Commercial provision of zero house-edge gambling products

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In commercial gambling, the odds of winning are against the gambler. Roulette is a good game to demonstrate this principle with. A roulette wheel has the numbers from 1 – 36 that the wheel can land on, and a successful stake of £1 on one of these numbers will pay-off £36 (including the return of the stake). However, a European roulette wheel has an extra number, zero, which the wheel can also land on (and which can also be bet on). This means that a bet on any specific number will only win 1 in 37 times on average, resulting in an average loss of 2.7% of all money staked. This average loss for the gambler is known as the house edge.[1] American roulette has a second zero (the double zero), but the payoffs are the same. These further reduced odds of winning in American roulette translate into a higher house edge of 5.3%, making this a less attractive gambling product.[2] This shows how the house edge can be compared across gambling products,[3] which along with the total amount bet, predicts gamblers' average losses.[4] Since these losses lead to harm,[5] some economists have proposed zero house-edge games as a theoretical harm reduction approach.[6] But these games are not just a theoretical possibility, as at least three significant online operators have either provided or promised to provide these games. This article reviews this short history of zero house-edge games, while also proposing an alternative model for how they could be commercially provided.

Betfair is an innovative online operator, having introduced the first popular sports betting exchange, where bettors trade against one another like in the financial markets, with Betfair

[1] Philip W. S. Newall et al., *Statistical risk warnings in gambling*, BEHAVIOURAL PUBLIC POLICY (2020).
[2] Nigel E. Turner & Jing Shi, *The relationship between game volatility, house edge and prize structure of gambling games and what it tells us about gambling game design*, 22 INTERNATIONAL JOURNAL OF COMPUTER RESEARCH 107–131 (2015).
[3] Richard Woolley et al., *House edge: hold percentage and the cost of EGM gambling*, 13 INTERNATIONAL GAMBLING STUDIES 388–402 (2013); Kevin A. Harrigan & Mike Dixon, *Government sanctioned "tight" and "loose" slot machines: How having multiple versions of the same slot machine game may impact problem gambling*, 26 JOURNAL OF GAMBLING STUDIES 159–174 (2010).
[4] Michael Auer, Andreas Schneeberger & Mark D. Griffiths, *Theoretical loss and gambling intensity: a simulation study*, 16 GAMING LAW REVIEW AND ECONOMICS 269–273 (2012).
[5] Matthew Browne & Matthew Rockloff, *Measuring harm from gambling and estimating its distribution in the population*, 10 *in* HARM REDUCTION FOR PROBLEM GAMBLING: A PUBLIC HEALTH APPROACH. ROUTLEDGE 14–22 (Henrietta Bowden-Jones et al. eds., 2019).
[6] David Rowell & Dorte Gyrd-Hansen, *Could a Pigouvian subsidy mitigate poker machine externalities, in Australia?*, 33 ECONOMIC PAPERS 327–338 (2014).

taking a commission as a market maker.[7] As these trades do not lead to any risks for Betfair as the market maker, Betfair is able to charge lower commissions (its equivalent of the house edge) than comparable online sports betting operators.[8] However, Betfair also offered some unique casino games in its "zero lounge".[9] For example, in "zero roulette", gamblers could bet on a roulette wheel that had no zero at all, and only the numbers 1 – 36. Given that this game had the same pay-offs as other roulette games, this was therefore a roulette game with no house edge at all.[10] This is the first example, that we know, of a commercial operator offering a zero house-edge game to all gamblers. While operators sometimes offer bonuses which can translate into long-term profits for gamblers (effectively a negative house edge), these bonuses are limited by both time and total amount wagered.[11] It is possible that Betfair offered zero roulette to attract more gamblers to sign-up and perhaps use its sport betting exchange.

Betfair offered other games in its zero lounge, specifically baccarat, blackjack, and video poker.[12] However, these games differed in that the gamblers had to play "optimal strategy", i.e., knowing exactly when to stick or twist in blackjack,[13] in order to obtain a zero house-edge. This means that most gamblers might well have still lost in these three games, making them only slightly more fair versions of their standard counterparts. Zero roulette was, however, due to the lack of skill in that game, fair in the sense that all gamblers played with a zero house-

[7] David C. Williams & S. Steve Seteroff, *Betfair: a case study on the U.S. internet gaming market*, 13 GAMING LAW REVIEW AND ECONOMICS 41–49 (2009).
[8] Mark Davies et al., *Betfair.com: Five technology forces revolutionize worldwide wagering*, 23 EUROPEAN MANAGEMENT JOURNAL 533–541 (2005).
[9] Lorien Pilling & Warwick Bartlett, *The Internet gambling industry*, *in* ROUTLEDGE INTERNATIONAL HANDBOOK OF INTERNET GAMBLING 66–78 (Robert Williams, Robert Wood, & Jonathan Parke eds., 2012), https://www.taylorfrancis.com/chapters/edit/10.4324/9780203814574-11/internet-gambling-industry-lorien-pilling-warwick-bartlett (last visited Jul 4, 2022).
[10] ALEX GOWAR & JACK HOUGHTON, WINNING ON BETFAIR FOR DUMMIES (2011).
[11] James Banks, *Edging your bets: Advantage play, gambling, crime and victimisation*, 9 CRIME, MEDIA, CULTURE 171–187 (2013).
[12] OnlineGamblingWebsites.com, *What Was Betfair's Zero Lounge? A Fair Fight Between the Savvy Player & the House*, (2021), https://web.archive.org/web/20210411154341/https://www.onlinegamblingwebsites.com/blog/betfair-zero-lounge/ (last visited Jul 4, 2022).
[13] EDWARD O. THORP, BEAT THE DEALER (1966).

edge. Betfair closed its zero lounge in 2013, effectively deciding to steer its online casino game customers toward games with conventional house-edges.[14] It would be a few more years until a zero house-edge game was again offered online.

The last two significant operators were based on cryptocurrencies. Cryptocurrencies are decentralized digital tokens with volatile prices, which can be bought and sold 24-hours a day online.[15] Many people have therefore engaged in either long-term investing or active trading in cryptocurrencies as a way of making money.[16] Others have attempted to profit by inventing new cryptocurrencies. If a new cryptocurrency solves a particular "use case",[17] such as providing cryptocurrency users with additional privacy, then the value of the cryptocurrency should increase, allowing the inventors to profit by selling their newly generated cryptocurrency assets at a profit. The provision of gambling that is either trustworthy, low-cost, or anonymous is amongst these potential use cases.[18] And in a few short years cryptocurrency-based gambling has moved from a theoretical possibility,[19] to a few simplified games,[20] and then to a new generation of operators offering a range of games that rival that of conventional online gambling operators.[21] At least two prominent cryptocurrencies have been developed

[14] OnlineGamblingWebsites.com, *supra* note 12.
[15] Lee Kuo Chuen David, Li Guo & Yu Wang, *Cryptocurrency: a new investment opportunity?*, 20 JAI 16–40 (2017).
[16] Devin J. Mills & Lia Nower, *Preliminary findings on cryptocurrency trading among regular gamblers: A new risk for problem gambling?*, 92 ADDICTIVE BEHAVIORS 136–140 (2019); Paul Delfabbro et al., *Cryptocurrency trading, gambling and problem gambling*, 122 ADDICTIVE BEHAVIORS (2021).
[17] Kuo Chuen David, Guo, and Wang, *supra* note 15.
[18] House edge, explained | is it really better at bitcoin casinos?, CASINOSBLOCKCHAIN.IO, https://web.archive.org/web/20210728221205/https://casinosblockchain.io/house-edge-casinos/ (last visited Jul 25, 2022).
[19] Sally M. Gainsbury & Alex Blaszczynski, *How blockchain and cryptocurrency technology could revolutionize online gambling*, 21 GAMING LAW REVIEW 482–492 (2017).
[20] Oliver James Scholten et al., *Ethereum crypto-games: mechanics, prevalence, and gambling similarities*, *in* PROCEEDINGS OF THE ANNUAL SYMPOSIUM ON COMPUTER-HUMAN INTERACTION IN PLAY 379–389 (2019), https://dl.acm.org/doi/10.1145/3311350.3347178 (last visited Jul 27, 2022).
[21] Maira Andrade et al., *Safer gambling and consumer protection failings amongst 40 frequently visited cryptocurrency-based online gambling operators*, (2022), https://psyarxiv.com/fgxrb/ (last visited Jul 27, 2022).

based around the idea of providing zero house-edge games, Edgeless in 2017,[22] and ZeroEdge in 2018.[23]

These two cryptocurrency projects had the same premise of providing at least some zero house-edge games to gamblers. They aimed to make money by allowing users to gamble only in the new underlying cryptocurrencies invented by the projects. If the games were popular, then many people would buy the underlying cryptocurrency to gamble, therefore pushing up the cryptocurrency's price, and providing the projects with an indirect profit-making model. However, neither of these models succeeded. The Edgeless cryptocurrency debuted at a value of $0.02, and within a year increased to $2.93, providing large profit potential for early adopters.[24] However, the price began to drop in August 2019, and has since stayed around or below its debut value of $0.02. Effectively, this means that any gamblers hoping to benefit from a zero house-edge will have likely been hurt by losses on their associated cryptocurrency holdings. The outcomes were even worse for anyone who bought the ZeroEdge cryptocurrency. The CEO of ZeroEdge turned out to be using a false identity, and all details of the website were deleted within a year of its initial offering.[25] Buyers of the ZeroEdge cryptocurrency therefore lost all their money, with corresponding losses estimated at between $4 and $7 million.[26] Although cryptocurrency could someday be used to provide genuine zero house-edge games to gamblers, neither of these example projects succeeded.

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[22] S. Zhu, *Navigating the crypto gambling wasteland*, DERIBIT INSIGHTS (2020), https://web.archive.org/web/20220716075459/https://insights.deribit.com/market-research/navigating-the-crypto-gambling-wasteland/ (last visited Jul 27, 2022).
[23] ZeroEdge.Bet, ICOMARKS, https://web.archive.org/web/20220725145344/https://icomarks.com/ico/zeroedge-bet (last visited Jul 25, 2022).
[24] Edgeless price today, EDG to USD live, marketcap and chart | CoinMarketCap, COIN MARKET CAP, https://web.archive.org/web/20220725151319/https://coinmarketcap.com/currencies/edgeless/ (last visited Jul 25, 2022).
[25] S. Isaacs, *ZeroEdge.bet EXPOSED: Caught in Huge ETH Scam! - Gamblescope*, GAMBLESCOPE (2021), https://web.archive.org/web/20210726193951/https://gamblescope.com/news/casino-news/zeroedge.bet-exposed-caught-in-huge-eth-scam.html (last visited Jul 24, 2022).
[26] *Id.*

Taken overall, this short history of zero house-edge games does not look good for gamblers. The Betfair zero lounge only offered one product with a genuine zero house-edge for all gamblers,[27] while the cryptocurrency-based offerings simply shifted the potential risk of loss to another aspect of the product. However, we believe that this need not always be the case, and that genuine zero house-edge games could be commercialized via another model, which is more similar to lottery-based savings.

Many countries have experimented with lottery-based savings,[28] with the UK perhaps having the longest history of introducing an element of randomness to some of its debt offerings,[29] which is currently reflected in a product called "premium bonds".[30] Like other lottery-based savings, premium bonds, instead of offering a fixed interest rate, offer a chance of winning prizes currently ranging from £25 to £1 million. Premium bonds can be cashed-in for the amount deposited, meaning they have no risk of loss, while offering an average return from the prizes roughly equivalent to the interest rates offered by other savings providers. Lottery-based savings can potentially encourage people to avoid conventional gambling products,[31] and actually have an effective *negative* house-edge, given that they pose no risk of loss. Lottery-based savings providers can offer such a good deal on their products as, like other savings providers, their profitability rests on investing these savings in higher-return opportunities.

As yet, lottery-based savings have only transformed one gambling product, the lottery. However, there is no reason why their basic approach of offering a vehicle with a better pattern

[27] OnlineGamblingWebsites.com, *supra* note 12.
[28] Melissa S. Kearney et al., *Making savers winners: an overview of prize-linked saving products*, *in* FINANCIAL LITERACY: IMPLICATIONS FOR RETIREMENT SECURITY AND THE FINANCIAL MARKETPLACE (Olivia S. Mitchell & Annamaria Lusardi eds., 2011); Shawn Cole, Benjamin Iverson & Peter Tufano, *Can gambling increase savings? Empirical evidence on prize-linked savings accounts*, 68 MANAGEMENT SCIENCE 3282–3308 (2022).
[29] Jacob Cohen, *The element of lottery in British government bonds, 1694-1919*, 20 ECONOMICA 237–246 (1953).
[30] Peter Tufano, *Saving whilst gambling: An empirical analysis of UK premium bonds*, 98 AMERICAN ECONOMIC REVIEW 321–326 (2008).
[31] Sylvan Herskowitz, *Gambling, saving, and lumpy liquidity needs*, 13 AMERICAN ECONOMIC JOURNAL: APPLIED ECONOMICS 72–104 (2021).

of outcomes than their corresponding gambling product could not be adapted to other gambling products. While a corresponding product based on say zero roulette would, unlike lottery-based savings, still require a risk of loss, it is possible that this model could be adapted to instead offer zero house-edge casino games for all gamblers. Such a model would need to be delivered online (as this is more cost-effective than land-based gambling), and perhaps require cost savings by either limiting or penalizing withdrawals. However, such an approach could conceivably lead to commercial profits given that the potential gains from investing gamblers' deposits in safe assets are higher than the net-zero returns paid-out to gamblers. Such a model could potentially realize the theoretical welfare gains from zero house-edge gambling games.[32]

[32] Rowell and Gyrd-Hansen, *supra* note 6.