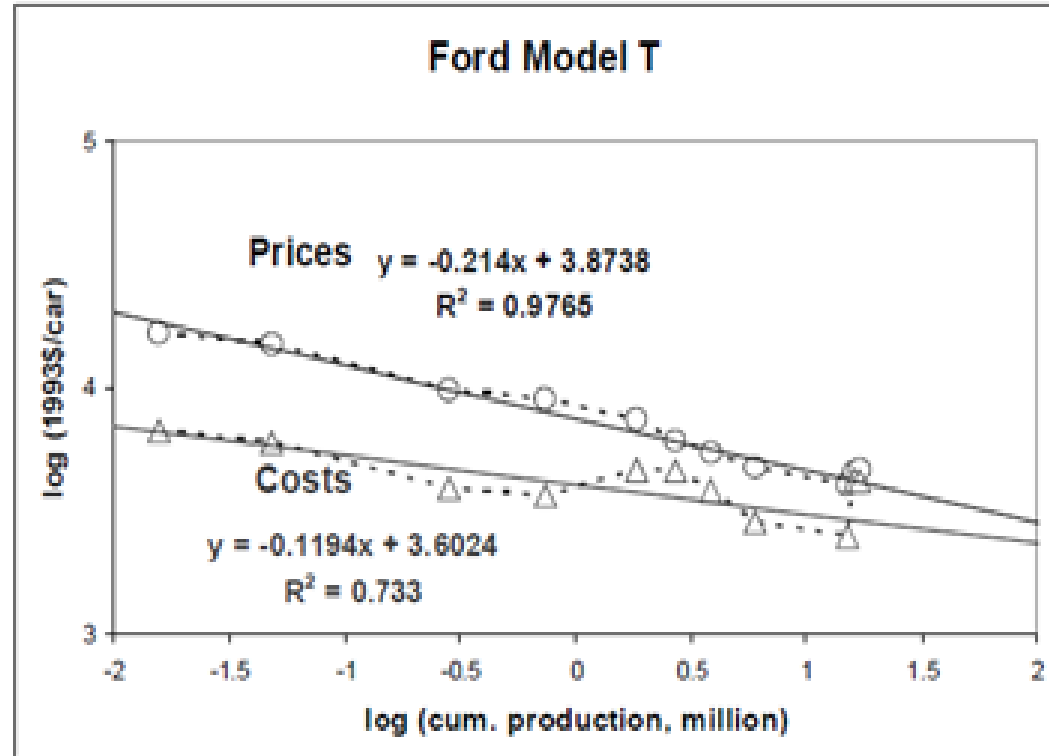
← This Maybe Overpriced

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If a Product's Cost Exceeds its Value, Profits Cease, the Line Halts³

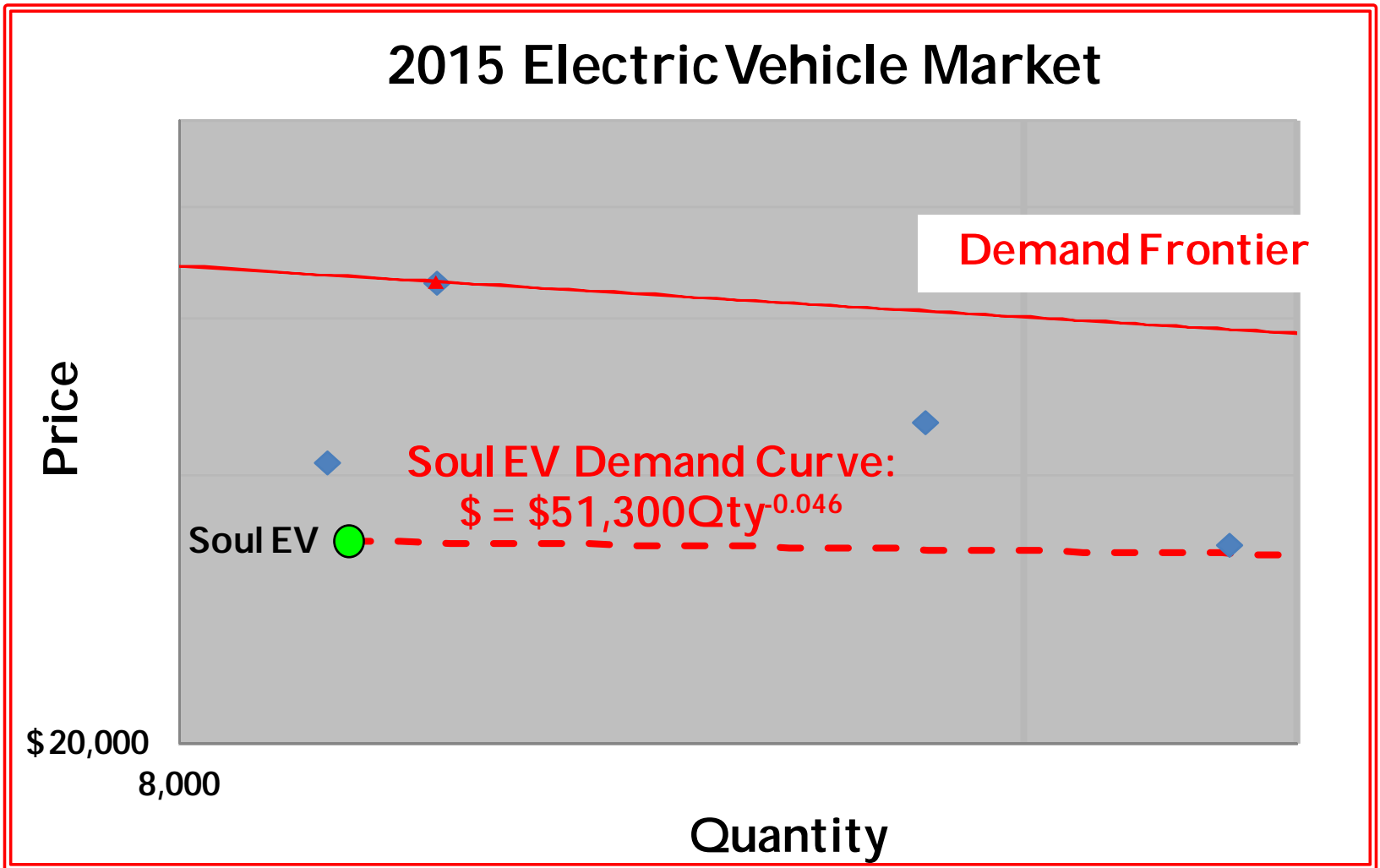
Improved Economics: Prices vs. Costs



Source: Based on Abernathy&Ward, 1975

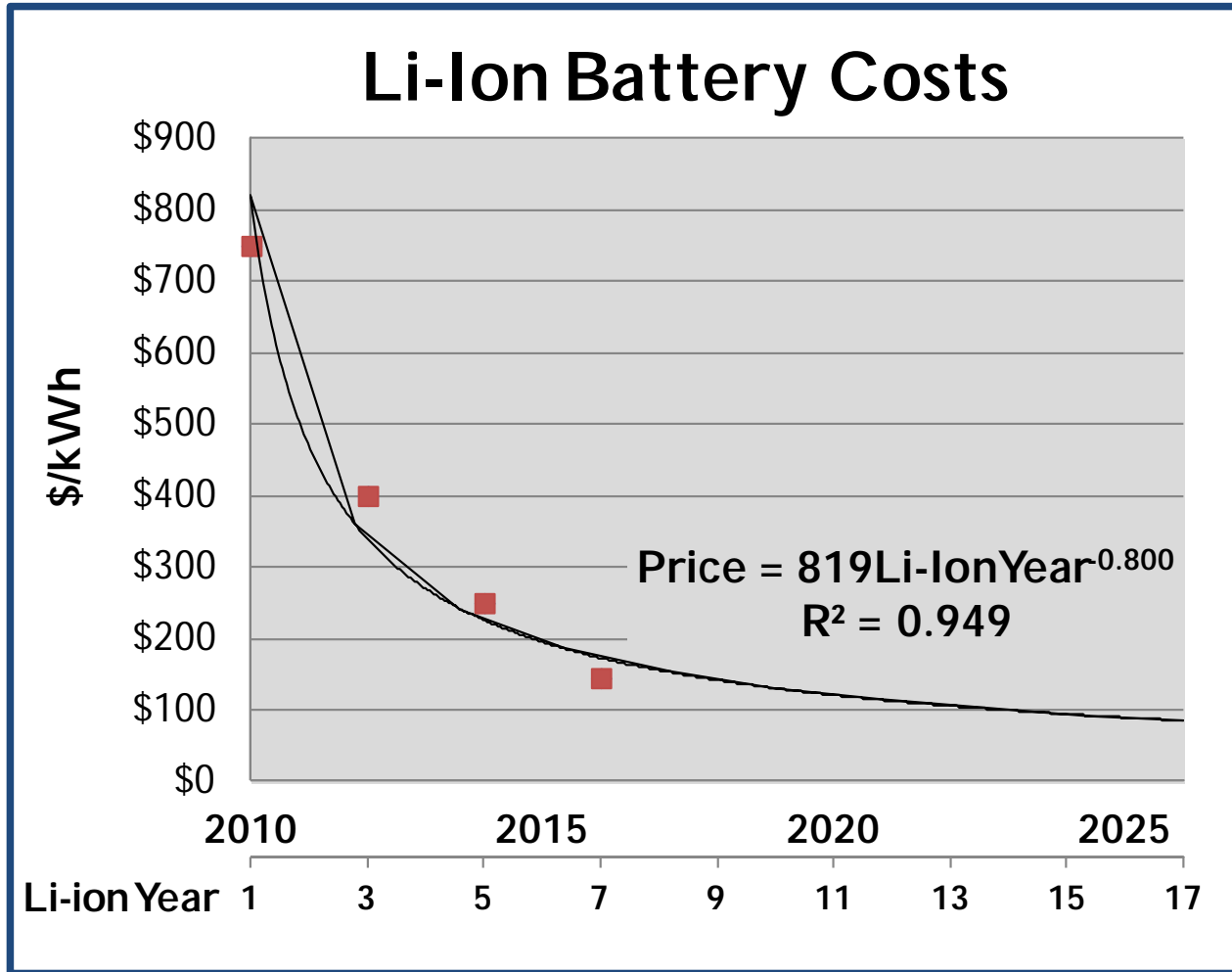
Ford Made Over 15 Million Model Ts

Consider the Product Demand Curve Slope and the Kia Soul EV



The Soul EV Value Falls Just Over \$1000 as Quantity Goes from 9.6K to 20K

Li-Ion Battery Costs, A Major Cost Component, Have Fallen Dramatically⁴



This Bodes Well for the Industry, as this Cost Curve is Much Steeper than the Product Demand Curve, as Shown for the Kia Soul EV

A Detailed Analysis Would Examine Motors, Electronics, Crashworthiness, Etc.

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- **Markets Self-Organize to Form**
 - Value Response Surfaces
 - Demand Curves
 - 4D States
- **Gaps Exist in Markets with Respect to**
 - Features
 - Prices
- **Immediate Aiming takes Place in the Short Term**
- **Ultimate Aiming Occurs in the Long Term**
- **4D Analysis Reveals Immediate and Ultimate Aiming Possibilities for**
 - Buyers
 - Sellers
 - **New Market Entrants**

- 1) Picture of shooter retrieved December 6, 2016 from <http://www.shotguncombogauge.com/UPSS.html>
- 2) Missile picture retrieved December 6, 2016 from: <http://www.raytheon.com/capabilities/missiledefense/>
- 3) Abernathy, William, *Productivity Dilemma: Roadblock to Innovation in the Automobile*, The Johns Hopkins University Press, 1978, 279, ISBN-13: 978-0801820816
- 4) Battery prices retrieved December 12, 2016 from: https://en.wikipedia.org/wiki/Electric_vehicle_battery