

Time Consistency and Seller Commitment in Inter-temporal Movie Distribution: An Empirical Study of the Video Window

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Overview

- Empirical study of the determinants of the U.S. “video window” (days from theatrical opening to video street date).
- **Overall question:** How have movie distributors maintained video window (at about 6 months for 1988-97 study period)?

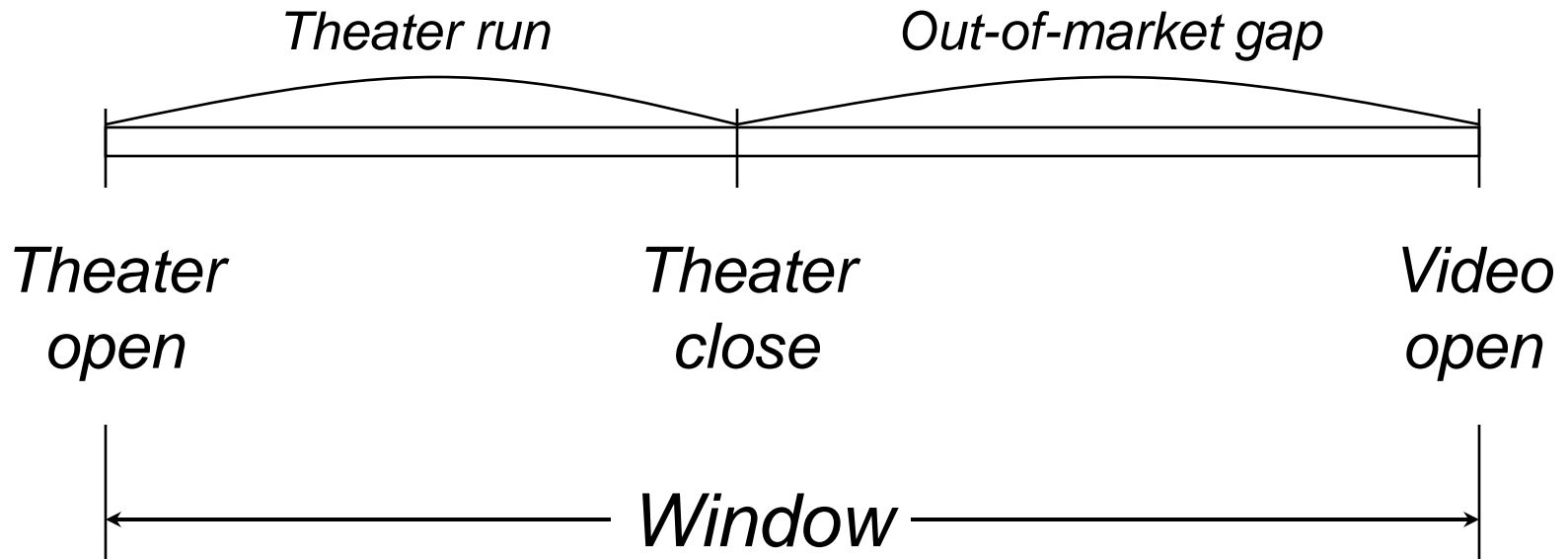
- **Motivating example**

| Movie Title | Dist/date | Box office rev. | Theater run (days) | Out-of-market days | Video window |
|------------------------------|--------------|-----------------|--------------------|--------------------|--------------|
| <i>Father of the Bride 2</i> | Disney, 1996 | \$76 m | 140 | 46 | 186 |
| <i>Screamer</i> | Sony, 1996 | \$6 m | 21 | 158 | 179 |

- **Working Hypothesis:** Coordinated behavior by U.S. distributors to maintain windows above competitive levels.



Graphic





The Time Consistency Problem

- The timed movie release sequence as inter-temporal price discrimination (theater → video → pay TV....)
- The general inability of sellers of durable goods to price discriminate over time unless they can commit to a minimum time before price is reduced.
- Movie consumers anticipate video windows based on some *average* of video windows for movies in the past.
- An individual movie distributor has an incentive to shorten the window to take advantage of freshness of the movie/ad campaign and to get revenues sooner.
- With fully competitive behavior, windows would thus tend to collapse—openly discussed by distributors.



Coping with Time Consistency

- In most EU countries, industry agreements have maintained video windows (6 or 8 months in mid-90s); legislation in some countries, including France
- In the U.S., trade press references to “unspoken agreement” to maintain a 6 month window; industry coordination is plausible;
- Presumably, industry collusion/coordination to maintain windows would be socially beneficial.



Theoretical literature

- Original time consistency insight: Coase (1972)
- Formalized by Bulow (1982); Stokey (1981)
- Commitment devices: Coase (1972); Bulow (1982); Tirole (1988); Butz (1990); Ausubel and Deneke (1987); Takeyama (2002);
 - leasing; buybacks; best price provisions, firm reputation; destruction or capacity limitation; quality differentiation; discipline of competitors
- Intertemporal price discrimination: Stokey (1979); Varian (1989)



Industry-related studies

- Rosen and Rosenfield (1997); live theater
- Frank (1994): German video windows
- Prasad, Bronnerberg and Mahajan (2004): video release timing
- Nelson, Reid, and Gilmore (2007): DVD out-of-market gap



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Database

- Main sources: Video Store Magazine; A.C. Nielsen EDI; Kagan Research
- 1429 theatrical films, released on video in U.S. from 1988 to 1997
- Criteria for inclusion: wholesale video volume of 50,000+; all movies with at least \$1 million box-office and 24 screens at widest reach; video window of 365 days or less.



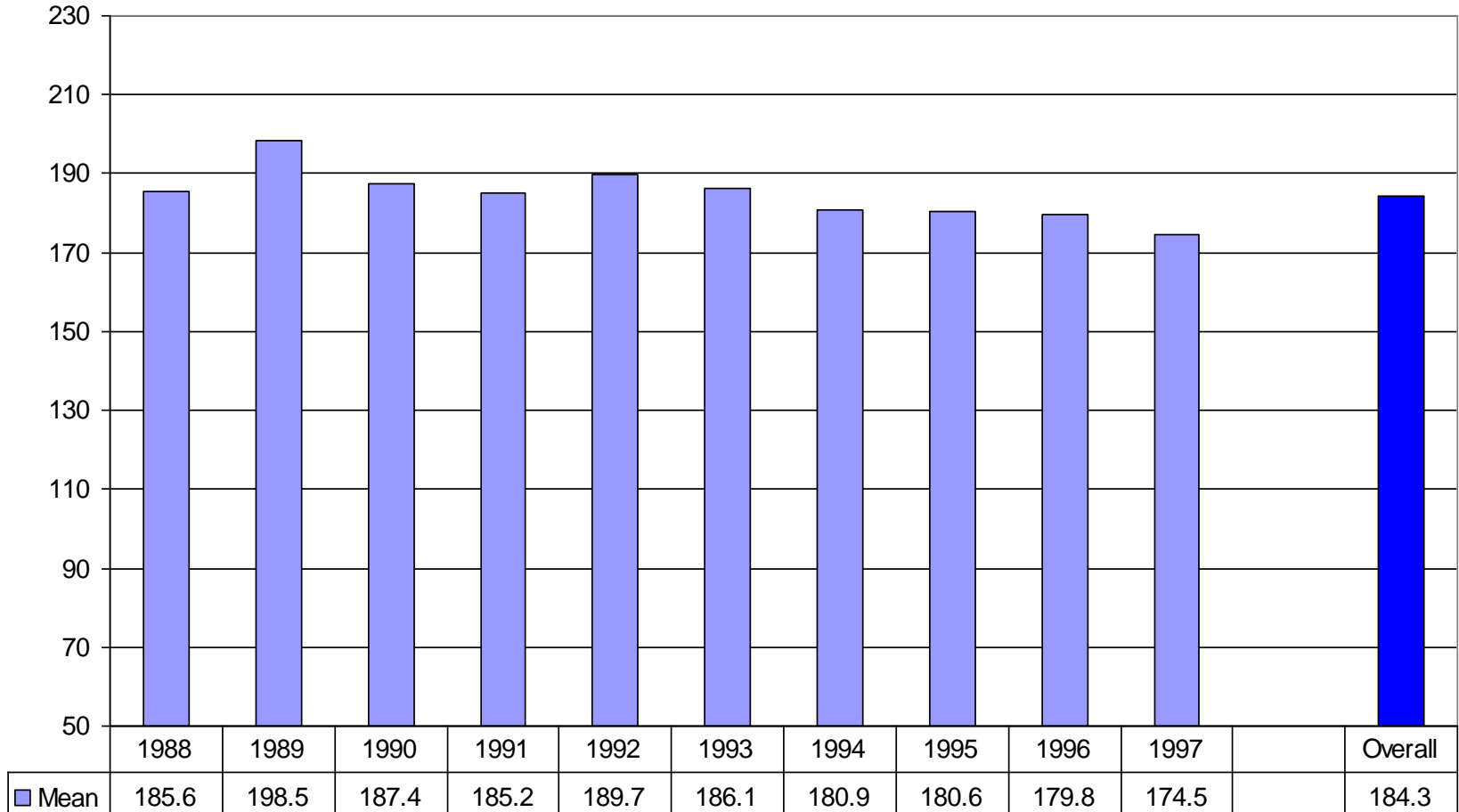
Methods

- Evaluate descriptive data for signs of successful coordination (minimum benchmarks, stability over time, response to external forces)
- Test if MPAA and non-MPAA (independent) distributors behave differently.
- How do VCR diffusion, interest rates, box-office performance, production costs, other economic variables affect windows?
- Test predictions of a no-commitment, competitive model vs. a full-commitment, industry coordination model.



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Window Means

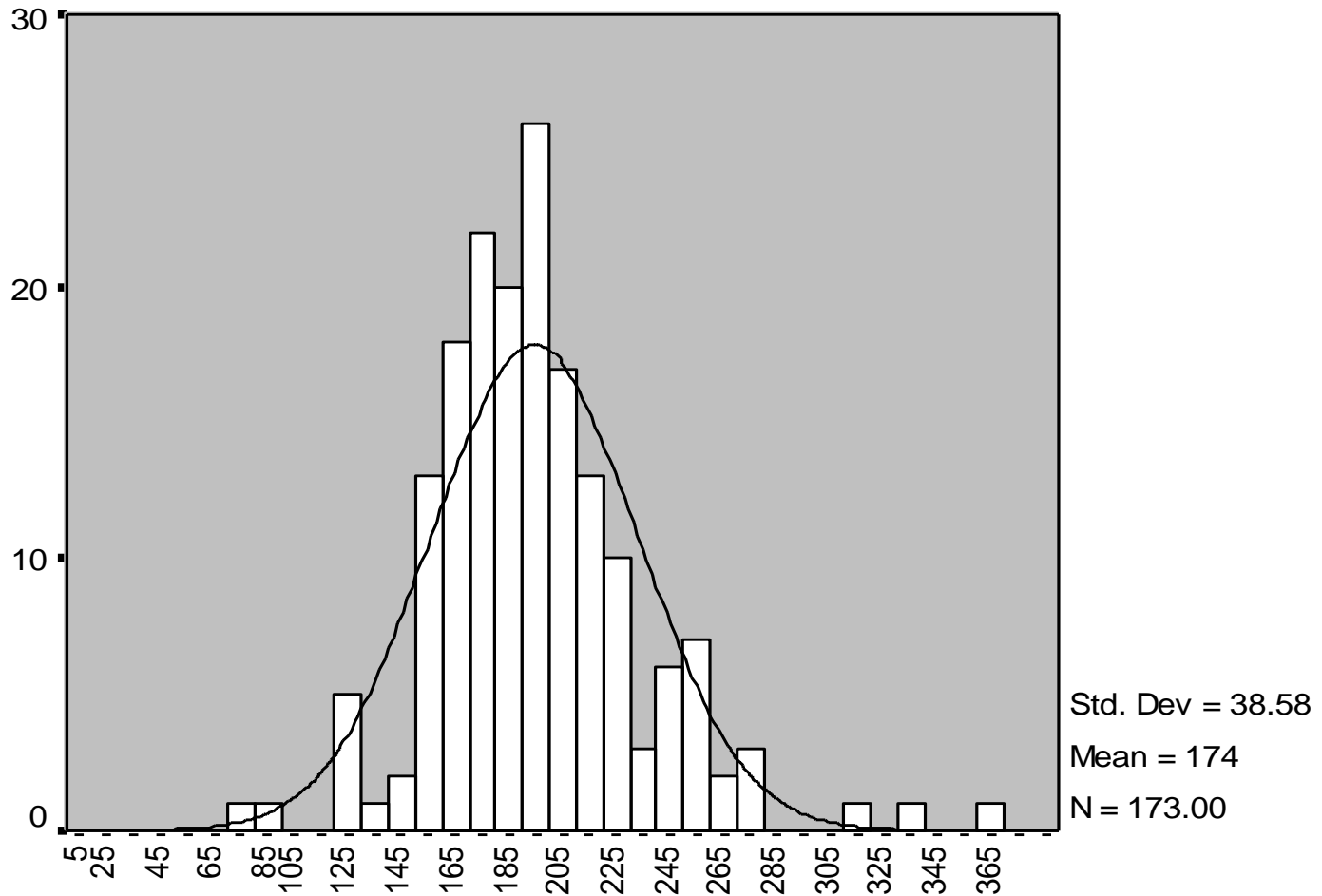




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Window Frequency (I)

Video Release Year = 1997

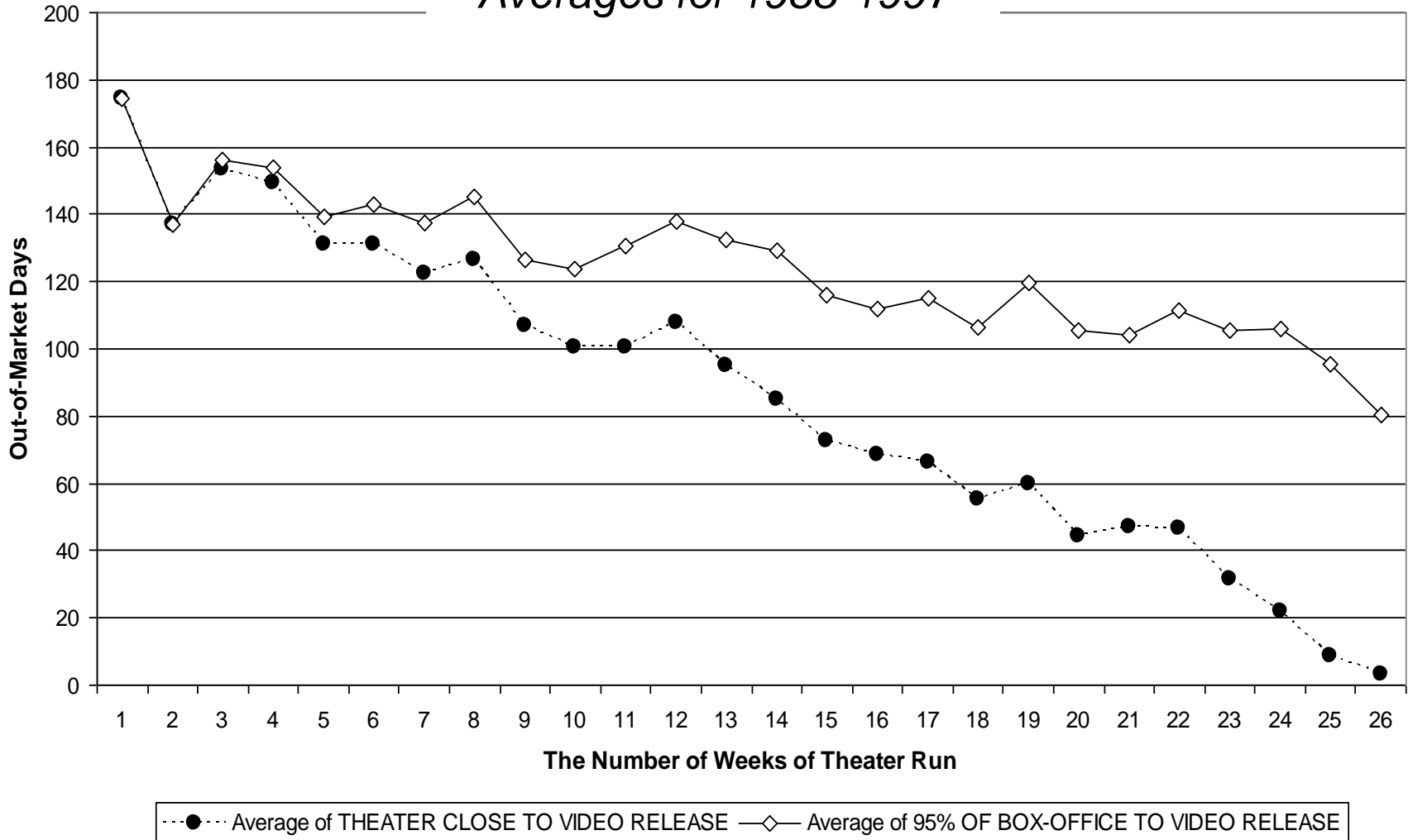




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The "Out-of-Market" Gap in Relation to Theater Run Lengths

Averages for 1988-1997





Descriptive data summary

- No minimum benchmarks evident—wide dispersion around the mean
- Relatively consistent mean over time, declining variance
- Long out-of-market periods for shorter run movies not readily explained by “natural” factors



For the individual distributor of a movie

$$(1) \quad \Pi = (P_T - C_T) A_T + (1 + d)^{-W} (P_V - C_V) A_V - K$$

P_T, P_V : theater, video prices;

C_T, C_V : theater, video costs per capita

d : time discount of the distributor;

W : the window,

K : movie production cost

A_T, A_V : theater, video demand.



Continued

$$(2) \quad A_T = A_T (W^e, W, P_B, P_V, V-T, S, Z)$$

$$(3) \quad A_V = A_V (W^e, W, P_B, P_V, V-T, S, Z)$$

W^e : the distribution of consumers' commonly expected window

$V-T$: general revenue potential of the video market relative to the theatrical market

S : season of release

Z : vector of individual movie characteristics



Continued

$$(4) \quad W^e = W^e(\Omega, P_T - C_T, P_V - C_V, V-T, d, Z, S)$$

Ω : consumer past experience with windows.

In equilibrium, $W^e = W$,

$$(5) \quad W^* = W^*(P_T - C_T, P_V - C_V, V-T, d, Z, S)$$



Basic empirical model

*Video Window = f { VCR penetration (-),
box-office revenues (+/-),
production cost (-),
real interest rate (-),
non-MPAA membership dummy (-),
number of theaters in widest release (-),
seasonal dummies, genre dummies (?),
length of theater run (+) }*

*Key Variations: Out-of-market gap in place of Video Window;
length of theater run defined as date 95% revenues earned*



Summary of empirical effects on video window (full sample)

| | |
|--------------------------------------|------------------------------|
| <i>VCR penetration:</i> | <i>negative</i> |
| <i>box-office revenues:</i> | <i>insignificant</i> |
| <i>production costs:</i> | <i>negative</i> |
| <i>real interest rates:</i> | <i>negative</i> |
| <i>non-MPAA dummy:</i> | <i>negative (25-27 days)</i> |
| <i>number of theaters:</i> | <i>insignificant</i> |
| <i>seasonal dummies:</i> | <i>mostly insignificant</i> |
| <i>genre dummies:</i> | <i>mostly insignificant</i> |
| <i>theater run:</i> | <i>positive</i> |
| <i>(adj. $R^2 = .20$)</i> | |



Subsample definitions

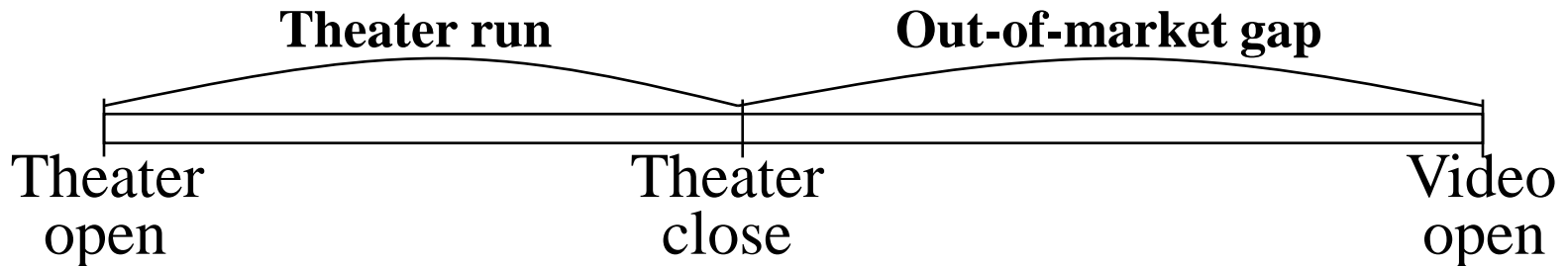
- Movies having theater runs of:
 - (a) under 11 weeks: commitment clearly relevant
 - 1-70 days + 63 days = 1 - 133 days, vs. mean window of 184 days
 - (b) 11-17 weeks: commitment may be relevant
 - 77-119 days + 63 days = 140 - 182 days
 - (c) 17+ weeks: commitment probably not relevant



Predictions for commitment-relevant Subsamples

“**No commitment**” model → window is positively related to theater run length; unrelated to out-of-market gap; economic variables significant

“**Full commitment**” model → window is independent of theater run length; out-of-market gap is inversely related ($b = -1$) to theater run length; economic variables insignif.





Subsample Results: Key Variables

| | Window | Window | Out-of-market gap | Out-of-market gap @95% Rev. |
|--|--------------|-------------|-------------------|--------------------------------|
| <i>Under-11 week theater runs (N = 410)</i> | | | | |
| Theater run | -0.32 (1.8)* | | -1.32 (7.6)** | |
| Theater run @95% Rev. | | -0.06 (0.3) | | -1.06 (4.2)** |
| Adj R-sq | 0.04 | 0.03 | 0.15 | 0.06 |
| <i>11-17 week theater runs (N = 363)</i> | | | | |
| Theater run | -0.21 (1.3) | | -1.21 (7.3)** | |
| Theater run @95% Rev. | | 0.09 (0.5) | | -1.09 (6.0)** |
| Adj R-sq | 0.08 | 0.08 | 0.19 | 0.11 |
| <i>Over-17 week theater runs (N = 384)</i> | | | | |
| Theater run | 0.43 (9.9)** | | -0.57 (13.3)** | |
| Theater run @95% Rev. | | 0.46 (7.5) | | -0.54 (8.8)** |
| Adj R-sq | 0.38 | 0.32 | 0.46 | 0.27 |

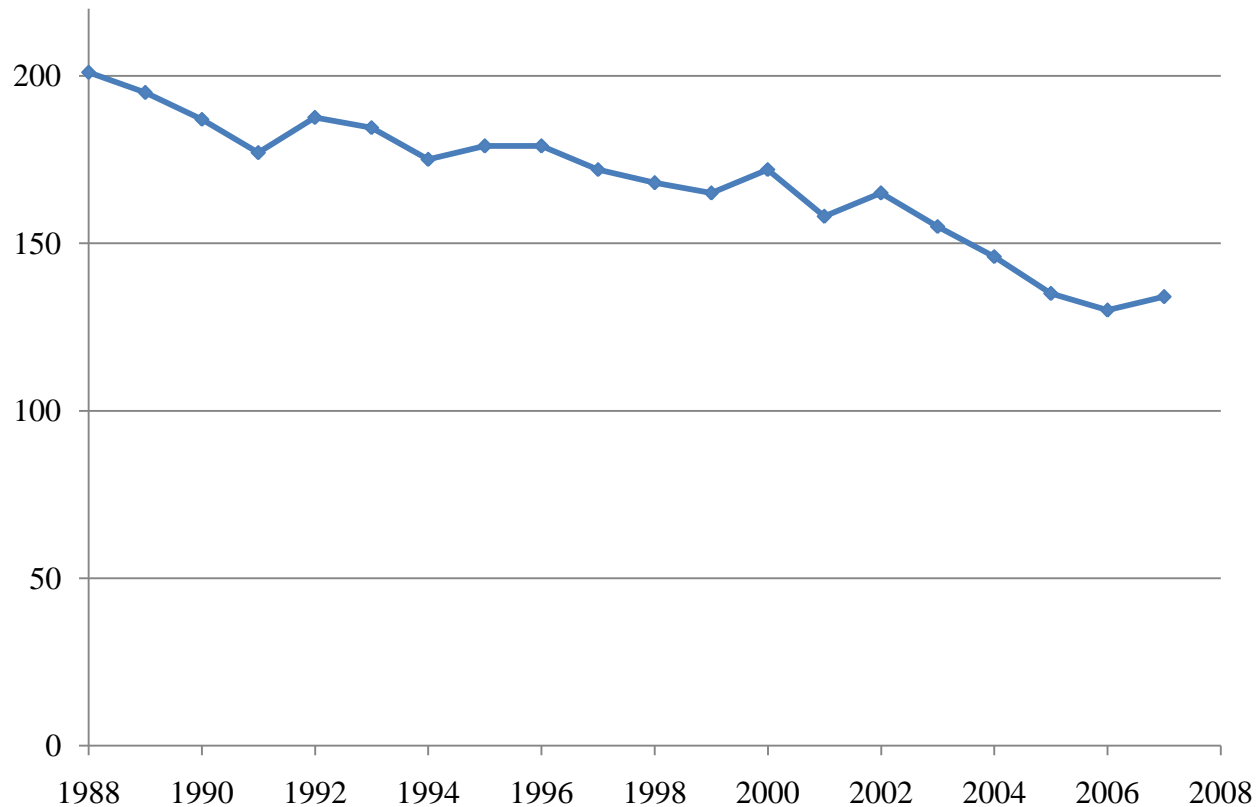


Summary of Main results

- Descriptive data suggest window benchmarks (at about 180 days) maintained over time from 1988-97, but high variance around mean for individual movies.
- For the full sample, econometric models show:
 - VCR penetration somewhat shortened windows over time;
 - Windows for independents shorter (25-27 days)
 - Windows somewhat reduced by higher interest rates and higher production costs
- For movies having shorter, commitment-relevant run lengths, models show:
 - Windows unrelated to theater run lengths; out-of-market gaps inversely related to run lengths; robust to alternative definitions



Figure 6: Trends in the Average U.S. Video Window, 1988-2007
(Days between Theater and Video release)



Source: : Waterman(2005), Hollywood Roads to Riches, Appendix E, Motion Picture Investor, Kagan Research



Conclusions

- Results support our primary hypothesis that U.S. motion picture distributors (including independents) resolve time-consistency by coordinating their behavior to maintain longer windows than would result from a competitive model in which consumer expectations are ignored.
- In general, empirical results consistent with a loosely coordinated window benchmark model over the period.



Video Windows in Europe (1994-96)

| Country | Mo. | Window setting method |
|-------------|-----|---|
| Austria | 6 | industry agreement (fixed by contract for each release) |
| Belgium | 6 | industry agreement (follows French and Dutch patterns) |
| Denmark | 6 | industry agreement |
| France | 12 | statute (12 months by law, but 6 months if total box-office admissions are under 100,000; if admissions under 400,000, a derogation may be applied for) |
| Germany | 6 | industry agreement ("voluntary," but 6 months is mandatory for state-subsidized films; distributors "nearly always stick" to the 6 months on non-subsidized movies. |
| Greece | 6 | industry agreement |
| Ireland | 6 | industry agreement |
| Italy | 8 | statute/industry agreement (until 1994, one year; set at 8 months by law in 1994, with conditions set for derogations. |
| Netherlands | 6 | industry agreement |
| Norway | 6 | industry agreement ("strictly adhered to") |
| Portugal | 12 | statute |
| Spain | 6 | industry agreement (fixed on a case-by-case basis within guidelines: mandatory 6 months on subsidized films until 1996, when shortened from 6 to 4 months) |
| Sweden | 6 | industry agreement ("fairly relaxed") |
| Switz | 4-6 | industry agreement ("not compulsory") |
| UK | 6 | industry agreement |

Source: Paul Kagan Associates, *Kagan's European Home Video, 1994; Euromedia Regulation*, Feb. 21, 1996.



The Video Window: Descriptive Statistics (number of days)

| Video year | Obs | Mean | Median. | Variance | Var/Mean |
|------------|------|-------|---------|----------|----------|
| 1988 | 120 | 185.6 | 191.0 | 3163.9 | 17.0 |
| 1989 | 134 | 198.5 | 194.0 | 2578.1 | 13.0 |
| 1990 | 130 | 187.4 | 183.5 | 2082.6 | 11.1 |
| 1991 | 136 | 185.2 | 175.5 | 2095.5 | 11.3 |
| 1992 | 132 | 189.7 | 187.0 | 1778.6 | 9.4 |
| 1993 | 142 | 186.1 | 184.5 | 1813.1 | 9.7 |
| 1994 | 156 | 180.9 | 177.0 | 1233.8 | 6.8 |
| 1995 | 142 | 180.6 | 179.0 | 1145.9 | 6.3 |
| 1996 | 164 | 179.8 | 179.0 | 2030.0 | 11.3 |
| 1997 | 173 | 174.5 | 172.0 | 1488.8 | 8.5 |
| Overall | 1429 | 184.3 | 180.0 | 1930 | 10.5 |



Mean and Median of Window-Related Variables (number of days)

| Video year | Theater open to theater close | | Theater open to 95% of box-office* | | Theater close to video release | | 95% of box-office* to video release | |
|------------|-------------------------------|--------|------------------------------------|--------|--------------------------------|--------|-------------------------------------|--------|
| | mean | median | mean | median | mean | median | mean | median |
| 1988 | 84.8 | 70.0 | 60.8 | 49.0 | 100.8 | 101.5 | 124.8 | 123.5 |
| 1989 | 84.9 | 70.0 | 58.6 | 49.0 | 113.6 | 117.0 | 140.0 | 137.0 |
| 1990 | 93.6 | 84.0 | 59.8 | 49.0 | 93.8 | 95.0 | 127.6 | 122.0 |
| 1991 | 102.2 | 84.0 | 64.3 | 56.0 | 83.0 | 94.0 | 120.9 | 123.0 |
| 1992 | 96.8 | 98.0 | 63.7 | 63.0 | 92.9 | 94.5 | 125.9 | 124.5 |
| 1993 | 100.5 | 94.5 | 64.9 | 56.0 | 85.6 | 83.0 | 121.1 | 117.0 |
| 1994 | 100.1 | 94.5 | 60.6 | 56.0 | 80.8 | 82.0 | 120.3 | 117.0 |
| 1995 | 119.4 | 112.0 | 64.5 | 56.0 | 61.3 | 67.0 | 116.1 | 123.0 |
| 1996 | 114.1 | 101.5 | 56.9 | 49.0 | 65.8 | 67.0 | 122.9 | 122.5 |
| 1997 | 116.8 | 112.0 | 60.5 | 49.0 | 57.6 | 60.0 | 114.0 | 116.0 |
| Overall | 102.3 | 91.0 | 61.4 | 56.0 | 82.1 | 83.0 | 123.0 | 123.0 |

*95% of box-office: the date by which 95% of the movie's eventual total box-office receipts have been earned



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Descriptive Statistics for Basic Independent Variables (I)

| Variable | Mean | Median | Std. Dev. | Min | Max |
|----------|------|--------|-----------|-----|-------|
| VCRPEN | 69.1 | - | - | - | - |
| 1988 | 50.6 | - | - | - | - |
| 1989 | 58.9 | - | - | - | - |
| 1990 | 63.6 | - | - | - | - |
| 1991 | 66.3 | - | - | - | - |
| 1992 | 68.7 | - | - | - | - |
| 1993 | 70.9 | - | - | - | - |
| 1994 | 72.2 | - | - | - | - |
| 1995 | 74.2 | - | - | - | - |
| 1996 | 77.5 | - | - | - | - |
| 1997 | 79.6 | - | - | - | - |
| BOXTOTAL | 27.2 | 15.3 | 34.7 | 1.0 | 312.2 |
| 1988 | 23.0 | 13.8 | 28.1 | 1.2 | 164.2 |
| 1989 | 24.9 | 11.8 | 34.8 | 1.1 | 251.2 |
| 1990 | 23.3 | 12.4 | 28.3 | 1.1 | 138.1 |
| 1991 | 30.6 | 15.6 | 43.3 | 1.0 | 281.6 |
| 1992 | 27.0 | 16.4 | 31.0 | 1.0 | 162.8 |
| 1993 | 27.3 | 14.4 | 31.6 | 1.1 | 172.7 |
| 1994 | 21.6 | 15.3 | 21.2 | 1.2 | 102.2 |
| 1995 | 28.5 | 17.5 | 38.2 | 1.0 | 312.2 |
| 1996 | 29.5 | 17.2 | 36.3 | 1.0 | 241.7 |
| 1997 | 33.8 | 18.1 | 43.5 | 1.0 | 260.3 |



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Descriptive Statistics for Basic Independent Variables (II)

| Variable | Mean | Median | Std. Dev. | Min | Max |
|-----------|--------|--------|-----------|-------|--------|
| MAXSCREEN | 1294.9 | 1307.5 | 673.6 | 25.0 | 3565.0 |
| 1988 | 1042.4 | 1117.0 | 488.2 | 49.0 | 2562.0 |
| 1989 | 1073.6 | 1118.0 | 543.5 | 54.0 | 2837.0 |
| 1990 | 1098.3 | 1095.0 | 583.5 | 31.0 | 2332.0 |
| 1991 | 1191.0 | 1230.5 | 579.6 | 75.0 | 2509.0 |
| 1992 | 1186.2 | 1223.0 | 619.1 | 25.0 | 2644.0 |
| 1993 | 1324.4 | 1391.0 | 606.2 | 25.0 | 2491.0 |
| 1994 | 1315.9 | 1406.5 | 648.4 | 126.0 | 2748.0 |
| 1995 | 1422.7 | 1491.5 | 697.7 | 40.0 | 2893.0 |
| 1996 | 1543.5 | 1635.0 | 684.6 | 34.0 | 3012.0 |
| 1997 | 1567.5 | 1745.0 | 871.9 | 49.0 | 3565.0 |
| REAL_INT | 1.9 | 2.3 | 1.8 | -1.3 | 5.5 |
| 1988 | 2.9 | 2.8 | 0.4 | 2.5 | 4.0 |
| 1989 | 4.6 | 4.6 | 0.7 | 2.5 | 5.5 |
| 1990 | 4.1 | 4.1 | 0.3 | 3.6 | 5.5 |
| 1991 | 2.6 | 2.8 | 0.9 | 0.6 | 4.1 |
| 1992 | 0.2 | -0.1 | 0.7 | -1.3 | 1.5 |
| 1993 | -1.1 | -1.1 | 0.2 | -1.3 | -0.4 |
| 1994 | -0.3 | -0.6 | 0.7 | -1.1 | 1.4 |
| 1995 | 2.3 | 2.6 | 0.6 | 1.0 | 3.0 |
| 1996 | 2.2 | 2.2 | 0.2 | 1.8 | 2.6 |
| 1997 | 2.3 | 2.2 | 0.1 | 2.1 | 2.5 |



Descriptive Statistics for Basic Independent Variables (III)

| Variable | Mean | Median | Std. Dev. | Min | Max |
|----------|------|--------|-----------|-----|-------|
| PRODCOST | 21.8 | 17.0 | 18.1 | 0.0 | 175.0 |
| 1988 | 13.5 | 12.0 | 9.3 | 1.7 | 58.0 |
| 1989 | 14.1 | 14.0 | 7.5 | 2.0 | 50.0 |
| 1990 | 16.0 | 13.0 | 11.0 | 0.5 | 55.0 |
| 1991 | 20.3 | 17.0 | 14.7 | 0.3 | 95.0 |
| 1992 | 20.1 | 16.5 | 14.0 | 2.5 | 80.0 |
| 1993 | 20.7 | 18.0 | 12.4 | 2.5 | 65.0 |
| 1994 | 23.2 | 20.0 | 15.5 | 3.0 | 77.0 |
| 1995 | 27.2 | 23.5 | 19.8 | 0.0 | 90.0 |
| 1996 | 29.8 | 24.0 | 24.2 | 0.0 | 175.0 |
| 1997 | 33.6 | 25.0 | 28.8 | 0.3 | 145.0 |



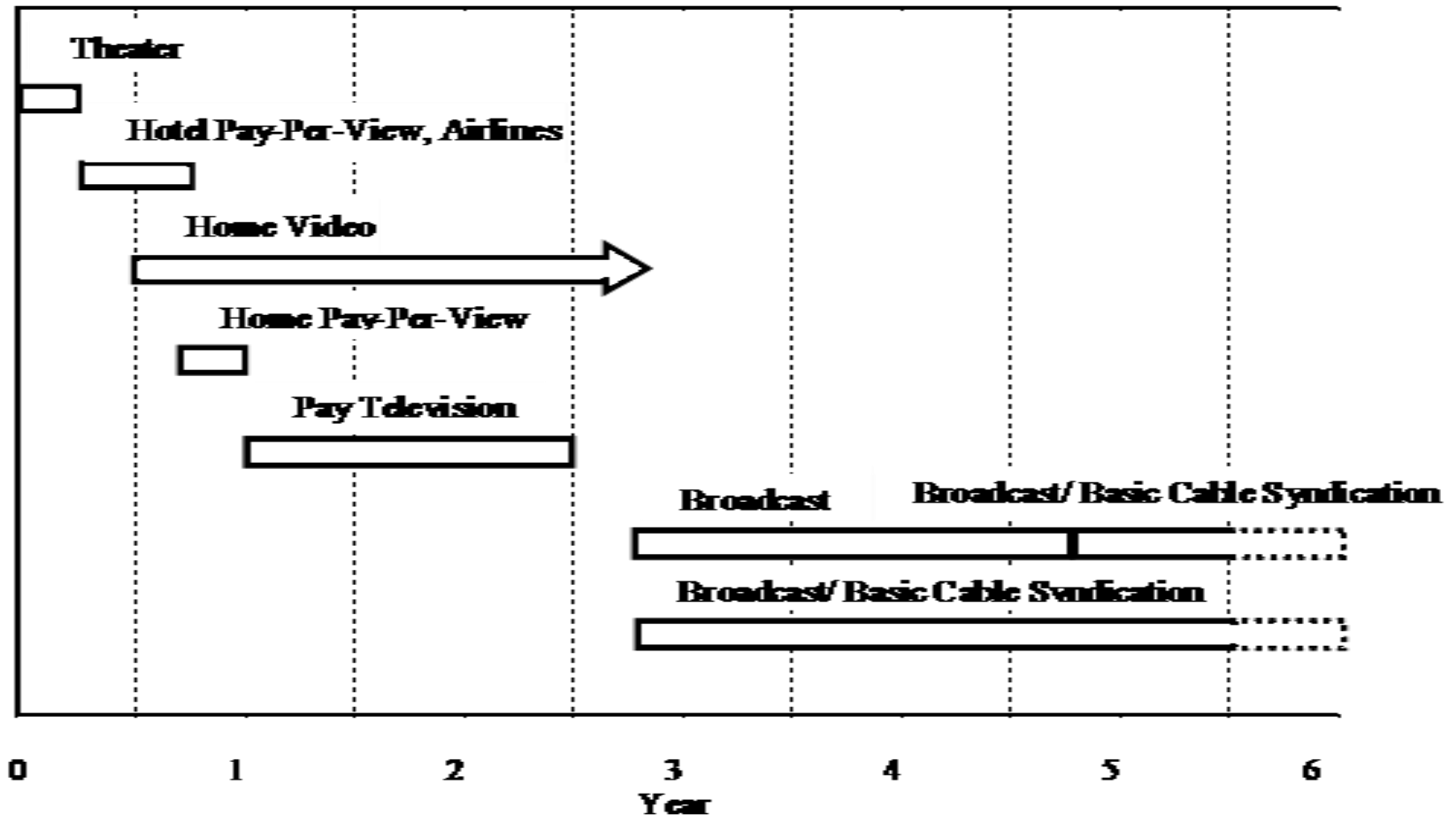
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Characteristics of MPAA and Non-MPAA distributed Movies

| Variable | IND-DUM=1 | | IND-DUM=0 | | ALL | |
|--|-----------|-------|-----------|--------|------|--------|
| | Obs | Mean | Obs | Mean | Obs | Mean |
| WINDOW THEATER OPEN TO THEATER CLOSE | 83 | 168.0 | 1346 | 185.3 | 1429 | 184.3 |
| THEATER OPEN TO 95% OF BOX CLOSE TO VIDEO | 83 | 93.8 | 1346 | 102.8 | 1429 | 102.3 |
| THEATER OPEN TO 95% OF BOX CLOSE TO VIDEO | 83 | 65.1 | 1346 | 61.1 | 1429 | 61.4 |
| 95% OF BOX TO VIDEO | 83 | 74.2 | 1346 | 82.5 | 1429 | 82.1 |
| 95% OF BOX TO VIDEO | 83 | 102.9 | 1346 | 124.2 | 1429 | 123.0 |
| PRODCOST | 54 | 8.1 | 1108 | 22.5 | 1162 | 21.8 |
| BOXTOTAL | 83 | 6.7 | 1346 | 29.6 | 1429 | 28.3 |
| MAXSCREEN | 83 | 669.4 | 1329 | 1334.0 | 1412 | 1294.9 |



Typical Domestic Theatrical Release Sequence

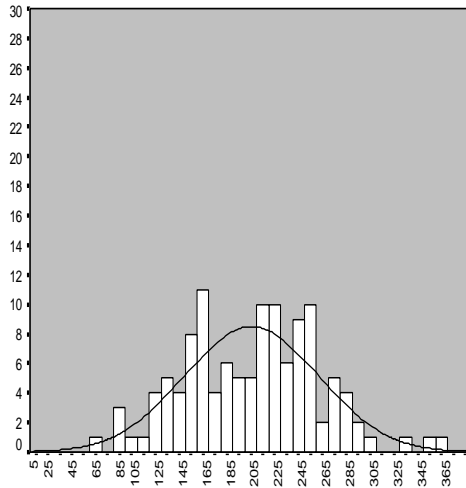




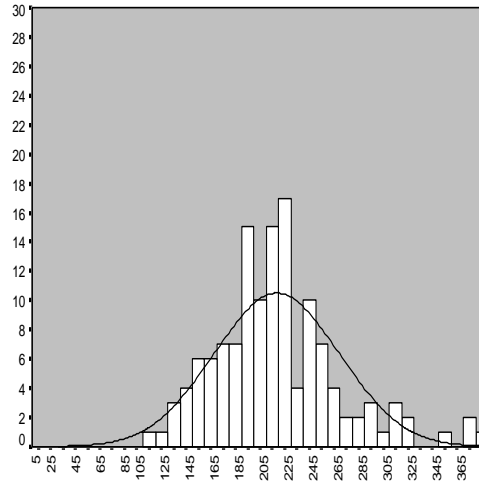
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Window Frequencies (II)

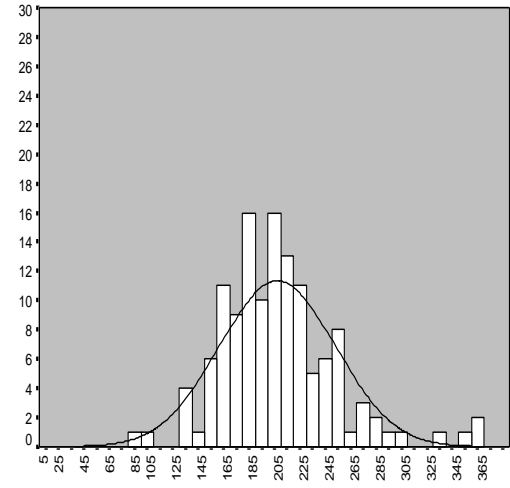
1988



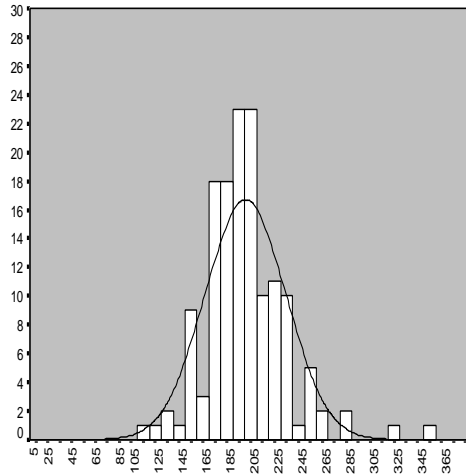
1989



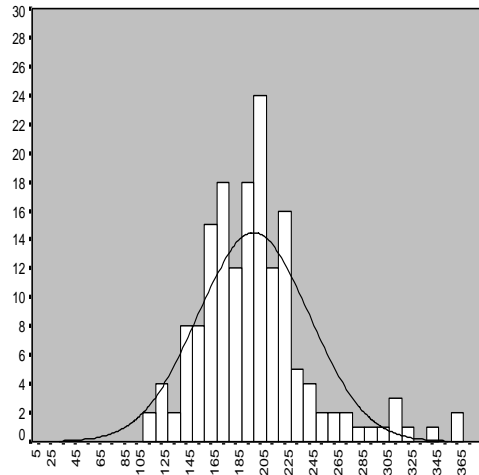
1990



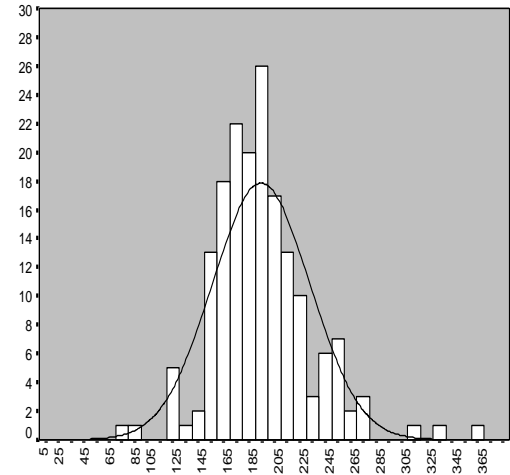
1995



1996



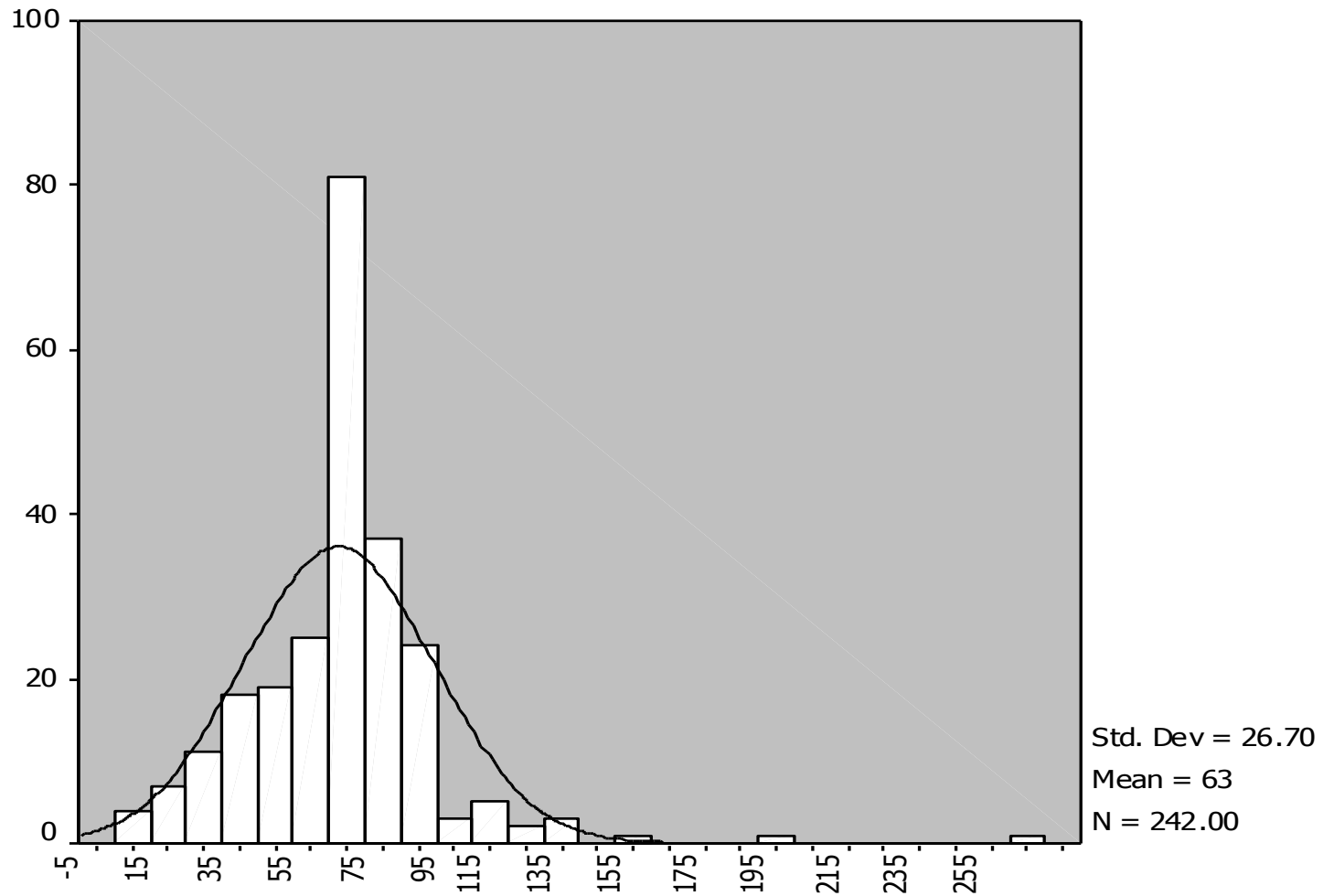
1997





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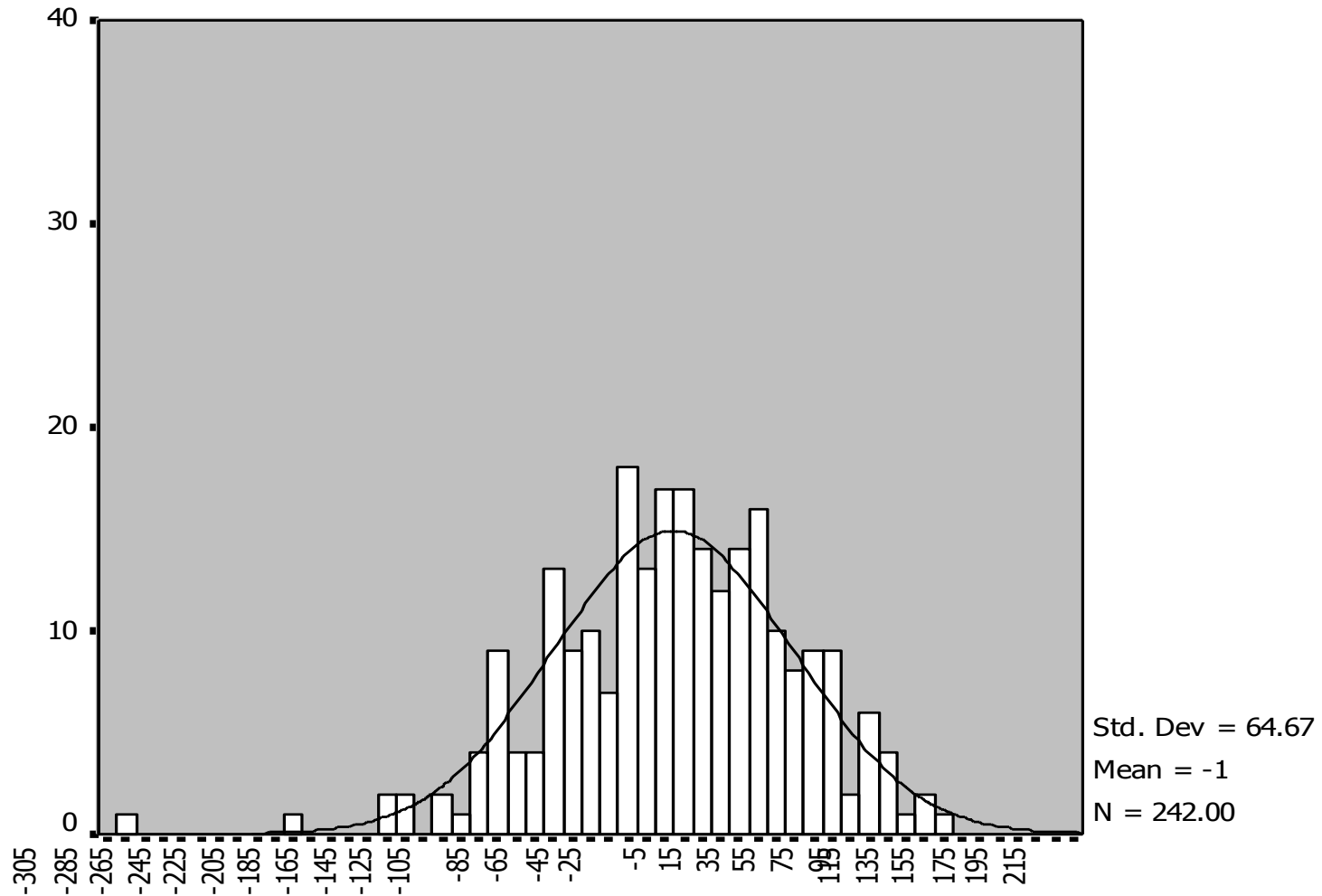
The Video Announcement Period





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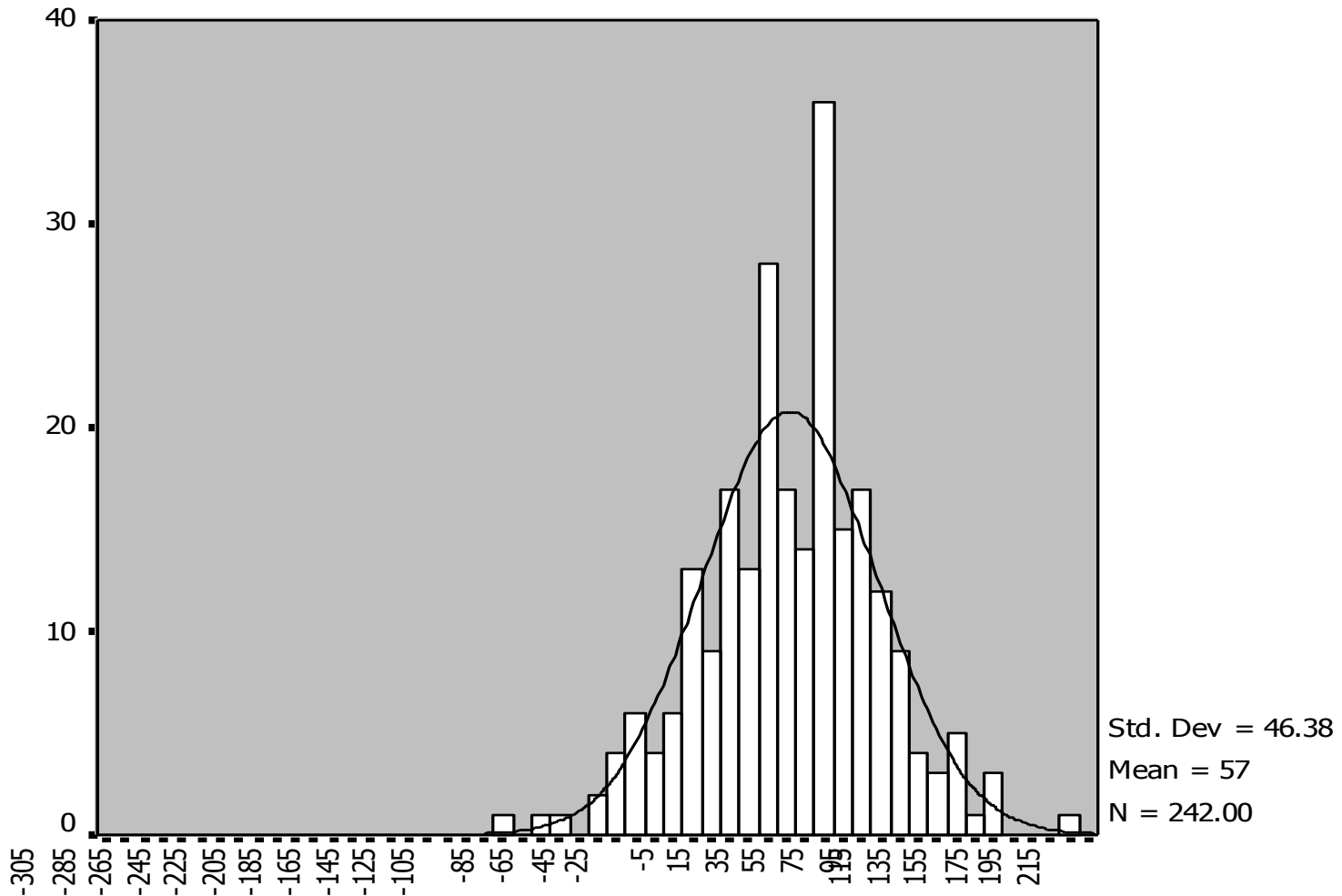
Video Announcement Date Less Theater Close Date





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Video Announcement Date Less 95% of Theater Box-office Date





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The "Out-of-Market" Gap Less the Mean Announcement Period, in Relation to Theater Run Lengths

