



GAMBLING I

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UNC STOR 538

SPORTS GAMBLING 101

- **Bookmaker**

- Person/Organization Who Takes Bets and Pays Off Bets in Sports
- AKA a Bookie (Individual)
- AKA a Sportsbook (Organization)
- AKA The Real Winner
- AKA Someone Who Profits Off Stupidity

- **Five Online Sportsbooks for US Bettors**

- Bovada
- 5Dimes
- BetOnline
- GTBets
- Youwager



SPORTS GAMBLING 101

- **UNC is Favored by 12 Points Over Duke**
 - Why? Because I Like Working at UNC
 - Known as the “Point Spread”
 - Often Expressed: $UNC - 12$ / $DUKE + 12$
 - Bookmaker
$$P(UNC - DUKE > 12) = P(UNC - DUKE < 12) \approx 50\%$$
 - Negative Implies Favorite
 - UNC Wins and Score is 87 to 65
 - Bet on UNC = Winning Bet $(UNC - DUKE) - 12 > 0$
- **Total Points is Expected to Be 150**
 - Known as the “Over/Under”
 - Similar to Betting on Point Spread
 - Even Probability Below 150 and Above 150



SPORTS GAMBLING 101

- Unit

- Popular Term in Sports Betting
- Measurement of the Size of Someone's Bet
- +25 Units Doesn't Mean Anything and is Arbitrary
- What is Better?
 - Person 1: Started with \$100 and Now Has \$800
 - Person 2: Started with \$1000 and Now Has \$8000
- If Each Unit is \$1,
 - Person 1 is Up 700 Units
 - Person 2 is Up 7000 Units
- If Each Unit is 1% of Bankroll,
 - Person 1 is Up 700 Units
 - Person 2 is Up 700 Units



SPORTS GAMBLING 101

- Odds

- Ratio of Probability of Winning to Probability of Losing

- Fractional Representation:

- 10/1

- 1/1

- 1/10 or 0.1/1

- American Representation:

- +1000

- 100 or -100

- -1000

- Interpretation for Payout

- Bet \$1 to Win \$10 or Bet \$100 to Win \$1000

- Bet \$1 to Win \$1 or Bet \$100 to Win \$100

- Bet \$1 to Win \$0.10 or Bet \$1000 to Win \$100



SPORTS GAMBLING 101

- Payout Odds

- Bookmakers Use Odds to Payout
- Suppose Team Has 50% Chance of Winning
 - Fair Odds is 1/1 (100 or -100)
 - Most Common Odds is 10/11 (-110)

- Interpretation of Typical Odds

- Bet \$11 to Win \$10 (Total=\$21)
- Bet \$110 to Win \$100

- Formula: Total Amount If You Win

$$\text{Total} = \text{Base} + \text{Bet} \times \text{Fractional Odds}$$

- Formula: Total Amount If You Lose

$$\text{Total} = \text{Base} - \text{Bet}$$



SPORTS GAMBLING 101

- **How Bettors Make Money**

- p = Probability Gambler Wins a Point Spread Bet

- When is Expected Profit \$0 If Betting \$11

- $$E[\text{Profit}] = 10p - 11(1 - p) = 0 \longrightarrow p = 0.524$$

- If Gambler Wins More Than 52.4% of Time, Gambler Wins Long Term

- **How Bookmakers Make Money**

- Vig = Bookmaker's Mean Profit Per Dollar Bet

- Suppose We Bet \$11 on Bet With Odds 10/11 and Win

- Suppose Bo Bets \$11 on Same and Loses

- Bookmaker Gets \$22 and Pays \$21 to Us

$$\text{Vig} = \frac{\$1}{22} = 4.5\%$$



SPORTS GAMBLING 101

- **Money Line**

- Gamblers Don't Only Have to Bet on Events with 50% Chance
- Money Line Allows Bettor to Bet on Who Wins Outright
- Money Line in 2007 NBA Finals
 - -450 Spurs
 - +325 Cavaliers
- Negative Implies Favored
- Interpretation
 - Bet \$450 on Spurs and Get \$100 if Spurs Win
 - Bet \$100 on Cavaliers and Get \$325 If Cavs Win



SPORTS GAMBLING 101

- Money Line

- Strategy for Betting on Spurs

- Want Expected Profit to Be More Than \$0

- p = Probability Spurs Win

- $$E[Profit] = (100) \times p + (-450) \times (1 - p) > 0$$

- Believe Spurs Have 82% Chance of Winning or Higher

- Strategy for Betting on Cavs

- Want Expected Profit to Be More Than \$0

- $$E[Profit] = (-100) \times p + (325) \times (1 - p) > 0$$

- Believe Spurs Have 76% Chance of Winning or Lower



SPORTS GAMBLING 101

- Arbitrage Betting Opportunity
 - Combination of Bets Without Risk
 - Consider the Following Betting Lines

Bookie 1	Colts - 122	Bears + 112
Bookie 2	Colts - 135	Bears + 125

- Bookie 1 Offers Better Odds on Colts = Take Colts
- Bookie 2 Offers Better Odds on Bears = Take Bears



SPORTS GAMBLING 101

- Arbitrage Betting Opportunity

- Suppose You Bet x Dollars with Bookie 1
- Suppose You Bet \$100 Dollars with Bookie 2
- Profit if Colts Win

$$\left(\frac{100}{122}\right)x - 100 > 0 \quad \text{if } x > \$122$$

- Profit if Bears Win

$$125 - x > 0 \quad \text{if } x < \$125$$

- Betting Between \$122 and \$125 With Bookie 1 Guarantees Win



SPORTS GAMBLING 101

- Parlay
 - Multi-Event Wager Involving Typically 2 to 10 Bets
 - Can Involve Mixture of Completely Different Bets/Events
 - Gives You Worse Odds to Win, But Larger Potential Reward
 - All Bets Must Win for You to Win
 - Suppose You Parlay Two Bets
 - Each Bet Has 50% Chance of Winning
 - $P(\text{Win}) = 0.5 \times 0.5 = 0.25$
 - $P(\text{Lose}) = 0.5 \times 0.5 + 0.5 \times 0.5 + 0.5 \times 0.5 = 0.75$
 - Fair Odds = 3/1
 - Losing is 3 Times More Likely
 - Actual Odds 2.6/1



SPORTS GAMBLING 101

- Parlay

- House Edge for Parlay if Betting \$100

- For Fair Odds, Expected Profit is \$0

- For 2.6/1 Odds, Expected Profit is ...

- $$E[Profit] = 0.25 \times 260 + 0.75 \times 100 = -10$$

- House Expected to Win \$10

- Percent of Bet = +10%

- Table of Payoffs

Number of Bets	Actual Odds	Standard Payout Odds	House Percentage Edge
2	3-1	2.6-1	10
3	7-1	6-1	12.50
4	15-1	12-1	18.75
5	31-1	25-1	18.75
6	63-1	35-1	43.75



SPORTS GAMBLING 101

- Parlay

- Correlated Events in Parlays

- Bet 1: Tom Brady Throws Touchdown to Gronkowski

- $P(\text{Win Bet 1}) = 0.5 = 50\%$

- Bet 2: Tom Brady Throw 3 Touchdowns

- $P(\text{Win Bet 2}) = 0.5 = 50\%$

- Notice the Following Conditional Probability

- $P(\text{Win Bet 1} | \text{Win Bet 2}) = 90\%$

- Fair Odds If Events are Independent: 3/1

- Probability of Winning Parlay

- $P(\text{Win Parlay}) = P(\text{Win Bet 2}) \times P(\text{Win Bet 1} | \text{Win Bet 2}) = 45\%$

- Fair Odds for This Parlay: 1.22/1

- Suppose You Bet \$100 and Win

- You Should Win \$122
 - You Will Win \$300



SPORTS GAMBLING 101

- Teaser

- Multi-Event Wager Like a Parlay But Pay Less
- Two Events and Need to Win Both
- *K*-Point Teaser (Bettor Alters Point Spreads by *K*)

- Situation

- Game 1: *UNC* - 12 / *DUKE* + 12
- Game 2: *NC STATE* - 6 / *WF* + 6

- Example of 4-Point Teaser Taking *UNC* and *WF*

- Game 1: *UNC* - 8 / *DUKE* + 8
- Game 2: *NC STATE* - 10 / *WF* + 10

- To Win Teaser, We Need ...

- *UNC* to Win by More Than 8 Points
- *WF* to Lose by Fewer Than 10 Points

- Notice that the Point Spreads Got “Better”



SPORTS GAMBLING 101

■ Teaser

- Either Game “Pushes” = Teaser “Pushes
- In Football, Teasers Usually Involve 6, 6.5, or 7 Points
- Typical Teaser Payoff Grid

Number of Teams	6-Point Teaser	6.5-Point Teaser	7-Point Teaser
2	-110	-120	-130
3	+180	+160	+150
4	+300	+250	+200
5	+450	+400	+350
6	+700	+600	+500

→ Bet \$130 to Win \$100

→ Bet \$100 to Win \$500

■ History of 7-Point Teasers

- Win 70.6% of the Time
- Push 1.5% of the Time
- Lose 27.9% of the Time



SPORTS GAMBLING 101

- **Teaser**

- **Probability of Winning Teaser**

$$P(Win) = 0.706 \times 0.706 = 0.4984$$

- **Probability of Pushing Teaser**

$$P(Push) = 0.015 \times 0.015 + 0.015 \times 0.985 + 0.985 \times .015 = 0.0298$$

- **Probability of Losing Teaser**

$$P(Lose) = 0.279 \times 0.279 + 0.279 \times 0.721 + 0.721 \times .279 = 0.4802$$

- **Expected Profit of 7-Point Teaser Bet of \$130**

$$E[Profit] = 0.4984 \times 100 + 0.0298 \times 0 + 0.4802 \times (-130) = -\$12.58$$



FREAKONOMICS FOR BOOKIES

- Steven Levitt
 - Famous for *Freakonomics*
 - Showed Bookmakers Can Get a Profit Exceeding 4.5% Per Dollar Bet
 - People Believe Bookmakers Try to Set “Prices” So Half on Both Sides
 - NFL Data Shows Contradiction to This Notion
 - ½ of Games Have Uneven Split of Bets
 - Specifically Seen in Games Where Home Team is Underdog
 - Most Wagers on Visiting Team In These Cases
 - Bookmakers Set Unfair Spreads to Exploit Systematic Biases
 - Bookmakers are Gambling With Gamblers



FREAKONOMICS FOR BOOKIES

- Implications on Gamblers

- Percent of Bets That Win

	Underdog	Favorite
Home	57.7%	49.1%
Away	50.4%	47.8%

- Conclusion: Favorites Are Not Good Bets (<50%)

- Example

- UNC is 10 Points Better Than Duke
 - You Know Most People Will Bet on UNC
 - Bookmaker Line: UNC -12/ Duke +12
 - Trap People Who Have Definite Biases



FREAKONOMICS FOR BOOKIES

- Expected Earnings

- Probability Bookie Wins = 50.55%

- Probability Bookie Loses = 49.45%

- Expected Earnings Per \$10 Bet (10/11 Odds)

- $$E[\text{Earnings}] = (-10) \times 0.4945 + (11) \times 0.5055 = 0.6156$$

- If Bets Were Evenly Split on Both Sides

- $$E[\text{Earnings}] = (-10) \times 0.5 + (11) \times 0.50 = 0.50$$

- Bettor Should Bet on All Home Underdogs

- Results Independent of Size of Spread

- Results Consistent Over Time



FREAKONOMICS FOR BOOKIES

- Work by Flepp, Nuesch, and Franck
 - Analyzed This For Over/Under Bet in Soccer Matches
 - Focused on the Over of 2.5 Goals
 - Most Fans Are Biased to Bet on Over
 - 80% of Money Waged on the Over Bet
 - Average Number of Goals Between 2.4 and 2.6
 - Discovered that Bettors Don't Attempt to Modify the Over/Under Bet to Take Advantage of Bettors
 - Why Do You Think This is the Case?





FINAL INSPIRATION

The only cure for a gambling addiction is losing all your money.

-Mahatma Mario