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Who's Watching: The Accuracy of Forecasting Broadcast TV Audience Demand Using Advertising Prices

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ABSTRACT

Broadcast and cable networks are struggling to keep up with the multitude of entertainment options available today, including but not limited to streaming services. However, these networks still play a role in the entertainment landscape. In order to maintain their role, they must first assess which shows deliver higher ratings and why. Ratings indicate audience demand for a particular show, which can be unpredictable. Regardless, networks sell commercial spots to advertisers at predetermined prices based on their expectations of future ratings, or demand. As such, this research paper focuses on broadcast networks and investigates two questions: Are broadcast networks able to accurately predict ratings, or audience demand, for their upcoming season of primetime shows, indicated by the predetermined prices for ad spots in the shows? If advertising prices do not reflect audience demand for the upcoming season, what is the reason for this? To address the research questions, a two-part mixed method design of both quantitative and qualitative research was used, showing that broadcast networks have been successful in predicting ratings for their upcoming primetime shows, but they should consider additional factors when creating shows to capture the most audience attention.

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INTRODUCTION

As streaming services gain popularity, they are taking audience attention away from traditional television such as broadcast and cable networks. To understand traditional television's role in the entertainment industry, traditional television outlets must be able to predict audience demand, a key metric of business success in entertainment. However, demand can be unpredictable, which presents a difficulty for networks that generate advertising revenue based on future demand (Blumenthal & Goodenough, 2006, p. 74). To accurately predict demand, networks must analyze which shows deliver higher ratings and why. This paper will investigate whether broadcast networks are able to accurately predict audience demand for their upcoming primetime season shows, indicated by the predetermined prices for advertisement spots in the shows. If advertising prices do not reflect audience demand for the upcoming season, what is the reason for this? The answers to these questions will indicate whether networks are prioritizing the right shows, and if not, which shows are more popular.

The broadcast and cable television industry, especially its ability to predict demand, is intriguing because its share of total viewing is slowly being lost to streaming, which was at 25 percent of total television usage in 2020 (The Nielsen Company, 2020, p. 15). Streaming platforms such as Netflix and Amazon Prime are taking crucial audience attention away from traditional television. As a result, the television industry must be able to accurately predict the demand, or lack thereof, for its shows, so it can decide whether to change its content in order to compete with streaming services. As an audience member who watches shows through streaming as well as traditional networks, I am interested in whether traditional television will be able to compete with streaming for capturing audience attention. Measuring demand is essential in

understanding whether traditional television provides value for audiences and whether it can maintain its role in the changing landscape of the entertainment industry.

LITERATURE REVIEW

Concept of Television

What is television? A few decades ago, the answer to this question was relatively simple: television consisted of broadcast network shows that aired at specific times so people watched "*en masse* simultaneously across the country" (Mittell, 2010, p. 10). People had dedicated television sets for watching shows and often gathered together to watch. Now, the answer is more complicated than that. Viewers can record shows and watch them at later times, reducing the dependency on preset television schedules. Broadcast and cable networks are being disrupted by streaming services, which flaunt on-demand content that viewers can watch at any time. In addition, smartphones and other technological advances have expanded the platform options for television viewing. People can use not only television sets but also mobile devices such as laptops and tablets to watch television. The increase in accessibility and variation has blurred the definition of television. Tefertiller and Sheehan (2019) acknowledge that "the exact meaning of 'TV' may not always be a consistent concept across users" (p. 612). The lack of a clear definition of television creates problems in accurately measuring its audience. Kosterich and Napoli (2016) note that 20% of television viewing is unmeasured due to "audience fragmentation," which is the ongoing expansion of viewing options (p. 260). Fragmentation has prevented some television viewing from being measured since it is harder to measure a fragmented audience than a complete audience. Thus, television has to be appropriately defined so its audience can be measured and companies can allocate their resources accordingly.

Various studies define television differently. For instance, Tefertiller and Sheehan (2019) "broadly conceptualize television in terms of the many means, program types, and distribution models available" (p. 612). To inform their main study, they used a pilot study to "determine a functional definition of television," which found that respondents think of television in terms of the *devices* used, *content* or shows, and how it is *delivered*. The authors use this to create a broad definition of television that incorporates both television sets and mobile devices as *devices*; all types of shows as *content*; and broadcast networks, cable channels, and streaming services as *delivery* methods (p. 600). This broad definition includes every aspect of television viewing that comes to mind with the word *television*. However, it lumps together traditional television viewing with streaming services, ignoring the fundamental differences between the two. To tackle this issue, some studies narrow their focus to just one type of television viewing. In an observational study about dual-income families' television viewing habits, television viewing is defined by watching shows on television sets (Saxbe, Graesch, & Alvik, 2011). Therefore, it does not include watching shows on laptops or mobile devices through streaming services. This allows the study to focus on the characteristics of traditional television viewing and extrapolate meaningful results.

Audience Measurement

To quantify television viewing, we need a way to measure audiences. The business model of the traditional television industry, or broadcast and basic cable television, depends heavily on advertising, which, in turn, depends on metrics of audience demand (Baker & Dessart, 1998, p. 90-91). Advertisers pay a lot of money for commercial slots during television programs, generating revenue for broadcast networks. This revenue is "directly proportionate to the number of viewers that tune in to each show," which "makes viewership the essential measure of

success" (Basin, 2019, p. 10). As such, there are metrics of audience demand that measure viewership, such as ratings and shares. In general, ratings are the "percent of households or people that tuned to a program during a given period of time." The most commonly used ratings for national television are average audience ratings, which are "the percent of people who tuned into an average minute of the program." Sometimes, it is reported in projections of the number of people who were viewing the show in an average minute (The Nielsen Company, 2019). For the purposes of this paper, *ratings* are assumed to be average audience ratings. Moreover, ratings and audience demand will be used interchangeably because ratings measure viewership, which reflects consumer demand for the shows. Advertising prices are then based on these metrics of audience demand, as measured by Nielsen (Kosterich & Napoli, 2016, p. 257).

Historically, television audience measurement has been the prerogative of the Nielsen Company, a data analytics firm with a proprietary method of measuring ratings. As "the sole provider of TV ratings for network television," Nielsen has used the National People Meter (NPM) as an audience measurement tool since 1987 (Buzzard, 2012, p. 1-2). The ratings gathered by the NPM have been the industry standard for several decades. However, in 2007, Nielsen started releasing C3 ratings, which were "minute-by-minute commercial audience ratings that included three days of viewing recorded for playback" (Buzzard, 2012, p. 6). C3 ratings aggregate audiences that watch television in real-time with those that record shows and watch them up to three days later. Thus, C3 attempts to reduce the effect of audience fragmentation by increasing the percentage of television viewing that gets measured. Basin (2019) refers to C3 ratings as "Live + 3," explaining that "'Live + 3' and 'Live + 7' ratings include viewers that watched the recorded show within the three days and seven days,

respectively, following the initial broadcast of the show" (p. 196). Live + 7 ratings attempt to better capture the viewership by extending the criteria to seven days.

Nevertheless, the effects of audience fragmentation are significant. Bulgrin (2019) emphasizes that as platforms for viewing television have expanded, "measurement has not kept pace, and knowledge gaps thus are increasing" because Nielsen does not sufficiently measure audiences across platforms (p. 11). A significant amount of television viewing goes unmeasured, so networks and advertisers do not have the complete picture of the current state of television viewing. More recently, Nielsen has attempted to close the knowledge gap with other methods, such as the Local People Meter, the Portable People Meter, the Software Meter (or Internet ratings), and digital cable set-top box ratings (Buzzard, 2012, p. 9). These methods provide valuable metrics of audience demand, but they have not closed the knowledge gap. Audiences are still not being "adequately measured" and thus, "monetized" (Kosterich & Napoli, 2016, p. 260). Thus, networks may be losing out on crucial advertising dollars for shows that are more popular than measured or wasting time on shows that are less popular than measured. In an effort to more accurately measure audiences, a new method has emerged: social TV analytics. With the rise of social media networks such as Facebook and Twitter, social analytics became a viable method of audience measurement as television viewers interacted online while watching live shows (Nielsen Social, 2015).

Nielsen ratings may soon be overtaken by social TV analytics, which goes beyond audience measurement. As described by Kosterich and Napoli (2016), Nielsen ratings measure audience exposure, while social analytics measure audience engagement (p. 255). In a practical sense, Nielsen can only measure how many people watched a show, but social analytics reveals how those people felt about the show. In a study about social analytics, Guo (2018) defines social

engagement as "the degree of interactions or connections that a viewer develops with television content through social media platforms over time" (p. 196). This includes various activities, such as posting about a show, following a show-related social media account, and others. Guo (2018) further clarifies by identifying four dimensions of social engagement: vertical involvement, diagonal interaction, horizontal intimacy, and horizontal influence (p. 204). The first dimension of *vertical involvement* measures the extent to which viewers interact with a "core [program] content and/or ancillary content" (p. 205) by, for example, following a show's social media account. *Diagonal interaction*, the second dimension, measures viewers' social media interaction with characters or celebrities from the show (p. 205). The third dimension, *horizontal intimacy*, measures viewers' interactions with each other, such as in "online discussion forums" (p. 205). Lastly, the fourth dimension, *horizontal influence*, also measures viewers' interactions with each other, but in terms of identification with a fandom. It includes the extent to which viewers may influence non-viewers by promoting the show (p. 206).

Clearly, social analytics measure multifaceted engagement with a show. It provides crucial data about viewers' level of interest in a particular show. At the same time, it is important to understand what motivates viewers to engage in social behavior. Lin, Chen, and Sung (2018) found that the motivations of social engagement are social infotainment, and to a lesser extent, social companionship. *Social infotainment* refers to "entertainment, social interaction, and exchange of information," while *social companionship* refers to "companionship and need for belonging" (p. 14). Thus, television viewers mostly engage with social media for entertainment and learning about the show from others. The study also found that participating in social engagement increases "viewers' commitment toward programs," which is "an important antecedent to network loyalty" (p. 15). When viewers are socially engaged, they are more likely

to continue watching the show and consequently, more likely to watch other shows on the same network. Social engagement is beneficial to broadcast and cable networks as it increases the hype about shows, leading to greater audience commitment to both the shows and networks (Lin, Chen, & Sung, 2018, p. 12). Therefore, social TV analytics is not only a new technique for measuring audiences, but its very existence helps to support those audiences.

Despite the advantages of social analytics, Nielsen ratings are still necessary to measure the number of people watching a show, even if they do not participate in social engagement about the show. Going forward, the television industry needs additional methods of audience measurement to supplement Nielsen ratings and social analytics. Bulgrin (2019) calls for "standardized, cross-platform measurement" (p. 12) that could combine the various methods. It is unclear how that hybrid measurement technique would work, but its development is likely in the near future.

Forecasting Demand

Even more difficult than measuring an audience is forecasting the audience numbers. In forecasting any variable, there will be uncertainty and error (Saffo, 2007). The goal is to get the forecast as close to real values as possible. Its accuracy will depend on the forecast drivers and whether they are appropriate. In forecasting television audiences, there could be any number of drivers, or factors, that influence demand. However, some factors are more useful than others. For instance, Hunter (2019) analyzed ten seasons' worth of pilot episode scripts of 183 different series on the broadcast networks ABC, CBS, Fox, and NBC. He used the data to predict Nielsen ratings for the first five episodes of each series. The results indicated that "the originality of a series' premise, the track record of success of the creators, and the cognitive complexity of its pilot episode script" are all factors that can predict audience demand (p. 9). Scripts themselves

are important for forecasting the audience for a show. Thus, self-contained elements of a television show, such as its script, can be factors of audience demand.

At the same time, outside elements that do not pertain to the show itself can be factors of demand. As an example, Napoli (2001) found that forecasts are more accurate when the show's "lead-in or lead-out is a returning program with a ratings history." He identifies a show's *lead-in* as the show that precedes the target show, while the *lead-out* is the show that follows (p. 54). Whether or not the show has a returning lead-in or lead-out can help predict its audience. These are outside elements because they are not related to the show itself, but rather the scheduling of shows around it. Accordingly, both self-contained and outside elements can be useful factors in predicting audience demand for a television show.

Advertising in Broadcast Television

The television business boils down to "the buying and selling of eyeballs," the industry's term for each audience member's attention (Baker & Dessart, 1998, p. 65). Broadcast networks think of television viewers in terms of the price they can charge advertisers and how much the advertisers are willing to pay to reach viewers (Baker & Dessart, 1998, p. 65). Mittell (2010) agrees that the networks' main goal is "to sell airtime for advertising" because advertising is their main revenue source (p. 54).

In the 1940s, network television was based on a single-sponsorship system where shows were sponsored by an advertiser, and advertisements for the same product were placed throughout the show (Mittell, 2010, p. 56). Instead of multiple advertisers buying commercial time, each program had a single sponsor (Lotz, 2014, p. 23). Single-sponsorship was expensive and inefficient for both networks and advertisers, so the industry shifted to a magazine sponsorship system. This allowed networks to sell short segments within shows to different

advertisers as commercial spots (Mittell, 2010, p. 58). Advertisers could then distribute their budgets across various shows and networks had more control over show content (Mittell, 2010, p. 58). The magazine sponsorship system is still in effect today, as commercial breaks featuring products from different advertisers split broadcast television episodes into "acts" (Levy, 2019, p. 117). A single show may feature a variety of advertisements, but they are linked together by a key element of television programming: the target demographic.

The target demographic of a television show informs not only the content of the program itself but also the type of advertisements that accompany it. Television shows are produced with a certain demographic in mind, defined by Nielsen categories, such as "Teens 12-17" (Levy, 2019, p. 124). The numbers 12-17 refer to teenagers between the ages of 12 and 17, who might have different viewing interests than children or adults. The demographic can also be split by gender. For example, network programmers might target Women 18-34, or W18-34 (Levy, 2019, p. 124). By selling a show's commercial spots to advertisers, the network sells the specific demographic that the show caters to. A network targeting W18-34 sells "the attention of Women 18-34 to advertisers" (Levy, 2019, p. 124). Thus, networks are well-aware of their shows' demographics and choose to sell spots to advertisers with the same target demographics for their products.

Similarly, advertisers carefully choose the shows in which they place advertisements since their goal is to find potential customers. Networks and advertisers can narrow their target demographic of viewers by factors beyond age and gender, such as relative affluence and education levels (Levy, 2019, p. 126). The target demographic affects the advertising prices, or how much networks charge advertisers for commercial spots. With more information about the

audience, advertisers can better target their messages and reduce uncertainty (Lotz, 2014, p. 228).

Levy (2019) explains the importance of viewer "quality" for determining prices. The low-income and the less-educated audience is large so targeting this demographic can lead to more ratings. However, the affluent and educated demographic is "worth more to advertisers" because those viewers are "more scarce" and have more spending money, which enables networks to "charge more for commercial time in shows that attract that audience" (Levy, 2019, p. 126). This suggests that advertising prices are partly determined by the target demographic of the show, with a more educated audience leading to higher prices. Similarly, CBS has different demographic categories such as Sports Enthusiasts and Media Trendsetters, which presumably require different types of advertisements and thus, different prices (Lotz, 2014, p. 229). Clearly, a show's target demographic influences its advertising prices.

Advertising prices are set through a process that involves the upfront, scatter, and spot markets. The upfront market opens once the broadcast networks release the prime-time schedule for the fall season so that networks can sell commercial spots "up front" for those shows. From May to July, networks offer advertisers 65 to 75 percent of prime-time available spots at a discount of 15 percent (Blumenthal & Goodenough, 2006, p. 73). Networks may even sell 75 to 90 percent of the advertising spots upfront (Lotz, 2014, p. 180). During the upfront, networks and advertisers negotiate a cost per thousand viewers (CPM) based on estimates of the expected ratings for the show. If the ratings are expected to be low, advertisers will pay a lower CPM since they are not reaching as many viewers as they want (Blumenthal & Goodenough, 2006, p. 74). Advertising prices are also individually negotiated based on the advertiser's deal. For instance, if

an advertiser buys more time, or "more time in less desirable shows," the price will be lower (p. 74).

Regardless, the price is mostly dependent on ratings, as deals are based on guaranteed gross rating points (GRPs). The networks use the estimated ratings to guarantee "a minimum number of GRPs within a specific demographic" (p. 74). If a show does not meet ratings expectations, the network makes good on its guarantee by placing advertisements in other shows ("make-goods") to provide the remaining ratings points (p. 74). These make-goods are "supplementary advertising slots" that networks provide "if they failed to achieve the guaranteed audience reach with the initial purchase" (Lotz, 2014, p. 181). Make-goods fulfill the guarantee, but these other shows could be less desirable or not meet the advertiser's needs (Blumenthal & Goodenough, 2006, p. 74). Therefore, networks and advertisers want to avoid make-goods by having accurate predictions of future ratings. Though the networks' audience forecasts are calculated with "predeterminable margins of error," the forecasts are simply estimates, and "billions of dollars rest on them" (Baker & Dessart, 1998, p. 94). It is essential for the networks to accurately forecast audience demand in order to attract business from advertisers.

The scatter and spot markets are where networks sell commercial spots that were not sold during the upfront market. These markets are smaller but still valuable. The scatter market opens "days before the start of the new quarter, offering negotiated packages of sold inventory," while the spot market offers individual commercial slots as available (Blumenthal & Goodenough, 2006, p. 76). Prices in the scatter market could be higher than they were in the upfront "depending on advertising demand." Some shows have coveted spots that are limited and only available during the upfront. As a result, scatter market prices are 15 percent higher than the upfront on average (Lotz, 2014, p. 180). Nevertheless, if the network does not sell commercial

spots in time, it does not make any money. To avoid this, the network uses the spots to fulfill its upfront GRP guarantees or sells them to its best advertising clients at low prices (Blumenthal & Goodenough, 2006, p. 76). These scatter and spot markets help networks fill in the gaps, but the main selling of spots occurs in the upfront market. As such, the data used in this paper is based on prices set during the upfront.

The current state of audience research goes into depth about television's successes and shortcomings, but lacks the specific angle taken in this paper. Research about audience measurement ranges from Nielsen ratings to social analytics, while a wide variety of research into television includes broadcast, cable, and streaming services. However, research into the direct correlation between advertising prices and ratings for broadcast network primetime shows, combined with an analysis of qualitative factors that cause discrepancies, is not easily available. This dual-method analysis provides deeper insight into broadcast shows and whether networks accurately predict ratings for their upcoming season, indicated by the predetermined ad prices, and the reasons for potential discrepancies.

RESEARCH QUESTIONS AND METHODOLOGY

This paper uses a narrow, traditional definition of television that includes broadcast and basic cable networks, but not streaming services. Although streaming services provide content that mirrors traditional television, their business models and functionalities are very different. As a result, it is important to study traditional television viewing to not only understand and quantify it but also compare it to streaming content.

The research questions are:

1. Are broadcast networks able to accurately predict ratings, or audience demand, for their upcoming season of primetime shows, indicated by the predetermined advertising prices?

2. If advertising prices do not reflect audience demand for the upcoming season, what is the reason for this?

A two-part mixed methods design was used: quantitative research to address the first question, and qualitative research using content analysis to investigate the second. To understand whether networks are able to accurately predict demand through advertising rates, two sets of data were compared:

1. The top 100-plus most-expensive broadcast network television shows, listed by prices for 30-second advertising spots for the past 3 seasons (2017-2019).
2. The top 100-plus most-viewed broadcast network television shows, listed by Nielsen ratings for the past 3 seasons (2017-2019).

The first dataset represents audience forecasts because it ranks shows by what advertisers are willing to pay, indicating how popular the networks expect shows to be. The second dataset demonstrates actual audience measurement using Nielsen ratings, the industry standard. The research focuses on broadcast network shows because they are more widely accessible to the general public than shows on cable channels or streaming services. A scatterplot analysis will find out whether the datasets correlate. If the forecasts correlate with the actual ratings, then broadcast networks are generally successful in predicting audience demand. If the forecasts do not correlate with actual ratings, then networks are unable to accurately predict demand, which is the expectation. “Make-goods” provide more rating points for advertisers when a show underperforms. The use of “make-goods” as contingency suggests that networks cannot always predict future ratings (Blumenthal & Goodenough, 2006, p. 74). A content analysis of the outliers found in the top 20 broadcast shows will identify factors that influence audience demand. This content analysis will be qualitative research into self-contained, or internal,

elements such as the show's plotline, longevity, etc., and outside elements such as controversy surrounding actors.

These methods are conventional to the field of research in the television industry. Qualitative research is often used to define terms and identify factors, as Tefertiller and Sheehan (2019) do to generate a comprehensive definition of television. Quantitative research is used to generate or test forecasts, complete with statistical analysis and regression models, as Hunter (2019) and Napoli (2001) do in their forecasting. Thus, a dual-method research design that uses quantitative research to test forecasts, and qualitative research to identify factors of audience demand for television, are the most appropriate methods to apply.

Methodology

Two types of datasets were analyzed: pricing data for 30-second advertising spots in broadcast network shows and the Nielsen ratings for those shows.

Advertising Prices Data

The advertising pricing data was obtained from articles in *Ad Age*, a "global media brand" that publishes information about trends and key statistics in marketing and media (Ad Age, n.d.). Five seasons' worth of ad pricing data was copied and pasted from *Ad Age* articles to spreadsheets in an Excel workbook for ease of analysis. The five seasons were 2016-2017, 2017-2018, 2018-2019, 2019-2020, and 2020-2021. (All five seasons' data was retrieved because the initial plan was to analyze five seasons, not just three.) One television season runs from September of one year to May of the next year. For example, the 2019-2020 season ran from September 23, 2019, to May 20, 2020 (Porter, 2020). For simplicity, the 2016-2017 season is referred to as "the 2016 season," the 2017-2018 season is "the 2017 season," and the same logic applies to other seasons.

The pricing data consisted of the top shows of each season on the five broadcast networks (ABC, CBS, NBC, Fox, and The CW), listed by most to least expensive prices for 30-second advertisement spots in the show (Poggi, 2016; Poggi, 2017; Poggi, 2018; Poggi, 2019; Poggi, 2020). Thus, the *price ranking* of a show refers to its rank in the list of shows, ordered from highest to lowest ad price. The data was originally collected by Ad Age for its annual survey of "as many as" six media buying companies (Poggi, 2016). Ad Age includes a disclaimer, noting that the prices are closer to "directional indicators" rather than actual prices paid by all advertisers (Poggi, 2016). They depend on "agency estimates" that change based on "the amount of inventory purchased from a network, the inclusion of any nontraditional advertising such as product placements, and the relationship an advertiser and media-buying agency has with a network" (Poggi, 2016). The prices are estimates since television advertising is usually bought "as part of larger negotiations, not on a one-off basis" (Poggi, 2016). Though they are not exact prices, they can still indicate the relative direction of a show: whether it has become more expensive over time and how it ranks in comparison to other shows. It is sufficient for this paper because the focus is on the price rankings rather than the exact prices.

Another disclaimer is that the 2016 prices are not a complete representation of that season's prices because some orders for advertisements had not been placed yet at the time of data collection. The advertisers had not yet ordered "commercial time in shows appearing mid-season" (Poggi, 2016). As a result, shows such as *Scandal* were not included in the list of ad prices (Poggi, 2016). However, most of the other orders for advertising spots had been placed already so the data can still indicate general trends (see Table B2 in Appendix).

This ad pricing data is also useful because it was negotiated during the upfront market. According to Ad Age, for example, the 2016 data "reflect the prices advertisers and networks

agreed on in this year's upfront marketplace" (Poggi, 2016). Thus, the ad prices for the 2016-2017 season refer to shows that aired from September 2016 to May 2017, but the prices themselves were decided much earlier during the upfront market in May 2016 (Steinberg, 2016). This concept is the crux of this paper; one season's ratings determine the ad prices for the next season, and those prices essentially forecast the next season's ratings because the pre-negotiated prices represent the networks' expectations of future ratings.

Ratings Data

The Nielsen ratings data was obtained from articles on *The Hollywood Reporter* website. Unfortunately, data for all five seasons were not available. However, two seasons of data were available: 2018-2019 and 2019-2020. These are the two most recent seasons. At this time, the 2020 season is still in progress since it will end in May 2021, so the data would be incomplete. The two seasons' worth of ratings data was copied and pasted from *The Hollywood Reporter* website to different spreadsheets in the same Excel workbook as the ad pricing data.

The 2019 ratings data consisted of the top 133 shows on the five broadcast networks, listed by their live-plus-7 ratings for the "key ad-sales demographic" of Adults 18-49 (Porter, 2020). It also included the change in ratings from the 2018 season for each show. Another chart for the 2019 season showed the top 133 shows listed by total viewers (Porter, 2020). Live-plus-7 ratings are the combined ratings for the show as it aired live, as well as the ratings from viewers who watched the recorded show up to seven days later (Basin, 2019, p. 196). The *ratings ranking* of a show refers to its rank in the list of shows, ordered from highest to lowest live-plus-7 ratings.

The 2018 ratings data consisted of the top 143 broadcast shows, listed by live-plus-7 ratings for Adults 18-49, as well as the change in ratings from the 2017 season. Another chart

showed the top 143 shows of the 2018 season listed by total viewers (Porter, 2019). Since the 2018 data included the change in ratings between the 2017 and 2018 seasons, in a column called "2018 Gain/loss," it was used to extrapolate the 2017 ratings data with the following formula: 2017 ratings = 2018 ratings - (2018 Gain/loss). Thus, the 2018 ratings were used to create a chart of live-plus-7 ratings for Adults 18-49 for broadcast shows in the 2017 season. Overall, three seasons of ratings data were used: 2017, 2018, and 2019.

Correlations

After compiling the five seasons of ad pricing data and three seasons of ratings into the same Excel workbook, the data was cleaned. This clean-up included adjusting column sizes, formatting the data as tables, and most importantly, checking if show titles match between the pricing and ratings data. A separate "2017 Correlation" spreadsheet was created to compare the 2017 prices to 2017 ratings. First, the 2017 pricing data was copied and pasted onto the new sheet. A column for the 2017 ratings was created next to the 2017 prices. The VLOOKUP function was used to input ratings, using the show title as a reference "lookup value" when searching the ratings data. This function would look for a certain show, *Sunday Night Football* for example, in the 2017 ratings spreadsheet and input its ratings value into the "2017 ratings" column of the Correlation sheet. This method enabled automatic comparison between the prices and the ratings of each show.

However, it also highlighted the need for data cleanup, as the VLOOKUP function would not recognize a show if the title differed between the pricing and ratings datasets. To ensure the function worked properly, the show titles were manually checked and any discrepancies were adjusted in the ratings data. For instance, *Dateline NBC* was referred to as *Dateline - Friday* in the ratings data, so it was adjusted to *Dateline NBC* in order to match the pricing data (see Table

A1 in Appendix). Once the 2017 pricing and ratings data were matched, a scatterplot was created to visualize the correlation between the two datasets.

Next, a "2018 Correlation" sheet was created to compare the 2017 ratings to 2018 prices, and 2018 prices to 2018 ratings. The VLOOKUP function was employed again to input the ratings data, using the 2018 pricing data as a basis for the show titles. After adjusting show titles as mentioned earlier, two scatterplots were created: one plot to show the correlation between 2017 ratings and 2018 prices, and another to show the correlation between 2018 prices and 2018 ratings. Similarly, a "2019 Correlation" sheet was created to compare the 2018 ratings to 2019 prices, and 2019 prices to 2019 ratings, using VLOOKUP to input ratings. Again, two scatterplots were created to show the correlation between ratings and prices, and prices and ratings.

The scatterplots of one year's ratings versus the next year's prices indicated whether prices were related to past ratings as expected. Advertisers often use ratings data to "predict likely series performance prior to the upfront to determine the best purchase" to reach their target demographic (Lotz, 2014, p. 184). They consider past ratings when deciding what ad prices they are willing to pay because past ratings can help predict future ratings. As such, networks and advertisers negotiate ad prices for the upcoming season based on ratings from the previous season. Thus, it is expected that prices correlate with the previous year's ratings. The scatterplots of one year's prices versus the same year's ratings indicated whether the prices reflect future ratings. If networks are able to accurately predict the success of their shows, the prices they demand from advertisers during the upfront market should correlate with the actual ratings of the shows.

Top 20

The scatterplots consisted of all the top broadcast network shows included in *AdAge* and *The Hollywood Reporter*'s data. For a more in-depth perspective, the top 20 shows were analyzed. The top 20 shows listed by 2017 ad prices (top 20 price ranking) were copied and pasted into a new spreadsheet. Then VLOOKUP was used to input each show's ranking in the 2017 ratings data; this was the ratings ranking. It was expected that a top 20 priced show would also be in that year's top 20 rated shows. If 100% of the top 20 priced shows in 2017 have a top 20 rating in 2017, then the networks are accurate in their ratings expectations. If less than 100% of the shows are rated in the top 20, the networks should look at which shows underperformed and why.

Furthermore, the top 20 shows listed by 2017 ratings were put in a new sheet. VLOOKUP was used to input each show's ranking in the 2018 pricing data; this was the price ranking. It was expected that a top 20 rated show would have a top 20 price in the following year, as prices often relate to the previous year's ratings. If 100% of the top 20 rated shows in 2017 have a top 20 price in 2018, it reflects how ratings determine ad prices for the next season. If less than 100% of the shows are priced in the top 20, it indicates that other factors contribute to ad prices besides ratings. This process was repeated for the 2018 pricing and 2019 pricing data, in a total of six tables.

Research Ethics

It is important for research to follow ethical standards. In terms of this paper, ethical standards call for the disclosure of relevant information and issues that may impact the research. Accordingly, disclaimers were included with descriptions of the advertising prices and ratings datasets. Issues with finding data were mentioned to clarify the reasoning behind certain

methods. The necessary data cleanup and adjusting of discrepancies were explained in order to provide an honest view of the research. Overall, this paper follows ethical standards for research by providing a clear and truthful review of the data and subsequent analysis.

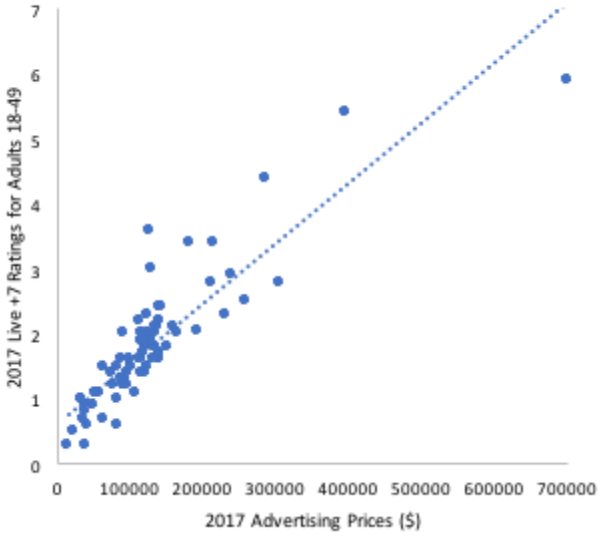
RESULTS AND DISCUSSION

Correlations

Five scatterplots were created to visualize the correlations between advertising prices and ratings. The scatterplot of 2017 pricing and 2017 ratings data shows the correlation between the two. As seen in Figure 1, as advertising prices increased, the ratings increased, demonstrating a positive correlation. Of course, correlation does not imply causation, but it does indicate that the two variables typically trend together. This positive correlation matches up with expectations. It is expected that broadcast shows with more expensive advertising spots also end up with higher ratings during the season because the higher audience reach is what advertisers are paying large sums for.

Figure 1

The Relationship between 2017 Prices and 2017 Ratings

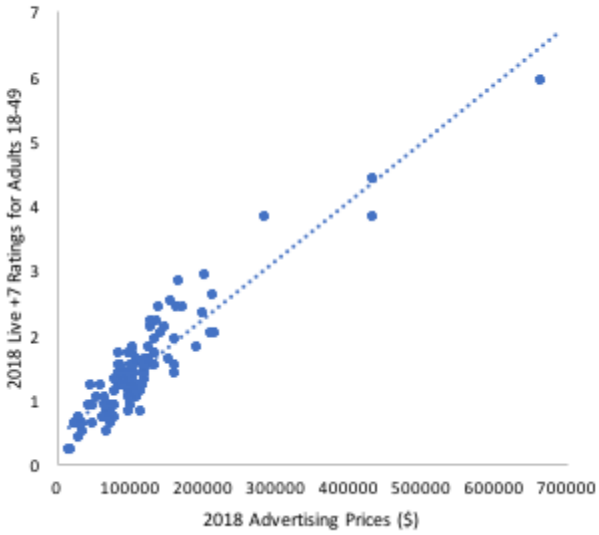


Note. Advertising prices for the 2017-18 season are plotted against the ratings for the 2017-18 season, showing a positive correlation.

The positive correlation between ad prices and the ratings for the same season suggests that generally, broadcast networks are able to accurately predict ratings for their upcoming season of primetime shows. This is the first research question, which can be answered generally because the scatterplot displays all of the broadcast shows, providing a general overview of the relationship between prices and ratings. Since the ad prices are predetermined during the upfront market, they represent future ratings. The fact that higher prices correlate with higher ratings indicates that networks are accurately valuing their shows, with more popular shows garnering higher ad prices. This relationship is further supported by two other scatterplots, which show a positive correlation between 2018 prices and 2018 ratings, and 2019 prices and 2019 ratings (see Figures 2 and 3 below). Thus, ad prices and ratings for the same season typically trend together.

Figure 2

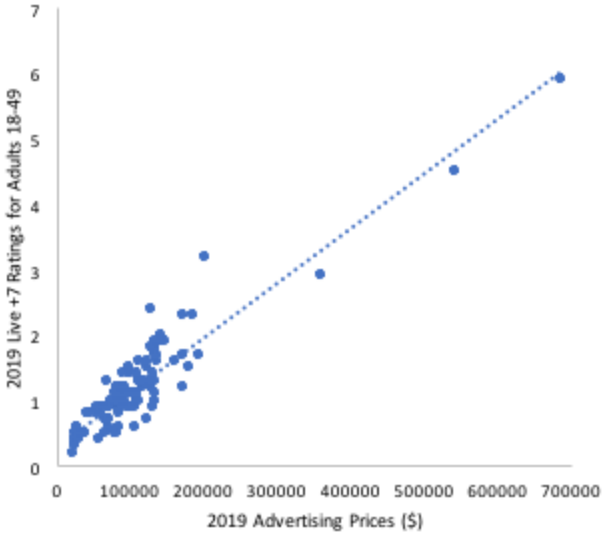
The Relationship between 2018 Prices and 2018 Ratings



Note. Advertising prices for the 2018-19 season are plotted against the ratings for the 2018-19 season, showing a positive correlation.

Figure 3

The Relationship between 2019 Prices and 2019 Ratings

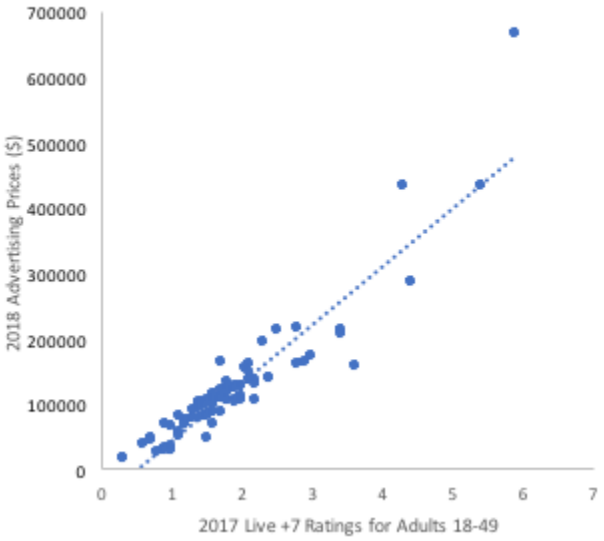


Note. Advertising prices for the 2019-20 season are plotted against the ratings for the 2019-20 season, showing a positive correlation.

Meanwhile, the fourth scatterplot relates 2017 ratings to 2018 prices (see Figure 4). As ratings increased, ad prices increased, so there is a positive correlation. This coincides with expectations because the next season's prices are partially determined by past ratings (Lotz, 2014, p. 184). If a show has high ratings in a certain season, the network is able to justify high ad prices for the next season because if the high ratings continue, the show will reach a wide audience so the network can charge advertisers more for the spots. Thus, ad prices are positively related to past ratings.

Figure 4

The Relationship between 2017 Ratings and 2018 Prices

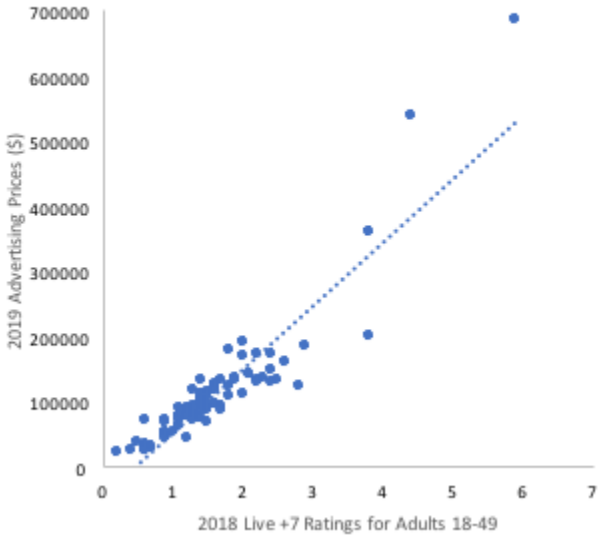


Note. Ratings for the 2017-18 season are plotted against the advertising prices for the 2018-19 season, showing a positive correlation.

Similarly, the fifth scatterplot visualizes the positive correlation between 2018 ratings and 2019 prices (see Figure 5). Once again, ad prices for the next season are related to the previous season's ratings, with higher ratings being followed by higher prices. As mentioned earlier, these scatterplots do not prove that prices depend on ratings since causation is separate from correlation. However, they indicate that there is a strong positive relationship between the two variables, which matches expectations.

Figure 5

The Relationship between 2018 Ratings and 2019 Prices



Note. Ratings for the 2018-19 season are plotted against the advertising prices for the 2019-20 season, showing a positive correlation.

The purpose of analyzing the relationships between prices and past ratings, and prices and future ratings, is to see whether the advertising prices negotiated during the upfront market represent future ratings for the shows, and what connection they may have with past ratings. As shown by the scatterplots, prices are not only positively correlated with past ratings, but also with future ratings. Therefore, broadcast networks are able to predict future ratings and incorporate those predictions into the prices negotiated in advance.

Top 20

From a broad viewpoint, it seems that broadcast networks are able to predict audience demand for their upcoming season of primetime shows. However, the scatterplots (see Figures 1-5) show that the relationship between advertising prices and future ratings, and prices and past ratings, is not perfectly correlated all the time. There are outliers, shows that are expected to

garner high ratings but fail to do so in the next season, or shows that are disproportionately priced compared to their performance in the past season. To analyze the shows at a closer level, the top 20 shows listed by prices, and then by ratings, were compared.

The tables can be analyzed in two groups of three: shows listed by top 20 prices versus top 20 ratings. Group A consists of Tables 1, 2, and 3; group B is Tables 4, 5, and 6.

Table 1: Top 20 Shows Listed by 2017 Advertising Prices

Table 2: Top 20 Shows Listed by 2018 Advertising Prices

Table 3: Top 20 Shows Listed by 2019 Advertising Prices

Table 4: Top 20 Shows Listed by 2017 Ratings

Table 5: Top 20 Shows Listed by 2018 Ratings

Table 6: Top 20 Shows Listed by 2019 Ratings

Group A

Table 1 displays the top 20 most expensive shows in the 2017-18 season, along with their rank in the ratings for the 2017-18 season. For example, in 2017, *Empire* was the fifth most expensive show, with an ad price of $305,369. However, it had only the twelfth highest ratings. This is a discrepancy of seven between the ratings rank and price rank, which is shown in the last column. The percentage of these top 20 shows that were also rated in the top 20 is 76.92%. Any instance of "#N/A" indicates that the show was not included in the ratings data. These shows were not counted for the final percentage. The resulting 76.92% indicates that the majority of shows with a top 20 ad price also ended up with a rating in the top 20. Ideally, this should be 100%, with high prices correlating to high ratings. However, certain shows do not meet this expectation. Shows with a difference between the ratings rank and price rank greater than 10 were highlighted in red.

Table 1

Top 20 Shows Listed by 2017 Advertising Prices

Top 20 shows by prices in 2017					
2017 Price Rank	Network	Show	2017 Price ($)	2017 Ratings Rank	2017 Ratings Rank - 2017 Price Rank
1	NBC	Sunday Night Football	699602	1	0
2	NBC	Thursday Night Football NBC	550709	#N/A	#N/A
3	CBS	NFL Thursday Night Football	549791	#N/A	#N/A
4	NBC	This Is Us	394428	2	-2
5	FOX	Empire	305369	12	7
6	CBS	The Big Bang Theory	285908	3	-3
7	NBC	The Voice (Monday)	259180	14	7
8	ABC	Modern Family	239782	11	3
9	NBC	The Voice (Tuesday)	229956	17	8
10	ABC	Grey's Anatomy	213576	8	-2
11	NBC	Will & Grace	211856	13	2
12	ABC	Scandal	194482	#N/A	#N/A
13	ABC	American Idol	191999	#N/A	#N/A
14	CBS	Young Sheldon	180393	7	-7
15	ABC	Designated Survivor	174572	#N/A	#N/A
16	ABC	Roseanne	166573	#N/A	#N/A
17	ABC	How to Get Away with Murder	164984	28	11
18	ABC	The Goldbergs	160193	24	6
19	NBC	Law & Order True Crime: Menendez Murders	153556	#N/A	#N/A
20	FOX	Star	150262	39	19
% of top 20 priced shows in 2017 that have a top 20 rating in 2017				76.92%	
				=COUNTIF(E3:E22,"<=20")/(20-7)	

Note. The top 20 most expensive shows in the 2017-18 season are listed, along with their rank in the ratings for the 2017-18 season. The difference between the ratings rank and price rank is shown in the last column. "#N/A" indicates that the show was not included in the ratings data, so these shows were not counted for the final percentage, highlighted in yellow.

In Table 1, *How to Get Away with Murder* and *Star* had differences of 11 and 19, respectively. A difference of 11 is not that substantial, so the main discrepancy is from *Star*. On the review website *Rotten Tomatoes*, *Star*'s first season was poorly rated, with claims of "melodrama and overly cartoonish stereotypes" (Rotten Tomatoes, n.d.). Though the 2017 season was its second, *Star*'s story issues seem to have persisted. One viewer's blog compares *Star* to *Game of Thrones* for the excessive number of character deaths, which adds to the drama and inconsistency in the plotline (Allah, 2018). Thus, the overly dramatic story may have

detracted from the show, causing viewers to lose interest. This could explain why *Star* was priced in the top 20 in 2017, with expectations of high viewership, but was ranked 39 in ratings for the season (see Table 1). Clearly, the story and plotline is a crucial outside factor that can impact ratings.

Table 2 displays the top 20 most expensive shows in the 2018-19 season with their ratings rank for the 2018-19 season. The percentage of these top 20 shows that were also rated in the top 20 is 64.71%. Any shows with "#N/A" ratings rank were not counted for the final percentage. The resulting 64.71% indicates that the majority of shows with a top 20 ad price also ended up with a rating in the top 20. This is lower than the previous year, which had 76.92% of top 20 priced shows having a top 20 rating. Multiple shows had a discrepancy between the ratings rank and price rank. Shows with a rank difference greater than 10 were highlighted in red.

Table 2

Top 20 Shows Listed by 2018 Advertising Prices

Top 20 shows by prices in 2018					
2018 Price Rank	Network	Show	2018 Price ($)	2018 Ratings Rank	2018 Ratings Rank - 2018 Price Rank
1	FOX	NFL Game	687921	#N/A	#N/A
2	NBC	Sunday Night Football	665677	1	-1
3	FOX	Thursday Night Football FOX	434078	2	-1
4	NBC	This Is Us	433866	3	-1
5	CBS	The Big Bang Theory	285934	4	-1
6	FOX	Empire	216171	22	16
7	CBS	Young Sheldon	213536	10	3
8	NBC	The Voice (Monday)	212618	23	15
9	ABC	Grey's Anatomy	204792	7	-2
10	ABC	The Conners	201065	15	5
11	NBC	The Voice (Tuesday)	193140	28	17
12	FOX	911	173854	13	1
13	NBC	Manifest	167311	8	-5
14	ABC	Modern Family	164767	12	-2
15	FOX	The Simpsons	162725	61	46
16	NBC	Chicago Med	161561	25	9
17	NBC	Will & Grace	161373	44	27
18	ABC	The Good Doctor	155916	11	-7
19	ABC	American Idol	154096	#N/A	#N/A
20	ABC	The Bachelorette	153096	#N/A	#N/A
% of top 20 priced shows in 2018 that have a top 20 rating in 2018				64.71%	
				=COUNTIF(L3:L22,"<=20")/(20-3)	

Note. The top 20 most expensive shows in the 2018-19 season are listed, along with their rank in the ratings for the 2018-19 season.

In Table 2, *Empire*, *The Voice* (Monday), *The Voice* (Tuesday), *The Simpsons*, and *Will & Grace* had differences of 16, 15, 17, 46, and 27, respectively. *The Simpsons* clearly had the largest difference at 46, reflecting how its advertisement slots were priced highly, but it was not a very popular show. Its ratings rank was 61, so it was nowhere near the top 20 viewed shows. *The Simpsons* exemplifies how broadcast networks might expect a show to garner high ratings, so they price it highly, but then the show fails ratings expectations. However, *The Simpsons* has also been airing since 1989 (IMDb, n.d.), which may point to its inherent ad value, unrelated to its

ratings expectations. According to Fox, the network that airs it, *The Simpsons* is "the longest-running primetime scripted show in television history." It became part of mainstream culture in 1990 and "has remained one of the most groundbreaking and innovative entertainment franchises, recognizable throughout the world" (Fox, n.d.). This means that Fox might be exploiting *The Simpsons* brand name and longevity to charge high prices, even though the show does not attract large audiences anymore. Thus, a show's popularity in society and longevity can contribute to its ad pricing, beyond its ability to garner ratings.

The other shows had a smaller rank difference, but still substantial. *Empire* was already showing signs of decreased ratings in 2015. Barker (2015) suggests that the show's "melodramatic" plotline with "entire arcs beginning and ending in the span of a couple of weeks" was alienating viewers. He also attributes the drop in ratings to scheduling issues since *Empire* took breaks in programming that may have caused viewers to lose enthusiasm. Rawden (2016) also emphasizes the issue with scheduling breaks, claiming that "viewers will even drop or forget about shows if they disappear for a time." She notes that networks had been starting fall and midseason shows in September and January, but *Empire* was "off of the schedule" until March 2017 (Rawden, 2016). *Empire*'s breaks in scheduling and overly dramatic plotline may have led up to its ratings discrepancy in 2018. Fox expected it to have high ratings, so it was priced highly as the sixth most expensive show in 2018. However, its ranking in the ratings for the 2018 season was only 22, indicating that Fox overestimated its popularity. *Empire* was still feeling the effects of its scheduling and plotline issues from the previous years.

The Voice (Monday) and *The Voice* (Tuesday) are singing competition shows that were priced in the top 20 for 2018, but not rated as highly. Ratings can be impacted by many factors, but the show's content is a critical one. Near the end of 2018, *The Voice* garnered controversy

because of the actions of one coach, Adam Levine. After the Top 10 finalists performed, viewers voted for contestants to go to the semifinals. Three contestants with the lowest votes had the chance to perform again; one would get "saved" from elimination by the viewers' votes in real-time (Yahr, 2018). These three contestants were Dave Fenley, DeAndre Nico, and Reagan Strange. However, Strange was sick and could not perform. Levine pleaded with viewers to save Strange regardless and ultimately, she won. Without Levine's interference, Nico would have won because he had almost as many votes as Strange (Yahr, 2018). Many viewers thought that Levine's actions were unfair and biased as Strange won without even performing. On tv.com, several fan reviews from December 2018 vehemently criticize Levine's actions and declare that they are "done with *The Voice*" ("Not so much the voice," 2018). Some viewers started "boycotting" the show and others asked for Levine to leave (Rumer, 2018). With so many viewers explicitly stating that they stopped watching the show, it is clear that ratings were affected. Though controversy can sometimes draw more viewers, in this case, it may have pushed them away. This could explain why *The Voice*'s ratings rank in 2018 was not in the top 20, even though its ad prices were (see Table 2). Thus, with its high ad prices, NBC expected *The Voice* to have higher ratings, but this was hindered by unpredictable controversy.

Lastly, *Will & Grace* was also priced highly in the top 20 shows, but rated 44th in 2018 (see Table 2). *Will & Grace* is a revival of an old show that first aired in 1998. It is a comedy centered around the friendship between Will, a gay lawyer, and Grace, his straight best friend. After running for eight seasons, the show ended in 2006. In 2017, NBC revived *Will & Grace* (Framke, 2017). *Will & Grace* had a 2017 ratings rank of 13 (see Table 1). Thus, its first revived season in 2017 placed it in the top 20 most-viewed shows of the year. The revival was clearly a success. As a result, NBC priced it highly in 2018, expecting the next season to do just as well.

However, the 2018 ratings rank was 44, so it was no longer in the top 20. NBC overestimated the long-term popularity of the revived version of *Will & Grace*. The first new season may have piqued viewers' interest because it was a return to characters they had not seen for almost a decade. Nevertheless, the show was not interesting enough to keep viewers watching. Apparently, NBC promised that the revival would be "identical in spirit" to the old show (Framke, 2017). Framke (2017) suggests that *Will & Grace* tried too hard to retain its original "spirit" and did not adapt to the new television "landscape" in 2017. The lack of newer elements could have led to lower ratings in the 2018 season. Thus, broadcast networks should try to incorporate current trends or ideas into new shows, even if they are revived versions of old shows. Audiences want to watch shows that reflect the world as it is now.

Table 3 displays the top 20 most expensive shows in the 2019-20 season with their ratings rank for the 2019-20 season. The percentage of these top 20 shows that were also rated in the top 20 is 73.68%. Any shows with "#N/A" ratings rank were not counted for the final percentage. The resulting 73.68% indicates that the majority of shows with a top 20 ad price also ended up with a rating in the top 20. This is higher than the previous year, which had 64.71% of top 20 priced shows having a top 20 rating. Nevertheless, multiple shows still had a discrepancy between the ratings rank and price rank. Shows with a rank difference greater than 10 were highlighted in red. In Table 3, *The Voice* (Tuesday), *Empire*, *The Goldbergs*, and *The Unicorn* had differences of 16, 32, 16, and 48, respectively. The difference of 16 is not as substantial as the others, so *Empire* and *The Unicorn* are the main focus of analysis.

Table 3

Top 20 Shows Listed by 2019 Advertising Prices

Top 20 shows by prices in 2019					
2019 Price Rank	Network	Show	2019 Price ($)	2019 Ratings Rank	2019 Ratings Rank - 2019 Price Rank
1	FOX	NFL Game	689988	#N/A	#N/A
2	NBC	Sunday Night Football	685227	1	-1
3	FOX	Thursday Night Football FOX	540090	2	-1
4	NBC	This is Us	359413	4	0
5	FOX	The Masked Singer	201683	3	-2
6	NBC	The Voice (Monday)	192983	15	9
7	ABC	Grey's Anatomy	186026	7	0
8	NBC	The Voice (Tuesday)	179951	24	16
9	FOX	911	172215	6	-3
10	NBC	New Amsterdam	172085	19	9
11	FOX	Empire	171187	43	32
12	CBS	Young Sheldon	160698	21	9
13	ABC	Modern Family	148228	12	-1
14	NBC	Chicago P.D.	143082	8	-6
15	NBC	Chicago Fire	140834	10	-5
16	ABC	The Conners	135996	20	4
17	CBS	NCIS	135858	18	1
18	ABC	The Goldbergs	134284	34	16
19	CBS	The Unicorn	134107	67	48
20	ABC	The Good Doctor	133281	14	-6
% of top 20 priced shows in 2019 that have a top 20 rating in 2019				73.68%	
				=COUNTIF(S3:S22,"<=20")/(20-1)	

Note. The top 20 most expensive shows in the 2019-20 season are listed, along with their rank in the ratings for the 2019-20 season.

The Unicorn had the largest difference at 48, indicating that its ad slots were priced at a high position, but it was not a widely viewed show. Its ratings rank was 67, far from the top 20 viewed shows. *The Unicorn* was a new show that first aired on September 26, 2019 (CBS, n.d.). It is an example of how broadcast networks place high expectations on new shows. They overestimate the popularity of a new show, so they price it highly. If the show is not well received, it does not have high ratings and cannot justify the high ad prices. This is a situation

that networks would want to avoid because they do not want to waste time, money, and effort on shows that cannot fulfill ratings expectations.

Empire was once again mispriced based on actual ratings. It was priced at a high position, but did not garner high ratings. *Empire* continued on its downward trend in ratings, moving from its 2018 ratings rank of 22 (see Table 2) to 43 in 2019 (see Table 3). In May 2019, Fox canceled *Empire*, announcing that the 2019-20 season would be its last (Bradley, 2019). This decision was made after a wave of controversy surrounding the actor Jussie Smollett, who was arrested after allegedly "staging a hate crime" (Shaw, 2019). Though the charges were dropped, the legal drama hurt the show's ratings. Several media sources connected the legal controversy to the show's fall in ratings and eventual cancellation (Bradley, 2019; Clark, 2019; Shaw, 2019; Spencer, 2019). Thus, outside factors beyond the show, such as an actor's personal affairs, can impact its ratings. With such a huge controversy, it should not be surprising that *Empire*'s 2019 ratings were low. Its high ad price in 2019 may be attributed to its past performance, but both networks and advertisers were aware that it was a sinking ship.

Group B

Table 4 displays the top 20 most viewed shows in the 2017-18 season, along with their rank in the advertising prices for the 2018-19 season. For example, in 2017, *The Big Bang Theory* was the third most-viewed show, with a rating of 4.4. It had the fifth-highest ad price, so the discrepancy between the price rank and ratings rank was two, as shown in the last column. The percentage of the top 20 most viewed shows that had an ad price in the top 20 is 76.47%. Any instance of "#N/A" indicates that the show was not included in the ad pricing data. These shows were not counted for the final percentage. The resulting 76.47% indicates that the majority of shows with a top 20 rating also ended up with an ad price in the top 20 for the next season.

Table 4

Top 20 Shows Listed by 2017 Ratings

Top 20 shows by ratings in 2017					
2017 Ratings Rank	Network	Show	2017 Ratings	2018 Price Rank	2018 Price Rank - 2017 Ratings Rank
1	NBC	Sunday Night Football	5.9	2	1
2	NBC	This Is Us	5.4	4	2
3	CBS	The Big Bang Theory	4.4	5	2
4	Fox	Thursday Night Football FOX	4.3	3	-1
5	Fox	The OT	3.7	#N/A	#N/A
6	ABC	The Good Doctor	3.6	18	12
7	CBS	Young Sheldon	3.4	7	0
8	ABC	Grey's Anatomy	3.4	9	1
9	NBC	Football Night in America Pt 3	3.1	#N/A	#N/A
10	Fox	911	3	12	2
11	ABC	Modern Family	2.9	14	3
12	Fox	Empire	2.8	6	-6
13	NBC	Will & Grace	2.8	17	4
14	NBC	The Voice (Monday)	2.5	8	-6
15	CBS	Survivor	2.4	24	9
16	ABC	The Bachelor	2.4	23	7
17	NBC	The Voice (Tuesday)	2.3	11	-6
18	NBC	Ellen's Game of Games	2.3	#N/A	#N/A
19	NBC	Chicago P.D.	2.2	28	9
20	NBC	Law & Order: SVU	2.2	52	32

% of top 20 rated shows in 2017 that have a top 20 price in 2018	76.47%
	=COUNTIF(E28:E47,"<=20")/(20-3)

Note. The top 20 most viewed shows in the 2017-18 season are listed, along with their rank in the advertising prices for the 2018-19 season.

This is expected to be 100%, with high ratings in one season corresponding with high ad prices for the next season. However, certain shows do not meet this expectation. Shows with a difference between the price rank and ratings rank greater than 10 were highlighted in red. In Table 4, *The Good Doctor* and *Law & Order: SVU* had differences of 12 and 32, respectively. These shows had relatively high ratings in the 2017-18 season, but they were not priced highly for 2018-19, the next season. Regardless, most shows did not have much of a difference between the price rank and ratings rank, indicating that prices correlate with previous ratings, even at the level of individual shows.

Table 5 displays the top 20 most viewed shows in the 2018-19 season, along with their rank in the advertising prices for the 2019-20 season. The percentage of the top 20 most viewed shows that had an ad price in the top 20 is 76.47%. Any instance of "#N/A" indicates that the show was not included in the ad pricing data, so it was not counted for the final percentage. The resulting 76.47% indicates that the majority of shows with a top 20 rating also ended up with an ad price in the top 20 for the next season. This is the same as the previous year, which also had 76.47% of top 20 rated shows having a top 20 price.

Table 5

Top 20 Shows Listed by 2018 Ratings

Top 20 shows by ratings in 2018					
2018 Ratings Rank	Network	Show	2018 Ratings	2019 Price Rank	2019 Price Rank - 2018 Ratings Rank
1	NBC	Sunday Night Football	5.9	2	1
2	Fox	Thursday Night Football FOX	4.4	3	1
3	NBC	This Is Us	3.8	4	1
4	CBS	The Big Bang Theory	3.8	#N/A	#N/A
5	Fox	The Masked Singer	3.8	5	0
6	Fox	The OT	3.3	#N/A	#N/A
7	ABC	Grey's Anatomy	2.9	7	0
8	NBC	Manifest	2.8	31	23
9	NBC	Football Night in America Pt 3	2.7	#N/A	#N/A
10	CBS	Young Sheldon	2.6	12	2
11	ABC	The Good Doctor	2.5	20	9
12	ABC	Modern Family	2.4	13	1
13	Fox	911	2.4	9	-4
14	ABC	The Bachelor	2.4	26	12
15	ABC	The Conners	2.3	16	1
16	NBC	New Amsterdam	2.2	10	-6
17	CBS	Survivor	2.2	23	6
18	NBC	America's Got Talent: The Champions	2.2	25	7
19	NBC	Chicago P.D.	2.1	14	-5
20	NBC	Chicago Fire	2.1	15	-5
% of top 20 rated shows in 2018 that have a top 20 price in 2019				76.47%	
				=COUNTIF(L28:L47,"<=20")/(20-3)	

Note. The top 20 most viewed shows in the 2018-19 season are listed, along with their rank in the advertising prices for the 2019-20 season.

However, multiple shows still had a discrepancy between the price rank and ratings rank. Shows with a rank difference greater than 10 were highlighted in red. In Table 5, *Manifest* and *The Bachelor* had differences of 23 and 12, respectively. These shows had high ratings in the 2018-19 season, but they were not priced as highly for the next season of 2019-20. Still, most shows did not have much of a difference between the 2019 price rank and 2018 ratings rank, indicating that prices correlate with previous ratings.

Table 6 displays the top 20 most viewed shows in the 2019-20 season, along with their rank in the advertising prices for the 2020-21 season. The percentage of the top 20 most viewed shows that had an ad price in the top 20 is 92.86%. Any instance of "#N/A" indicates that the show was not included in the ad pricing data, so it was not counted for the final percentage. The resulting 92.86% indicates that the majority of shows with a top 20 rating also ended up with an ad price in the top 20 for the next season. This is higher than the previous year, which had only 76.47% of top 20 rated shows having a top 20 price. Nevertheless, there were still discrepancies between the price rank and ratings rank for certain shows. Shows with a rank difference (which had an absolute value) greater than 10 were highlighted in red.

Table 6

Top 20 Shows Listed by 2019 Ratings

Top 20 shows by ratings in 2019					
2019 Ratings Rank	Network	Show	2019 Ratings	2020 Price Rank	2020 Price Rank - 2019 Ratings Rank
1	NBC	Sunday Night Football	5.9	1	0
2	Fox	Thursday Night Football FOX	4.5	2	0
3	Fox	The Masked Singer	3.2	5	2
4	NBC	This Is Us	2.9	3	-1
5	ABC	The Bachelor	2.4	10	5
6	Fox	911	2.3	#N/A	#N/A
7	ABC	Grey's Anatomy	2.3	7	0
8	NBC	Chicago P.D.	2	17	9
9	CBS	Survivor	1.9	#N/A	#N/A
10	NBC	Chicago Fire	1.9	15	5
11	Fox	Lego Masters	1.9	#N/A	#N/A
12	ABC	Modern Family	1.9	#N/A	#N/A
13	Fox	Lone Star	1.8	#N/A	#N/A
14	ABC	The Good Doctor	1.8	21	7
15	NBC	The Voice (Monday)	1.7	4	-11
16	ABC	American Idol - Monday	1.7	#N/A	#N/A
17	NBC	Chicago Med	1.7	14	-3
18	CBS	NCIS	1.7	18	0
19	NBC	New Amsterdam	1.7	12	-7
20	ABC	The Conners	1.6	13	-7
% of top 20 rated shows in 2019 that have a top 20 price in 2020				92.86%	
				=COUNTIF(S28:S47,"<=20")/(20-6)	

Note. The top 20 most viewed shows in the 2019-20 season are listed, along with their rank in the advertising prices for the 2020-21 season.

In Table 6, *The Voice* (Monday) had a difference of -11. The negative value indicates that the show had high ratings in the 2019-20 season, but it was priced even higher than expected for the next season of 2020-21. *The Voice* (Monday) had ratings of 1.7 in the 2019-20 season, placing it in the fifteenth position in the ratings. Since ratings and next season's prices are correlated, it is expected that *The Voice* (Monday) would have a similar position in next season's ad prices. However, it has a higher position than expected, as the fourth most expensive show.

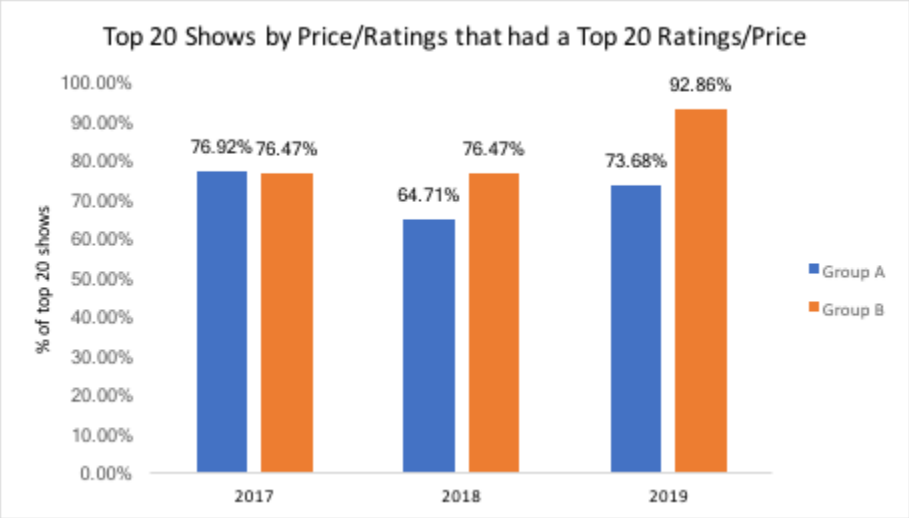
This suggests that the show performed well in 2019, but it was expected to perform even better in 2020, which allowed networks to charge a higher price to advertisers. The rest of the shows had a minimal difference between the price rank and ratings rank, suggesting that prices generally do correlate with previous ratings.

Group A vs Group B (Figure 6)

Group A is Tables 1, 2, and 3, which list the top 20 shows by ad prices and then compare their price rankings to the ratings rankings for the same year. These tables compare the rankings of predetermined prices for the season to the rankings of actual ratings. This comparison indicates whether networks were able to accurately predict how a show would perform by agreeing with advertisers on prices that reflected future ratings. Each table calculates the percentage of top 20 priced shows that ended up with a top 20 rating in that year. Figure 6 shows these percentages over time in the columns for Group A from 2017 to 2019. They fluctuate, hovering around 70 percent. Therefore, networks are able to predict ratings through their ad price agreements for the majority of shows. However, some shows' ratings could not be predicted due to internal factors pertaining to the show's content or external factors beyond the show itself. These shows were analyzed on a case-by-case basis.

Figure 6

Group A vs Group B Over Time



Note. Group A includes the percentages for three years of top 20 priced primetime shows that ended up with a top 20 rating in that year. Group B includes the percentages for three years of top 20 rated primetime shows that ended up with a top 20 ad price for next year. Group B is more consistent and shows an upward trend.

Meanwhile, Group B is Tables 4, 5, and 6, which list the top 20 shows by ratings and then compare their ratings rankings to the ad price rankings for the next year. These tables compare rankings of ratings for one season to the rankings of prices for the next season. This comparison hints at how networks determine ad prices based on the previous year's ratings. Each table calculates the percentage of top 20 rated shows that ended up with a top 20 price for next year. Figure 6 shows these percentages over time in the columns for Group B from 2017 to 2019. They have an upward trend, reaching above 90 percent in 2019. Thus, networks are setting ad prices that relate to previous ratings.

Group B has higher percentages than Group A. This is reasonable because networks tend to set ad prices based on previous ratings, leading to high percentages for Group B. However,

since these ad prices are based on previous ratings, they are not as predictive of future ratings, which can be influenced by unexpected factors. This leads to lower percentages for Group A. Thus, networks are more focused on a show's past performance when they should be considering other factors (internal and external) that determine future performance. Broadcast networks are generally successful at estimating audience demand for shows, indicated by the related ad prices, but they should analyze shows holistically before producing or renewing them. This would help networks avoid shows that have to be canceled prematurely for failing ratings expectations.

CONCLUSION

This research was subject to several limitations, including a lack of access to complete datasets. For instance, some highly-rated shows were not listed in the pricing data, leading to "#N/A" values. Further research into this topic should analyze a complete list of broadcast shows that includes both ratings and advertising prices for each show. This would avoid the issue of "#N/A" and provide a clearer analysis. In addition, further research can look into ratings and pricing discrepancies based on show genre, broadcast network, and/or over a longer time period. This research focused on the 2017, 2018, 2019, and 2020 seasons, as this data was more readily available. A longer-term analysis of the past five, ten, or twenty years could provide insight into societal trends in broadcast television viewing and trends in the corresponding ad pricing.

The purpose of this research was to investigate whether broadcast networks are able to accurately predict ratings for their upcoming season of primetime shows, indicated by the predetermined advertising prices. If ad prices did not reflect ratings for the upcoming season, what was the reason? The research indicates that networks are able to accurately predict ratings for the upcoming season since the predetermined prices generally correlate with future ratings, as seen in the scatterplots in Figures 1, 2, and 3. At the same time, these predetermined prices are

related to previous ratings, as seen in the scatterplots of Figures 4 and 5. Thus, networks generally can predict future ratings through their ad prices.

To investigate the second research question, the top 20 shows were analyzed in Tables 1, 2, and 3, and a qualitative approach was taken. Most shows garnered ratings that represented the predetermined prices, but those that did not were impacted by factors such as the show's plotline or actor's controversy. Clearly, a wide variety of internal and external factors can impact a show's ratings, which networks should take into consideration when setting ad prices but also creating new shows. The television industry depends on quality content that brings viewers back for more. The *Will & Grace* revival teaches an important lesson; television should reflect the current world. This does not mean the show has to be set in the present, but rather that it should reflect viewers' desires in the present. Television is a business with many interconnected participants, but it all ultimately comes down to one: the viewer. After all, that is who's watching.

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Appendix

Table A1

Discrepancies Between Show Titles

Ad Pricing Data	Ratings Data
Dateline NBC	Dateline - Friday
Dateline Mystery	Dateline Saturday Mystery
DC's Legends of Tomorrow	Legends of Tomorrow
Chicago P.D.	Chicago PD
The Voice (Monday)	The Voice - Monday
The Voice (Tuesday)	The Voice - Tuesday
Midnight Texas	Midnight, Texas
S.W.A.T.	SWAT
Marvel's Agents of S.H.I.E.L.D.	Agents of SHIELD
A.P. Bio	AP Bio

Note. The advertising pricing data used slightly different titles for the same shows listed in the ratings data.

Table B2

2016-2017 Advertising Prices of 30-Second Spot for Top 97 Shows

Source: (Poggi, 2016)

How Much For a 30-Second TV Spot?

Rank	Network	Show	Day	Time	2016 Price ($)	2015 Price ($)	% Change
1	ABC	Scandal	Thursday	9 p.m.	NA	224,509	NA
2	NBC	Sunday Night Football	Sunday	8 p.m.	673,664	603,000	12%
3	CBS	NFL Thursday Night Football	Thursday	8 p.m.	522,910	464,625	13%
4	NBC	Thursday Night Football NBC	Thursday	8 p.m.	485,695	NA	NA
5	FOX	Empire	Wednesday	9 p.m.	437,100	497,364	-12%
6	CBS	The Big Bang Theory	Monday/Thursday	8 p.m.	289,136	348,300	-17%
7	NBC	This Is Us	Tuesday	9 p.m.	272,000	NA	NA
8	ABC	Modern Family	Wednesday	9 p.m.	224,571	239,993	-6%
9	NBC	The Voice (Monday)	Monday	8 p.m.	214,079	240,502	-11%
10	NBC	The Voice (Tuesday)	Tuesday	8 p.m.	202,600	233,720	-13%
11	ABC	Grey's Anatomy	Thursday	8 p.m.	193,210	157,609	23%
12	NBC	Timeless	Monday	10 p.m.	188,046	NA	NA
13	ABC	How to Get Away with Murder	Thursday	10 p.m.	178,339	252,934	-30%
14	FOX	Lethal Weapon	Wednesday	8 p.m.	172,429	NA	NA
15	NBC	Chicago Fire	Tuesday	10 p.m.	164,133	NA	NA
16	ABC	Designated Survivor	Wednesday	10 p.m.	162,616	NA	NA
17	FOX	The Simpsons	Sunday	8 p.m.	161,633	186,050	-13%
18	CBS	Kevin Can Wait	Monday	8 p.m./ 8:30 p.m.	160,635	NA	NA

19	CBS	NCIS	Tuesday	8 p.m.	152,942	151,738	1%
20	NBC	The Blacklist	Thursday	10 p.m.	145,122	193,793	-25%
21	CBS	The Great Indoors	Thursday	8:30 p.m.	144,312	NA	NA
22	ABC	Notorious	Thursday	9 p.m.	144,274	NA	NA
23	ABC	The Goldbergs	Wednesday	8 p.m.	144,210	137,826	5%
24	FOX	Son of Zorn	Sunday	8:30 p.m.	140,987	NA	NA
25	CBS	Life in Pieces	Thursday	9:30 p.m.	140,946	192,379	-27%
26	ABC	Black-ish	Wednesday	9:30 p.m.	139,483	155,990	-11%
27	CBS	2 Broke Girls	Monday	9 p.m.	138,203	148,071	-7%
28	ABC	Speechless	Wednesday	8:30 p.m.	136,859	NA	NA
29	CBS	Bull	Tuesday	9 p.m.	136,102	NA	NA
30	NBC	Chicago Med	Thursday	9 p.m.	135,535	120,642	12%
31	FOX	New Girl	Tuesday	8 p.m./ 8:30 p.m.	135,100	NA	NA
32	NBC	Blindspot	Wednesday	8 p.m.	134,629	209,700	-36%
33	FOX	Family Guy	Sunday	9 p.m.	132,467	164,933	-20%
34	FOX	Gotham	Monday	8 p.m.	130,674	151,080	-14%
35	CBS	Survivor	Wednesday	8 p.m.	128,723	125,449	3%
36	CBS	Criminal Minds	Wednesday	9 p.m.	127,179	133,983	-5%
37	FOX	Lucifer	Monday	9 p.m.	126,798	NA	NA
38	CBS	Man With A Plan	Monday	8:30 p.m.	126,490	NA	NA
39	ABC	Dancing with the Stars	Monday	8 p.m.	125,260	115,962	8%
40	ABC	The Middle	Tuesday	8 p.m.	124,787	141,874	-12%
41	NBC	Law & Order: SVU	Wednesday	9 p.m.	124,452	85,230	46%
42	FOX	Scream Queens	Tuesday	9 p.m.	122,219	147,808	-17%
43	CBS	Mom	Thursday	9 p.m.	121,116	144,660	-16%
44	NBC	Chicago P.D.	Wednesday	10 p.m.	119,088	121,061	-2%
45	CBS	60 Minutes	Sunday	7 p.m.	115,630	111,298	4%
46	CBS	Scorpion	Monday	10 p.m.	109,988	142,108	-23%

47	ABC	Conviction	Monday	10 p.m.	109,662	NA	NA
48	ABC	Once Upon a Time	Sunday	8 p.m.	109,410	155,596	-30%
49	CBS	The Odd Couple	Monday	9:30 p.m.	108,438	127,932	-15%
50	CBS	NCIS: Los Angeles	Sunday	8 p.m.	108,145	109,940	-2%
51	ABC	Marvel's Agents of S.H.I.E.L.D.	Tuesday	10 p.m.	107,904	134,707	-20%
52	ABC	Quantico	Sunday	10 p.m.	106,074	120,387	-12%
53	CBS	Code Black	Wednesday	10 p.m.	103,300	129,626	-20%
54	CBS	Madam Secretary	Sunday	9 p.m.	101,778	99,587	2%
55	ABC	Fresh off the Boat	Tuesday	9 p.m.	101,386	120,133	-16%
56	FOX	Brooklyn Nine-Nine	Tuesday	8 p.m.	100,822	129,892	-22%
57	ABC	Shark Tank	Friday	9 p.m.	99,553	99,631	-0.10%
58	ABC	Secrets and Lies	Sunday	9 p.m.	99,101	NA	NA
59	CBS	NCIS: New Orleans	Tuesday	10 p.m.	97,033	125,920	-23%
60	ABC	American Housewife	Tuesday	8:30 p.m.	94,615	NA	NA
61	FOX	The Last Man on Earth	Sunday	9:30 p.m.	94,293	131,045	-28%
62	NBC	The Good Place	Thursday	8:30 p.m.	93,992	NA	NA
63	FOX	Pitch	Thursday	9 p.m.	93,554	NA	NA
64	NBC	Superstore	Thursday	8 p.m.	87,707	NA	NA
65	CBS	Pure Genius	Thursday	10 p.m.	87,584	NA	NA
66	ABC	Saturday Night Football	Saturday	8 p.m.	87,084	NA	NA
67	FOX	Rosewood	Thursday	8 p.m.	83,430	88,687	-6%
68	ABC	20/20	Friday	10 p.m.	79,149	65,994	20%
69	FOX	Hell's Kitchen	Friday	8 p.m.	78,566	NA	NA
70	CBS	Elementary	Sunday	10 p.m.	78,346	98,138	-20%
71	CBS	Hawaii Five-0	Friday	9 p.m.	76,520	77,683	-1%
72	NBC	Grimm	Friday	9 p.m.	76,060	81,198	-6%
73	ABC	Last Man Standing	Friday	8 p.m.	75,576	64,631	17%

74	CBS	Blue Bloods	Friday	10 p.m.	74,368	75,965	-2%
75	CBS	MacGyver	Friday	8 p.m.	72,310	NA	NA
76	ABC	The Real O'Neals	Tuesday	9:30 p.m.	71,869	NA	NA
77	FOX	Bob's Burgers	Sunday	7:30 p.m.	65,903	74,733	-12%
78	FOX	Sleepy Hollow	Friday	9 p.m.	65,282	98,253	-34%
79	ABC	Dr. Ken	Friday	8:30 p.m.	64,228	63,543	1%
80	ABC	America's Funniest Home Videos	Sunday	7 p.m.	62,363	61,567	1%
81	CW	The Flash	Tuesday	8 p.m.	60,660	70,687	-14%
82	CW	Supergirl	Monday	8 p.m.	54,667	NA	NA
83	NBC	Dateline	Friday	10 p.m.	53,323	47,261	13%
84	FOX	The Exorcist	Friday	9 p.m.	52,176	NA	NA
85	NBC	Caught on Camera with Nick Cannon	Friday	8 p.m.	44,398	NA	NA
86	CW	Arrow	Wednesday	8 p.m.	40,368	48,056	-16%
87	NBC	Dateline Saturday Night Mystery	Saturday	7 p.m.	38,841	NA	NA
88	CW	DC's Legends of Tomorrow	Thursday	8 p.m.	37,033	NA	NA
89	CW	Frequency	Wednesday	9 p.m.	31,858	NA	NA
90	NBC	Saturday Night Live Encores	Saturday	10 p.m.	31,767	25,242	26%
91	CBS	48 Hours	Saturday	10 p.m.	31,038	33,831	-8%
92	CW	Supernatural	Thursday	9 p.m.	28,300	35,631	-21%
93	CW	No Tomorrow	Tuesday	9 p.m.	28,004	NA	NA
94	CW	Jane the Virgin	Monday	9 p.m.	25,075	25,034	0.20%
95	CW	The Vampire Diaries	Friday	8 p.m.	24,929	44,924	-45%
96	CBS	Crimetime Saturday	Saturday	8 p.m./ 9 p.m.	24,546	18,471	33%
97	CW	Crazy Ex-Girlfriend	Friday	9 p.m.	14,309	23,159	-38%