

The theatrical window: uncharted waters?

Hasan Bakhshi¹, March 2007

Summary

- The window between a film's release at the cinema and on DVD/video rental fell on average by one-third from 190 to 125 days between May 1999 and April 2006.
- There is robust evidence that the growing importance of the DVD market over time is an important factor in explaining the trend toward shorter windows.
- At any one time, theatrical windows are bunched closely around the median despite the great difference in box office performance and DVD/video potential across films. This suggests that the window-setting process may be characterised by tacit co-ordination in the industry.
- The abolition of the DVD/video rental-retail window from 2003 led to turbulence in distributors' release strategies, but there were tentative signs of re-convergence in 2005 and 2006.
- There is no statistically significant relationship between box office returns and window length, suggesting that box office revenues have not been 'cannibalised' by DVD/video transactions – at least to date.
- There is – perhaps surprisingly – little statistical evidence of differences in window strategies between the major and independent distributors.
- Windows fell in 2004–2006 by more than can be explained by the set of factors considered in this report. Further research is needed to identify the source of the weakness: concerns about DVD piracy, and the threat of new digital leisure technologies are two prime candidates.

1 Introduction

As in other media sectors, distribution companies in the film industry release their products through a multitude of channels. Historically, distribution has followed a clear sequence: films have first been released on cinemas, followed by DVD/video, pay-per-view, subscription channels, cable and satellite television and finally free-to-air broadcasting. New digital technologies, such as video-on-demand and internet downloads are presenting distributors with further options. The globalisation of the film industry has made the international dimension of distribution strategies increasingly important: distributors must also decide how to sequence theatrical and DVD/video release across countries.

In this paper, we use a new data set of films released at UK cinemas between May 1999 and April 2006 – put together by the Research and Statistics Unit in the UK Film Council – to model trends in the window between theatrical and DVD/video release. Our goal is to inform industry discussions on release strategy. We show that the window between a film's release at the cinema and on DVD/video rental fell on average by one-third from 190 to 125 days over this period. The window between cinema and DVD/video *retail* fell by even more, reflecting the abolition by distributors of the rental-retail window in 2002 and 2003. We use Screen Digest data to note that

¹ Hasan Bakhshi MPhil (Econ) is an independent economist who was formerly an Executive Director at Lehman Brothers, a manager at the Bank of England and Deputy Chief Economist at the Foreign and Commonwealth Office.

the shortening window is a feature in other European markets, and to a lesser extent in the US too.

We review previous attempts in the academic literature to explain the behaviour of the theatrical window. We split the literature into two vintages.

In the earliest studies, the window reflects the trade-off that distributors face between so-called 'cannibalisation' and 'marketing' effects. Distributors prefer longer windows to the extent that they protect box office revenues (cannibalisation effect), but shorter windows in so far as this lets them capitalise on DVD sales while a film remains fresh in the minds of the public (marketing effects) (Frank (1994), Lehmann and Weinberg (2000)). The more lucrative the DVD/video market (relative to returns from cinema exhibition), the more the strategy will be skewed to milking revenues from that source. Exhibitors of course care only about the cannibalisation effect so, other things being equal, prefer longer windows.

More recent research stresses the impact that release distribution strategies have on movie-goers' expectations (Waterman and Lee (2002), Prasad, Bronnenberg and Mahajan (2004) and Waterman (2005)). These studies predict that distributors have incentives to coordinate their release strategies around long windows: that way, movie-goers – basing their expectations of future DVD release dates on the historical average – have strong incentives to go to the cinema.

In this paper, we pool the films in our data set, and estimate an econometric model for the theatrical window based on the study by Waterman and Lee (2002). We conclude by suggesting further areas for research.

2 The data set

Using box office data from Nielsen EDI we first identified films released in the UK and Republic of Ireland between May 1999 and April 2006 and which took a box office in excess of £0.5 million.² We also recorded the genre, name of distributor and theatrical release date for each film. This resulted in a sample of 1406 films.

We then matched the films with DVD and video rental dates wherever these were available from the research consultancy MRIB, which allowed us to calculate the theatrical-DVD/video rental window³ for each of these films. Following other studies eg Waterman and Lee (2002), we excluded the small number of movies for which the theatrical window exceeded 365 days on the grounds that idiosyncratic factors are likely to have been important in setting these windows.

To complete the data set, we used Nielsen EDI sources to extract the widest point of release for each film – that is, the largest number of sites on which the film was showing during its release (for over 90% of films in our sample this was in the opening week).

This procedure resulted in a data set of 806 films which we use in our econometric analysis. Together these films accounted for the bulk of the overall UK box office over our seven year

² Nielsen EDI publishes these data at the 'distribution territory' level, which means that the UK and Republic of Ireland cannot easily be separated out.

³ Throughout this paper, unless stated otherwise, the theatrical window refers to the gap between cinema release and the release of the DVD/video to the rental market. From 2003 the rental window was abolished, so the cinema-to-rental and cinema-to-retail windows converged.

sample period. In 2005, for example, our data set captured over 95% of the combined UK/Republic of Ireland box office.

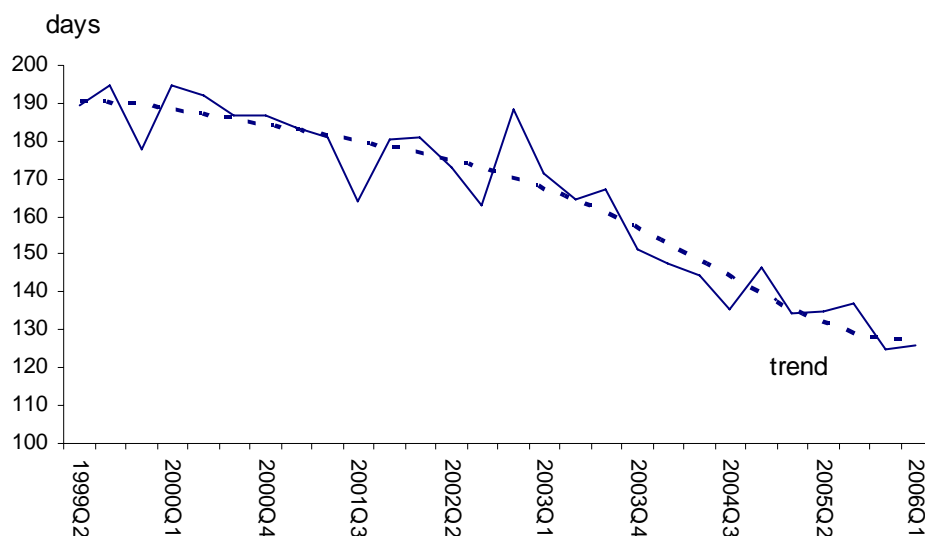
Figures A1 to A4 in the Appendix show that our data set is representative across a number of dimensions: by year (but with a smaller number of films in the incomplete years 1999 and 2006); by genre (with comedy and drama most popular); by distributor (with the big 6 distributors accounting for over 80% of films in our sample), and by calendar month of release.

3 Trends in the theatrical window

Figure 1 shows that the theatrical window has fallen over time in the UK, from around 190 days in May 1999 to 125 days in April 2006. The trend line shows that the rate of decline was broadly steady until late 2003, after which it appeared to have stepped up a gear.

The debate on window strategies has raged on throughout this period. In a number of high-profile cases last year – such as Stephen Soderbergh’s *Bubble* and Michael Winterbottom’s *The Road to Guantanamo* – distributors released films simultaneously at the cinema, on DVD and through other channels, though these examples remain (very) few and far between.

Figure 1: Average theatrical–DVD/video window, 1999 Q2 – 2006 Q1

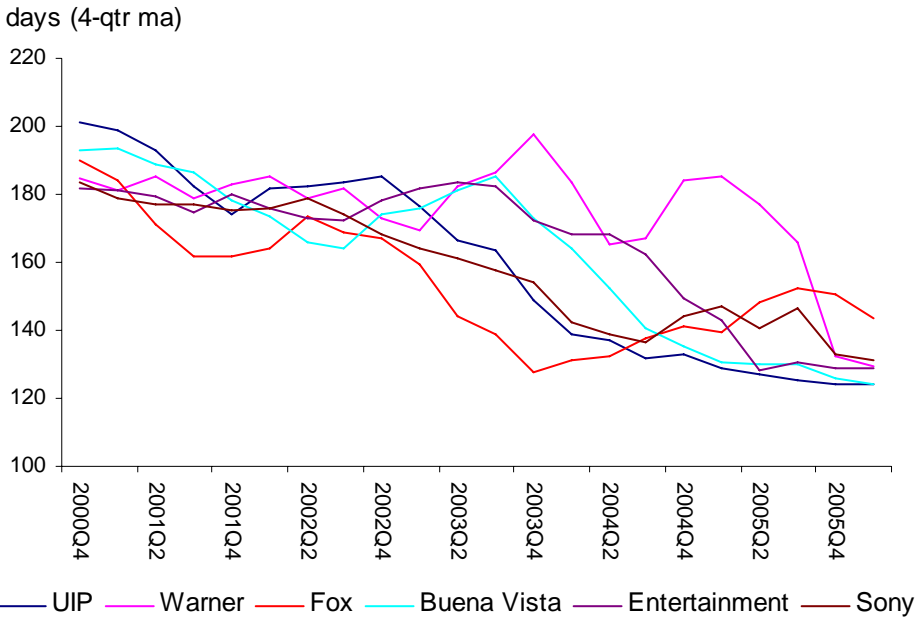


Source: Nielsen EDI and MRIB.

Note: Theatrical window is defined as the number of days separating a film’s theatrical release date from its DVD or VHS rental release date (whichever of the two comes first). The ‘trend’ line denotes a polynomial trend.

Figure 2 shows that the decline in the theatrical window is common across film distributors, but that there has been a good deal of turbulence in release strategies since 2003. There are tentative signs of re-convergence in late 2005 and 2006. Formal statistical measures of dispersion confirm this picture (Figure A5).

Figure 2: Average theatrical–DVD/video window: by distributor, 1999 Q2 – 2006 Q1



Source: Nielsen EDI and MRIB.

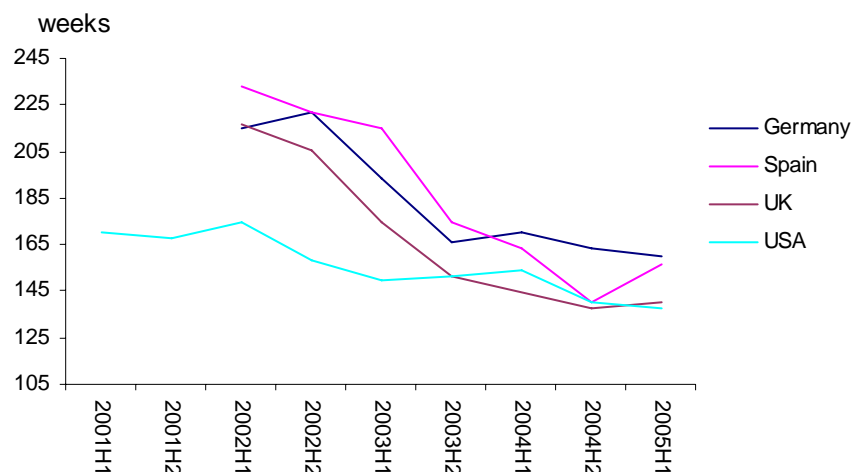
Note: this chart plots the 4–quarter moving average of the theatrical window to iron out volatility in the average for a given quarter caused by the small number of films released by distributors in some quarters.

The decline in theatrical window in recent years is even more marked when looking at the window between a film’s theatrical release and its appearance on DVD *retail*. This reflects the abolition in 2002/3 of the additional window that distributors used to set between release of films on DVD/video rental and DVD/video retail (Screen Digest (2005)). The abolition of this window meant that there was a sharp fall in the theatrical window in 2003 measured on a DVD/video retail basis compared with a rental basis. This explains why Screen Digest (2005) reports that the theatrical–DVD retail window fell by around 75 days between 2002 H1 and 2005 H1, compared with the 43 day fall in our theatrical–DVD rental data set.⁴

Figure 3 shows that the trend decline in the theatrical window has been an international phenomenon. Interestingly, European release strategies have also been converging to those seen in the US. Screen Digest (2005) suggests that greater alignment of release dates worldwide reflects the increased importance of publicity generated in European markets from US releases, and the distributors’ response to international piracy.

⁴ Screen Digest (2005) asserts that the “shortening of the retail window to match the former rental window has not, in most cases, materially affected the overall theatrical–to–DVD window, but simply shifted it from rental to retail.” This implies that the rental window has remained unchanged over time. Our analysis shows clearly that – at least for the UK – this is not in fact the case.

Figure 3: Average theatrical–DVD retail window



Source: Screen Digest.

4 Economics of the theatrical window

There have been a number of studies in the academic literature which have attempted to model the theatrical window using formal statistical techniques.

4.1 *The trade-off between cannibalisation and marketing*

The earliest studies concentrated on the trade-off facing distributors between so-called ‘cannibalisation’ and ‘marketing’ effects. On the one hand, longer windows protect box office revenues by increasing the period of exclusivity for movie-goers (or, in other words, reducing the cannibalisation of box office revenues by DVD/video transactions). Shorter windows on the other hand boost DVD/video revenues: first, because DVD/video business is more likely to benefit from pre-theatrical release marketing; and second, because word-of-mouth effects from cinema audiences are likely to be stronger where the delay between release dates is shorter. (We label these ‘marketing effects’).

In these models, the main determinant of the trade-off is the relative revenue streams available from each source. All else being equal, if box-office revenues are lucrative compared with DVD/video revenues, then concerns about cannibalisation may dominate, leading to longer windows; if DVD transactions are a relatively larger revenue source, then distributors may place more emphasis on the marketing effects.

Frank (1994) is an early attempt to model the trade-off using econometric methods. In his sample of 91 films released in Germany between 1984 and 1988, Frank detected the expected positive effect between a film’s box office and its theatrical window: other things being equal, a film with a higher opening box office and more durable box office revenues had a longer window. Frank also reported that increasing household video penetration – the proportion of German households owning a video cassette recorder – had a negative effect on the theatrical window, as the expanded revenue potential of the video market made marketing effects more important.

Lehmann and Weinberg (2000) used a different technique to model the trade-off between cannibalisation and marketing effects in their sample of 35 films released in the US between January 1994 and August 1995. They calibrated for each of their films a statistical model that described the rate at which box office revenues and video rentals decayed over time following release. Making simple assumptions about operating costs, Lehmann and Weinberg solved for the profit-maximising or 'optimal' window length for each of the films in their data set.

For their sample of films, the optimal window varied between 3 and 10 weeks, much lower than the 26 week window observed at that time. Taken literally, Lehmann and Weinberg's analysis suggests that distributors could have very significantly raised their profits in 1994/5 by shortening their theatrical windows.

These models of the cannibalisation/marketing trade-off beg at least two questions. First, if distributors could have made more money by slashing theatrical windows as early as 1994/5 why did they not do so? Second, how can we explain the fact that films are generally released on DVD/video only some weeks after they have been withdrawn from the cinema? (Waterman (2005) calls this the 'out-of-market gap' as films are in effect withdrawn from the market during this period). These questions suggest that something is missing in the analysis.

One limitation of Frank (1994) and Lehmann and Weinberg (2000)'s analysis is that the choice of theatrical window is modeled from the viewpoint of the distributor. This abstracts from the divergent interests of distributors and cinema exhibitors. Generally, cinema exhibitors – interested in maximising box office revenues – prefer longer windows. Incorporating exhibitors' preferences into these models would presumably increase the predicted length of the window. But it remains far from obvious why there would be an out-of-market gap.

4.2 Tacit coordination of distribution strategies

Waterman and Lee (2002), Prasad, Bronnenberg and Mahajan (2004) and Waterman (2005) propose an explanation that can account for the out-of-market gap, as well as windows that exceed those predicted by the cannibalisation-marketing trade-off. These researchers take as their starting point the observation that movie-goers have a repeat relationship with cinemas and distribution companies. Audiences are drawn to cinemas on the expectation of there being a material window before a film is released on DVD/video. This expectation is reasonably influenced by perceptions of the average window in the past.

Under these circumstances, distributors and exhibitors as a *group* have an incentive to coordinate their release strategies around long windows – perhaps significantly longer than implied by the cannibalisation-marketing trade-off for any single film. Depending on how long the industry feels windows must be maintained to attract audiences to the cinema, these windows may also imply an out-of-market gap. Industry coordination can also help explain the observed bunching of theatrical windows around their median value – something which may otherwise be tough to explain given the differences in box office performance and DVD/video potential across films.

But group interests and individual interests may not coincide. Specifically, under the additional plausible assumption that audiences do not distinguish between distributors when they watch movies, individual distributors may have reason to shorten the window for any one movie to take

advantage of marketing effects to boost DVD revenues, without risking their reputation with movie-goers. Of course if all other distributors did the same, then the window would collapse.⁵

This incentive to 'cheat' can in principle create a real challenge for industry coordination. The industry as a whole may rely on informal mechanisms, such as distributors' concern for their individual reputations, to ensure that such cheating is kept to a minimum; in some countries, formal regulation plays a role.

What might be the consequences of this industry coordination – to the extent it exists – for audiences? On the one hand, it may frustrate some fans by delaying a DVD release. But, as Waterman and Lee (2002) note, it also helps sustain a cinema sector that may not otherwise be profitable for distributors to support. In that sense it is also in the interests of the cinema-going public.

Waterman and Lee (2002) estimated an econometric model of the theatrical window using data for 1429 films released on US cinemas between 1988 and 1997. They showed that after controlling for economic factors such as a film's box office and the household video penetration rate, films distributed by companies that were not members of the Motion Picture Association of America (MPAA) had significantly shorter windows than those distributed by companies which were MPAA members. They interpreted this as indirect evidence that membership of the MPAA may have facilitated tacit coordination between film distributors.

4.3 Piracy

Many industry commentators have argued that shorter windows are needed to fight piracy, as the following quote from director Stephen Soderbergh illustrates:

"Name any big-title movie that's come out in the last four years. It has been available in all formats on the day of release. It's called piracy. Peter Jackson's Lord of the Rings, Ocean's Eleven, and Ocean's Twelve – I saw them on Canal Street on opening day. Simultaneous release is already here. We're just trying to gain control over it. "

Stephen Soderbergh, December 2005, interview with WIRED magazine

Digital technologies and broadband internet have undoubtedly increased the potential for DVD piracy. Research by the UK Film Council, based on survey estimates from Ipsos, suggests that in 2006 as many as 20.9 million cinema attendances and 26.9 million DVD transactions (rental and retail) in the UK were forgone as a result of piracy. The number of individuals illegally downloading movies is difficult to estimate, though the signs are that it is growing rapidly. Estimates from the British Video Association suggest that as many as 1.7 million people in the UK were already downloading films or TV files illegally in 2003, up three-fold from 2002.

The role of piracy has not been explicitly modeled here, but as we shall see later, it may be one factor explaining recent trends in the window.

⁵ This divergence of interests between individual distributors and distribution companies as a whole is an example of what game theorists call the Prisoners' Dilemma (see, for instance, the exposition in Gibbons (1992)).

5 An econometric model of the theatrical window

In this section we present the results of an econometric analysis of the theatrical window based on our pooled sample of 806 films released in the UK between 1999 and 2006. The model is based on the specification in Waterman and Lee (2002). We posit that a film's theatrical window is determined by:

- its box office performance (to capture the cannibalisation effect);⁶
- the household DVD penetration rate (a proxy for the potency of marketing effects);
- a film's widest point of release (distributors who satisfy audience demand by releasing films on a larger number of sites may do so for shorter periods before releasing them on DVD/video);
- the season in which a film is released (distributors may curtail windows of movies released in the summer in time for the pre-Christmas DVD market);
- the year in which a film is released (to test if economic variables capture the full extent of the fall in windows).

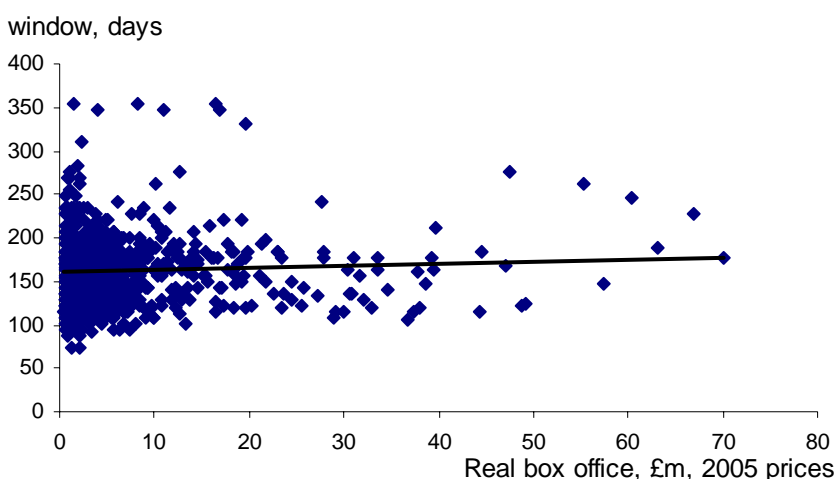
The model is estimated using standard ordinary least squares techniques.

5.1 Graphical analysis

Before presenting the results of the model, it is useful to plot the variables individually against the theatrical window.

Figure 4 shows that the theatrical window shows a positive but only weak correlation with the real box office in the sample as a whole. Figures A6–A13 in the Appendix further suggest that this relationship has varied over time: the correlation appears to have flipped from positive in the first half of the sample period to negative in 2003, though again the relationship is weak.

Figure 4: Theatrical–DVD/video rental window against real box office revenues, 1999–2006



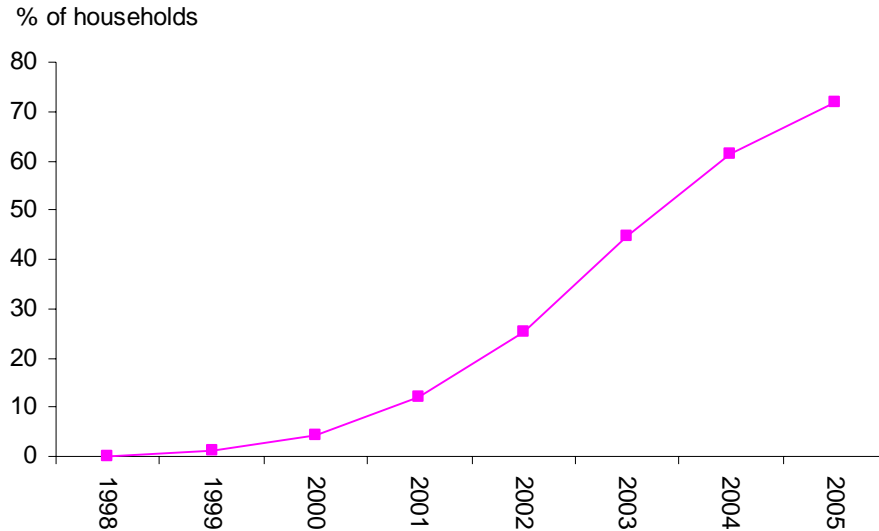
Source: Nielsen EDI, MRIB, Office for National Statistics.

Screen Digest publishes annual data for the proportion of UK households that own a DVD player – the DVD penetration rate – up to and including 2005 (Figure 5).⁷ These show that 72% of

⁶ We allow for the effect of inflation on box office revenues by dividing them through by the all-items consumer price index published by the Office for National Statistics.

households owned a DVD player in 2005, up from 45% in 2003 (though there are signs that the rate of increase is easing off). (The household VCR penetration rate – at 85% – remains higher than DVD ownership, but is some way below the 91% reached in 2001 (Figure A14)).

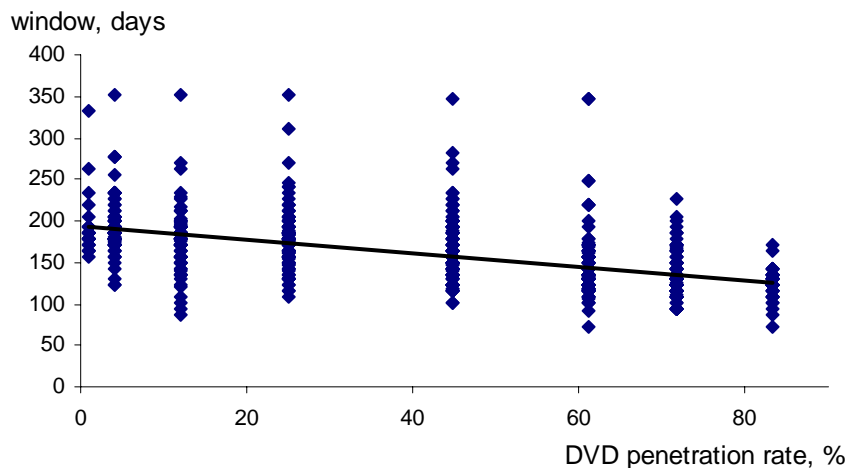
Figure 5: Household DVD penetration rate



Source: Screen Digest.

Since higher DVD penetration implies a larger market for DVD sales, it is not surprising that it is negatively correlated with the theatrical window (Figure 6).

Figure 6: Theatrical–DVD/video rental window against household DVD penetration rate



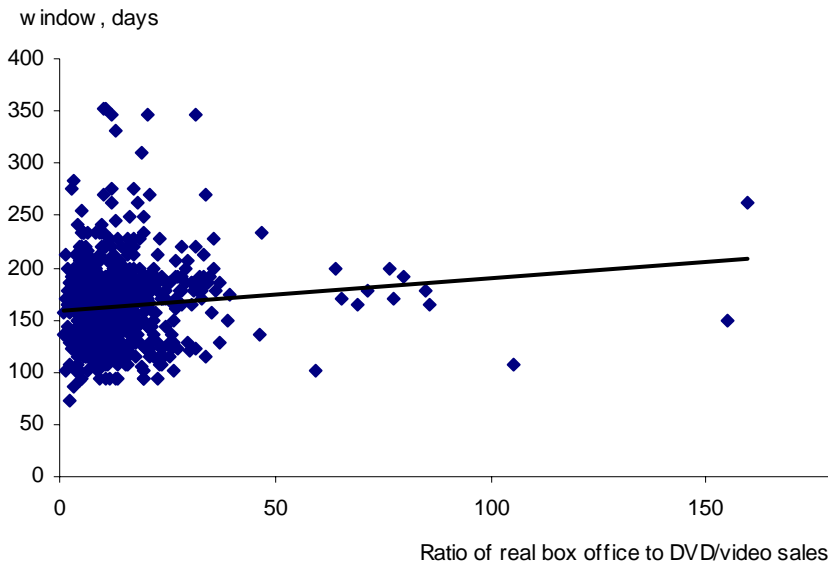
Source: Nielsen EDI, MRIB, Screen Digest.

Taken together, Figures 4–6 suggest that as the DVD market has become a relatively more important source of revenues, the desired trade–off between the cannibalisation and marketing effects has shifted, resulting in shorter windows. This conclusion is reinforced by the positive

⁷ For estimation purposes, as our sample of films includes some movies released on cinemas in the first four months of 2006, we include an estimate – of 83% – for DVD penetration in 2006. This estimate is based on fitting a simple polynomial trend through past data and extrapolating forward the series.

correlation between a film's theatrical window and the ratio of its box office in real terms to DVD sales (Figure 7).

Figure 7: Theatrical–DVD/video rental window against ratio of box office to DVD sales

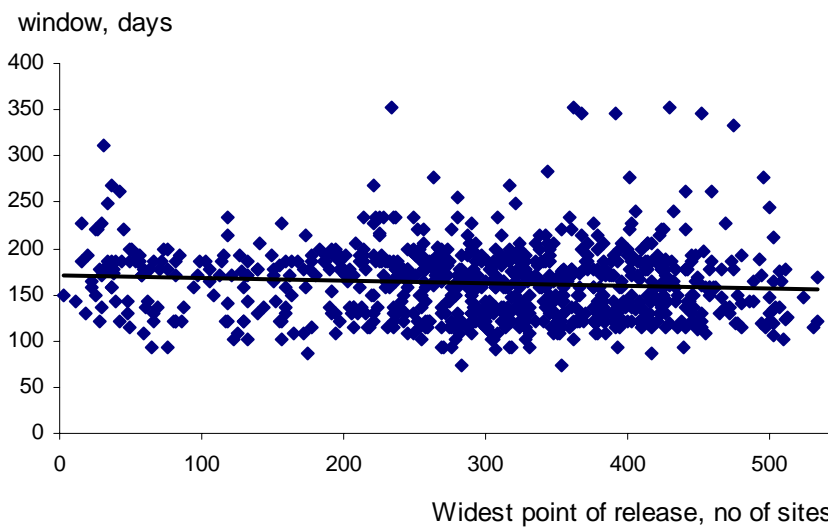


Source: Nielsen EDI, MRIB, National Statistics, UK Charts Company.

Note: This figure excludes a small number of films for which we could not readily match DVD/video sales. Films released at cinemas in January – April 2006 are also dropped from this figure, on the grounds that final DVD/video sales for these films are likely to be much bigger than our estimates. The DVD/video sales and box office numbers are not strictly comparable, as the former cover the UK only while the latter include the Republic of Ireland. Lastly, we implicitly assume that the volume of a film's DVD/video rental transactions is positively correlated with the number of its DVD sales.

The theatrical window also has the expected negative – albeit weak – correlation with a film's widest point of release, suggesting that films that which show on a greater number of sites are, other things been equal, distributed more quickly on DVD/video (Figure 8).

Figure 8: Theatrical DVD/video–rental window against widest point of release



Source: Nielsen EDI, MRIB.

5.2 *Econometric modeling results*

This section summarises the results of our econometric analysis (Figure A15 in the Appendix reports the estimation output in full). Note that the model's overall statistical properties are reasonable – in particular, the model's residuals show little sign of autocorrelation and heteroskedasticity and they appear to be normally distributed.⁸

The model identifies the DVD penetration rate as an important determinant of window size. Household DVD penetration (DVDPEN) enters negatively, meaning that the trend increase in DVD penetration over time has, as expected, pushed down the theatrical window. This effect is robust – as indicated by the very low standard error with which it is estimated (the associated *t*-statistic is almost 6.5).⁹

In contrast, although over the sample period as a whole there is a positive relationship between box office performance (LRBOX) and the theatrical window, the effect is not statistically significant (and, as suggested earlier, may even have become negative in later time periods). Further analysis – not reported in this paper – shows that the cannibalisation effect is no more significant for independent distributors than it is for the majors, nor is it stronger for films which have limited success at the box office. This tentatively suggests that the cannibalisation effect may not be as strong as some have feared, at least at the window lengths experienced to date.

The model also shows that the widest point of release (LWSCR) has a significant negative effect on windows – again as expected – with a *t*-statistic of 2.0. In other words, films which are released more widely tend to come out more quickly on DVD. There is strong evidence that windows are significantly lower for films released on cinemas in the month of July than can otherwise be explained by the model (JULDUM).¹⁰

Finally, an important result is that time dummy variables for the years 2004, 2005 and 2006 are all statistically significant and negatively signed. This suggests that the window has fallen by more in recent years than is explained by the economic variables in the model.

6 Interpretation of results

The absence of a significant box office effect is at first surprising: it suggests that distributors are not adjusting their strategies to capitalise on strong box office performance by extending the

⁸ These statistical diagnostic tests are not reported, but the results are available from the author on request.

⁹ One statistical qualification is that the downward trend in theatrical windows and upward trend in DVD penetration may be spuriously related if the series are individually non-stationary. Unfortunately using our data set it is not possible to meaningfully rule out this possibility with formal cointegration tests, as we only have seven years of data. However, as we have discussed in this paper, there are strong theoretical reasons for expecting DVD penetration and windows to be related in a causal sense, and previous studies have documented this relationship in other countries (eg Frank (1994) for Germany and Waterman and Lee (2002) for the US).

¹⁰ All other monthly dummy variables were statistically insignificant at conventional significance levels. We also tested for whether individual distributors employed different window strategies and whether the window varied systematically across film genre, but found no such systematic pattern. Following Waterman and Lee (2002) we further tried including real interest rate terms to capture the idea that lower interest rates should increase windows by making distributors less impatient for receipts from DVD/video release. These interest rates terms are not significant, no doubt reflecting the low variation in interest rates over our sample period. This contrasts with Waterman and Lee (2002) who did find a significant negative effect from interest rates on the window over their 1988 – 1997 sample period. Interest rates varied greatly over that period.

release window. However, if the desire to coordinate release strategies is strong, it is less surprising that distributors do not fine tune windows for individual films. Screen Digest (2005) also notes the absence of systematic relationship between theatrical window and box office. It argues the relationship is actually negative for the blockbusters, as distributors take advantage of the 'buzz' created by high box office sales to put DVDs out more quickly.

The idea that distributors tacitly coordinate their release strategies is also consistent with the 'bunching' we observe of windows around their median value (Figures A16–A23). If in contrast distributors were picking windows based on the box office performance and DVD/video potential of individual films we would expect far greater variation. Formal statistical tests confirm that there are a greater number of films around the median than would be expected in a normal distribution.

The histograms shown in Figures A16–A23 echo Figure 2 in suggesting some turbulence – or de–bunching – of theatrical windows in 2003 and 2004, followed by re–bunching in 2005 and the first quarter of 2006 (the standard deviation of window lengths steps up in 2003 and 2004 before falling back in 2005 and 2006). One speculative explanation is that the abolition of the rental–retail window in 2002/2003 may have placed stress on industry norms, which – the evidence tentatively suggests – may prove temporary.

Growing concerns about DVD piracy, and fears that new technologies such as video–on–demand and movie downloads will have a negative effect on the market for DVDs, may also have played a role. There is certainly evidence from the econometric model that windows were weaker in 2004–2006 than economic variables such as the increase in household DVD penetration can explain.

7 Areas for further research

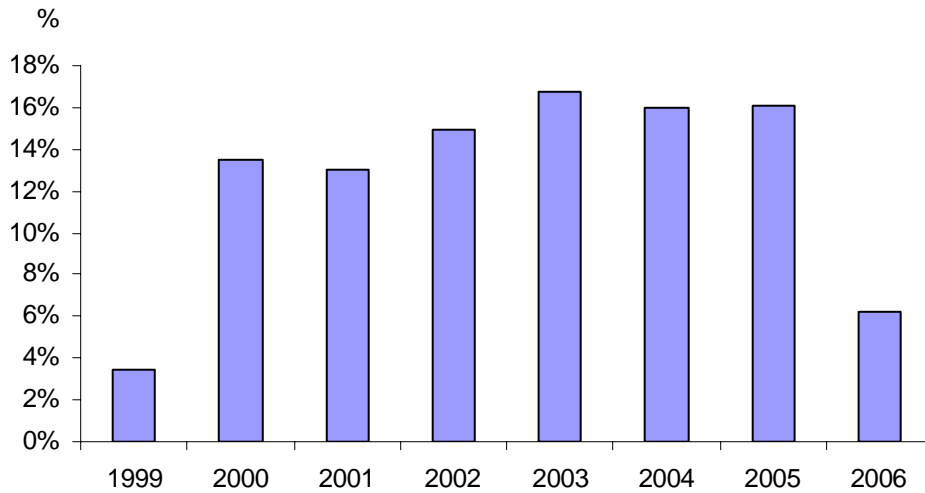
The analysis in this paper suggests several useful areas for further research:

- Analysis of film–goers' attitudes to the theatrical window, and how individuals form their expectations of windows, would directly help understand the importance of the cannibalisation effect. Likewise, it is important to investigate the extent to which cinema and DVD are genuine substitutes, or whether they may in some cases be complements (eg when people buy a DVD if they have enjoyed the film at the cinema).
- There is increasing evidence that distributors use theatrical release as a loss leader for revenues earned through other channels, and in particular DVD sales/rentals. If theatrical release is seen more as a marketing tool than as a revenue generator, marketing effects – as set out in this paper – may be much more important to distributors than the cannibalisation effect. Further research is needed to establish what implications such a strategy would have overall for the choice of theatrical window.
- There is a need for theoretical models which explicitly consider the interests of exhibitors.
- As we have noted, the fall in theatrical windows is an international phenomenon, as are concerns about DVD piracy and the implications of new digital leisure technologies. Analysis of trends in the theatrical window using cross–country data would help to pick out the underlying drivers.

A deeper understanding of these issues could shed light on what the *optimal* release window should be – something that an analysis of historical trends alone cannot achieve.

Appendix

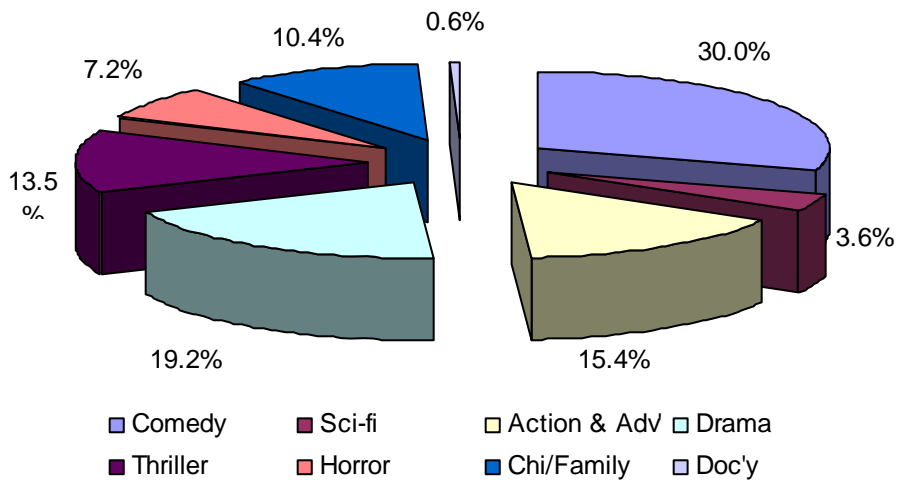
Figure A1: Distribution of films in sample by year, 1999 – 2006



Source: Nielsen EDI.

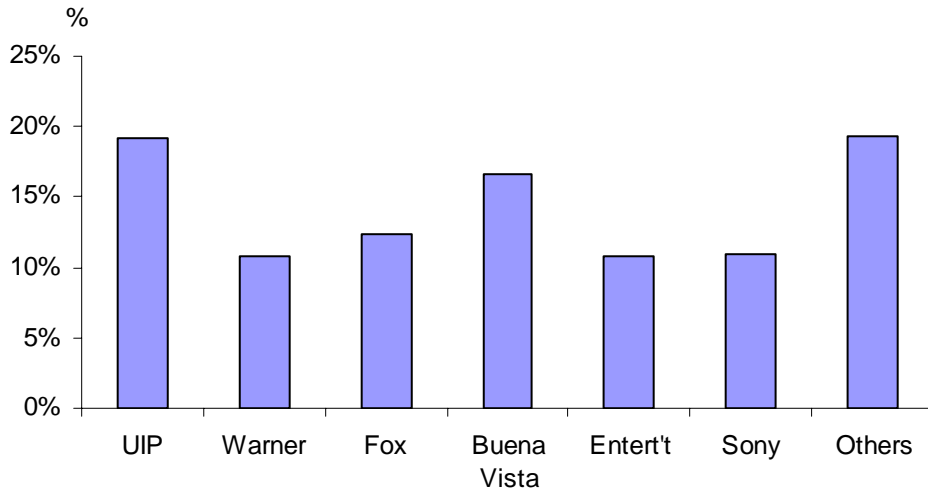
Note: 1999 refers to January – May 1999 and 2006 refers to January – April 2006.

Figure A2: Distribution of films in sample by genre



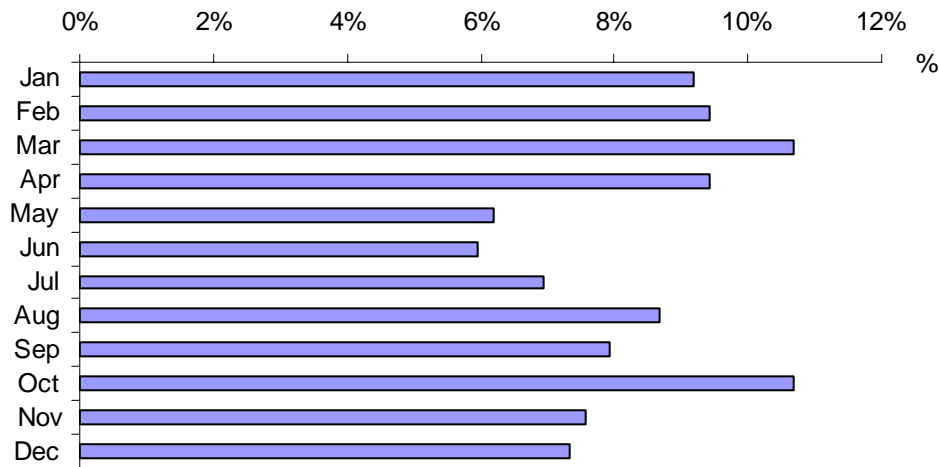
Source: Nielsen EDI.

Figure A3: Distribution of films in sample by distributor



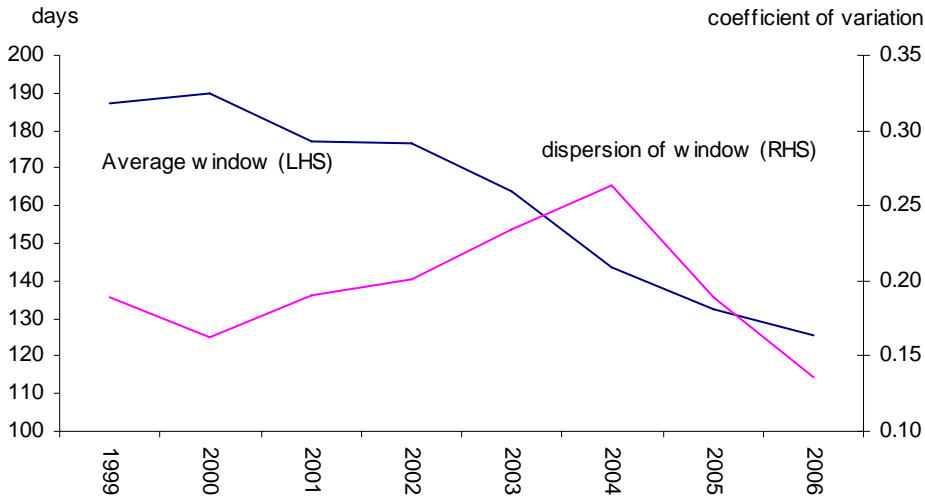
Source: Nielsen EDI.

Figure A4: Distribution of films in sample by calendar month of cinema release



Source: Nielsen EDI.

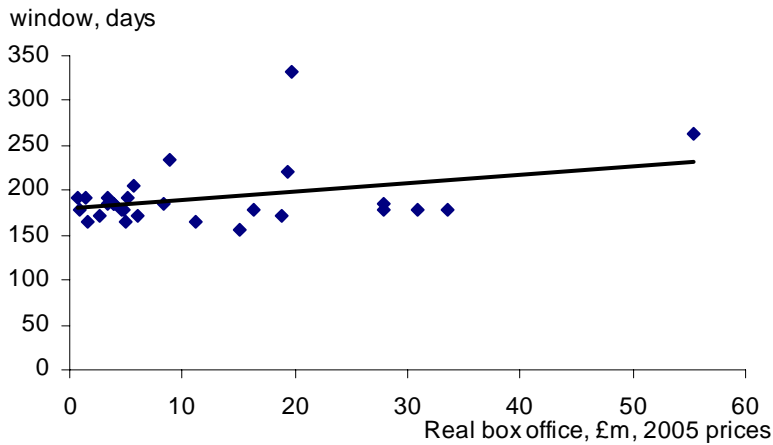
Figure A5: Dispersion of theatrical–DVD/window across films, 1999 – 2006



Source: Nelson EDI, MRIB and author's calculations.

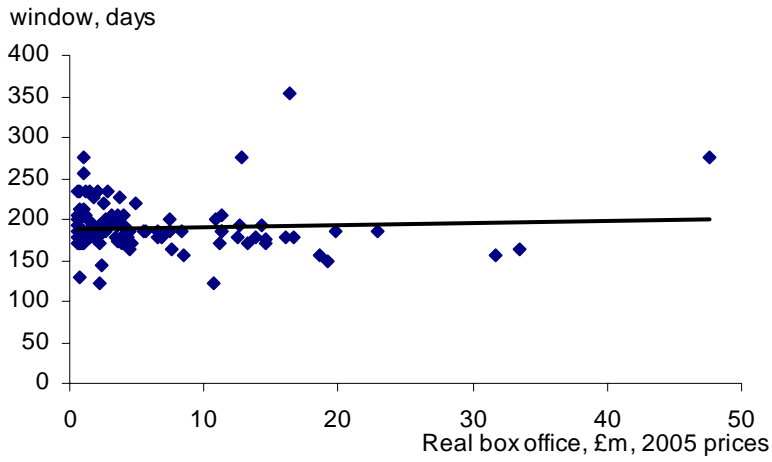
Note: the coefficient of variation for a given year is calculated as the standard deviation of the theatrical window across films released at the cinema that year divided by the mean theatrical window. It is a unit-free number which allows comparison of the dispersion of distributions that have different mean values.

Figure A6: Theatrical–DVD/video rental window against real box office revenues, 1999



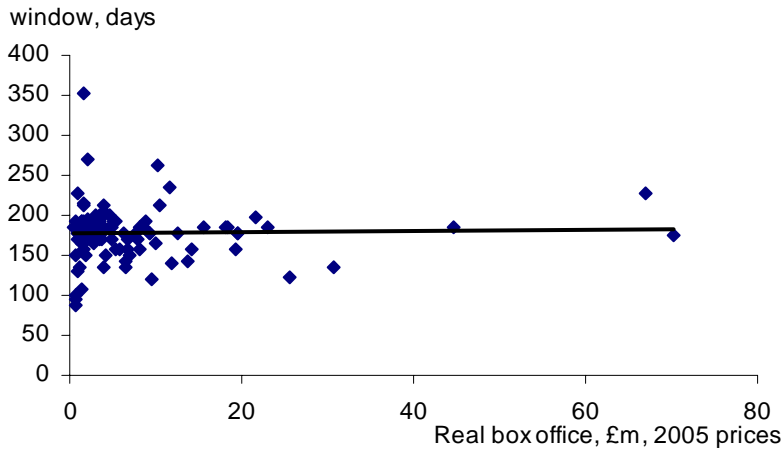
Source: Nielsen EDI, MRIB and National Statistics.

Figure A7: Theatrical–DVD/video rental window against real box office revenues, 2000



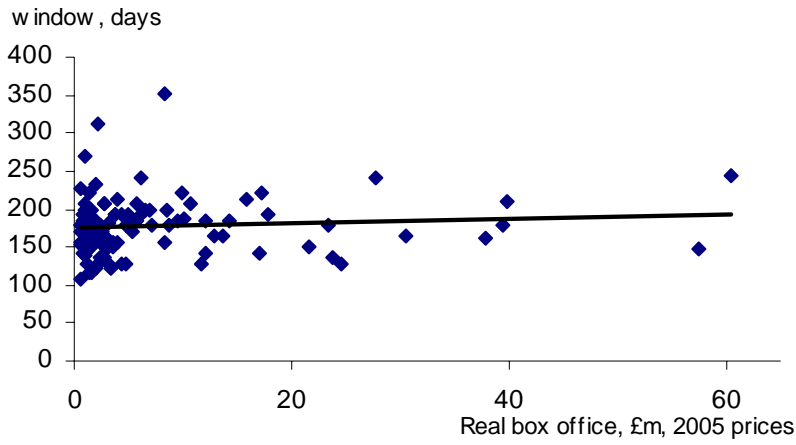
Source: Nielsen EDI, MRIB and National Statistics.

Figure A8: Theatrical–DVD/video rental window against real box office revenues, 2001



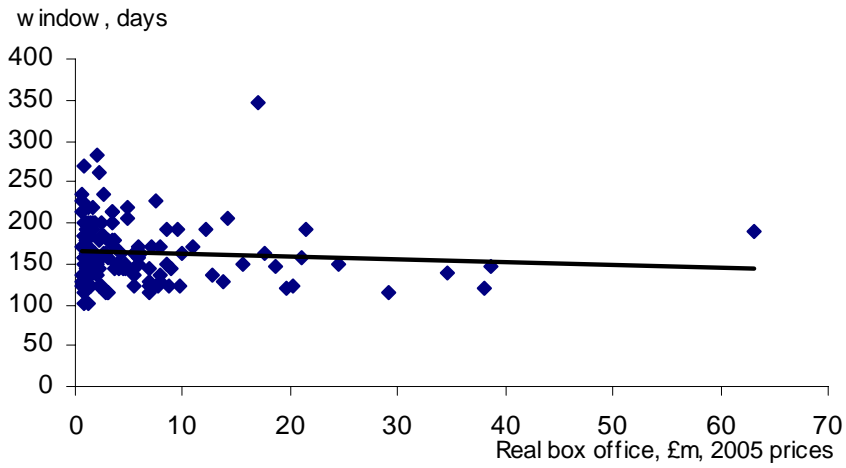
Source: Nielsen EDI, MRIB and National Statistics.

Figure A9: Theatrical–DVD/video rental window against real box office revenues, 2002



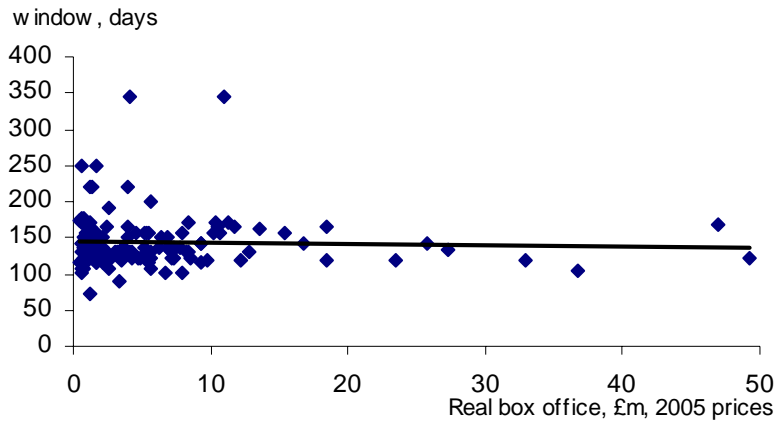
Source: Nielsen EDI, MRIB and National Statistics.

Figure A10: Theatrical–DVD/video rental window against real box office revenues, 2003



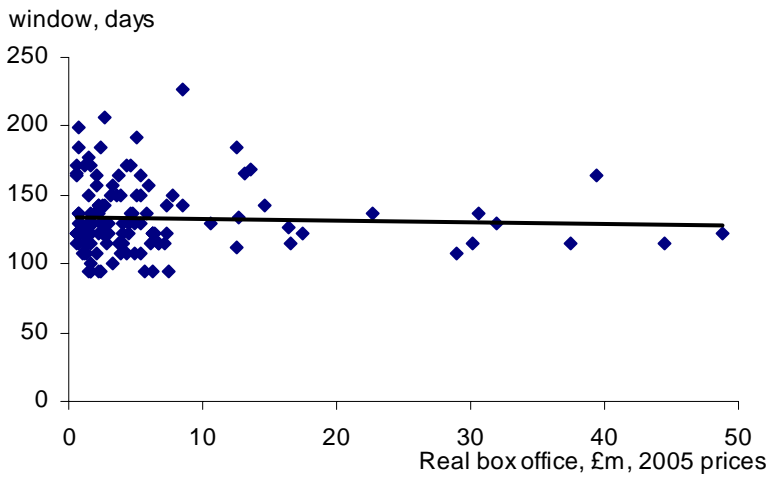
Source: Nielsen EDI, MRIB and National Statistics.

Figure A11: Theatrical–DVD/video rental window against real box office revenues, 2004



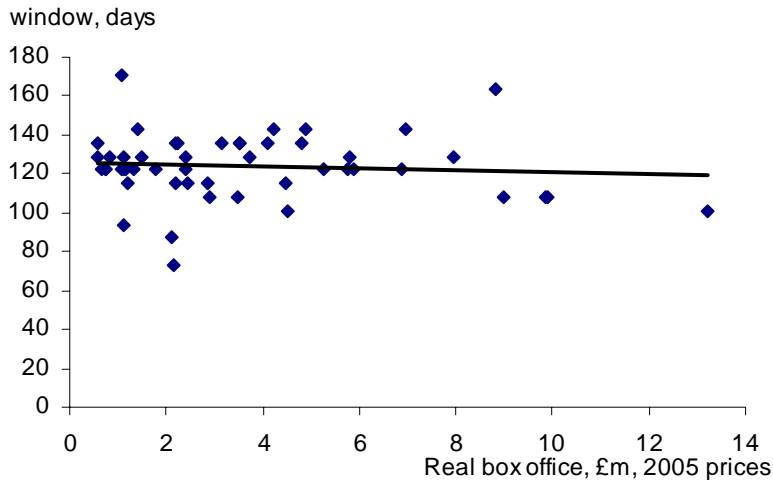
Source: Nielsen EDI, MRIB and National Statistics.

Figure A12: Theatrical–DVD/video rental window against real box office revenues, 2005



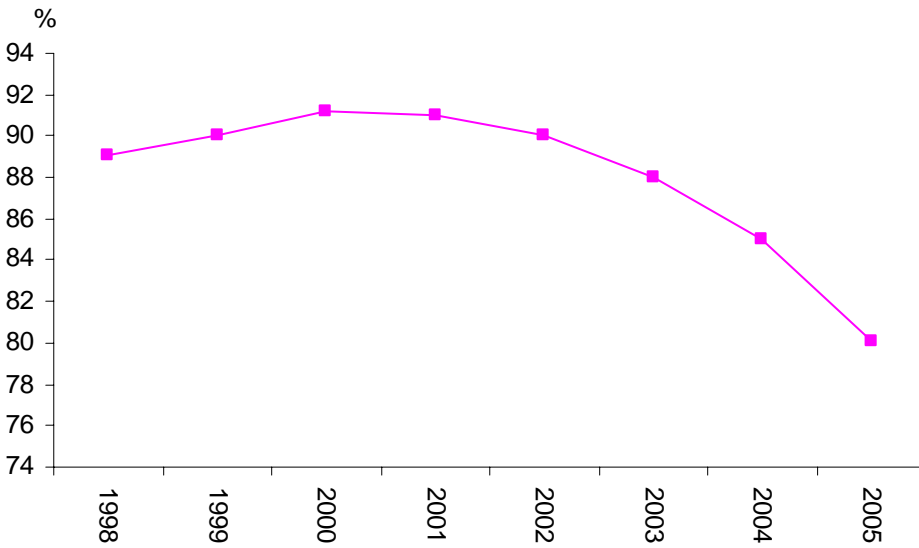
Source: Nielsen EDI, MRIB and National Statistics.

Figure A13: Theatrical–DVD/video rental window against real box office revenues, 2006



Source: Nielsen EDI, MRIB and National Statistics.

Figure A14: Household VCR penetration rate



Source: Screen Digest.

Figure A15: Econometric model of the theatrical–DVD/video rental window

Dependent Variable: LTRWINDOW

Method: Least Squares

Sample: 1 806

Included observations: 806

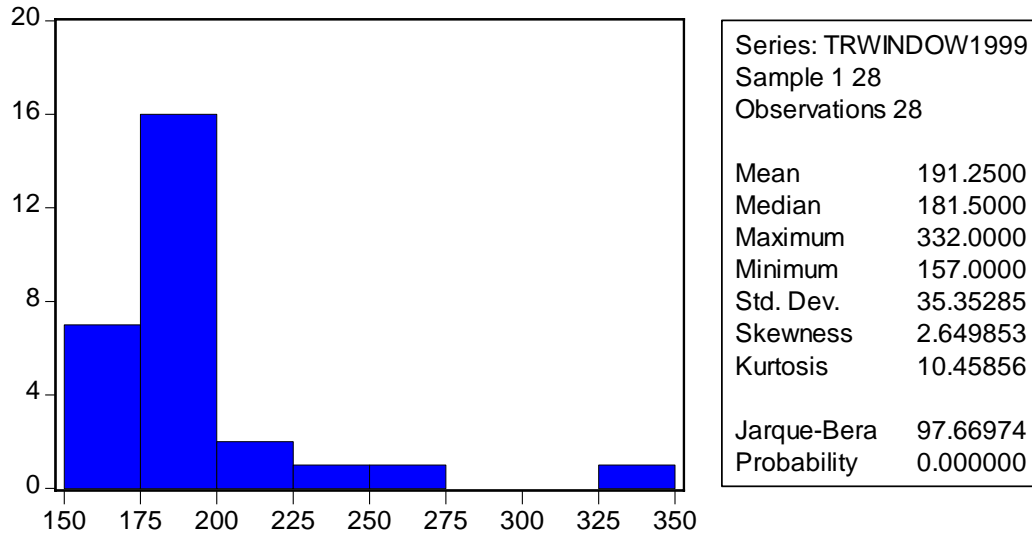
Newey-West HAC Standard Errors & Covariance (lag truncation=6)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5.375160	0.068946	77.96220	0.0000
LRBOX	0.010026	0.008329	1.203698	0.2291
DVDPEN	-0.354432	0.054932	-6.452131	0.0000
LWSCR	-0.026272	0.013224	-1.986722	0.0473
DUM2004	-0.073847	0.030459	-2.424457	0.0156
DUM2005	-0.105984	0.034510	-3.071102	0.0022
DUM2006	-0.136765	0.041624	-3.285686	0.0011
JULDUM	-0.101601	0.028334	-3.585850	0.0004
Adjusted R-squared	0.365879	Mean dependent var	5.055549	
S.E. of regression	0.188906	S.D. dependent var	0.237225	

Source: Diagnostic test results are available from author on request.

Note: The adjusted R-squared indicates how much of the overall variation in the theatrical window can be explained by the model (a value of 0 would suggest that the model can explain none of the variation; a value of 1 would suggest it explains it all). Newey–West standard errors are presented which are robust to serial correlation and heteroskedasticity (though none is detected in the diagnostic tests). The theatrical window, real box office and widest point of release are all expressed in log terms. The -0.35 coefficient on DVDPEN implies that a 1pp rise in the household DVD penetration, say from 83% to 84%, is associated with a -0.35% fall in the theatrical window. At around 125 days this translates into just under 0.5 day. Using this ready reckoner, the estimated 11.6pp rise in the DVD penetration rate in 2006 may have accounted for over five days of the observed fall in windows. The yearly dummy variables take a value of 1 if a film's theatrical release is in the year in question, and zero otherwise. So, for example, DUM2004 has a value of 1 for all films released at the cinema in 2004, and zero otherwise. JULDUM takes a value of 1 if the film's theatrical release is in the month of July, and zero otherwise.

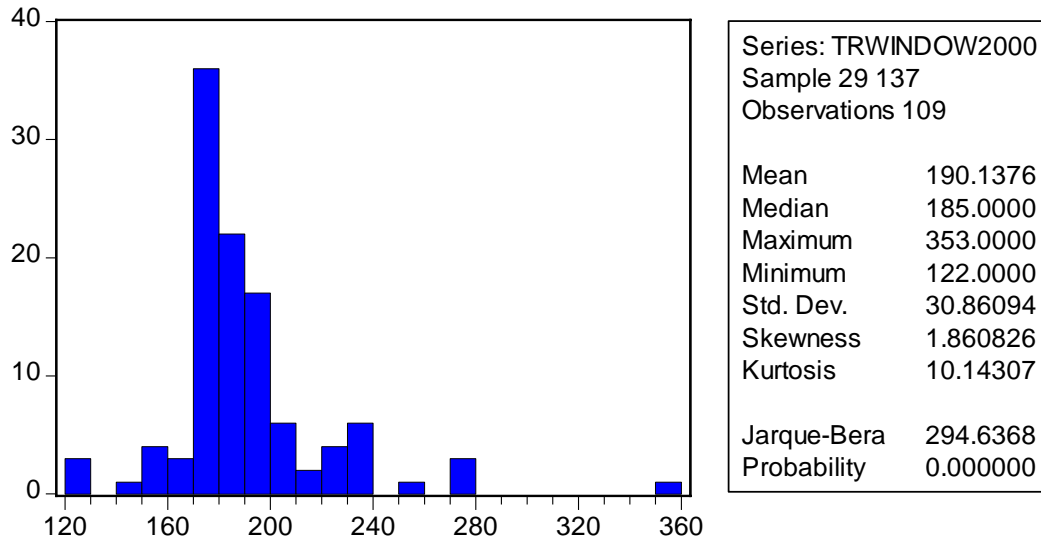
Figure A16: Frequency distribution of theatrical–DVD/video rental window, 1999



Source: Nielsen EDI, BMRB

Note: A probability value below 0.05 for the Jarque–Bera statistic means that the null hypothesis that the distribution is normal is correctly rejected with 95% confidence.

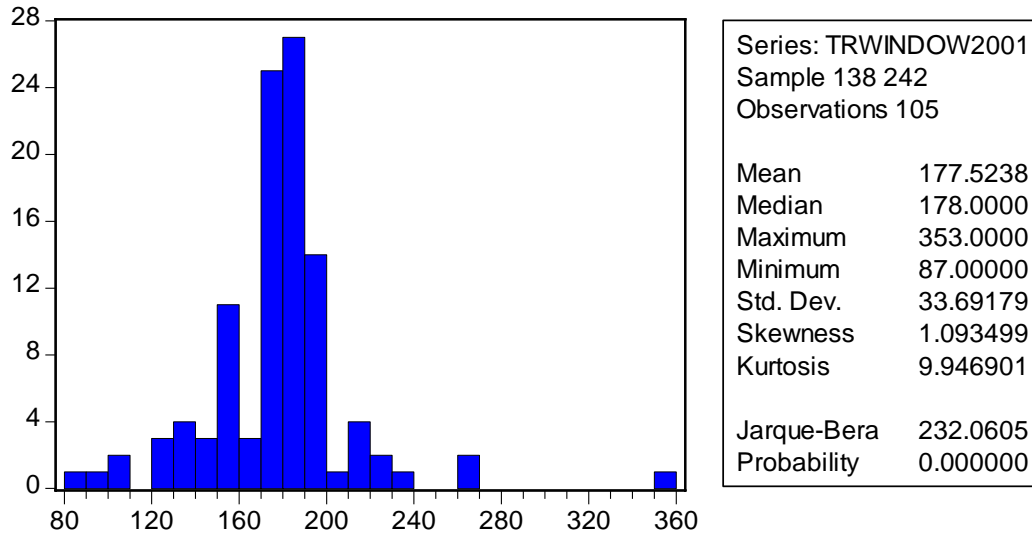
Figure A17: Frequency distribution of theatrical–DVD/video rental window, 2000



Source: Nielsen EDI, BMRB

Note: A probability value below 0.05 for the Jarque–Bera statistic means that the null hypothesis that the distribution is normal is correctly rejected with 95% confidence.

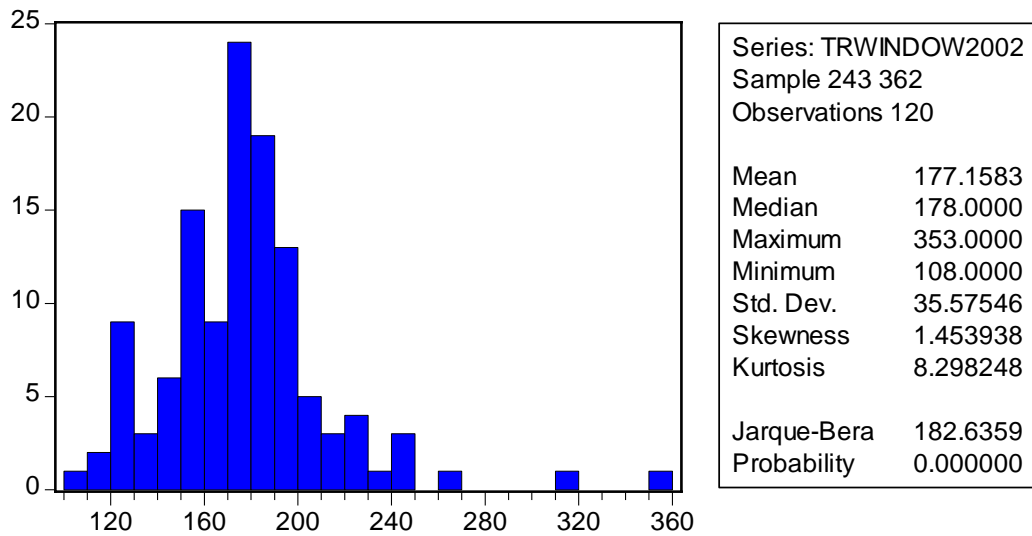
Figure A18: Frequency distribution of theatrical–DVD/video rental window, 2001



Source: Nielsen EDI, BMRB

Note: A probability value below 0.05 for the Jarque–Bera statistic means that the null hypothesis that the distribution is normal is correctly rejected with 95% confidence.

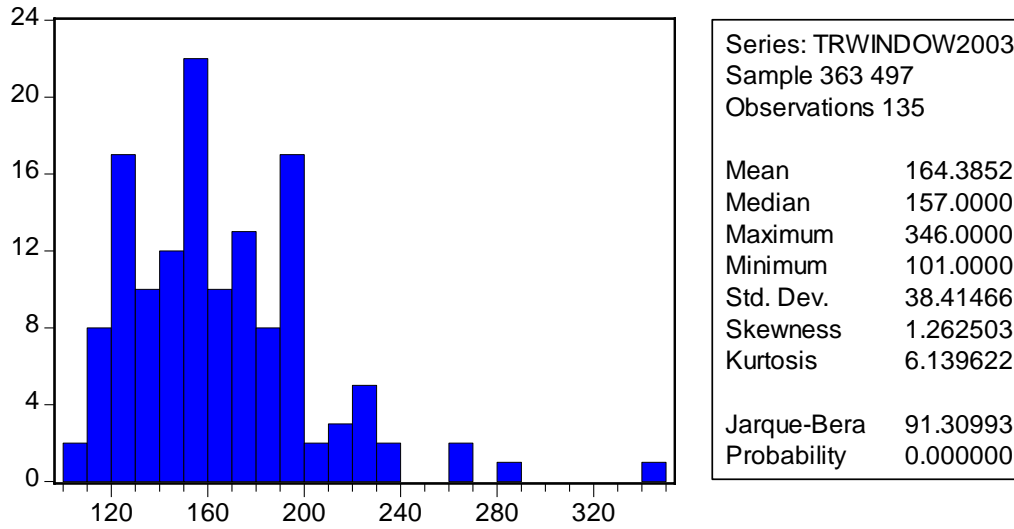
Figure A19: Frequency distribution of theatrical–DVD/video rental window, 2002



Source: Nielsen EDI, BMRB

Note: A probability value below 0.05 for the Jarque–Bera statistic means that the null hypothesis that the distribution is normal is correctly rejected with 95% confidence.

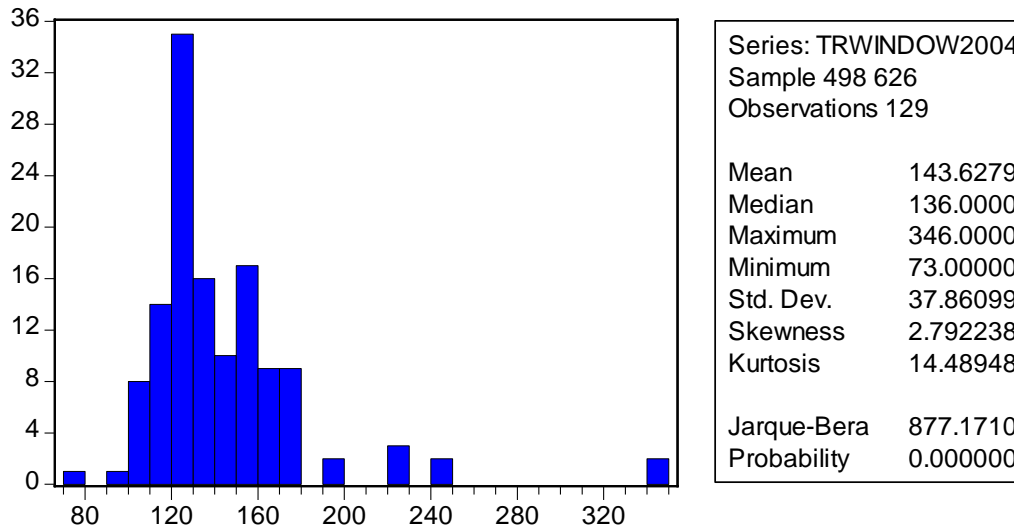
Figure A20: Frequency distribution of theatrical–DVD/video rental window, 2003



Source: Nielsen EDI, BMRB

Note: A probability value below 0.05 for the Jarque–Bera statistic means that the null hypothesis that the distribution is normal is correctly rejected with 95% confidence.

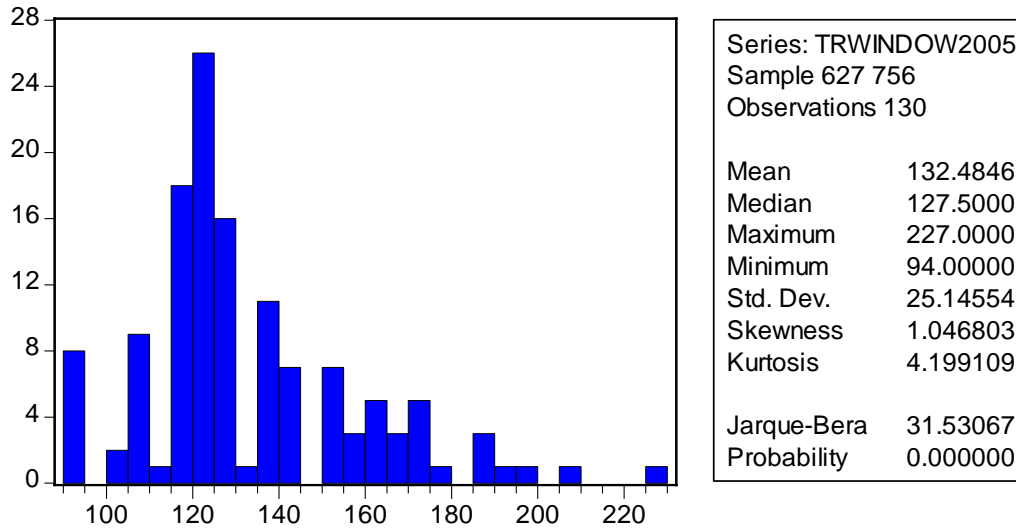
Figure A21: Frequency distribution of theatrical–DVD/video rental window, 2004



Source: Nielsen EDI, BMRB

Note: A probability value below 0.05 for the Jarque–Bera statistic means that the null hypothesis that the distribution is normal is correctly rejected with 95% confidence.

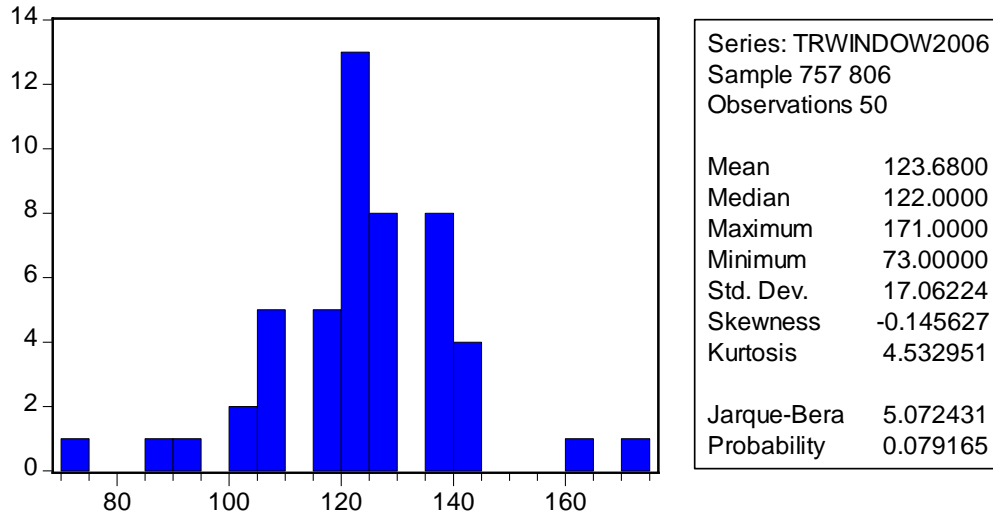
Figure A22: Frequency distribution of theatrical–DVD/video rental window, 2005



Source: Nielsen EDI, BMRB

Note: A probability value below 0.05 for the Jarque–Bera statistic means that the null hypothesis that the distribution is normal is correctly rejected with 95% confidence.

Figure A23: Frequency distribution of theatrical–DVD/video rental window, 2006



Source: Nielsen EDI, BMRB

Note: A probability value below 0.05 for the Jarque–Bera statistic means that the null hypothesis that the distribution is normal is correctly rejected with 95% confidence.

References

Frank (1994), "Optimal timing of movie releases in ancillary markets: the case of video releases", *Journal of Cultural Economics*

Gibbons (1992), *A primer in game theory*, FT Prentice Hall

Lehmann and Weinberg (2000), "Sales through sequential distribution: an application to movies and videos", *Journal of Marketing*

Prasad, Bronnenberg and Mahajan (2004), "Product entry timing in dual distribution channels: the case of the movie industry", *Review of Marketing Science*

Screen Digest (2005), *Squeeze or Stretch? The cinema to DVD window in focus*

UK Film Council (2006) UK Film Council *Statistical Yearbook*

Waterman and Lee (2002), "Time consistency and the distribution of theatrical films: an empirical study of the video window", *Indiana University working paper*

Waterman (2005), *Hollywood's Road to Riches*, Harvard University Press