

# High-stakes hedges are misunderstood too. A commentary on: “Valuing bets and hedges: Implications for the construct of risk preference”

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## Abstract

Frederick, Levis, Malliaris & Meyer (2018) report a package of laboratory studies where participants underestimate the value of “hedges”: Risky bets which cancel out the risk of another presently-held bet. However, it might be questioned to what extent laboratory findings predict field behavior. People might better understand hedges when more money is at stake, or when they have more time to reflect. We discuss three gamblers who, instead of hedging, used a costly “cash-out” option to eliminate the risk of their bets on Leicester FC’s improbable victory in the 2015/2016 English Premier League soccer season. The decision to cash-out rather than to hedge led to individual losses of up to £8,000, and did not seem plausibly explained by rational economic factors. High-stakes hedges are misunderstood too.

Keywords: gambling, sports betting, hedging, cash-out, soccer

## 1 Introduction

Frederick, Levis, Malliaris and Meyer (2018) demonstrated a laboratory phenomenon where participants systematically undervalued a pair of bets which perfectly “hedge” (eliminate) each other’s risk. Participants were first asked their maximum willingness to pay for a \$10 bet that a given fair coin lands heads. Most participants answered less than \$5, in line with risk aversion. Participants were then asked how much they would pay for \$10 if the same coin lands tails, given that they already own a \$10 bet on the coin landing heads. In isolation these bets are risky, but as a pair they perfectly hedge each other’s risk, and are equivalent to being given \$10 for sure (the coin must land either heads or tails). But most participants in Frederick et al.’s studies valued the pair of bets at well under \$10, effectively leaving free money on the table. These studies were, however, conducted in the laboratory, and only two studies involved non-hypothetical payoffs. Replications of Frederick et al.’s effect performed by Chatterjee and Mookerjee (2018) were also conducted with hypothetical payoffs. It is plausible that these instances of economic irrationality will disappear for more consequential decisions outside of the laboratory. Sports betting is a natural domain to investigate this question.

## 2 A real-life scenario: The 2015/16 English Premier League

The 2015/2016 English Premier League soccer season thrust a few sports bettors into some consequential potential hedging situations. The Premier League features 20 teams each year, but success is highly concentrated, with only six unique teams having won the Premier League since its inception in 1992. The previous season Leicester FC had barely survived in the League, finishing 14th out of 20 teams (teams finishing 18th to 20th in the Premier League are relegated and forced to play the next season in a lower division). A bet on Leicester at the start of the season to win the Premier League could earn £5,000 per £1 risked — an event that no soccer fan could imagine happening (Khan, 2016). Nonetheless, some people did bet on Leicester at these odds — presumably loyal Leicester fans (Massey, Simmons & Armor, 2011).

Leicester started the season well, winning their first match in August, and were even on top of the League on Christmas day. A defeat on December 26th saw Leicester slip to second place. In all expectation, Leicester would slip further behind, as the busy period of holiday season fixtures tends to favour the established clubs who can afford larger squads of more famous players. However, Leicester returned to the top on January 16th, and remained there until the end of the season, winning England’s top division for the first time in their 132-year history on May 2nd 2016 with two matches still to play.

This period from January 16th to May 2nd 2016 provides a window into the relevance of Frederick et al.’s results to consequential high-stakes decisions. As the remainder of the

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season played out, Leicester bettors began to contemplate that they could win some life-changing amounts. Table 1 summarizes three cases reported in the media, with potential payouts from £5,000 to £250,000.

### 3 Opportunities to hedge

Modern sports betting markets create multiple opportunities to hedge risk. A bettor wishing to hedge the risk of Leicester winning could bet with a bookmaker on all the other teams that could still mathematically win the league. The odds on each team winning will vary, but there will always be a bet size for each contender which will guarantee a sure amount no matter what happens — a perfect “dutching” hedge (Axén & Cortis, 2019). A simpler alternative is to use a betting exchange, where bettors trade amongst themselves and the exchange takes a percentage commission (Cortis & Briguglio, 2017). A bettor can “lay” the odds on Leicester, a bet which pays-off *only* if Leicester do not win the League. The original bet on Leicester to win the League, plus a lay bet on Leicester not to win the league, is therefore a pair of hedged bets, just like the bets on heads and tails in Frederick et al.’s studies. We call this approach a lay-hedge for the sake of simplicity. A lay bet can be used to hedge the risk of Leicester winning, and calculation of the correct bet size will guarantee a sure amount no matter what happens (Axén & Cortis, 2019).

Here we will demonstrate how to calculate a lay-hedge for the original bet, using the case reported on 12<sup>th</sup> February 2016 (Table 1) as an example. This bettor placed £1 at odds of £5,000. That is if Leicester won the league in May, the bettor would have received £5,000. When looking at betting markets, the odds for Leicester to win the league on 12th February were approximately 4. That is, any bettor placing a new bet on 12th February 2016 on Leicester to win the league (that ends in May) would have received £4 for every £1 bet. The lay-hedge bet size that results in an equal payoff irrespective of outcome can be calculated as follows:

$$\frac{(1 - \text{betting exchange commission}) \times (\text{potential win from already placed bet})}{\text{odds-betting exchange commission}}$$

This equation is derived by equating the potential wins from Leicester winning net of the cost of placing a lay bet, and the potential gains from the lay bet if Leicester does not win. Our calculations indicate that the bettor could have hedged the original bet’s risk by laying  $\frac{(1-5\%) \times 500}{4-0.05} = £3,797.47$  on the betting exchange. This creates a perfect hedge as follows. If Leicester win the league, the £5,000 profit from the original bet, minus a loss of £3,797.47 from the hedge, results in a profit of £1,202.53. If Leicester failed to win the league, the bettor would have not received anything from the original

bet, but still have received £1,202.53 from the lay-hedge. In either case, the profit is the same. Table 1 reports these calculations for each of the three bettors.

Bookmakers offer another way to exit bets. Bettors are offered sure amounts that they can “cash-out” a risky bet for (Lopez-Gonzalez & Griffiths, 2017). This offer is much simpler to understand than a hedge. Table 1 lists the sure amounts that each reported case cashed-out for. For example, the first bettor who could have gotten £1,202.53 from lay-hedging, but accepted a cash-out of £1,100.22 from the bookmaker, resulting in a loss of £102.31. Bettors cost themselves up to £8,173.47 by cashing-out instead of lay-hedging.

However, there are two noteworthy economic differences between lay-hedging and cashing-out. First, hedging requires additional funds for the offsetting bet. This additional money may not be trivial; Table 1 calculates these amounts as from £3,797.47 to £169,491.50. However, bettors without this additional money on hand should be able to borrow the required money from a range of sources, construct the hedge, and still gain more after repaying interest on the loan than they received from cashing-out. They could have borrowed the funds at an Annual Percentage Rate (APR) of between 11.1% to 28.8% APR, and would have still earned more by lay-hedging than by cashing-out (see Table 1). Any financially savvy lender would have been able to lower the interest rate charge used to lay-hedge given the risk-free circumstances of the loan.

Second, hedging means receiving the sure amount after a delay, whereas cashing-out is instant. Time preference is therefore a potential economic reason to cash-out now rather than hedge with a delay. However, the percentage profits of a lay-hedge over a cash-out ranged from 9.3% to 11.3% of the amount cashed-out for, which translate to annual equivalent rates (AERs) of 42.3% to 77.7% (see Table 1). These rates of return are much higher than returns on conventional investments, and were risk free. Only very impatient decision makers should prefer to cash-out now than to hedge at those rates of return (Frederick, Loewenstein, & O’Donoghue, 2002).

In conclusion, at least some of these observed cases of cashed-out Leicester bets may be due to an inability to comprehend the logic of hedging — rather than alternative economic explanations. It is unclear why the bettors did not seek professional advice when faced with such large sums. We conclude that a misunderstanding of hedging logic, shown in experimental studies (Chatterjee & Mookerjee, 2018; Frederick et al., 2018), extends to consequential high-stakes decisions. And in fact, when considering Frederick et al.’s studies 1a-1g, we note that the largest undervaluation of the hedged portfolio occurred for the highest-stakes non-hypothetical study (study 1f, with one \$100 bet played out for real). This misunderstanding of hedging logic appears robust to payoff size.

TABLE 1: Cash-out versus hedging calculations.

Reported date	12 <sup>th</sup> February 2016 Whaling (2016)	5th March 2016 Press Association (2016)	8th March 2016 Innes (2016a) Davis (2016)
Bet size	£1	£20	£50
Potential win if Leicester are champions	£5,000	£100,000	£250,000
Amount cashed-out for	£1,100.22	£29,000	£72,335
Certain amount available via laying	£1,202.53	£32,203.39	£80,508.47
Gain from laying	£102.31	£3,203.39	£8,173.47
Percentage gain from laying	9.2% (92 days, 42.3% AER)	11.0% (71 days, 71.4% AER)	11.3% (68 days, 77.7% AER)
Assumed available lay odds	4	3	3
Amount required to lay (& APR of loan for equivalency to cashing-out)	£3,797.47 (11.1%)	£67,796.61 (26.8%)	£169,491 (28.8%)

*Note:* The assumptions are lay odds of 4 in February and 3 in March (Innes, 2016b; Schooler, 2016), and a 5% betting exchange commission. Both of these are conservative estimates, which ensure we do not overestimate the possible gains from hedging. An explanation of how betting exchanges work can be found in Cortis and Briguglio (2017). “Reported date” is the day that the bet was reported in the national press. “Bet size” is the reported amount that the bettor placed on Leicester to win the Premier league. “Potential win if Leicester are champions” is the amount of money the bettor could win from this bet size if Leicester win the Premier League. “Amount cashed-out for” is the sure amount of money that the bettor accepted in return for cancelling their bet. “Certain amount available via laying” is the guaranteed win from the combination of the original bet and the lay hedge. “Gain from laying” is the difference between “Certain amount available via laying” and “Amount cashed-out for.” “Percentage gain from laying” compares the gain from laying to the amount cashed-out for. “Assumed available lay odds” are the betting odds on a bet for Leicester to not win the league, which is required to hedge the original bet’s risk. “Amount required to lay” is the amount of money required to bet on Leicester to not win the league to hedge the original bet’s risk.

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