# Comprehensive Analysis of Mr. Bl@ck.s.bot

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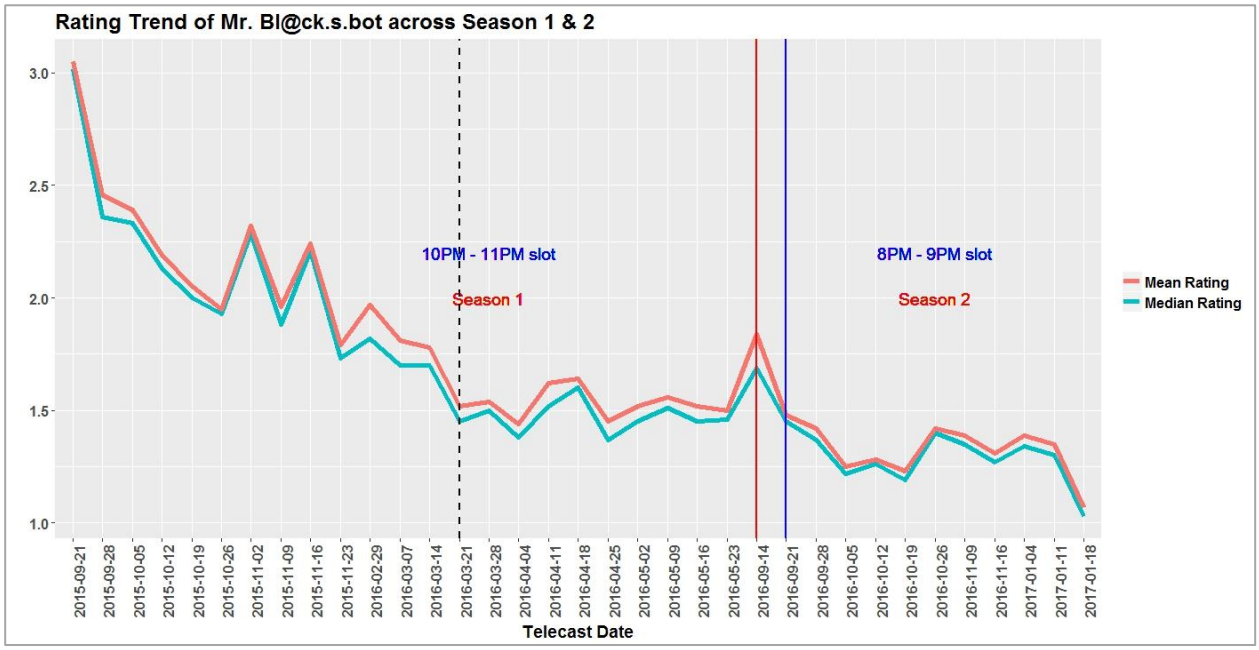
## How has Mr. Bl@ck.s.bot been performing since its start?

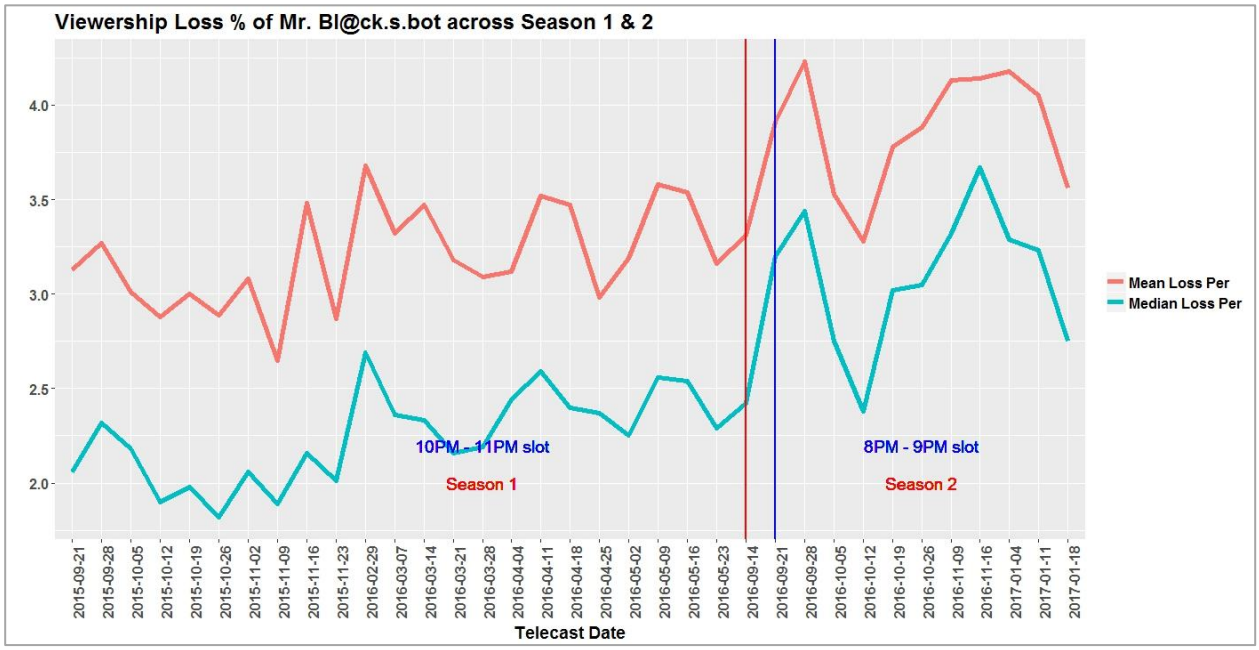
The average and median rating has been declining since the show premiered on 2015-09-21. The rating dropped by approx. 50% from the 14th episode onwards of Season 1 compared to the show start rating. First episode of Season 2 received a higher rating, but significantly lesser than first episode of Season 1.

The reason mean & median rating across the episodes have been close is because the entire 60 minutes received a similar rating, i.e there was no time(s) in the show where the ratings significantly dropped/picked up.

The change in show timing from the second episode onwards of Season 2 from 10PM – 11PM to 8PM-9PM slot has not improved ratings.




The viewership loss has been increasing since the show started. The difference in mean and median viewership loss across the episodes' state that there are times in the show when the viewership loss significantly dropped/picked up.



## Hypothesis Testing about Mr. Bl@ck.s.bot show

### Claim 1: Average Rating of Season 1 is higher than Average Rating of Season 2

**Null Hypothesis** – Average Rating of Season 1 is same as Average Rating of Season 2

**Alternate Hypothesis** – Average Rating of Season 1 is higher than Average Rating of Season 2

```
        Welch Two Sample t-test

data:  Rating by season
t = 33.827, df = 2081, p-value < 2.2e-16
alternative hypothesis: true difference in means is greater than 0
95 percent confidence interval:
 0.4910542       Inf
sample estimates:
mean in group 1 mean in group 2
       1.884275        1.368111
```

Since p value is significant, less than 5% at 95% Confidence Interval, we reject our null hypothesis and safely conclude that Average Rating of Season 1 is higher than Average Rating of Season 2.

### Claim 2: Average Viewership Loss of Season 1 is lesser than Average Viewership Loss of Season 2

**Null Hypothesis** – Average Viewership Loss of Season 1 is same as Average Viewership Loss of Season 2

**Alternate Hypothesis** – Average Viewership Loss of Season 1 is lesser than Average Viewership Loss of Season 2

```
        Welch Two Sample t-test

data:  Total_Loss_perc by season
t = -4.5412, df = 1610, p-value = 3.004e-06
alternative hypothesis: true difference in means is less than 0
95 percent confidence interval:
      -Inf -0.403601
sample estimates:
mean in group 1 mean in group 2
       3.198406        3.831418
```

Since p value is significant, less than 5% at 95% Confidence Interval, we reject our null hypothesis and safely conclude that Average Viewership Loss of Season 1 is lesser than that of Season 2.

### Claim 3: Changing the show timing to 8PM-9PM from 10PM-11PM has increased rating, on average.

**Null Hypothesis** – Average Rating of 10PM-11PM slot is same as Average Rating of 8PM-9PM slot

**Alternate Hypothesis** – Average Rating of 10PM-11PM slot is higher than Average Rating of 8PM-9PM slot

Since p value is less than 5% at 95% Confidence Interval, we reject our null hypothesis and safely conclude that changing the show timing to 8PM-9PM from 10PM-11PM has NOT increased rating, on average.

```
        Welch Two Sample t-test

data:  Rating by time_slot
t = 40.778, df = 1966.4, p-value < 2.2e-16
alternative hypothesis: true difference in means is greater than 0
95 percent confidence interval:
 0.5344237       Inf
sample estimates:
mean in group 10PM-11PM   mean in group 8PM-9PM
               1.882318                1.325420
```

### **Claim 4:** Total Ad minutes has decreased in Season 2 because of poor ratings

**Null Hypothesis -** Average commercial minutes in Season 1 & 2 are same

**Alternate Hypothesis -** Average commercial minutes in Season 1 > Average commercial minutes in season 2

```
        Welch Two Sample t-test

data:  total_ad_minutes by season
t = -3.7291, df = 24.752, p-value = 0.9995
alternative hypothesis: true difference in means is greater than 0
95 percent confidence interval:
 -2.853074       Inf
sample estimates:
mean in group 1 mean in group 2
       20.04348        22.00000
```

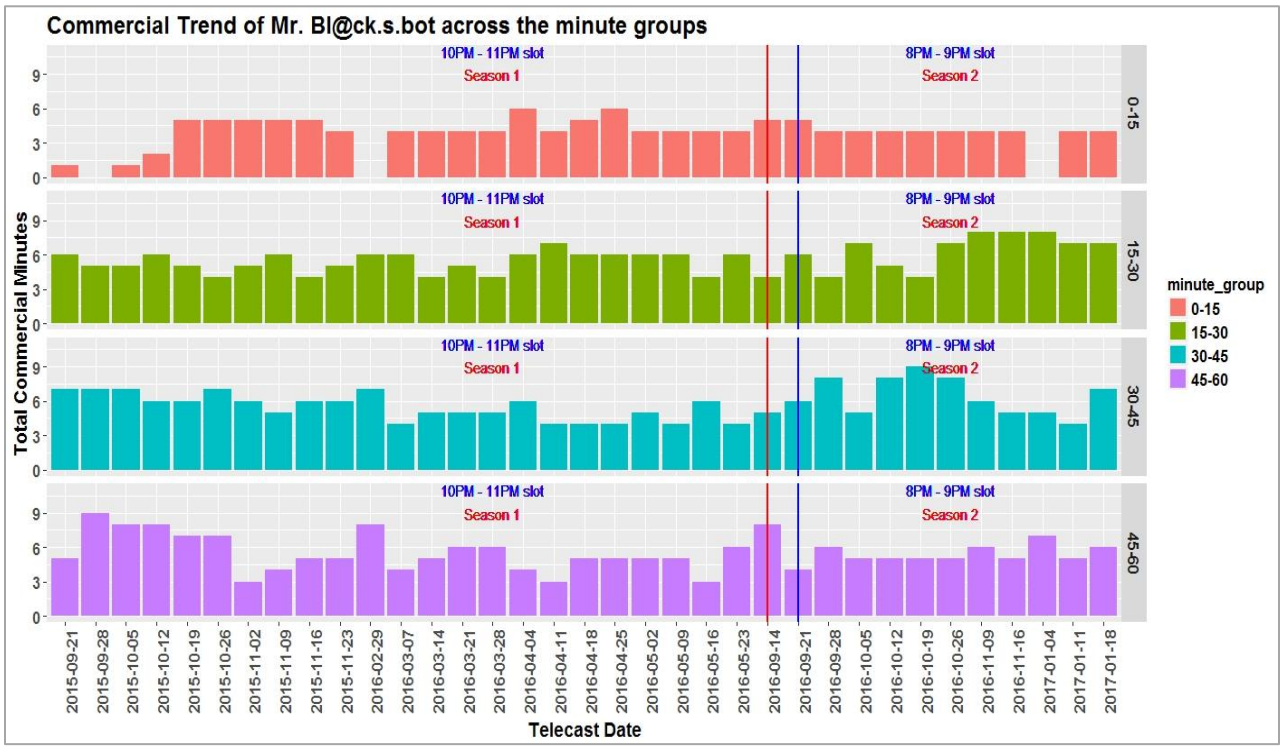
Since p value is insignificant (more than 5%), we fail to reject our null hypothesis and can safely conclude that Total Ad minutes' have not dropped due to poor ratings in Season 2.

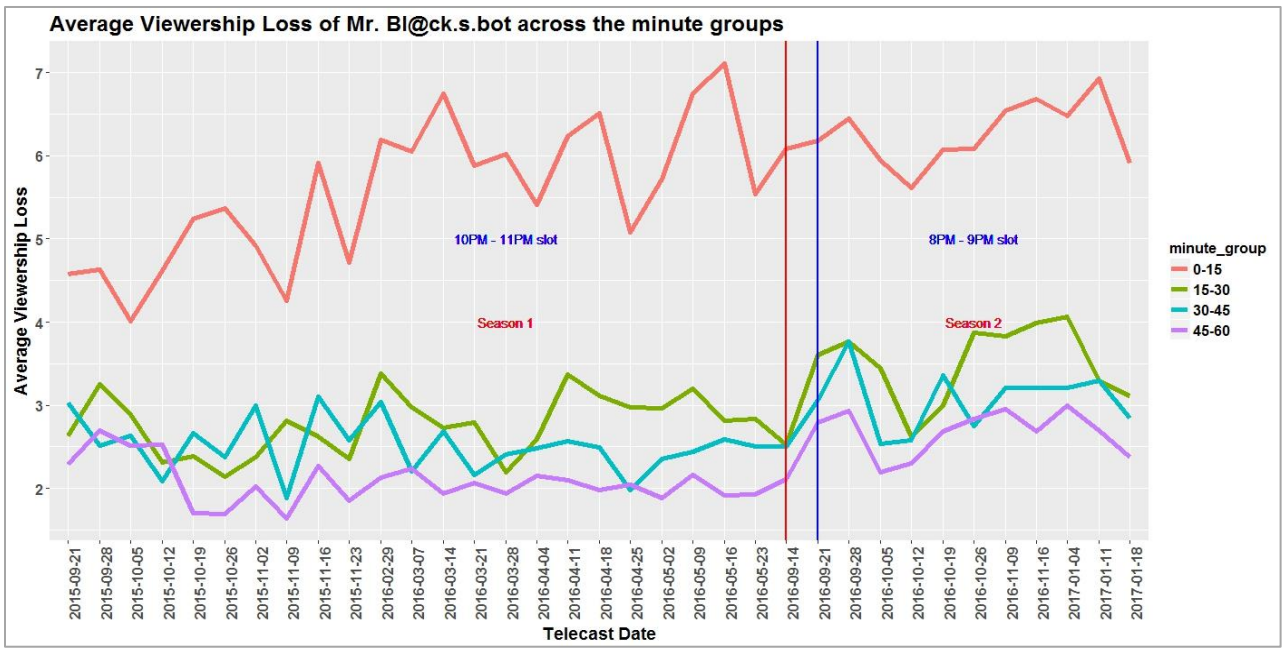
**CONCLUSION:**

1. **Season 2 has lower ratings and higher viewership loss than Season 1, on average.**
2. **Changing the show timing to 8PM-9PM from 10PM-11PM has NOT increased rating.**
3. **Total Ad minutes' have not dropped due to poor ratings in Season 2.**

## Does Mr. Bl@ck.s.bot have similar viewership loss during its 60-minutes course?

To better understand the reason between the gap in average and median viewership loss, I have grouped the 60-minute slot in 4 groups, each of 15-minute duration. Total commercial minutes during the first 15 minutes is lesser than the other groups. However, average viewership loss during the first 15 minutes is higher than other groups across the two seasons. Hence, we can say the viewership loss is not due to the commercials!






## Granger Causality Test between Viewership Loss and Total Commercial Minutes during first 15 minutes

To check whether commercial minutes' cause viewership loss in the first 15 minutes, I have performed Granger Causality Test.

```
> adf.test(diff(diff(group1$total_ad_minutes)))

        Augmented Dickey-Fuller Test

data:  diff(diff(group1$total_ad_minutes))
Dickey-Fuller = -4.2394, Lag order = 3, p-value = 0.0128
alternative hypothesis: stationary

> adf.test(diff(group1$mean_loss_perc))

        Augmented Dickey-Fuller Test

data:  diff(group1$mean_loss_perc)
Dickey-Fuller = -4.3024, Lag order = 3, p-value = 0.01015
alternative hypothesis: stationary
```

For Granger Causality Test, we require the series to be stationary (constant mean and variance). Hence we use Augmented Dickey-Fuller Test to check the stationarity. The null hypothesis of Dickey-Fuller Unit Root Test states the series is NOT stationary and alternate hypothesis states it is.

Since the p value is significant (less than 5%) for the Total_Ad_Minutes and Viewership_Loss_perc we have a stationary series after differencing.

In Granger Causality test,

**Null hypothesis:** Total Ad Minutes does not cause Viewership Loss at lag 1

**Alternate hypothesis:** There is a causal relationship at lag 1.

Since p value is not significant, we fail to reject null hypothesis and can safely conclude that viewership loss is not due to the commercials!

```
Granger causality test

Model 1: diff(diff(mean_loss_perc)) ~ Lags(diff(diff(mean_loss_perc)), 1:1) + Lags(diff(diff(total_ad_minute
s)), 1:1)
Model 2: diff(diff(mean_loss_perc)) ~ Lags(diff(diff(mean_loss_perc)), 1:1)
  Res.Df Df      F Pr(>F)
1     29
2     30 -1 1.2184 0.2788
```

**CONCLUSION:**

1. **Average viewership loss during the first 15 minutes is higher than other groups across the two seasons.**
2. **Viewership loss during the first 15 minutes is not due to the commercials.**

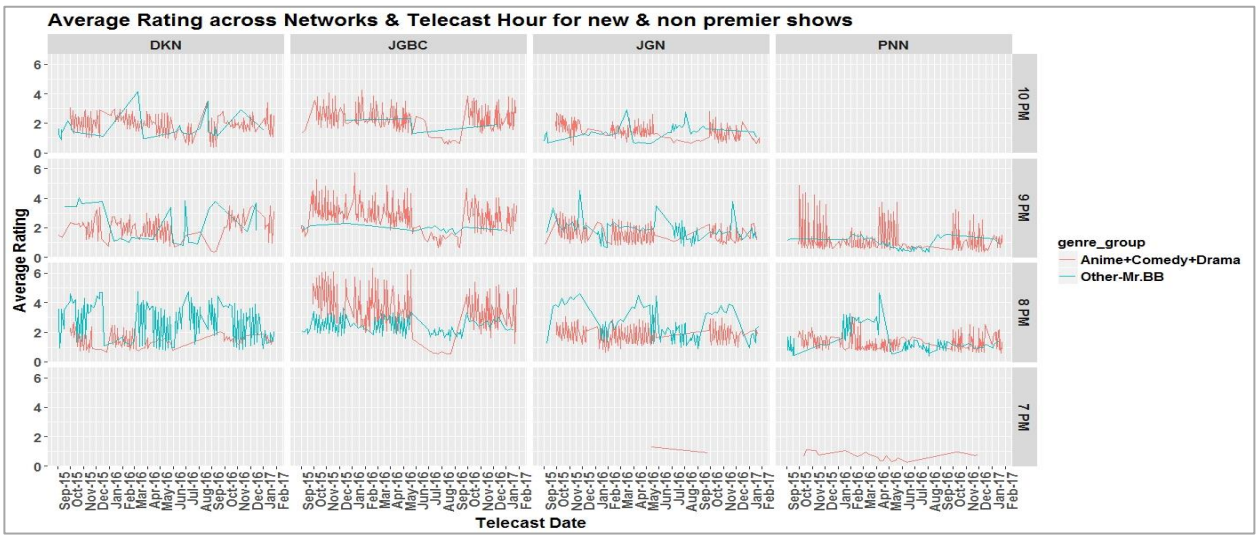
## Does 8 PM to 9 PM slot have higher rating for all genres across all Networks?

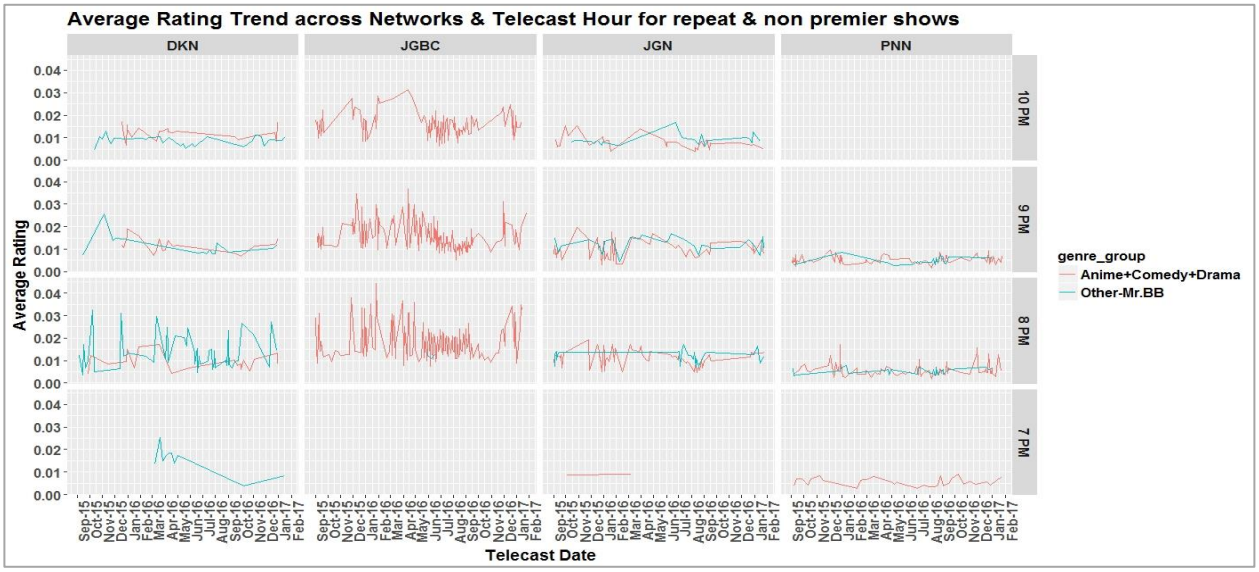
Assuming Mr. BB *(Mr. Bl@ck.s.bot)* belongs to the Sci-Fi genre ("Other" genre here), I have made two groups – Other (including Mr. BB) and Animation+Comedy+Drama.

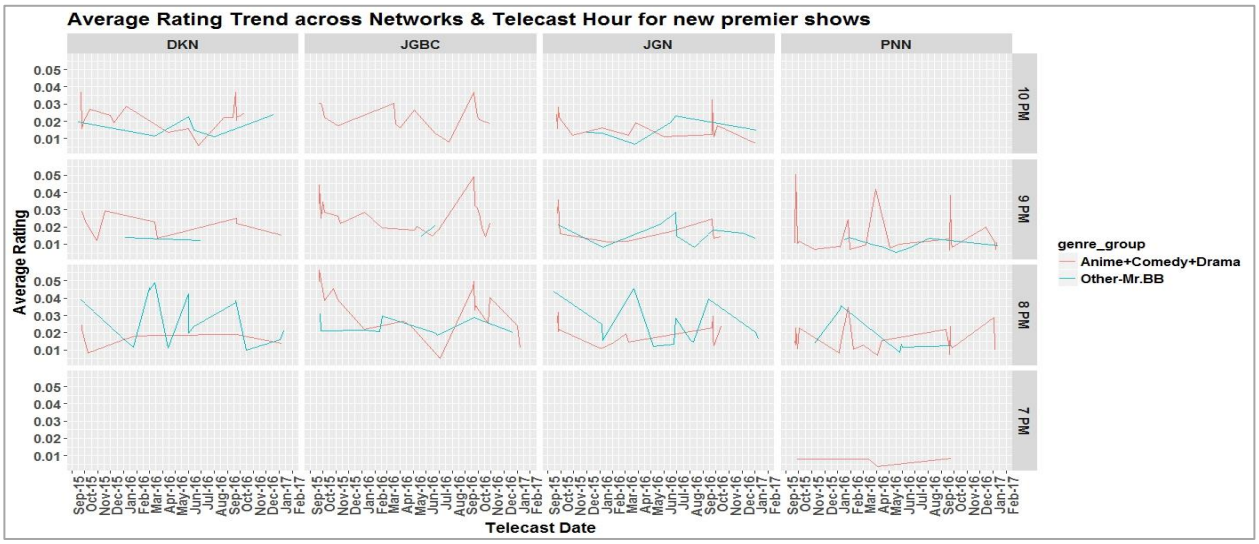
Further, I have obtained average rating across networks and time slots for the above two genre groups based on:

1. New & non-premier shows
2. Repeat & non-premier shows
3. New premier shows

The home network of Mr. BB, DKN runs more shows of the "Other" genre as compared to the other networks during the 8PM-9PM slot and their rating, on average seems alright from the plots below. Also, the average rating of 8PM-9PM shows of "Other" group is higher than that of 10PM-11PM shows on DKN network. Hence, the decision to move Mr. BB from 10PM-11PM slot to 8PM-9PM slot is understandable. However, it has not led to any improvement in the rating and viewership.






## Conclusion Summary

1. Season 2 has lower ratings and higher viewership loss than Season 1, on average.
2. Changing the show timing to 8PM-9PM from 10PM-11PM has NOT increased rating.
3. Average viewership loss during the first 15 minutes is higher than other groups across the two seasons.
4. Viewership loss during the first 15 minutes is not due to the commercials.
5. Total Ad minutes' have NOT dropped due to poor ratings in Season 2.

## Recommendation & Next Steps

One question needs to be answered - **Can DKN *"afford"* to give time to Mr. BB for improving ratings?**

**If YES,** there is an imperative need to attract viewer's attention immediately and ensure the momentum is maintained. Following are my recommendations, constrained on budget:

1. **Cast a celebrity in the upcoming episode(s)**
    - Advertise the "celebrity episode(s)" during the highly rated shows on DKN Network, mainly of similar genre and during prime time, say 8PM -10PM, which might lure the audience.
    - Advertise the "celebrity episode(s)" on sister networks during prime time.
2. **Introduce an interesting twist in the plot**
    - Advertise these episodes with a catchy tagline during the highly rated shows on DKN Network, mainly of similar genre during prime time.
    - Advertise these episodes on sister networks during prime time.
3. **Cast protagonist(s) of highly rated shows on DKN Network as recurring guests**
    - Advertise these episodes with a catchy tagline during the highly rated shows on DKN Network, mainly of similar genre during prime time.
    - Advertise these episodes on sister networks during prime time.

The show's performance can be tracked over a certain period of time say, the rest of Season 2. If there is a significant improvement in the rating leading to higher revenue & profits from the show, it can be renewed for another season.

**If NO,** DKN needs to introduce a new show in the prime time slot. If there is no new show in the pipeline, it can move a show with high potential to the 8PM-9PM slot and introduce repeat shows in its place.