Video Landscape - ATUS, Nielsen & Hakuhodo

NBCU Corporate Digital Measurement Strategy

April 13, 2018

EXECUTIVE SUMMARY

As traditional TV viewing declines, the natural questions to ask are…where are viewers going and what are they doing? Unfortunately, this very simple question has many answers depending on who you ask. Of critical concern to TV programmers is whether or not there's a still opportunity to capture viewers' attention. The business question is presented in this way… "even if we perfectly execute video content, if there's no opportunity…then what difference does it make".

The data and information we've explored in this analysis infers that the bulk of the decline in live TV video usage is transferring over to video consumption on other platforms - as opposed to other non-video forms of online activity. The data further shows, that more time allocated to online usage does not detract from cross-platform video consumption.

Our analysis utlizes secondary research from the U.S Bureau of Labor Statistics's American Time Usage Survey, Nielsen/Pivotal Research custom research and for comparative analysis - Tokyo based survey data conducted by the Hakuhodo research firm.

Fundamentally, video content makers are still competing among themselves, and not with application makers for engagement. We're also able to see, that viewing video programming on a TV screen is alive and well. In fact, Netflix, reports that despite new users signing up on phones and laptops, 70% of viewing occurs on a connected TV[1].

It's also important to know that sometimes OTT providers can get it wrong. An example is Hulu Japan, which flopped because it had content that wasn't relevant to its market, at very high price point ($19.25/per month) [2]. In 2014, Hulu Japan was sold to Nippon TV, which was able to exapnd its catalog with local content, and lower the price to (900 Yen/$8.50)[3].

Today, in the US market, it's cheaper to channel surf on OTT SVOD than cable TV - representing an opportunity for some, a big hurdle for others. Technology itself isn't the driver, it appears to be content and price. Technology has been a facilitator of competition, but itself is not the draw.

DATA SOURCES: ATUS, Nielsen & Hakuhodo

The American Time Usage Survey (ATUS) is a very high-level report, that doesn't distinguish between video viewing platforms. ATUS's TV usage survey question covers what is essentially viewing long-form "TV" content on any platform. The same principle applies to the computer usage question, it applies to mobile and desktop, excluding gaming activity. ATUS survey data gives us a trended look from 2003-2016. There are a total of three charts in our analysis from this data source.

Nielsen and Pivotal research have created custom average audience delivery for cross-platform TV viewing, along with traditional live ratings as well. The date range for this study is from 2008-2016. There are a total two charts in our analysis from this data set.

Finally, for the purposes of a comparative analysis, we'll look at survey data from the Hakuhodo research firm. Hakuhodo's survey also asks about TV viewing, but it is confined to live TV.

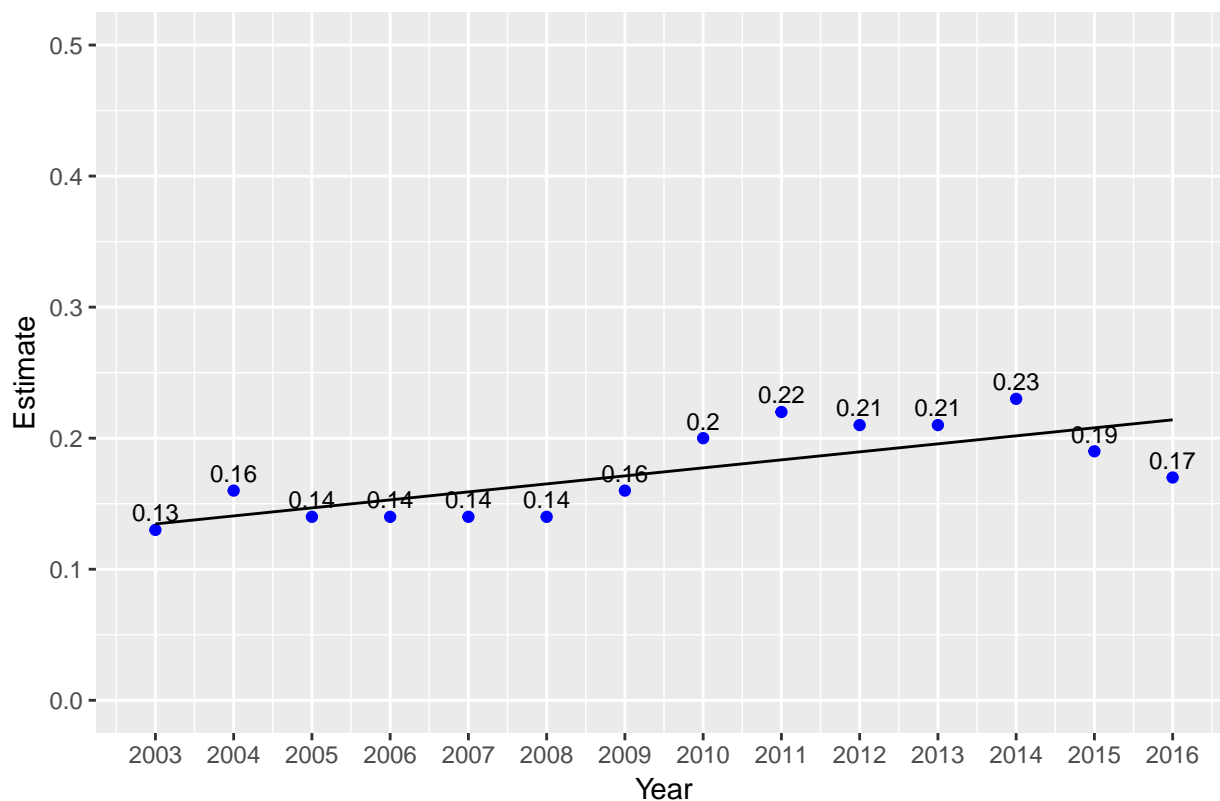[1] You can watch Netflix on any screen you want, but you're probably watching it on a TV
[2] Hulu Japan Launches, But Falls Flat
[3] Netflix Japan vs Hulu Japan: Which one is the best?

DATA EXPLORATION & ANALYSIS

Series Title: Avg hrs per day - Computer use for leisure, excluding games

ATUS Avg Daily Hours on a Computer

ATUS Data Source:[4]

According to the ATUS survey, respondents report online usage on any device, besides gaming, for .17 hours per day. Although there is a peak starting in 2011, that seems to decline starting in 2015, making the overall trend flat. BLS confirmed that this usage includes mobile usage of social media. The regression shows zero growth per year, and is statisically significant at 99% confidence interval. See output below:

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.1300  0.1400  0.1650  0.1743  0.2075  0.2300

##
## Call:
## lm(formula = Estimate ~ Year, data = ATUS_Compdf)
##
## Residuals:
##       Min       1Q    Median       3Q       Max
## -0.044000 -0.016643 -0.005681  0.020159  0.036549
##
```

[4][Series ID: TUU10101AA01006114
Type of estimate: Average hours per day
Activity: Computer use for leisure Day of week: All days
Age: 15 years and over]

```
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept) -12.10354    3.27476  -3.696  0.00306 **
## Year          0.00611    0.00163   3.749  0.00277 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.02458 on 12 degrees of freedom
## Multiple R-squared:  0.5395, Adjusted R-squared:  0.5011
## F-statistic: 14.06 on 1 and 12 DF,  p-value: 0.002775
```

Series ID: TUU10101AA01014236
Series Title: Avg hrs per day - Watching TV
Type of estimate: Average hours per day
Activity: Watching TV
Day of week: All days
Age: 15 years and over

ATUS Avg Daily Hours TV 7 days
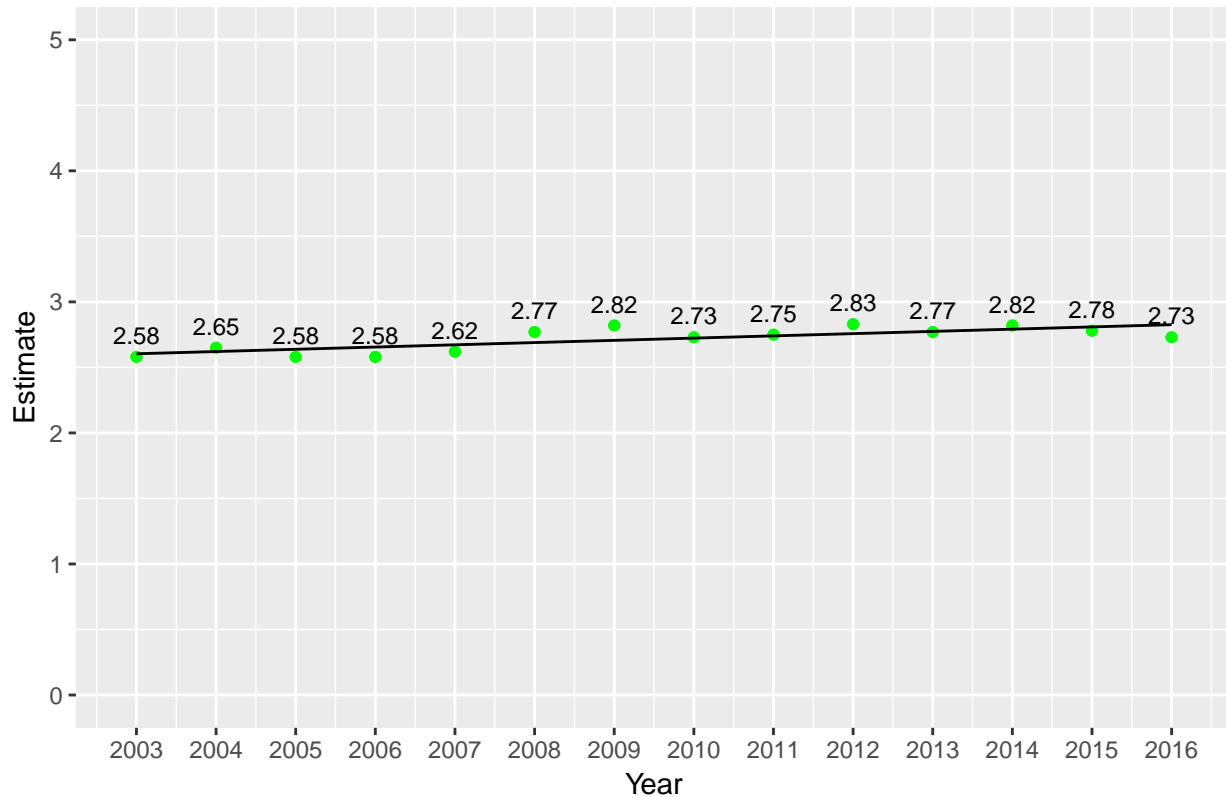
According to the ATUS survey, respondents report watching TV on any platform, all days of the week, for 2.72 hours per day. The regression shows that viewing on any platform has been growing at 1 minute per year from 2003-2016 on average, and is statisically significant at 99% confidence interval. See output below:

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   2.580   2.628   2.740   2.715   2.778   2.830

##
## Call:
## lm(formula = Estimate ~ Year, data = ATUS_TV_Alldf)
##
## Residuals:
##       Min        1Q    Median        3Q       Max
## -0.096000 -0.046462  0.000846  0.028731  0.113538
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept) -31.601077   8.496594  -3.719  0.00293 **
```

```
## Year          0.017077   0.004228    4.039  0.00164 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.06377 on 12 degrees of freedom
## Multiple R-squared:  0.5762, Adjusted R-squared:  0.5408
## F-statistic: 16.31 on 1 and 12 DF,  p-value: 0.001643
```

Series ID: TUU10101AA01014241
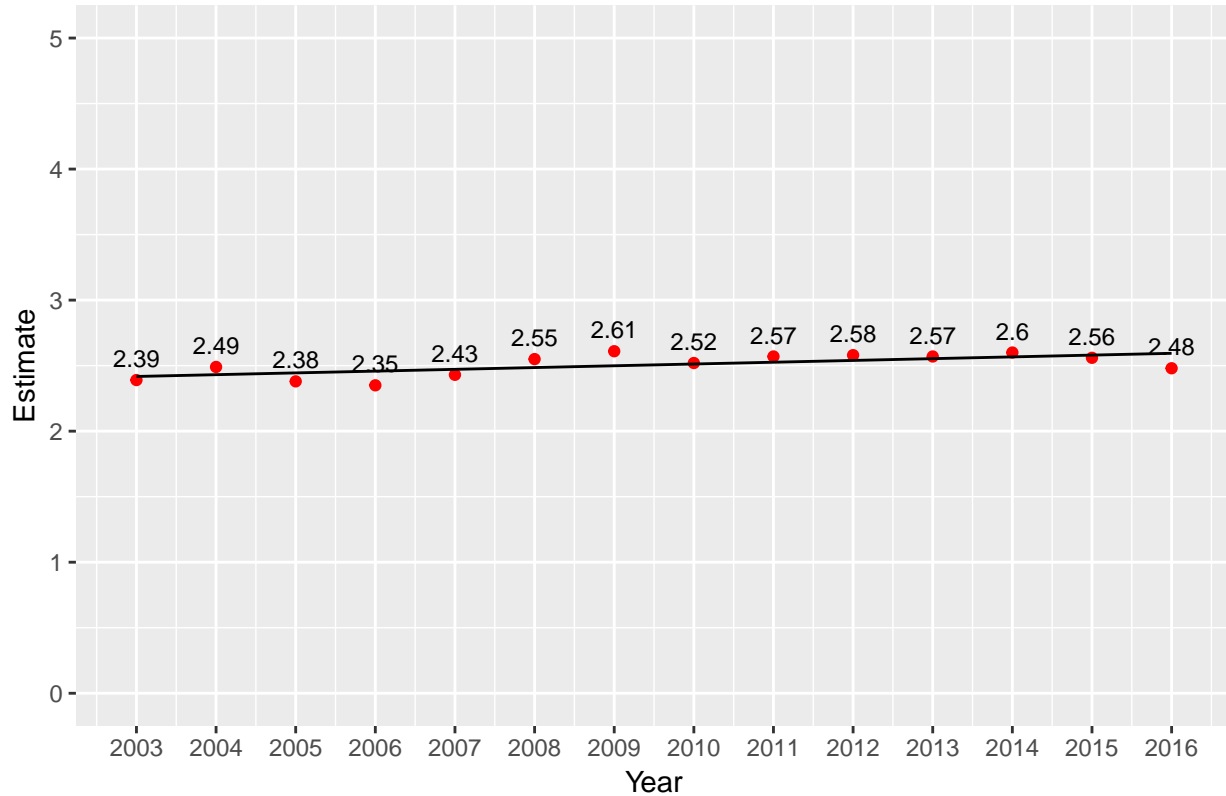Series Title: Avg hrs per day - Watching TV, Nonholiday weekdays
Type of estimate: Average hours per day
Activity: Watching TV
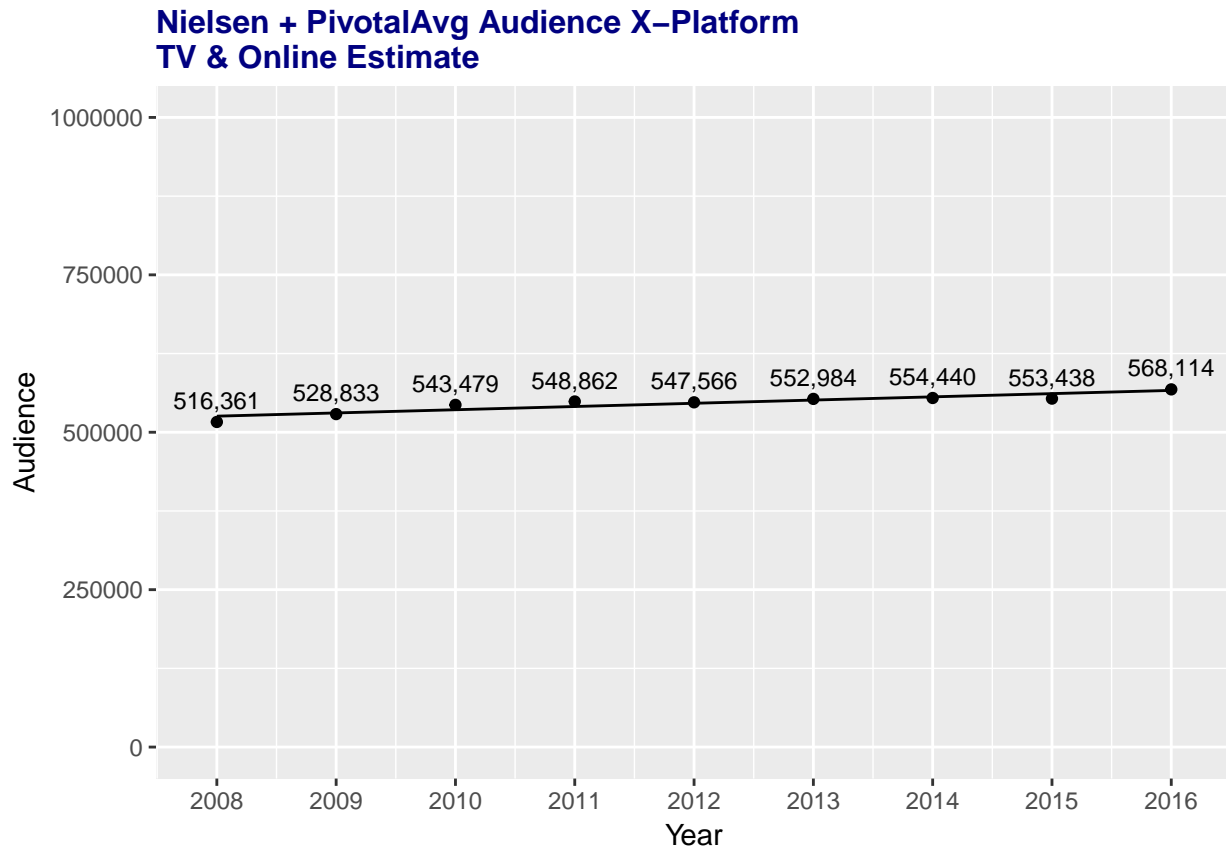Day of week: Nonholiday weekdays
Age: 15 years and over

ATUS Avg Daily Hours TV Weekdays

According to the ATUS survey, respondents report watching TV on any platform, all days of the week, for 2.51 hours per day. The regression shows that viewing on any platform has been growing at 49 seconds per year from 2003-2016 on average, and is statisically significant at 95% confidence interval. See output below:

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   2.350   2.443   2.535   2.506   2.570   2.610

##
## Call:
## lm(formula = Estimate ~ Year, data = ATUS_TV_wkdaydf)
##
## Residuals:
##      Min       1Q  Median       3Q      Max
## -0.11400 -0.03818  0.01212  0.04302  0.11108
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept) -24.78815    9.16388  -2.705   0.0191 *
## Year          0.01358    0.00456   2.978   0.0115 *
## ---
```

```
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.06878 on 12 degrees of freedom
## Multiple R-squared:  0.425,  Adjusted R-squared:  0.3771
## F-statistic: 8.871 on 1 and 12 DF,  p-value: 0.01152
```

Nielsen + PivotalAvg Audience X–Platform TV & Online Estimate

Audience values by year:

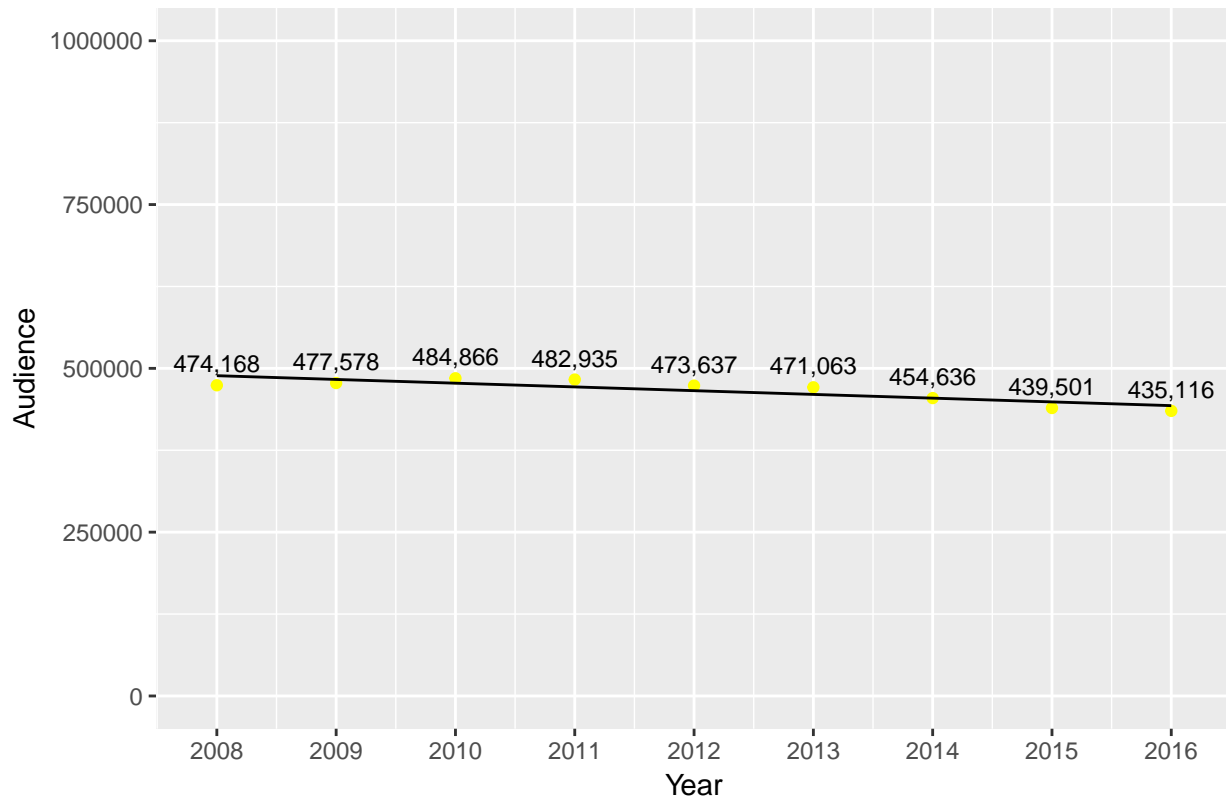| Year	Audience
2008	516,361
2009	528,833
2010	543,479
2011	548,862
2012	547,566
2013	552,984
2014	554,440
2015	553,438
2016	568,114

Nielsen + Pivotal research's average audience estimate for cross-platform TV viewing is 546,000 spanning 2008-2016. The log-transformed regression model, enables percentage based reporting and shows on average a 1% increase per year, at a 100% confidence interval.

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  516400  543500  548900  546000  553400  568100

##
## Call:
## lm(formula = log(Audience) ~ Year, data = Nielsen_videodf)
##
## Residuals:
##       Min       1Q    Median       3Q       Max
## -0.017751 -0.003316  0.002310  0.003613  0.014994
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept) -5.766879   3.120450  -1.848   0.1071
## Year         0.009432   0.001551   6.081   0.0005 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.01201 on 7 degrees of freedom
## Multiple R-squared:  0.8409, Adjusted R-squared:  0.8181
## F-statistic: 36.98 on 1 and 7 DF,  p-value: 0.0005001
```

## Nielsen + Pivotal Avg Audience Live TV & Online Estimate

Nielsen + Pivotal research's average audience estimate for Live TV viewing is 465,900 spanning 2008-2016. The log-transformed regression model, enables percentage based reporting and shows a -1% derease per year in audience on average, at a 99% confidence interval.

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  435100  454600  473600  465900  477600  484900

##
## Call:
## lm(formula = log(Audience) ~ Year, data = Nielsen_Livedf)
##
## Residuals:
##       Min       1Q    Median       3Q       Max
## -0.031577 -0.017966  0.001029  0.017083  0.024079
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept) 38.090446   5.870107   6.489 0.000338 ***
## Year        -0.012445   0.002918  -4.266 0.003721 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.0226 on 7 degrees of freedom
## Multiple R-squared:  0.7222, Adjusted R-squared:  0.6825
## F-statistic:  18.2 on 1 and 7 DF,  p-value: 0.003721
```

Hakuhodo – Tokyo Avg Daily Hours TV
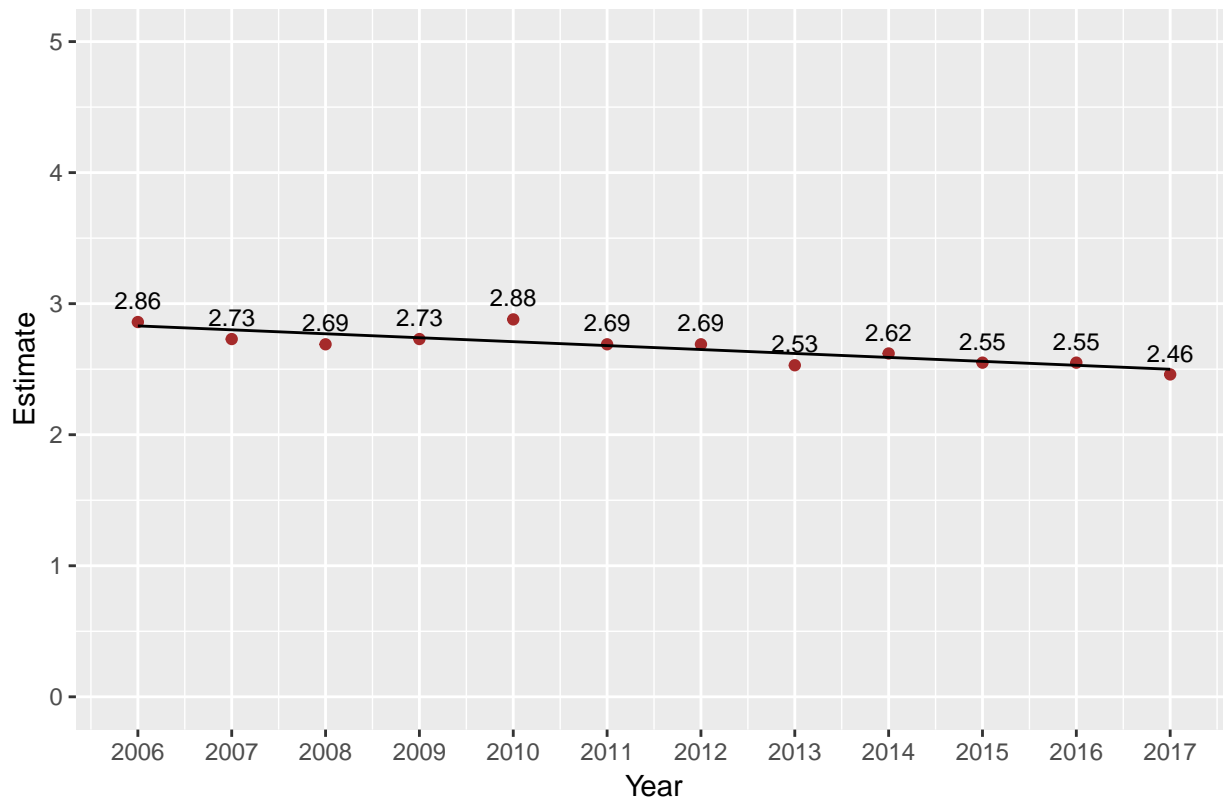
According to the Hakuhodo survey, respondents report watching live TV, for 2.67 hours per day. The regression shows that viewing on any platform has been slowing by 1 minute and 48 seconds per year from 2006-2017 on average,and is statisically significant at 100% confidence interval. See output below:

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   2.460   2.550   2.690   2.665   2.730   2.880

##
## Call:
## lm(formula = Estimate ~ Year, data = Tokyo_videodf)
##
## Residuals:
##       Min       1Q    Median        3Q       Max
## -0.089895 -0.047290  0.000105  0.029755  0.169895
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept) 63.150664  12.360804   5.109 0.000458 ***
## Year        -0.030070   0.006145  -4.893 0.000629 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.07348 on 10 degrees of freedom
## Multiple R-squared:  0.7054, Adjusted R-squared:  0.6759
## F-statistic: 23.94 on 1 and 10 DF,  p-value: 0.0006293
```

CORRELATION ANALYSIS

Essentially we've analyzed data from a variety of sources, that leverage different methodologies - but all indicating that Live TV viewing is decreasing while cross-platform TV is increasing. In this section we'll examine the correlation between these different data sources for further confirmation of the trends we've observed.

For example, Hakuhodo Tokyo survey research and Nielsen Live TV ratings have a Pearson's R value of .74 - indicating a very strong positive correlation between the two sources. The data sets represent different methodologies, that are attempting to measure the same phenomenon - and both are indicating that live TV viewing is declining. The fact that they have strong correlation, serves evidence that the live TV - regardless of how it's measured is declining.

Additionally, we can see for the correlation stats below, when comparing ATUS computer usage to its own survey data for cross-platform TV usage (.72), and Nielsen/Pivotal Research cross-platform TV viewing estimates (.58) that there is positive correlation. In other words, computer/online usage doesn't seem to negatively impact cross-platform video viewing.

However, when we correlate ATUS cross-platform TV viewing data with Nielsen/Pivotal cross-platform estimates we actually see a negative correlation (-.23). How is that possible? From 2003-2016, the ATUS cross-platform averages a positive growth rate, but from 2008-2016 (the years that we have Nielsen data for), the trend is actually flat. In other words, from 2008-2016 the ATUS survery data for cross-platform viewing trends virtually flat but statiscally insignificant (.00, p = .81), while the Nielsen/Pivotal research data trends positive - explaining the divergence between the two data sets.

In the final analysis, it's been found to be statisically significant from multiple sources (albeit in different markets), that live TV viewing is decreasing.

However, regarding overall cross-platform video viewing the picture becomes a little murky with the narrative ranging from flat to slight growth depending on the years in question.

Finally, non-video compputer/mobile use positively correlates with overall video viewing, and therefore doesn't negatively impact cross-platform viewing of TV programming.

Pearson's R

ATUS Computer & TV Correlation

0.7257461

Hakuhodo & Nielsen Live TV Correlation

0.7365505

ATUS TV & Nielsen Xplatform Correlation

-0.2376375

ATUS Computer & Nielsen Xplatform Correlation

0.5829963

```
##
## Call:
## lm(formula = Estimate[6:14] ~ Year[6:14], data = ATUS_TV_Alldf)
##
## Residuals:
```

```
##        Min        1Q    Median        3Q       Max
## -0.050444 -0.029111 -0.006444  0.038222  0.052222
##
## Coefficients:
##               Estimate Std. Error t value Pr(>|t|)
## (Intercept)  5.460444  10.596097    0.515     0.622
## Year[6:14]  -0.001333   0.005266   -0.253     0.807
##
## Residual standard error: 0.04079 on 7 degrees of freedom
## Multiple R-squared:  0.009074,   Adjusted R-squared:  -0.1325
## F-statistic: 0.0641 on 1 and 7 DF,  p-value: 0.8074
```
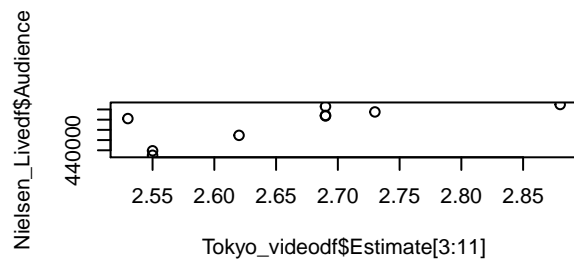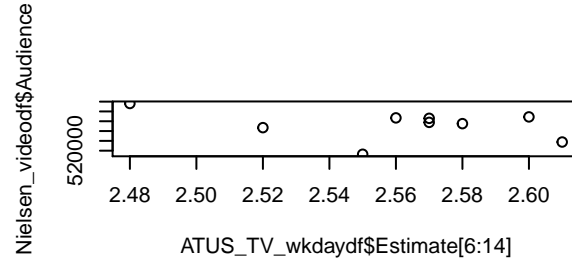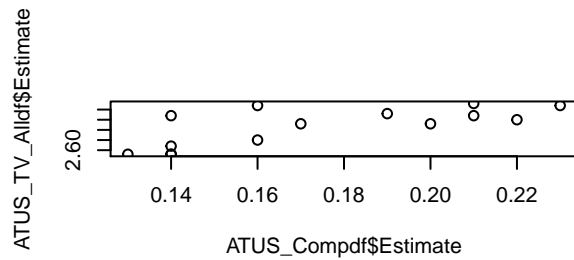
ATUS COMPUTER USAGE FORECAST

```
## Initial log joint probability = -2.17335
## Optimization terminated normally:
##    Convergence detected: absolute parameter change was below tolerance
```
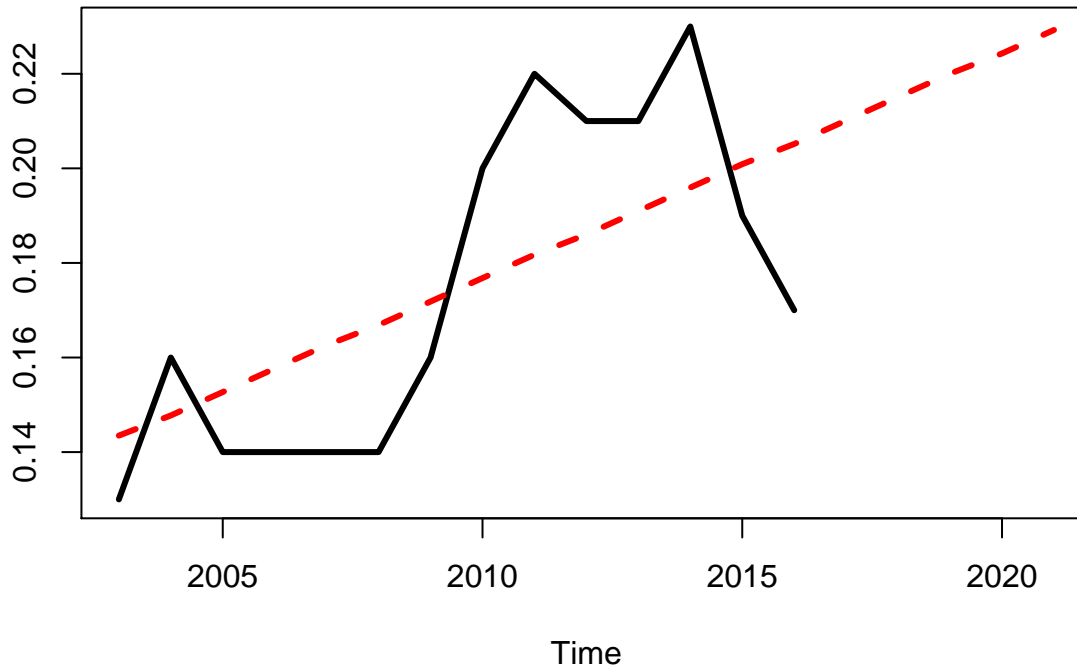


```
## [1] 0.2101216 0.2150799 0.2200290 0.2242940 0.2292613
```

upper

mean

lower

Actual

0.1943782

0.1742857

0.1541932

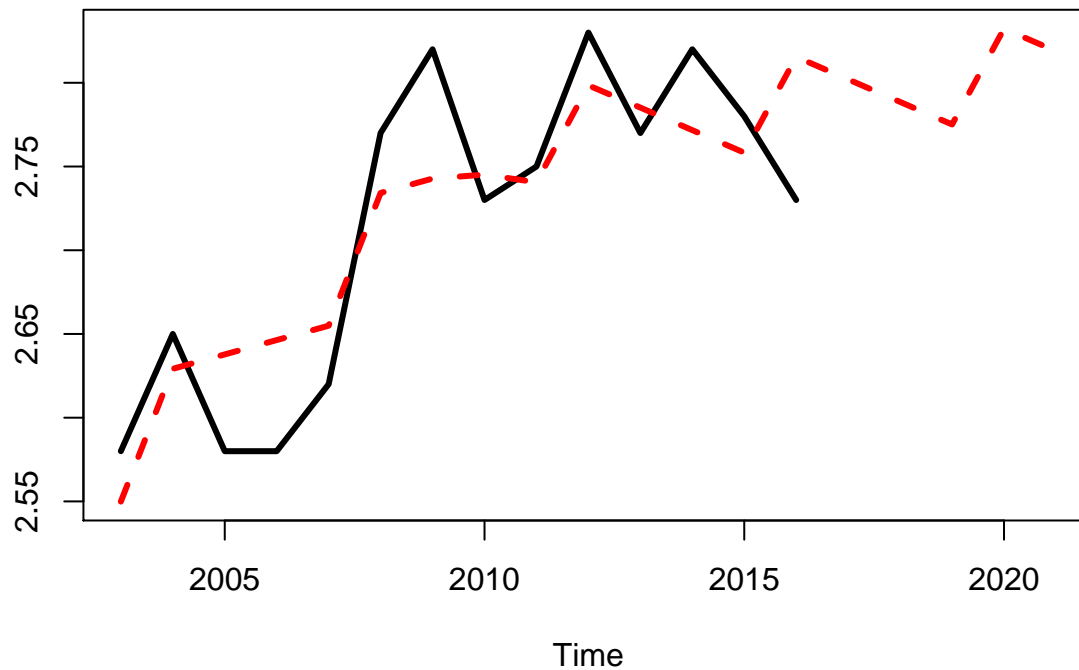Prediction

0.2097811

0.1982166

0.1866522

ATUS CROSS-PLATFORM TV VIEWING FORECAST

```
## Initial log joint probability = -2.02331
## Optimization terminated normally:
##    Convergence detected: absolute parameter change was below tolerance
```

[1] 2.802032 2.788573 2.775112 2.832312 2.818877

upper

mean

lower

Actual

2.769341

2.715000

2.660659

Prediction

2.797621

2.779198
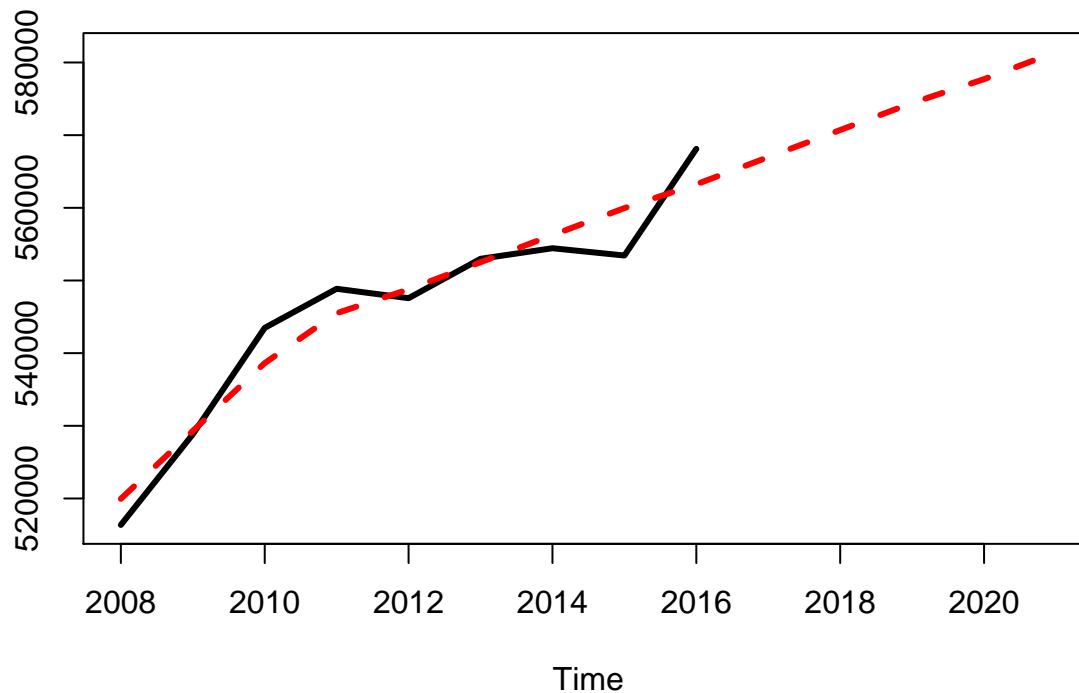
2.760775

NIELSEN/PIVOTAL CROSS-PLATFORM TV VIEWING FORECAST

```
## Initial log joint probability = -2.0175
## Optimization terminated normally:
##   Convergence detected: absolute parameter change was below tolerance
```

```
## [1] 566977.5 570705.8 574425.7 577705.2 581441.7
```

upper

mean

lower

Actual

557711.9

546008.6

534305.2

Prediction

566661.3

556098.1

545534.9

FORECAST SUMMARY

Establishing a correlation between different phenomena and forecasting future outcomes are indeed separate but related exercises. The primary goal of our analysis, was to accomplish two main things. The first, determine if overall video usage is increasing or decreasing. The problem is that we there's no one source that has the entire breadth and depth to answer that question. Therefore, we broke our analysis into two parts - first to determine what our sources were predicting for video usage, by type (Live TV vs Cross-Platform). Once we established which sources were measuring the same phenomena, albeit with different methods the next step was to determine if they correlated together - essentially telling the same story. As we saw in our correlation section, generally this was the case. Finally, once we determined with some statisical confidence that trends were either decreasing or increasing, the next step was to try and provide forecast for our key behaviors of interest - overall computer usage (excl. games), ATUS reporting all TV viewing and Nielsen

+ Pivotal Research Crossplatform TV viewing. Essentially ATUS survey based reported computer usage and cross-platform TV usage trended up, but reporting predicted means that were more that one standard deviation from the observed means, limiting our confidence in the predictions (not the trend). However, our predicted values from Nielsen/Pivotal research for average audience viewing of cross-platform viewing was within one standard deviation of the actual or observed values, confirming the validity of our predicted values.

Please see the table below:

	ATUS Online Time	ATUS All-TV Time	Nielsen/Pivotal (000)
2017	0.21	2.80	566,977
2018	0.22	2.79	570,706
2019	0.22	2.78	574,426
2020	0.22	2.83	577,705
2021	0.23	2.82	581,442

APPENDIX - DATA DISTRIBUTION

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.1300  0.1400  0.1650  0.1743  0.2075  0.2300

##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   2.580   2.628   2.740   2.715   2.778   2.830

##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   2.350   2.443   2.535   2.506   2.570   2.610

##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  516400  543500  548900  546000  553400  568100

##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  435100  454600  473600  465900  477600  484900

##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   2.460   2.550   2.690   2.665   2.730   2.880
```

Histogram of ATUS_Compdf$Estimate

Histogram of ATUS_TV_Alldf$Estimate

Histogram of ATUS_TV_wkdaydf$Estimate

Histogram of Nielsen_videodf$Audience

Histogram of Nielsen_Livedf$Audience

Histogram of Tokyo_videodf$Estimate