Average Load Factor, Distribution of Leg Load Factors and O-D Control Benefits

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- Previous results have shown that the distribution of the leg load factor had a large influence on the magnitude of O-D control revenue gains while the average load factor was kept constant

- Investigate more thoroughly the relationship between leg load factor distribution, average load factor and O-D control revenue gains in network D

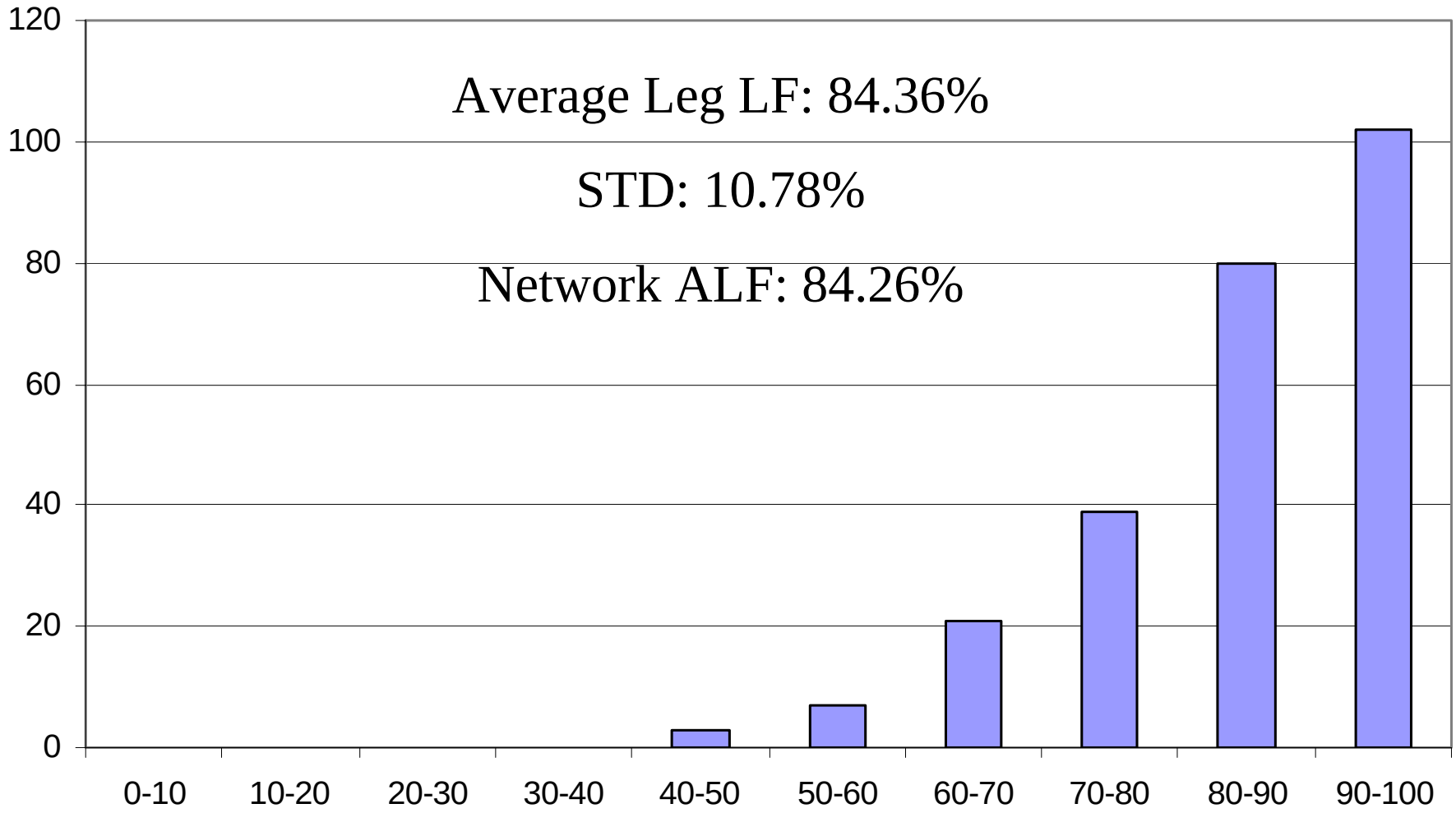
- Define metrics representative of average load factor and leg load factor distribution and study their correlation with O-D control revenue gains

- Network D
  - ✈ New booking curves
  - ✈ 35/65 Business-Leisure mix
- Three Load Factors
  - ✈ 79% Network ALF (DM 0.9)
  - ✈ 84.5% Network ALF (DM 1.0)
  - ✈ 88% Network ALF (DM 1.1)
- RM Methods:
  - ✈ Eb vs. Eb
  - ✈ DAVN vs. Eb
  - ✈ DAVN vs. DAVN
  - ✈ ProBP vs. Eb

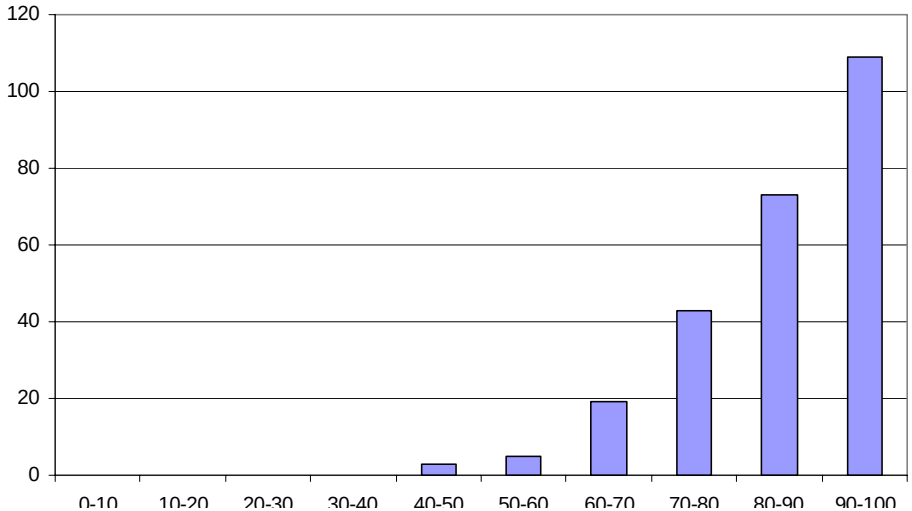
- The objective was to obtain various leg load factor distributions while keeping the average network load factor constant to avoid a network ALF effect on O-D control revenue gains for the base case with a demand multiplier of 1.0
- In order to reach that objective, two key input were modified
  - A/C capacity: A/C capacity was either increased (low cases) or decreased (high cases) on a select number of legs based on the load factor
  - Demand multiplier: after A/C capacity was modified, the demand multiplier was adjusted to keep network ALF constant
- Five cases were developed
  - Base Case
  - Two Low Cases in which A/C capacity is increased to 120 seats on some routes
  - Two High Cases in which A/C capacity is decreased to 70 seats on some routes
- For each of the five cases developed, the demand was then multiplied by respectively 0.9 and 1.1 to design 10 additional cases with different average load factors

Leg Load Factor Distributions

Leg Load Factor Distribution: Base Case (Eb vs. Eb, DM 1.0)



Leg Load Factor Distribution: Low Cases (Eb vs. Eb, DM 1.0)



A1

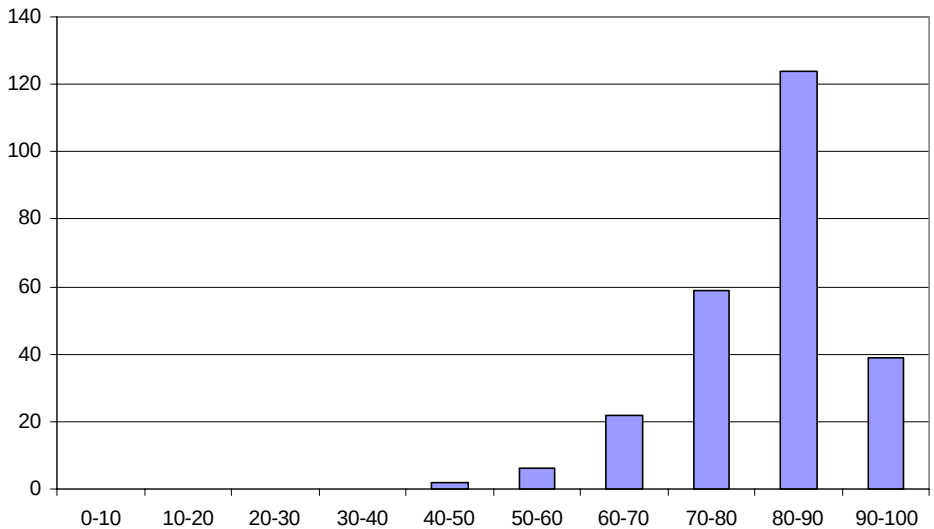
# of legs with adjusted A/C capacity: 14

Demand Multiplier: 1.0

Avg. Leg LF: 84.40%

STD: 10.52%

Network ALF: 84.32%



A2

# of legs with adjusted A/C capacity: 102

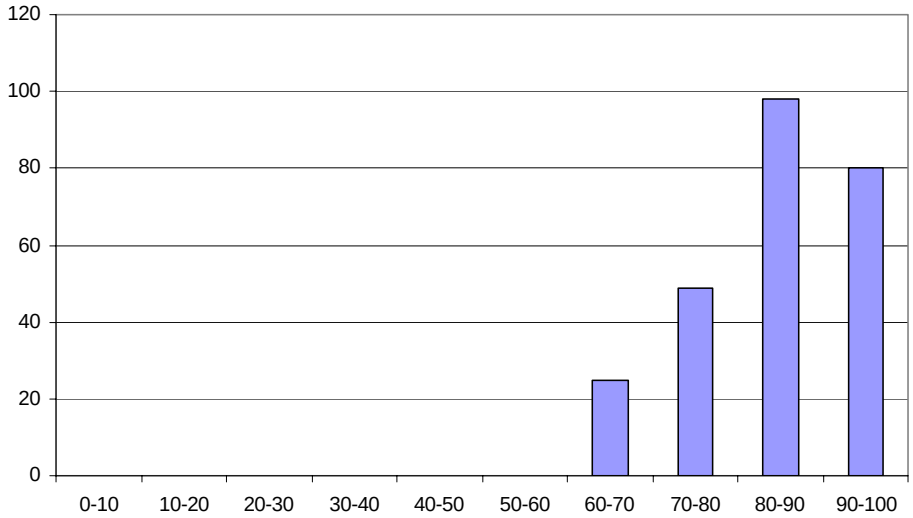
Demand Multiplier: 1.05

Avg. Leg LF: 84.34%

STD: 8.70%

Network ALF: 84.41%

Leg Load Factor Distribution: High Cases (Eb vs. Eb, DM, 1.0)



B1

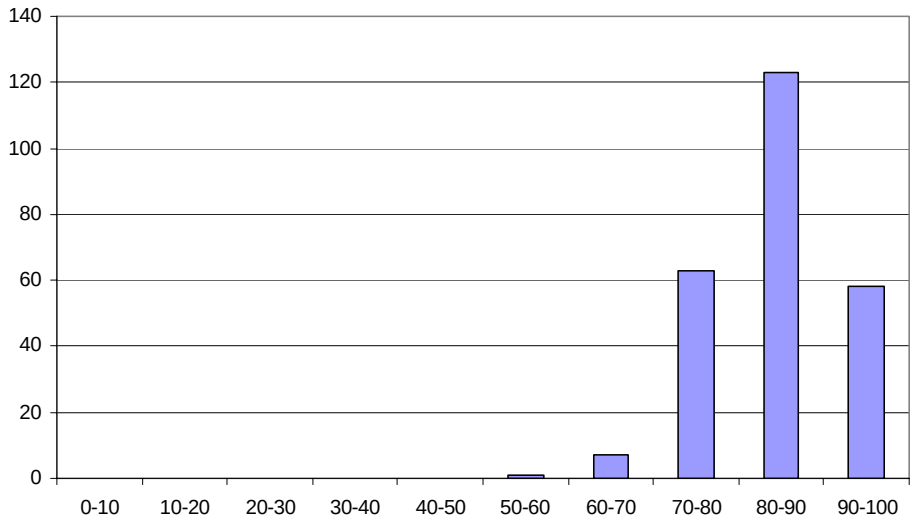
# of legs with adjusted A/C capacity: 18

Demand Multiplier: 0.96

Avg. Leg LF: 84.01%

STD: 8.85%

Network ALF: 84.35%



B2

# of legs with adjusted A/C capacity: 52

Demand Multiplier: 0.9

Avg. Leg LF: 83.85%

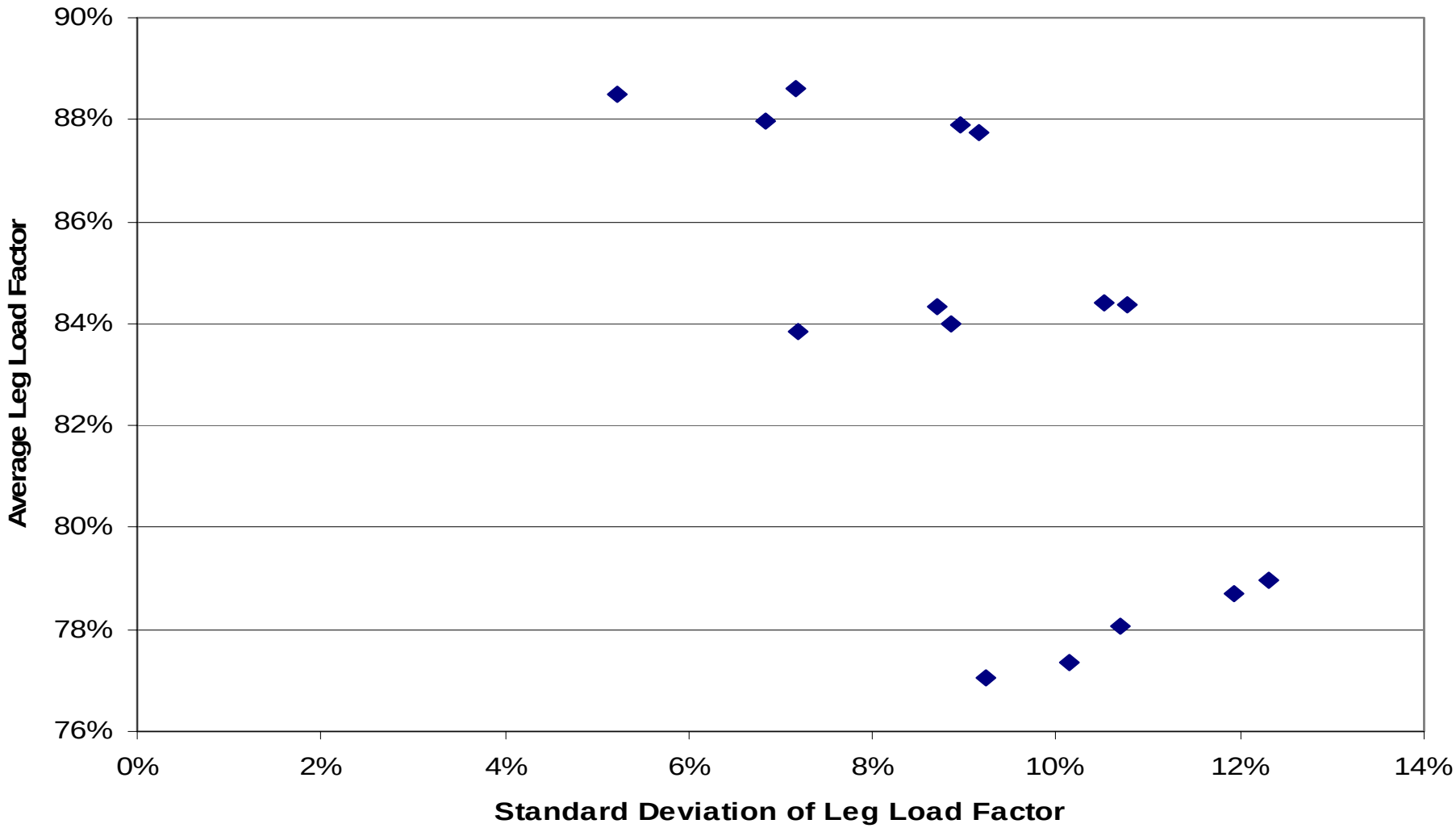
STD: 7.19%

Network ALF: 84.08%

Summary Table of the 15 Cases

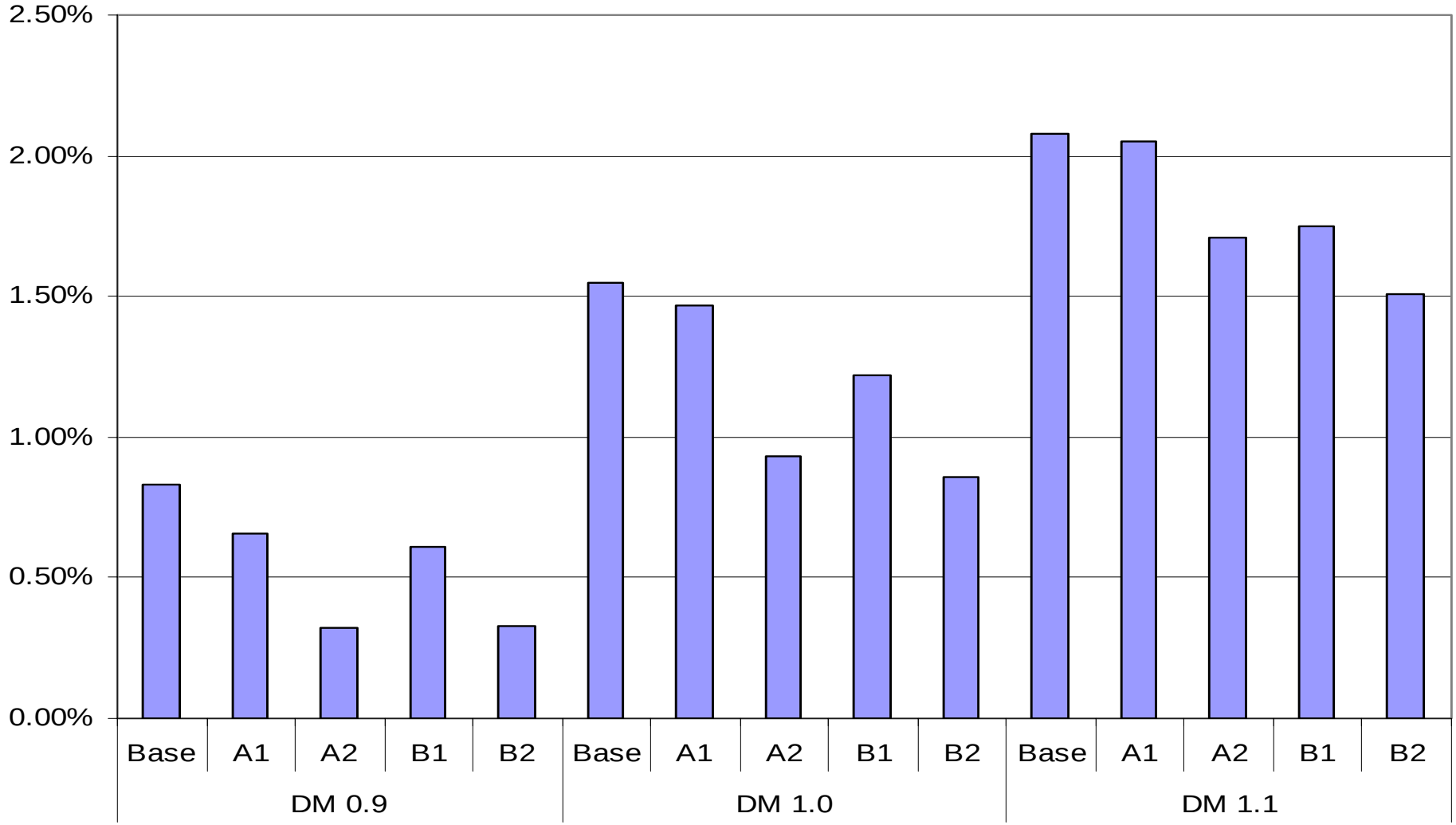
Demand Multiplier	Case	Avg. Leg LF	STD Leg LF	% Legs 90-100%	% Legs 80-90%
0.9	Base	78.98%	12.30%	22.22%	32.14%
0.9	A1	78.70%	11.94%	17.86%	36.51%
0.9	A2	77.34%	10.13%	5.95%	42.06%
0.9	B1	78.06%	10.70%	17.86%	28.57%
0.9	B2	77.05%	9.22%	7.94%	30.95%
1	Base	84.36%	10.78%	40.48%	31.75%
1	A1	84.40%	10.52%	43.25%	28.97%
1	A2	84.34%	8.70%	27.38%	50.40%
1	B1	84.01%	8.85%	31.75%	38.89%
1	B2	83.85%	7.19%	23.02%	48.81%
1.1	Base	87.76%	9.16%	62.30%	19.44%
1.1	A1	87.91%	8.95%	63.49%	19.44%
1.1	A2	88.63%	7.17%	63.10%	25.79%
1.1	B1	87.99%	6.84%	51.59%	30.95%
1.1	B2	88.49%	5.23%	46.03%	46.83%

Average and Standard Deviation of the Leg Load Factor Distribution (Eb vs. Eb, all demand multipliers)

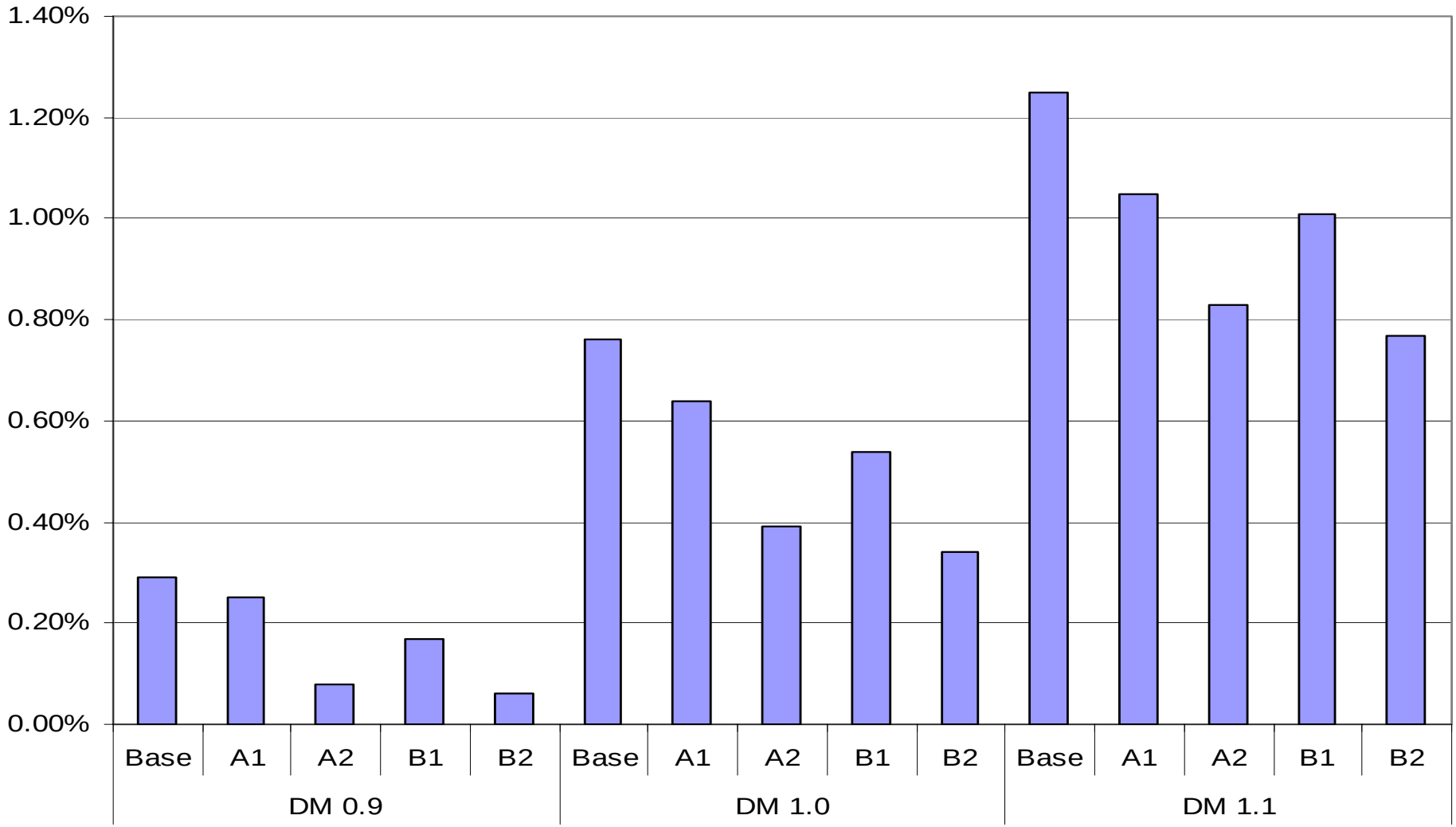


O-D Control Revenue Gains

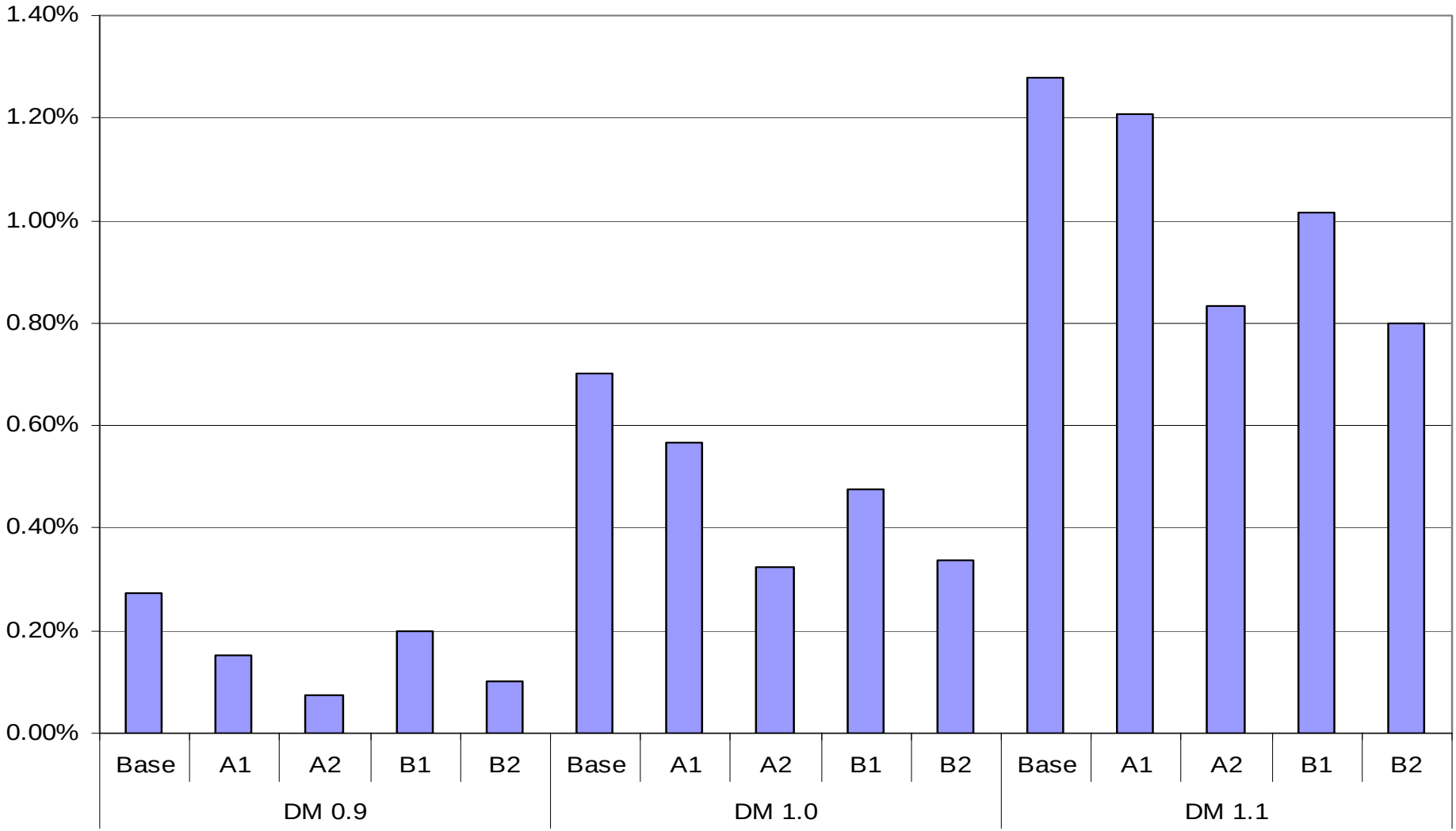
AL 1 DAVN Revenue Gains increase with the average load factor and the dispersion of the leg load factor distribution (AL 1 uses DAVN, BC: Eb vs. Eb)



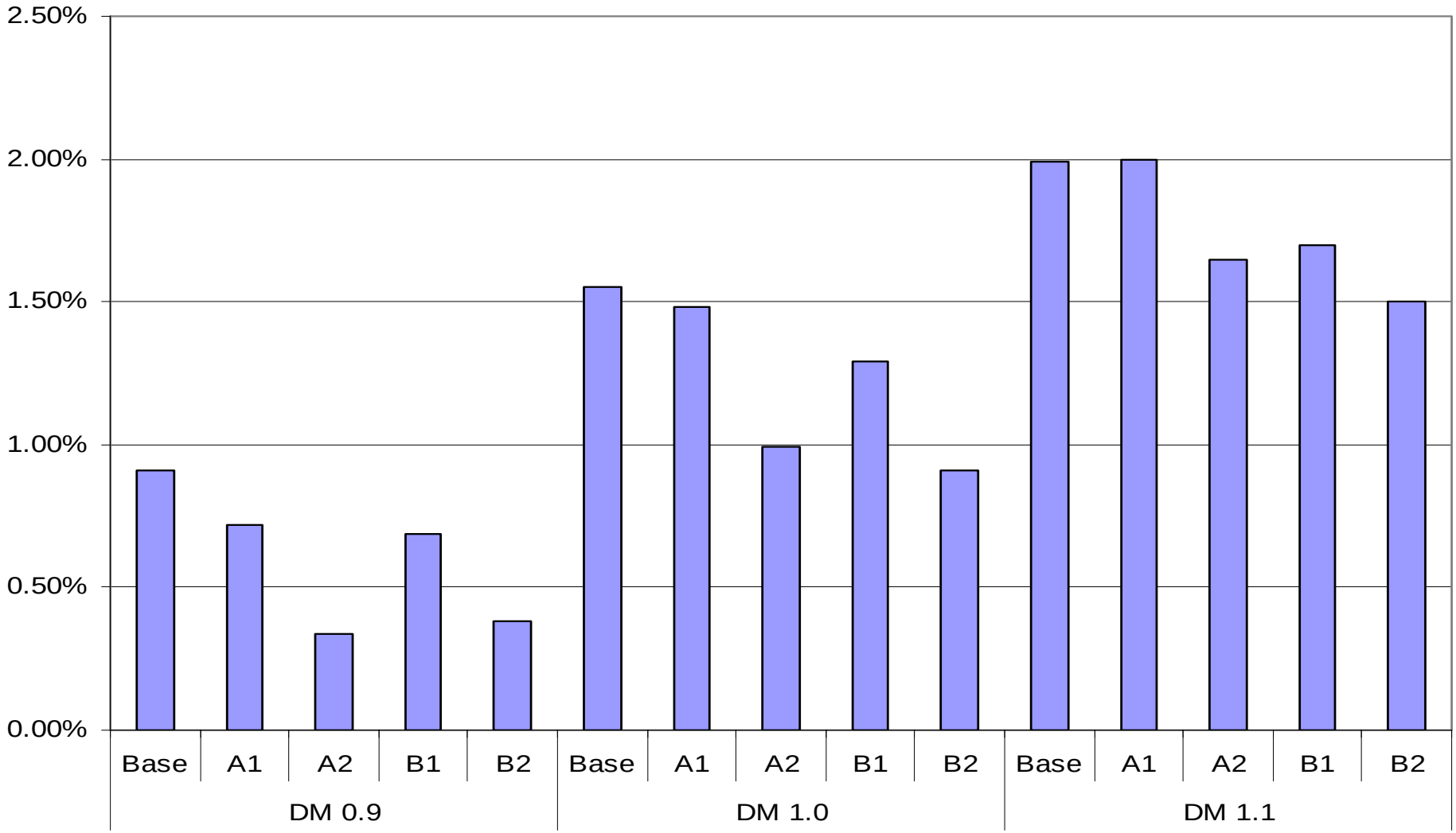
The same relationship is observed when both airlines use DAVN for AL1 revenues (Both airlines use DAVN, BC: Eb vs. Eb)



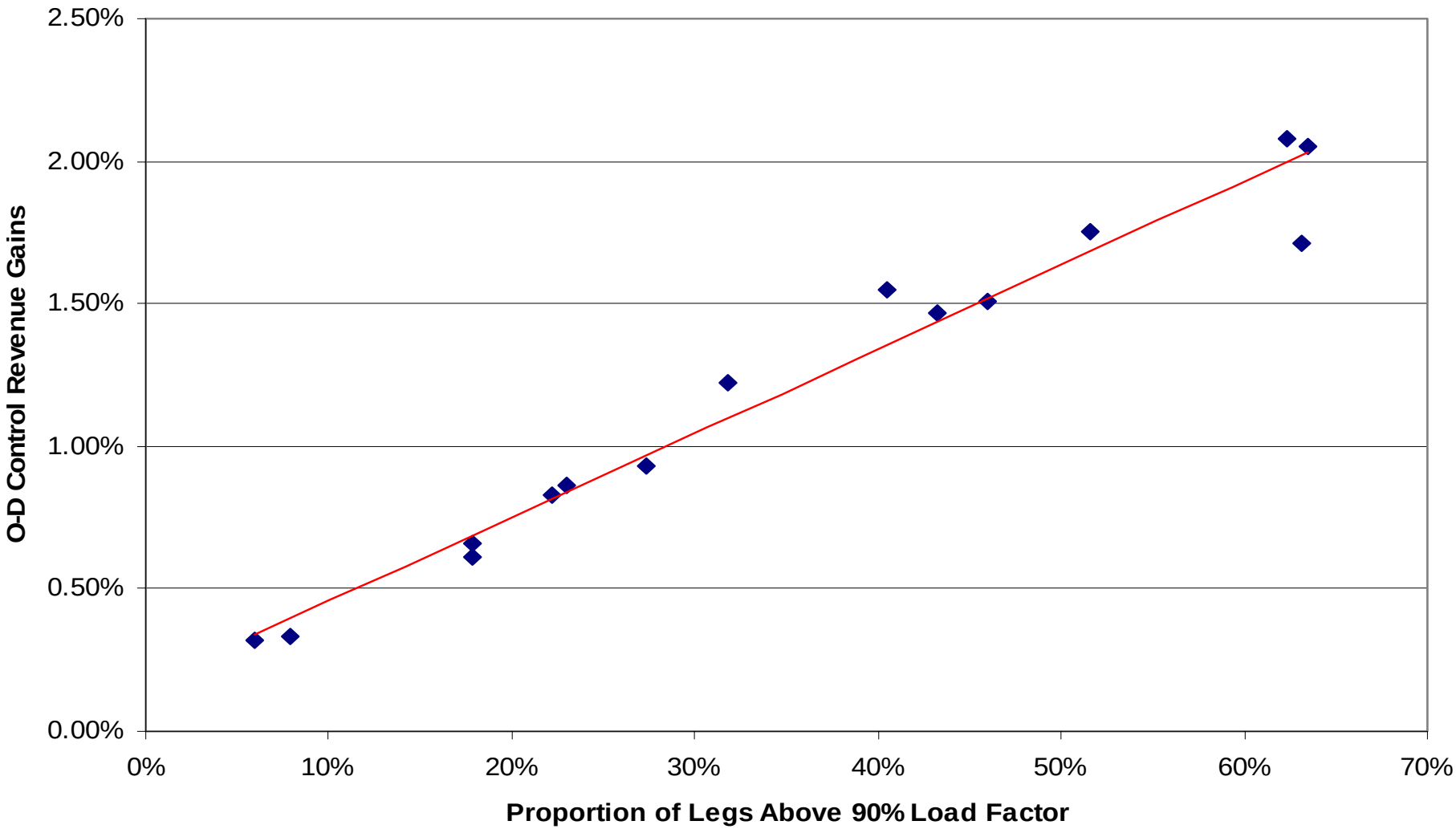
As well as for AL 2 revenue gains (Both airlines use DAVN, BC: Eb vs. Eb)



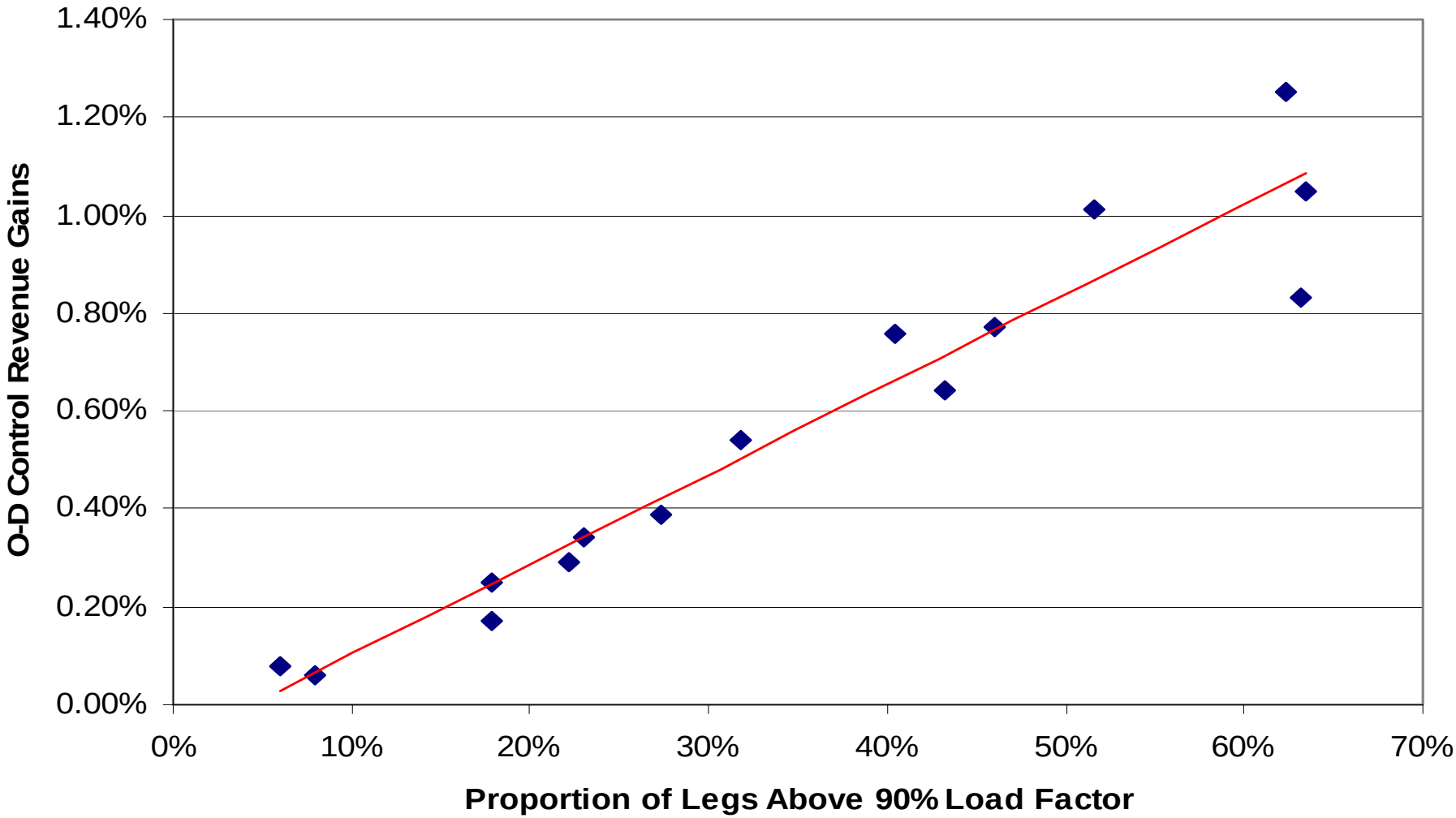
The same relationship also holds true for ProBP (AL 1 uses ProBP, BC: Eb vs. Eb)



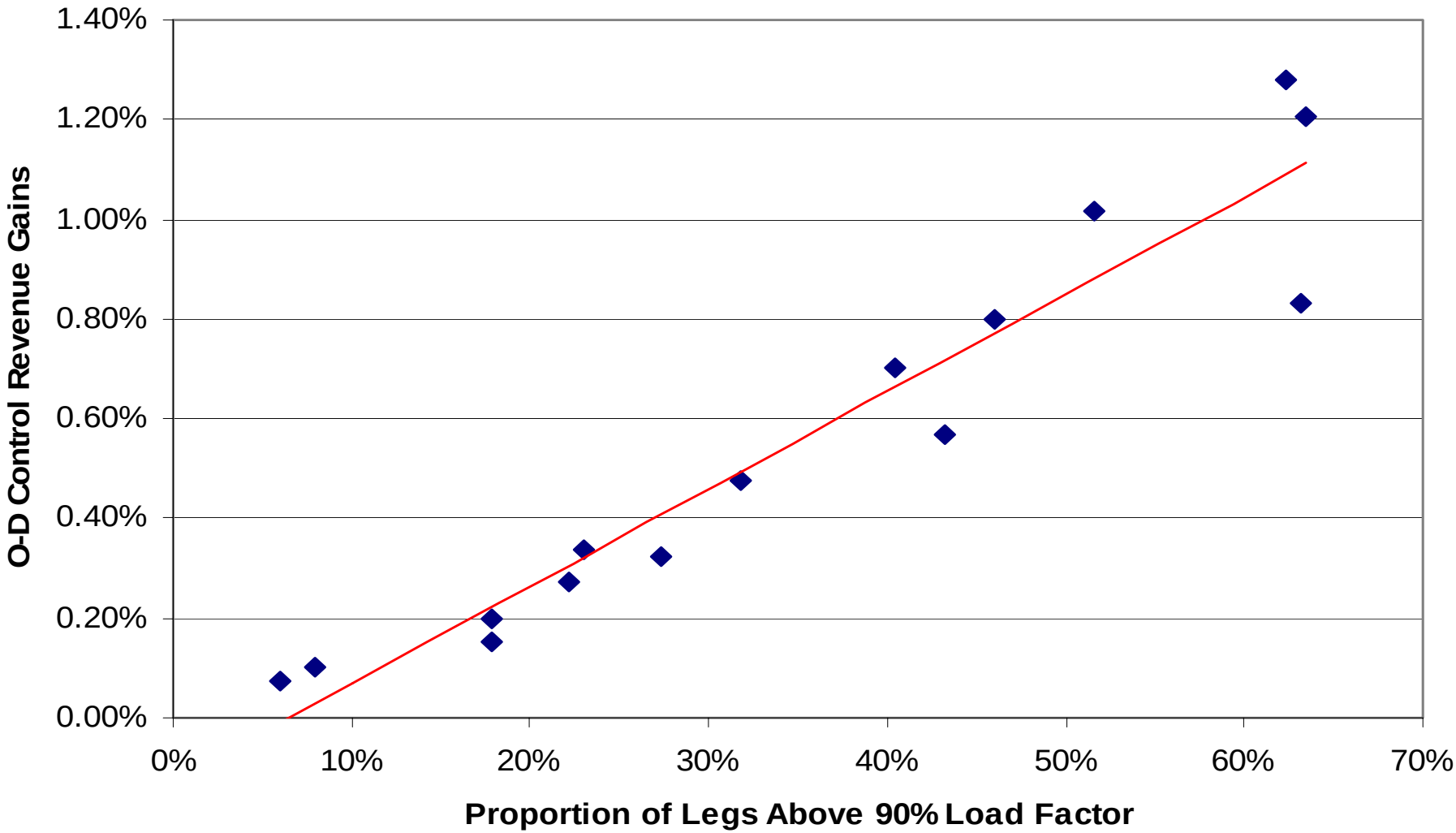
O-D control revenue gains increase almost linearly with the proportion of legs that have a load factor above 90% (DAVN vs. Eb, AL 1)



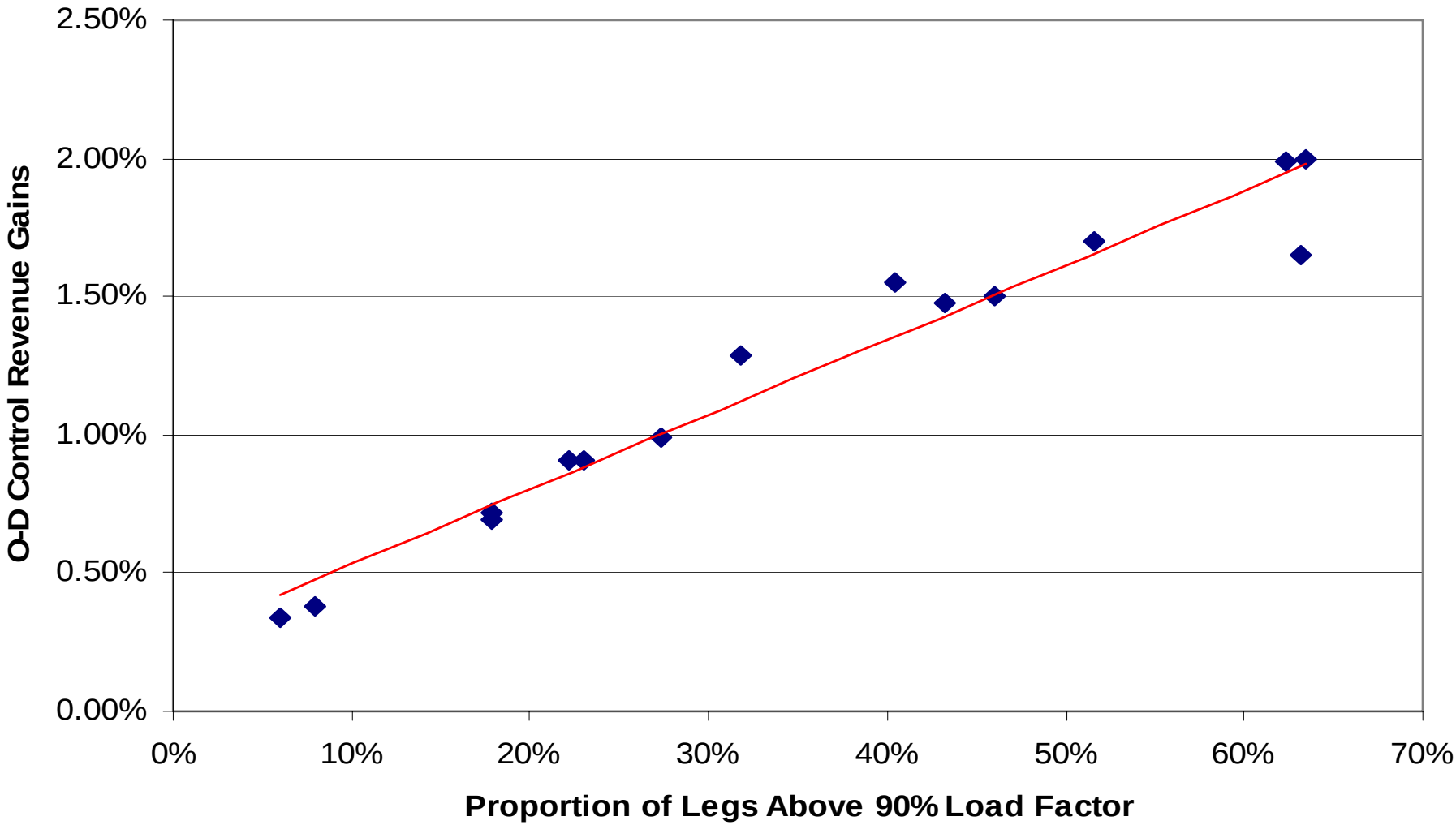
The relationship seems also fairly linear for AL 1 Revenue Gains when both airline use DAVN (DAVN vs. DAVN, AL 1)



The same hold true for AL 2 Revenue Gains when both airlines use DAVN (DAVN vs. DAVN, AL 2)



And AL 1 ProBP Revenue Gains (ProBP vs. Eb, AL 2)



Regression Analysis

The linear regression of O-D control Revenue Gains w.r.t. to one variable indicates that the proportion of legs with a load factor above 90% has the strongest explanatory power

	% legs above 90%	T-test	Adj. R Square
AL 1 DAVN vs. Eb	0.0295	18.55	0.9608
AL 1 DAVN vs. DAVN	0.0184	12.74	0.9201
AL 2 DAVN vs. DAVN	0.0195	11.84	0.9086
AL1 ProBP vs. Eb	0.0270	16.12	0.9487
	Avg. LF	T-test	Adj. R Square
AL 1 DAVN vs. Eb	0.1243	8.33	0.8301
AL 1 DAVN vs. DAVN	0.0779	7.63	0.8034
AL 2 DAVN vs. DAVN	0.0815	6.92	0.7699
AL1 ProBP vs. Eb	0.1145	8.21	0.8260
	STD Leg LF	T-test	Adj. R Square
AL 1 DAVN vs. Eb	-0.1184	-1.56	0.0925
AL 1 DAVN vs. DAVN	-0.0803	-1.68	0.1154
AL 2 DAVN vs. DAVN	-0.0913	-1.82	0.1417
AL1 ProBP vs. Eb	-0.1054	-1.49	0.0805

The regression of O-D control revenue gains w.r.t. two variables shows that the models that include the proportion of legs with a load factor above 90% have the best fit to the data

	% legs above 90%	T-test	Avg. LF	T-test	Adj. R Square
AL 1 DAVN vs. Eb	0.0275	6.41	0.0095	0.49	0.9584
AL 1 DAVN vs. DAVN	0.0166	4.26	0.0095	0.49	0.9151
AL 2 DAVN vs. DAVN	0.0192	4.27	0.0015	0.08	0.9010
AL1 ProBP vs. Eb	0.0247	5.46	0.0116	0.57	0.9458

	% legs above 90%	T-test	STD LF	T-test	Adj. R Square
AL 1 DAVN vs. Eb	0.0301	16.73	0.0141	0.79	0.9596
AL 1 DAVN vs. DAVN	0.0184	10.99	0.0008	0.05	0.9134
AL 2 DAVN vs. DAVN	0.0192	10.10	-0.0068	-0.36	0.9021
AL1 ProBP vs. Eb	0.0278	14.75	0.0170	0.91	0.9480

	Avg. LF	T-test	STD LF	T-test	Adj. R Square
AL 1 DAVN vs. Eb	0.1647	12.85	0.0141	4.60	0.9334
AL 1 DAVN vs. DAVN	0.0997	8.80	0.0701	2.81	0.8715
AL 2 DAVN vs. DAVN	0.1000	6.71	0.0596	1.81	0.8044
AL1 ProBP vs. Eb	0.1538	13.99	0.1266	5.23	0.9425

The regression of O-D control revenue gains w.r.t. the three variables shows that the number of legs with a load factor above 90% is the only variable that is significant across all cases

	% legs above 90%	T-test	Avg. LF	T-test	STD LF	T-test	Adj. R Square
AL 1 DAVN vs. Eb	0.0196	3.88	0.0614	2.19	0.0603	2.30	0.9693
AL 1 DAVN vs. DAVN	0.0139	2.54	0.0265	0.88	0.0208	0.73	0.9117
AL 2 DAVN vs. DAVN	0.0213	3.35	-0.0123	-0.35	-0.0161	-0.49	0.8943
AL1 ProBP vs. Eb	0.0150	3.08	0.0744	2.75	0.0732	2.88	0.9663

The log-linear regression of O-D control revenue gains w.r.t. the proportion of legs with a load factor above 90% gives a slightly better fit than the linear regression

	Linear		
	% legs above 90%	T-test	Adj. R Square
AL 1 DAVN vs. Eb	0.0295	18.55	0.9608
AL 1 DAVN vs. DAVN	0.0184	12.74	0.9201
AL 2 DAVN vs. DAVN	0.0195	11.84	0.9086
AL1 ProBP vs. Eb	0.0270	16.12	0.9487

	Log-Linear		
	% legs above 90%	T-test	Adj. R Square
AL 1 DAVN vs. Eb	0.8297	25.99	0.9797
AL 1 DAVN vs. DAVN	1.2473	17.27	0.9550
AL 2 DAVN vs. DAVN	1.2081	16.57	0.9513
AL1 ProBP vs. Eb	0.7613	28.24	0.9827

And shows that the relationship between O-D Control revenue gains and the proportion of legs above 90% load factor is not linear

	% legs above 90%	Sigma	Significantly different from 1
AL 1 DAVN vs. Eb	0.8297	0.0319	Yes
AL 1 DAVN vs. DAVN	1.2473	0.0722	Yes
AL 2 DAVN vs. DAVN	1.2081	0.0729	Yes
AL1 ProBP vs. Eb	0.7613	0.0270	Yes

- As expected, O-D control revenue gains tend to increase with the average load factor and the dispersion of the leg load factor distribution

- The regression of O-D control revenue gains w.r.t. to the proportion of legs with a load factor above 90% reveals a strong relationship between these two elements for both DAVN and ProBP

- The proportion of legs with a load factor above 90% is a metric that combines the impact of both the average and the dispersion of the distribution of leg load factor on O-D control revenue gains