Ratings Forecaster: Analysis of Test Cases

13 November, 2017

Executive Summary

This presentation contains detailed analysis of 17 Test Cases provided by XYZ.

GRP was forecast for 10 weeks of 2009 as part of this analysis.

- Average percentage error (MAPE) for 6 weeks ahead forecasts was 9%.
- For shorter forecast horizons (1 – 4 weeks) MAPE was 5-7%.

Ratings for a program were forecast for Week 45 (3 – 7 Nov) of 2008.
- The error for 6 weeks ahead forecast was 0.37.
- As forecast horizons shortened, MAE reduced and was 0.06 for 1 week ahead forecast.

Ratings were forecast for 9 launch/high-points.

- All forecasts were made 9 weeks prior to the planned launch.
- The average error (MAE) is 0.57 (where we did not use any information on GRP burn)
- The results are skewed by one bad forecast – the error for Little Monkeys - 3.08; if we omit this case the average error is 0.15.
- The results can be improved in some cases by using GRP burn information.

- The above summarizes the results of purely statistical forecasts without any human intervention.
- They can be further improved by use of appropriate user influence.
- GRP forecasts can also be improved by using what-if analysis to predict launch, high point & movie GRPs
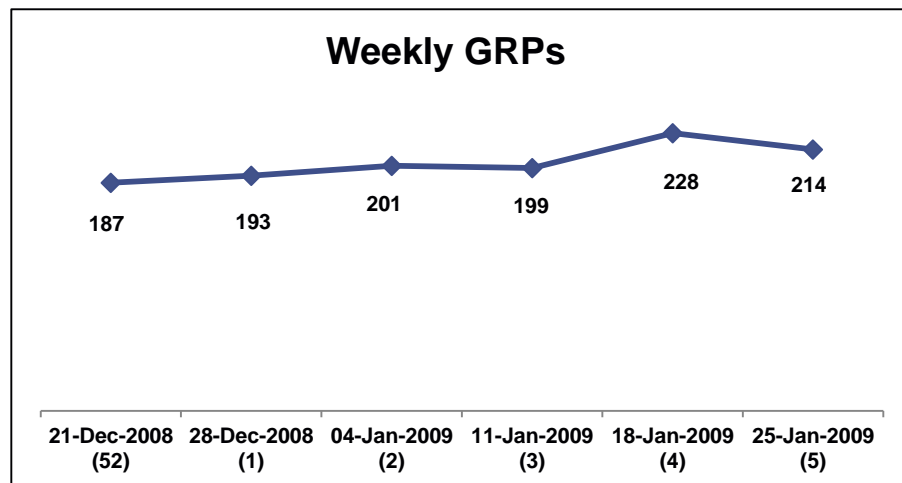
Weekly GRP Forecasts

GRP Forecast

- Channel GRP forecasts are based on 74 weeks historical data. If less than 74 weeks data is available, all data is used.

- GRPs are calculated from day-part ratings. Missing values are imputed by considering data from immediately preceding weeks.

- Outliers (unusually large or small values) are removed using statistical rules to avoid forecast bias.

- Forecasts are carried out using either ARIMA (if sufficient data is available) or moving averages method (in case of sparse data, e.g. New channel or new market, target groups).

- ARIMA searches for trends and complex inherent patterns in historical data.

- Over time the forecaster learns from new data points and modifies its forecasts. As 74 weeks of history is currently used, adjustments are usually gradual.

Experiment 8

Target Selection		
Forecast for Week	Event	Market-TG combination
Wk 6'09	Competition has finale XXXXX	

Weeks ahead	Actual	Forecasts
6weeks ahead	191.91	185.44
5weeks ahead	191.91	187.65
4weeks ahead	191.91	208.66
3weeks ahead	191.91	191.13
2weeks ahead	191.91	192.50
1week ahead	191.91	210.90

Weekly GRPs

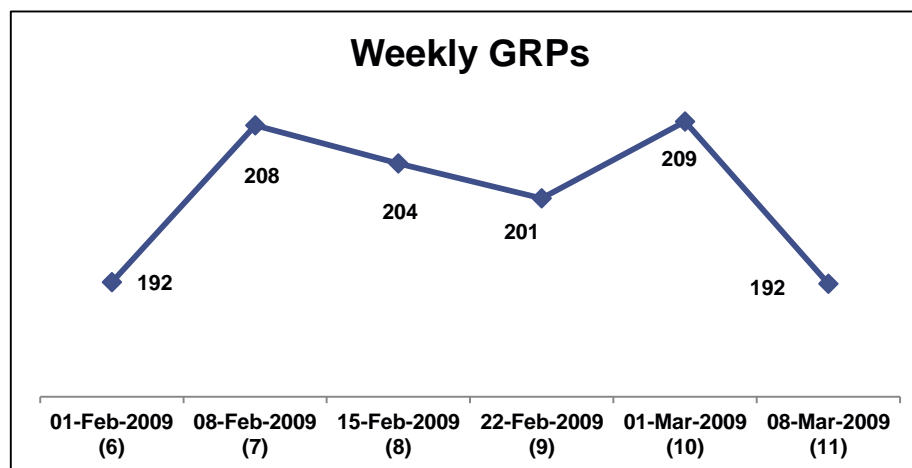|					
187	193	201	199	228	214
21-Dec-2008 (52)	28-Dec-2008 (1)	04-Jan-2009 (2)	11-Jan-2009 (3)	18-Jan-2009 (4)	25-Jan-2009 (5)

- **Week 4 high ratings due to YYYYY Finale(Jan 24,2009)-37 GRPs**
- **Week 5 Premier movie BBBBB-18 GRPs**
- **No comparable program in Week 6.**
- **User influence and use of What-If Analysis (Program Launch, Highpoint and Movie Planner) might have improved the forecasts**

Experiment 15

Target Selection		
Forecast for Week	Event	Market-TG combination
Week 12' 09	-	

Weeks ahead	Actual	Forecasts
6weeks ahead	222.07	193.42
5weeksahead	222.07	198.56
4weeks ahead	222.07	198.33
3weeks ahead	222.07	200.80
2weeks ahead	222.07	204.15
1week ahead	222.07	197.15

Weekly GRPs

192 208 204 201 209 192

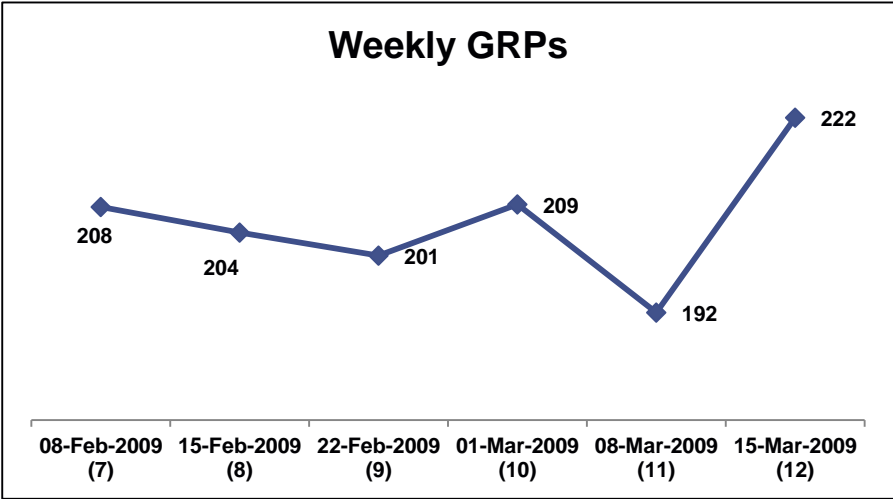| 01-Feb-2009 (6) | 08-Feb-2009 (7) | 15-Feb-2009 (8) | 22-Feb-2009 (9) | 01-Mar-2009 (10) | 08-Mar-2009 (11) |

Rise in ratings in Week 12 due to:
- **Launch of CCCCC(12.5 GRPs) replacing DDDD**
- **Movies with high ratings, e.g., EEE(8.5 GRPs), FFF(6 GRPs), GGG(9 GRPs) and HHH(5 GRPs)**
- **User influence and use of What-If Analysis might again have improved the forecasts.**

Experiment 17

Target Selection		
Forecast for Week	Event	
Wk 13'09	-	

Weeks ahead	Actual	Forecasts
6weeks ahead	238.99	197.42
5weeks ahead	238.99	197.02
4weeks ahead	238.99	200.34
3weeks ahead	238.99	203.64
2weeks ahead	238.99	196.32
1week ahead	238.99	208.50

Weekly GRPs

Data points: 208 (08-Feb-2009, week 7), 204 (15-Feb-2009, week 8), 201 (22-Feb-2009, week 9), 209 (01-Mar-2009, week 10), 192 (08-Mar-2009, week 11), 222 (15-Mar-2009, week 12)

• **It is too early for a model to judge whether this increase of 30 GRPs in Week 12 is an outlier or beginning of a trend.**
•**Part of the increase is due to high ratings of blockbuster movie-JJJ (18 GRPs)**
•**Forecast might have improved if Movie Planner had been used.**

Experiment 7 (g)

Target Selection		
Forecast for Week	Event	
Wk 22'09	similar to last year IPL (2008)	

Weeks ahead	Actual	Forecasts
6week ahead	245.3	228.47
5week ahead	245.3	217.12
4week ahead	245.3	221.05
3week ahead	245.3	228.58
2week ahead	245.3	218.73
1week ahead	245.3	219.63
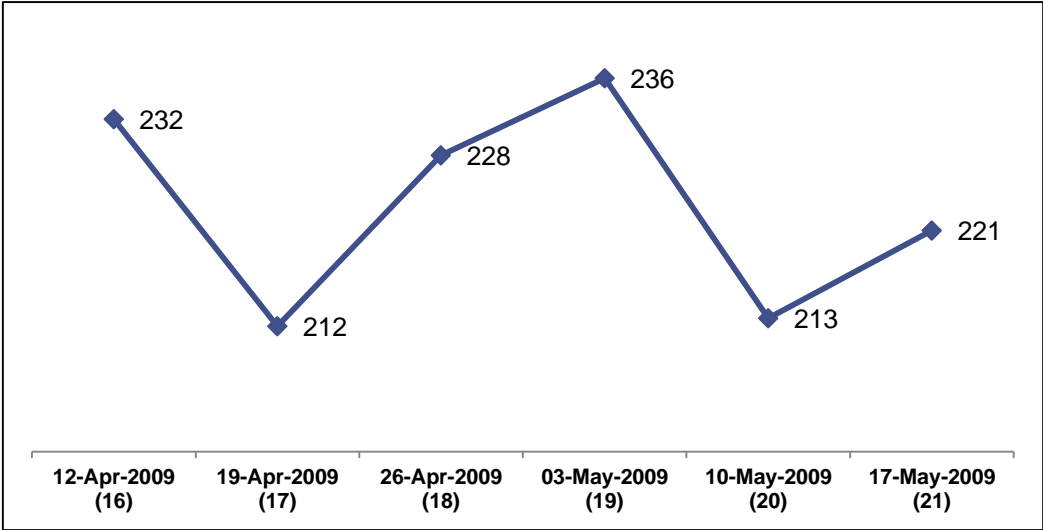
- **Week 22 high ratings due to KKK Grand Finale(May 30,2009)-41 GRPs**
- **User influence and use of What-If Analysis might have improved the forecasts**

Day-part/Program Forecasts

Day-part/Program Forecast

- Day-part/Program forecasts are based on 74 weeks historical data. If less than 74 weeks data is available, all data is used.

- Extremely challenging as very small numbers have to be forecast.

- Missing values are imputed by considering data from immediately preceding weeks.

- Outliers (unusually large or small values) are removed using statistical rules to avoid forecast bias.

- Forecasts are carried out using either ARIMA (if sufficient data is available), or Holt Winters Method (in case of less data), or Moving Averages method (in case of very sparse data, e.g. New channel or new market, target groups).

- Forecasts take into account :
    o Trends in data
    o Day-of-week effect
    o Autoregressive patterns

Experiment 11

Target Selection	
Forecast for Program	
LLLL(19:00:00 to 19:29:59)	

Actual Ratings
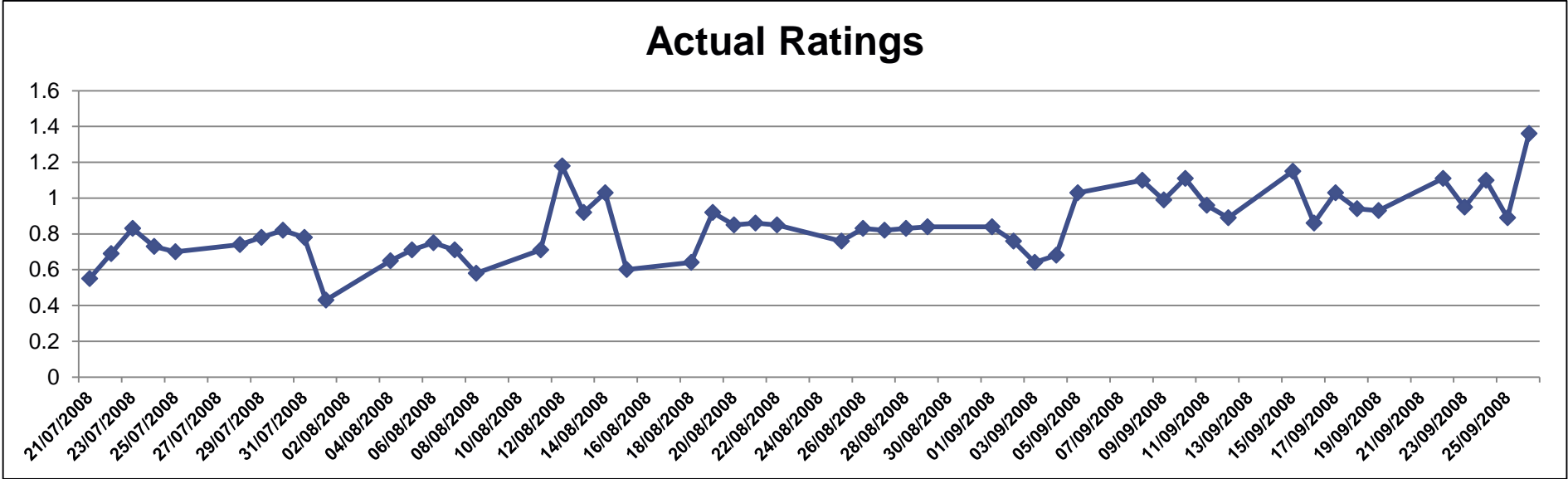
Note: **6 weeks ahead program data**

•**No strong DOW pattern**
•**Overall increasing trend**

DOW	Average	Std Dev
Mon	0.79	0.17
Tue	0.81	0.14
Wed	0.85	0.18
Thu	0.80	0.14
Fri	0.76	0.21

Experiment 11

Date	Actual	6 weeks ahead Forecasts
03/11/2008	0.63	1.12
04/11/2008	0.78	1.13
05/11/2008	0.80	1.13
06/11/2008	0.79	1.14
07/11/2008	0.83	1.14

Actual rating before 6 weeks

	Mon 22/09/2008	Tue 23/09/2008	Wed 24/09/2008	Thu 25/09/2008	Fri 26/09/2008

Values plotted: 1.11, 0.95, 1.1, 0.89, 1.36
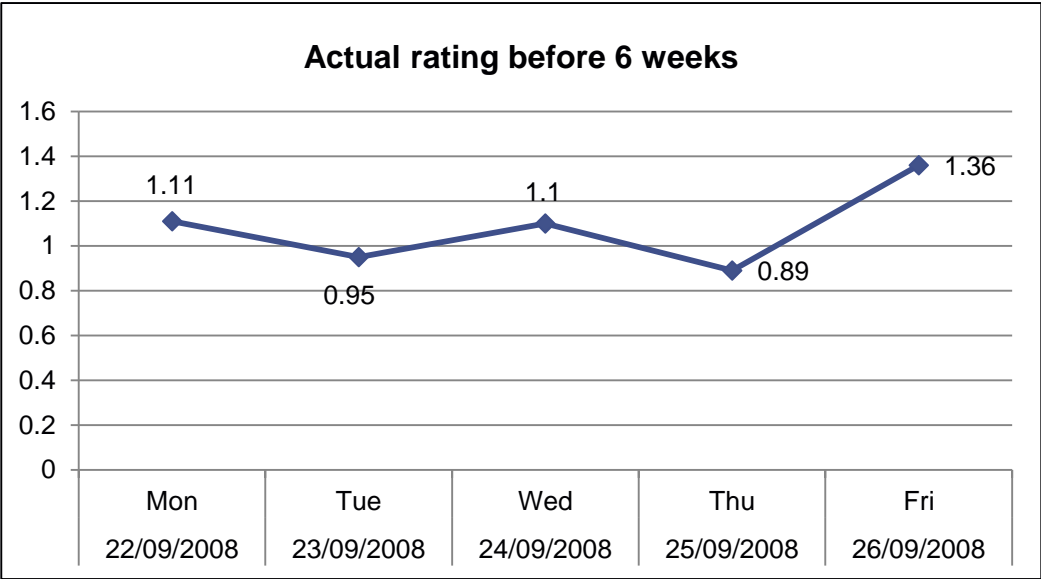
•**Model perceives increasing trend and forecasts accordingly**

Experiment 11

Date	Actual	5 weeks ahead Forecasts
03/11/2008	0.63	1.08
04/11/2008	0.78	1.09
05/11/2008	0.80	1.09
06/11/2008	0.79	1.10
07/11/2008	0.83	1.10

Actual ratings before 5 weeks

	Mon 29/09/2008	Tue 30/09/2008	Wed 01/10/2008	Thu 02/10/2008	Fri 03/10/2008
	0.84	1.02	0.88	1	0.96
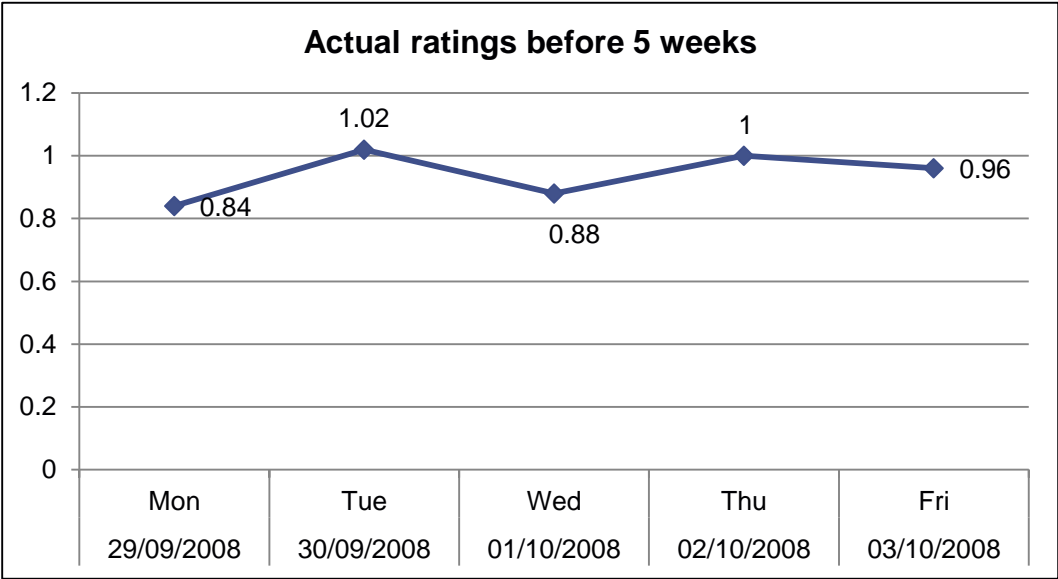
- There was a decrease in actual ratings in Week 40
- However overall long term trend is still increasing and this is reflected in forecasts

Experiment 11

Date	Actual	4 week ahead Forecasts
03/11/2008	0.63	1.04
04/11/2008	0.78	1.04
05/11/2008	0.80	1.04
06/11/2008	0.79	1.05
07/11/2008	0.83	1.05

Actual Ratings before 4 weeks

	Mon 06/10/2008	Tue 07/10/2008	Wed 08/10/2008	Thu 09/10/2008	Fri 10/10/2008
	0.8	0.97	1.07	0.79	0.89
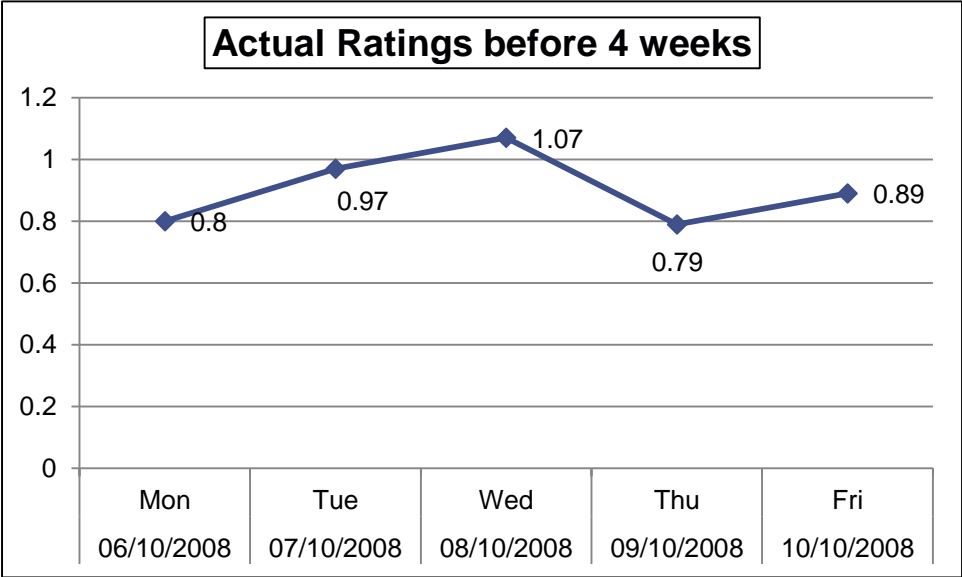
Experiment 11

Date	Actual	3 week ahead Forecasts
03/11/2008	0.63	1.01
04/11/2008	0.78	1.01
05/11/2008	0.80	1.01
06/11/2008	0.79	1.02
07/11/2008	0.83	1.02

Actual Ratings before 3 Weeks
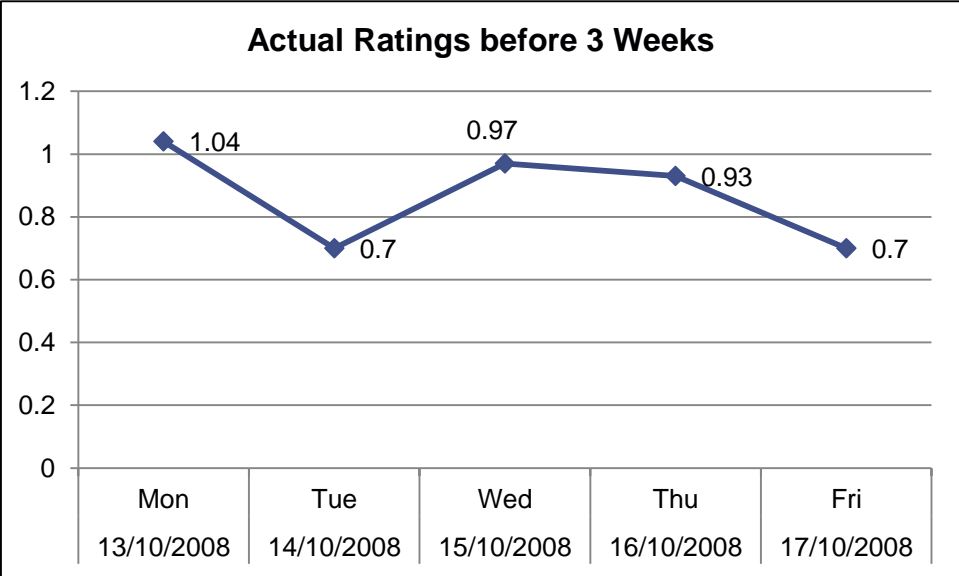
- **Although the overall long term trend is increasing the short term trend is decreasing**
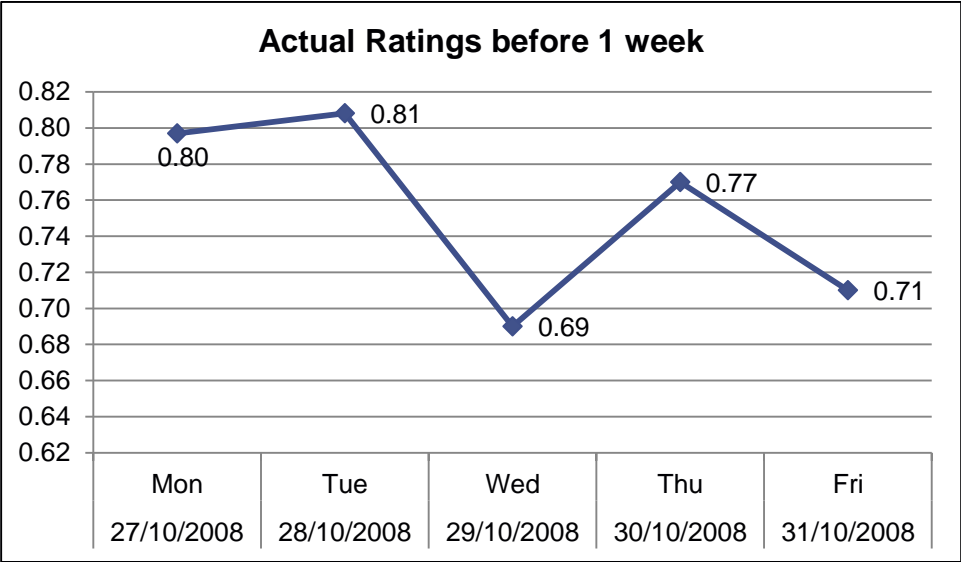- **Forecasts are therefore lower than in previous weeks**

Experiment 11

Date	Actual	2 week ahead Forecasts
03/11/2008	0.63	0.94
04/11/2008	0.78	0.94
05/11/2008	0.80	0.95
06/11/2008	0.79	0.95
07/11/2008	0.83	0.95

Actual Ratings before 2 weeks

	Mon 20/10/2008	Tue 21/10/2008	Wed 22/10/2008	Thu 23/10/2008	Fri 24/10/2008
Value	0.89	0.81	1.08	0.85	0.94
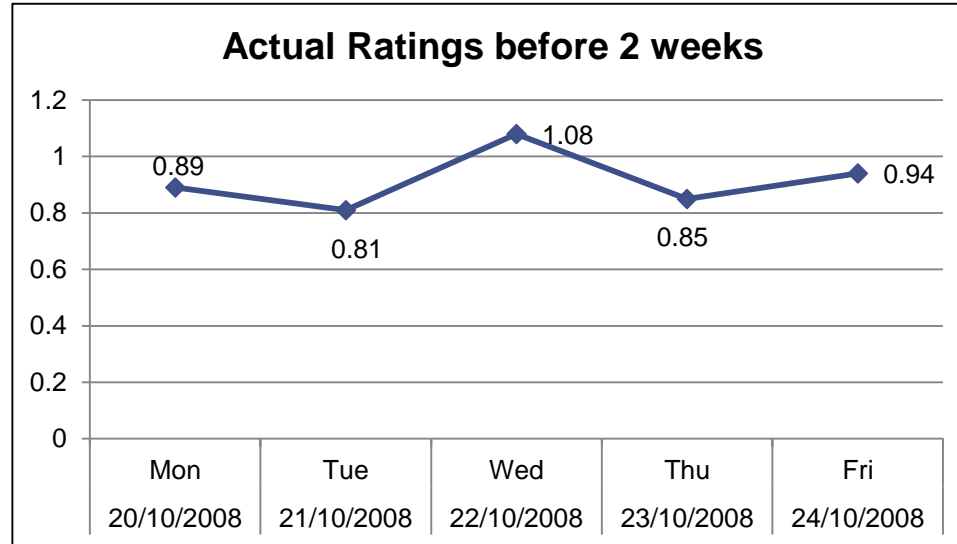
•**Even though there was some increase in actual ratings in Week 43 the forecasts continue to decrease because of recent decreasing trend**
•**Recent forecasts are more accurate than distant ones**

Experiment 11

Date	Actual	1 week ahead Forecasts
03/11/2008	0.63	0.82
04/11/2008	0.78	0.82
05/11/2008	0.80	0.82
06/11/2008	0.79	0.82
07/11/2008	0.83	0.82

Actual Ratings before 1 week

	Mon	Tue	Wed	Thu	Fri
	27/10/2008	28/10/2008	29/10/2008	30/10/2008	31/10/2008
Value	0.80	0.81	0.69	0.77	0.71

- **1 week ahead forecasts are quite accurate**
- **Forecasts increase in accuracy as we tend towards the target week**

Experiment 9

| Target Information		Proxy Information	
Ratings Provider :			Experiment : MMM
Market And TG :		Channel	XYZ
Forecast From :	8-Dec-08	Ratings Provider	
Forecast To :	12-Dec-08	Daypart/Prg	NNN(19:00:00 to 19:29:59)
DayPart :	19:30:00 to 19:59:59	Launch date	21-Apr-08
Program Name :	**MMM**	Mkt & TG	
GRP Burn(Week - 4,3,2,1) :	127, 212, 255, 255	GRP Burn	90,150,180,180

Actual Ratings(19:30-20:00) till 9 weeks before planned launch
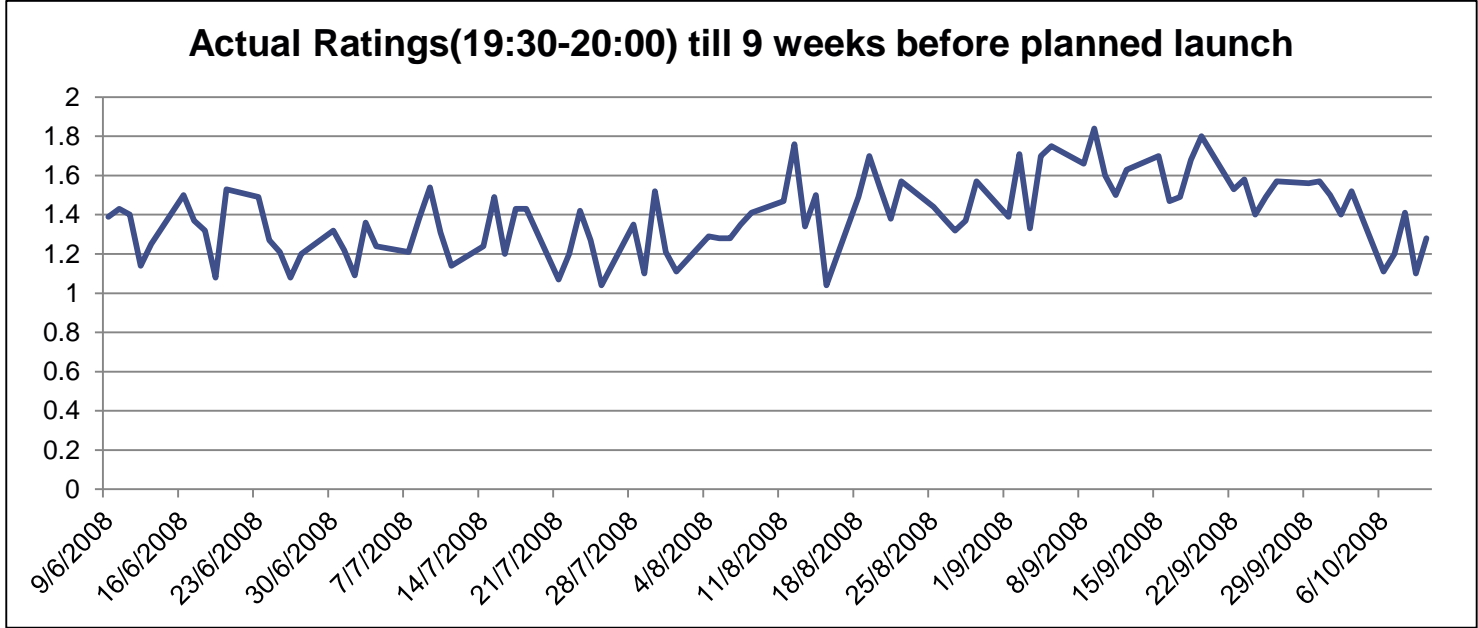
Date	Target Day-part Forecast
8-Dec-08	1.25
9-Dec-08	1.25
10-Dec-08	1.25
11-Dec-08	1.25

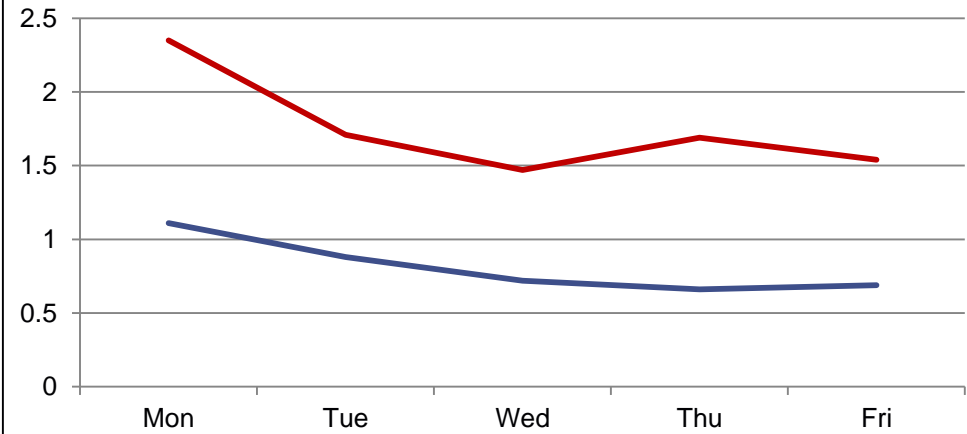# Experiment 9

Proxy Actual Ratings without launch week
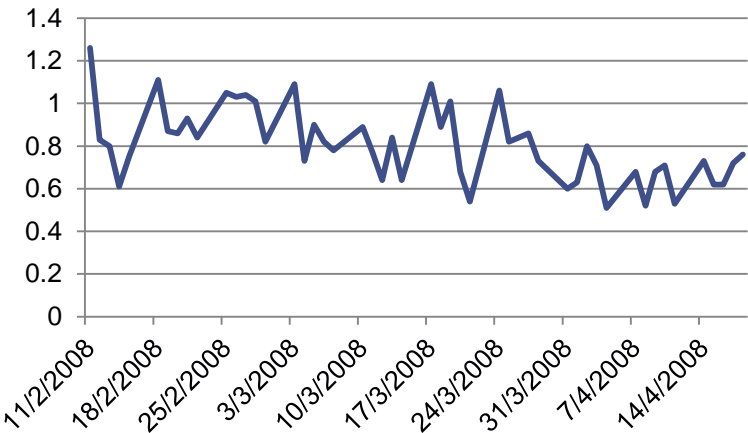
Proxy Actual in launch week and hypothetical proxy forecast if there were no launch
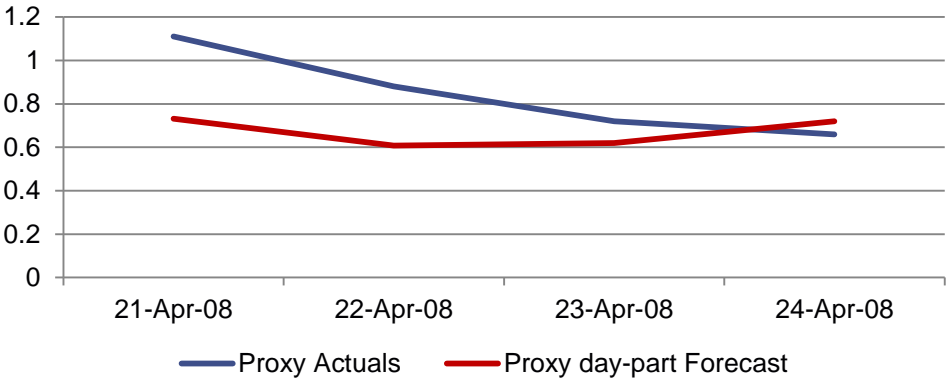
Date	Lift without GRP	Launch forecast	Actual
8-Dec-08	1.52	1.90	2.35
9-Dec-08	1.45	1.81	1.71
10-Dec-08	1.16	1.45	1.47
11-Dec-08	0.92	1.15	1.69
Average		**1.58**	**1.81**
Average (Excluding 1st Day)		**1.47**	**1.62**

Actual(in Launch Week): Target Vs Proxy

Experiment 9

GRP Burns Distribution		
Week	Target	Proxy
4	127	90
3	212	150
2	255	180
1	255	180
Total	840	600

With GRP					
RatingsDate	Lift without GRP	Lift from GRP	Lift with GRP	Forecasts	Actuals
8-Dec-08	1.52	1.42	2.15	2.68	2.35
9-Dec-08	1.45	1.42	2.05	2.56	1.71
10-Dec-08	1.16	1.42	1.65	2.06	1.47
11-Dec-08	0.92	1.42	1.30	1.62	1.69
			Average	**2.23**	**1.81**
			Average (Excluding 1st Day)	**2.08**	**1.62**

Summary

Weekly GRP Forecasts

Channel	
XYZ	

Experiments	Week	Actual	Forecasts:6 weeks ahead	Forecasts:5 weeks ahead	Forecasts:4 weeks ahead	Forecasts:3 weeks ahead	Forecasts:2 weeks ahead	Forecasts:1 week ahead
8	Wk 06'09	191.91	185.44	187.65	208.66	191.13	192.5	210.9
15	Wk 12'09	222.07	193.42	198.56	198.33	200.8	204.15	197.15
17	Wk 13'09	238.99	197.42	197.02	200.34	203.64	196.32	208.5
7(a)	Wk 16'09	231.63	202.11	193.85	206.38	222.79	231.14	232.78
7(b)	Wk 17'09	211.93	193.02	205.67	222.27	230.92	232.33	231.4
7(c)	Wk 18'09	228.21	204.96	221.76	230.7	231.87	230.81	220.18
7(d)	Wk 19'09	235.54	221.24	230.47	231.42	230.23	219.42	223.53
7(e)	Wk 20'09	212.68	230.25	230.96	229.64	218.65	222.71	229.82
7(f)	Wk 21'09	221.04	230.5	229.06	217.89	221.88	229.2	219.49
7(g)	Wk 22'09	245.3	228.47	217.12	221.05	228.58	218.73	219.63
MAPE*			9%	8%	7%	5%	6%	7%

*Mean Absolute Percentage Error(MAPE) is the average of absolute values of all the percentage error

Thank you!