

An exploration of the origins of the favourite-longshot bias in horserace betting markets

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Nature of the problem



Favourites under-bet & longshots over-bet



Paradox:

- Bettors use complex models (Ceci & Liker, 1986)
- Ideal calibration conditions (Johnson & Bruce, 2001)
- F/L persistent: time, countries, market forms



Exceptions-

- competing explanations adequate?

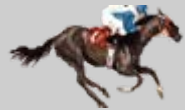


Clues from mkt participants

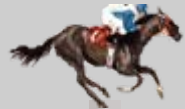
- different populations



Structure of paper



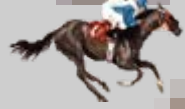
Existing explanations



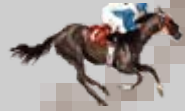
Nature of UK pari-mutuel market



Research questions/hypotheses



Data



Results



Conclusions

Alternative explanations



Cognitive errors

- Under/over est. large/small probs (Kahneman & Tversky, 1979; (Snowberg & Wolfers, 2005)
- Discount fixed fraction losses (Henery, 1985)
- Noise traders (horse's name) (Thaler & Ziemba, 1988)
- Random errors (Chadha & Quandt, 1996)
- Over-confidence (Golec & Tamarkin, 1998)



Non-financial motivation

- Longshot ticket utility (Snyder, 1978; Thaler & Ziemba, 1988)
- Excitement (Bruce & Johnson, 1992)



Alternative explanations



Preferences (rational framework)

- Low prob./high returns (Rosett, 1956)
- Risk loving (Hamid et. al, 1996)
- Positive skewness (Walls & Busche, 2003)



Technical market features

- Positive transaction costs (Vaughan Williams & Paton, 1998)
- Heterogeneous beliefs (Hurley & McDonough, 2005)
- Breakage (Walls & Busche, 2003)



Exceptions



No F/L bias

- HK, Macao, Japan & some US tracks



Reverse F/L bias

- Some tracks in US

Pari-mutuel operators' & bookmakers' view



Two populations of bettors:

- Unskilled/uninformed, leisure/excitement consumers
- Informed/rational, returns seeking, capitalise on biases of the unskilled



Search for markets where each population predominate

UK pari-mutuel market



Odds = bettors subjective probs

$$O_{ij} = \left(\frac{\sum_{i=1}^{n_j} V_{ij}}{V_{ij}} \right) (1-d) - 1$$



One aggregate pool

Home


- Racetrack where race run- 'Home market'

Away

- Remote racetracks- 'Away track market'
- High street betting offices- 'Away shop market'



Multiple betting environments

	Transaction	Costs	Engagement	Information
Mkt.	Variable : takeout + tax	Fixed: Travel entrance		
Home	17%	High	High	Rich/complex
Away track	17%	High	Low	Moderate/ filtered
Away shop	17% + 9%	Low	Low	Moderate/ filtered



Hypotheses?

Hypotheses

Home track:

Motivation: engagement/leisure/financial returns

1. Home track bettors to display greater F/L bias than away market bettors.

Away track:

Motivation: financial returns

2. Away track bettors to display reverse F/L bias

Betting shop:

Motivation: (a) intellectual challenge/profit- small stakes (Johnson & Bruce, 1992)

(b) excitement/leisure/social interaction (Bruce & Johnson, 1995)

3. Betting shop bettors to display less F/L bias than home track bettors & less reverse F/L bias than away track bettors

Data: UK pari-mutuel betting market

 2057 races, 66 racetracks, June-Aug. 1996

 Home track: £15.62m; 84.3% pool

 Away mkt: £2.9m; 15.6% pool

- Betting shop: £1.07m; 5.8% pool

- Away track: £1.82m; 9.8% pool



Degree of F/L bias

Bettors' subjective prob :
$$p_{ki}^s = h_{ki} / \sum_{l=1}^{m_i} h_{li}$$

Conditional logit to model probabilities:

(McFadden, 1974; Bolton & Chapman, 1986)

$$\text{Odds probs: } p_{ki}^o = \frac{\exp(\alpha \ln(p_{ki}^s))}{\sum_{l=1}^{m_j} \exp(\alpha \ln(p_{li}^s))} = \frac{(p_{ki}^s)^\alpha}{\sum_{l=1}^{m_i} (p_{li}^s)^\alpha}$$

$\alpha > 1$ Favours under-bet, longshots over-bet

$\alpha < 1$ Favours over-bet, longshots under bet

Nature of F/L bias

- Compare obj. & subj. probs of horses grouped by:
 - final odds (e.g. Coleman, 2004)
 - degree of favouritism (e.g. Terrell, 1997)



Results



Aggregate Market

Parameter	estimate	standard error	t-statistic	p-value
Ln(subj. prob)	1.0898	0.3321E-01	32.82	0.000

$H_0: \alpha=1 \quad t=2.70$



Favs. under-bet, longshots over-bet





Results: Aggregate Market

Odds range	N	mean net return	Obj. Prob	Subj. – Obj. prob
(0,1)	478	-0.07	0.531	-.05
(1,2.8)	2063	-0.15	0.288	-.01
(2.8,4.5)	2125	-0.19	0.176	-.00
(4.5,6.5)	2061	-0.21	0.122	+.01
(6.5,9)	2043	-0.13	0.099	-.00
(9,12.6)	2052	-0.15	0.072	-.00
(12.6,17.6)	2055	-0.20	0.051	+.00
(17.6,26.3)	2058	-0.18	0.038	+.00
(26.3,45.4)	2053	-0.43	0.017	+.01
(45.4-)	2003	-0.39	0.009	+.00
Sum	18991			



Fav. rank	N	Obj. prob	Subj - obj
1 st	2057	0.337	-.02
2 nd	2056	0.201	+.00
3 rd	2053	0.139	+.01
Sum(fav)	6166	0.226	-.01
4 th	2016	0.097	+.01
5 th	1902	0.071	+.01
6 th	1737	0.064	-.00
7 th	1501	0.055	-.01
8 th	1282	0.041	-.00
9 th	1054	0.034	-.00
10 th -12 th	2005	0.018	+.01
≥ 13 th	1328	0.012	+.00
Sum(long-shots)	12825	0.052	+.00

Results: Home v. Aggregate Away Mkt

Home market

Parameter	estimate	standard error	t-statistic	p-value
Ln(subj. prob)	1.0703	0.3441E-01	31.11	0.000

$H_0: \alpha=1$ $t=2.04$



Favs. under-bet, longshots over-bet

Aggregate away market

Parameter	estimate	standard error	t-statistic	p-value
Ln(subj. prob)	0.7765	.2498E-01	31.08	0.000

$H_0: \alpha=1$ $t=8.95$



Favs. Over-bet, longshots under-bet



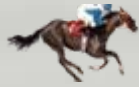
Results: Home v. Aggregate Away Mkt

Odds range	N	Obj. prob	Home Subj -	Agg. Away Obj
(0,1)	478	0.531	-.11	+.08
(1,2.8)	2063	0.288	-.02	+.01
(2.8,4.5)	2125	0.176	+.01	-.01
(4.5,6.5)	2061	0.122	+.01	-.01
(6.5,9)	2043	0.099	+.00	-.02
(9,12.6)	2052	0.072	+.00	-.01
(12.6,17.6)	2055	0.051	+.00	+.00
(17.6,26.3)	2058	0.038	+.00	+.00
(26.3,45.4)	2053	0.017	+.01	+.01
(45.4-)	2003	0.009	+.00	+.00
Sum	18991			

Fav. rank	N	Obj prob	Home Subj. – Obj prob	Agg. away Subj. – Obj prob
1 st	2057	0.337	-.04	+.03
2 nd	2056	0.201	-.00	-.01
3 rd	2053	0.139	+.01	-.02
Sum(fav)	6166	0.226	-.01	+.00
4 th	2016	0.097	+.01	-.01
5 th	1902	0.071	+.01	-.00
6 th	1737	0.064	-.00	-.01
7 th	1501	0.055	-.01	-.01
8 th	1282	0.041	-.00	+.00
9 th	1054	0.034	-.00	+.00
10 th -12 th	2005	0.018	+.01	+.01
≥ 13 th	1328	0.012	+.00	+.01
Sum(long-shots)	12825	0.052	+.01	-.00

Results





Results: Hyp 1

Greater F/L in home v. aggregate away mkt

Home market characteristics:

- Bettors motivated by leisure/excitement
 - Excitement in leisure (Elias & Dunning, 1986)
 - Consume mimetic excitement (suppressed elsewhere)
 - Proximity to race 'engages gears of passion' (Murphy et al 1990)
- Rich/complex information environ.
 - Simplifying strategies (Karen & Wagenaar, 1985)
 - Increased risk taking (Johnson & Bruce 1998)
 - Poor decision making (Bruce & Johnson, 1994)

Results



Away Track Market

Parameter	estimate	standard error	t-statistic	p-value
Ln(subj. prob)	0 .4595	0.1883E-01	24.40	0.000

$H_0: \alpha=1$ $t=-28.70$



Favs. over-bet, longshots under-bet





Results: Away track market

Odds range	N	Obj prob	Subj - Obj
(0,1)	478	0.531	+.05
(1,2.8)	2063	0.288	+.05
(2.8,4.5)	2125	0.176	+.01
(4.5,6.5)	2061	0.122	+.00
(6.5,9)	2043	0.099	-.02
(9,12.6)	2052	0.072	-.02
(12.6,17.6)	2055	0.051	-.02
(17.6,26.3)	2058	0.038	-.01
(26.3,45.4)	2053	0.017	-.00
(45.4-)	2003	0.009	-.00
Sum	18991		



Fav rank	N	Obj prob	Away track
1 st	2057	0.337	+0.05
2 nd	2056	0.201	+0.01
3 rd	2053	0.139	-0.00
Sum(fav)	6166	0.226	+0.02
4 th	2016	0.097	-0.01
5 th	1902	0.071	-0.01
6 th	1737	0.064	-0.02
7 th	1501	0.055	-0.02
8 th	1282	0.041	-0.01
9 th	1054	0.034	-0.01
10 th -12 th	2005	0.018	-0.00
≥ 13 th	1328	0.012	-0.00
Sum(long-shots)	12825	0.052	-0.01

Results: Hyp 2

Favs over-bet and longshots under-bet
in away track market

Returns focussed bettors exploit
F/L bias in home market

Results



Betting shop Market

Parameter	estimate	standard error	t-statistic	p-value
Ln(subj. prob)	0.4193	0.1987E-01	21.10	0.000

$H_0: \alpha=1$ $t=-29.23$



Favs. over-bet, longshots under-bet



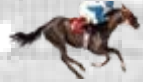


Results: Betting shop market

Odds range	N	Obj prob	Subj - Obj
(0,1)	478	0.531	+.06
(1,2.8)	2063	0.288	-.03
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(45.4-)	2003	0.009	+.01
Sum	18991		

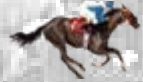
Favs. rank	N	Obj prob	Subj - Obj
1 st	2057	0.337	-.01
2 nd	2056	0.201	-.04
3 rd	2053	0.139	-.02
Sum(fav)	6166	0.226	-.02
4 th	2016	0.097	+0.00
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6 th	1737	0.064	+0.01
7 th	1501	0.055	+0.01
8 th	1282	0.041	+0.02
9 th	1054	0.034	+0.02
10 th -12 th	2005	0.018	+0.02
≥ 13 th	1328	0.012	+0.01
Sum(long-shots)	12825	0.052	+0.01

Results: Hyp. 3



Betting shop:

- Over-betting of short odds
- Under-betting mid-odds
- Over-betting long odds



- Less F/L than Home mkt,
- Less reverse F/L than Away track



Two populations:

- Social interaction/leisure/excitement seekers – F/L
- Intellectual challenge/returns focussed – reverse F/L

Transaction cost debate



Transaction costs → F/L bias?

(Vaughan Williams & Paton (98) v. Hurley & McDonough, 96)



Low T.C. in Home mkt → F/L bias

Low T.C. in Away Track mkt → Reverse F/L bias

High T.C. in Betting shop → Mixed F/L bias

Conclusion



F/L bias varies between locations

- Returns focussed bettors – reverse F/L
- Leisure/excitement/social int. – F/L



T.C. + market ecology → Bettor type → F/L bias

- Proximity
- Social interaction
- Information



Distinct betting populations explain F/L anomalies
e.g HK, Macao, Japan

Market operators are smart!!

