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The Impact Of Sound Technology On The Distribution Of Shot Lengths In Hollywood Cinema, 1920 To 1933

Nick REDFERN

Independent Researcher, nickredfern@hotmail.com

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Abstract

The impact of sound technology on Hollywood is analysed through looking at the median shot lengths of silent films from the 1920s (N=54) and early sound films (n=106). The results show a large increase in the median shot lengths with the introduction of sound (Mann Whitney U=554.0, Z=-8.33, p= <0.01, PS = 0.0968), *estimated to be 2.0s* (95% CI: 1.6, 2.4). *The dispersion of shot lengths measured using the robust estimator Qn shows a similarly large increase in the dispersion of shot lengths with the transition to sound* (Mann Whitney U = 319.0, Z = -9.18, p = <0.01, PS = 0.0557)*, estimated to be 2.0s* (95% CI: 1.7, 2.4).

Keywords: film style, statistical analysis, Hollywood, shot length distributions, sound cinema, silent cinema

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Introduction

It is generally accepted the introduction of synchronous sound in the late-1920s had an immediate impact on the style of Hollywood cinema as the film industry adapted to incorporate new technologies and filmmaking practices into its mode of production. Sound opened up a range of new aesthetic possibilities, but it also constrained the choices available to filmmakers and, in the short-term, is considered to have retarded the development of film style[1]. Filmmaking became studio bound as early microphones, being omni-directional and highly sensitive to ambient sound, were unsuitable for location filming. The quality of microphones was also a problem within the studio, with the mobile camera of the late-silent period imprisoned in a soundproof booth for the earliest sound films. The synchronous recording of sound and image made filmmaking a less flexible process, particularly for sound-on-disc systems. Dialogue determined the length of takes and the image edited to match the soundtrack, so that the recording of sound determined the tempo of a film. To avoid the monotony of scenes shot as a single take, multiple-camera shooting was used as a means of preserving narrative space by having several cameras film a scene simultaneously and then cutting between the different shots. Editing patterns became more formulaic as the master shot became crucial in guaranteeing the relationship between image and sound and coverage became standard. Reframing replaced cutting as a means of guiding the viewer's attention, with an increase in panning and tacking shots. David Bordwell, Janet Staiger, and Kristin Thompson summarise the impact of sound technology on Hollywood cinema:

> The differences between silent and sound visual style, then, can be seen as issuing in large part from attempts during the transitional years 1928-1931 to retain the power of editing in the classical style. Slightly longer takes, with more camera movement, emerged as functional equivalents for controlling spatial, temporal, and narrative continuity. Technical agencies worked to make the equivalents viable and efficient. It is during this period that basic premises of the classical style were transmitted into the sound cinema.[2]

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The transition to sound film did not result in the emergence of a new film style in Hollywood. It was, rather, a process of assimilating new technologies into existing stylistic norms where possible and of adapting those norms when not.

One of the most frequently cited changes in film style attributed to the impact of these new technologies is the increase in the duration of shot lengths. To date, quantitative analyses of the impact of sound technology on Hollywood film style have used the mean shot length as a statistic of film style, and have consistently reported a slowing in the cutting rate from the silent to the sound era. Bordwell, Staiger, and Thompson describe the change in shot lengths as an increase from a mean mean shot length of approximately 5-6 seconds in 1917-1927 to a mean of ~11 seconds in 1928-1934[3]. Barry Salt quotes similar figures, with a mean mean shot length for American films in the period 1924-1929 of 4.8s and increasing to a mean of 10.8s for the period 1928-1933[4]. Although these studies do not quote measures of dispersion or confidence intervals making direct comparisons impossible, the general consensus amongst film scholars is that the introduction of sound technology caused shot lengths in Hollywood cinema to increase by approximately 6 seconds from ~5s to ~11s. Charles O'Brien and Salt both note a similar change in the mean shot lengths of European films.[5]

The mean is the point at which a data set is balanced, and as a 'centre of gravity' is a representative statistic of central tendency when the distribution of the data is symmetrical. However, the distribution of shot lengths in a motion picture is characterised by its lack of symmetry so that the majority of shot lengths are less than the mean due to the influence of a number of shots that are of exceptionally long duration relative to the rest of the shots in a film. In statistical terms, the mean shot length is not a robust statistic of film style because it does not provide a stable description of a data set when underlying assumptions (e.g. a symmetrical normal distribution) are not met. It has a breakdown point of 0 and high gross error sensitivity so that just a single outlying data point can lead to the mean becoming an arbitrarily bad estimate of the centre of a data set[6]. Consequently, the mean shot length does not give an accurate or reliable description of a film's style and use of this statistic to compare shot length distributions inevitably leads to flawed inferences. The conclusions of those statistical studies on the impact of sound on film style cited above are flawed and the estimates of the size of the impact of sound technology on the distribution of shot lengths in Hollywood cinema incorrect. Furthermore, many of the above results are also based on an analysis of shot lengths in the first 1800 seconds of a film, and this method may under- or over-estimate the mean shot length of the whole film. Consequently, researchers have been laboring under a series of

misconceptions about the nature of film style. It is therefore necessary to reassess the claims made regarding changes in shot length distributions with the introduction of sound technologies in Hollywood. This paper examines changes in shot length distributions with the introduction of sound technologies in Hollywood in the 1920s and 1930s by looking at robust statistics of film style.

Methods

Data

We collected shot length data for silent and sound films produced in Hollywood between 1920 and 1933, inclusive, selected from the Cinemetrics database (http://www.cinemetrics.lv/). Shot length data was not collected from films where the submitter had acknowledged errors in the process of data entry. Shot length data was not collected from films for which multiple submissions had been made unless it was possible to judge which submission could be considered more reliable. In interpreting the results presented here it is important to bear in mind that the accuracy of data produced using the Cinemetrics software is dependent on the response time of the submitter to observing a cut, and this will inevitably incorporate some observational error into the results. For this reason, the data are best regarded as estimates of a film's style even though all the shot length data has been included.

Descriptive Statistics

In place of the mean shot length, we use the median shot length as a robust measure of central tendency. The median shot length is widely used for the analysis of style in motion pictures. Brett Adams, Chitra Dorai, and Svetha Venkatesh base their analysis of editing's contribution to tempo in motion pictures on the median shot length because it 'provides a better estimate of the average shot length in the presence of outliers.'[7] Similarly, Nuno Vasconcelos and Andrew Lippman reject the use of the mean because it is 'well known in the statistics literature [...] that the sample mean is very sensitive to the presence of outliers in the data,' and that '[m]ore robust estimates can be achieved by replacing the sample mean by the sample median.'[8] Hang-Bong Kang used the median shot length 'because it shows a better estimate than the average [mean] shot length in the presence of outliers' when analysing the relationship between emotion and film style.[9] Finally, in television studies Richard

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Schaefer and Tony Martinez used the median shot length in order to study changing editing patterns in news bulletins because it provided a better indicator of shot length than the mean, because the latter is inordinately influenced by a few "outlier" values from the longest shot.[10]

The median (M) is the middle value when shot length data is ranked by order of magnitude, so that for any film 50 per cent of shots will be less than or equal to the median and 50 per cent will be greater than or equal to the median shot length. If the data set contains an odd number of observations the median is the centre value of the order statistics. If the data set contains an even number of values the median is equal to the mean of the two middle values. Since the median is based on the ranked data rather than the data values themselves so that it locates the centre of a distribution irrespective of its shape. It has the highest possible breakdown point of 0.5, which means that half the data can take on extreme values before the median is heavily influenced, and low gross error sensitivity so that it is resistant to the influence of outlying data points.[11] Consequently, the median shot length is a robust statistic of film style and accurately describes the style of a film without requiring assumptions about the underlying probability distribution of the data.[12] Using the median shot length we can make reliable comparisons of the style between films: a film with a higher median shot length is edited more slowly than a film with a lower median shot length. Similarly, we can reliably compare the style of two or more samples of films by comparing the median shot lengths for every film in each sample. Using the median shot length we can also be confident our estimates of the size of any change in film style will reflect the actual change and not the influence of outliers on non-robust statistics.

Just as we need a robust measure of central tendency, we also need a robust measure of the variability of shot lengths. Peter Rousseuw and Christophe Croux proposed Qn as a highly robust measure of variation in a data set:[13]

$$Q_n = c_{Qn} \times 2.2219 \times \{|X_i - X_j|; i < j\}_{(k)}.$$

This means we calculate the absolute difference of every data value from every other and find the kth largest value in this set. For large N, k is approximately equal to the lower quartile of the ordered absolute differences. This value is multiplied by the factors c_{Qn} and 2.2219 for bias correction and consistency. Q_n is robust with a breakdown point of 0.5 and does not depend on any measure of central tendency making it ideal for the asymmetrical data sets we encounter in analysing film style. Q_n is therefore a scaled measure of the typical

distance between the shot lengths in a film, and in making comparisons of film style we conclude that the greater the value of Q_n the more variation exhibited by the shot lengths.

Removing outliers and trimming or Winsorising shot length data is undesirable as outlying shot lengths may be a significant element of a film's style: removing the opening shot from *Touch of Evil* (Orson Welles, 1958) or the tracking shot of the traffic scene from *Weekend* (Jean-Luc Godard, 1967) from our analysis would be to take away the most distinctive (and certainly the most famous) aspects of these films' style. It is often the unusual deployment of style that is of interest to the film analyst and so including this data is important for the analysis of film style; but it is necessary to ensure these unusual events do not distort our overall understanding of a film's style. The robustness of the median and Q_n allows us to retain all the shot length data for a film without arriving invalid conclusions.

Statistical analyses

We compared the median (M) shot lengths of the films in each sample using the Mann-Whitney U test, with a null hypothesis of stochastic equality:

$$H_0: P(M_{silent} < M_{sound}) = P(M_{silent} > M_{sound}).$$

This means we test the hypothesis the median shot lengths of silent films are no more likely to be less than or greater than the median shot lengths of sound films. We used the same method to analyse differences in the dispersion of shot lengths in silent and sound films using the values of Q_n for the films in each sample. In both cases an asymptotic two-tailed p-value of less than 0.05 was considered statistically significant.

The effect size of any differences between the two samples was quantified by the probability of superiority (PS) as a measure of the stochastic superiority of one sample over another[14]:

$$PS = P(M_{silent} > M_{sound}) + 0.5P(M_{silent} = M_{sound}).$$

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We estimate the probability of superiority as PS = U / ($n_1 \times n_2$), where U is the Mann-Whitney test statistic and n_1 and n_2 are the sample sizes. If the two samples overlap one another completely, the probability of randomly selecting a silent film with a median shot length greater than the median shot length of sound film is equal to the probability of randomly selecting a silent film with a median shot length less than the median shot length of a sound film, and PS = 0.5. If the median shot lengths of all the silent films were greater than the median shot lengths of all the sound films, then the probability of randomly selecting a silent film with a median shot length greater than the median shot length of sound film is PS = 1.0. Conversely, if the median shot lengths of all the silent films were less than the median shot lengths of all the sound films, then the probability of randomly selecting a silent film with a median shot length greater than the median shot length of sound film is PS = 0.0.

We estimated the effect with the Hodges-Lehmann median difference (HLΔ) with a 95% (Moses) confidence interval.[15] This statistic is the median of the set of pairwise differences between the data values in the two samples, and is resistant to the influence of outliers and robust against to deviations from normality.

All statistical analyses were carried out using Microsoft Excel 2007.

Results

We collected shot length data for a total of 160 Hollywood films from the Cinemetrics database: (census date: 1 July 2011). These films were sub-divided into two groups: silent films of the 1920s (n = 54) and early sound films from the period 1929 to 1933 (n = 106). The supplementary material in Appendix 1 contains the values of the median and Q_n for each film.

There is a statistically significant difference in the median shot lengths of the films: U = 554.0, Z = –8.33, p = <0.01. This represents a large difference in film style, with the median shot of a sound film considerably more likely to be greater than that of a silent film: PS = 0.0968. This supports the argument that the introduction of sound technologies had a general effect on the distribution of shot lengths in Hollywood cinema during the transitional period. However, the size of that change is much smaller than that predicted by the difference in mean shot lengths described by Salt, Bordwell, and others. Specifically, there is an estimated increase in median shot lengths from the silent to the sound films by HLΔ = 2.0s (95% CI: 1.6, 2.4). This is considerably less than the figure of ~6 seconds that has been widely reported by studies based on the mean shot length. Figure 1 shows the distribution of the median shot lengths for each sample. While it is generally considered editing practices became more uniform in the transitional period due to a loss of flexibility at both the shooting and editing stages of

production, the results presented here indicate that early sound films show much greater variation in shot lengths than silent films. This variation is evident in the greater dispersion of median shot lengths in the early sound era compared to the silent period. It is clear from Figure 1 that there is greater variation in the median shot lengths of the sound films than those of the silent films. The range of the median shot lengths of the silent films is 4.8s, and the interquartile range is 1.3s; while the corresponding figures for the sound films are 9.9s and 2.2s respectively.

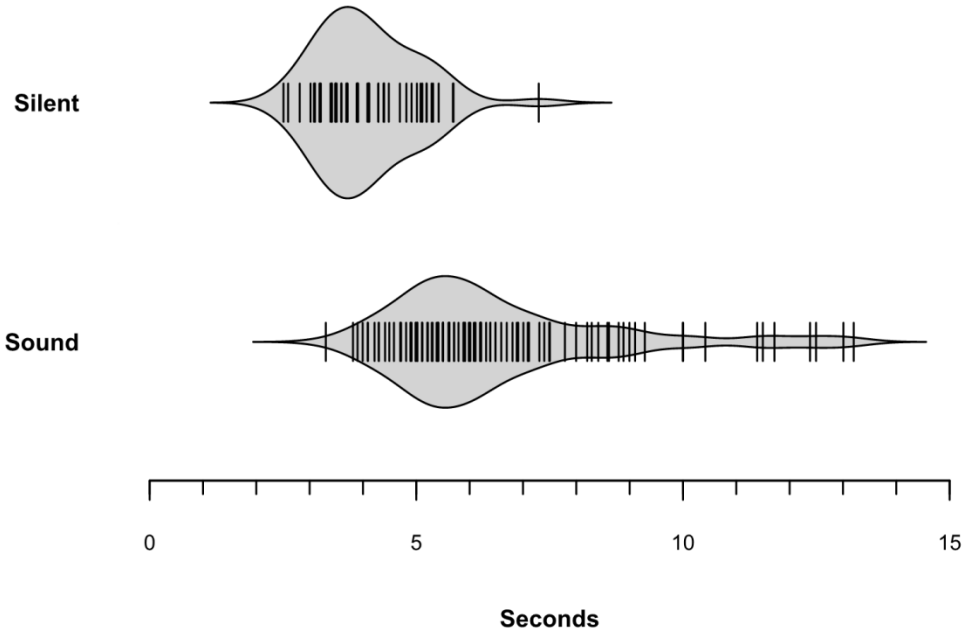

Figure 1: The distribution of median shot lengths for silent films (n = 54) and sound films (n = 106) produced in Hollywood in the 1920s and early-1930s.

Turning to the dispersion of shot lengths, we see the same patterns described above. There is a statistically significant difference between the samples, with the values of Q_n of the sound films stochastically superior to those for the silent films: U = 319.0, Z = –9.18, p = <0.01. This difference represents an average increase in the dispersion of shot lengths of HLΔ = 2.0s (95% CI: 1.7, 2.4). The effect size for the difference in the values of Q_n is slightly larger than for the median shot lengths (PS = 0.0557). The distribution of the values of Q_n for each sample is presented in Figure 2, and we again see there is greater variation in the values of Q_n for the sound films. This provides further evidence for the argument that the introduction of sound technology resulted in a more diverse range of shot lengths being used.

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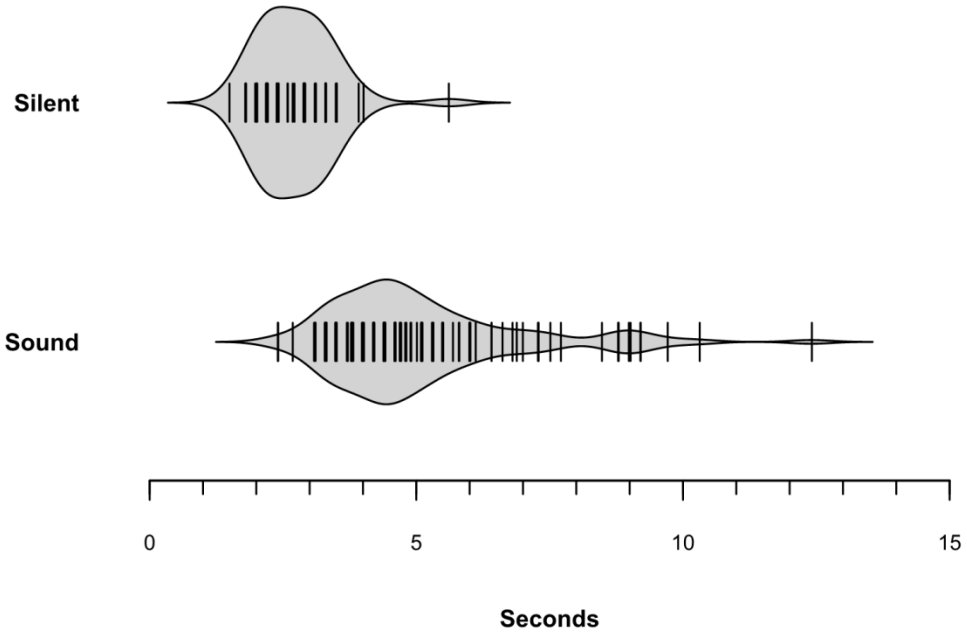

Figure 2: The distribution of Q_n for silent films (n = 54) and sound films (n = 106) produced in Hollywood in the1920s and early-1930s

Conclusion

Shot length distributions are typically characterised by two features: (1) they are positively skewed, and (2) they have a number of outlying data points. Consequently, the mean shot length is an unreliable statistic of film style because it is affected by unusually large shot lengths and displaced from the mass of the data. Similarly, the standard deviation gives a misleading impression of the dispersion of shot lengths in a motion picture. The median shot length is a superior measure of central tendency of the distribution of shot lengths in a motion picture, as it is unaffected by the asymmetry of the data, resistant to the influence of outlying shot lengths, and robust to deviations from any assumed underlying parametric model. Similarly, Q_n is a robust statistic of the dispersion of shot lengths appropriate for describing film style.

For the first time, we presented a study of the changes in the distribution of shot lengths in Hollywood cinema attributed to the changes in production practices resulting from the introduction of synchronous sound technology in the late-1920s and early-1930s using robust statistics of film style. The results support the conclusions of earlier studies that the shift from silent to sound cinema led to an overall increase in shot lengths but the size of this effect is shown to be much smaller than that described by studies using the mean shot length. There is also an increase in the variation of shot lengths used in sound films, suggesting that while sound cinema may have lead to the emergence of formulaic editing patterns it also produced a greater degree of variability in shot lengths that is not evident in silent cinema. These changes in the shot length distribution of early Hollywood sound films may be explained by existing historical accounts of the need to accommodate new technologies and new working practices into the mode of production and film style of classical Hollywood cinema; but by using robust statistical methods we arrive at better estimates of the size of those changes.

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NOTES

[1] See David Bordwell, Janet Staiger, and Kristin Thompson, Classical Hollywood Cinema: Film Style and Mode of Production to 1960 (London: Routledge, 1985), 298-308; James Chapman, Cinemas of the World: Film and Society from 1895 to the Present (London: Reaktion Books, 2003), 92; Richard Maltby, Hollywood Cinema: An Introduction (Oxford: Blackwell, 2003), 238-248; Charles O'Brien, Cinema's Conversion to Sound: Technology and Film Style in France and the U.S (Bloomington: Indiana University Press, 2005); Alan Williams, "Historical and Theoretical Issues in the Coming of Recorded Sound to the Cinema," in Sound Theory/Sound Practice, ed. Rick Altman. (London: Routledge, 1992), 126-137.

[2] Bordwell, Staiger, & Thompson, *Classical Hollywood Cinema*, p. 308.

[3] Bordwell, Staiger & Thompson, *Classical Hollywood Cinema*, p. 304.

[4] Barry Salt, Film Style and Technology: History and Analysis, second edition (London: Starwood, 1992), 174, 214.

[5] Salt. *Film Style and Technology*, 174, 215-216; and O'Brien, Cinema's Conversion to Sound, 82-93.

[6] Rand R. Wilcox, Modern Statistics for the Social and Behavioural Sciences: A Practical Introduction (Boca Raton, FL.: CRC Press, 2011), 19-21.

[7] Brett Adams, Chitra Dorai, and Svetha Venkatesh, "Formulating Film Tempo: The Computational Media Aesthetics Methodology in Practice," in Media Computing: Computational Media Aesthetics, ed. Chitra Dorai and Svetha Venkatesh (Norwell, MA: Kluwer Academic Publishers, 2002): 72.

[8] Nuno Vasconcelos and Andrew Lippman, "Statistical Models of Video Structure for Content Analysis and Characterization," IEEE Transactions on Image Processing 9 (2000): 17.

[9] Hang-Bong Kang, "Affective Contents Retrieval from Video with Relevance Feedback," in Digital Libraries: Technology and Management of Indigenous Knowledge for Global Access, ed. Tengku Sembok, Halimah Zaman, Hsinchun Chen, Shalini Urs, and Sung-Hyon Myaeng (Berlin: Springer, 2003), 245.

[10] Richard J. Schaefer and Tony Martinez, "Trends in Network News Editing Strategies from 1969 through 2005," Journal of Broadcasting and Electronic Media 53 (2009): 347-364.

[11] Wilcox, Modern Statistics for the Social and Behavioural Sciences, 22-24.

[12] Given the skewed nature of shot length distributions and that every shot must have a duration greater than 0s, Barry Salt claims the lognormal distribution is an appropriate parametric model for shot length distributions. See Barry Salt, Moving into Pictures: More on Film History, Style, and Analysis (London: Starwood 2006), 389-395. Since a random variable (X) is lognormally distributed if its logarithm (log(X)) is normally distributed, we applied the Shapiro-Francia normality test to the log-transformed shot length data of each

film in order to test the generality of this claim for Hollywood films of the 1920s and early-1930s, with the null hypothesis of lognormality rejected at $p \leq 0.05$. The results show that the null hypothesis of lognormality was rejected for 77 per cent of silent films and for 78 per cent of the sound films, and we conclude there is no evidence to justify the assumption of lognormality for the shot length data of Hollywood films of the 1930s and early-1930s in general (see Appendix 1). The Shapiro-Francia test could not be applied to two silent films (It!, Seventh Heaven) and one sound film (All Quiet in the Western Front) since logarithms only exist for real number strictly greater than zero and the data in the Cinemetrics database gave the minimum shot length for these films 0.0 seconds. On the Shapiro-Francia test see S.S. Shapiro and R.S. Francia, "An Approximate Analysis-of-variance Test for Normality," Journal of the American Statistical Association 67 (1972): 215-216; and Stephen W. Looney, and Thomas R. Gulledge, "Use of the Correlation Coefficient with Normal Probability Plots," The American Statistician 39 (1985): 75-79.

[13] Peter J. Rousseuw and Christophe Croux, "Alternatives to the Median Absolute Deviation," Journal of the American Statistical Association 88 (1993): 1273–1283.

[14] See András Vargha and Harold D. Delaney, "The Kruskal-Wallis Test and Stochastic Homogeneity," Journal of Educational and Behavioral Statistics 23 (1998): 170-192; and András Vargha and Harold D. Delaney, "A Critique and Improvement of the CL Common Language Effect Size Statistic of McGraw and Wong," Journal of Educational and Behavioral Statistics 25 (2000): 101-132.

[15] J.L. Hodges and E.L. Lehmann, "Estimates of Location Based on Rank Tests," Annals of Mathematical Statistics 34 (1963): 598-611.

Table 1: Sample statistics for silent and sound films produced in Hollywood in the 1920s and early-1930s

	Median shot length		Q_n	
	1920s	1929-1933	1920s	1929-1933
Sample size	54	106	54	106
Minimum (s)	2.5	3.3	1.5	2.4
Lower Quartile (s)	3.4	5.1	2.2	3.9
Median (s)	3.9	6.0	2.7	4.6
95% CI	3.6, 4.2	5.7, 6.2	2.5, 2.9	4.3, 4.9
Upper Quartile (s)	4.7	7.3	3.3	5.8
Maximum (s)	7.3	13.2	5.6	12.4

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Appendix 1: Supplementary Material

Descriptive statistics and Shapiro-Francia test for silent and sound Hollywood films, 1920 to 1933, from the Cinemetrics database: http://www.cinemetrics.lv

Title	Year	Median	Q_n	Shapiro-Francia	P	Submitted by	Date submitted	Database ID
Just Pals	1920	2.8	1.5	0.9863	<0.01	Cid Vasconcelos	29/12/09	4828
Number Please	1920	3.2	2.2	0.9881	0.01	Fabrice Lyczba	17/07/07	792
Penalty, The	1920	4.1	2.9	0.9953	<0.01	Mohsen Nasrin	05/09/09	3681
Within Our Gates	1920	3.9	2.9	0.9926	<0.01	Cid Vasconcelos	02/09/09	3667
Bell Hop, The	1921	3.9	2.6	0.9943	0.40	Torey Liepa	14/06/07	779
I Do	1921	2.5	1.8	0.9776	<0.01	Mohsen Nasrin	22/08/09	3577
Kid, The	1921	4.4	3.3	0.9768	<0.01	Charles O'Brien	14/01/08	1070
Cops	1922	5.2	3.5	0.9923	0.38	John C	10/10/06	276
Down to the Sea in Ships	1922	4.4	2.9	0.9978	0.18	Fabrice Lyczba	15/09/08	1961
Grandma's Boy	1922	4.1	2.9	0.9966	0.17	Mohsen Nasrin	21/08/09	3565
Moran of the Lady Letty	1922	3.2	2.2	0.9911	<0.01	Fabrice Lyczba	15/09/08	1960
Paleface, The	1922	3.5	2.4	0.9832	<0.01	John C	23/05/06	120
Frozen Hearts	1923	3.6	2.4	0.9924	0.11	Mohsen Nasrin	02/09/09	3660
Mother's Joy	1923	4.1	2.9	0.9924	0.19	Mohsen Nasrin	26/09/09	3764
Oranges and Lemons	1923	3.9	3.3	0.9820	0.12	Mohsen Nasrin	02/09/09	3659
Our Hospitality	1923	5.3	3.3	0.9916	<0.01	Charles O'Brien	28/01/08	1092
Roughest Africa	1923	2.6	1.8	0.9752	<0.01	Mohsen Nasrin	02/09/09	3661
Safety Last	1923	3.4	2.4	0.9860	<0.01	Charles O'Brien	22/01/08	1080
Soliers, The	1923	3.9	2.9	0.9842	<0.01	Mohsen Nasrin	21/09/09	3752
White Rose, The	1923	5.7	3.3	0.9966	0.02	Yuri Tsivian	10/10/07	902
Marriage Circle, The	1924	3.7	2.2	0.9724	<0.01	Mohsen Nasrin	19/04/09	3039
Navigator, The	1924	4.9	3.5	0.9943	0.06	John C	26/06/06	162
Near Dublin	1924	3.0	2.0	0.9881	0.01	Mohsen Nasrin	17/10/09	3870
Postage Due	1924	3.5	2.4	0.9805	<0.01	Mohsen Nasrin	24/12/09	4805

Title	Year	Median	Q_n	Shapiro-Francia	p	Submitted by	Date submitted	Database ID
Sherlock Jr	1924	5.1	3.5	0.9916	0.05	Charley Leary	05/02/07	479
Short Kilts	1924	3.5	2.0	0.9654	<0.01	Mohsen Nasrin	26/09/09	3765
West of Hot Dog	1924	3.5	2.2	0.9786	<0.01	Mohsen Nasrin	24/12/09	4807
Zeb vs. Paprika	1924	3.9	2.7	0.9836	<0.01	Mohsen Nasrin	17/10/09	3871
Dr Pyckle and Mr Pryde	1925	4.7	3.3	0.9643	<0.01	Mohsen Nasrin	24/12/09	4801
Freshman, The	1925	3.4	2.2	0.9939	<0.01	Charles O'Brien	21/02/08	1149
Gold Rush, The	1925	4.3	3.1	0.9917	<0.01	Charley Leary	03/02/07	476
Half a Man	1925	5.3	4.0	0.9602	<0.01	Mohsen Nasrin	24/12/09	4802
Navy Blue Days	1925	5.1	3.9	0.9839	0.10	Mohsen Nasrin	24/12/09	4804
Phantom of the Opera, The	1925	4.1	2.7	0.9883	<0.01	John C	24/06/06	161
Sleuth, The	1925	7.3	5.6	0.9860	0.23	Mohsen Nasrin	24/12/09	4808
Snow Hawk, The	1925	3.9	2.6	0.9715	<0.01	Mohsen Nasrin	24/12/09	4806
Super-Hooper-Dyne-Lizzies	1925	3.7	1.8	0.9877	0.03	Hilde D'haeyere	03/04/10	5075
Mum's the Word	1926	3.4	2.2	0.9695	<0.01	Mohsen Nasrin	04/01/10	4844
Sorrows of Satan, The	1926	5.7	3.3	0.9977	0.24	Yuri Tsivian	18/10/08	2121
Cat and the Canary, The	1927	3.2	2.0	0.9841	<0.01	Charles O'Brien	12/10/09	3835
General, The	1927	5.4	3.3	0.9857	<0.01	Charles O'Brien	01/02/08	1099
It	1927	3.1	2.0	N/A	N/A	Barry Salt	18/08/10	5866
Seventh Heaven	1927	4.4	2.4	N/A	N/A	Barry Salt	18/08/10	5867
Show, The	1927	3.7	2.2	0.9963	0.02	Torey Liepa	30/01/07	469
Three's a Crowd	1927	4.1	3.1	0.9896	<0.01	Charles O'Brien	04/10/09	3796
Two Arabian Knights	1927	3.4	2.2	0.9675	<0.01	Cid Vasconcelos	05/11/09	4276
Chaser, The	1928	3.1	2.2	0.9821	<0.01	Charles O'Brien	04/10/09	3795
Docks of New York, The	1928	4.5	2.9	0.9825	<0.01	Cid Vasconcelos	01/01/10	4835
Last Command, The	1928	4.3	2.9	0.9872	<0.01	Charles O'Brien	10/12/07	990
Laugh, Clown, Laugh	1928	5.0	3.3	0.9959	0.08	Charles O'Brien	17/12/07	1011
Speedy	1928	3.1	2.0	0.9851	<0.01	Charles O'Brien	10/12/07	991

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Title	Year	Median	Q_n	Shapiro-Francia	p	Submitted by	Date submitted	Database ID
Steamboat Bill, Jr	1928	4.8	2.9	0.9680	<0.01	Charles O'Brien	19/12/07	1012
Student Prince in Old Heidelberg, The	1928	3.6	2.4	0.9601	<0.01	Charles O'Brien	27/09/09	3769
That Certain Thing	1928	5.2	3.1	0.9906	<0.01	Charles O'Brien	25/04/10	5319
Applause	1929	5.6	4.9	0.9664	<0.01	Kira Vorobiyova	06/06/09	3223
Battle of Paris, The	1929	7.5	6.0	0.9951	0.28	Charles O'Brien	07/04/07	656
Charming Sinners	1929	6.5	5.3	0.9950	0.32	Charles O'Brien	20/11/06	374
Coquette	1929	8.0	6.6	0.9889	0.02	Charles O'Brien	02/04/07	646
Desert Song, The	1929	6.2	4.6	0.9855	<0.01	Charles O'Brien	21/11/06	378
Dynamite	1929	7.5	6.0	0.9862	<0.01	Tristan Mentz	17/10/09	3875
Eternal Love	1929	3.8	2.7	0.9567	<0.01	Charles O'Brien	12/05/10	5425
Happy Days	1929	12.5	10.3	0.9895	0.09	Charles O'Brien	24/11/09	4507
Lady Lies, The	1929	6.2	4.2	0.9740	<0.01	Charles O'Brien	08/11/06	337
Love Parade, The	1929	6.9	5.8	0.9787	<0.01	Charles O'Brien	28/03/07	611
Love Trap, The	1929	5.0	3.3	0.9780	<0.01	Armin Jaeger	23/02/10	5038
Mexicali Rose	1929	5.3	3.8	0.9943	0.07	Charles O'Brien	12/03/07	550
New York Nights	1929	6.9	5.1	0.9946	0.21	Charles O'Brien	08/12/07	985
On with the Show	1929	5.4	3.8	0.9731	<0.01	Charles O'Brien	20/03/10	5113
Rio Rita	1929	8.8	7.5	0.9909	0.03	Charles O'Brien	13/04/07	679
Salute	1929	8.9	6.8	0.9813	<0.01	Jonah Horwitz	18/05/08	1648
Studio Murder Mystery, The	1929	4.3	3.5	0.9861	<0.01	Charles O'Brien	17/04/07	683
Tanned Legs	1929	5.4	4.4	0.9809	<0.01	Charles O'Brien	15/03/07	562
Their Own Desire	1929	9.0	7.7	0.9662	<0.01	Aaron Granat	12/10/09	3832
Vagabond Lover, The	1929	8.3	6.1	0.9905	0.05	Kira Vorobiyova	11/08/09	3500
Abraham Lincoln	1930	8.6	5.8	0.9949	0.13	Charles O'Brien	19/07/08	1892
All Quiet on the Western Front	1930	4.0	4.4	N/A	N/A	Barry Salt	29/03/07	619
Animal Crackers	1930	13.0	9.7	0.9948	0.39	Charles O'Brien	02/04/07	643
Be Yourself	1930	7.8	5.5	0.9878	<0.01	Charles O'Brien	23/10/09	3968

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Big Trail, The	1930	7.4	5.3	0.9971	0.23	Charles O'Brien	24/04/10	5314
Bright Lights	1930	5.5	3.8	0.9854	<0.01	Tristan Mentz	13/11/09	4393
Dawn Patrol, The (Flight Commander)	1930	5.5	3.5	0.9923	<0.01	Tristan Mentz	11/12/09	4714
Devil's Holiday, The	1930	10.0	8.5	0.9942	0.33	Charles O'Brien	29/11/06	389
Divorcee	1930	6.2	4.8	0.9851	<0.01	Charles O'Brien	28/09/09	3772
Doorway to Hell, The	1930	5.7	4.0	0.9908	<0.01	Tristan Mentz	09/12/09	4696
Feet First	1930	5.9	4.7	0.9894	<0.01	Charles O'Brien	08/04/07	659
Follow Thru	1930	7.0	5.3	0.9962	0.22	Charles O'Brien	09/04/07	662
Going Wild	1930	6.1	4.2	0.9862	<0.01	Tristan Mentz	10/12/09	4701
Hell's Heroes	1930	5.3	3.7	0.9830	<0.01	Armin Jaeger	12/02/10	5032
Hook, Line, and Sinker	1930	5.5	4.0	0.9922	<0.01	Charles O'Brien	30/04/09	3078
Let Us Be Gay	1930	5.6	5.1	0.9799	<0.01	Andrea Comiskey	15/10/09	3858
Madam Satan	1930	5.6	4.4	0.9905	<0.01	Charles O'Brien	23/03/07	587
Maybe It's Love	1930	4.7	3.3	0.9821	<0.01	Tristan Mentz	17/11/09	4412
Notorious Affair, A	1930	5.2	3.1	0.9921	<0.01	Tristan Mentz	10/12/09	4703
Office Wife, The	1930	4.9	3.5	0.9887	<0.01	Tristan Mentz	09/12/09	4697
Playboy of Paris, The	1930	4.9	4.4	0.9878	<0.01	Charles O'Brien	14/05/08	1638
Sea Legs	1930	7.5	6.4	0.9881	0.02	Charles O'Brien	07/11/06	331
Sins of the Children, The	1930	9.1	7.3	0.9836	<0.01	Kira Vorobiyova	13/06/09	3240
Soldier's Plaything, A	1930	5.0	3.8	0.9879	<0.01	Tristan Mentz	20/11/09	4453
Song o' My Heart	1930	12.4	9.2	0.9673	<0.01	Charles O'Brien	06/11/06	329
Sweet Kitty Bellairs	1930	5.4	3.8	0.9837	<0.01	Tristan Mentz	20/11/09	4452
A House Divided	1931	5.0	3.5	0.9735	<0.01	Armin Jaeger	23/02/10	5039
Arrowsmith	1931	8.6	6.4	0.9889	<0.01	Jonah Horwitz	01/06/08	1725
Bad Company	1931	4.8	4.4	0.9965	0.30	Charles O'Brien	12/07/08	1873
Cheat, The	1931	6.1	4.6	0.9766	<0.01	Charles O'Brien	12/10/09	3834
Free Soul, A	1931	6.6	6.0	0.9748	<0.01	Charles O'Brien	07/08/08	1922

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Front Page, The	1931	10.0	8.8	0.9633	<0.01	Barry Salt	29/03/07	618
Lady Refuses, The	1931	5.4	3.7	0.9773	<0.01	Charles O'Brien	29/05/08	1717
Little Caesar	1931	7.1	5.3	0.9931	0.03	Charles O'Brien	22/05/07	741
Lonely Wives	1931	5.0	3.8	0.9735	<0.01	Charles O'Brien	28/05/08	1713
Mata Hari	1931	7.3	5.5	0.9926	0.01	Charles O'Brien	03/07/06	174
Miracle Woman, The	1931	6.0	5.1	0.9858	<0.01	Niels Beirnaert	29/07/09	3434
Palmy Days	1931	5.9	4.0	0.9927	<0.01	Charles O'Brien	11/11/06	347
Parlour, Bedroom & Bath	1931	4.9	4.2	0.9789	<0.01	Charles O'Brien	14/08/06	230
Politics	1931	6.2	4.7	0.9933	0.04	Amanda McQueen	20/10/09	3890
Seas Beneath	1931	7.1	5.1	0.9810	<0.01	Jonah Horwitz	22/05/08	1673
Smart Money	1931	5.8	4.4	0.9857	<0.01	Tristan Mentz	07/11/09	4299
Stolen Heaven	1931	11.7	9.0	0.9934	0.35	Charles O'Brien	10/04/07	666
Street Scene	1931	6.4	5.1	0.9906	0.01	Charles O'Brien	28/05/08	1714
Struggle, The	1931	9.3	7.0	0.9970	0.74	Charles O'Brien	04/12/09	4659
Svengali	1931	5.1	3.3	0.9854	<0.01	Charles O'Brien	21/05/07	737
Waterloo Bridge	1931	13.2	12.4	0.9934	0.42	Charles O'Brien	08/08/08	1923
20,000 Years in Sing Sing	1932	4.7	3.5	0.9978	0.43	Barry Salt	29/03/07	630
American Madness	1932	5.7	4.6	0.9901	<0.01	Niels Beirnaert	15/07/09	3335
Bird of Paradise	1932	4.6	3.1	0.9786	<0.01	Charles O'Brien	02/06/08	1730
Broken Lullaby	1932	4.5	4.2	0.9773	<0.01	Charles O'Brien	11/12/06	420
Doctor X	1932	4.1	3.5	0.9933	<0.01	Mohsen Nasrin	01/11/09	4214
Freaks	1932	6.0	4.4	0.9853	<0.01	Mohsen Nasrin	17/09/09	3730
Grand Hotel	1932	10.4	8.8	0.9939	0.12	Charles O'Brien	17/07/08	1885
Greeks Had a Name for Them, The	1932	6.4	4.6	0.9872	<0.01	Charles O'Brien	03/04/08	1578
Love Me Tonight	1932	5.2	4.2	0.9858	<0.01	Charles O'Brien	07/05/08	1608
Melodía de arrabal	1932	6.9	5.5	0.9950	0.16	Charles O'Brien	01/05/08	1584
Million Dollar Legs	1932	3.3	2.4	0.9922	<0.01	Charles O'Brien	16/10/08	2102

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Movie Crazy	1932	5.5	4.6	0.9715	<0.01	Charles O'Brien	18/07/10	5726
Mr. Robinson Crusoe	1932	3.9	2.4	0.9744	<0.01	Charles O'Brien	18/07/08	1891
Mummy, The	1932	5.5	4.7	0.9894	<0.01	Charles O'Brien	23/07/10	5758
Night World	1932	6.1	4.9	0.9849	<0.01	Charles O'Brien	25/04/10	5316
Rain	1932	5.1	5.0	0.9542	<0.01	Charles O'Brien	15/07/08	1882
Rasputin and the Empress	1932	5.4	4.2	0.9859	<0.01	Yuri Tsivian	30/01/09	2641
Red Dust	1932	5.6	4.7	0.9853	<0.01	Olivier Van den Broeck	17/07/09	3341
Red Headed Woman	1932	6.0	4.8	0.9733	<0.01	Charles O'Brien	21/04/10	5299
This is the Night	1932	5.0	4.2	0.9869	<0.01	Charles O'Brien	23/03/07	586
Tom Brown of Culver	1932	5.9	4.4	0.9976	0.57	Armin Jaeger	24/02/10	5044
Trouble in Paradise	1932	4.3	4.0	0.9644	<0.01	Charles O'Brien	21/03/07	580
White Zombie	1932	4.7	3.3	0.9800	<0.01	Mohsen Nasrin	30/11/09	4627
Bedtime Story, A	1933	5.1	3.3	0.9894	<0.01	Charles O'Brien	25/04/08	1561
Bombshell	1933	6.5	6.0	0.9921	0.01	Olivier Van den Broeck	16/07/09	3338
Child of Manhattan	1933	11.4	9.0	0.9903	0.08	Charles O'Brien	14/11/09	4397
College Humor	1933	8.4	7.3	0.9947	0.27	Charles O'Brien	14/03/07	555
Counsellor at Law	1933	8.2	6.9	0.9923	0.05	Armin Jaeger	03/03/10	5064
Diplomaniacs	1933	6.2	5.1	0.9843	<0.01	Charles O'Brien	01/07/08	1837
Duck Soup	1933	4.2	3.1	0.9932	<0.01	Charles O'Brien	13/05/05	1637
Female	1933	4.4	3.3	0.9896	<0.01	Charles O'Brien	05/09/09	3687
Forty Second Street	1933	6.2	4.4	0.9941	0.01	Charles O'Brien	29/04/08	1573
His Private Secretary	1933	6.7	5.5	0.9886	0.01	Charles O'Brien	02/05/10	5344
I'm No Angel	1933	7.1	5.7	0.9837	<0.01	Charles O'Brien	14/07/08	1879
My Weakness	1933	6.3	4.6	0.9917	0.01	Charles O'Brien	02/03/10	5114
Mystery of the Wax Museum	1933	4.1	3.1	0.9975	0.27	Mohsen Nasrin	07/12/09	4682
Rafter Romance	1933	11.5	9.2	0.9922	0.18	Charles O'Brien	09/05/07	719
Son of Kong	1933	5.9	4.4	0.9833	<0.01	Kira Vorobiyova	17/08/09	3543
Torch Singer	1933	6.8	5.1	0.9939	0.07	Charles O'Brien	04/12/09	4664

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