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Demand, Recurring Costs, And Profitability

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"So it is said that if you know your enemies and know yourself, you can win a hundred battles without a single loss. If you only know yourself, but not your opponent, you may win or may lose. If you know neither yourself nor your enemy, you will always endanger yourself."

The Art of War by *Sun Tzu*

Outline

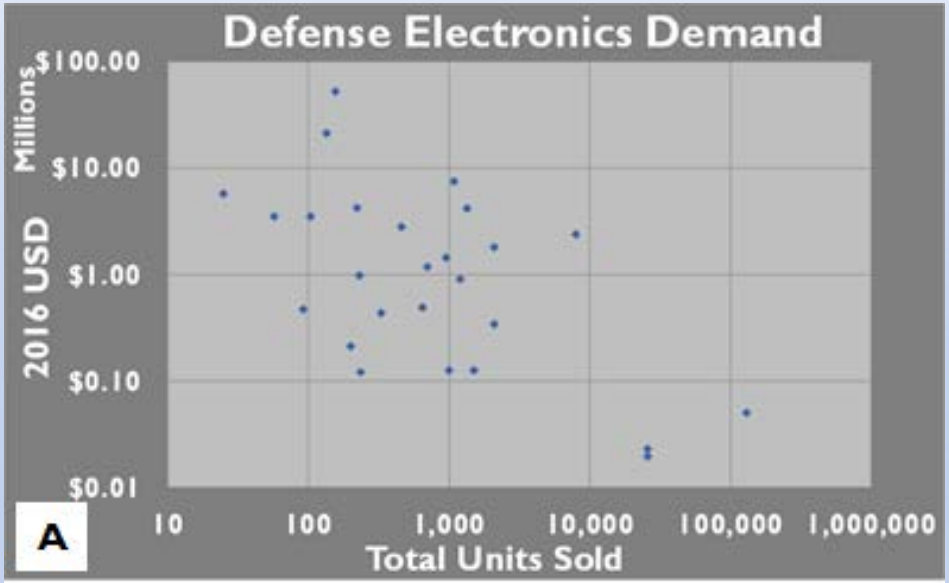
- Fuzzy demand
- Market limits
  - Demand Frontier
  - Market Aggregate Demand
- Price responsiveness & limit enforcement
- Working with the Demand Frontier

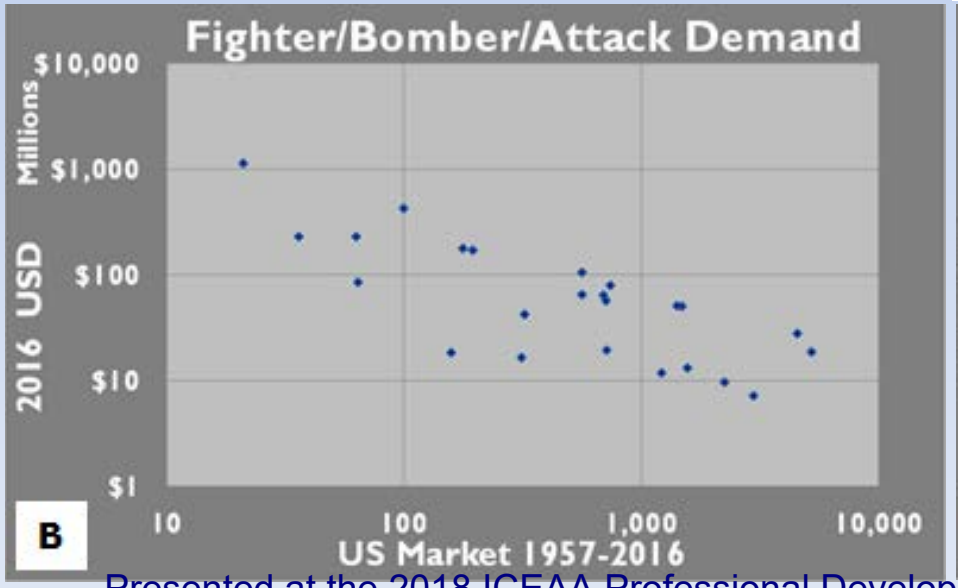
In This Section

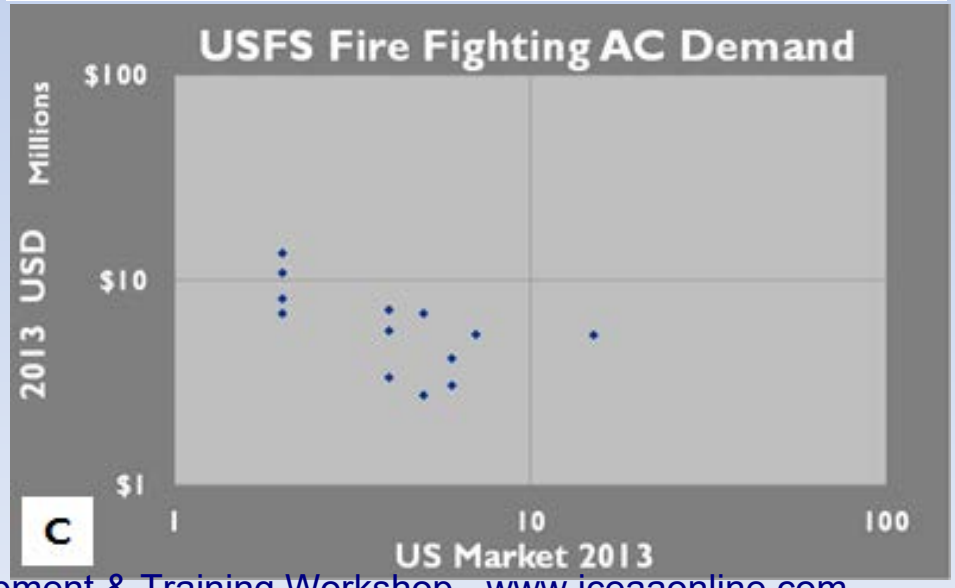
Fuzzy Demand

Fuzzy Demand: Here Are The Quantity-Price Points For Three Markets

Simply regressing the data will not provide much insight – What will?



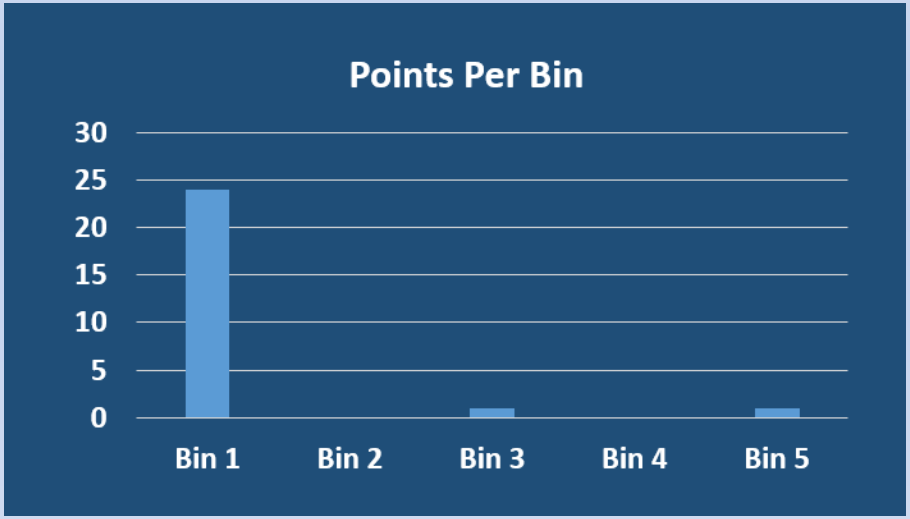




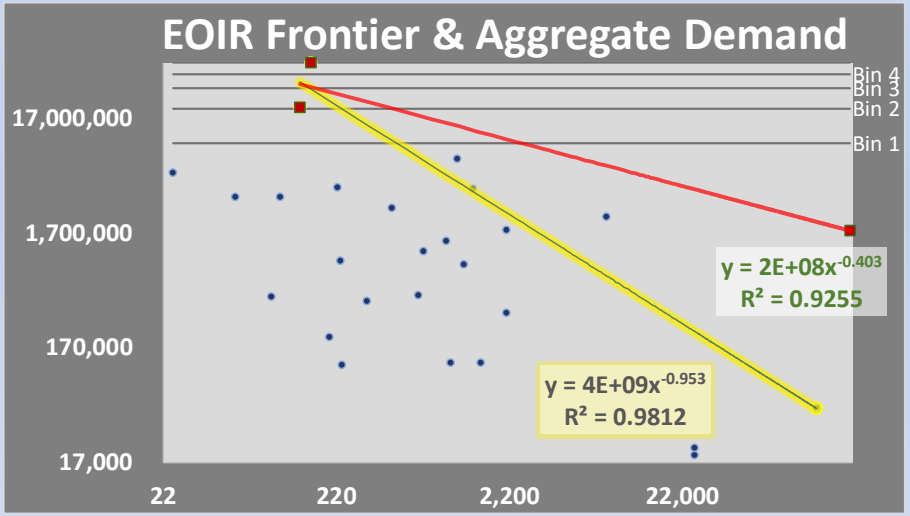
Market Limits

Let's Examine Defense Electronics By Evenly Binning Models By Price

We begin by dividing the models into bins evenly spaced by price; note that the lowermost bin has most of the data



Market Aggregate Demand, indicated by the red line, is the regressed value of the red points in each bin, the total quantity and weighted average price

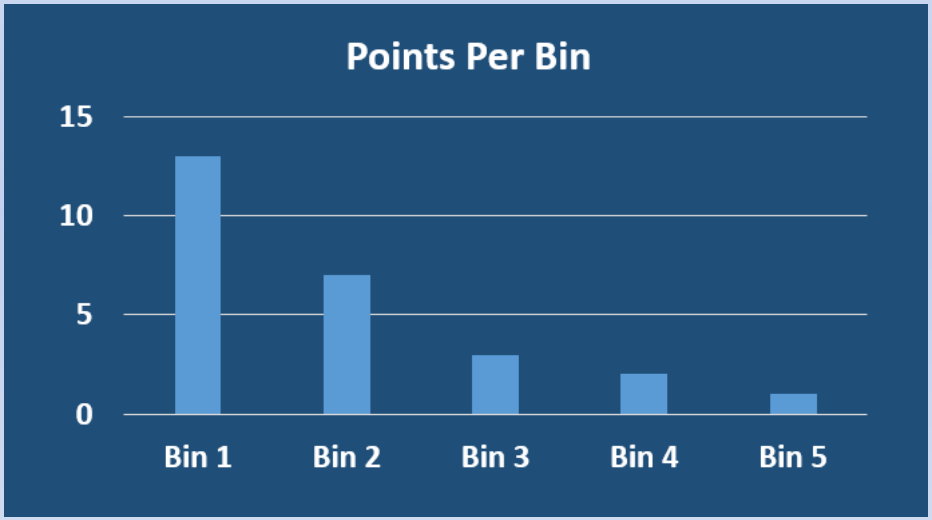


The Demand Frontier is defined by the outermost points in the data, selected as the rightmost and next rightmost points in each bin – this is good but not great

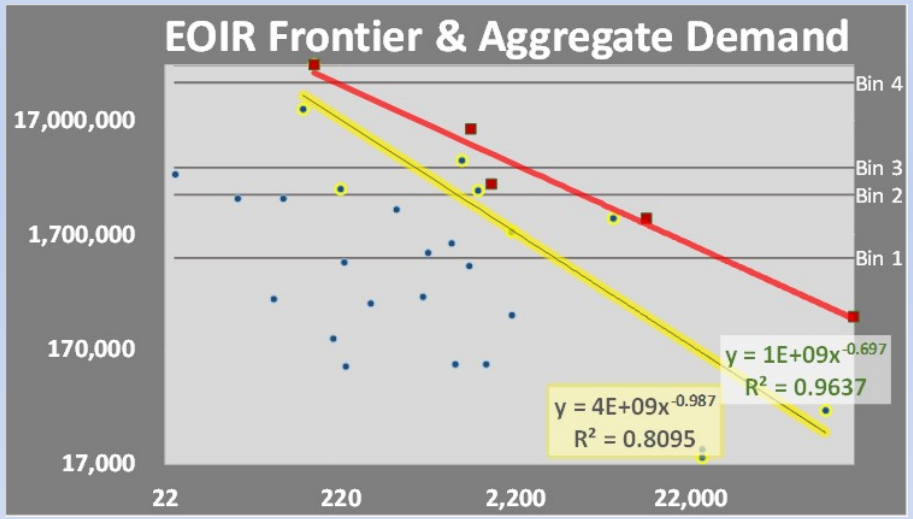
We will try another technique to see if we can improve results

Instead Of Even Binning, Here We Use Bins Based On A Geometric Series

Geometrically based binning provides a more regular pattern to the analysis



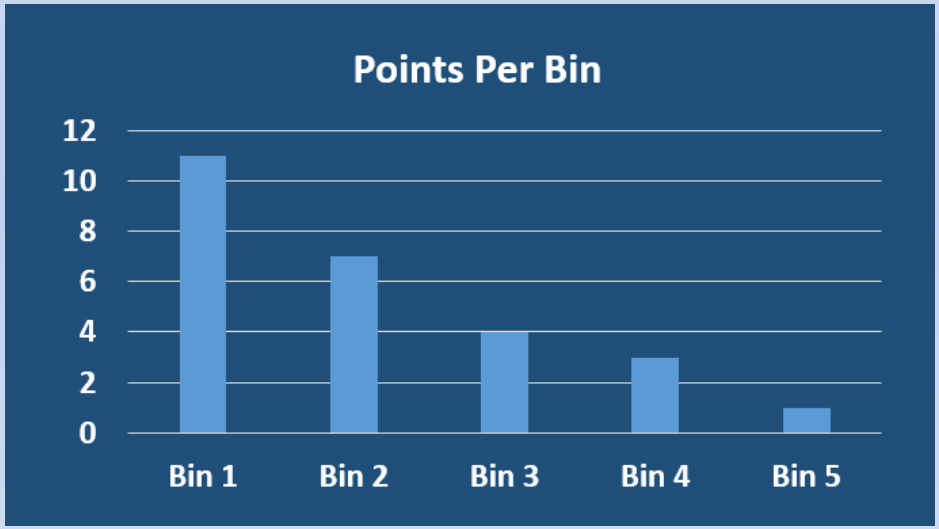
This has improved Market Aggregate Demand correlation, but we've made no attempt to improve our Demand Frontier Analysis here



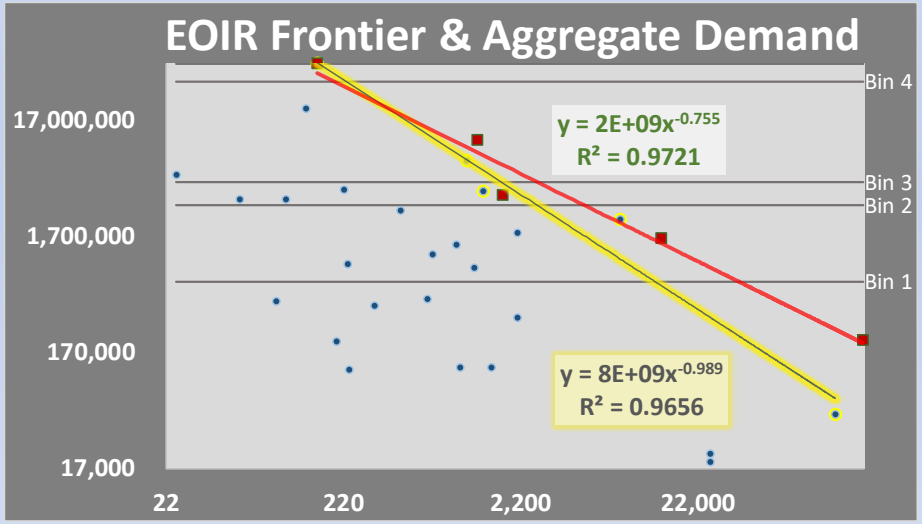
We will try a third technique to see if we can improve results

Now We Will Try Binning Based On the Fibonacci Series

Fibonacci based binning provides an even more regular pattern to the analysis



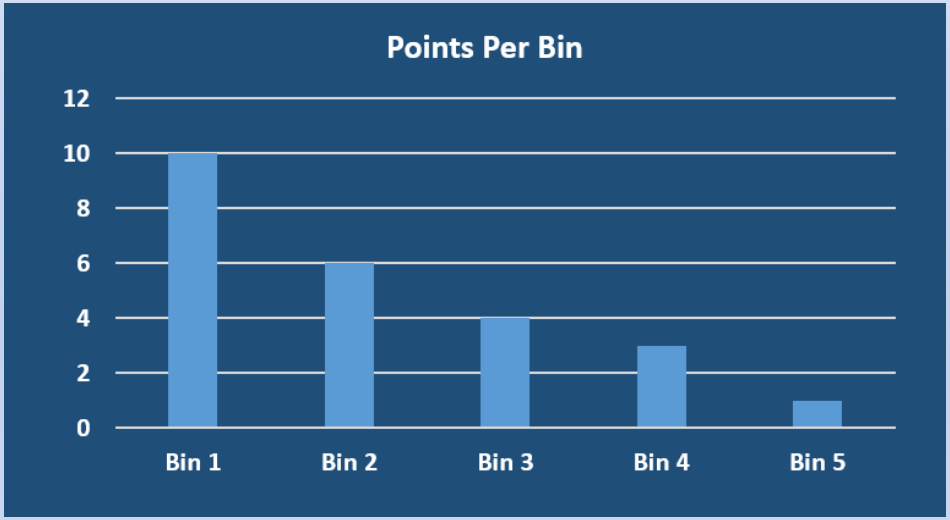
In this case, we now have our best Market Aggregate Demand and Demand Frontier correlations and P-values



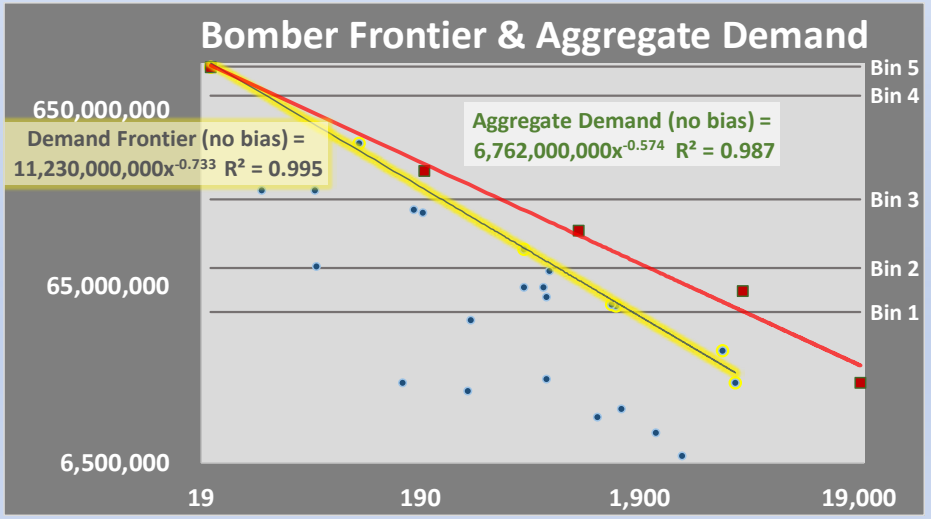
Price Responsiveness & Limit Enforcement

Let's Consider Market For Fighters, Bombers And Attack Aircraft

Fibonacci based binning again provides a regular pattern to the analysis



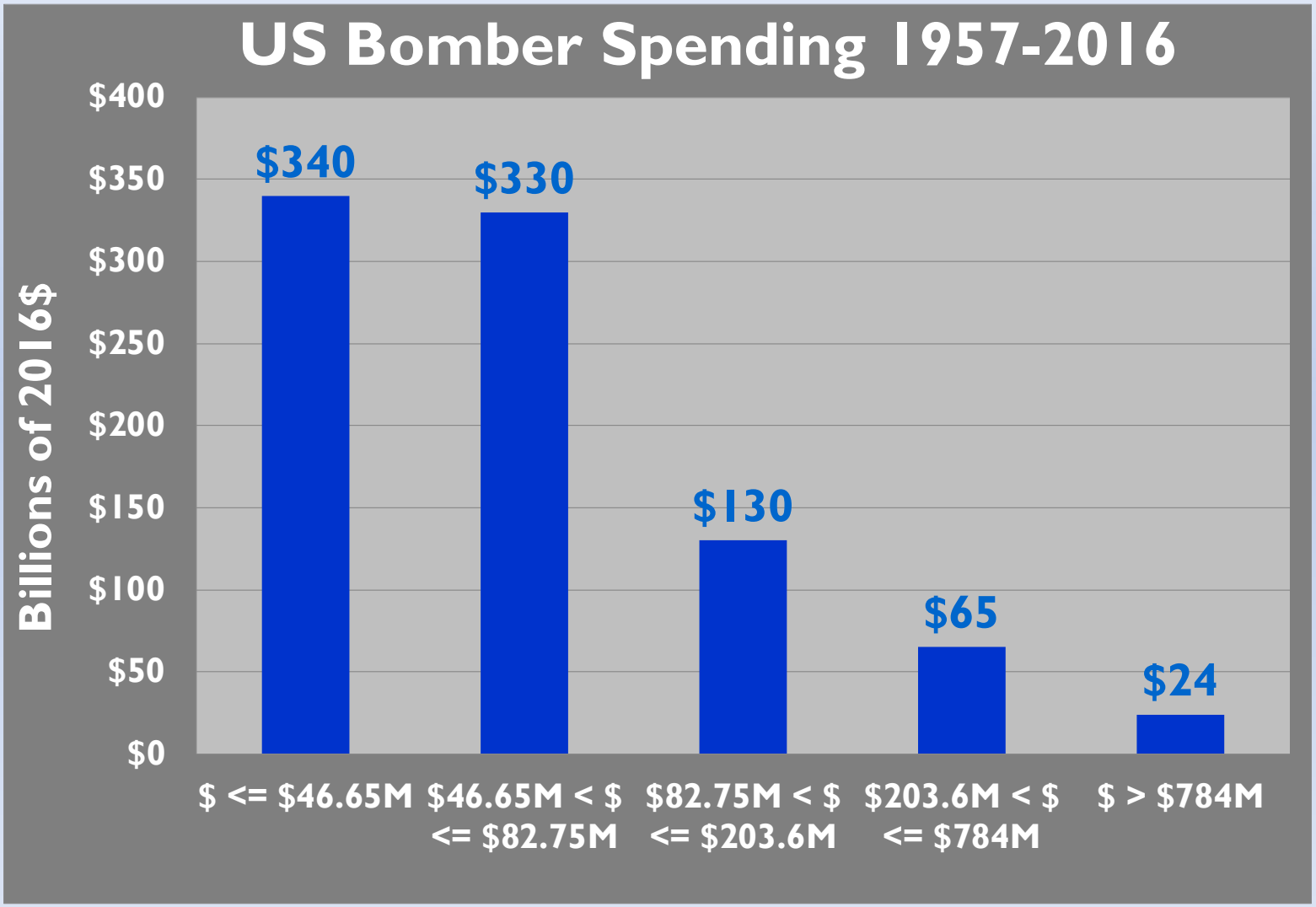
The Demand Frontier and Aggregate Demand Curves are well-correlated



Curve	Pearson's^2	P-Value	Standard Error
Demand Frontier	99.7%	6.79E-09	$33.5M
Aggregate Demand	99.9%	0.07%	$28.7M

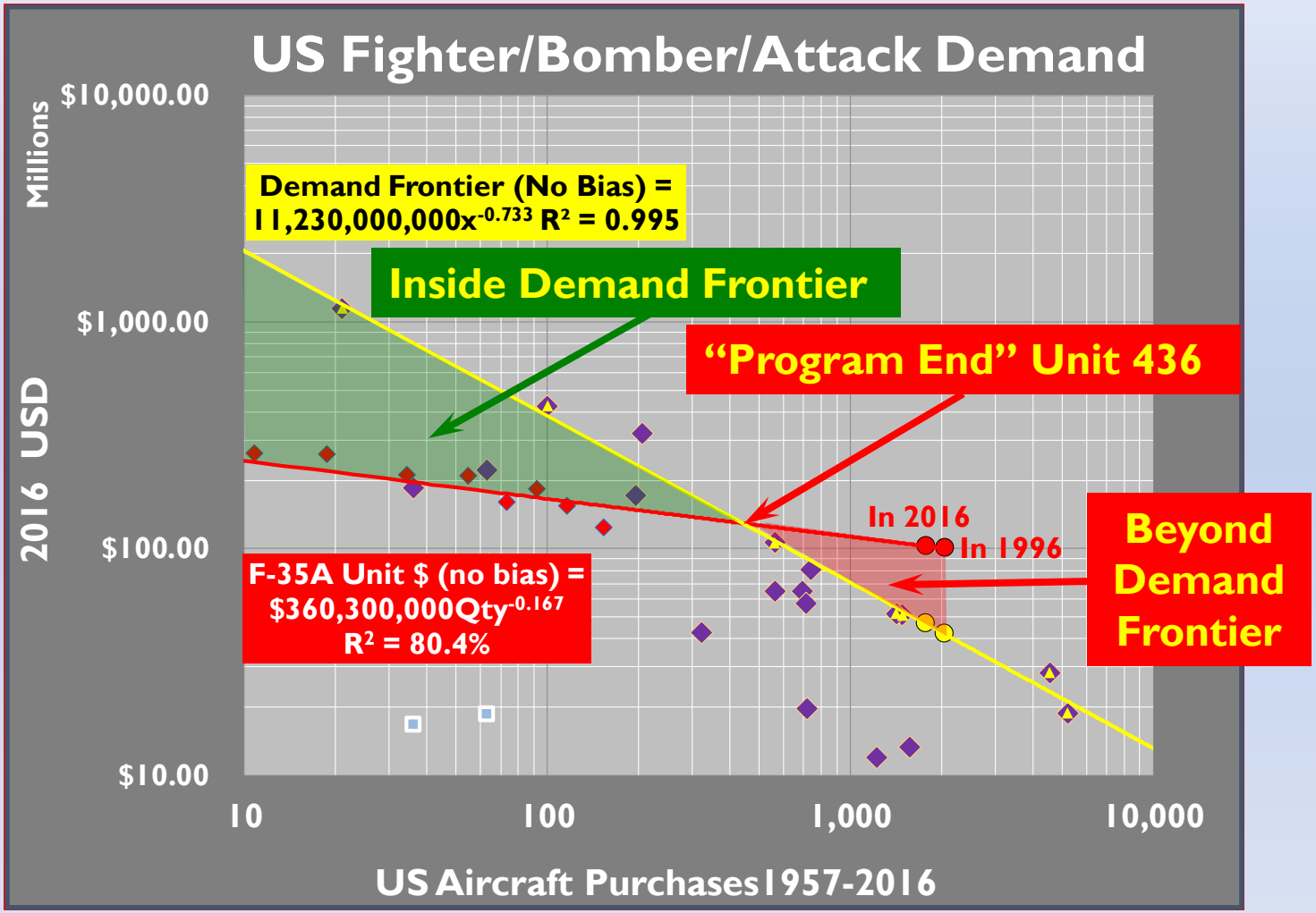
What can we do with this analysis?

First, We Might Want To Know Where All Of The Money Goes



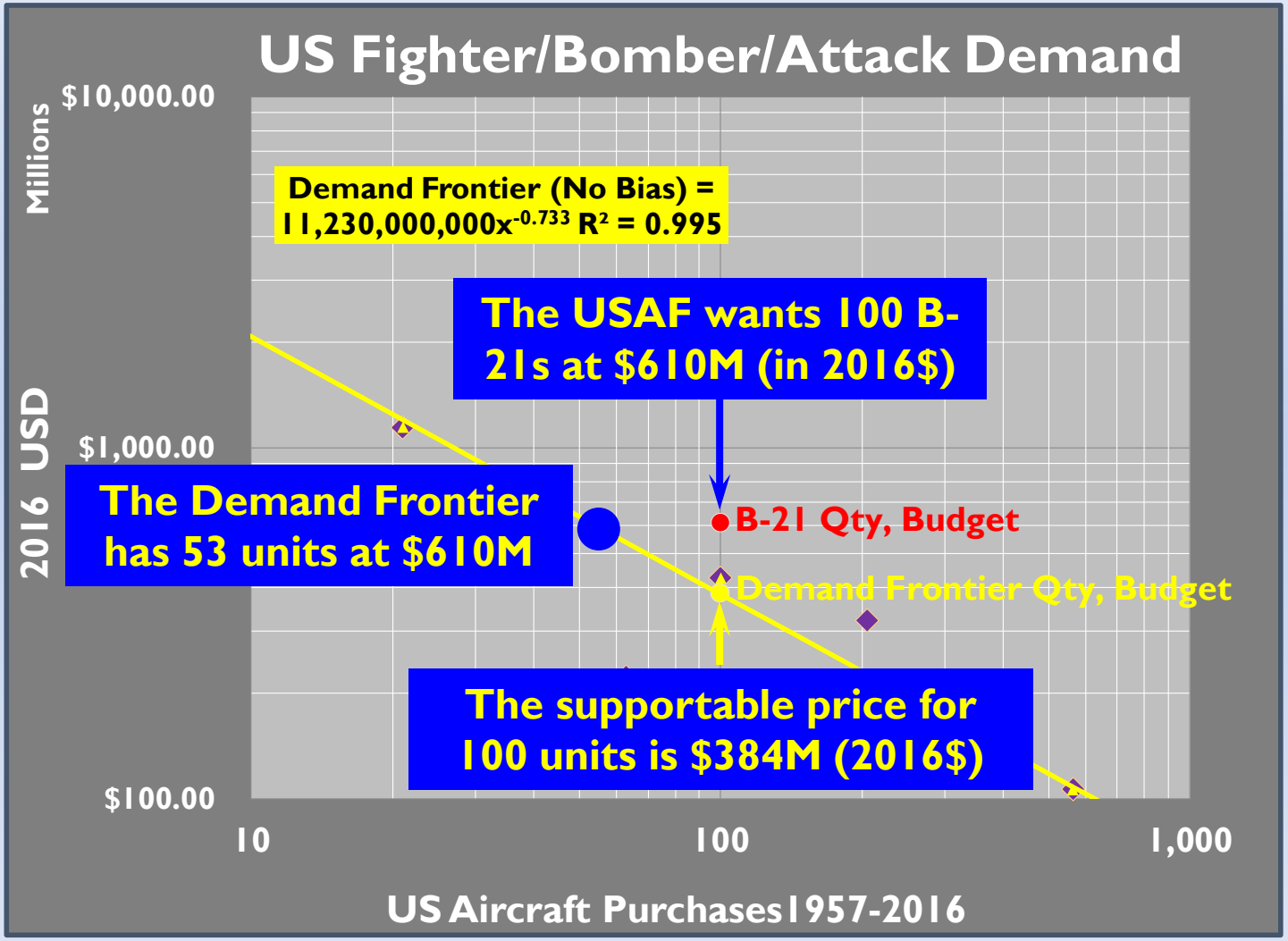
The vast majority of the monies go to the lower-priced models

What Does This Mean For Ongoing Models, Such As The F-35A?



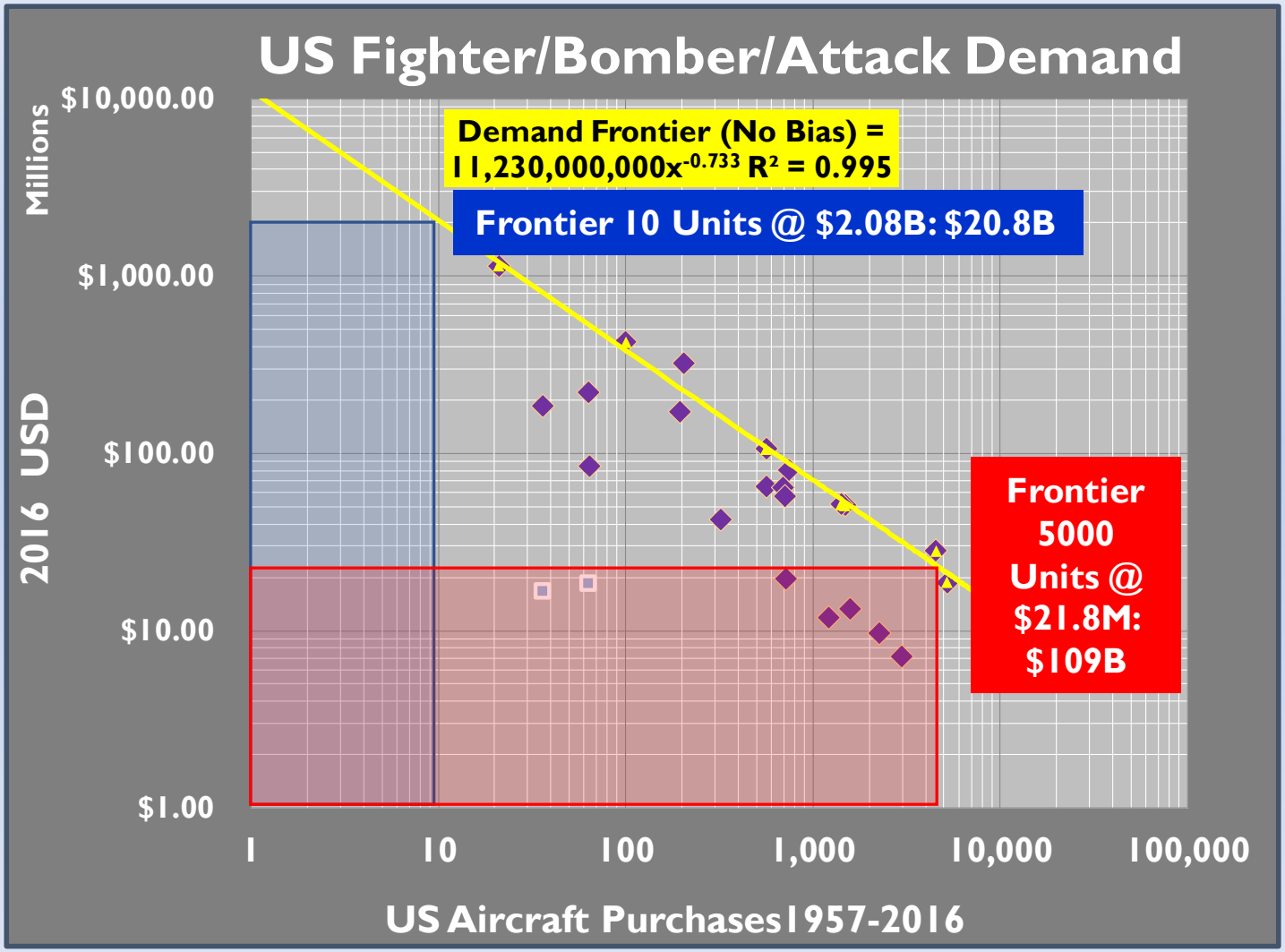
Year	Sales Goal	Frontier $	F-35A $	Difference	Std. Devs.
1996	2036	$42,200,000	$100,900,000	$58,700,000	1.8
2016	1763	$46,900,000	$103,400,000	$56,500,000	1.7

What About The B-21?



Year	Sales Goal	Frontier $	B-21 Target $	Difference	Std. Devs.
2016	100	$384,000,000	$610,000,000	$56,500,000	6.7

What Does The Demand Frontier Show Us About Unit And Revenue Potential?



There is more money available for the lower-priced models

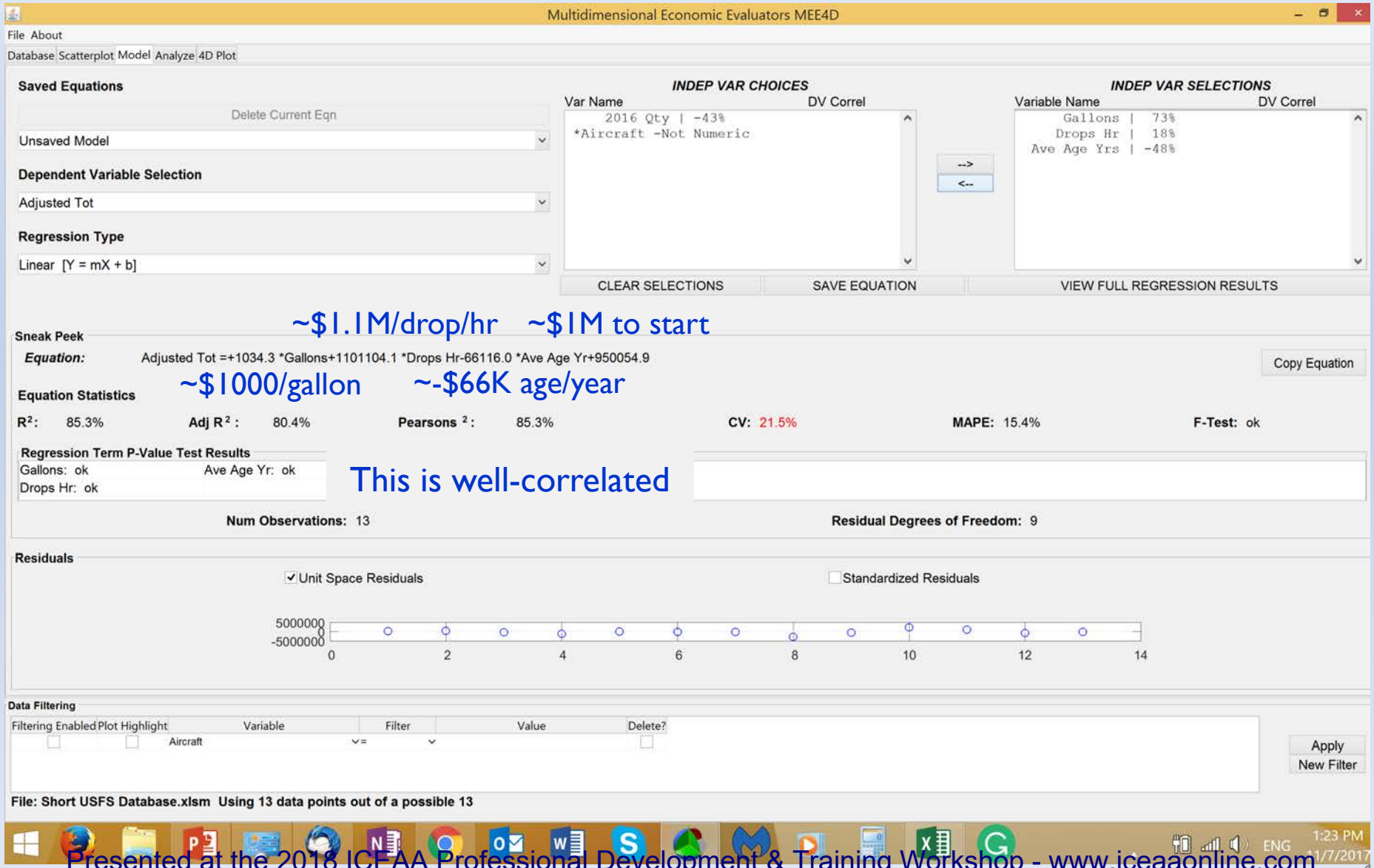
Working with the Demand Frontier

Let's Entertain The United States Forest Service (USFS) Firefighting Operations

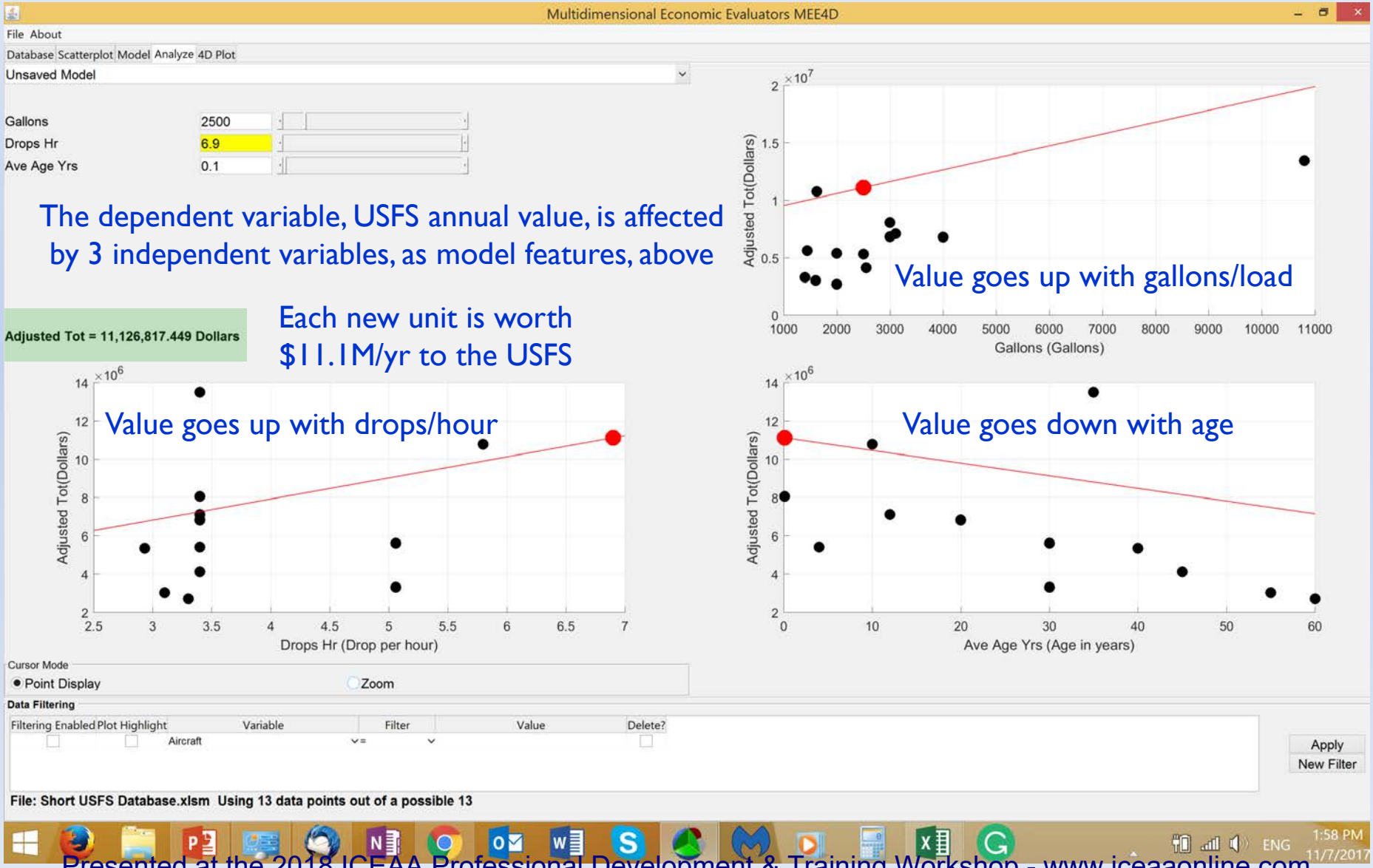
Model	$/season/unit	Gallons/drop	Drops/hr from 10	Ave. Age (Years)	2013 Qty
Bae 146	$6,855,000	3,000	3.4	20	5
P2V	$3,050,000	1,600	3.1	55	6
P3	$4,134,000	2,550	3.4	45	6
C27J	$5,432,000	2,000	3.4	4	7
C130XJ	$8,078,000	3,000	3.4	0.1	2
DC10	$13,500,000	10,800	3.4	35	2
CV580	$2,725,000	2,000	3.3	60	5
CL215 piston	$3,331,000	1,400	5.1	30	4
CL215 turbine	$5,640,000	1,440	5.1	30	4
CL415	$10,780,000	1,620	5.8	10	2
S64	$5,365,000	2,500	2.9	40	15
MD87	$6,831,000	4,000	3.4	20	2
RJ85	$7,126,000	3,110	3.4	12	4

What supports the prices that these models fetch?

Firefighting Aircraft Value Is A Function Of Capacity, Speed And Age



A New Plane Enters The Market: 2,500 Gallons, 6.9 Drops/Hr, 0.1 Yrs Old



The dependent variable, USFS annual value, is affected by 3 independent variables, as model features, above

Each new unit is worth $11.1M/yr to the USFS

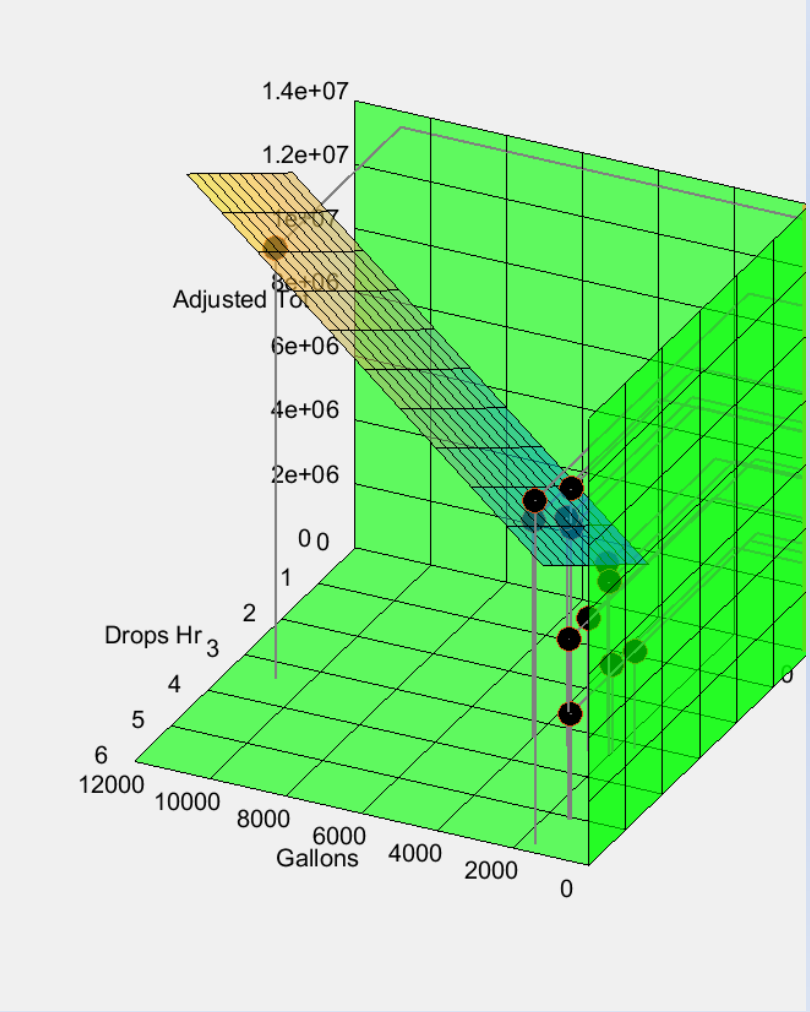
Value goes up with gallons/load

Value goes up with drops/hour

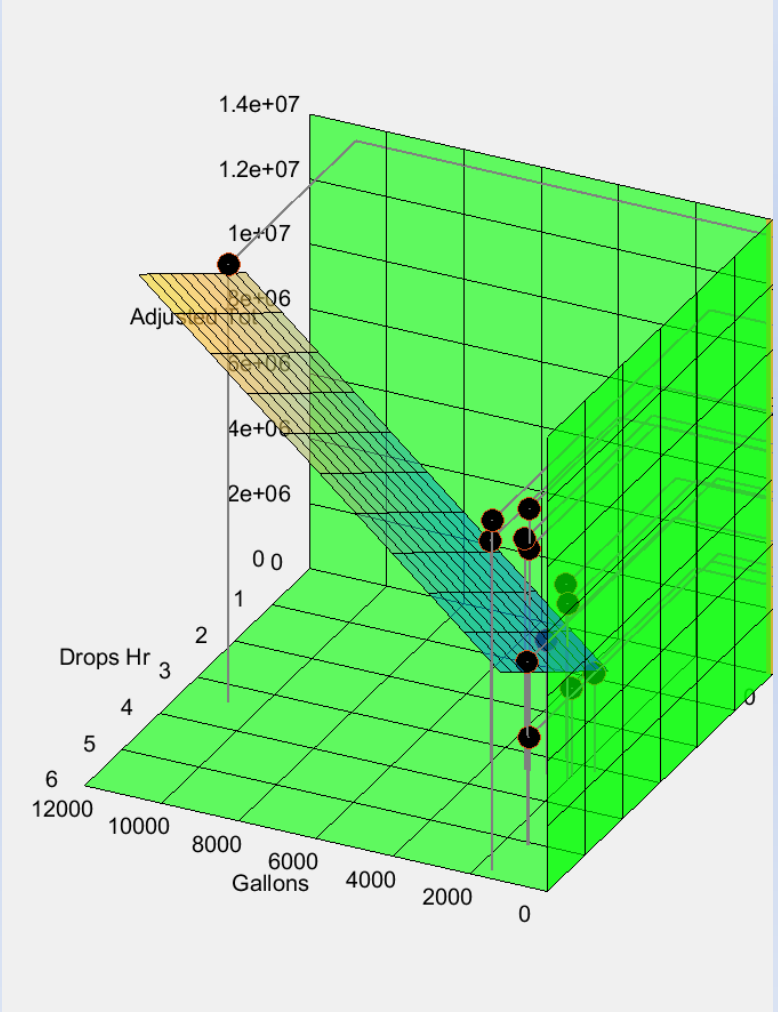
Value goes down with age

Here Are A Pair Of 3D Views Of USFS Firefighting Aircraft Value

This is the value of a new model

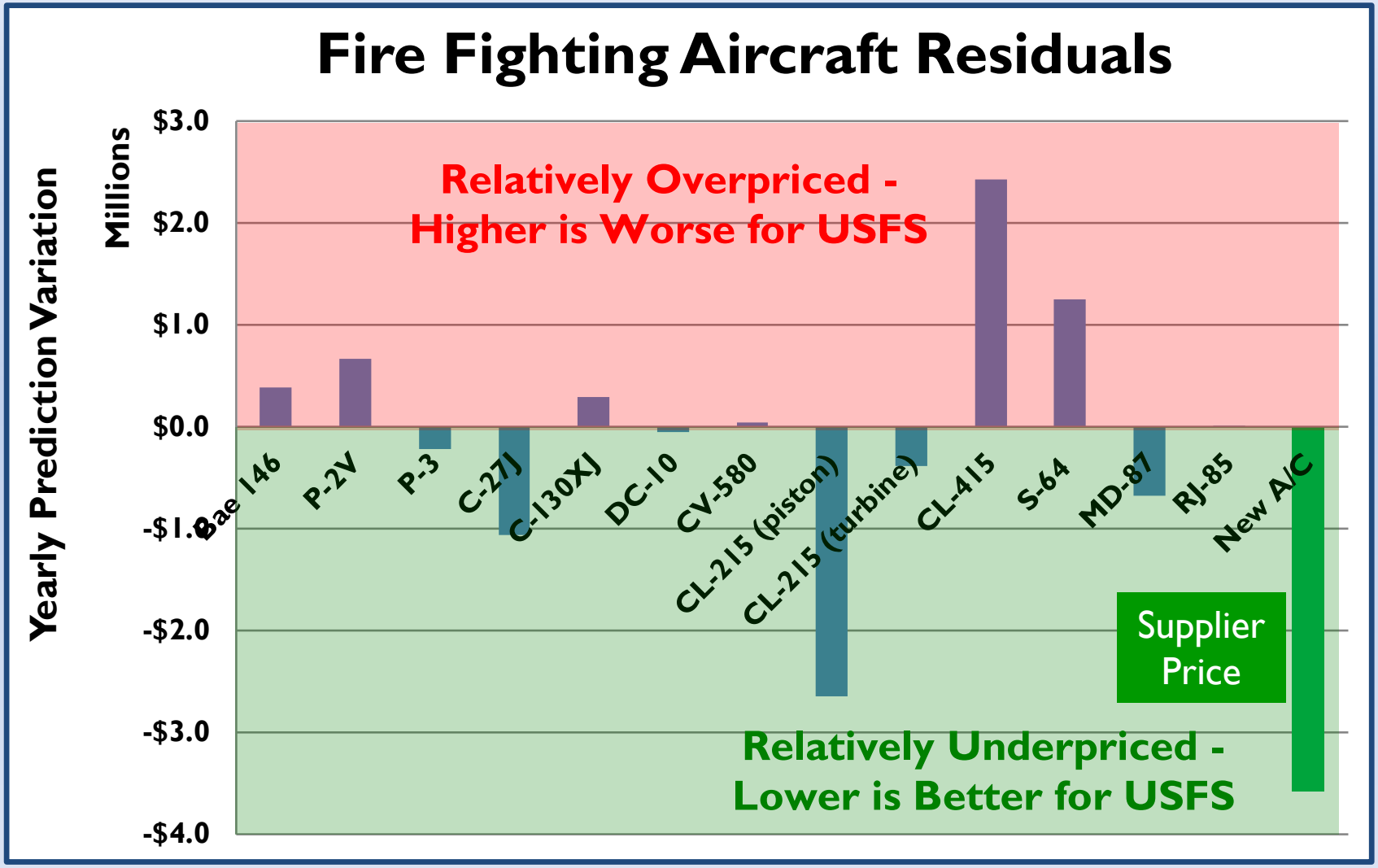


Here's the value of a 40 yr old model



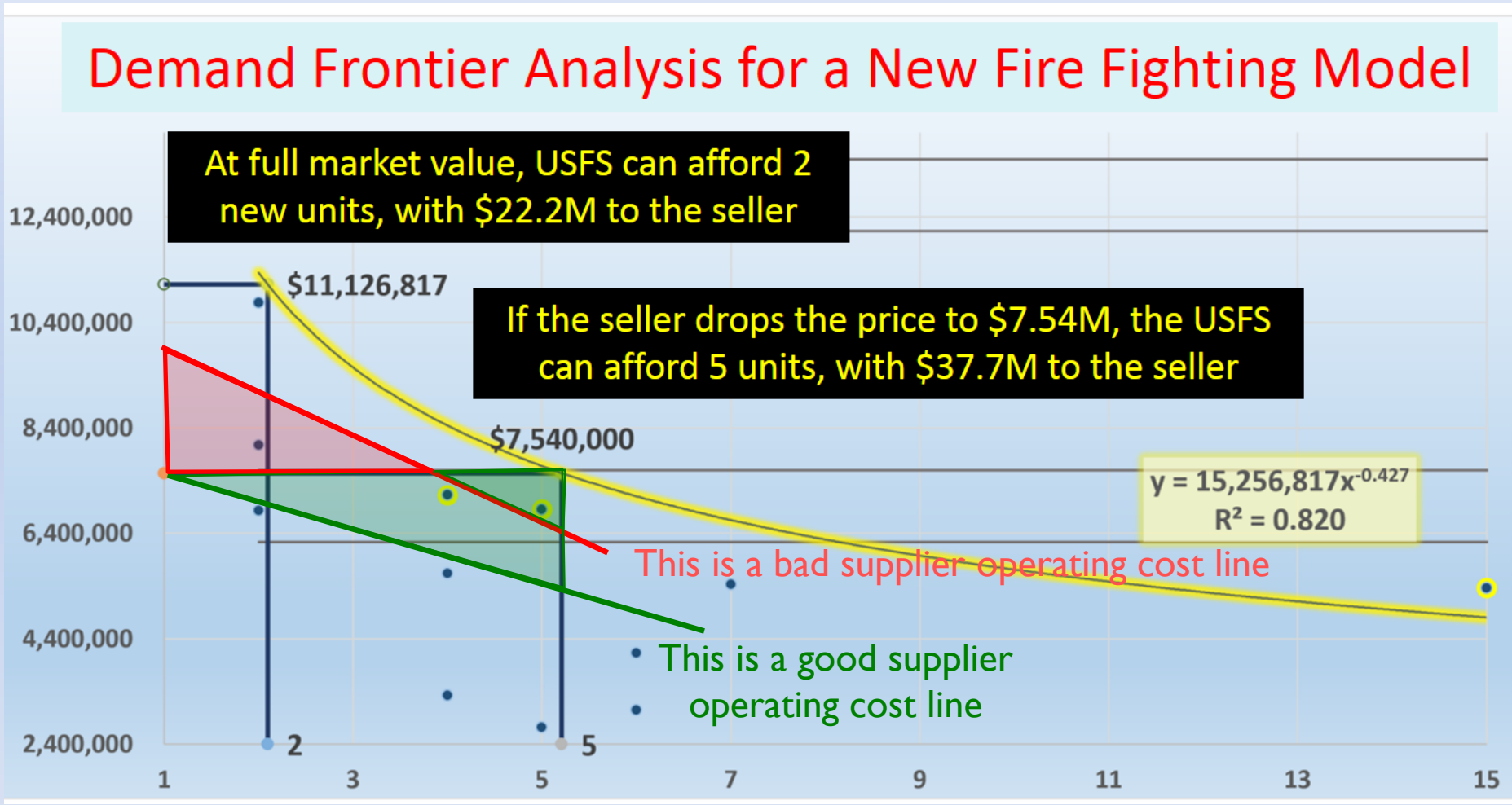
Value goes up for capacity and speed, and falls for poor reliability

Suppose A Supplier Sells Services To The USFS For Less Than The Going Rate



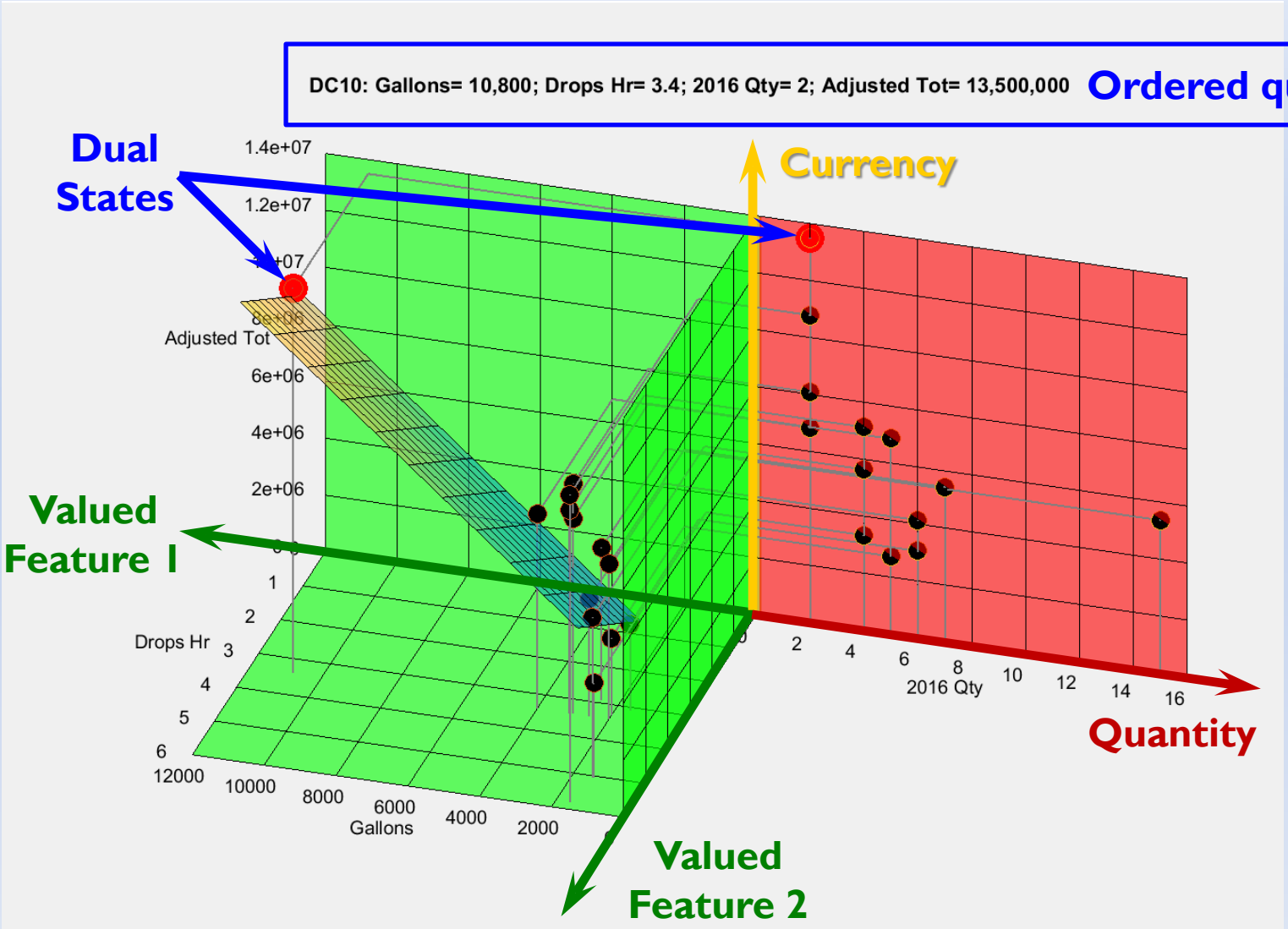
In this case, this becomes a great deal for the USFS

What Does The Lower Price Mean To The Supplier?



Clearly, the supplier must know his value, demand and cost

The 3D Value Space and 2D Demand Plane Join to Form 4D Markets

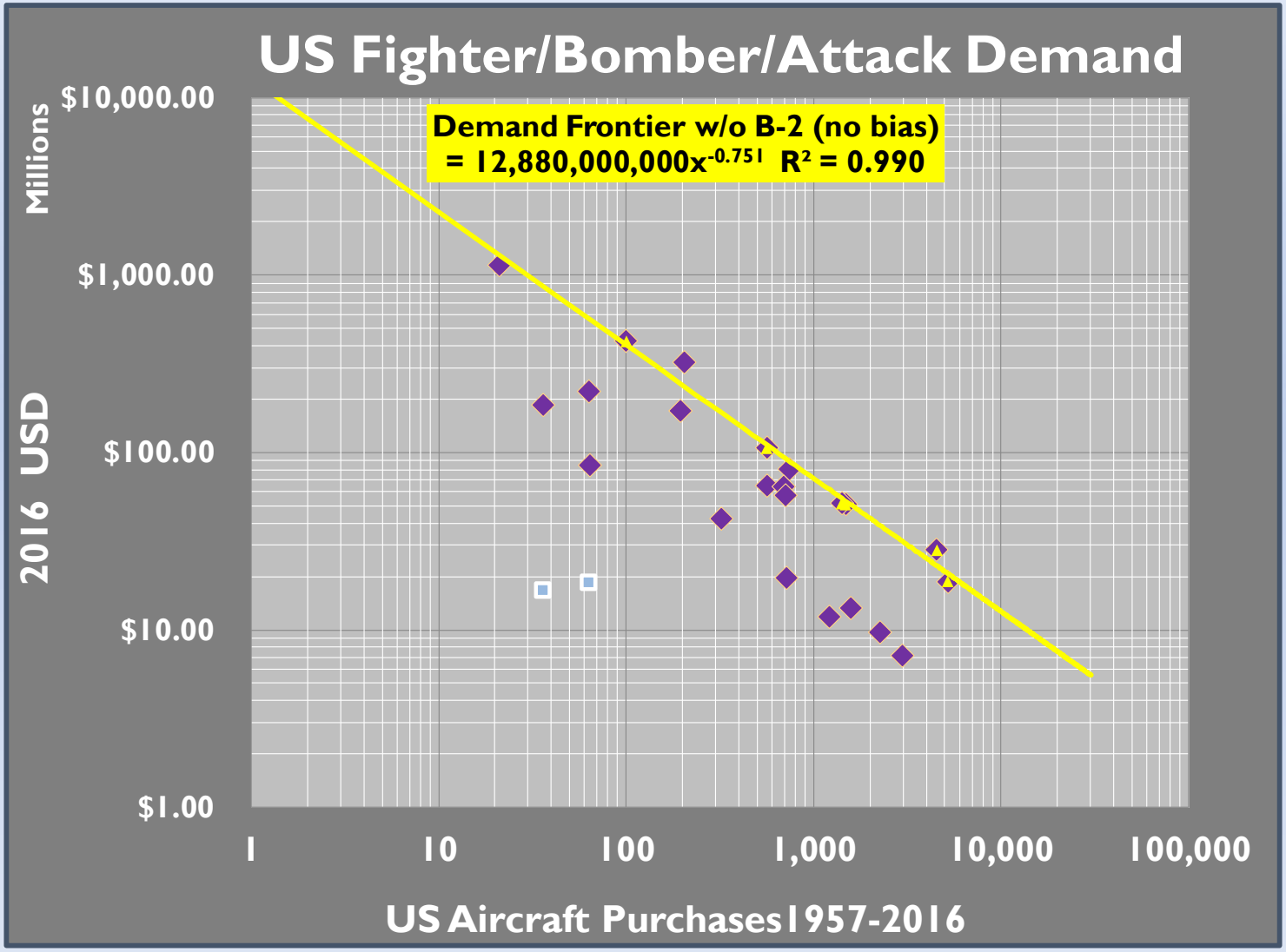


All markets operate in this manner

Summary

- Demand appears fuzzy but may be characterized by
  - Demand Frontiers
  - Market Aggregate Demands
- Markets limit sales about their Demand Frontiers according to their slope and standard deviations
  - Broad variations to the Demand Frontiers are rare
  - Estimators, program managers and engineers should take these limits into account as they begin programs
- It is possible to plan in advance to
  - Maximize capacity (as for a service branch)
  - Maximize profits (as for a for-profit company)

Removing B-2 From The Set Still Produces A Highly Significant Curve



Removing the B-2 from the analysis leaves the B-21 as an extrapolation