CENTRE FOR RISK RESEARCH

UNIVERSITY OF Southampton
School of Management

Toward an understanding of variation in the nature of betting market populations via an exploration of the 'weekend effects' in a horserace betting market

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&

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Parallel section 5: Betting

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Contents

Literature – 'weekend effect':

Stock returns are persistently and significantly lower over the weekend than on other days of the week

Financial market:

- Before 1980s: market-based explanations
  - (1) Interest cost resulting from trading settlement lags *(e.g., Gibbons and Hess, 1981; Lakonishok and Levi, 1982)*
  - (2) Measurement errors in bid-ask spreads *(e.g., Keim and Stambaugh, 1984)*
  - (3) Firms tend to release adverse information after trading closes for the weekend *(e.g., Penman, 1987; Damodaran, 1989)*
- After 1980s: participant-based explanations
  - (1) Individual investors tend to be more active on Mondays, particularly in sell-related transactions *(e.g., Lakonishok and Smidt, 1988; Lakonishok and Maberly, 1990; Abraham and Ikenberry, 1994; Brooks and Kim, 1997)*
  - (2) Their trading focuses on the stocks of smaller firms where the weekend effect is more pronounced *(Lakonishok et al., 1992).*
  - (3) Institutional investors tend to be less active on Mondays *(e.g., Osborne, 1962).* This is reflected in lower aggregate trading volumes on Mondays *(e.g., Jain and Joh, 1988; Lakonishok and Maberly, 1990).*

Literature – 'weekend effect' (continued...)

Financial market:

• After 1980s: participant-based explanations (continued...)

As individual investors are less informed than institutional investors, greater activity of individual investors on Monday distorts market prices.

• Summary & implications:

(1) Weekend effect is a persistent feature of financial markets

(2) Recent papers attribute the effect to the trading behaviour of individual (c.f. institutional) investors.

(3) Uneven returns across days of the week implies that abnormal returns may be achievable by trading on the anomaly.

• Limitations:

In stock markets, there is no definitive end point at which the price of a stock can be determined and at which an investor's judgments can be accurately assessed.

Literature – 'weekend effect'

Horserace betting market:

• Evidence:

Correlation between market prices and the outcome of races (finishing order) in weekday races was significantly higher than that in weekend races (0.57 c.f. 0.42) *(Kopelman and Minkin,1991).*

• Implications:

Investment of casual bettors cause distortions in market prices.

• Limitation:

Simply investigating the degree to which market prices correspond to the outcome of a race is not a sufficiently rigorous test of the degree to which the weekend effect distorts the market.

Research Hypotheses

A 'weekend effect' exists in horserace betting markets, namely that prices formed by the wagering decisions of bettors during weekend periods are not as accurate a guide to horses' prospects as those formed in weekday periods

Casual bettors make up a significantly greater proportion of the betting population for weekend races

Why bookmaker - based horserace betting market:

Advantages of bookmaker horserace betting market

- Similarities:
  shared with wider financial markets
- Availability of market prices:
  reflect the public's assessments
- Simpler than wider financial markets:
  an unequivocal outcome (a winner) &
  associated rate of return within a finite time frame
- Bookmakers:
  more akin to market makers in wider financial markets
- Fixed prices (odds):
  attract more serious & informed bettors
- Economic importance:
  UK turnover £15,500 million (2005)

Hence

- Lessons drawn from horserace betting markets
  shed light on investors' behaviour in financial markets

Background: Odds (prices) in horserace betting market

	Odds (Price)	Odds implied probability
Favourite	0.66 to 1	1/(0.66+1)=0.6
Longshot	1.5 to 1	1/(1.50+1)=0.4
Sum of normalised odds implied probability:		**1.0**

Background: well-documented anomaly
Favourite-longshot bias

Longshot

0.2

True winning probability

Favourite

0.8

0.4

Odds-implied probability

0.6

Research design - Data

Data source: U.K. bookmaker horserace betting market supplied by *Raceform Ltd.*

Variables: "Closing bookmaker market prices (odds)" & "finishing positions" for all the horses in the dataset

Time span: 16 June 99' – 13 Aug 00'

Geographic spread: 35 racetracks in the U.K.

Data Structure:

Sample split	Sample period	Weekend		Weekday	
		Races	Horses	Races	Horses
Training sample	16 Jun 99' 15 May 00'	993	10,793	2,655	29,721
Holdout sample	16 May 00' 13 Aug 00'	528	5,669	1,382	14,385
Total		1,521	16,462	4,037	44,106

Research design – Modelling process

Measure mis-pricing (F/L bias) for weekend & weekday:

1. Rate of return across odds categories

(e.g., Ziemba & Hausch, 1986)

2. Parameter in conditional logit model

(Bacon-Shone, Lo & Busche, 1992)

$$p_{ij}^{e} = \frac{\exp\left[\beta Ln\left(p_{ij}^{s}\right)\right]}{\sum_{i=1}^{n_j}\exp\left[\beta Ln\left(p_{ij}^{s}\right)\right]} = \frac{\left(p_{ij}^{s}\right)^{\beta}}{\sum_{i=1}^{n_j}\left(p_{ij}^{s}\right)^{\beta}}$$

Explore the strength of the weekend effect:

Kelly strategy + Jackknife (leave-one-out) procedure

Rate of return > 0 significantly → weekend effect exists

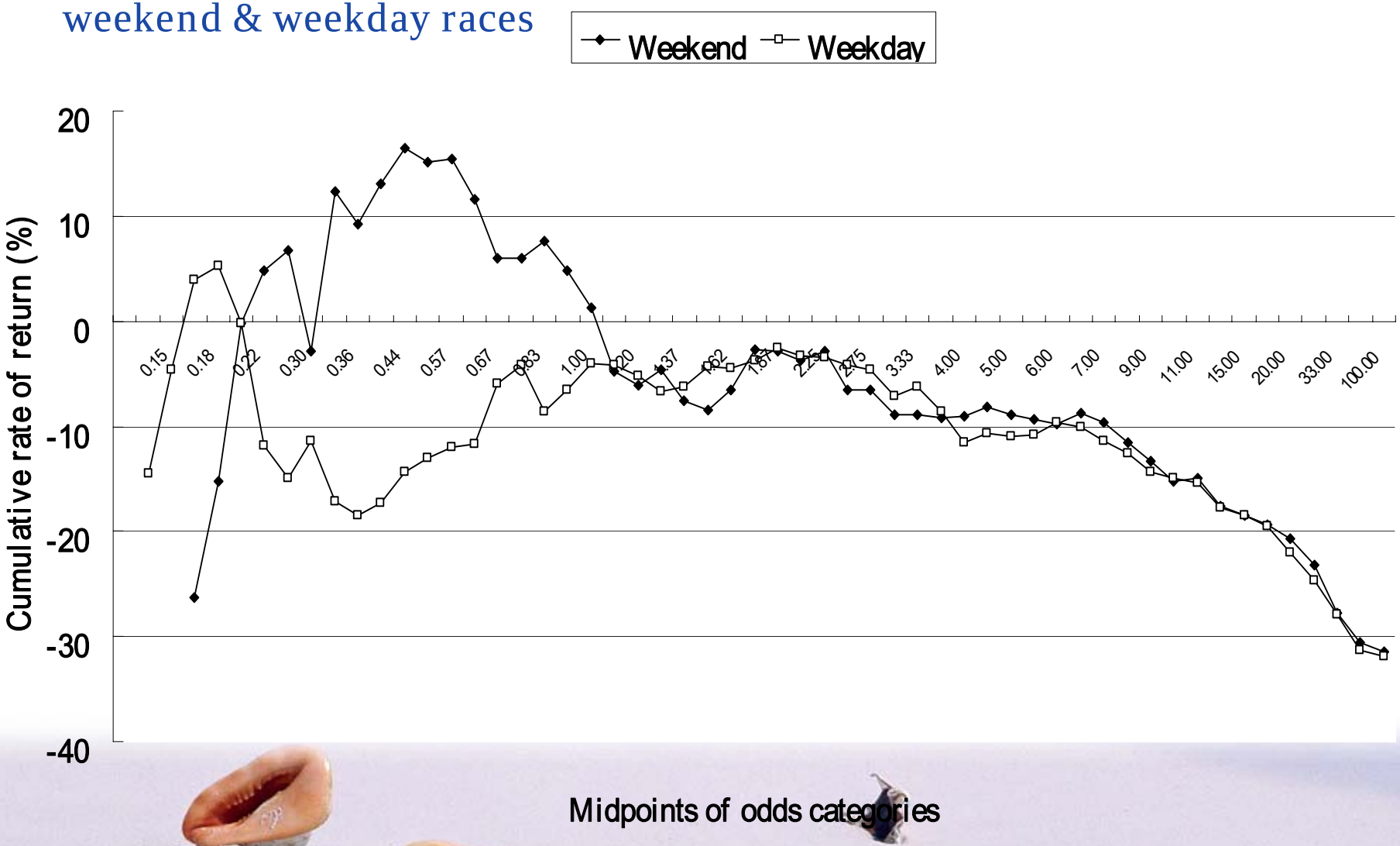
Explore the origin of the weekend effect:

Shin's (1991, 1992, 1993) index

Measure the proportion of informed investors (c.f. casual ones)

Results:
Measure mis-pricing (F/L bias) for weekend & weekday:

(1) Results – Rates of return from bets at given final market odds: weekend & weekday races



Measure mis-pricing (F/L bias) for weekend & weekday:

(2) Results – Conditional logit models for weekend & weekday based on log (normalised odds probability)

Model	Weekend races	Weekday races
Coefficient (β)	1.2421[a]	1.2362[b]
Standard Error	0.0515	0.0299
t-ratio	24.0964	41,2899
LL ratio statistic	3,122.88	8,158.58
Pseudo R-square	0.1611	0.1728
No. of races	993	2,655
No. of horses	10,793	29,721

[a] The coefficient of the weekend model is significantly different from 1 (*t*-value 4.7, p<0.01, n=993)

[b] The coefficient of the weekday model is significantly different from 1 (*t*-value 7.9, p<0.01, n=2,655)

Explore the strength of the weekend effect:

Results – Comparison of returns from various wagering strategies for weekend & weekday markets

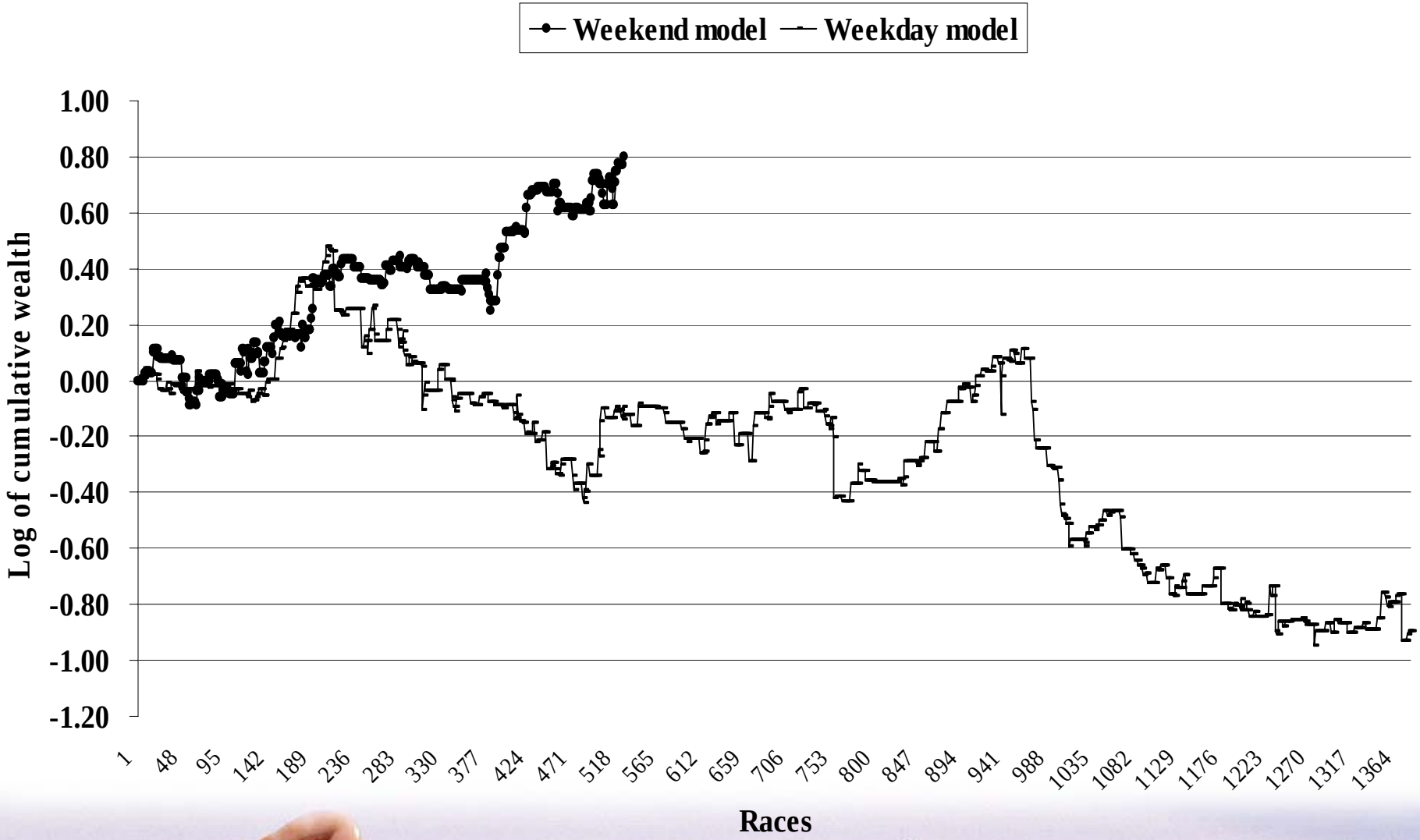
Wagering strategies	Weekend races						*Weekday races*					
	No. of bets	No. of races bet	No. of races won	Amt. bet (£)	Profits (£)	Rate of return (%)	*No. of bets*	*No. of races bet*	*No. of race won*	*Amt. bet (£)*	*Profits (£)*	*Rate of return (%)*
Kelly strategy[a]	187	162	76	4,720	910	**19**	*424*	*370*	*165*	*11,520*	*-520*	***-5***
£1 bet on each horse	5,669	528	85	5,669	-1,834	-32	*14,385*	*1,382*	*228*	*14,385*	*-4,449*	*-31*
Return £1 on each horse if the horse wins	5,669	528	0	641	-113	-18	*14,385*	*1,382*	*0*	*1,685*	*-303*	*-18*
£1 bet on favourite of each race[b]	575	528	189	575	-6	-1	*1,506*	*1,382*	*484*	*1,506*	*-91*	*-6*

[a] A Kelly strategy can involve betting on more than one horse in a race.

[b] Where a race has more than one favourite, £1 is bet on each favourite.

Explore the strength of the weekend effect:

Results – using Kelly strategy for races run at weekends & on weekdays during the holdout period (16 May~13 Aug 00')



Explore the strength of the weekend effect:

Jackknife results (to confirm that the previous results do not derive from the particular selection of the holdout sample):

	Weekends	Weekdays
Mean return (μ) per race	0.00101	-0.00042
Standard error	0.00066	0.00037
H_0: μ= 0 H_1: μ> 0	Significant at 6.4% level	Not significantly different from 0

Hypothesis 1 is confirmed

A 'weekend effect' exists in horserace betting markets, namely that prices formed by the wagering decisions of bettors during weekend periods are not as accurate a guide to horses' prospects as those formed in weekday periods

The case is stronger than the raw results suggest:

- The f/l bias is *greater* in bookmaker markets when a greater proportion of informed traders are present *(e.g., Vaughan Williams & Paton,1997; Bruce & Johnson,2003)* due to the *actions of* bookmakers restricting the prices on longshots to protect themselves from informed traders *(Shin, 1991,1992,1993).*
- Bookmakers' actions are less likely to be the cause of this bias when the proportion of informed traders is smaller in weekend markets.
- As a result, wagering decisions of ***bettors*** cause the ***mis-pricing*** observed during ***weekends***.

Hypothesis 2 is confirmed

Casual bettors make up a significantly greater proportion of the betting population for weekend races

Wagering activity of casual bettors is a factor in weekend effect - in line with speculation concerning the origin of the weekend effect in **wider financial markets** *(e.g., Miller, 1988; Lakonishok and Maberly, 1990; Abraham and Ikenberry, 1994).*

16 June 99 and 13 Aug 00'	Weekends	Weekdays
Mean Shin's z value	2.43%	2.52%
Standard error	0.0002	0.0001
No. of races	1,521	4,037
t-statistic = 3.47		
p-value < 0.0004		

Conclusions

Mis-pricing

Mis-pricing *is shown to occur in races run during weekends* ***and*** *weekdays.*

Only weekends

Only mis-pricing on ***weekends*** *is sufficient for betting strategy to be constructed, based on* ***final market prices****, which results in* ***abnormal returns****.*

Casual investors

Weekend markets attract more ***casual investors****. Their biased decisions appear to cause the* ***weekend effect****.*

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Q & A

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