Market Dimensional Expansion, Collapse, Costs, and Viability





O V E R V I E W



- How does a market evolve?
- What is 2D Demand?
- What is 3D Value?
- What is a 4D Market?
- How do Markets Pair to Form 7D Systems?
- What are ND Systems?
- Cost, Value, and Demand must fall within Market Constraints
- Summary

A Short Observation





A Brief History of Reconnaissance*,**



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Proc Biol Sci. 2007	' Jun 22; 274(161)	7): 1505–1509.		PMCID: PMC2176157
Published online 20	007 Apr 10. doi: <u>1</u> 0	0.1098/rspb.2007.0138		PMID: 17426016
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Nigel R Franks,* Ja	ames W Hooper, A	 Copyright and License information 	Alexander L Hayward, a	and <u>Stefanie M Berghoff</u>

Rock ants look for

- Floor area
- Headroom
- Darkness
- Hygiene state
- Proximity of hostiles

Part of their collective output (GDP) is their reconnaissance

Ants first appeared on the earth between 140 to 168 million years ago

Hypothesis: Humans have been doing reconnaissance since they emerged, forming part of their GDP

*<u>https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2176157/</u>

***<u>https://expeditions.fieldmuseum.org/australian-ants/ant-evolution-and-environment</u>

Watchtowers Were A Way To Gain Early Warning



This tower, on a hill in Krupina, Slovakia (about 200 kilometers east of Vienna, Austria), built in the late 1500s, combined with others, gave the town advance warning of approaching armies (its updated stairs and porch came later)

The uneven terrain around the town called for several watchtowers, which drained resources

Watchtowers have no mobility and rely on a network of them to work well



Hundreds of Years Later, There Were Advances



The French had the first use of balloons in surveillance in 1794

Both sides used balloons in the Civil War; this is the Union Balloon Intrepid

Balloons made great targets, and were dangerous for pilots



World War I Saw More Advances



This Caudron G.3 was an improvement



The Allied Powers flew over 2800 of these models, flying faster and higher than airships

The added features did not ensure safety



Flying battlefield assessment, this G.3 pilot (my grandfather) had his tail shot off (friendly fire)

USG Response: Go Higher and Faster

After WWII, The Cold War Drove New Platforms



The Lockheed U-2 went higher than ever



While it flew successfully for years, the Russians eventually shot one down

Solution: Higher and Much, Much Faster



The SR-71 went to 85K' and Mach 3.2 and was never shot down – but it was costly

An Evolved Response: Go Unpiloted

Partial Move to Satellites And UAVs



The market minimum suggests that if you can build one good unit, you'll have a baseline expectation set by the Minimum Demand



UAVs and Sats Have The Same Value Proposition



Buyers pay more for Payload, Miles per Hour, and Altitude, and pay less for each succeeding unit (that is they have a Product Demand Curve)



Successful programs balance Cost, Value, and Demand

An Interactive Estimator Helps Bound The Problem



Every addition to the market changes it; analysts should follow its movement

Suppose You Needed To Estimate Business Jets



File About Database Scatterplot Model Analyze Demond 4D Plot	🛓 Hypernomica															
Dabase Scatterplot Model Analyze Demand 4D Plot Manufacturer Model S2019M MMPH Pass Cab Cab Cab VolPss Range Eng BalFL T1/2 ChyoH13 ChyoP18 1 Airbus ACJ319 44/269 S40.500 8 S49 7.1167 12.1667 70.9167 28.367. 4 2 5070 2 17 6 2 Airbus ACJ329 44.269 S40.500 8 5447 7.1167 71.1667 70.9167 7.9256-80 2 6070 2 1 1 3 Airbus ACJ320 191.5029 566.500 2 17.2500 17.717.4 80.10 11.553 9.80.00 2 567.50 2 49 2 690.9 2 6 5 3 11.583 9.80.00 38.75.7 7.636.003 2 57.75 2 49 2 7 7 8 Boeing Boeing Bueing Business Let 2	ile About															
Manufacturer Model \$2019M MMPH Pass Cab Vol Cab H Cab W	Database Scatter	plot Model Analyze Dema	and 4D Plot													
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3 Airbus ACJ320 Prestige 81.1170 540.5000 25 6.9682e+03 7.4167 12.1667 91 366.74 6.9000e+03 2 6.9000 2 115 4 Airbus ACJ321 95.333 540.5000 25 1.725200 177.6200 137.64 907.10. 1.1558+149 2 90909 2 6 5 6 Airbus ACJ340 277.8200 566.500 25 2.0503+e4 79167 17.2500 137.64 907.10. 1.1558+140 4 141430 2 4 4 7 Boeing Boeing Business Jet 2 77.719 541 8 6525 7.0833 11.583 98.300 83.67 7.650e+03 2 6985 2 9 8 9 Boeing Business Jet 747 307.7427 594.900 19 2.4955e+04 7.833 12.0833 13.744 12.026e+04 4 10600 2 8 9 10 Boeing Business Jet 777 27.594 608.100 19 2.4955e+04 7.833 12.0833 15.87	2 Airbus	ACJ319	74.4269	540.5000	8	5843	7.4167	12.1667	78.7500	315.97	7.7625e+03	2	6070	2	54	26
4 Airbus ACJ321 95.3333 540.5000 8 8547 7.4167 12.167 113 449.84 44830 2 7.970 2 1 1 5 Airbus ACJ300 191.5029 566.9500 25 2.5039-04 7.9167 7.2500 17.17. 820.13 1.5138 4 1.0430 2 6 4 7 Boeing Boeing Business Jet 65.228 8.5080 7.0833 11.5833 91.667 65.252 8.5080-003 2 65.258 8.5080-003 2 65.25 7.800 9 66.13 90.0004 2 90.0013 11.5833 91.6501 91.553 7.667 65.25 7.6360e+03 2 60.495 2 60.495 2 60.495 2 60.495 2 60.495 2 60.401 2 2.555+04 7.8333 10.5033 91.3033 93.303 83.675 7.6360e+03 2 60.401 1 1<.206 2 1.43 43.000 2 1.43 1.43 1.43 1.43 1.43 1.43 1.43	3 Airbus	ACJ320 Prestige	81.1170	540.5000	25	6.9682e+03	7.4167	12.1667	91	366.74	6.9000e+03	2	6 <mark>9</mark> 00	2	15	10
S Airbus ACJ330 191.5029 566.9500 25 1.7235e+04 7.9167 7.2500 77.717 20.31 1.1558e+04 2 9990 2 6 4 7 Boeing Boeing Business Jet 65.2281 540.5000 8 569.500 70833 11.5833 79.167 15.250. 77.717 62.013 1.630.90.803.00 8.65.25. 8.0500e+03 2 6995 2 9 9 8 9 Boeing Boeing Business Jet 3 82.7895 54.1 8 6525 7.0833 11.5833 903.00 86.75 7.6300e+03 2 6995 2 0 2 18 Boeing Boeing Business Jet 747 307.427 594.900 19 2.4955e+0 7.8333 19.2500 19.425 1.7356 1.3402e+04 4 10000 2 .3 13 18 Boeing Boeing Business Jet 777 275.949 608.120 19.2501.47.4333 19.2500 19.425 1.7366 1.4302e+04 2 6000 2 .4 12 14 14 1.4308047 1.1437e+04	4 Airbus	ACJ321	95.3333	540.5000	8	8547	7.4167	12.1667	113	449.84	4830	2	7970	2	1	1
6 ArDado 277.8200 566.9500 25 2.0503e+04 7.9167 17.2500 17.17 820.13 11385 4 104.00 2 4 12 7 Boeing Boeing Business Jet 65.2281 540.5000 8 5396 7.033 11.533 9.1667 656.25. 8.5000e+03 2 697.5 2 49 29 9 Boeing Boeing Business Jet 2 77.719 541 8 6525 7.083 11.583 98.300 836.75. 7.6360e+03 2 698.5 2 0 10 Boeing Business Jet 777 307.427 594.900 19 2.4955e+04 7.833 20.033 20.75. 1.314. 1.0206e+04 4 10600 2 8 9 12 Boeing Business Jet 777 275.9649 662.7500 19 2.4955e+04 7.833 10.801 18.38 18.45.00 18.48.7. 18.48.7. 1.437e+04 2 660.00 2 1 1 14 Boeing Business Jet 777 275.9649 62.1104.250 19 16.50	5 Airbus	ACJ330	191.5029	566.9500	25	1.7235e+04	7.9167	17.2500	137.64	907.10	1.1558e+04	2	9090	2	6	5
7 Boeing Boeing Business Jet 65.2281 540.5000 8 5396 7.0833 11.5833 79.166 656.25. 8.0500e+03 2 6.775 2 4.99 8 9 Boeing Business Jet 2 77.7719 541 8 652.5 7.0833 11.5833 98.3300 83.75.7 7.5360e+03 2 66985 2 9 7 10 Boeing Business Jet 77 98.3334 541 8 652.5 7.0833 11.5833 91.763 7.5360e+03 2 66985 2 0 7 11 Boeing Business Jet 777 27.59649 608.120 19 2.4955e+04 7.8333 19.250 1.3134 1.0206e+04 4 10000 2 6.89 9 12 Boeing Business Jet 777 27.59649 608.120 19 1.6501e+04 7.8333 19.833 18.87.5 868.47.1 1.1437e+04 2 6.600 2 6.600 18.333 18.75.5 6.600 18.333 18.75.5 6.6007 13.41.7 1.437e+04 2 6.600 2 6.6	6 Airbus	ACJ340	277.8200	566.9500	25	2.0503e+04	7.9167	17.2500	177.17	820.13	11385	4	10430	2	4	1
8 Boeing Boeing Business let 2 77.7719 541 8 6525 7.083 11.583 98.300 83.67.5 7.6360e+03 2 698.5 2 707 9 Boeing Business let 3 82.7895 541 8 7202 7.083 11.583 107.6. 7.4922e+03 2 6985 2 708 10 Boeing Business let 747 307.400 98.9334 541 8 6525 7.083 11.583 90.303 83.75 7.680e+04 4 1060.0 2 8.9 12 Boeing Business let 777 27.59649 608.1200 19 2.45504 7.833 15.250 194.25. 1.7456 4.060.0 2 608.0 2 10 12 14 Bombardier Global 7500 722 611.4250 19 1.6501e 7.907 13.78.8. 84855 2 6467 2 32 155 16 Bombardier Global 5000	7 Boeing	Boeing Business Jet	65.2281	540.5000	8	5396	7.0833	11.5833	79.1667	656.25	8.0500e+03	2	5775	2	49	29
9 Boeing Boeing Business let 3 82.7895 541 8 7290 7.083 11.583 107.6. 911.25. 7.4922e+03 2 80.40 2 7 10 Boeing 737-800 98.9334 5541 8 6525 7.0833 11.5833 98.308 83.67.5. 7.6360e+03 2 6985 2 00 2 11 Boeing Boeing Business Jet 747 307.7427 594.90 19<2.955e+04	8 Boeing	Boeing Business Jet 2	77.7719	541	8	6525	7.0833	11.5833	98.3300	836.75	7.6360e+03	2	6985	2	9	8
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12 Boeing Boeing Business Jet 777 275.9649 608.1200 19 2.0456e+04 7.833 19.250 19.425. 10.766. 1.402e+04 2 10800 2 3 8 13 Boeing Boeing Business Jet 787 214.9181 627.9500 19 1.5501e+04 7.500 18.833 158.75. 668.47. 1.1437e+04 2 6.00 2 1 12 14 Bombardier Global 7500 62.3100 581.8800 13 1.9975e+03 6.500 7.9167 40.7500 58.06 2 6.600 2 355 13 183 6.500 7.9167 42.458 144.76. 5984 2 6.505 2 8 13 193 193 192.04 8.300 59.200 201.50. 2.1186e+03 2 6.80 2 8 13 183 8.300 59.200 201.50. 2.1186e+03 2 6.60 14 14 280 6.200 8.300 9.200 20.42.8. 2.8785e+03 2 6.00 14 14 14 14 14 14 14 14	11 Boeing	Boeing Business Jet 747	307.7427	594.9000	19	2.4955e+04	7.8333	20.0833	207.50	1.3134	1.0206e+04	4	10600	2	8	9
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15 Bombardier Global 6000 62.3100 581.6800 13 1.9797e+03 6.500 7.9167 40.7500 153.65 6.9000e+03 2 6.467 2 322 335 16 Bombardier Global 5000 50.4400 581.6800 13 1188 6.5000 7.9167 42.4583 144.76 5984 2 5540 2 139 153 17 Bombardier CL 890 47.5000 541.6500 14 2261 6.200 8.300 59.200 20.15 2.7186e+03 2 6.465 2 8.8 18 Bombardier CL 870 40.5300 541.6500 14 2806 6.200 8.300 8.4167 14.14 2.8476e+03 2 6.565 2 0 7.8 20 Bombardier Challenger 605 33.3500 540.500 10 1146 6 7.9167 25.833 14.40 4.3194e+03 2 5665 2 0 7.8 21 Bombardier Challenger 605 33.2500 561.2000 9 1160 6.0833 7.1667 25.2000 <td< td=""><td>14 Bombardier</td><td>Global 7500</td><td>72</td><td>611.4250</td><td>19</td><td>2637</td><td>6.2000</td><td>8</td><td>54.5000</td><td>138.78</td><td>8855</td><td>2</td><td>5800</td><td>2</td><td>0</td><td>1</td></td<>	14 Bombardier	Global 7500	72	611.4250	19	2637	6.2000	8	54.5000	138.78	8855	2	5800	2	0	1
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17 Bombardier CL 890 47.5000 541.6500 14 2821 6.200 8.300 59.200 20.15 2.1786e+03 2 6.665 2 8 8 18 Bombardier CL 870 40.5300 541.6500 14 2860 6.200 8.3000 59.2000 20.42.8. 2.8785e+03 2 6.630 2 10 11 19 Bombardier CL 850 30.9900 527.8500 14 1990 6.2000 8.3000 8.30167 14.14 2.8244e+03 2 6.630 2 6.00 7.00 20 Bombardier Chalenger 650 33.3500 561.5000 10 1146 6 7.9167 25.583 14.00 4.3194e+03 2 564.0 2 205 200 21 Bombardier Chalenger 605 32.8200 561.5000 10 1160 6.0833 7.167 25.833 95.555 3.5247e+03 2 446.0 2 24 2446 210 22 Bombardier Chalenger 350 28.1369 540.500 10 86.06.0803 7.1667 25.20	16 Bombardier	Global 5000	50.4400	581.6800	13	1882	6.5000	7.9167	42.4583	144.76	5984	2	5540	2	139	153
18 Bombardier CL 870 40.5300 541.6500 14 280 6.200 8.300 59.200 204.28 2.8785e+03 2 556 2 10 11 19 Bombardier CL 850 30.9900 527.8500 14 1990 6.200 8.300 48.4167 142.14 2.8244e+03 2 6605 2 00 78 20 Bombardier Challenger 605 33.3500 561.2000 9 1116 6.79167 25.833 114.00 4.3194e+03 2 5665 2 00 78 21 Bombardier Challenger 605 32.8200 561.2000 9 1150 6.083 8.1667 28.4167 12.77 4.4091e+03 2 48410 2 446 210 22 Bombardier Challenger 300 22.81369 540.5000 10 8.060 7.1667 25.000 86 36800e+03 2 48.415 2 0 250 2 48.316 22.250 2 48.315 2 0 12 2 48.31 32235e+03 2 48.33 <t< td=""><td>17 Bombardier</td><td>CL 890</td><td>47.5000</td><td>541.6500</td><td>14</td><td>2821</td><td>6.2000</td><td>8.3000</td><td>59.2000</td><td>201.50</td><td>2.7186e+03</td><td>2</td><td>6465</td><td>2</td><td>8</td><td>8</td></t<>	17 Bombardier	CL 890	47.5000	541.6500	14	2821	6.2000	8.3000	59.2000	201.50	2.7186e+03	2	6465	2	8	8
19 Bombardier CL 850 30.9900 527.8500 14 1990 6.2000 8.3000 48.4167 14.21.4 2.8244e+03 2 6.605 2 0.0 20 Bombardier Challenger 650 33.3500 540.5000 10 1146 6.79167 25.5833 114.60 4.3194e+03 2 5665 2 0.0 78 21 Bombardier Challenger 605 32.8200 540.5000 9 1150 6.083 8.1667 28.583 94.4091e+03 2 5680 2 202 202 28 Bombardier Challenger 300 27.0819 547.4000 9 860 6.0803 7.1667 25.2000 68 3600e+03 2 44815 2 0 259 24 245 2 358 2 0 259 24 2453 2 350 52 202 2500 8 36050e+03 2 4835 2 0 259 2 250 2 350 2 0 159 2 54.500 16 54.500 2 54.66 <	18 Bombardier	CL 870	40.5300	541.6500	14	2860	6.2000	8.3000	59.2000	204.28	2.8785e+03	2	5562	2	10	1
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21 Bombardier Challenger 605 32.8200 561.200 9 1150 6.0833 8.1667 28.4167 127.77 4.4091e+03 2 584.0 2 225 202 22 Bombardier Challenger 300 27.0819 547.4000 9 860 6.0833 7.1667 28.533 95.555 3.5247e+03 2 4480 2 446 210 23 Bombardier Challenger 350 28.1369 540.500 10 860 6.0803 7.1667 25.200 66 3.6800e+03 2 4483 2 0 259 24 Cessna CF680A Citation Latitude 117 512.900 9 1059 6 64167 21.7500 117.66 3.1050e+03 2 4483 2 0 169 25 Cessna 750 Citation X+ 23 618.0350 12 538 6 6 25 44.48.33 3.325e+03 2 2 0 2 26 Cessna 750 Citation X+ 24.7300 618.0350 12 5585 6 625 3.4167 3.9790e+03 2<	20 Bombardier	Challenger 650	33.3500	540.5000	10	1146	6	7.9167	25.5833	114.60	4.3194e+03	2	5665	2	0	78
22 Bombardier Challenger 300 27.0819 547.4000 9 8.06 6.0833 7.1667 28.5833 95.5556 3.5247e+03 2 4.481 2 4.46 210 23 Bombardier Challenger 350 28.1369 540.5000 10 8.60 6.0800 7.1667 25.2000 86 3.6800e+03 2 4.835 2 0 259 24 Cessna CF.680A Citation Latitude 117 512.9000 9 105 6 64167 7.17500 117.66 3.1050e+03 2 3.555 2 0 169 25 Cessna 750 Citation X 23 618.0350 12 538 6 6 24 4.4833 3.3235e+03 2 2 0 170 26 Cessna 750 Citation X+ 24.7300 618.0350 12 593 6 6 25 4.4163 3.3235e+03 2 2 0 2 720 2 720 2 2 0 170 2 2 2 0 170 2 2 2 0	21 Bombardier	Challenger 605	32.8200	561.2000	9	1150	6.0833	8.1667	28.4167	127.77	4.4091e+03	2	5840	2	225	202
23 Bombardier Challenger 350 28.1369 540.500 10 860 6.0800 7.1667 25.200 86 3.6800e+03 2 4483 2 0 25.99 24 Cessna CE-680A Citation Latitude 17 512.900 9 1059 6 6.4167 21.7500 17.66. 3.1050e+03 2 3580 2 0 169 25 Cessna 750 Citation X 23 618.0350 12 538 6 6 24 44.833 3.235e+03 2 5520 2 99 12 26 Cessna 750 Citation X+ 24.300 618.0350 12 593 6 6 25 49.4167 3.9790e+03 2 5242 2 0 169 27 Cessna 680 Sovereign+ 18 527.800 9 585 6 6 25 63.4444 3.0130e+03 2 2.8 8 2 7.66 3.6444 3.0130e+03 2 3.68 2 680 3.680 2.8 3.680 2 3.56 6 5.5000 8.50444	22 Bombardier	Challenger 300	27.0819	547.4000	9	860	6.0833	7.1667	28.5833	95.5556	3.5247e+03	2	4810	2	446	210
24 Cessna CE-680A Citation Latitude 17 512.9000 9 1059 6 6.4167 21.7500 17.66 3.1050e+03 2 3.580 2 0 169 25 Cessna 750 Citation X 23 618.0350 12 538 6 6 24 44.833 3.3235e+03 2 5520 2 99 12 26 Cessna 750 Citation X+ 24.7300 618.0350 12 559 6 6 25 49.4167 3.9790e+03 2 5242 2 0 27 27 Cessna 680 Sovereign+ 18 527.850 9 557 6 6 25 63.4444 3.0130e+03 2 2 0 169 28 Cessna 680 Citation Sovereign 18 528.800 9 5571 6 6 25 63.4444 3.0130e+03 2 3.560 2 8.80 29 Cessna 560 Citation SLS+ 13 507.1500 9 422 5.6667 5.5000 18.500 46.8889 24.15 2 3560 2 <t< td=""><td>23 Bombardier</td><td>Challenger 350</td><td>28.1369</td><td>540.5000</td><td>10</td><td>860</td><td>6.0800</td><td>7.1667</td><td>25.2000</td><td>86</td><td>3.6800e+03</td><td>2</td><td>4835</td><td>2</td><td>0</td><td>259</td></t<>	23 Bombardier	Challenger 350	28.1369	540.5000	10	860	6.0800	7.1667	25.2000	86	3.6800e+03	2	4835	2	0	259
25 Cessna 750 Citation X 22 618.0350 12 538 6 6 24 44.8333 3.3235e+03 2 5550 2 93 12 26 Cessna 750 Citation X+ 24.7300 618.0350 12 593 6 6 25 49.4167 3.9790e+03 2 5524 2 0 27 27 Cessna 680 Sovereign+ 18 527.8500 9 585 6 6 25 65 3.1890e+03 2 3260 2 0 169 28 Cessna 680 Citation Sovereign 18 528.8000 9 57.1 6 6 25 65 3.1890e+03 2 326 2 0 169 28 Cessna 680 Citation Sovereign 18 528.8000 9 57.000 18.5000 48.8889 2415 2 3350 2 8 80 29 Cessna 560 Citation XLS+ 13 507.1500 9 42.2 5.6667 5.5000 18.5000 46.8889 2415 2 3560 2 349	24 Cessna	CE-680A Citation Latitude	17	512.9000	9	1059	6	6.4167	21.7500	117.66	3.1050e+03	2	3580	2	0	169
26 Cessna 750 Citation X+ 24.7300 618.0350 12 593 6 6 25 49.4167 3.9790e+03 2 5242 2 0 27 27 Cessna 680 Sovereign+ 18 527.8500 9 585 6 6 25 65 3.1890e+03 2 3260 2 0 169 28 Cessna 680 Citation Sovereign 18 528.8000 9 571 6 6 25 653 3.1890e+03 2 3360 2 8 80 29 Cessna 560 Citation XLS+ 13 507.1500 9 422 5.6667 5.5000 18.5000 46.8889 2415 2 33560 2 349 62	25 Cessna	750 Citation X	23	618.0350	12	538	6	6	24	44.8333	3.3235e+03	2	5250	2	93	12
27 Cessna 680 Sovereign+ 18 527.8500 9 585 6 6 25 65 3.1890e+03 2 3260 2 0 169 28 Cessna 680 Citation Sovereign 18 528.8000 9 571 6 6 25 63.4444 3.0130e+03 2 3.750 2 8 80 29 Cessna 560 Citation XLS+ 13 507.1500 9 4.22 5.6667 5.5000 18.5000 46.8889 2415 2 33560 2 349 62	26 Cessna	750 Citation X+	24.7300	618.0350	12	593	6	6	25	49.4167	3.9790e+03	2	5242	2	0	27
28 Cessna 680 Citation Sovereign 18 528.8000 9 571 6 6 25 63.4444 3.0130e+03 2 3.750 2 8 29 Cessna 560 Citation XLS+ 13 507.1500 9 4.22 5.6667 5.5000 18.5000 46.8889 2415 2 33560 2 349 62	27 Cessna	680 Sovereign+	18	527.8500	9	585	6	6	25	65	3.1890e+03	2	3260	2	0	169
29 Cessna 560 Citation XLS+ 13 507.1500 9 422 5.6667 5.5000 18.5000 46.8889 2415 2 3560 2 349 62	28 Cessna	680 Citation Sovereign	18	528.8000	9	571	6	6	25	63.4444	3.0130e+03	2	3750	2	8	80
	29 Cessna	560 Citation XLS+	13	507.1500	9	422	5.6667	5.5000	18.5000	46.8889	2415	2	3560	2	349	62
30 Cessna 525C Citation CJ4 9.2000 518.6500 10 293 4.7500 4.8333 17.3300 29.3000 2.4898e+03 2 3410 2 144 286	30 Cessna	525C Citation CJ4	9.2000	518.6500	10	293	4.7500	4.8333	17.3300	29.3000	2.4898e+03	2	3410	2	144	286

File: Business Jet 2019 Rev 4.m4d

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File: Business Jet 2019 Rev 4.m4d Using 95 data points out of a possible 115

If you built a database of business aircraft, what could you do with it beside estimating their costs?

Here, we have Quantity highlighted

If we add Price, we have a lot to consider

2D Demand is the Quantity-Price Relationship



Upper Demand Frontier: Price Limited Outer Demand Frontier: Saturation Limited Lower Demand Frontier: Margin Limited

Markets have limits:

Inner Demand Frontier: Efficiency Limited



Ignoring These Limits Can Lead To Financial Disaster



Consider the Aerion AS2



The company wanted to build 300 supersonic business jets in 10 years at \$120M each They launched with 20 orders



In Dec 2020, I wrote a LinkedIn post stating that they wouldn't get 300 orders since that would put them past the Demand Frontier

5 Years later, they still had 20 orders



EDITORS' PICK

The Collapse Of Aerion Supersonic Shows That Aviation Advances Must Be As Affordable As They Are Amazing

A New Bomber Must Abide By Its Demand Frontier



These limits mean we can only afford a few squadrons at very high prices – This means we should get more less-expensive solutions forward-based

Air To Surface Missiles Have Limits Too





The United States Congressional Budget Office said they would recommend buying 100 of these missiles, with an average price of \$14M each, but...



At 108 Standard Deviations past the Demand Frontier, there was no chance that the USG can afford 100 AGM-183s, and it was canceled

If 2D Demand is the Quantity-Price Relationship



What holds the Prices up?

17

3D Value Reveals What Customers Willingly Pay For



Business Jet buyers who can afford it willingly pay for bigger cabins and faster planes



18

4D Markets Merge 2D Demand and 3D Value Space



Every market forms these relationships as ordered quads governed by the Law of Value and Demand:

I) Features drive Value

- 2) Value sets Price
- 3) Price limits quantity sold
- 4) Quantity sold is a feature



Consider the 4D Market for Turbofan Engines

It behaves much the same way as the market for business jets, with ordered quads explaining market positions



7D Systems Form Between Related 4D Markets





What If We Wanted More Dimensions In One View?



Have you ever noticed how poster racks and Rolodexes keep their information intact?

This gives us some ideas for displaying markets



Consider These 3 General Aviation Planes

Madal	Casta	Max	\$M	Quan-		
Model	Seats	MPH	(2005)	tity		
SR22	4	212	\$0.29	1705		
Baron 58	6	232	\$1.00	330		
Caravan I	8	213	\$1.50	504		

Their 4D plot is

The Demand Plane is like a poster; we can rotate it





Once rotated, what once took 180° of arc now needs 90°

With Each Market Taking 90°, We can Plot 4 at Once





The CIA on GDP



In 2014, the CIA characterized about \$78.3T of GDP in this way:

Blue = Agriculture Yellow = Industry Red = Services

We could show every subset of the economy at the same time – but for that, we'll need dimensional collapse



Collapse & Expand an Existing Coordinate System



Let's start with a Cartesian Coordinate system, adding whole numbered radii from the origin

With it, we can plot some ordered pairs

If we lower the angle between the axes, reflecting **dimensional collapse**, information is not lost

Now we are using Polar Parallel Coordinates

They can adjust to any angle the markets dictate

They can expand to any angle required, back to their original settings, or any angle in between, depicting **dimensional expansion**



26

Compressing All Markets Simply Extends The Process



We start with one market off an anchor line, with its proportion of the center circle representing its contribution to GDP

If a market's contribution to GDP is larger, indicative of *dimensional expansion*, we represent it appropriately

We can add another market according to its part in the World GDP



And another...

Obviously, there is no upper limit to the number of markets we could depict

Each market's portion of GDP varies over time

What Does a 5-Market, 16D System Look Like?



Here's How We Built Up The Previous View



Maulant	Dimension Manua	1 Juniter	Din	nension T	Number of		
Market	Dimension Name	Units	Common	Value	Demand	Markets	Dimensions
All	Currency	Dollars	×				I
	Demand	Units per Year			×	1	2
Civil Aircraft	Max MPH	Miles per Hour		×			3
	Passengers	Seats		×			4
Packago	Demand	Parcels per Year			×	2	5
Раскаде	Package Ibs	Pounds		×			6
Delivery	Package Miles	Miles to Delivery		×			7
I Inited States	Demand	Pounds per Year			х	3	8
Meet	Package Size	Pounds per Package		×			9
rieat	Leanness	Percentage		х			10
Internal	Demand	Units per Year			×	4	11
Combustion	HP	Horsepower		×			12
Engine Car	MPG	Miles per Gallon		×			13
	Demand	Units per Year			×	5	14
Electric Car	HP	Horsepower		×			15
	Range	Miles		×			16
All		Dimension Count	I.	10	5		



How Did We Depict The Markets We Used?





Summary



- Reconnaissance has been part of our GDP since the beginning of humanity
- All Markets work in 4D according to the Law of Value and Demand
 - Features drive Value
 - Value sets Price
 - Price limits quantity sold
 - Quantity sold is a feature
- We can combine any number of markets into a single view
 - Each market slice is its portion of GDP
 - Markets evolve over time
- Viable products balance Cost, Value, and Demand





