

Spill and Recapture Methodology

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- To understand how spill and recapture is modeled, we need to first understand some terminology.
- Load Factor On Closed Flights (LFCF) - The maximum load factor before spill occurs. In the model world, 92% is often used.
- Coefficient of Variation (CV) - Because Flights can have either a wide variance in LF, or little variance in LF, a CV is required.
 - The Coefficient of Variation (CV) is equal to the standard deviation divided by the average load factor.

Spill and Recapture Methodology

- Observed Load Factor - The amount of demand that will be accommodated on a flight. Calculated based on demand, LFCF, and CV
- Recapture - Spilled Passengers that will be reclaimed
 - Attraction and Accommodated
- Passenger Closing Rate - The probability that the next passenger will not be accommodated on the flight

Example of Max Rule Spill

Spill

Scenario Characteristics									
Segment				O&D					
No.	Segment	Seats	Mileage	No.	O&D	Itin	Demand	Fare	Market Size
1	AAA-BBB	100	849	1	AAA-CCC	1 + 2	30	189	50
2	BBB-CCC	200	806	2		3 + 4	20	214	
3	AAA-DDD	120	568	1	AAA-BBB	1	50	89	70
4	DDD-CCC	150	1061	2		3 + 5	20	100	
5	DDD-BBB	150	648	1	DDD-BBB	5	50	108	50
				1	DDD-CCC	4	55	107	75
				2		5 + 2	20	129	
				1	BBB-CCC	2	130	97	130
				1	AAA-DDD	3	50	89	50

Spill

		1		2	3	4	5	6	7	12	16	17	18	19
<u>LEG</u>														
No.	Segment	Seats	Dmd Local Pax	Dmd Total pax	Dmd Total L.F.	Post Spill L.F.	Unadj. Post Spill Pax	Unadj Pax Spill	Spill Rate	Up/Down Spill	Total Spill	Total Post Spill Pax	Total Post Spill L.F.	Total Max Recap Pax
1	AAA-BBB	100	50	80	0.8	0.74	73.5	6.5	0.081	1.40	7.9	72.1	0.72	6.85
2	BBB-CCC	200	130	180	0.9	0.79	157	23	0.128	0.00	23	157	0.79	20.64
3	AAA-DDD	120	50	90	0.75	0.7	84.4	5.64	0.063	0.00	5.64	84.36	0.7	6.69
4	DDD-CCC	150	55	75	0.5	0.49	73.5	1.5	0.02	0.85	2.35	72.65	0.48	4.72
5	DDD-BBB	150	50	90	0.6	0.58	87.3	2.7	0.03	2.61	5.31	84.69	0.56	3.99
Legend		Inputs	Inputs	Inputs	2 / 1	Table	4 * 1	2 - 5	6 / 2	Sum 11	6 + 12	2 - 16	17 / 1	Sum 15
			8	9	10	10.5	11		13	14	15			
<u>O&D</u>														
No.	O&D	Seg Itin	Demand Pax	Max Spill Rate	Srvc O&D Spill Pax	Srvc Post Spill Pax	UP/Down Spill Pax Seg 1 Seg 2		Total O/D Spill Pax	Srvc Dmd Share	Max Recap Pax			
1	AAA-CCC	1 + 2	30	0.128	3.83	26.17	1.4	0	5.09	0.6	3.05			
2		3 + 4	20	0.063	1.25	18.75	0	0.85	5.09	0.4	2.03			
1	AAA-BBB	1	50	0.081	4.06	45.94	0		5.32	0.71	3.81			
2		3 + 5	20	0.063	1.25	18.75	0	0.65	5.32	0.29	1.52			
1	DDD-BBB	5	50	0.03	1.5	48.5	0		1.5	1	1.5			
1	DDD-CCC	4	55	0.02	1.1	53.9	0		3.66	0.73	2.68			
2		5 + 2	20	0.128	2.56	17.44	1.96	0	3.66	0.27	0.97			
1	BBB-CCC	2	130	0.128	16.61	113.39	0		16.61	1	16.61			
1	AAA-DDD	3	50	0.063	3.13	46.87	0		3.13	1	3.13			
Legend			Input	Max 7	8 * 9	8 - 10	10 - (7*8)		Sum 10	8 /Sum 8	13 * 14			

Example of Recapture Using Trapezoidal Rule

Recapture Using Trapezoidal Rule

		18	20	21	22	23	24	25	26	27	28	32	33
LEG													
No.	Segment	Beg L.F	Beg Close Rate	Max L.F	End L.F	End Close Rate	Beg Accom Rate	End Accom Rate	Trap Area	Rectangle Area	Recap Tate	Total Obs Pax	Total Obs L.F
1	AAA-BBB	0.72	0.42	0.79	0.79	0.62	0.59	0.38	0.033	0.068	0.48	74.65	0.75
2	BBB-CCC	0.79	0.61	0.89	0.89	0.93	0.39	0.08	0.024	0.103	0.23	161.83	0.81
3	AAA-DDD	0.7	0.36	0.76	0.76	0.53	0.64	0.47	0.031	0.056	0.56	88.07	0.73
4	DDD-CCC	0.48	0.01	0.52	0.52	0.03	0.99	0.97	0.031	0.031	0.98	76.41	0.51
5	DDD-BBB	0.56	0.08	0.59	0.59	0.12	0.92	0.88	0.024	0.027	0.9	87.12	0.58
Legend	Input	17 / 1	Table	(17 + 19)/1	<91.6	Table	"1" - 20	"1" - 23	(22-18)*((24+25))/2	22-18	26 / 27	Sum 31	32 / 1
			15	29	30	10.5	31						
O&D													
No.	O&D	Seg Itin	Max Recap Pax	Recap Rate	Recap Pax	Srv Post Spill Pax	Obs Pax						
1	AAA-CCC	1 + 2	3.05	0.23	0.71	26.17	26.88						
2		3 + 4	2.03	0.56	1.13	18.75	19.88						
1	AAA-BBB	1	3.8	0.48	1.84	45.94	47.77						
2		3 + 5	1.52	0.56	0.84	18.75	19.59						
1	DDD-BBB	5	1.5	0.9	1.35	48.5	49.85						
1	DDD-CCC	4	2.68	0.98	2.63	53.9	56.53						
2		5 + 2	0.97	0.23	0.23	17.44	17.67						
1	BBB-CCC	2	16.61	0.23	3.89	113.39	117.28						
1	AAA-DDD	3	3.13	0.56	1.74	46.87	48.61						
Legend			13 * 14	Min 28	15 * 29	8 - 10	30 + 11						

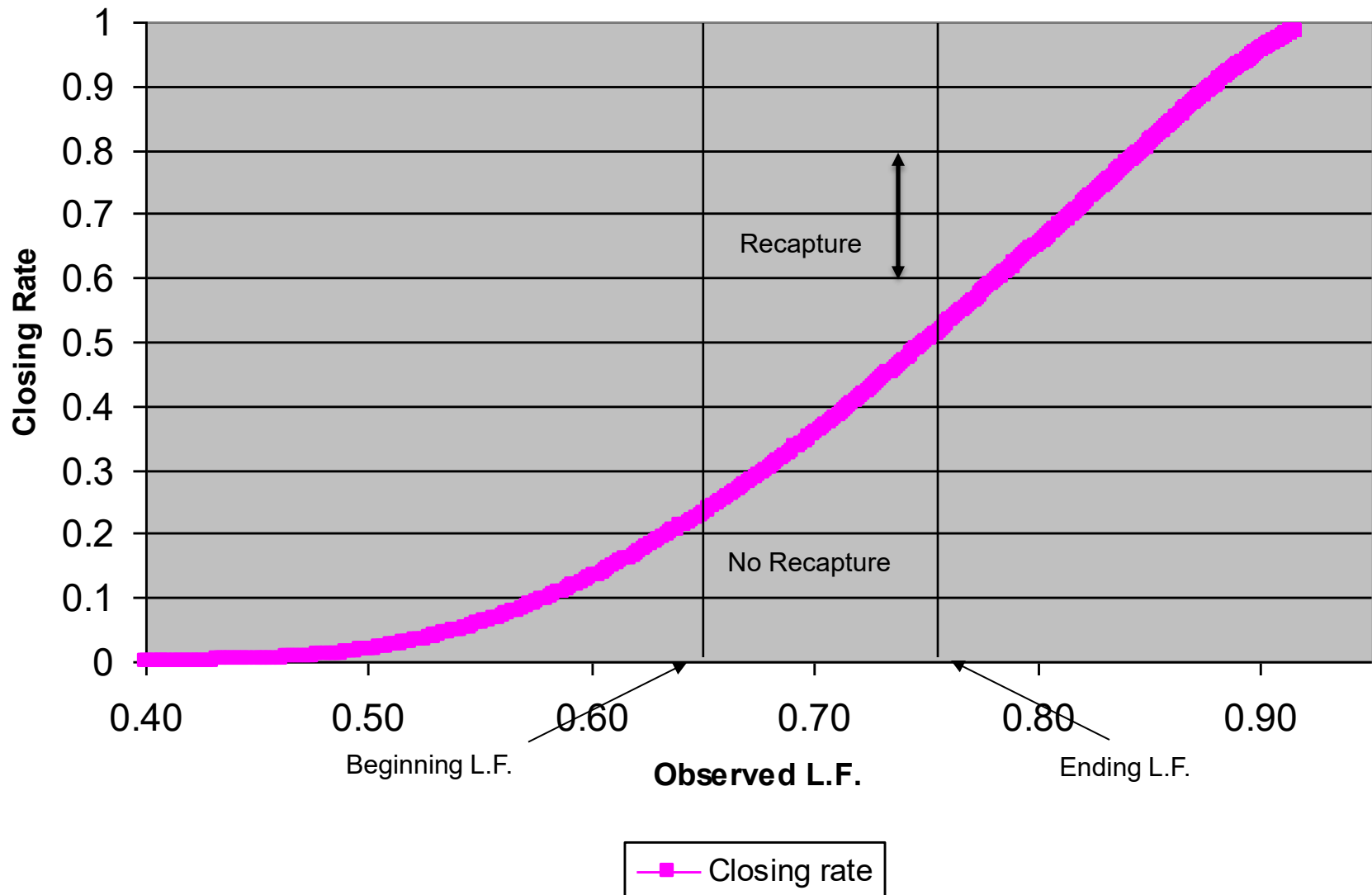
Recapture using Trapezoidal Rule

Recapture Rate Examples

	Case 1	Case 2	Case 3
Beginning L.F (After Spill)	0.5	0.65	0.8
Ending L.F. (After Spill + Max Recapture)	0.6	0.75	0.9
Beginning Closing Rate	0.018	0.233	0.65
Ending Closing Rate	0.101	0.5	0.954
Beginning Accommodation Rate	0.982	0.767	0.35
Ending Accommodation Rate	0.899	0.5	0.046
Trapezoidal Area (Prop. Of Max that can be accommodated):			
Base * ((Height 1 + Height 2)/2)			
(End LF - Beg LF) * ((Beg Accom Rate+End Accom Rate)/2)	0.094	0.063	0.02
Rectangular Area (Maximum Recapture L.F.):			
Base * Height			
(End LF - Beg LF) * 1.0	0.1	0.1	0.1
Recapture Rate:			
Trapezoidal Area / Rectangular Area:			
Percent of passengers desiring recapture on a flight that can be accommodated	0.941	0.634	0.198

Trapezoidal Rule

Passenger Closing Rate by Observed L.F.



Process Summary

- Spill - O&D demand passengers spilled proportionally by segment, based on load factor
 - Columns 1-7, using segment demand load factors and observed load factors in the Spill Table, calculate spill rates and initial spill for each segment
 - Columns 8-10, spill O&D service level demand passengers using maximum spill rate of any segment in the itinerary
 - Column 11, for each leg in a service itinerary, calculate additional spill resulting from up or down-line legs with greater spill rate
 - Columns 12 and 16, for each segment combine all up/down-line spill passengers and add this sum to initial segment spill
 - Columns 17-18, Subtract this total spill from segment demand to arrive at total segment post-spill passengers and load factor

Process Summary

- Reattraction – based on the demand share of each O&D service. Passengers will prefer re-accommodation on services with the highest demand share, even though these services may offer the least change of recapture
 - Columns 15 and 19, calculate spilled passengers that are re-attracted to individual O&D services and sum to segment level

Process Summary

- Recapture - recaptures O&D spilled passengers using segment load factor- based recapture rates
 - Column 21, calculate maximum segment load factors by adding maximum reattracted passengers to post-spill passengers
 - Columns 22-28, using post-spill and maximum segment load factors, calculate segment recapture rates with the trapezoidal rule
 - Columns 29-30, for each service itinerary, calculate recapture passengers by multiplying the minimum itinerary recapture rate by the maximum service itinerary recapture passengers
 - Columns 31-33, calculate observed service itinerary and segment passengers adding recapture passengers to service post-spill passengers, and summing to segment level