BLOCKCHAIN PREDICTION MARKETS: WHERE THEY CAME FROM, WHY THEY MATTER & HOW TO REGULATE THOSE INVOLVED

INTRODUCTION

On July 9, 2018, Judge Brett Kavanaugh was nominated to succeed retiring Justice Anthony Kennedy on the United States Supreme Court.[1] After three days of public hearings held in early September,[2] Mr. Kavanaugh appeared poised for confirmation to the high Court bench. Then, in an unpredictable turn of events, reports of an alleged sexual assault surfaced,[3] prompting the Senate Judiciary Committee to schedule additional hearings.[4] Political chaos ensued.[5]

Between news of the sexual assault allegation on September 16 and the decisive confirmation vote on October 5, pundits filled countless columns and hours of airtime speculating about the likelihood of Mr. Kavanaugh serving as a Supreme Court justice. In spite of this attention, and in part due to media polarization,[6] people curious about the actual probability of Mr.

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1. Sophie Tatum, *Brett Kavanaugh's Nomination: A Timeline*, CNN, https://www.cnn.com/interactive/2018/10/politics/timeline-kavanaugh/ [https://perma.cc/S2V5-XHAZ].

2. Hearings were held between September 4 and September 6, 2018 before the Senate Judiciary Committee. *Id.*; *Nomination of the Honorable Brett M. Kavanaugh to be an Associate Justice of the Supreme Court of the United States: Hearing Before the S. Comm. on the Judiciary*, 115th Cong. (2018).

3. Emma Brown, *California Professor, Writer of Confidential Brett Kavanaugh Letter, Speaks Out About Her Allegation of Sexual Assault*, WASH. POST (Sept. 16, 2018), https://www.washingtonpost.com/investigations/california-professor-writer-of-confidential-brett-kavanaugh-letter-speaks-out-about-her-allegation-of-sexual-assault/2018/09/16/46982194-b846-11e8-94eb-3bd52dfe917b_story.html [https://perma.cc/49DU-LGU3].

4. Tatum, *supra* note 1.

5. *See, e.g.*, Molly Hooper, *Corker Predicts Kavanaugh Will Be Confirmed, Says Dems 'Overplayed Their Hand,'* HILL (Oct. 2, 2018), https://thehill.com/hilltv/rising/409573-corker-predicts-gop-has-votes-to-confirm-kavanaugh-slams-dems-as-having [https://perma.cc/R4ME-2HLS]; Elaine Kamarck, *Will Kavanaugh Be Confirmed? It's Up to These Five Senators and the FBI*, BROOKINGS: 5 ON 45 (Sept. 28, 2018), https://www.brookings.edu/podcast-episode/will-kavanaugh-be-confirmed-its-up-to-these-five-senators-and-the-fbi/ [https://perma.cc/78UJ-R8W4]; Dylan Scott & Tara Golshan, *The Senate Bloc that Will Decide Kavanaugh's Supreme Court Confirmation*, VOX (Oct. 5, 2018, 11:25 AM), https://www.vox.com/policy-and-politics/2018/10/3/17933106/brett-kavanaugh-senate-confirmation-vote-supreme-court [https://perma.cc/7B7S-HP39].

6. According to a Reuters Institute study, the United States has the most polarized media environment of any Western nation. NIC NEWMAN ET AL., REUTER'S INST., REUTERS INSTITUTE DIGITAL NEWS REPORT 2017, at 20 (2017), https://reutersinstitute.politics.ox.ac.uk/sites/default/files/Digital%20News%20Report%202017%20web_0.pdf [https://perma.cc/XUA6-FN5T]; *see also* Brett Edkins, *Report: U.S. Media Among Most Polarized in The World*, FORBES (June 27, 2017, 6:25 AM), https://www.forbes.com/sites/brettedkins/2017/06/27/u-s-media-among-most-polarized-in-the-world-study-finds/#58978c382546 [https://perma.cc/82P5-SK67].

Kavanaugh's confirmation had few unbiased sources to consider.

Throughout this time period, there was one venture promising an impartial projection of Mr. Kavanaugh's confirmation odds on a real-time basis. PredictIt, a research initiative developed at the Victoria University of Wellington,[7] hosted a prediction market which financially incentivized individuals to correctly guess whether or not Mr. Kavanaugh would be confirmed (PredictIt Kavanaugh Market, PKM).[8] The PKM served a dual purpose as an investing platform and as an information aggregator. Because its traders were monetarily motivated to track every twist and turn in the weeks leading up to the Senate vote, the PKM provided immediate and impartial updates on the likelihood of Mr. Kavanaugh's confirmation.

The PKM logged over ten thousand comments in its nineteen-day run,[9] an indication of people's willingness to participate in a marketplace of ideas. As a means of harnessing this marketplace and channeling it towards more reliable forecasting, prediction markets have been met with great support from economists and private entities.[10] However, they have faced equally great scrutiny from regulatory agencies.[11]

While it is likely that at least a few Kavanaugh confirmation prediction markets operated illegally,[12] the Commodity Futures Trading Commission (CFTC) addressed the lawfulness of PredictIt's operation in a no-action letter.[13] The CFTC recognized that PredictIt's markets were not contrary to American public interest as long as they followed certain guidelines, such as limiting the number of traders in any particular contract to 5,000 and limiting each trader's investment to $850 per contract.[14] Furthermore, PredictIt's exception was based, in part, "upon the facts that . . . [its] proposed market for event contracts ha[d] been designed to serve academic purposes and [that] the operators w[ould] receive no compensation."[15]

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7. *What is PredictIt?*, PREDICTIT, https://www.predictit.org/support/what-is-predictit [https://perma.cc/AB7N-YXQE].

8. *Will Brett Kavanaugh Be the Next Confirmed Supreme Court Justice?*, PREDICTIT, https://www.predictit.org/markets/detail/4858/Will-Brett-Kavanaugh-be-the-next-confirmed-Supreme-Court-justice [https://perma.cc/M3FQ-AU4L].

9. *Id.*

10. Kenneth J. Arrow et al., *The Promise of Prediction Markets*, 320 SCI. 877, 877–78 (2008).

11. For instance, the Commodity Futures Trading Commission solicited public comment on futures markets. Request for Comment: Concept Release on the Appropriate Regulatory Treatment of Event Contracts, 73 Fed. Reg. 25,669 (May 7, 2008); *see infra* Section III.

12. *See infra* Section III.A.

13. Neil Quigley, CFTC No-Action Letter, CFTCLTR No. 14-130, 2014 WL 5499971 (Oct. 29, 2014) [hereinafter Quigley, No-Action].

14. *Id.*

15. *Id.* at 5.

The basis of CFTC prediction market jurisdiction stems from its interpretation of trades in prediction markets as swaps of commodity futures and options contracts.[16] The CFTC has recognized that prediction markets have the capacity to facilitate information discovery and therefore benefit the public;[17] nevertheless, Commission staff have indicated that these public-interest benefits only extend to contracts related to subject matters which have generally-accepted and predictable financial, commercial, or economic consequences.[18] While Supreme Court decisions may prompt secondary economic effects, whether or not a particular justice will be confirmed would fail the "economic purpose" test that the CFTC has used to determine which matters are suitable for futures trading.[19] Therefore, operation of the PKM was only permissible due to PredictIt's adherence to the CFTC's no-action terms.[20]

Yet, with the development of new technologies, nefarious markets are becoming increasingly difficult to regulate.[21] Prediction market protocols are now hosted on decentralized platforms,[22] which facilitate the formation of markets that are highly resistant to censorship or third-party interference.[23] Closely watched by regulators, these decentralized prediction markets led one CFTC commissioner to publicly contemplate their appropriate regulatory treatment.[24]

This Note defends the social value produced by well-regulated prediction markets, then offers a novel approach for liability analysis in the context of markets formed using blockchain technology. After establishing the weaknesses of individual predictions and the benefits that forecasting tools can offer, Section I introduces prediction markets and explains how they generate valuable information. Section II then describes blockchain technology and the properties that make it so effective in the realm of prediction markets. Section III focuses on the regulatory environment

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16.   *See infra* Section III.A.
17.   Request for Comment: Concept Release on the Appropriate Regulatory Treatment of Event Contracts, 73 Fed. Reg. 25,669, 25,672 (May 7, 2008).
18.   *Id.* at 25,671.
19.   *Id.* at 25,672.
20.   *See* Quigley, No-Action, *supra* note 13.
21.   *See infra* Section III.B.
22.   *See infra* Section II.C.
23.   Kevin Werbach, *Trust, but Verify: Why the Blockchain Needs the Law*, 33 BERKELEY TECH. L.J. 487, 550 (2018).
24.   Brian Quintenz, Comm'r, U.S. Commodity Futures Trading Comm'n, Remarks at the 38th Annual GITEX Technology Week Conference (Oct. 16, 2018), https://www.cftc.gov/PressRoom/Speec hesTestimony/opaquintenz16 [https://perma.cc/389N-2V4X].

surrounding prediction markets and considers the unique complications presented by distributed ledgers. Finally, Section IV depicts frameworks of liability analysis developed in intellectual property common law and proposes a novel application of these principals as applied to blockchain prediction markets.

I. PREDICTION MARKETS[25]

Predicting the future is extremely challenging.[26] Economists and social scientists readily acknowledge how difficult it is to form reliable forecasts; they regularly study why people are flawed at making predictions as well as which tools effectively foster improved forecasting.[27] One such tool promising to improve forecasting accuracy is the prediction market, which offers a mechanism to incentivize information gathering and revelation.[28] By harnessing the power of the free market and channeling it towards speculation on the outcome of any definable contingency, prediction markets provide a valuable prognostic metric: market price.[29]

A. "It Is Difficult to Predict, Especially the Future"[30]

A prediction is an informed guess or opinion about the future.[31] Because the future is inherently unknown, predictions embody what an individual or entity believes is most likely to occur, based on available information.[32] Predictions are useful for guiding behaviors and expectations in the fields

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25.   These markets are also commonly referred to as event markets, information markets, decision markets, idea markets, and opinion markets. *See, e.g.*, Michael Gorham, *Event Markets Campaign for Respect*, FUTURES INDUSTRY MAG., Jan./Feb. 2004; Robert W. Hahn & Paul C. Tetlock, *Using Information Markets to Improve Public Decision Making*, 29 HARV. J.L. & PUB. POL'Y 213 (2005).

26.   *See infra* Section I.A.

27.   *See infra* Sections I.A–B.

28.   *See infra* Section I.B.

29.   *See infra* Sections I.C–D.

30.   This quotation has been attributed to Niels Bohr, among others. THE YALE BOOK OF QUOTATIONS 92 (Frank Shapiro ed., 2006).

31.   "When it is not clear under which law of nature an effect or a class of effects belongs, we try to fill this gap by means of a guess." HANS CHRISTIAN ØRSTED, SELECTED SCIENTIFIC WORKS OF HANS CHRISTIAN ØRSTED 297 (Karen Jelved et al., trans. & eds., 1998).

32.   Armin Grunwald, *Modes of Orientation Provided by Futures Studies: Making Sense of Diversity and Divergence*, 2 EUR. J. FUTURES RES. 30, 30–31 (2014).

of science,[33] finance,[34] politics,[35] and more. Unfortunately, inaccurate predictions can prove counterproductive.

Over the past fifty years, volumes of research into heuristics and biases have dispelled the notion that people are able to impartially process information on a consistent basis.[36] For example, when an individual has an interest in the result of a given event, optimism bias tends to cause that individual to believe that the desired outcome is more likely.[37] Due to this tendency to inflate the probability of desirable results, the accuracy—and forecasting utility—of interested predictions comes into question.[38]

Even when an individual is disinterested in a given event, as soon as a belief has been formed about what is most likely to occur, the ubiquitous confirmation bias hinders consideration of counter-evidence moving forward.[39] Confirmation bias impacts every species of decision, but its implications are particularly well-illustrated in the jury selection process.[40] In selecting jurors from the *venire*, a lawyer's goal is to ascertain the jurors' biases, and strike those jurors most obviously prone to drawing premature unfavorable conclusions.[41] Lawyers are entitled to remove a limited number

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33. For example, Galileo's Equivalence Principle, Newton's Perihelion Procession of Mercury, and Einstein's Theory of Relativity are all famous predictions. Adam Hadhazy, *Putting Relativity to the Test*, DISCOVER, Apr. 2015, at 30, 30–33.

34. *See, e.g.*, Nick Bilton, *Google Search Terms Can Predict Stock Market, Study Finds*, N.Y. TIMES: BITS BLOG (Apr. 26, 2013, 7:43 PM), https://bits.blogs.nytimes.com/2013/04/26/google-search-terms-can-predict-stock-market-study-finds/ [https://perma.cc/WC6E-ZX6P].

35. *See* Nate Silver, *Even Without InTrade, Billions Will Be Bet on 2016 Race*, FIVETHIRTYEIGHT (Mar. 11, 2013, 3:04 PM), https://fivethirtyeight.com/features/even-without-intrade-billions-will-be-bet-on-2016-race/ [https://perma.cc/5BK2-GC4M].

36. *See* Thomas Gilovich & Dale Griffin, *Introduction – Heuristics and Biases: Then and Now*, *in* HEURISTICS AND BIASES: THE PSYCHOLOGY OF INTUITIVE JUDGMENT 1, 2–7 (Thomas Gilovich et al. eds., 2002).

37. David A. Armor & Shelley E. Taylor, *When Predictions Fail: The Dilemma of Unrealistic Optimism*, *in* HEURISTICS AND BIASES: THE PSYCHOLOGY OF INTUITIVE JUDGMENT 334, 334–47 (Thomas Gilovich et al. eds., 2002).

38. Cass R. Sunstein, *Deliberating Groups Versus Prediction Markets (or Hayek's Challenge to Habermas)* 20–21 (John M. Olin Program in Law & Econ., Working Paper No. 321, 2007), https://chicagounbound.uchicago.edu/cgi/viewcontent.cgi?article=1165&context=law_and_economics [https://perma.cc/63M6-LM5S].

39. Raymond S. Nickerson, *Confirmation Bias: A Ubiquitous Phenomenon in Many Guises*, 2 REV. GEN. PSYCHOL. 175, 177 (1998) ("[O]nce one has taken a position on an issue, one's primary purpose becomes that of defending or justifying that position. This is to say that regardless of whether one's treatment of evidence was evenhanded before the stand was taken, it can become highly biased afterward.").

40. Jurors tend to "look for, or give undo weight to, evidence that supports" their initial determination about the proper outcome of a case. *Id.* at 193–94.

41. *See* Robert A. Clifford, *How to Pick and Talk to a Jury: Plaintiff Perspective*, GPSOLO, Sept.–Oct. 2014, at 12, 16, https://www.americanbar.org/groups/gpsolo/publications/gp_solo/2014/september-october/how_to_pick_and_talk_to_a_jury_plaintiff_perspective/.

of jurors for no reason at all,[42] but have an unlimited number of challenges "for cause" to remove jurors for lack of impartiality.[43] In allowing unlimited strikes for cause, the justice system recognizes that jurors biased from the outset will be unable to reach an impartial conclusion based on the evidence presented.[44]

Outside of the courtroom, confirmation bias may prove particularly dangerous in the digital information age. People have more access than ever before to wide-ranging and self-serving evidence,[45] while also exhibiting strong tendencies to treat that evidence selectively.[46] Though conflicting viewpoints tend not to be avoided entirely, far more time is spent considering attitude-consistent messages, particularly when the topic is deemed highly important.[47] Because these biases skew our ability to make predictions and these flawed predictions drive decision-making, society would benefit from a more reliable, accountable, and accurate forecasting device. One tool worthy of consideration is the prediction market.

B. *Putting Your Money Where Your Mouth Is, for the Good of Society: An Introduction to Prediction Markets*

Prediction markets involve collections of people speculating on the outcome of a future event.[48] These markets allow participants to trade contracts that are similar to event derivatives, where the contract price

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42.   Importantly, these peremptory challenges may not be used to exclude jurors based solely on their race. Batson v. Kentucky, 476 U.S. 79 (1986).

43.   Carol A. Chase & Colleen P. Graffy, *A Challenge for Cause Against Peremptory Challenges in Criminal Proceedings*, 19 LOY. L.A. INT'L & COMP. L.J. 507, 507–08 (1997).

44.   *See* Mark W. Bennett, *Unraveling the Gordian Knot of Implicit Bias in Jury Selection: The Problems of Judge-Dominated Voir Dire, the Failed Promise of* Batson*, and Proposed Solutions*, 4 HARV. L. & POL'Y REV. 149, 152 (2010). However, judges and attorneys are as susceptible to implicit biases as anyone else. *Id.* at 158.

45.   Giovanni Luca Ciampaglia & Filippo Menczer, *Biases Make People Vulnerable to Misinformation Spread by Social Media*, SCI. AM.: THE CONVERSATION (June 21, 2018), https://www.sc ientificamerican.com/article/biases-make-people-vulnerable-to-misinformation-spread-by-social-medi a/ [https://perma.cc/WYW9-S2PN].

46.   Nickerson, *supra* note 39, at 175. Even Amazon founder and CEO Jeff Bezos has said that "the Internet in its current incarnation is a confirmation bias machine." Nick Bastone, *Jeff Bezos: Today's Internet Is a 'Confirmation Bias Machine' That Could Help Autocratic Regimes*, BUS. INSIDER (Oct. 15, 2018, 7:41 PM), https://www.businessinsider.com/jeff-bezos-internet-confirmation-bias-mach ine-help-autocratic-regimes-2018-10 [https://perma.cc/3Y2R-V4VZ].

47.   Silvia Knobloch-Westerwick et al., *Confirmation Bias in Online Searches: Impacts of Selective Exposure Before an Election on Political Attitude Strength and Shifts*, 20 J. COMPUTER-MEDIATED COMM. 171, 181 (2014).

48.   Justin Wolfers & Eric Zitzewitz, *Prediction Markets*, J. ECON. PERSP., Spring 2004, at 107, 108.

reflects the probability of a specified result.[49] Though prediction market prices are subject to certain biases,[50] "the potential for profit (and loss) creates strong incentives to search for better information" and prediction markets have a demonstrated record of successful use.[51] The range of applications is vast, including political events, financial events, science and technology events, and more.[52]

To demonstrate the mechanics of a political prediction market, imagine a contract that specifies that President Trump will be reelected in 2020; this hypothetical contract pays out one-hundred dollars post-election if President Trump wins and zero dollars if he does not (the "Trump2020" contract).[53] If the last Trump2020 trade was for forty dollars, the implied market odds of President Trump's reelection are 40 percent.[54] Similar contracts can be formed in order to determine each Democratic candidate's likelihood of earning the Democratic Party nomination.

Leading up to November 3, 2020, those interested in a market-based measure of the likelihood of President Trump's reelection could monitor the price of the Trump2020 contract.[55] This information is valuable because the accuracy of market-based predictions often surpasses other forms of forecasting.[56] Prediction markets are particularly well-suited forecasting aids due to three chief benefits that they provide. First, they incentivize the gathering of accurate information.[57] Next, they incentivize the truthful revelation of that information.[58] Finally, they offer "an algorithm for aggregating diverse opinions."[59]

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49.   Lukas Schor, *Explained: Prediction Markets*, MEDIUM (June 20, 2018), https://medium.com/ @argongroup/decentralized-prediction-markets-explained-d9f0425d331c [https://perma.cc/F9JB-XEZ X].

50.   Arrow et al., *supra* note 10, at 877.

51.   *Id.*

52.   *See* Wolfers & Zitzewitz, *supra* note 48, at 110–11 (listing examples of prediction markets).

53.   *See* Adam Ozimek, *The Regulation and Value of Prediction Markets* 3 (Mercatus Ctr., George Mason Univ., Working Paper No. 14-07, 2014), https://www.mercatus.org/system/files/Ozimek PredictionMarkets_v1.pdf [https://perma.cc/A7QW-GUXS] (providing a similar example, but with the 2012 election). Conversely, one can imagine (or observe) a contract that specifies that President Trump will be impeached in his first term. *Will Donald Trump Be Impeached in His First Term?*, PREDICTIT, https://www.predictit.org/markets/detail/3537/Will-Donald-Trump-be-impeached-in-his-first-term [htt ps://perma.cc/JU6A-WZVL].

54.   Ozimek, *supra* note 53, at 3.

55.   *Id.* The price will react and respond to available information, reflecting the perceived future value of the contract, akin to a traditional securities instrument. *Id.* at 4–6.

56.   *See infra* Section I.C.

57.   Wolfers & Zitzewitz, *supra* note 48, at 125.

58.   *Id.*

59.   *Id.*

In the reelection example, statisticians and forecasters have a profit motive to search for better information, and improve upon modeling techniques, in order to come up with more accurate forecasts of the likelihood of President Trump's reelection. If an entity has reason to believe that the price of the Trump2020 contract does not reflect the true likelihood of reelection, this information will be revealed either through the purchase or sale of shares. Assuming that the Trump2020 market attracts sufficient trading volume and liquidity, its price is a single, observable metric useful for estimating reelection probability.[60]

The effectiveness of any given prediction market to accomplish the three benefits mentioned above is not free from debate.[61] Notably, in an arena such as political elections, many public and private entities are motivated to generate accurate predictions; this makes it less likely that the existence of a prediction market will incentivize expenditures of additional time or resources to produce revelatory information.[62] Further, prediction markets hold less value in instances where the relevant information is held by a few informed parties, rather than being dispersed.[63] Nonetheless, prediction markets generate a unique information set capable of improving traditional forecasting methods,[64] and because they allow shrewd investors to profit from the mistakes of lesser informed individuals, prediction markets "tend to correct rather than amplify individual errors."[65]

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60.   *Id.* at 124.

61.   *See, e.g.*, Lionel Page & Robert T. Clemen, *Do Prediction Markets Produce Well-Calibrated Probability Forecasts?*, 123 ECON. J. 491, 510–12 (2013).

62.   There are a number of publicly available models designed to aid in election forecasting. *See, e.g.*, D.R., *Introducing Our Prediction Model for America's Mid-Term Elections*, ECONOMIST (May 24, 2018), https://www.economist.com/graphic-detail/2018/05/24/introducing-our-prediction-model-for-a mericas-mid-term-elections [https://perma.cc/5ULV-SPE8]; Nate Silver, *How FiveThirtyEight's House Model Works*, FIVETHIRTYEIGHT (Aug. 16, 2018, 12:30 PM), https://fivethirtyeight.com/features /2018-house-forecast-methodology/ [https://perma.cc/Y2UR-PLQA]. However, these tools are far less common in other fields. *See also infra* Section II.D.

63.   Sunstein, *supra* note 38, at 24 (describing "two conspicuous failures" where prediction "markets found it more probable than not that Special Prosecutor Patrick Fitzgerald would indict White House adviser Karl Rove in 2005, and they found it exceedingly improbable that President George W. Bush would appoint John Roberts to the United States Supreme Court." In these instances, "[t]he best explanation is that there was not a great deal of dispersed information about the particular decisions . . . . [I]nvestors . . . lacked the kind of information that would permit successful judgments.").

64.   David Rothschild, *Combining Forecasts for Elections: Accurate, Relevant, and Timely*, 31 INT'L J. FORECASTING 952, 953–55 (2015).

65.   Sunstein, *supra* note 38, at 27.

C. The Economic Rationale Supporting Prediction Markets

Prediction markets facilitate the distillation of information into an illuminating metric: market price.[66] In many situations, information is dispersed among diverse actors; consequently, it is desirable to find a mechanism to collect and aggregate this scattered knowledge.[67] Though polls are revealing when scientifically conducted,[68] free markets can efficiently accomplish the same objective by providing a profit-motive to stimulate the search for information.[69]

In an efficient prediction market,[70] the contract price will be the single best indicator of the likelihood of that event.[71] No combination of available polls or other public information can improve on the market-generated forecasts, because the price incorporates and reflects all of that information.[72] In reality, prediction markets need not and will not be perfectly efficient.[73] Nevertheless, prediction market prices have proven revelatory when the following conditions are met: the tradeable contract is drafted with sufficient specification; the market contains effective matching mechanisms to pair sellers with buyers; the market attracts participants drawing upon diverse information; and these participants possess ample motivation to actively participate in the market.[74]

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66. F. A. Hayek, *The Use of Knowledge in Society*, 35 AM. ECON. REV. 519, 526 (1945) ("[I]n a system where the knowledge of the relevant facts is dispersed among many people," prices act as a mechanism of communicating information).

67. *Id.*

68. Scientific polling is expensive, and someone must foot the bill. For a list of questions useful in helping determine poll validity, see Sheldon R. Gawiser & G. Evans Witt, *20 Questions a Journalist Should Ask About Poll Results*, NAT'L COUNCIL ON PUB. POLLS, http://www.ncpp.org/files/20%20Quest ions%203rd%20edition_Web%20ver_2006.pdf [https://perma.cc/B5NY-E7UD].

69. Arrow, *supra* note 10, at 877.

70. "A market is efficient with respect to information set θ_t if it is impossible to make economic profits by trading on the basis of information set θ_t." Michael C. Jensen, *Some Anomalous Evidence Regarding Market Efficiency*, 6 J. FIN. ECON. 95, 96 (1978). Note, the market need not (and cannot) be perfectly efficient. For an in-depth analysis of the efficient market hypothesis, see generally Burton G. Malkiel, *The Efficient Market Hypothesis and Its Critics*, J. ECON. PERSP., Winter 2003, at 59.

71. Wolfers & Zitzewitz, *supra* note 48, at 108.

72. *Id.* Note, the perfect efficiency of markets is not a prerequisite for their price to aggregate and reveal information. Hayek, *supra* note 66, at 12.

73. *See* Sanford J. Grossman & Joseph E. Stiglitz, *On the Impossibility of Informationally Efficient Markets*, 70 AM. ECON. REV. 393, 404 (1980).

74. Wolfers & Zitzewitz, *supra* note 48, at 121.

D. *Prediction Markets in Action*

When it comes to events subject to less public attention than national elections, and outcomes unrelated to public sentiment, prediction markets can be of particular value to journalists and reporters.[75] For a diverse set of questions, such as whether and when the Higgs boson particle would be discovered,[76] where Lebron James would sign in free agency,[77] and whether Congress would pass the Affordable Healthcare Act,[78] *New York Times* columnists and reporters cited prediction markets, particularly InTrade, as reliable sources of forecasting information.[79]

No longer confined to economists' toolbelts, prediction markets have become an increasingly popular topic of discussion and application in the legal field as well.[80] FantasySCOTUS is the leading Supreme Court prediction market operator and has enabled tens of thousands of lawyers, academics, law students, and members of the public to make predictions about case outcomes.[81] FantasySCOTUS' operational mission is to utilize experts, crowds, and algorithms to generate accurate Supreme Court case forecasts.[82]

Supreme Court verdicts often carry economic implications,[83] and

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75.   Ozimek, *supra* note 53, at 12–13.

76.   *See, e.g.*, Dennis Overbye, *New Data on Elusive Particle Shrouded in Secrecy*, N.Y. TIMES (June 19, 2012), https://www.nytimes.com/2012/06/20/science/new-data-on-higgs-boson-is-shrouded-i n-secrecy-at-cern.html [https://perma.cc/G2QM-DSVR].

77.   *See, e.g.*, J. David Goodman, *King James and Other Small Things*, N.Y. TIMES: CITY ROOM (July 8, 2010, 11:07 AM), https://cityroom.blogs.nytimes.com/2010/07/08/king-james-and-other-small-things/ [https://perma.cc/4FEC-ZQX3].

78.   *See, e.g.*, Paul Krugman, *Health Care Resurrection*, N.Y. TIMES: THE CONSCIENCE OF A LIBERAL (Mar. 9, 2010, 9:46 AM), https://krugman.blogs.nytimes.com/2010/03/09/health-care-resurrec tion/ [https://perma.cc/MJG5-ZACE].

79.   Ozimek, *supra* note 53, at 12.

80.   *See, e.g.*, Michael Abramowicz & M. Todd Henderson, *Prediction Markets for Corporate Governance*, 82 NOTRE DAME L. REV. 1343, 1346 (2007) (prediction market for corporate governance); Josh Blackman et al., *FantasySCOTUS Crowdsourcing a Prediction Market for the Supreme Court*, 10 NW. J. TECH. & INTELL. PROP. 125, 152 (2012) (prediction market for Supreme Court appointments); M. Todd Henderson, Justin Wolfers & Eric Zitzewitz, *Predicting Crime*, 52 ARIZ. L. REV. 15 (2010) (prediction market for crime rate).

81.   Mike Bommarito et al., *About FantasySCOTUS*, LEXPREDICT, https://fantasyscotus.lexpredi ct.com/about/ [https://perma.cc/9F3C-TRFL].

82.   *Id.* While Justice Stephen Breyer does not "think [he] will bet on it," he is encouraged by the public's interest and believes "[t]he more the public knows about the court, the better." Josh Blackman, *Asked About FantasySCOTUS.net in an Interview, Justice Breyer Responded: "I Don't Think I Will Bet on it.,"* JOSH BLACKMAN'S BLOG (Nov. 30, 2009), http://joshblackman.com/blog/2009/11/30/justice-breyer-asked-about-fantasyscotus-net-in-an-interview-his-response-i-dont-think-i-will-bet-on-it/ [https: //perma.cc/2BES-2UY5].

83.   Daniel Martin Katz et al., Law on the Market? Abnormal Stock Returns and Supreme Court

prediction markets related to case outcomes represent just one of the many ways in which private entities can utilize prediction market prices. In the technology sector, prediction markets were able to forecast Google's initial public offering price better than Google had with internal auction mechanisms that it had designed to "avoid . . . underpricing."[84] In the health field, prediction markets have provided prognoses of seasonal influenza activity two to four weeks in advance of historically-based forecasts[85] and have accurately predicted the spread of dengue fever outbreaks.[86] Perhaps most strikingly, prediction markets tied to macroeconomic indicator data releases outperformed surveys of professional analysts, as the markets were better able to estimate payrolls, unemployment claims, retail sales, business confidence, and other measures of macroeconomic performance.[87] The breadth and success of private prediction markets indicates that they have utility,[88] but their operation creates logistical and regulatory concerns.

II. DISTRIBUTED LEDGERS AND DECENTRALIZED PREDICTION MARKETS

Prediction markets have historically been operated in a centralized fashion.[89] This is because the most straightforward method of trade aggregation "is for a trustworthy entity to maintain a ledger."[90] Centralized

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Decision-Making (May 14, 2017) (unpublished manuscript) (manuscript at 12), https://ssrn.com/abstract =2649726.

84.   Joyce E. Berg et al., *Searching for Google's Value: Using Prediction Markets to Forecast Market Capitalization Prior to an Initial Public Offering*, 55 MGMT. SCI. 348, 348–50 (2009).

85.   Philip M. Polgreen et al., *Use of Prediction Markets to Forecast Infectious Disease Activity*, 44 CLINICAL INFECTIOUS DISEASES 272, 277–78 (2007).

86.   Crystal Franco et al., *Electronic Health Markets Predict Spread of Dengue in U.S.*, CLINICIANS' BIOSECURITY NEWS (Nov. 5, 2010), http://www.centerforhealthsecurity.org/resources/cbn /articles/2010/cbnreport_11052010.html [https://perma.cc/4CTW-RS7W].

87.   These market prices outperformed expert surveys by an average of 5 percent. Refet S. Gürkaynak & Justin Wolfers, *Macroeconomic Derivatives: An Initial Analysis of Market-Based Macro Forecasts, Uncertainty, and Risk* 8–9 (Nat'l Bureau of Econ. Research, Working Paper No. 11929, 2006), https://www.nber.org/papers/w11929.pdf [https://perma.cc/EY5X-P9R8].

88.   *See, e.g.*, Robin Hanson, *The Policy Analysis Market: A Thwarted Experiment in the Use of Prediction Markets for Public Policy*, INNOVATIONS: TECH., GOVERNANCE, GLOBALIZATION, Summer 2007, at 73, 85–86 (describing prediction market use in the Department of Defense); Polgreen et al., *supra* note 85, at 272 (discussing prediction market use in the health care industry); Bo Cowgill et al., *Using Prediction Markets to Track Information Flows: Evidence from Google*, *in* AUCTIONS, MARKET MECHANISMS AND THEIR APPLICATIONS 3 (Sanmay Das et al. eds., 2009) (detailing prediction markets use in multibillion-dollar corporations such as Chrysler, Frito Lay, General Electric, General Mills, Google, Hewlett-Packard, IBM, Microsoft, Nokia, Qualcomm, Siemens, TNT, and Yahoo).

89.   Jack Peterson et al., *Augur: A Decentralized Oracle and Prediction Market Platform*, AUGUR 1 (July 12, 2018), https://www.augur.net/whitepaper.pdf [https://perma.cc/CV2S-7QSS].

90.   *Id.*

markets also require an "impartial, trusted judge to determine the outcome" and then "distribute payouts to traders."[91] Critically, these centralized markets are subject to severe regulatory scrutiny.[92]

Blockchain technology, also known as Distributed Ledger Technology (DLT), offers an alternative to centralization and enables people, for the first time, to maintain digital trust without the use of an intermediary.[93] By combining prediction markets with DLT, developers now have the tools to efficiently and effectively unleash the wisdom of the crowds.[94] DLT prediction markets date back to 2014, and as of 2019 there are working prototypes available to the public.[95]

A. An Introduction to DLT

Over the past decade, DLT has married traditional record-keeping methods with technological advances to create a new system for preserving and sharing data.[96] In the not-so-distant past, it was impossible for users to agree that a digital transaction was valid without a trusted, centralized authority performing verification.[97] Today, DLT enables crowdsourced verification and empowers separate parties to independently form a consensus regarding transaction validity.[98]

DLT facilitates transactions through three fundamental features: (1) "decentralized consensus mechanisms," (2) "distributed data storage," and (3) "cryptographic algorithms."[99] Decentralized consensus describes the principles and techniques through which participants on a distributed network come to an agreement on the validity of the transactions on their shared database. Because consensus can be reached in a decentralized

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91.   *Id.*
92.   *See infra* Section III.
93.   *See infra* Section II.A.
94.   *See infra* Section II.B.
95.   *See infra* Section II.C.
96.   *See* Trevor I. Kiviat, *Beyond Bitcoin: Issues in Regulating Blockchain Transactions*, 65 DUKE L.J. 569, 577 (2015).
97.   *See id.* at 577–78.
98.   Carla L. Reyes, *Moving Beyond Bitcoin to an Endogenous Theory of Decentralized Ledger Technology Regulation: An Initial Proposal*, 61 VILL. L. REV. 191, 197–98 (2016).
99.   Kelsey Bolin, Note, *Decentralized Public Ledger Systems and Securities Law: New Applications of Blockchain Technology and the Revitalization of Sections 11 and 12(A)(2) of the Securities Act of 1933*, 95 WASH. U. L. REV. 955, 958 (2018); *see also* Reyes, *supra* note 98, at 197 (citing Aaron Wright & Primavera De Filippi, Decentralized Blockchain Technology and the Rise of *Lex Cryptographia* (Mar. 12, 2015) (unpublished manuscript) (manuscript at 4–5), https://www.intgovfo rum.org/cms/wks2015/uploads/proposal_background_paper/SSRN-id2580664.pdf [https://perma.cc/L Y4C-RNH5]).

manner, no single entity is required to confirm a transaction's validity.[100] Similarly, by distributing data storage, the need for a single recordkeeper is obviated. Instead, each member of the network retains a complete record of transactions, and cryptographic algorithms ensure the integrity of these records.[101]

These unique attributes allow market formation to occur in a public, permanent, and trustless manner.[102] Because the underlying ledger is "maintained by no one and available to everyone,"[103] the information stored in a decentralized ledger is resistant to fraud or error.[104] These properties also ensure that DLT-published code cannot be retroactively tampered with, even by its creator.

B. The Theoretical Promise of DLT Prediction Markets

Before the advent of DLT, it was challenging to create accessible prediction markets.[105] Centralized market formation is limited by high startup costs and no guarantee of liquidity.[106] Now, using programmable smart contracts,[107] "[a]nyone can create a market based on any real-world event"[108] and "parties can confirm that an event or condition has in fact occurred without the need for a third party."[109]

To demonstrate, a functional DLT prediction market protocol operates as follows. First, "[t]he *market creator* sets the *event end time* and chooses

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100. Bolin, *supra* note 99, at 957–58; *see also* Joshua Fairfield, *Smart Contracts, Bitcoin Bots, and Consumer Protection*, 71 WASH. & LEE L. REV. ONLINE 35, 36 (2014).

101. Wright & De Filippi, *supra* note 99 (manuscript at 5–7).

102. Kiviat, *supra* note 96, at 577.

103. Fairfield, *supra* note 100, at 36.

104. *Id.* at 44–45.

105. *See* Peterson, *supra* note 89, at 1. As will be further discussed, many of these challenges revolve around the regulatory environment that centralized prediction market developers operate in.

106. Startup costs include storing value, processing value, and backend coordination of payouts and markets. *Id.*

107. Maher Alharby & Aad van Moorsel, *Blockchain Based Smart Contracts: A Systematic Mapping Study*, *in* COMPUTER SCIENCE & INFORMATION TECHNOLOGY: 3RD INTERNATIONAL CONFERENCE ON ARTIFICIAL INTELLIGENCE AND SOFT COMPUTING 125, 125–26 (Dhinaharan Nagamalai & Abdúlkadir Özcan eds., 2017).

108. Peterson, *supra* note 89, at 1.

109. Wright & De Filippi, *supra* note 99, at 10. Note, the theoretical ability to trade in a market does not necessarily mean that people will do so. There are still considerable barriers to entry in DLT prediction market use, including understanding how to buy and use cryptocurrency. *See* Drew Millard, *The Hype, the Horror, and the Letdown of Prediction Market Augur*, BREAKERMAG (Oct. 3, 2018), https ://breakermag.com/the-hype-the-horror-and-the-letdown-of-prediction-market-augur/ [https://perma.cc /5FAQ-MQUL].

a *designated reporter* to report the outcome of the event."[110] Then, "[m]arket participants forecast the outcomes of events by trading *shares* of those market outcomes."[111] Finally, "[o]utcomes are determined by [an] oracle, which consists of profit-motivated reporters, who simply report the actual, real-world outcome of the event."[112] This model appears uniquely well-situated to keep up with the "constant small changes which make up the whole economic picture."[113] In theory, the ability to fund—and profit from—wide-ranging prediction markets provides people across the world with an incentive to seek and sort information, capitalize on price inefficiencies, and disclose privately held knowledge.

C. *Augur: A Blockchain Prediction Market Protocol in Action*

While numerous DLT prediction markets are in development,[114] Augur was a pioneer on the DLT prediction market front.[115] Conceived in 2014, Augur raised over five million dollars of working capital the next year.[116] That money was used to fund the Forecast Foundation (FF), a non-profit entity comprised of "developers and technology professionals who . . . support[ ] and develop[ ] the free, open-source protocol that is Augur."[117] Augur is not a prediction market itself; rather, it enables users to create their own market or trade on markets created by others.[118]

It is helpful to conceptualize Augur as comprising two separate dimensions: a user-facing application and a set of DLT contracts.[119] The user-facing application consists of a "website with no affiliation, support, or relationship to the Forecast Foundation."[120] The FF is exclusively

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110.   Peterson, *supra* note 89, at 2 (explaining Augur, a prediction market platform).

111.   Peterson, *supra* note 89, at 2.

112.   Peterson, *supra* note 89, at 3.

113.   Hayek, *supra* note 66, at 523.

114.   Notable projects include: Gnosis, Stox, Delphy, and BlitzPredict. *See* Sudhir Khatwani, *5 Best Blockchain-Based Prediction Markets Cryptocurrencies*, COINSUTRA (Oct. 15, 2018), https://coins utra.com/prediction-markets-cryptocurrencies/ [https://perma.cc/V9D9-BWS9].

115.   Ben Munster, *The Long Shot*, DECRYPT (Oct. 15, 2018), https://decryptmedia.com/3690/aug ur-ico-prediction-market [https://perma.cc/PED4-DEL9].

116.   *Id.* (explaining how Augur raised this money "without the support of venture capitalists, banks, or any kind of institutional middleman").

117.   *FAQs*, AUGUR, https://www.augur.net/faq/ [https://perma.cc/Q4FD-Y6RG].

118.   Steven Buchko, *What Is Augur (REP)? A Guide to the Decentralized Prediction Market*, COINCENTRAL (Dec. 1, 2018), https://coincentral.com/augur-beginner-guide/ [https://perma.cc/H2EY-H47G].

119.   Matt Shapiro, MULTICOIN CAPITAL, *Spring 2019 Summit: The Promise of Prediction Markets*, YOUTUBE 1:38 (May 14, 2009), https://youtu.be/QnbBog9Y620.

120.   *Redirect Notice*, AUGUR, https://www.augur.net/ipfs-redirect.html [https://perma.cc/8MWQ

concerned with developing Augur as a protocol;[121] in other words, it is focused on supporting the DLT contracts so that people can create and engage with markets. Because the FF does not profit from use of the Augur application, it has no incentive to invest on improving Augur's user experience (UX). Therefore, while the smart contracts driving Augur are impressive, its interface can be onerous.[122]

In October 2019, over 2,700 markets were active on the Augur platform with over three million dollars at stake,[123] though only twenty-one of those markets were liquid.[124] While approximately one hundred and thirty thousand dollars has been transacted, to date, in the market "Will Donald Trump be Re-Elected in 2020?,"[125] the vast majority of markets have attracted no trading at all.[126]

In order to address Augur's UX deficiency, the startup Veil built a platform designed to streamline interaction with the Augur protocol.[127] While similar to the FF in many regards, Veil assumed an active role in limiting which traders were allowed on its platform and restricting the markets that they were able to create.[128] Veil's UX improvements to the Augur protocol were motivated by a 1 percent fee which it charged on all

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-B87N]. Though the Augur website redirects to this user-facing website which allows individuals to interact with DLT contracts, the FF notes that it "does not endorse [the user-facing] website, its sponsor, or any policies, activities, products, or services offered on the site . . . ." *Id.*

121. Shapiro, *supra* note 119, at 4:58.

122. Shapiro, *supra* note 119, at 3:46. For example, each user who creates a market must categorize the market him or herself—this has led to redundant categories for "sports," "sport," "sports basketball," "NBA," etc. *Id.* at 3:34. As of May 27, 2019, over two hundred categories have been established without an accompanying streamlined search method. *Markets*, CLOUDFLARE, https://cloudf lareipfs.com/ipfs/QmNPsckfWkAyhAkMX5ahNYTVRSc3GUvRiFttLHm54etd5L/?ethereum_node_h ttp=https%3a%2f%2fethmainnet.alchemyapi.io%2fjsonrpc%2f7sE1TzCIRIQA3NJPD5wg7YRiVjhxu WAE&augur_node=wss%3a%2f%2fpredictions.market:9002#!/markets (last visited July 13, 2019).

123. *Prediction Markets*, PREDICTIONS.GLOBAL, https://predictions.global/?s=Volume (last visited Oct. 10, 2019).

124. *Id.*

125. *Will Donald Trump Be Re-Elected in 2020?*, PREDICTIONS.GLOBAL (Oct. 10, 2019), https://p redictions.global/augur-markets/will-donald-trump-be-re-elected-in-2020-0xdecbd869eccac116193886 c3f7fa4a150ffab681.

126. *See, e.g.*, *Will Kim Kardashian and Kayne [sic] West File for Divorce by 2020?*, PREDICTIONS.GLOBAL (Aug. 3, 2018), https://predictions.global/augur-markets/will-kim-kardashian-an d-kayne-west-file-for-divorce-by-2020-0x6cfa62c9853eb93951e89db64ec9f9dd735bf169;   *Will   a Nuclear Weapon Be Detonated as Part of an Attack Against a Sovereign Nation Before 12:00 (Eastern Standard Time) January 20, 2021*, PREDICTIONS.GLOBAL (July 26, 2018), https://predictions.global/aug ur-markets/will-a-nuclear-weapon-be-detonated-as-part-of-an-attack-against-a-sovereign-nation-before -12-00-eastern-standard-time-ja-0x796d2288faa42f86e802789ac598f025c3f92635.

127. *About Veil*, VEIL, https://veil.co/about [https://perma.cc/3WQS-LV47].

128. *Veil International Rulebook: Version 2*, VEIL, https://veil.co/legal/rulebook [https://perma.cc /9ZLR-84Z7].

orders;[129] however, Veil ceased operations shortly after its launch.[130] Proffering a reason as to why Veil failed, its co-founder and CEO asserted: "We weren't decentralized or regulated. Some users want a fully decentralized, unstoppable product and others want a regulated product. It's hard to offer something in between that people find valuable."[131]

In contrast to Veil, the FF has no operational role in the markets created on Augur, cannot access the funds that are held in escrow, "does not control how markets resolve or are created, does not approve or reject trades or other transactions on the network, and do[es] not have the ability to modify, cancel, undo, or interact with orders on the network."[132] In essence, the FF has published a decentralized protocol that places full control in the hands of the users.[133]

III. PREDICTION MARKET REGULATORY PARADIGMS

While DLT prediction markets present a slew of new regulatory challenges, the CFTC has made it clear that it intends to regulate these markets to the full extent of its authority.[134] As the principal agency tasked with regulating commodity futures and options, the CFTC relies on a sweeping definition of "commodity," which includes all goods, articles, services, rights, and interests which are or may be the subject of futures contracts.[135] Under congressional authority,[136] the CFTC takes regulatory purview over entities operating prediction markets.[137] Over the years, no-

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129. Jeremy Paly Batchelder, *A Primer on Augur and Veil*, MEDIUM (Feb. 10, 2019), https://mediu m.com/coinmonks/a-primer-on-augur-and-veil-221994a69ebf [https://perma.cc/C9HB-6GN8].

130. Paul Fletcher-Hill, *Next Steps for Veil*, MEDIUM (July 11, 2019), https://medium.com/veil-bl og/next-steps-for-veil-133777c4a774 [https://perma.cc/H3LB-HTBB].

131. *Id.*

132. *FAQs*, *supra* note 117.

133. *See* Matthew Leising, *As Crypto Meets Prediction Markets, Regulators Take Notice*, BLOOMBERG (July 26, 2018, 11:17 AM), https://www.bloomberg.com/news/articles/2018-07-26/as-cry pto-meets-prediction-markets-u-s-regulators-take-notice [https://perma.cc/AUE4-97YN].

134. *See infra* Section III.B.

135. 7 U.S.C. § 1a(9) (2012) ("The term 'commodity' means wheat, cotton, rice, corn, oats, barley, rye, flaxseed, grain sorghums, mill feeds, butter, eggs, Solanum tuberosum (Irish potatoes), wool, wool tops, fats and oils (including lard, tallow, cottonseed oil, peanut oil, soybean oil, and all other fats and oils), cottonseed meal, cottonseed, peanuts, soybeans, soybean meal, livestock, livestock products, and frozen concentrated orange juice, and all other goods and articles, except onions (as provided by section 13-1 of this title) and motion picture box office receipts (or any index, measure, value, or data related to such receipts), and all services, rights, and interests (except motion picture box office receipts, or any index, measure, value or data related to such receipts) in which contracts for future delivery are presently or in the future dealt in.").

136. Commodity Exchange Act, 7 U.S.C. § 1 (2012).

137. Letter from Andrea M. Corcoran, Dir., Div. of Trading & Mkts., CFTC, to Professor George

action letters transitioned to million-dollar penalties, as the CFTC's tolerance for prediction markets steadily waned.

A. The CFTC's Historical Approach Towards Regulating Prediction Markets

Prediction markets have a rich history in the United States, with large, centralized entities organizing political speculation markets between 1868 and 1940.[138] Though public interest dwindled through the middle of the twentieth century, by 1990, an operation at the University of Iowa had established markets on elections for educational and research purposes (Iowa Electronic Markets, IEM).[139] It was these markets that caught the attention of the CFTC and led to a series of actions demonstrating progressively tighter regulations.

The CFTC's first two letters pertaining to prediction markets, issued in 1992 and 1993,[140] promulgated three primary policies: (1) "nonpolitical markets [were] only open to 'academic traders,'" (2) the "maximum investment" per individual was limited to five hundred dollars and markets were "limited to 1,000–2,000 traders," and (3) the CFTC's nonaction was premised on "IEM's academic purpose and nonprofit operation."[141] These nonaction letters signaled that the CFTC's chief concern was limiting market size, and small-scale prediction markets proliferated.[142]

By 2005, the CFTC indicated increased interest in inhibiting prediction market activity and announced that it had reached a settlement with the Trade Exchange Network (TEN), directing TEN to pay $150,000 for

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R. Neumann, Professor of Econ., Univ. of Iowa (Feb. 5, 1992) [hereinafter Corcoran letter 1992] (granting no-action relief with respect to the operation of a political prediction market); Letter from Andrea M. Corcoran, Dir., Div. of Trading & Mkts., CFTC, to Professor George R. Neumann, Professor of Econ., Univ. of Iowa (June 18, 1993) [hereinafter Corcoran letter 1993] (granting no-action relief with respect to the operation of a political prediction market and an economic indicator prediction market, but declining to offer no-action relief on an earnings prediction market, due to the possibility that contracts traded on these markets could be viewed as securities and would therefore be excluded from CFTC jurisdiction pursuant to 7 U.S.C. § 2 (2012)).

138. Paul W. Rhode & Koleman S. Strumpf, *Historical Presidential Betting Markets*, J. Econ. Persp., Spring 2004, at 127, 127. In 1916, there was over $235 million (in 2019 dollars) wagered on a single election. *Id.* at 128. Inflation calculator found at https://www.usinflationcalculator.com/.

139. *What Is the IEM?*, Iowa Electronic Mkts., https://iemweb.biz.uiowa.edu/media/summary.html [https://perma.cc/DDX5-LXGP]. Over one hundred Universities, including Harvard, MIT, Michigan, and Northwestern, have enrolled in the program. *Id.*

140. Corcoran letter 1992, *supra* note 137; Corcoran letter 1993, *supra* note 137.

141. Ozimek, *supra* note 53, at 26.

142. Ozimek, *supra* note 53, at 26–27.

offering commodity option contracts.[143] The CFTC found that TEN solicited U.S. customers to trade in markets for gold prices, crude oil prices, the intraday Euro versus U.S. Dollar rate, and the U.S. Dollar versus Yen cash rate.[144] Because these markets were not excepted or exempted from the Commission's regulation banning options trading, TEN was found in violation of the Commodity Exchange Act (CEA).[145] In spite of these penalties, sustained interest in prediction markets during the 2008 election led the CFTC to solicit comment on appropriate regulatory treatment.[146]

These comments were reflected in the CFTC's next prediction market-related action in 2010, which approved two markets for box-office futures.[147] Regrettably for cinephiles, this Hollywood-centric carve-out was short-lived—the Dodd-Frank Wall Street Reform and Consumer Protection Act of 2010 amended the CEA "to explicitly define box-office revenues as not a commodity, and thereby effectively banned box-office futures."[148]

Furthermore, the 2010 legislation amended the CEA to prohibit the trading of any contract which is "contrary to the public interest," defined as including: "(I) activity that is unlawful under any Federal or State law; (II) terrorism; (III) assassination; (IV) war; (V) gaming; or (VI) other similar activity determined by the Commission, by rule or regulation, to be contrary to the public interest."[149] This legislation encouraged heightened CFTC enforcement,[150] and no case better illustrates the CFTC's post-Dodd-Frank prediction market crackdown than that of InTrade.[151]

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143. Press Release, Commodity Futures Trading Comm'n, U.S. Commodity Futures Trading Commission Assesses Penalties Against Irish Company Trade Exchange Network Limited for Offering Illegal Commodity Option Contracts (Oct. 4, 2005), https://www.cftc.gov/sites/default/files/opa/enf05/opa5124-05.htm [https://perma.cc/78EZ-6KW3].

144. *In re* Trade Exchange Network, CFTC No. 05-14 (Sept. 29, 2005).

145. *Id.* at 5.

146. *See* Request for Comment: Concept Release on the Appropriate Regulatory Treatment of Event Contracts, 73 Fed. Reg. 25,669 (May 7, 2008).

147. U.S. Commodity Futures Trading Comm'n, Statement of the Commission, *In Re* MDEX 3 (June 14, 2010), https://www.cftc.gov/sites/default/files/idc/groups/public/@otherif/documents/ifdocs/mdexcommissionstatement061410.pdf [https://perma.cc/M2YY-45RR]. The CFTC commissioners found that box-office future contracts met the definition of "commodity," but because the "paramount concern to the Commission [was] whether this contract [was] susceptible to manipulation" and they found the contracts not susceptible, they approved the market. *Id.* at 4–5.

148. Ozimek, *supra* note 53, at 29. By excluding film futures from the definition of a "commodity," it therefore cannot be the subject of trading on any commodity futures exchange. Dodd-Frank Wall Street Reform and Consumer Protection Act, Pub. L. No. 111-203, § 721(a)(4), 124 Stat. 1376, 1659 (2010).

149. Dodd-Frank Wall Street Reform and Consumer Protection Act, Pub. L. No. 111-203, § 745(b), 124 Stat. 1376, 1737 (2010).

150. Ozimek, *supra* note 53, at 30.

151. John Cassidy, *What Killed InTrade?*, NEW YORKER (Mar. 10, 2013), https://www.newy

Founded in Ireland in 2001, and acquired by TEN in 2003, InTrade earned a reputation as the world's leading prediction market during the 2008 and 2012 U.S. elections.[152] By November 2012, InTrade was generating fifty million monthly page views.[153] This success proved to be for naught, because according to the CFTC, InTrade's operations were in violation of the 2005 cease and desist order issued to TEN.[154] In this 2005 order, TEN— and by extension InTrade—agreed to cease soliciting and accepting orders from U.S. customers for the trading of options not excepted or exempted from the CFTC's ban on off-exchange trading.[155]

In November 2012, the CFTC charged InTrade for multiple violations stemming from its operation of prediction markets.[156] A few months later, InTrade shut down,[157] and six years after the charges were initially filed, InTrade and TEN were required to pay a three million dollar civil monetary penalty for these violations of the CEA and CFTC Regulations.[158] This case demonstrates the harsh consequences of operating a centralized prediction market in America, or soliciting American users, in light of the regulatory shift "from uncertainty and legal gray areas to gradually more restrictive laws and enforcement."[159]

B. A Commissioner's Perspective on DLT Prediction Markets

The CEA,[160] which statutorily grounds the CFTC's actions, was drafted in an environment in which known "swap dealers, futures commission

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orker.com/news/john-cassidy/what-killed-intrade [https://perma.cc/KA6G-LBF6].

152. *About InTrade*, INTRADE, http://www.InTrade.com/history [https://perma.cc/2U9G-JB5J].

153. Aaron Stanley, *Tradesports Rises from InTrade's Ashes*, FINANCIAL TIMES (May 1, 2014), https://www.ft.com/content/bd49768c-cfbe-11e3-9b2b-00144feabdc0 [https://perma.cc/6B4T-MY2X].

154. Press Release, U.S. Commodity Futures Trading Comm'n, CFTC Charges Ireland-Based "Prediction Market" Proprietors (Nov. 26, 2012), https://www.cftc.gov/PressRoom/PressReleases/pr64 23-12.

155. *Id.* at 2.

156. *Id.* In granting summary judgment to the CFTC, the District Court for the District of Columbia found that TEN and InTrade permitted U.S. customers to trade 5,503 binary option contracts involving CFTC-regulated commodities from September 2007 through June 2012 in violation of the CFTC's ban on off-exchange options trading. CFTC v. Trade Exch. Network Ltd., 117 F. Supp. 3d 29, 34–39 (D.D.C. 2015). The court also found that TEN violated a 2005 Cease and Desist Order that the CFTC issued against TEN. *Id.* at 39.

157. Cassidy, *supra* note 151.

158. CFTC v. Trade Exch. Network Ltd., 318 F. Supp. 3d 26, 34 (D.D.C. 2018) (granting an "assessment of a $3 million CMP, plus post-judgment interest, for which defendants are to be held jointly and severally liable").

159. Ozimek, *supra* note 53, at 31.

160. Commodity Exchange Act, 7 U.S.C. § 1 (2012).

merchants, clearinghouses, and fund managers" all participated in a centralized exchange.[161] This framework was not designed in reaction to, or in anticipation of, "the disintermediated world of blockchain."[162] However, the dissemination of increasingly complex technology creates both a need and an opportunity for the CFTC to revisit its policies.[163]

On October 16, 2018, CFTC Commissioner Brian Quintenz expressed his view on the CFTC's role in regulating DLT prediction markets.[164] Commissioner Quintenz pointed out that event contracts have a unique spot in CFTC jurisprudence.[165] Specifically, Commissioner Quintenz called attention to the public policy concerns that certain event contracts can raise. The Commissioner noted that the CFTC has historically "only permitt[ed] them in limited circumstances when it has found that they operate on a small-scale, non-profit basis, and serve academic purposes."[166]

If DLT prediction market contracts resemble traditional prediction market event contracts, then they likely fall under the general prohibition of being contrary to the public interest, unless they are subject to the IEM and PredictIt exceptions.[167] Speaking in hypothetical language, Commissioner Quintenz considered "event contracts, executed in a potentially for-profit manner, between retail customers, on any conceivable event, for any sum of money," and concluded that these types of contracts would raise numerous CFTC regulatory concerns.[168] Regardless of whether a contract is formed with DLT, if the contract is a product within the CFTC's jurisdiction, then it is subject to CFTC enforcement.[169] Given the recent penalty imposed against InTrade and TEN,[170] this reality may prove troublesome for the creators of blockchain prediction markets.

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161. Quintenz, *supra* note 24.
162. *Id.*
163. *See* Brian Tamanaha, *Law's Evolving Emergent Phenomena: From Rules of Social Intercourse to Rule of Law Society*, 95 WASH. U. L. REV. 1149, 1173 (2018) ("Social, economic, technological, and political life are increasingly complex, and law is correspondingly complex as it struggles to keep up with surrounding technical complexities that legal officials themselves sometimes have difficulty comprehending.").
164. Quintenz, *supra* note 24.
165. *Id.*
166. *Id.*
167. *Id.*
168. *Id.*
169. *Id.*
170. CFTC v. Trade Exch. Network Ltd., 318 F. Supp. 3d 26, 34 (D.D.C. 2018).

C. *Conflict Brewing Between the Forecast Foundation and the CFTC*

Due to the tamper-proof nature of blockchain code,[171] the FF "has no power to censor, restrict, or curate markets, orders, trades, positions or resolutions on the Augur protocol contracts."[172] The FF has therefore taken the stance that where a market contravenes law or regulation, liability falls on the market-maker, as opposed to the developers of the code that enables creation of the market.[173]

This theory remains largely untested, and though the Augur website contains multiple liability disclaimers and encourages users to follow local laws and regulations,[174] it remains unclear how the CFTC will pursue enforcement against DLT prediction market participants generally, and the FF specifically. In his October address, Commissioner Quintenz posed the pertinent, perhaps rhetorical, question: "[W]ho should be held accountable for this activity?"[175] Interestingly, "[w]ill the Forecast Foundation face an enforcement action from the SEC or CFTC before Dec[ember] 21, 2018 for hosting unregulated derivatives markets?" is one of the thousands of prediction markets created so far via the Augur code.[176]

IV. A PROPOSAL ON PREDICTION MARKET REGULATION IN THE BLOCKCHAIN ERA

Commissioner Quintenz recognized that, when considering enforcement against DLT prediction market participants, two potentially liable groups

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171. Kiviat, *supra* note 96, at 577 n.46. ("[T]ransactions on the blockchain are essentially accounting entries that are cryptographically sealed, preventing tampering and enabling near-real-time auditing.").

172. *FAQs*, *supra* note 117. The FF further claims to "encourage users to follow their respective local jurisdictional laws, rules and regulations, even though it can't and doesn't control their use of the Augur protocol." *Id.*

173. *Id.* ("Users of the Augur protocol must themselves ensure that the actions they are performing are compliant with the laws in all applicable jurisdictions and must acknowledge that others' use of the Augur protocol may not be compliant. Users of the Augur protocol do so at their own risk.").

174. *Id.*

175. Quintenz, *supra* note 24.

176. *Will the Forecast Foundation Face an Enforcement Action from the SEC or CFTC Before Dec. 21, 2018 for Hosting Unregulated Derivatives Markets?*, PREDICTIONS.GLOBAL (July 19, 2018), https://predictions.global/augur-markets/will-the-forecast-foundation-face-an-enforcement-action-from-the-sec-or-cftc-before-dec-21-2018-for-hosting-unregulated-0xa5706d1d3da0f9c0878a457132296ea9d cd2ce65. The market opened on July 19, 2018, indicating a 65 percent likelihood of enforcement. Ultimately, no traders participated in the market before its close. *Id.* There has been no public enforcement action at this point, however, it is clear that DLT prediction markets are in the CFTC's crosshairs. *See supra* Section III.B.

are the *developers* of the code underlying the event contracts and the individual *users* of that code who create or trade in the markets.[177] As discussed, some code developers have asserted that because they merely created the protocol and have no control over user behavior, they therefore assume no liability.[178] Nevertheless, existing legal theories in the realm of intellectual property can offer guidance.

Specifically, the theory of secondary liability found in patent law,[179] as well as in copyright cases,[180] provides a useful framework through which to analyze liability in the DLT prediction market landscape. Because the threshold requirement for secondary liability and contributory infringement is the existence of direct liability or direct infringement,[181] the analysis must begin by considering what categories of prediction markets are or should be banned.

A. Examining Categories of Disallowed Markets

Reforms ushered in with Dodd-Frank prohibit the listing, trading, or clearing of a product that is based on certain excluded commodities and that involves terrorism, war, assassination, gaming, activity that is unlawful under any state or federal law, or a product determined to be contrary to the public interest.[182] Ostensibly, each of the above categories represents subject matter that Congress prefers for people to refrain from speculating upon; however, in some instances, these policies are misguided.

This Note contends that Congress should amend the CEA to strike the blanket prohibitions against markets related to terrorism, war, and gaming. Further, due to the economic value of the information produced by wide-ranging prediction markets, the CFTC should use its discretion to deem the vast majority of markets permissible under the public interest test.

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177. Quintenz, *supra* note 24.

178. *Id.*; *see also FAQs*, *supra* note 117.

179. *See, e.g.*, 35 U.S.C. § 271(c) (2010) ("Whoever offers to sell or sells within the United States or imports into the United States a component of a patented machine, manufacture, combination or composition, or a material or an apparatus for use in practicing a patented process, constituting a material part of the invention, knowing the same to be especially made or especially adapted for use in an infringement of such patent, and not a staple article or commodity of commerce suitable for substantial noninfringing use, shall be liable as a contributory infringer.").

180. *See, e.g.*, Metro-Goldwyn-Mayer Studios Inc. v. *Grokster*, Ltd., 545 U.S. 913 (2005); Sony Corp. of Am. v. Universal City Studios, Inc., 464 U.S. 417 (1984).

181. Deepsouth Packing Co., Inc. v. Laitram Corp., 406 U.S. 518, 526 (1972) ("[T]here can be no contributory infringement without the fact or intention of a direct infringement.").

182. 17 C.F.R. § 40.11 (2012).

1. Terrorism and War

In 2001, the Defense Advanced Research Project Agency (DARPA) began experimenting with methods for applying prediction market insights to intelligence operations.[183] In July 2003, it was revealed that DARPA allowed trading in various forms of geopolitical risk, including economic and military scenarios.[184] News of this program was met with a public outcry, and critics attacked DARPA for dealing in "terrorism futures."[185] Instead of spending political capital defending a small operation, DARPA dropped the proposal.[186]

Congressional outrage against "terrorism futures" seems to have been entirely misplaced, as, rather than encouraging terrorism, it is likely that DARPA's prediction markets could have contributed to tactical initiatives undertaken by the U.S. Intelligence Community.[187] Concerns of market manipulation—the fear that terrorists could influence the market to mislead the intelligence community or potentially even use the market to finance attacks[188]—are not supported by the data.[189] Instead, prediction markets can supply useful estimates of tactical trends and threats, and contribute to cost-benefit assessments of ongoing or proposed policies.[190]

Terrorism and war deal with similar moral concerns; however, outbreaks of war raise an entirely unique set of economic questions.[191] Because the prospect of armed conflict has serious repercussions on financial sectors, more accurately tracking the shifting probability of entering a war—and creating hedging opportunities—is a valuable service.[192]

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183.   Puong Fei Yeh, *Using Prediction Markets to Enhance US Intelligence Capabilities: A "Standard & Poors 500 Index" for Intelligence*, STUD. INTELLIGENCE, Number 4, 2006, at 37.

184.   Wolfers & Zitzewitz, *supra* note 48, at 107–08.

185.   *Id.*

186.   *Id.*

187.   Yeh, *supra* note 183, at 49.

188.   *Id.*

189.   Robin Hanson & Ryan Oprea, *A Manipulator Can Aid Prediction Market Accuracy*, 76 ECONOMICA 304, 312–13 (2009).

190.   Yeh, *supra* note 183, at 45. For example, if "a prediction market [had] existed on Iran's long-term political stability in 1979, fluctuations in the share prices of the appropriate contract would have quickly reflected the import of unfolding events and shifts in analytical judgments." *Id.*

191.   *See* Andrew Leigh et al., *What Do Financial Markets Think of War in Iraq?* 1–37 (Nat'l Bureau of Econ. Research, Working Paper No. 9587, 2003), https://www.nber.org/papers/w9587.pdf [https://perma.cc/778M-DQKH]; Reuven Glick & Alan M. Taylor, *Collateral Damage: Trade Disruption and the Economic Impact of War* 1–56 (Nat'l Bureau of Econ. Research, Working Paper No. 11565, 2005), https://www.nber.org/papers/w11565.pdf [https://perma.cc/MAL9-WHQK].

192.   Leigh et al., *supra* note 191, at 33–34. Using U.S. involvement in Iraq as a case study,

Establishing a prediction market tied to the outbreak of military activity does not consider the humanitarian costs of the speculated-upon event; it is also unlikely to impact the behavior of those in charge of military decisions.[193] Instead, war-based prediction markets may create a useful indicator for policy makers and corporate executives to consider in the macroeconomic context.[194] Given the sensitive nature of war- and terrorism-based markets, they undoubtedly warrant closer monitoring than most; nevertheless, a categorical ban on these classes of prediction markets will deprive U.S. actors of a telling economic barometer.[195]

2. Gaming

The CEA specifically preempts the application of any state or local law which prohibits or regulates gaming in the case of an agreement, contract, or transaction that falls under the public interest exemption provisions.[196] However, the CEA also states that it is not intended to supersede or preempt prosecution under any federal criminal statute.[197] Therefore, "while state law is preempted when the CFTC . . . determines a particular type of transaction is exempt from CEA, federal prohibitions against gaming, such as in the Federal Wire Act, are not."[198] In short, enforcing an embargo against gaming contracts falls to the Department of Justice (DOJ), not the

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economists found that macroeconomic effects of the conflict "could arise from short-term oil price shocks, from the effects of deficit-financed military spending, or from effects on consumer confidence in and investor expectations about the future." *Id.* at 5.

193.   *Id.* at 37. While prediction markets could "conceivably be used to inform decision-making in real time," perhaps raising "an endogeneity issue" "if policy makers . . . bas[ed] decisions on analyses of market expectations," this level of influence is unanticipated even by the most ardent prediction market proponents. *Id.* at 2 & n.2.

194.   *Id.* at 36–37. One study found that "war lowers the value of U.S. equities by around 15 percent. This effect is concentrated in the consumer discretionary sector, airlines and IT; the prospect of war bolsters the gold and energy sectors." *Id.* at abstract.

195.   Minimally, a market-based measure can complement expert opinions, because "[e]xpert opinions tend to vary widely (from expectations of a walk-over victory to dire predictions of terrorism and regional instability) and vary fairly directly with the ideological predisposition of the predictor." *Id.* at 1–2. Furthermore, "whereas careful experts tend to focus on the mostly easily analyzed costs of war (e.g., the budgetary impact), financial markets are forced to price the harder-to-assess but potentially much larger general equilibrium and political economy effects of war on the national economy." *Id.* at 2.

196.   7 U.S.C. § 16(e)(2) (2012).

197.   7 U.S.C. § 16(e)(1)(A) (2012).

198.   David R. Overstreet et al., *Regulated Wagering on Events Markets: Analysis*, WORLD ONLINE GAMBLING L. REP., August 2008, at 8, 8 (footnote omitted) (citing Wire Act, 18 U.S.C. § 1084(a) (2012) (prohibiting the use of telecommunications to conduct an illegal gambling business involving sporting events or contests)).

CFTC.

Gaming regulation has seen both permissive and restrictive developments since the start of 2018. On May 14, 2018, the Supreme Court held that the Professional and Amateur Sports Protection Act of 1992 (PASPA)[199] violated the Tenth Amendment and declared PASPA unconstitutional.[200] Within a month, Delaware became the first state outside of Nevada to legalize sports gambling;[201] as of this writing, seven states have permitted state-regulated betting industries and legislation is under review in nineteen more.[202] On the other hand, on January 15, 2019, the DOJ released an opinion that asserted that the Wire Act encompasses all forms of gambling that cross state boundaries.[203]

In reversing the department's previous policy that communications unrelated to a "sporting event or contest" fell outside of the Wire Act's reach,[204] the latest DOJ opinion indicates that it may pursue any type of interstate gambling or wagering activity.[205] The recency of this opinion makes it impossible to evaluate how enforcement will respond; however, in light of the demonstrated interest in over half of the states to establish regulated gaming markets,[206] these markets should be suppressed only to the extent that they contravene public interest.[207]

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199. This act effectively outlawed sports betting nationwide. 28 U.S.C. § 3702 (2012).

200. Murphy v. Nat'l Collegiate Athletic Ass'n, 138 S. Ct. 1461 (2018). While the decision only impacts intrastate sports gambling schemes, and interstate sports gambling remains illegal under the Federal Wire Act, the ruling leaves the American gaming landscape ripe for reform. *See* Adam Thew, *PASPA Repeal: What Does It Mean for the American Sports Betting Market?*, MEDIAWRITES (May 22, 2018), https://mediawrites.law/paspa-repeal-what-does-it-mean-for-the-american-sports-betting-market /#page=1 [https://perma.cc/3Z2S-Q873].

201. Maya Salam, *Delaware Kicks Off Full-Scale Sports Betting, a First Outside of Nevada*, N.Y. TIMES (June 5, 2018), https://www.nytimes.com/2018/06/05/sports/sports-betting-delaware.html [https: //perma.cc/S6W9-UFAS].

202. Dustin Gouker, *Legislative Tracker: Sports Betting*, LEGAL SPORTS REP., https://www.le galsportsreport.com/sportsbetting-bill-tracker/ [https://perma.cc/QR3C-JDTS].

203. Memorandum from the Deputy Attorney Gen. to U.S. Attorneys, Assistant Attorneys Gen. & Dir., Fed. Bureau of Investigation (Jan. 15, 2019) [hereinafter DOJ Opinion] (citing Reconsidering Whether the Wire Act Applies to Non-Sports Gambling, 42 Op. O.L.C. 1 (2018)); *see also* Michael Sykes, *New DOJ Opinion Expands Wire Act Outside of Sports Betting*, AXIOS (Jan. 14, 2019), https://ww w.axios.com/department-of-justice-sports-betting-casinos-wire-act-2814c61f-2675-478a-8c82-8ef168b f75f3.html [https://perma.cc/38HB-2H2N].

204. Whether Proposals by Illinois and New York to Use the Internet and Out-of-State Transaction Processors to Sell Lottery Tickets to In-State Adults Violate the Wire Act, 35 Op. O.L.C. 1 (2011).

205. DOJ Opinion, *supra* note 203 (citing Reconsidering Whether the Wire Act Applies to Non-Sports Gambling, 42 Op. O.L.C. 1 (2018)).

206. *See* Gouker, *supra* note 202.

207. According to Gallup polling, American support for gambling was at an all-time high in 2018. Jim Norman, *Acceptance of Gambling Reaches New Heights*, GALLUP (June 7, 2018), https://news.gallu

3. Contrary to Public Interest

"Contrary to the public interest," as defined in the CEA, encompasses the enumerated categories discussed above, as well as "other similar activity determined by the Commission, by rule or regulation."[208] This rulemaking process calls for "public notice and opportunity for a hearing on the record."[209] Because there is no fixed statutory definition, the agency must exercise discretion in its promulgation of public interest rules.

The CFTC is generally directed to consider the costs and benefits of all proposed regulations, paying closest attention to: (1) "[p]rotection of market participants and the public;" (2) "efficiency, competitiveness and financial integrity of futures markets;" (3) "price discovery;" and (4) "sound risk management practices."[210] In a 2008 solicitation for comment on the appropriate regulatory treatment of prediction markets, the CFTC recognized that "innovative event markets have the capacity to facilitate the discovery of information, and thereby provide potential benefits to the public."[211]

Nevertheless, a few years after this acknowledgement, the CFTC prohibited the listing or trading of political event contracts on the North American Derivatives Exchange.[212] In its Order, the CFTC asserted that political futures had no hedging or price discovery purpose due to the "unpredictability of the specific economic consequences of an election;"[213] therefore, these markets were deemed contrary to the public interest.[214] The

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p.com/poll/235379/acceptance-gambling-reaches-new-heights.aspx [https://perma.cc/42E2-EG6S]. As more ways to gamble have become readily available, Americans—never overwhelmingly opposed to the concept of legal gambling—have gradually solidified their support for the practice, though a sizable minority still sees it as morally wrong. *Id.*

208. Commodity Exchange Act, 7 U.S.C. § 7a-2(c)(5)(C)(i)(VI) (2012).

209. Commodity Exchange Act, 7 U.S.C. § 6c(e) (2012).

210. Commodity Exchange Act, 7 U.S.C. § 19(a)(2) (2012).

211. Request for Comment: Concept Release on the Appropriate Regulatory Treatment of Event Contracts, 73 Fed. Reg. 25,669, 25,672 (May 7, 2008).

212. Order Prohibiting the Listing or Trading of Political Event Contracts, U.S. Commodity Futures Trading Commission (Apr. 2, 2012).

213. *Id.*

214. "Customarily, hedging and price basing have been identified as two critical functions of the commodity derivatives markets." Request for Comment: Concept Release on the Appropriate Regulatory Treatment of Event Contracts, 73 Fed. Reg. 25,669, 25,672 (May 7, 2008). "Hedging occurs when positions acquired are economically appropriate to the reduction of risks in the conduct and management of a commercial enterprise." *Id.* at 25,672 n.16; *see, e.g.*, 17 C.F.R. § 1.3 (2011) (definition of bona fide hedging). "Price basing, a function of price discovery and dissemination, can occur when commercial entities enter into transactions in a particular commodity based upon commodity futures prices for that or a related commodity, oftentimes at a differential." Request for Comment: Concept Release on the Appropriate Regulatory Treatment of Event Contracts, 73 Fed. Reg. 25,669, 25,672 n.16

Commission further contended that political prediction markets contravened public interest because they "can potentially be used in ways that would have an adverse effect on the integrity of elections, for example by creating monetary incentives to vote for particular candidates even when such a vote may be contrary to the voter's political views of such candidates."[215]

This CFTC analysis and reasoning misses the mark on prediction markets by discounting the informational value generated by the market price and overestimating the behavioral impact of market formation.[216] As nineteen leading academics studying prediction markets argued in a joint statement, political prediction markets have real potential to serve a meaningful hedging function,[217] but the regulatory environment is operating as a major impediment preventing that reality.[218] Though it is sensible to prohibit the formation of markets contrary to the public interest, the public interest is likely best served through a laissez-faire approach to prediction market regulation.

B. Determining Who Is Liable for the Propagation of Banned Markets

Once it is established which particular markets deserve the bulk of CFTC regulatory attention, the decentralized environment of DLT prediction markets present novel enforcement challenges.[219] Considering whether code developers can absolve themselves of liability by eschewing a participatory role in the markets, Commissioner Quintenz claimed that the "appropriate question is whether these code developers could reasonably foresee, at the time they created the code, that it would likely be used by U.S. persons in a manner violative of CFTC regulations."[220] This "likelihood of infringing use" test is worth consideration, but the realm of intellectual property law provides multiple frameworks that may be tailored to the DLT prediction

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(May 7, 2008).

    215.   *Id.*

    216.   Ozimek, *supra* note 53, at 33.

    217.   Letter from Eric Zitzewitz, Assoc. Professor of Econ., Dartmouth College et al., to Hon. Gary Gensler, Chairman, Commodity Futures Trading Comm'n (Feb. 3, 2012), https://comments.cftc.gov/Pub licComments/ViewComment.aspx?id=56576&SearchText= [hereinafter Zitzewitz letter]. For example, evidence shows that Republican presidential wins are linked with higher equity valuations and bond yields. Ozimek, *supra* note 53, at 33 n.33; *see also* Erik Snowberg et al., *Partisan Impacts on the Economy: Evidence from Prediction Markets and Close Elections*, 122 Q. J. ECON. 807 (2007).

    218.   Zitzewitz letter, *supra* note 217, at 1–2.

    219.   Quintenz, *supra* note 24.

    220.   *Id.*

market context in accordance with the level of operational control and interest assumed by code developers.

1. Secondary Liability as Considered in Patent and Copyright Law

Because the developers of DLT prediction market protocols do not necessarily play an active role in the operation of markets using their code,[221] these developers can avoid allegations of a direct violation of the CEA. However, it may still be reasonable to find developers secondarily liable for the improper acts of others, depending on the intention for, and benefit obtained from, the code's publication and use. Practical frameworks for liability can be derived from patent and copyright law.

In patent law, the selling of a device that enables the purchaser's infringement of a patent is prohibited when the contributory infringer knew of the patent and that his or her actions would lead to infringement.[222] Importantly, in order for the patent holder to prevail, she must show that the allegedly infringing article or commodity is unsuited for any commercial non-infringing use.[223] The sale of a product or device capable of both an infringing use and other lawful uses is not sufficient for a finding of contributory infringement.[224]

Copyright law takes a slightly different approach and more closely resembles the viewpoint espoused by Commissioner Quintenz. In the realm of copyright, one who knowingly induces, causes, or materially contributes to copyright infringement by another, but who has not committed or participated in the infringing acts him or herself, may be held liable as a contributory infringer if he or she had knowledge, or reason to know, of the infringement.[225]

In a leading copyright case brought by twenty-eight of America's largest entertainment companies, the Supreme Court held that the distributors of a free software, which allowed computer users to share electronic files through peer-to-peer networks, could be liable for contributory infringement, regardless of the software's lawful uses, based on evidence that the software was distributed with the principal, if not exclusive, object

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221. *FAQs*, *supra* note 117.
222. ARO Mfg. Co. v. Convertible Top Replacement Co., 377 U.S. 476 (1964).
223. Dawson Chem. Co. v. Rohm & Haas Co., 448 U.S. 176 (1980).
224. Glob.-Tech Appliances, Inc. v. SEB S.A., 563 U.S. 754 (2011).
225. *See, e.g.*, Metro-Goldwyn-Mayer Studios Inc. v. Grokster, Ltd., 545 U.S. 913 (2005); Sony Corp. of Am. v. Universal City Studios, Inc., 464 U.S. 417 (1984).

of promoting its use to enable copyright infringement.[226] The inducement rule, as defined by the Court, premises liability on purposeful, culpable expression and conduct, and thus protects innovation and commerce with lawful potential.[227] Justice David Souter, in his unanimous opinion, was "mindful of the need to keep from trenching on regular commerce or discouraging the development of technologies with lawful and unlawful potential," and the Court confirmed that mere knowledge of either the possibility of infringement or of actual infringing uses is not enough to subject a distributor to liability.[228]

2. Considering DLT Prediction Market Developer Liability Under a Likelihood of Infringing Use Model

Following intellectual property precedent, an indispensable element of finding a party secondarily liable is that she knew or should have known about the transgressing behavior. The CFTC can claim that DLT prediction market code developers should have known of the high potential for infringing use, because prediction markets are only currently permissible when they conform to certain strict provisions.[229] Developers can respond that the code was also suited for lawful purposes and liability should therefore hinge on intent.

Adopting the logic of Justice Souter's majority opinion in *Metro-Goldwyn-Mayer Studios Inc. v. Grokster, Ltd.*, DLT prediction market developers would only incur secondary liability where they promote illegal conduct. It stands to reason that where developers profit off of the operation of markets using their protocol, they have financial motive to encourage market participation.[230] When developers are rewarded through use-fees, and proceed to support trading on illegal markets, profits are being realized from illicit activity.[231] Any entity that becomes enriched through the

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226. *Grokster*, 545 U.S. at 939.

227. *Id.* at 937.

228. *Id.*

229. Quintenz, *supra* note 24.

230. Evidence of 'active steps . . . taken to encourage direct infringement,' such as advertising an infringing use or instructing how to engage in an infringing use, show an affirmative intent that the product be used to infringe, and a showing that infringement was encouraged overcomes the law's reluctance to find liability when a defendant merely sells a commercial product suitable for some lawful use . . . .

Grokster, 545 U.S. at 936 (alteration in original) (citation omitted) (quoting Oak Indus., Inc. v. Zenith Elecs. Corp., 697 F. Supp. 988, 992 (N.D. Ill. 1988)).

231. Notably, the profit-taking platform Veil both prohibited U.S. traders, as well as the listing of

unlawful acts of others should face regulatory scrutiny.

Commissioner Quintenz conjured a hypothetical in which the developers of DLT code underlying illicit event contracts could be prosecuted if the code were specifically designed to enable the type of activity regulated by the CFTC and no effort was made to preclude its availability to U.S. persons.[232] To illustrate why he believes that DLT developers of blockchain prediction market code may reasonably be held liable, Commissioner Quintenz used the following metaphor:

> Think of someone asking you to borrow the keys to your car because they want to rob a bank. If you let them borrow your car, it would be reasonable for the government to hold you partially responsible for the ensuing criminal activity. However, it would be unreasonable for the government to prosecute the car manufacturer.[233]

In essence, Commissioner Quintenz is saying that, because prediction markets are under the CFTC's purview, DLT prediction market code developers need to either devise mechanisms which enable censorship of market activity or make efforts to preclude American use. Understanding that the ability to censor markets undermines the purpose of a decentralized system, the policy question at hand is whether it is desirable to compel DLT prediction market developers to deter American users.[234]

Prediction markets have the potential to provide substantial informational and hedging value, but they also create the potential for abuse: are DLT prediction market developers more like car-lending bank-robbing enablers or more like vehicle manufacturers? Under both patent and copyright law principles, only those developers who actively encourage illicit use should be held secondarily liable.[235]

It is important to distinguish nonprofit entities like the FF from profit-seeking entities. In contrast to developers who profit from the operation of

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contracts that: A) reference a security "as defined at 15 U.S.C. § 78c(a)(10) and 15 U.S.C. § 80a-2(a)(36)," B) reference "a liquidity event, such as a merger, initial public offering, or dissolution, of a U.S. company," C) are associated with assassination, a terrorist attack, or any other criminal activity, D) "violate[] a third-party's intellectual property rights," or E) reference pricing or valuation which can be controlled directly or indirectly by the market creator. *Veil International Rulebook: Version 2*, *supra* note 128.

232. Quintenz, *supra* note 24.

233. *Id.*

234. Even if these efforts are made, the Commissioner conceded that "[i]t seems likely that determined users will be able to gain access." *Id.*

235. *See supra* Section IV.B.1.

illicit markets, developers who yield no operational profit are far less theoretically culpable because they derive no gain from the unlawful use. If an entity lacks both profit incentive and operational control, that entity should only potentially be found liable in instances where it takes affirmative steps to promote trading in markets it knows to be illegal. As a rule, developers who release free software should be applauded for their contribution to computing progress and for affording users the freedom to share, study, utilize, and transform valuable source-code.

Enforcing CFTC regulations against DLT prediction market developers will do nothing to immediately hinder illegal market activity, as users of the code do not require ongoing developer support.[236] While secondary liability is helpful as a practical alternative to prosecuting all direct infringers,[237] and while DLT properties such as anonymization and global access make it a particularly challenging medium on which to target individual users,[238] pursuing software developers could drastically limit the development of beneficial technologies.[239]

This point has been clearly articulated in the context of peer-to-peer networks and music piracy:

> [I]f the courts declare [peer-to-peer] networks illegal altogether (or indirectly do so by ordering modifications . . .), the social cost will not only be the foregone legal uses of those networks at the time they are enjoined but also the unanticipated future benefits those networks could have brought. Economic evidence strongly suggests that those unanticipated future benefits, or "spillover" effects, often exceed the immediate value of most new technologies.[240]

In order to minimize spillover effects, enforcement should solely be focused on culpable actors—in copyright this is the pirating parties, in prediction markets it is those who create and trade in nefarious markets or derive profit therefrom.

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236. *Id.*
237. *Grokster*, 545 U.S. at 930.
238. Quintenz, *supra* note 24.
239. Mark A. Lemley & R. Anthony Reese, *Reducing Digital Copyright Infringement Without Restricting Innovation*, 56 STAN. L. REV. 1345, 1349–50 (2004) ("The fundamental difficulty is that while courts can make decisions about direct infringement on a case-by-case basis, lawsuits based on indirect liability sweep together both socially beneficial and socially harmful uses of a program or service, either permitting both uses or condemning both.").
240. *Id.* at 1386–87.

CONCLUSION

Prediction markets have experienced waves of interest from users and regulators alike, but coupled with DLT, these markets are now poised to facilitate seamless and global market participation. Rather than stifle this innovation, American regulators have an opportunity to be more permissive for both practical and theoretical purposes. Commissioner Quintenz declared that he would welcome feedback and discussion related to his conception of DLT prediction market liability. This Note answers that call.

By presenting the economic justification for and excitement behind prediction markets, exploring the categories of markets which deserve the bulk of regulatory attention, and proposing how to address secondary liability in the DLT prediction market context, this Note hopes to demonstrate that, in general, pursuing DLT prediction market developers is a misguided approach. Instead, the CFTC should exempt code developers from liability in their capacity as developers and issue guidelines detailing best practices for both non-profit and for-profit entities involved in promoting DLT prediction markets.

In comparing code developers of DLT prediction markets to individuals knowingly lending their car to aid and abet a bank robber, Commissioner Quintenz misstates the role that these developers play. Developers are more akin to the car manufacturer, and just as cars combine the power of many horses into a single engine, prediction markets combine the power of many minds into a single predictive metric. If the CFTC takes a measured approach towards DLT prediction market regulation, these markets can drive efficiency gains in every sector of the American economy.

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