

The Golden Age of Critics? Examining the Association Between Critic Scores and Audience Scores Over Time on Rotten Tomatoes

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2024-04-23

Background

- ▶ American society is experiencing low levels of trust and an anti-establishment mood
- ▶ Movies as a key cultural good
- ▶ Is this distrust reflected in a divergence in opinion on films between the general public and critics?

Research Questions

1. What is the historical association between critic opinion and public opinion for films?
2. Has the association between critic opinion and public opinion for films changed over time, especially during the 21st century?

Data

- ▶ Rotten Tomatoes
 - ▶ Popular movie review website that contains a “TomatoMeter” (aggregated critic score) and “Audience Score” (aggregated audience score) for thousands of films
 - ▶ Also contains information on other movie characteristics like release year, genre, etc.
- ▶ A Kaggle user scraped Rotten Tomatoes and made the data available at
<https://www.kaggle.com/datasets/andrezaza/clapper-massive-rotten-tomatoes-movies-and-reviews>
 - ▶ Table #1: Information on individual movies
 - ▶ Table #2: Information on critic reviews for these movies
- ▶ n = 17670 movies

Variables

- ▶ Dependent Variable
 - ▶ Audience Score = % of users on Rotten Tomatoes that rated a movie favorably
- ▶ Independent Variables
 - ▶ Critic Score = % of critics that reviewed a movie favorably
 - ▶ Restricted to critics defined as “Top Critics” by Rotten Tomatoes (work for established institutions like the New York Times, Indy Star, etc.)
 - ▶ Only films with ≥ 5 “Top Critic” reviews included
 - ▶ Release Date = decade movie was released in theaters
 - ▶ Pre-1980, 1990s, 2000s, 2010s, 2020s

Control Variables

- ▶ Run time (in minutes)
- ▶ Review Count
- ▶ Original Language ("English" or "Non-English")
- ▶ Genre
 - ▶ 18 possible categories
 - ▶ "Drama" modal category (4388 movies)
- ▶ Missing data were imputed using a bagging decision tree using the caret package in R

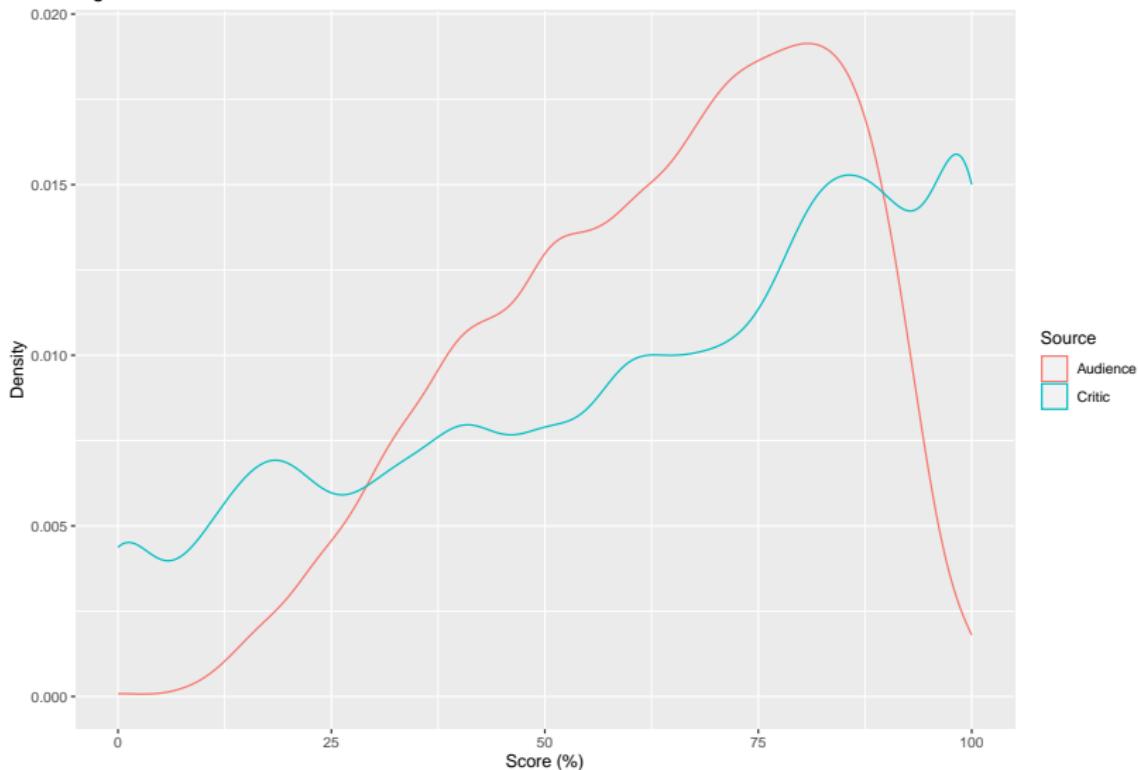
Table 1: Descriptive Statistics, n=(17670)

	Mean/Proportion	StdDev	Min.	Max.
Audience Score	63.67	20.09	0	100
Critic Score	62.10	29.71	0	100
Pre-1980	0.06		0	1
1980s	0.03		0	1
1990s	0.14		0	1
2000s	0.37		0	1
2010s	0.33		0	1
2020s	0.07		0	1
Runtime (minutes)	103.27	20.80	5	584
Review Count	21.80	18.28	5	166
Language (1=Non-English)	0.22		0	1
Drama	0.25		0	1
Action/Adventure	0.07		0	1
Biography	0.02		0	1
Comedy	0.18		0	1
Crime	0.03		0	1
Documentary	0.15		0	1
Fantasy	0.01		0	1
History	0.02		0	1
Holiday	0.01		0	1
Horror	0.05		0	1
Kids and Family	0.04		0	1
Musical	0.01		0	1
Mystery and Thriller	0.07		0	1
Other	0.001		0	1
Romance	0.05		0	1
Sci-fi	0.02		0	1
War	0.01		0	1
Western	0.01		0	1

Source: Rotten Tomatoes

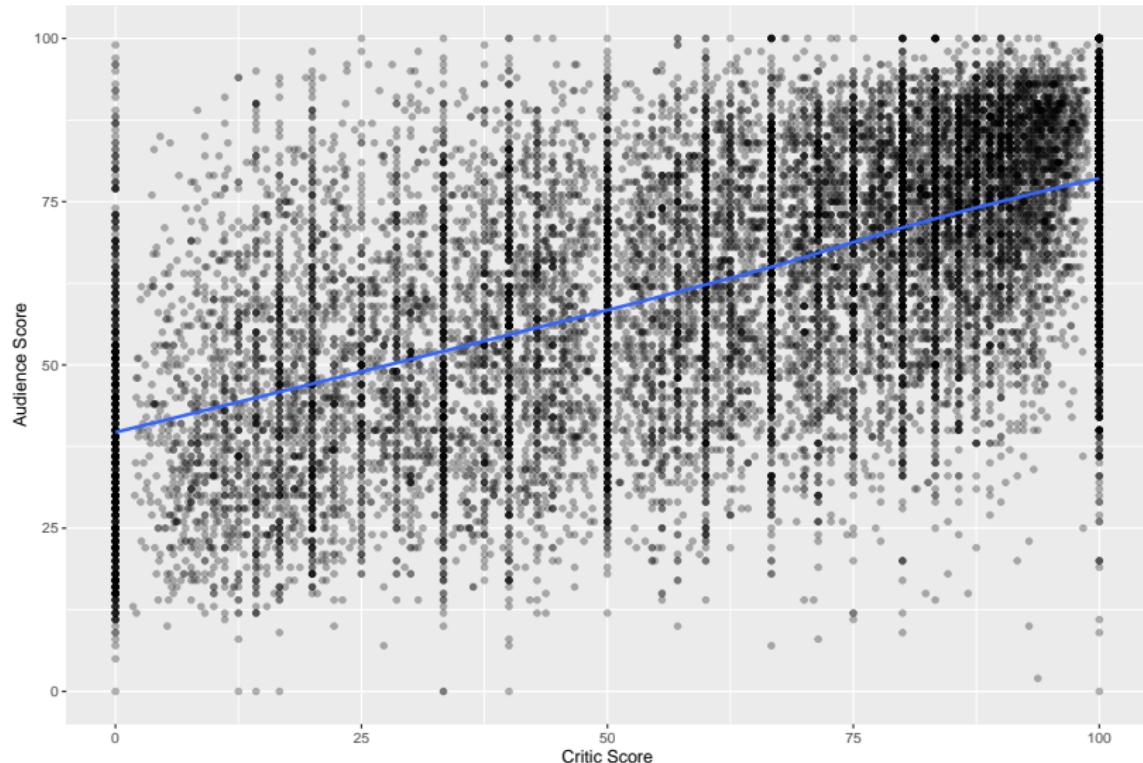
Distributions of Audience and Critic Scores

Figure 1. Distributions of Audience and Critic Scores



Audience Scores vs. Critic Scores

Figure 2. Audience Scores vs. Critic Scores Across All Years



$$\rho = 0.59$$

Table 2: OLS Model for Audience Score (Model 1)

	<i>Dependent variable:</i>
	Audience Score
Critic Score	0.29*** (0.004)
1980s	14.56*** (0.66)
1990s	12.64*** (0.38)
2000s	2.17*** (0.27)
2020s	7.08*** (0.47)
Pre-1980	16.63*** (0.55)
Runtime	0.21*** (0.01)
Runtime Squared	−0.0003*** (0.0000)
Review Count	0.17*** (0.01)
Language (1=Non-English)	−2.49*** (0.30)
Action/Adventure	−2.96*** (0.50)
Biography	1.48* (0.80)
Comedy	−1.55*** (0.35)
Crime	−2.82*** (0.67)
Documentary	8.29*** (0.39)
Fantasy	0.25 (1.01)
History	2.03** (0.87)
Holiday	−0.16 (1.37)
Horror	−9.68*** (0.54)
Kids and Family	−0.44 (0.61)
Musical	−0.31 (1.15)
Mystery and Thriller	−6.74*** (0.48)
Other	8.46** (4.11)
Romance	−1.72*** (0.54)
Sci-fi	−6.24*** (0.78)
War	2.75* (1.47)
Western	−2.62* (1.45)
Constant	21.79*** (1.12)
Observations	17,670
R ²	0.46
Adjusted R ²	0.46
Residual Std. Error	14.76 (df = 17642)
F Statistic	560.16*** (df = 27; 17642)

Note:

* p<0.1; ** p<0.05; *** p<0.01

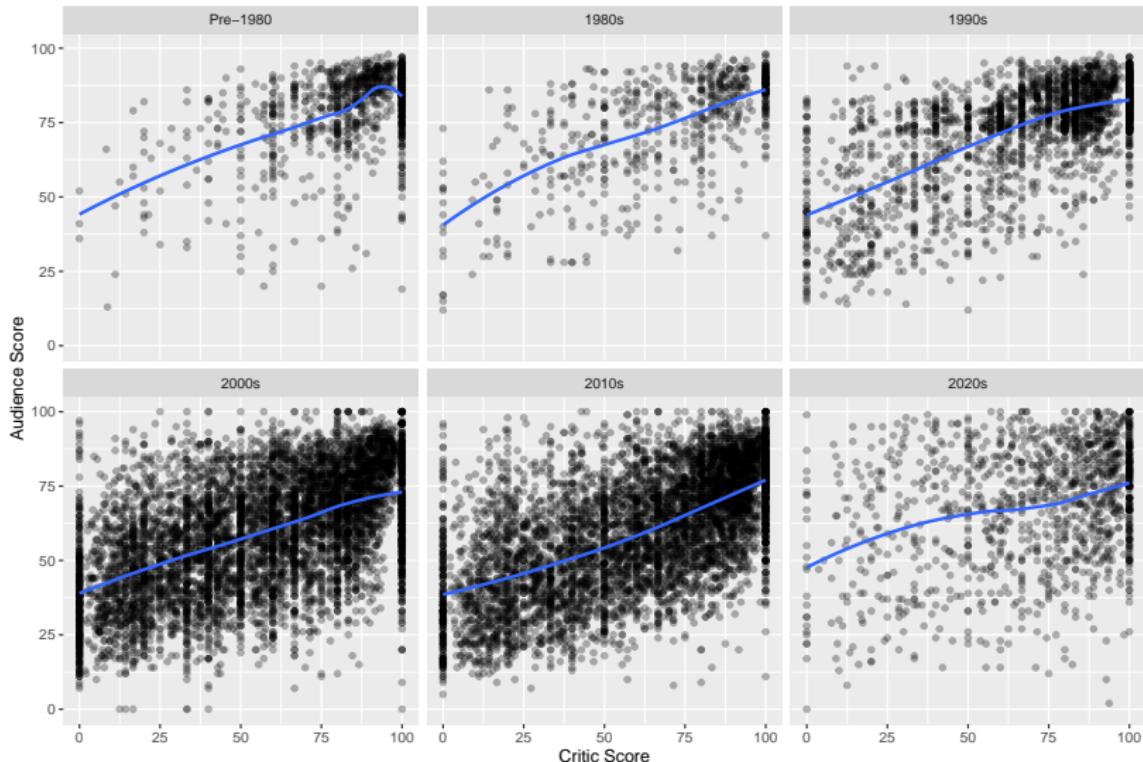
Source: Rotten Tomatoes

Critic Score's Impact

- ▶ The coefficient for critic score = 0.295
 - ▶ A 10 point increase in critic score is associated with an 2.95 point increase in audience score
 - ▶ A one standard deviation increase in critic score is associated with an 8.75 point increase in audience score
- ▶ The model explains a substantial portion of the variance in critic score (Adjusted $R^2 = 46.08$)
- ▶ The residuals are homoscedastic and normal, and the residual plot is null (see Appendix)

Audience Scores vs. Critic Scores By Decade

Figure 3. Audience Scores vs. Critic Scores By Decade



Audience Scores vs. Critic Scores By Decade

Table 3: Means and Correlations By Decade

	Mean Critic Score	Mean Audience Score	Correlation
Pre-1980	83.30	79.81	0.50
1980s	69.91	74.64	0.63
1990s	69.48	73.16	0.64
2000s	55.76	59.24	0.53
2010s	59.87	59.67	0.60
2020s	70.60	68.94	0.31

Source: Rotten Tomatoes

Table 4: OLS Model for Audience Score with Critic Score by Decade Interactions
(Model 2)

	<i>Dependent variable:</i>
	Audience Score
Critic Score	0.31*** (0.01)
Pre-1980	14.05*** (2.10)
1980s	13.90*** (1.74)
1990s	11.42*** (0.91)
2000s	4.02*** (0.58)
2020s	17.75*** (1.25)
Runtime	0.21*** (0.01)
Runtime Squared	-0.0003*** (0.0000)
Review Count	0.17*** (0.01)
Language (1=Non-English)	-2.53*** (0.30)
Action/Adventure	-3.05*** (0.49)
Biography	1.36* (0.80)
Comedy	-1.58*** (0.35)
Crime	-2.95*** (0.67)
Documentary	8.26*** (0.39)
Fantasy	0.24 (1.01)
History	1.93** (0.87)
Holiday	-0.34 (1.37)
Horror	-9.73*** (0.54)
Kids and Family	-0.44 (0.61)
Musical	-0.26 (1.14)
Mystery and Thriller	-6.81*** (0.48)
Other	8.59** (4.10)
Romance	-1.77*** (0.54)
Sci-fi	-6.28*** (0.78)
War	2.77* (1.46)
Western	-2.52* (1.45)
Critic Score*Pre-1980	0.03 (0.02)
Critic Score*1980s	0.01 (0.02)
Critic Score*1990s	0.01 (0.01)
Critic Score*2000s	-0.03*** (0.01)
Critic Score*2020s	-0.15*** (0.02)
Constant	20.63*** (1.16)
Observations	17,670
R ²	0.46
Adjusted R ²	0.46
Residual Std. Error	14.71 (df = 17637)
F Statistic	478.56*** (df = 32; 17637)

Note:

* p<0.1; ** p<0.05; *** p<0.01

Source: Rotten Tomatoes

Critic Score's Impact by Decade

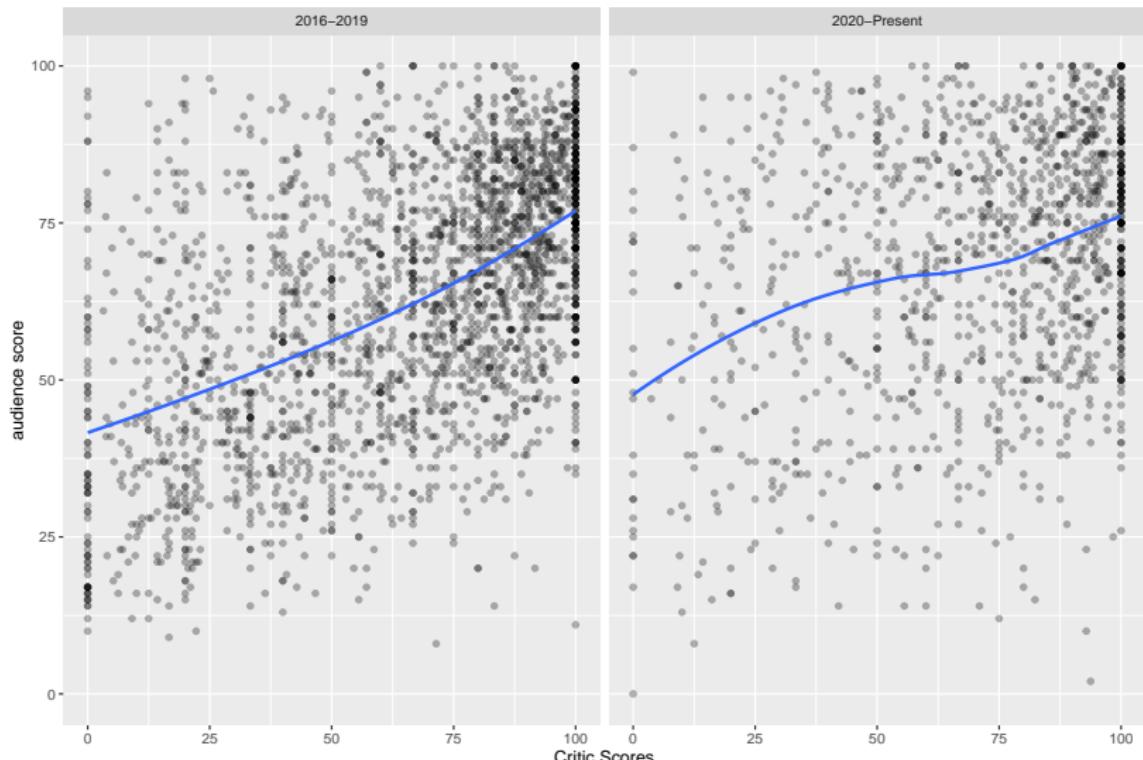
- ▶ An F-Test supports the model with the critic by decade interactions over the model without ($p < 0.001$)
- ▶ The coefficient on critic score is still significant (0.31, $p < 0.001$)
- ▶ Two critic score by decade interactions are significant: critic score*2000s and critic score*2020s
 - ▶ The 2010s are the baseline category

Critic Score's Impact by Decade

- ▶ A one standard deviation increase in critic score is associated with a 9.32 point increase in audience score in the 2010s
- ▶ The coefficient for the critic score by 2000s interaction is -0.032
 - ▶ The association between a one standard deviation increase in critic score and audience score is 8.37 points in the 2000s
 - ▶ Statistically different, but not meaningfully different
- ▶ The coefficient for the critic score by 2020s interaction is -0.154
 - ▶ The association between a one standard deviation increase in critic score and audience score is 4.74 in the 2020s
 - ▶ Meaningfully different = this is ~50% weaker

Pandemic Effect?

Figure 4. Audience Scores vs. Critic Scores Before/After 2020



$$\rho_{2016-2019} = 0.52; \rho_{2020-Present} = 0.31$$

Key Takeaways

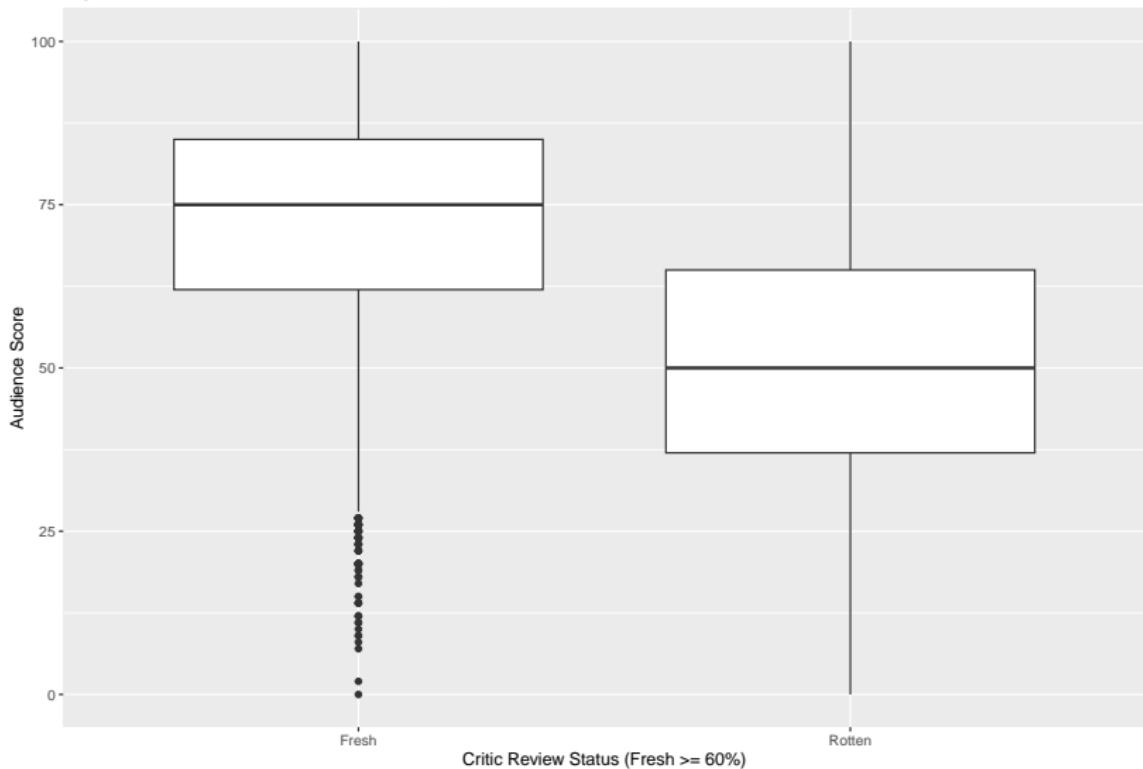
- ▶ The opinions of critics and the general public on movies has a moderately strong linear relationship
- ▶ Until 2020, this relationship did not meaningfully change over time
- ▶ After 2020 the relationship between critic opinion and public opinion weakened
 - ▶ Future analysts should determine if this is reflective of a societal anti-establishment mood or changes in the film industry due to COVID (e.g., straight-to-streaming)

Thank You!

<https://github.com/ethanphilipweiland/rotten-tomatoes>

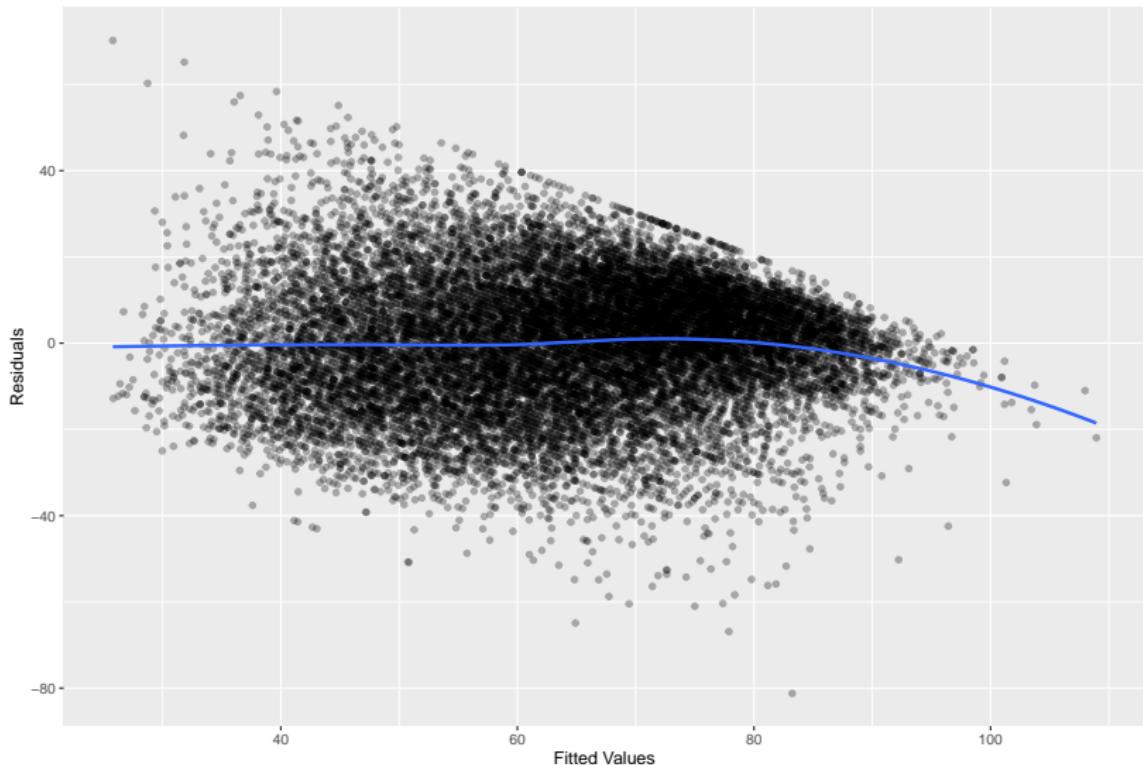
Appendix

Figure A1. Audience Scores vs. (Discrete) Critic Scores



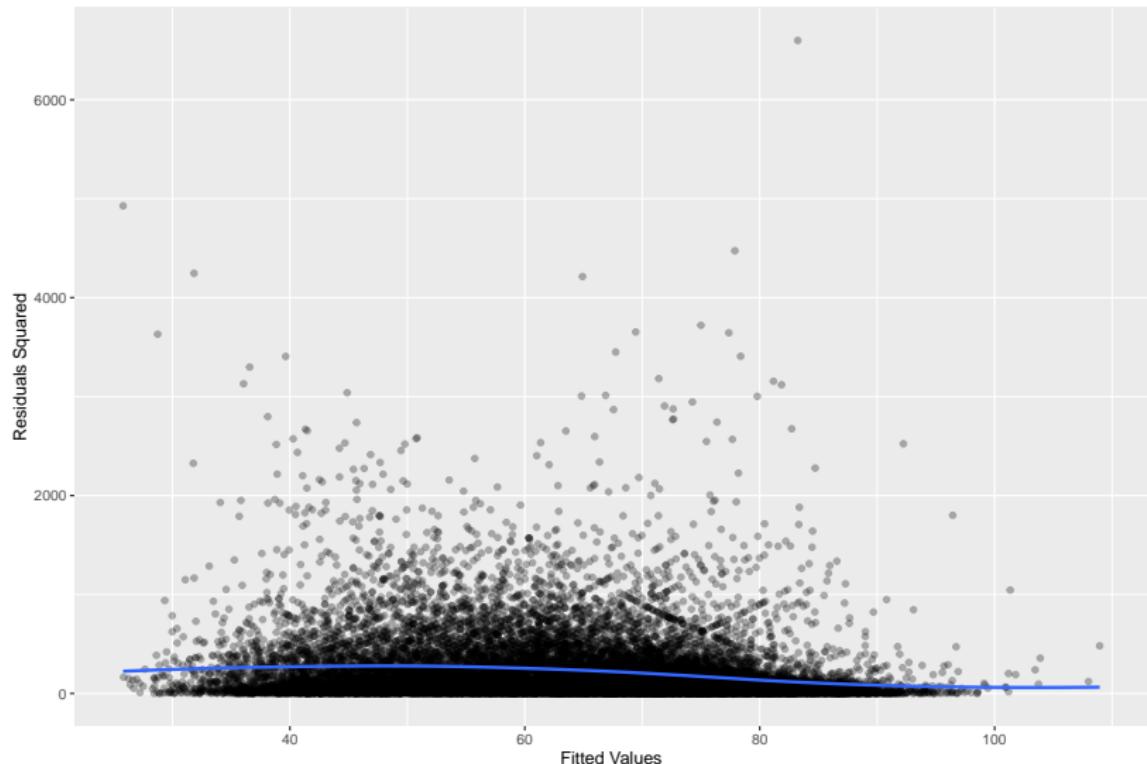
Appendix

Figure A2. Model 1 Residuals vs. Fitted Values



Appendix

Figure A3. Model 1 Residuals Squared vs. Fitted Values



Appendix

Figure A4. Normality of Model 1 Residuals

