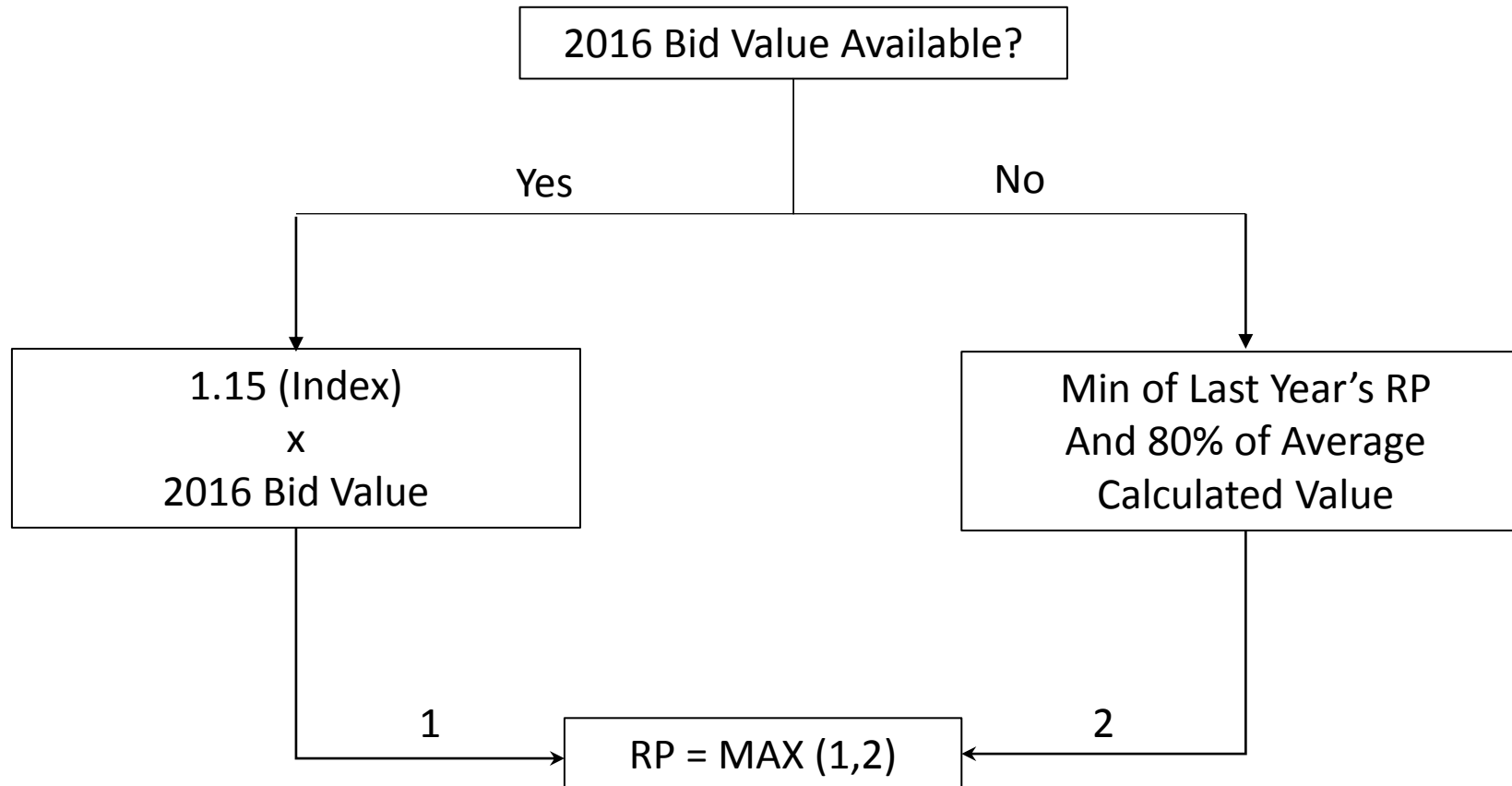


Estimating Reserve Prices for Auctions

Parag Kar

TRAI's Reserve Price Calculation Model



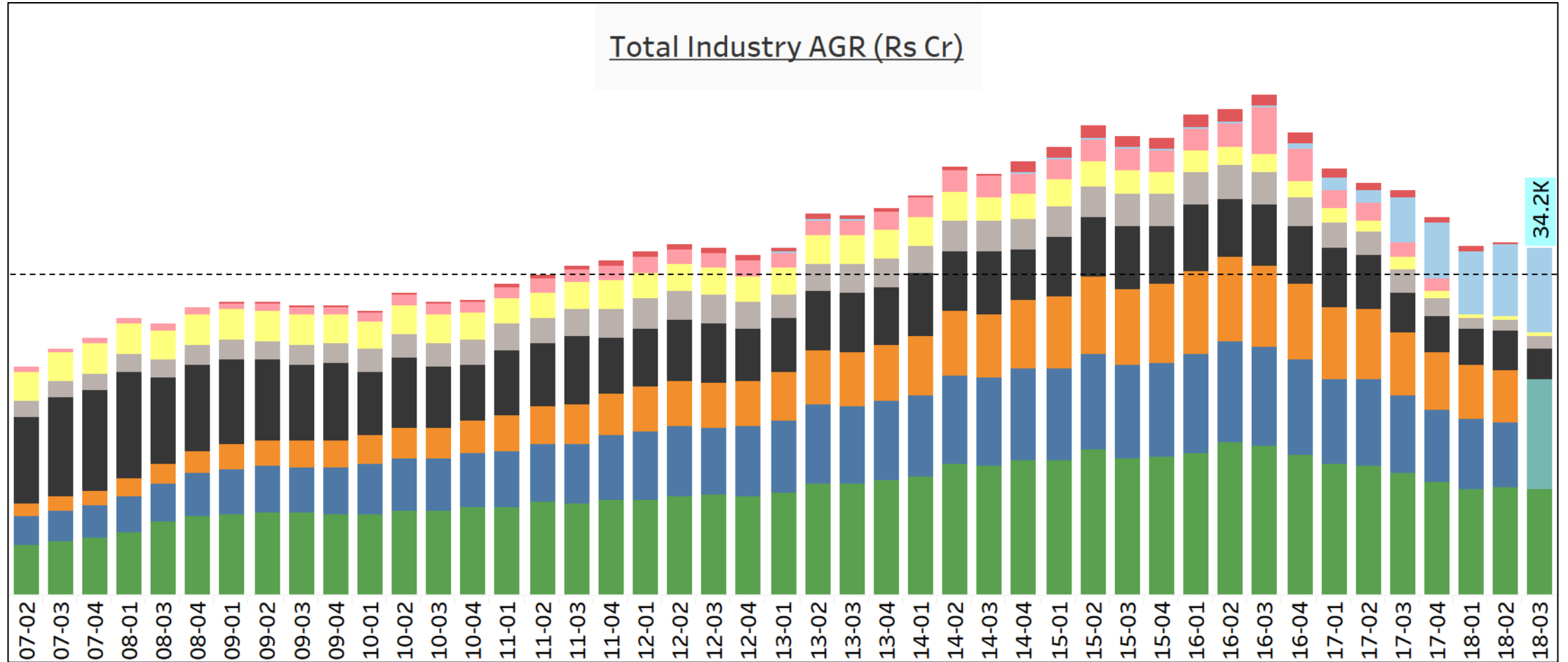
Pricing Model is biased towards last bid value

TRAI's Calculation for 1800 MHz

Col Nos	1	2	3	4	5	6	7	8
LSA	AP Last (Indexed)	Prod Surplus	Prod Function	Mul Reg	Rev Surplus	Mean (1 to 5)	80% of 6	RP(Max 1 & 7)
DL	457.42	336.03	206.13	713.00	127.76	368.07	294.45	457.42
MU	560.82	260.52	139.15	439.00	93.06	298.51	238.81	560.82
KO	173.28	75.07	36.41	95.00	28.24	81.60	65.28	173.28
AP	278.58	147.62	91.03	489.00	161.96	233.64	186.91	278.58
GU	272.85	208.18	73.33	423.00	84.23	212.32	169.85	272.85
KA		162.55	95.56		152.45	136.85	109.48	109.48
MA	364.56	237.52	105.07	726.00	145.74	315.78	252.62	364.56
TN		131.38	93.94		148.26	124.53	99.62	99.62
HA	56.52	47.22	22.80	57.00	26.85	42.08	33.66	56.52
KE	95.15	101.58	46.93	192.00	125.25	112.18	89.75	95.15
MP	95.15	167.09	64.25	112.00	71.42	101.98	81.59	95.15
PU	88.27	163.54	39.73	114.00	68.96	94.90	75.92	88.27
RA	105.36	153.34	65.97	110.00	64.24	99.78	79.83	105.36
UPE	152.64	218.56	80.00	95.00	81.61	125.56	100.45	152.64
UPW	114.99	109.73	60.03	79.00	50.96	82.94	66.35	114.99
WB	52.73	59.55	46.53	48.00	35.81	48.52	38.82	52.73
AS	45.86	47.63	26.62	45.00	38.36	40.69	32.56	45.86
BH	71.08	244.28	75.73	90.00	66.53	109.52	87.62	87.62
HP	18.34	16.00	12.73	17.00	12.24	15.26	12.21	18.34
JK	14.90	32.37	22.78	14.00	21.60	21.13	16.90	16.90
NE	12.61	37.68	14.50	19.00	23.76	21.51	17.21	17.21
OR		46.50	30.97		23.85	33.77	27.02	27.02
							Total (All Circles)	3290

Prices emanating out of models cannot be used in 19 of the 22 circles

Telecom Revenue Growth



It is unreasonable to index prices when the sector is shrinking

Modified Calculation For 1800 MHz

Col Nos	1	2	3	4	5	6	7	
LSA	Auction Last	Prod Surplus	Prod Function	Mul Reg	Rev Surplus	Median (1 to 5)	TRAI RP	
DL	399.00	336.03	206.13	713.00	127.76	336.03	457.42	
MU	489.20	260.52	139.15	439.00	93.06	260.52	560.82	
KO	151.20	75.07	36.41	95.00	28.24	75.07	173.28	
AP	243.00	147.62	91.03	489.00	161.96	161.96	278.58	
GU	238.00	208.18	73.33	423.00	84.23	208.18	272.85	
KA	NA	162.55	95.56		152.45	152.45	109.48	
MA	318.00	237.52	105.07	726.00	145.74	237.52	364.56	
TN	NA	131.38	93.94		148.26	131.38	99.62	
HA	49.30	47.22	22.80	57.00	26.85	47.22	56.52	
KE	83.00	101.58	46.93	192.00	125.25	101.58	95.15	
MP	83.00	167.09	64.25	112.00	71.42	83.00	95.15	
PU	77.00	163.54	39.73	114.00	68.96	77.00	88.27	
RA	91.90	153.34	65.97	110.00	64.24	91.90	105.36	
UPE	133.20	218.56	80.00	95.00	81.61	95.00	152.64	
UPW	100.30	109.73	60.03	79.00	50.96	79.00	114.99	
WB	46.00	59.55	46.53	48.00	35.81	46.53	52.73	
AS	40.00	47.63	26.62	45.00	38.36	40.00	45.86	
BH	62.00	244.28	75.73	90.00	66.53	75.73	87.62	
HP	16.00	16.00	12.73	17.00	12.24	16.00	18.34	
JK	13.00	32.37	22.78	14.00	21.60	21.60	16.90	
NE	11.00	37.68	14.50	19.00	23.76	19.00	17.21	
OR	NA	46.50	30.97		23.85	30.97	27.02	
						RP (Median Based)	RP (TRAI)	Median/TRAI
					Total All Circle	2388	3290	0.73
					80% of Total	1910	3290	0.58
					700 RP (2x1800)	3820	6568	0.58
					3500 RP (0.3x1800)	573	984	0.58

Correct Statistical Approach leads to a 42% reduction

5G Auction Prices

5G Spectrum Auctions				
Country	Auction Date	Spectrum Band	Qty Auction (MHz)	Price/MHz (Rs Cr)
South Korea	Jun-18	3.5 GHz	180	69.62
Spain	Jul-18	3.7 GHz	200	20.23
UK	Apr-18	3.4 GHz	150	71.35
Italy	Oct-18	3.7 GHz	160	174.40
Finland	Oct-18	3.5 GHz	390	1.89

International prices are still lower than those emanating out of models

Conclusion

- Last Auction Price Should not be indexed with SBI PLR
- Median (not Mean) should be used to aggregate prices of models
- 5G bands (especially higher freq) should not be linked with 4G bands
- Assumption of pricing models should be disclosed for scrutiny