ECON30580 Economics of Betting Markets
15. In-Play Bets and Cash Out

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Part I

In-Play Betting

In-Play Betting

- Fast internet and smartphones have allowed bookmakers to continually offer updated odds on events as they are happening.
- Industry estimates suggest that in-play now accounts for a majority of total sports betting in Europe.
- However, in-play betting is more expensive for bookmakers.
  - Real-time data feeds are expensive: In 2019, the British football leagues sold exclusive in-stadium data rights for the Premier League, EFL and SPFL to Genius Sports for over £70 million per year.
  - They need complex statistical models to price bets in real-time based on the huge amount of information from the data feeds.
  - They need more staff monitoring live markets, suspending and re-opening them when necessary.
- Our monopoly and disagreement model predicts that higher costs mean worse odds and thus higher loss rates.
- This is precisely what happens.

A Jump in Loss Rates When Play Starts

- From www.TheOdds-API.com, I gathered odds quotes for 3 seasons for the English Premier League (EPL), National Basketball Association (NBA) and National Football League (NFL) at four different time snapshots relative to when the games started:
  - One hour before
  - 5 minutes before
  - 5 minutes after
  - 30 minutes after
- I calculated average margins based on the overround calculation and average loss rates for people who would have accepted these bets.
- For EPL, there is a 1.6 percentage point jump in the margin from 5 minutes before to 5 minutes after. The jump in actual loss rates is a bit higher at 1.9 percentage points.
- For NBA and NFL, margins jump about 0.8 percentage points from 5 minutes before to 5 minutes after and then another 0.8 percentage points from 5 minutes after to 30 minutes after. Actual loss rates rise by more than margins.

Margins and Loss Rates Jump As Games Go In-Play

Average implied margins and loss rate across moneyline bets before and after games start in the EPL and NBA (2022/23 to 2024/25 seasons) and NFL (2023, 2024 and 2025 seasons)

	EPL 1X2		*NBA*		*NFL*	
	Margin	*Loss Rate*	*Margin*	*Loss Rate*	*Margin*	*Loss Rate*
One hour before	5.9%	7.8%	4.0%	3.8%	4.1%	6.0%
5 minutes before	5.8%	7.7%	4.0%	3.8%	4.1%	6.0%
5 minutes after	7.4%	9.6%	4.8%	4.6%	5.0%	7.1%
30 minutes after	7.4%	10.8%	5.5%	6.9%	5.7%	7.9%

Favourite-Longshot Bias on Steroids

- For EPL and NBA, I obtained odds for a set of in-play timestamps.
- The timestamps represent the actual passage of time, not game time, so for football 90 minutes here typically means about 20 minutes plus second-half stoppage time remaining.
- I also collected the final odds quotes from the data provider, usually very late in the game.
- The EPL results show a favourite-longshot bias before the matches start, but this gets stronger as the match proceeds: Accepting very late game odds quotes on the biggest longshots—which have an average normalised probability of winning of only 0.4%—gives an average loss rate of 78%.
- The longshots are getting even longer, so you would expect worse returns but the pricing of the longshots gets worse even holding their probabilities fixed.
- The NBA results don't show a favourite-longshot bias before the games but show a strong favourite-longshot bias as the games progress.
- Late game longshot NBA bets lose 95% on average.

Average Losses for In-Play Premier League Betting

Average loss rate on Premier League bets sorted by average normalised probabilities: 5 minutes before game

Normalised probability	*Loss rate*
0.14	14%
0.23	10%
0.28	8%
0.39	5%
0.63	1%

Average loss rate on Premier League bets sorted by average normalised probabilities: 30 minutes after game starts

Normalised probability	*Loss rate*
0.10	23%
0.21	14%
0.28	4%
0.39	9%
0.68	4%

Average loss rate on Premier League bets sorted by average normalised probabilities: 90 minutes after game starts

Normalised probability	*Loss rate*
0.03	46%
0.12	9%
0.25	6%
0.45	5%
0.81	5%

Average loss rate on Premier League bets sorted by average normalised probabilities: Final odds quotes

Normalised probability	*Loss rate*
0.004	78%
0.03	50%
0.07	42%
0.62	11%
0.95	2%

Average Losses for In-Play NBA Betting

Average loss rate on NBA bets sorted by average normalised probabilities: 5 minutes before game

Normalised probability	*Loss rate*
0.22	4%
0.38	4%
0.50	4%
0.62	4%
0.78	4%

Average loss rate on NBA bets sorted by average normalised probabilities: 60 minutes after game starts

Normalised probability	*Loss rate*
0.14	13%
0.32	12%
0.50	6%
0.68	3%
0.86	5%

Average loss rate on NBA bets sorted by average normalised probabilities: 120 minutes after game starts

Normalised probability	*Loss rate*
0.08	46%
0.26	11%
0.50	6%
0.74	3%
0.92	1%

Average loss rate on NBA bets sorted by average normalised probabilities: Final odds quotes

Normalised probability	*Loss rate*
0.05	95%
0.16	71%
0.50	17%
0.84	-6%
0.95	-1%

Why Do NBA Odds Change So Much In-Play?

- Pre-game NBA odds are easy to compare across sportsbooks.
  - Odds are listed on many comparison websites.
  - Sportsbooks know bettors can easily check competitors.
  - NBA bettors are cash cows that sportsbooks want to attract and retain.
- Because of this, we have shown before that pre-game NBA margins are relatively low and even across favourites and longshots.
- In-play betting markets are different.
  - In-play odds are not widely advertised on comparison sites.
  - They are mostly seen only by existing customers on sportsbook apps.
  - Most bettors only have a small number of accounts.
  - When betting live, you are focused on one app on the phone in your hand.
- This gives sportsbooks temporary monopoly power over their customers.
- Market power means maximising profits by pricing with a favourite-longshot bias.

Why In-Play Bets Are Harder for Bettors

- In-play betting involves a much harder probability problem for bettors than pre-game bets.
- Consider a football match between Chelsea and Fulham.
  - Chelsea begin the match as favourites.
  - Suppose Fulham score after 20 minutes.
  - Are Chelsea still favourites? What are the correct odds now?
  - To answer properly you would need a large historical database.
  - And you would also want to consider additional information:
    - ★ possession statistics
    - ★ expected goals
    - ★ quality of chances
- Bookmakers use statistical models and large datasets to price these bets in real time.
- If an in-play bet looks attractive, you may simply be missing information the sportsbook has already incorporated.

Fast and Slow Thinking

- Daniel Kahneman's book *Thinking, Fast and Slow* describes two kinds of thinking.
- **System 1:** fast, intuitive thinking.
  - Is it safe to cross the road?
  - Does this person look friendly?
  - What is 4+4?
- **System 2:** slow, deliberate thinking.
  - What is 17 times 41?
  - How should I invest my money?
  - Are these betting odds good value?
- This task – judging probabilities during play – rewards careful statistical thinking and the use of System 2.
- But in-play betting environments push people toward System 1. Odds are constantly changing and the underlying probabilities are shifting as every second goes by. For most people, placing an in-play bet is a matter of "trusting your gut".

Why Do People Bet On Late Longshots?

- Extremely longshot bets often appear late in games.
- These bets typically have terrible expected returns.
- Behavioural factors likely play a role.
- First, urgency.
  - If you think a comeback is coming, you want to bet quickly before the odds change.
- Second, people often misjudge very small probabilities.
  - A longshot priced at decimal odds of 100 implies a breakeven win rate of 1%.
  - People don't expect to win but hope they will do so just enough to break even.
  - In practice these bets may win only about 0.5% of the time.
  - That means bettors lose about 50% of the amount staked on average.
  - Bettors rarely keep logs of how these kinds of bets perform and probably don't know how bad the returns are.

The Lottery Ticket Effect

- Another explanation is the "lottery ticket" effect.
- Bettors know these bets are very unlikely to win.
- But the rare win can be exciting.
- Imagine correctly predicting a dramatic comeback late in a game.
- The payout is large and the story is memorable.
- The many losses are easily forgotten.
- These bets are often treated as entertainment rather than serious investments.
- But it is useful to remember that, on average, these bets burn a large fraction of the money staked.

Part II

Cash Out

Cash Out: A Key Feature of In-Play Betting

- One reason in-play betting has grown rapidly is the availability of the **cash out** option.
- Bookmakers offer you a guaranteed payment to settle your bet early.
- Example:
  - Your team is winning with ten minutes left.
  - The bookmaker offers a payment slightly below the full payout you would get if your bet won.
  - You can lock in a profit rather than risk a late comeback.
- Cash out looks like sensible risk management.
- But the offer is rarely fair.
- Cash out is simply another transaction with a bookmaker and all transactions with bookmakers are priced with a **profit margin**.
- So regularly accepting cash out offers reduces your expected return.

Why Cash Out Is Tempting

- Cash out appeals to several powerful behavioural instincts.
- **Risk aversion**
  - Locking in a profit feels safer than waiting for the final result.
- **Loss aversion**
  - If you refuse the cash out and the bet later loses, it feels like you lost both the original bet and the cash-out offer. You regret not taking the cash out.
- **System 1 thinking**
  - The instinctive reaction is to take the guaranteed money. Any win is good, right?
  - Evaluating the fairness of the offer requires slower System 2 thinking.

A Simple Cash Out Example

- Suppose you place a unit bet at decimal odds of 1.9.
- The bet has a 50% chance of winning.
- Expected payout rate:
  - $0.5 \times 1.9 = 0.95$
  - Average loss rate of 5%.
- Now imagine the game evolves in two equally likely ways.
  - **Good start**
    - ★ Your team looks strong.
    - ★ Win probability rises to 80%.
  - **Bad start**
    - ★ Your team struggles.
    - ★ Win probability falls to 20%.

If Cash Out Were Fair

- In the good scenario the expected value of your bet is

$$0.8 \times 1.9 = 1.52$$

- Suppose the bookmaker offers you the expected value of your bet as a cash out.
- If your approach is to always stick with your bet in the bad scenario and cash out in the good one, then your expected payout rate when you place the bet is

$$(0.5 \times 0.2 \times 1.9) + (0.5 \times 1.52) = 0.95.$$

  The first bracket here is your expected payout with the bad start and the second bracket is your expected payout from cashing in after the good start.
- The expected payout from this strategy is the same as if you always hang on to the end.
- And you will probably feel more relaxed during the good scenario now that you don't have to worry about your team throwing away its lead. Seems like cash out is a great option.

How Cash Out Really Works

- Bookmakers do not offer fair value.
- Cash outs are priced with a margin.
- Suppose the sportsbook offers only 75% of the value of a winning bet instead of 80%. Instead of 1.52, the offer becomes about 1.43.
- If you cash out in good scenarios but keep the bet in bad ones:

$$(0.5 \times 0.2 \times 1.9) + (0.5 \times 1.43) = 0.90.$$

- Your expected payout falls to about 0.90, so you are losing 10% on average instead of 5%.
- Cashing out when you are losing gives even worse results.
  - Cash out offers are linked to the in-play price of the bet.
  - Late longshot bets already have very large margins.
  - If your bet becomes a longshot, the sportsbook checks the in-play price and offers something similar or worse.

Why Bookmakers Love Cash Out

- Cash out has been a major success for sportsbooks.
- It increases profits in two ways.
  - **Direct margins**
    - ★ Cash out offers are priced below fair value.
  - **Bigger bets**
    - ★ Evidence shows that bettors who avail of in-play cash outs stake more because they believe they can cash out if things go badly.
- The option feels like a safety net.
- But it generally increases bettors' losses.

The Darker Side of In-Play Betting

- **Problem Gambling**:
  - In-play betting provides more opportunities to gamble.
  - Perhaps your bet on United to win has lost, maybe you can put a new bet on during the match to win the money back.
  - This can be particularly attractive for problem gamblers.
  - Studies show gamblers experiencing serious harm are far more likely to bet in-play.
- **Sports Farms**
  - Some operators now offer betting opportunities around the clock.
  - The result is an **always-on gambling environment**.
  - One controversial example involves "sports farms": Low-paid players repeatedly play short matches in warehouse venues and the games are streamed purely to generate betting opportunities.
  - Sports betting platforms often funnel these customers toward online casino games, which have even higher profit margins.
  - Some of the companies that offer these options are linked with organised crime.

Supplementary Material in the Draft Book

- Chapter 23: Betting, Fast and Slow
- Chapter 24: Cash Out and the Dark Side of In-Play