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Regulating Smart Contracts in the Domain of Financial Trading

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COMMENTS

REGULATING SMART CONTRACTS IN THE DOMAIN OF FINANCIAL TRADING

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INTRODUCTION

Roughly one-third of Americans yield control of their money in the hope hedge funds, mutual funds, and private equity funds (pooled investment funds) will achieve better returns than those Americans would achieve on their own.[1] In order to operate within financial

1. Gary Mottola, *A Snapshot of Investor Households in America*, U.S. SEC. & EXCHANGE COMMISSION 1 (Sept. 2015), https://www.sec.gov/spotlight/fixed-income-advisory-committee/finra-investor-education-foundation-investor-

standards of compliance,[2] pooled investment funds must collaborate with a great number of financial intermediaries.[3] Working with intermediaries makes operating a pooled investment fund more costly and sometimes decreases the fund's transparency.[4] Moreover, pooled investment funds are investing in many digital technologies, despite their volatile characteristics, to provide a more efficient way to operate.[5] One such technology is blockchain.[6]

households-fimsa-040918.pdf ("Data from the 2012 National Financial Capability study indicate[d] that 33[%] of U.S. households own taxable investment accounts [such as] stocks, bonds or mutual funds").

2. *See The Evolution of a Core Financial Service: Custodian & Depositary Banks*, DELOITTE (2019) [hereinafter *The Evolution of a Core Financial Service*], https://www2.deloitte.com/content/dam/Deloitte/lu/Documents/financial-services/lu-the-evolution-of-a-core-financial-service.pdf.

3. *See* Prachi M., *Financial Intermediaries*, INVESTORS BOOK, https://theinvestorsbook.com/financial-intermediaries.html (last visited Mar. 1, 2021). There are regulations for issuance, clearing and settlement, asset monitoring, and transaction oversight. An intermediary is a financial institution serving as a "middle-man" to facilitate transactions. *See The Evolution of a Core Financial Service*, *supra* note 2, at 13; James Chen, *Financial Intermediary*, INVESTOPEDIA, https://www.investopedia.com/terms/f/financialintermediary.asp#:~:text=A%20financial%20intermediary%20is%20an,mutual%20fund%2C%20or%20pension%20fund (last updated Jan. 29, 2021).

4. Intermediaries lack transparency because their business model involves asymmetrical access to information. Intermediaries are costly because the current regulatory structure and intermediaries' steep barrier to entry keeps intermediaries solely on top of this informational hierarchy. These dynamics allow intermediaries to charge higher fees through inelasticity and limited supply. *See* Kathryn Judge, *Intermediary Influence*, 82 U. CHI. L. REV. 573, 577–78 (2015) ("In a dynamic environment, however, *intermediaries may use . . . informational and positional advantages to promote and entrench high-fee institutional arrangements*") (emphasis added).

5. *See* Teresa Rodríguez de las Heras Ballell, *The Layers Of Digital Financial Innovation: Charting A Regulatory Response*, 25 FORDHAM. J. CORP. FIN. L. 381, 397-99 (2020) (stating, in reference to the previous boom-bust cryptocurrency market cycle in 2017-2018, "tokenization unleashes opportunities for asset management, fund raising, investing, and other financial services. Nonetheless, despite the initial perception of the endless invasion of digital assets in the financial markets, latest data show that 'the hype of 2017 was unsustainable.'").

6. *See, e.g.,* Sinclair Davidson, Primavera De Filippi & Jason Potts, *Blockchains and the Economic Institutions of Capitalism*, 14 J. INST. ECON. 639, 639–40 (2018) (stating "[t]hose who take a long position on blockchain technology are in effect arguing that it will improve the efficiency of economic systems by *disintermediating* many current patterns of exchange and production, thus improving

Currently, entrepreneurs are developing blockchain technologies to largely replace the custodial banks,[7] forensic accountants, transfer agents, and clearing services[88] with whom pooled investment funds work with.[9] Blockchain can begin to replace these intermediaries through a conditional instrument called "smart contracts."[10]

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economic efficiency.") (emphasis added). Bradley Keoun, *Tiny $217 Options Trade on Bitcoin Blockchain Could Be Wall Street's Death Knell*, COINDESK (Oct. 8, 2019, 9:30 AM), https://www.coindesk.com/tiny-217-options-trade-on-bitcoin-blockchain-could-be-wall-streets-death-knell; *How One Woman Is Institutionalizing Asset Management On Blockchain*, DIGFIN GROUP (July 16, 2019), https://www.digfingroup.com/blockchain-assets/.

7. "A custodian or custodian bank is a financial institution that holds customers' securities for safekeeping to prevent them from being stolen or lost. The custodian may hold stocks or other assets in electronic or physical form." Adam Barone, *Custodian*, INVESTOPEDIA, https://www.investopedia.com/terms/c/custodian.asp (last updated Oct. 15, 2020); *see* DigFin, *supra* note 6.

8. "Clearing is the procedure by which financial trades settle - that is, the correct and timely transfer of funds to the seller and securities to the buyer." James Chen, *Clearing*, INVESTOPEDIA [hereinafter Chen, *Clearing*], https://www.investopedia.com/terms/c/clearing.asp (last updated Dec. 22, 2020); *see* Keoun, *supra* note 6.

9. *See* Rodríguez, *supra* note 5, at 400-14 ("[D]igital technology can perform the same economic function as traditional financial intermediaries through a different architecture—blockchain-based settlement systems or trading platforms—providing a valid example of a dimension that would be overlooked by a rigid technology-neutral approach.").

10. *See* Deloitte, *supra* note 2, at 33 ("Once assets like shares or bonds are digitized on a distributed ledger, corporate actions could be managed using smart contracts, which are built in or referenced programs that can automatically trigger events such as distribution of dividends, stock splits, shareholder voting etc."); Jake Frankenfield, *Smart Contracts*, INVESTOPEDIA, https://www.investopedia.com/terms/s/smart-contracts.asp (last updated Oct. 8, 2019) ("A smart contract is a self-executing contract with the terms of the agreement between buyer and seller being directly written into lines of code. The code and the agreements contained therein exist across a distributed, decentralized blockchain network. The code controls the execution, and transactions are trackable and irreversible."); Caitlin Reilly, *CFTC Advisory Panel to Examine Growth, Hurdles of 'Decentralized Finance', in* CQ ROLL CALL WASHINGTON SECURITIES ENFORCEMENT & LITIGATION BRIEFING (2020), Westlaw 2020 CQSECRPT 1342 ("Decentralized finance or 'DeFi' seeks to disrupt the use of intermediaries in financial services through the use of blockchain-based smart contracts. The contracts are computer programs designed to automatically document or execute the terms of an agreement, which could have implications for the derivatives industry.").

Investors will benefit from limited adoption and use of smart contracts among pooled investment funds because smart contracts would decrease fees[11] and increase returns.[12] Regulators will play a vital role in spurring adoption of smart contracts among pooled investment funds. Nevertheless, regulators should maintain derivative regulations[13] and recent consumer protections.[14] If regulators strike the right balance, millions of Americans could save in indirect fees.[15]

Despite the perception that the American public is hesitant to adopt crypto solutions to its investing strategy,[16] many American consumers are experimenting with these same solutions on their

11. For example, $20,000,000.00 would be the management fee for a billion dollar fund. A billion dollar transaction could be made for around $5.00 if completed through a standard blockchain or smart contract platform. *Someone Transferred a Billion Dollars in Bitcoin For Less Than $5* [hereinafter *Someone Transferred a Billion Dollars*], COIN TELEGRAPH, https://cointelegraph.com/news/someone-transferred-a-billion-dollars-in-bitcoin-for-less-than-5 (last visited Mar. 7, 2021).

12. Pooled investment funds are straying away from the standard "2 and 20" fee structure when their performance is mediocre. This implies pooled investment funds are willing to pass on lower fees to investors. *See* Tom Teodorczuk, *Only a Third of Hedge Funds Charge '2 and 20' Fees, Says Expert*, BARRON'S (Nov. 11, 2018, 7:00 AM), https//www.barrons.com/articles/only-a-third-of-hedge-funds-charge-2-and-20-fees-says-expert-1541851200.

13. Regulations over derivatives are enforced by the CFTC. "The Commodity Futures Trading Commission (CFTC) is an independent U.S. federal agency established by the Commodity Futures Trading Commission Act of 1974. The Commodity Futures Trading Commission regulates the commodity futures and options markets. Its goals include the promotion of competitive and efficient futures markets and the protection of investors against manipulation, abusive trade practices, and fraud." James Chen, *Commodity Futures Trading Commission (CFTC)*, INVESTOPEDIA [hereinafter Chen, *CTFC*], https://www.investopedia.com/terms/c/cftc.asp (last updated Apr. 9, 2019).

14. Consumer protections alluded to here stem from the CFPB. "The Consumer Financial Protection Bureau (CFPB) is a regulatory agency charged with overseeing financial products and services that are offered to consumers." Jim Probasco, *Consumer Financial Protection Bureau (CFPB)*, INVESTOPEDIA [hereinafter Probasco, *CFPB*], https://www.investopedia.com/terms/c/consumer-financial-protection-bureau-cfpb.asp (last updated July 2, 2020).

15. *See* Teodorczuk, *supra* note 12.

16. Jonathan Leong, *To Accelerate Cryptocurrency Adoption We Must First Improve User Experience*, COIN TELEGRAPH (July 11, 2020), https://cointelegraph.com/news/to-accelerate-cryptocurrency-adoption-we-must-first-improve-user-experience.

own.[17] The chief concern with deploying smart contracts within pooled investment funds is replacing financial intermediaries with smart contracts is novel and not yet regulated enough to ensure investor protection.[18]

This Comment advocates for supplementing financial intermediaries with smart contracts while maintaining the consumer protections outlined in legislation following the 2008 Great Recession. Part I will focus on the current industry's framework and effects on American investors. This section also explores the latent, competing, and conflicting notions of investor protection and efficiency within the current regulatory framework. Part II gives an overview and background of blockchain, cryptocurrency, and smart contracts. Part III focuses on potential problems and solutions regulators may consider when implementing smart contract technologies. Finally, this article concludes with a summation of the proposed solution and set of problems to avoid.

I. POOLED INVESTMENT FUNDS' CURRENT FRAMEWORK

The debate over whether the federal government regulates the American financial industry too little[19] or too much[20] creates a

17. *Why Crypto Asset Management is the Next Big Thing*, INVESTOPEDIA, https://www.investopedia.com/tech/why-crypto-asset-management-next-big-thing/ (last updated Jan. 25, 2020).

18. *See The Evolution of a Core Financial Service*, *supra* note 2, at 27; DigFin, *supra* note 6.

19. *See* Alec C. Covington, *Fighting Yesterday's Battles: Proposed Changes To The Consumer Financial Protection Bureau*, 16 N.C. BANKING INST. 299, 321 (2012); Thomas W. Joo, *Lehman 10 Years Later: The Dodd-Frank Rollback*, 50 LOYOLA U. CHI. L.J. 561, 562 (2019); Patricia A. McCoy, *Inside Job: The Assault On The Structure Of The Consumer Financial Protection Bureau*, 103 MINN. L. REV. 2543, 2545–46 (2019).

20. *See* Audrey D. Wisotsky & David W. Freese, *Sweeping Federal Financial Reform Legislation Overhauls the U.S. Financial System*, 266 N.J. L., Oct. 2010, at 9, 13 (claiming that the Dodd-Frank Wall Street Reform and Consumer Protection Act is "massive in scope, and its effects likely will be far reaching"). *Compare* Todd Zywicki, *The Consumer Financial Protection Bureau: Savior Or Menace?*, 81 GEORGE WASH. L. REV. 856, 856 (2013) (pointing out structural flaws in the CFPB and claiming that this structure will lead to "excessive risk aversion, agency imperialism, and tunnel vision"), *with* Hosea H. Harvey, *Constitutionalizing Consumer Financial Protection: The Case For The Consumer Financial Protection Bureau*, 103 MINN. L. REV. 2429, 2432 (2019) (commenting on the imminence of a

difficult balancing act.[21] On one hand, America wants its best financial minds to compete with foreign investors,[22] but America also wants sufficient safeguards to protect investors from bad financial outcomes.[23] This is where financial intermediaries enter, offering investors a buffer between investors' money and portfolio managers' irresponsible decisions.[24] Although valuable, these intermediaries are not cheap.[25] This section is split into two parts. The first looks at pooled investment funds' incurred expenses and inefficiencies from working with financial intermediaries. The second explores why these expenses are mandatory, how legislation for these expenses arose from the Great Recession of 2008, and why legislators thought these mandates would better protect investors.

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constitutional challenge to the CFPB in the Supreme Court due to a perception that the Court will find the CFPB unconstitutionally structured), *and* Martin J. Gatens, Note, *Five-To-Four: The Case For A Defensive Redesign Of The CFPB*, 98 TEX. L. REV. 1115, 1117 (2020) (advocating for the underlying principles of the CFPB, but working from the presumption that the CFPB will be reformed due to constitutional concerns over its structure).

21. *See* Michael C. Nissim-Sabat, Note, *Capturing This Watchdog? The Consumer Financial Protection Bureau Keeping the Special Interests Out of Its House*, 40 W. ST. U. L. REV. 1, 3 (2012) (remembering that after the 2008 Great Recession, markets desperately needed effective regulatory reform). *But see* Franklin Allen & Douglas Gale, *Financial Intermediaries and Markets* 20 (The Wharton Fin. Inst. Ctr., Working Paper No. 00-44-C, 2003), https://core.ac.uk/download/pdf/6649969.pdf (stating, "[t]here is no scope for welfare-improving government intervention to prevent financial crises").

22. Zywicki, *supra* note 20, at 880.

23. *See infra* Subpart I.B.

24. *See* Judge, *supra* note 4, at 574 ("[Generally,] intermediaries can bridge information asymmetries, enable parties to find one another, and otherwise make it easier for parties to overcome the many barriers to transacting."). *But see* Jason Koebler, *Send This to Anyone Who Wants to Know WTF Is Up With GameStop Stock*, VICE (Jan. 27, 2021, 10:36 AM), https://www.vice.com/en/article/pkdvgy/send-this-to-anyone-who-wants-to-know-wtf-is-up-with-gamestop-stock (stating that an investment firm, Melvin Capital, was overextended in its short positions on GameStop securities. "By all accounts, Melvin Capital [was] in deep trouble . . . it took in $2.75 billion in funding, reportedly to help cover its GameStop shorts." This unfortunate outcome happened after intermediaries signed off on Melvin Capital's entries into its short positions.).

25. Judge, *supra* note 4, at 578 ("[I]ntermediaries may use [their] informational and positional advantages to promote and entrench high-fee institutional arrangements").

A. Investors' Fees From Pooled Investment Funds

Typically, a portfolio manager (also known as a deal team leader) runs a pooled investment fund.[26] The portfolio manager employs professional teams to execute delegated responsibilities.[27] Additionally, pooled investment funds and financial intermediaries must have a relationship.[28] Financial intermediaries check and oversee a fund's work.[29] These financial intermediaries include transfer agents and custodians, who audit and monitor services.[30] Additionally, clearing and settlement services are also intermediaries.[31]

For their specialized work, third-party intermediaries charge high fees,[32] resulting in financial costs to investors.[33] Financial intermediaries also make up a significant portion of pooled investment funds' expenses.[34] When taken into consideration with intermediary services' mandatory nature, fees can quickly add up for pooled investment funds. Each of the intermediaries is a separate entity.[35]

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26. *Building a Fund Management Team*, GLOB. IMPACT INVESTING NETWORK, https://thegiin.org/building-a-fund-management-team#:~:text=A%20typical%20fund%20management%20team,on%20its%20size%20and%20need (last visited Mar. 7, 2021). *See generally The Evolution of a Core Financial Service*, *supra* note 2.

27. Gregory Scopino, *Preparing Financial Regulation For the Second Machine Age: The Need For Oversight of Digital Intermediaries In the Futures Markets*, 2015 COLUM. BUS. L. REV. 439, 465 (2015) ("Congress placed additional categories of intermediaries under CFTC oversight."); *see* CEA § 8a(5), 7 U.S.C. § 12a(5).

28. *The Evolution of a Core Financial Service*, *supra* note 2, at 13.

29. *Id*.; *see* CEA § 8a(5), 7 U.S.C. § 12a(5).

30. *Id*.

31. *Upgrading Blockchains*, DELOITTE (June 8, 2016), https://www2.deloitte.com/us/en/insights/focus/signals-for-strategists/using-blockchain-for-smart-contracts.html.

32. Judge, *supra* note 4, at 578.

33. Investors cannot avoid these costs due to regulations requiring pooled investment funds to employ intermediaries throughout the process. *See id*. *See generally The Evolution of a Core Financial Service*, *supra* note 2.

34. *See* Judge, *supra* note 4, at 578. *See also The Evolution of a Core Financial Service*, *supra* note 2, at 29 (stating that automation would save asset managers 30-40% in expenses).

35. Barone, *Custodian*, *supra* note 7; *see also* Chen, *Clearing*, *supra* note 8.

Each intermediary employs its own staff.[36] Each intermediary also gathers its own repetitive records of what the fund is planning or attempting to do.[37]

Additionally, operating costs are high, and those costs are in addition to any intermediary expenses.[38] Different types of funds, whether hedge funds, private equity, or mutual funds, have different operation costs.[39] Typical hedge funds or private equity funds charge up to 2% of total assets under management to meet the expenses associated with running their respective funds.[40]

On the lower end of pooled investment fund expense sheets, a mutual fund could expect between 0.25-1% of total assets under management to constitute running expenses.[41] A minority of pooled investment funds may offer cheaper fee rates than other pooled investment funds, but those funds achieve a lower rate through lending out acquired equities, bonds, or other debt instruments while those assets are in their custody.[42] Investors may save money from lower fees, but investors also incur more risk. Not only is the

36. *See* Barone, *supra* note 7; Chen, *Clearing*, *supra* note 8; *The Evolution of a Financial Core Service*, *supra* note 2, at 20.

37. *Id*.

38. Grant Thornton LLP & Stonegate Capital Partners, *How Do You Start a Hedge Fund? The New Era of Hedge Fund Creation and Operational Management*, MANAGED FUNDS ASS'N 8 (Dec. 2011), https://www.managedfunds.org/wp-content/uploads/2012/03/Starting-a-hedge-fund-GrantThornton-Stonegate-Capital-Dec-2011.pdf ("In general, a manager that is looking to start either a domestic or offshore hedge fund is faced with budgeting approximately $75,000 in hedge fund startup costs, as well as annual costs averaging $100,000.").

39. *See id*. *See also* Barry Steinman, *Private Equity Fund Expenses,* DUANE MORRIS 1 (Fall 2014), https://www.duanemorris.com/site/static/private_equity_fund_expenses.pdf.

40. Steinman, *supra* note 39, at 5.

41. OFF. OF INV. EDUC. & ADVOC., SEC, INVESTOR BULLETIN: MUTUAL FUND FEES AND EXPENSES 2 (2014) [hereinafter OFF. OF INV. EDUC. & ADVOC]., https://www.sec.gov/files/ib_mutualfundfees.pdf

42. *See The Evolution of a Core Financial Service*, *supra* note 2, at 20; *see also Securities Lending—Where Banks Win, But Can't Lose*, THIS MATTER [hereinafter *Securities Lending*], https://thismatter.com/money/banking/securities-lending.htm (last visited Mar. 7, 2021) (" . . . JPMorgan Chase & Company took 40% of profits made by lending out the securities of a New Orleans municipal pension fund, but when such investments lost $340,000 for the fund, the pension fund had to absorb the entire loss").

investor's capital being used by a portfolio manager, but the assets their capital bought are lent to unknown parties.[43]

Further, separate intermediaries work together to verify pooled investment funds' records because the services a fund needs are not always completed by a single intermediary.[44] When working on a single deal or transaction, distinct intermediaries usually partake in limited communication between each other due to their contracting fund's highly sensitive and confidential service.[45] When intermediaries finally reconcile each other's records, the fund incurs associated fees.[46] This slow process is inefficient, but it is essential to ensuring the fund upholds its promises to investors.[47] The role of intermediaries is ultimately a worthy service, albeit a very costly one.

Although the fee structure of pooled investment funds has little variance between funds of the same type, a majority of hedge funds follow similar fee structures.[48] A majority of private equity funds and mutual funds also follow similar fee structures.[49] However, the slight

43. *See* Steve Kaaru, *Bank of New York Mellon Accused of Aiding $4B OneCoin Scam*, COINGEEK (Sept. 29, 2020), https://coingeek.com/bank-of-new-york-mellon-accused-of-aiding-4b-onecoin-scam/ (detailing how one custodian bank, BNY Mellon, was caught aiding a $4 billion money laundering scheme).

44. *See* Grant Thornton, *supra* note 38, at 9 (noting that, "most [smaller prime brokers] maintain a fully disclosed custody and clearing relationship with one or more of the larger global custodians").

45. *The Evolution of a Core Financial Service*, *supra* note 2, at 38 ("It is well known that custodian and depositary banks hold and operate with strictly confidential client data.").

46. Intermediary specialization leads to further, mandated transaction costs whenever collaboration between distinct intermediaries is necessary. *See* Judge, *supra* note 4, at 601 ("In the view of some scholars, the SEC's failure to bring an end to fixed fees on its own initiative may suggest that "the SEC is not motivated by some 'public interest,' but rather by the changing strength of competing, well-organized special interests, and securities firms were far better organized than the parties that they served").

47. Thus "bridg[ing] information asymmetries." Judge, *supra* note 4, at 574.

48. Teodorczuk, *supra* note 12. (Historically, hedge funds charged "2 and 20." "[H]edge funds are paid a flat rate 2% management fee as well as a 20% performance fee." Nevertheless, some funds are electing to charge a "1-10-20" structure. "Managers have a management fee of 1% and then a 10% incentive fee below a 10% net return, and a 20% incentive fee for returns above 10%.").

49. *Id*.; *see also* OFF. OF INV. EDUC. & ADVOC, *supra* note 41.

variance in fee structures is not guaranteed to all investors.[50] Pooled investment funds show preference to investors with long-standing partnerships or larger allocations.[51] The standard fee most investors pay to pooled investment funds is 2% of assets under management and 20% of profits.[52] For these investors, the full burden of costs can be quite expensive or risky under the current fee structure.[53]

Investors can either pay steeper running costs due to fund's expenses or they can save on expense but pay an opportunity cost of higher risk. Both options are less than ideal. Impliedly, investors' only way to save on fee costs is to let more risk enter into managing their capital or hope their chosen fund will offer a lower fee rate. The high costs, high inefficiencies, and low transparency make the intermediary industry ripe for technological disruption. Nevertheless, disruptive technologies, such as smart contracts, cannot enter the intermediary market without clearing significant regulatory hurdles, which are fully ingrained in the incumbent intermediary industry.

B. Why Intermediary Fees Are Currently Mandatory

Investors have minimal choice in whether they pay pooled investment funds' fees because each fund needs to cover its tax, auditing, and administrative expenses.[54] Due to congressional legislation, pooled investment funds have mandatory costs. Specifically, the Dodd–Frank Wall Street Reform and Consumer Protection Act (Dodd-Frank), passed in 2010, brought a host of mandates meant to better protect consumer investors in the wake of the Great Recession.[55] Specific provisions of Dodd-Frank touch upon

50. OFF. OF INV. EDUC. & ADVOC, *supra* note 41 ("Different investors in the same fund may be charged different management fees. Larger investors may require reduced management fees.").

51. *Id*.

52. *Mutual Funds vs. Hedge Funds: What's the Difference?*, INVESTOPEDIA, https://www.investopedia.com/ask/answers/173.asp (last updated Oct. 21, 2020).

53. *Securities Lending*, *supra* note 42.

54. Grant Thornton, *supra* note 38, at 8.

55. Mauricio Salazar, *Swapping More Than Regulations: Reexamining the Goals of the Dodd-Frank Act and the European Market Infrastructure Regulation on Over-The-Counter Derivative Markets*, 21 SW. J. INT'L L. 217, 218, 223–24 (2014); *see also* Carney Simpson, *Do End-Users Get The Best Of Both Worlds?*, 69 WASH. & LEE L. REV. 1759, 1762 (2012); Laurin C. Ariail, *The Impact Of Dodd-*

consumer investors, investment funds, and financial intermediaries. Title IV of Dodd-Frank mandates hedge funds to register with the Securities Exchange Commission (SEC).[56] Under Title VII, regulators must approve exotic investment vehicles before those investment vehicles are sold to citizens.[57] Title IX sought to grant even more comprehensive protections to investors.[58] Further, within these provisions, regulators attempted to provide additional disclosures about the riskiness of investments to investors.[59] Dodd-Frank also crafted a cohesive operating structure for the derivatives market, avoiding the disconnected nature of the pre-2008 era.[60]

Investors, now armed with greater knowledge, could make better-informed decisions with their capital.[61] In essence, Dodd-Frank not only created "rules of the road"[62] for the modern era of finance, but it also offered increased consumer protection for investors.[63]

Frank On End-Users Hedging Commercial Risk In Over-The-Counter Derivatives Markets, 15 N.C. BANKING INST. 175, 176 (2011).

56. *Dodd-Frank: Title IV - Regulation of Advisers to Hedge Funds and Others*, CORNELL, https://www.law.cornell.edu/wex/dodd-frank_title_IV (last visited Feb. 28, 2021).

57. *Id*.

58. For instance, Title IX establishes the Investor Advisory Committee which promotes investor confidence regarding the integrity of the securities market through conducting SEC studies on brokers, dealers, and investment advisors. *Dodd-Frank: Title IX - Investor Protections and Improvements to the Regulation of Securities*, CORNELL [hereinafter *Dodd-Frank: Title IX*], https://www.law.cornell.edu/wex/dodd-frank_title_ix_-_investor_protections_and_improvements_to_the_regulation_of_securities (last visited Feb. 28, 2021).

59. *Id*.

60. Salazar, *supra* note 55, at 224 ("[T]he United States passed Dodd-Frank, a comprehensive reform in the regulation of derivative markets that went into effect on July 21, 2010").

61. *Dodd-Frank: Title IX*, *supra* note 58.

62. *Create New Financial Regulations*, POLITIFACT, https://www.politifact.com/truth-o-meter/promises/obameter/promise/422/create-new-financial-regulations/ (last visited Feb. 28, 2021).

63. *Dodd-Frank: Title IX*, *supra* note 58.

However, critics of Dodd-Frank-era regulations argue they decreases efficiency.[64] Dodd-Frank's top-down mandates have suffered from criticisms of structural design[65] and constitutionality.[66]

Although the costs associated with increasing investor protection are worthwhile[67]—especially after the widespread pain of the Great Recession—they are steep. It is difficult for regulators to harmonize the competing interests of investor protection and efficiency, but novel technology offers a new frontier for both investors and regulators. Blockchain can service transactions at a fraction of the cost and offer greater transparency through public transactions. Efficiency-minded regulators favor blockchain's low transactional cost, while consumer protection and transparency-minded regulators favor blockchain's public-view nature.

II. HOW SMART CONTRACTS WORK

American law is notorious for being slow to respond to emerging technology.[68] Blockchain and cryptocurrency are not exempt, as regulations are far behind the complex and ever-changing industry.[69]

64. Zywicki, *supra* note 20. ("Proponents of the CFPB argue that extreme independence is justified to insulate it from political pressures. But the history of regulation teaches that insulation can be isolation, resulting in inefficient regulation.").

65. Martin J. Gatens, *Five-To-Four: The Case For A Defensive Redesign Of The CFPB*, 98 TEX. L. REV. 1115, 1117 (2020).

66. Harvey, *supra* note 20, at 2432.

67. Joo, *supra* note 19, at 562 ("[E]ven assuming Dodd-Frank's 'regulatory burdens' are significant ones, 'regulatory relief' is not necessarily justified: the cost savings for banks may be outweighed by increased risks to the institutions, their customers, or the financial system generally").

68. Paula H. Holderman, *Adapting to the New Legal Marketplace*, 102 ILL. B. J. 160, 161 (2014) (stating "[o]ne of the slowest institutions to change is the legal academy," and that small law firms were slow to adapt to LegalZoom); *see also supra* Part I.B.

69. *See* Douglas Horn, *The Chance for DeFi to Fulfill the Technology's Promise*, COINTELEGRAPH (Oct. 2, 2020), https://cointelegraph.com/news/the-chance-for-defi-to-fulfill-the-technology-s-promise (noting how decentralized finance within the blockchain industry has already allowed early cash outs, inflation, voting that is similar to a poll, and more); *see also* Sai Agnikhotram & Antonios Kouroutakis, *Doctrinal Challenges for the Legality of Smart Contracts: Lex Cryptographia or a New, 'Smart' Way to Contract?*, 19 J. HIGH TECH. L. 300, 303 (2019) (noting a common skeptical viewpoint: "In the public sphere, many conclude

The last two years have seen exponential growth in decentralized finance (DeFi).[70] DeFi is the use of blockchain technology in bankless finance,[71] which allows private citizens to use their capital similar to central banks.[72] DeFi also affords private citizens the opportunity to launch their own hedge funds[73] and invest on behalf of other people.[74] Currently, these innovations are mostly unregulated, but future regulations may affect all of DeFi because of DeFi's reliance on smart contracts.[75]

Current practices within the blockchain industry may have outpaced what regulators imagined blockchain would become. The innovation is even more impressive when one considers the entire industry is only twelve years old. The fast-paced news cycles of the blockchain sector, along with its novelty, leave the layperson gasping

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that the lack of a comprehensive regulatory approach is a major issue for further propagation of this technology."); *see also* Brad Rosen, *Decentralized Finance Trends and Challenges Spotlighted at CFTC's Technology Advisory Committee Meeting*, WOLTERS KLUWER (Dec. 15, 2020), https://lrus.wolterskluwer.com/news/securities-regulation-daily/decentralized-finance-trends-and-challenges-spotlighted-at-cftc-s-technology-advisory-committee-meeting/128235 (detailing a recent attempt by CFTC regulators to understand the challenges of decentralized finance *years* after first becoming aware of DAOs, a major DeFi innovation).

70. At the end of May 2020, there was less than $1 billion "locked" in DeFi projects. Over the next six months that amount would swell to nearly $15 billion. DEFI PULSE, https://defipulse.com/; *see also* Jeremy Eng-Tuck Cheaah, *What is DeFi and Why is It the Hottest Ticket in Cryptocurrencies*, THE CONVERSATION, https://theconversation.com/what-is-defi-and-why-is-it-the-hottest-ticket-in-cryptocurrencies-144883 (last visited Feb. 28, 2021).

71. *Id*.

72. Matthew Prewitt, *Decentralized Liquidity Is the Backbone of DeFi*, COINDESK, https://www.coindesk.com/decentralized-liquidity-is-the-backbone-of-defi (last visited Fe. 28, 2021); *see also* Horn, *supra* note 69.

73. Reto Trinkler & Mona El Isa, *Melon Protocol: A Blockchain Protocol For Digital Asset Management Draft*, GITHUB, https://github.com/enzymefinance/paper/blob/master/melonprotocol.pdf (last modified June 28, 2017).

74. Manuel Stagars, *Technology-Regulated and Operated Funds—The Vision of the Multichain Asset Managers Association (MAMA)*, MEDIUM: INSIGHTS BY BASE 58 (June 12, 2018), https://medium.com/base58/technology-regulated-and-operated-funds-the-vision-of-the-multichain-asset-managers-association-f14b7205d253.

75. Rosen, *supra* note 69.

for air.[76] This section briefly defines the common terms of the industry.

A. Blockchain, a Public Platform

Blockchain is a public ledger system akin to a large-scale ledger or spreadsheet.[77] It is analogous to an online banking account, where a user can see funds transferring in and out, accounting for expenses.[78] Blockchain's ledger is visible to all users.[79] Continuing with the online banking analogy, imagine if all bank account users were able to see both a bank's total cash balance (the aggregate of all cash the bank holds) and every transaction made by any of that bank's accounts.[80] In this scenario, users could see their own online banking statements (complete with transfers in and out of their account), but users could also see every other transaction made involving the bank's user accounts.[81] This means every transaction involving any of the bank's account numbers would be available for public view.[82]

Although public, there would still be a level of anonymity because users can only see another's bank account number—rather than a

76. Leong, *supra* note 16.

77. VIMI GREWAL-CARR & STEPHEN MARSHALL, DELOITTE, BLOCKCHAIN: ENIGMA, PARADOX, OPPORTUNITY 4 (2016), https://www2.deloitte.com/content/dam/Deloitte/uk/Documents/Innovation/deloitte-uk-blockchain-full-report.pdf (describing the basic parameters of a miner's role within a blockchain transaction); *see* Luke Conway, *Blockchain Explained*, INVESTOPEDIA, https://www.investopedia.com/terms/b/blockchain.asp (last updated Nov. 17, 2020).

78. Online banking is analogous to blockchain's ledger because a transaction can either add to or subtract from a user's total balance. GREWAL-CARR & MARSHALL, *supra* note 77, at 12 ("transactions are tied to 'wallets' rather than to individuals").

79. *Id*. at 6.

80. *See id*. at 4–5 (Not only are miners aware of transactions but so are transacting parties and anyone who searches for the "public key." "[Users] receive the first confirmation that the [cryptocurrency] was signed over to [them]. All the transactions in the block are now fulfilled and [the recipient] gets paid.").

81. *See, e.g.*, *id.* at 8 ("The Bitcoin network is public because anyone can read or write data from or to the ledger if they are running the appropriate Bitcoin software.")

82. *Id.*

user's name or any other personally identifying characteristics.[83] The only way, in this scenario, for a user to know how a second user transacted would be if one user knew the other's account number (and vice versa).[84] One could not see each account's balance; instead, one could see, for example, a $5.00 charge or a $120.00 payment made by that—or any—account.[85]

Similar to the online banking example, each blockchain user has a unique code associated with their wallet (here, wallets are analogous to bank accounts and the unique code is analogous to bank accounts numbers).[86] Additionally, there is a public record, or ledger, of all transactions made. The public can see when and how much each unique wallet sent or received.[87] While the public cannot see how much a specific account has, the public can see the worth of each account's transaction and how these transactions affected the total balance of a blockchain's associated cryptocurrency.[88]

Lastly, for applications other than financial trading, blockchain's tracking of incoming and outgoing variables offers ledger-based accounting that applies to various jobs and uses. For example, global supply chains use blockchain technology.[89] Once a checkpoint

83. *Id*. at 4–5 ("[A] payment address [is] a string of seemingly random numbers and letters.")

84. *See id.*

85. *Id*.

86. *Id*.

87. *Id*. at 8.

88. It is normal for a small portion of sent crypto to not make it to the intended receiver because a fee is taken out for miners who verified the transaction. Miners are paid through these nominal fees, and miners are paid with further cryptocurrency once they complete a "block" of transactions. The crypto earned from completing a block of transactions does not come from any individual, nor does it come from a specific transaction. Rather, the fees from completing a block of transactions comes from the original code of the blockchain. For purposes of this article, a cursory understanding of this process is sufficient. *See Explaining Bitcoin Transaction Fees*, BLOCKCHAIN SUPPORT CTR. [hereinafter *Explaining Bitcoin*], https://support.blockchain.com/hc/en-us/articles/360000939883-Explaining-bitcoin-transaction-fees#:~:text=Every%20bitcoin%20transaction%20must%20be,considered%20successfully%20completed%20or%20valid (last updated Apr. 11, 2021, 1:47).

89. *See* Lukas Wiesflecker, *6 Industries Where Vechain Can Be Successful*, MEDIUM (Sept. 30, 2020), https://medium.com/coinmonks/6-industries-where-

receives products, the products are "delivered" (like funds coming into a wallet would be classified as available).[90] With each delivery along the supply chain, product statuses adjust on the blockchain. The advantages of using a blockchain platform, instead of an online app, include greater security and more reliability.[91]

B. Concerns Over Blockchain's Public Nature

While blockchain's public nature allows blockchain to achieve high transparency, efficiency, and speed, one concern that arises from this public-view dynamic is that, although no one can see a user's name when making transactions, other users can see the code associated with anyone's wallet. If users can see anyone's wallet information so easily, those users could somehow steal another user's identity more easily.[91] In practice, someone could gain access to a blockchain wallet by hacking their account, similar to an online bank account.[92] Just as a lost, stolen, or regrettably-disclosed password can lead to negative outcomes in online banking, the same is true for blockchain passwords. However, the fact one's wallet information

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vechain-can-be-successful-2a72a1cda5fe; *see generally* VECHAIN, https://www.vechain.com/ (last visited Mar. 7, 2021).

90. John Ream et al., *Upgrading Blockchains*, DELOITTE (June 8, 2016), https://www2.deloitte.com/us/en/insights/focus/signals-for-strategists/using-blockchain-for-smart-contracts.html ("Blockchains can make supply chain and trade finance documentation more efficient, by streamlining processes previously spread across multiple parties and databases on a single shared ledger. All too often, supply chains are hampered by paper-based systems reliant on trading parties and banks around the world physically transferring documents, a process that can take weeks for a single transaction. Letters of credit and bills of lading must be signed and referenced by a multitude of parties, increasing exposure to loss and fraud").

91. Howard Poston, *Public-Key Cryptography in Blockchain*, INFOSEC (Sept. 29, 2020), https://resources.infosecinstitute.com/topic/public-key-cryptography-in-blockchain/#:~:text=Security%20of%20public%2Dkey%20cryptography%20in%20blockchain&text=While%20the%20public%20key%20cryptography,a%20number%20of%20different%20ways ("While the public key cryptography algorithms most commonly used in blockchain are generally regarded to be secure, their security can be undermined or threatened in a number of different ways").

92. *Id.* ("Even if an account's private key is generated securely, it can still be compromised if it isn't stored securely. Most blockchain "hacks" involve the theft of private keys from insecure cryptocurrency exchanges or via phishing and SIM hijacking attacks").

(account number) is public is not sufficient—by itself—to hack or learn another's *password*.[93]

Another concern arising from blockchain's public-view dynamic is stealing. Although a user's password is as secure as an online banking password, new users are often concerned their public wallet information could make it easier for hackers or scammers to steal from the network. Remarkably, however, miners prevent stealing.[94]

Miners verify every transaction across a blockchain network.[95] To be successful, a scammer would first have to create a program to steal the funds from the transacting wallets, and then, the scammer would have to create a program to hack a majority of the global mining network to access the wallets.[96] The manpower and infrastructure needed to pull off such an attack is incalculable.

Further, even if a hacker tried to scam a small portion of transactions, rather than the entirety of the aggregate transactions on a blockchain network, the hacker would still have to penetrate a majority of the global mining network.[97] Instead of incredibly high costs leading to the aggregate of all funds exchanged via blockchain, the hacker would still incur incredible costs only to receive a relatively small return. Thus, blockchain hacking is often too expensive for criminals to engage in successfully.[98]

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93. *Cf. id.* (except for in the very narrow domain of quantum computing. "The security of public key cryptography depends on the "hardness" of the problems that it is based on.").

94. *See* GREWAL-CARR & MARSHALL, *supra* note 77, at 2, 6. *See generally* Euny Hong, *How Does Bitcoin Mining Work?,* INVESTOPEDIA (Jan. 7, 2021), https://www.investopedia.com/tech/how-does-bitcoin-mining-work/.

95. GREWAL-CARR & MARSHALL, *supra* note 77, at 7. *See infra* Part II.C.

96. *Yes, Blockchain Can Be Hacked: 3 Ways It Can Be Done*, EPIQ GLOBAL [hereinafter *Yes, Blockchain Can Be Hacked*], https://www.epiqglobal.com/en-us/thinking/blog/blockchain-can-be-hacked (last visited Feb. 28, 2021).

97. A hacker would need the capability to hack an entire "block" of transactions. *See* GREWAL-CARR & MARSHALL, *supra* note 77, at 4 ("Many transactions occur in the network at any time. All the pending transactions in a given timeframe are grouped (*in a block*) for verification. *Each block has a unique identifying number*, creation time and reference to the previous block") (emphasis added). *But see* BLOCKCHAIN, https://www.blockchain.com/charts/n-transactions-per-block (last visited Mar. 7, 2021) (showing that around 2,000 transactions are held within a single block); *Yes, Blockchain Can Be Hacked*, *supra* note 97 (detailing the complexity of 51% attacks).

98. *Yes, Blockchain Can Be Hacked*, *supra* note 97.

Lastly, the openness of blockchain transactions presents privacy concerns.[99] Such concerns are peculiar for two reasons. First, the open nature of the technology allows for blockchain's security.[100] Allowing the world to see each transaction minimizes fraud and stealing while miners verify each new transaction based off previous, public transactions. Without previous public information, the verifiability of new transactions would not be possible.

Second, in the event the government uses blockchain data against citizens in criminal cases,[101] claims of reasonable expectations of privacy in their blockchain data would be confounding. Blockchain's essence relies on public information.[102] Blockchain offers secure global transacting which is only possible because its public nature.[103] By virtue of enjoying the advantages of blockchain, anyone who uses blockchain is actively affirming public information sharing. Blockchain is distinguished from cell phone data, for example, because blockchain users are active in their participation.[104] Cell phone users passively offer information of their most "mundane tasks" by simply turning on their phone.[105] Ultimately, blockchain's public nature is essential to its effectiveness, and upon further inspection, the drawbacks are not as problematic.

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99. Paul Belonick, *Transparency is the New Privacy*, 23 STAN. TECH. L. REV. 114, 119 (2020).

100. GREWAL-CARR & MARSHALL, *supra* note 77 at 5, 9.

101. *See* Robert A. Schwinger, *A Little Less Privacy: Cryptocurrency Transactions Under the Fourth Amendment*, N.Y. L.J. (July 27, 2020, 1:13 PM), https://www.law.com/newyorklawjournal/2020/07/27/a-little-less-privacy-cryptocurrency-transactions-under-the-fourth-amendment/.

102. GREWAL-CARR & MARSHALL, *supra* note 77, at 8.

103. *Id*. at 7.

104. *See* Schwinger, *supra* note 101 (The Fifth Circuit recently heard a case involving a defendant claiming a reasonable expectation of privacy in his Bitcoin transaction and affirmed the denial of his motion to suppress. The court rejected the defendant's argument that he had a privacy interest in the information held in the Bitcoin blockchain, holding that "the information on Bitcoin's blockchain is far more analogous to the bank records in *Miller* and the telephone call logs in *Smith* [two cases where the Fourth Amendment did not extend to offer defendants protections] than the [cell phone location information] in *Carpenter* [a case where the Fourth Amendment did protect the defendant's expectation of privacy].")

105. United States v. Jones, 565 U.S. 400, 417 (2012) (Sotomayor, J., concurring).

C. Miners and Cryptocurrency Defined

Individual users can edit blockchain's ledger because every time a user transacts using blockchain, that transaction must become publicly available.[106] When one user transfers money using blockchain technology, that user is editing the public ledger.[107] The "edits" to a blockchain constitute transfers of funds, and every transfer made on the blockchain is available for public view.[108] Any blockchain user who wants to transfer money must have a unique wallet address and must send their money to another blockchain user's unique wallet address.[109] The transfers are similar to transactions within a large online bank account. Anyone in the world can transact.[110] The blockchain's ledger tracks every transaction between unique addresses like a public spreadsheet, tracking users' edits.

A significant hurdle is the potential to deceptively transfer money from third parties to a user's own address.[111] In other words, blockchain needs to prevent users from stealing other's money.[112] If anyone can edit the ledger, then it is possible for a user to edit a ledger in a way that transfers money to that user.[113] However, miners make such a scenario avoidable.[114]

Miners are global users who control powerful computers and ensure each address receives the correct amount of money.[115] The problems of double-spending,[116] fraud, and theft are virtually

106. GREWAL-CARR & MARSHALL, *supra* note 77, at 4–5.

107. *See id*.

108. *Id*. at 4.

109. *Id*. at 4–5.

110. *See id.*

111. *Yes, Blockchain Can Be Hacked*, *supra* note 97.

112. *Id.*

113. *See id.*

114. Miners are the term used for Proof of Work blockchains. Their role is similar to that of stakers or bakers on other blockchains. The biggest smart contract platform, Ethereum, is currently transitioning from a Proof of Work system to a Proof of Stake system. *See* Hong, *supra* note 94; *See generally* GREWAL-CARR & MARSHALL, *supra* note 77, at 6.

115. *See id*.

116. Jake Frankenfield, *Double-Spending*, INVESTOPEDIA, https://www.investopedia.com/terms/d/doublespending.asp (last updated June 30, 2020) ("Double-spending is the risk that a digital currency can be spent twice. It is a

nonexistent because the network of miners on any given blockchain shield against such problems.[117] Miners are not individual users who manually comb through masses of transactions.[118] Miners commonly employ networks of computers or utilize powerful computer programs to sift through transactions.[119]

Creating these massive computer networks to verify blockchain edits and transfers comes at a price.[120] Miners earn cryptocurrency for verifying transactions on a blockchain network.[121] Although miners earn transaction fees, miners' fees are nowhere near as high as traditional intermediary fees.[122] Further, each blockchain has an associated cryptocurrency. Cryptocurrencies are exchanged for government-backed currencies. Cryptocurrencies are also traded on exchanges similar to foreign currencies, securities, or commodities. Cryptocurrencies are becoming easier to sell for government-backed currency due to numerous exchange platforms launching around 2017.[123]

In exchange for verifying transactions on blockchains, miners earn that blockchain's associated cryptocurrency.[124] The miners are financially incentivized to accurately verify as many transactions as possible.[125] The large number of miners verifying transactions act as

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potential problem unique to digital currencies because digital information can be reproduced relatively easily by savvy individuals who understand the blockchain network and the computing power necessary to manipulate it.").

117. Hong, *supra* note 94.

118. *Id*.

119. *Id*.

120. *Id*.

121. *Id*.

122. *See Explaining Bitcoin*, *supra* note 88. *See also Someone Transferred a Billion Dollars*, *supra* note 10.

123. Horn, *supra* note 69.

124. GREWAL-CARR & MARSHALL, *supra* note 77, at 4–5 ("[Using Bitcoin as an example,] [t]he algorithm rewards the winning miner with [Bitcoins], and the new block is added to the front of the blockchain.")

125. For example, on February 8, 2021, the price of one Bitcoin was about $48,000. A Bitcoin miner would earn $300,000 (6.25 x 48,000) for completing a block. Hong, *supra* note 94 ("The rewards for Bitcoin mining are reduced by half every four years. When Bitcoin was first mined in 2009, mining one block would earn you 50 [Bitcoins]. In 2012, this was halved to 25 [Bitcoins]. By 2016, this was halved again to 12.5 [Bitcoins]. On May 11, 2020, the reward halved again to 6.25.").

a group vote that can cancel deceptive transactions should such transactions be attempted.

D. Smart Contracts Defined

With blockchain, mining, and cryptocurrency defined, one can begin to understand smart contracts. If blockchains are public ledgers with verifiability, then smart contracts are public escrows with verifiability.[126] Smart contracts are "pieces of code that run 'on top of the blockchain.'"[127] Smart contracts, unlike the basic blockchain transactions, are conditional instruments for transferring money.[128] Although smart contracts function differently than standard blockchain transactions, the underlying principles and benefits are similar.[129] Smart contracts offer efficiency, transparency, and speed.[130] Additionally, the public can view smart contracts executed on a blockchain.[131] Unlike standard blockchain transactions, which execute when a sender initiates a transaction, smart contracts will not execute until there is an outside condition met.[132]

Smart contracts are most easily described using an example. Imagine Bob tells Sally that he will give her $5 if it rains today. Then, Bob deposits his $5 into a smart contract on his phone. Later that day, it rains, and Bob now owes Sally $5. Relying on a reputable weather app, the smart contract gains data that it is raining in Bob's current

126. Darcy W.E. Allen et al., *The Governance of Blockchain Dispute Resolution*, 25 HARV. NEGOT. L. REV. 75, 78 (2019).

127. *Id*. at 76.

128. *Id*. at 78.

129. *See* Ream, *supra* note 90 (stating blockchain-based smart contract benefits include speed and real-time updates; fewer intermediaries; and lower cost).

130. *Id.*

131. *See id*. ("Smart contracts are executed by a computer network that uses consensus protocols to agree upon the sequence of actions resulting from the contract's code . . . [w]ith a shared database running a blockchain protocol, the smart contracts auto-execute, and all parties validate the outcome instantaneously and without need for a third-party intermediary")*; see also* GREWAL-CARR & MARSHALL, *supra* note 77, at 6 ("The individuals involved are anonymous, but the [smart] contract is in the public ledger").

132. Allen et al., *supra* note 127, at 78.

location.[133] Upon the input from the weather app, Bob's $5, which was held similarly to escrow, gets deposited into Sally's account.

Miners verify smart contract transfers upon the met condition.[134] Miners play a similar role in smart contract technology to the role they play in standard blockchain transactions.[135] Moreover, the same incentive-driven parameters exist for smart contracts.[136] Smart contract miners are also rewarded with cryptocurrency when they verify transactions on the associated smart contract network.

In sum, blockchains can transfer money from user to user upon agreement or upon a condition being met. If users opt to transfer money only after meeting a condition, they are engaging in a smart contract.

III. THE PATHS REGULATORS MAY CHOOSE FROM WHEN PERMITTING INVESTMENT FUNDS' USE OF SMART CONTRACTS

While both smart contracts and intermediaries can conditionally hold money, intermediaries also hold investor capital or otherwise provide investors with security until intermediaries are certain capital gets used in an expected manner by portfolio managers. Although efficient at conditional transacting, smart contracts cannot provide an intermediary's human guidance. Additionally, smart contracts are not immune to disputes occurring after executed transactions.[137] Perhaps future development will help smart contracts meet fund needs more fully,[138] but smart contracts' current limitations hold back adoption within financial trading.

133. *See* Cryptopedia Staff, *What is Chainlink and How Does It Work?*, GEMINI, https://gemini.com/learn/what-is-chainlink-and-how-does-it-work (last updated Fe. 26, 2021) (The smart contract "gains data" through "oracles" such as Chainlink.)*; see generally* CHAINLINK, https://chain.link/ (last visited Mar. 7, 2021).

134. *See* Hong, *supra* note 94 (noting the role of miners in verifying bitcoin transactions).

135. *See generally id.*

136. *See generally id.*

137. Allen et al., *supra* note 127, at 76, 82.

138. *See* Davidson, *supra* note 6, at 3–4 (stating that "[i]t is unclear at this early stage whether any of the current hype surrounding blockchain is justified." Nevertheless, future blockchain innovations and judicial rulings could lead to more competent blockchain features.).

Smart contracts have short-term potential to supplement select intermediaries within the scope of command services as a means of increasing efficiency, transparency, and lowering costs.[139] Investors will not be sufficiently protected if smart contracts fully replace custodian banks and other financial intermediaries[140] because intermediaries provide guidance and advice in addition to facilitating fund transactions. For example, custodial banks do more than hold money and perform duties based off a single met condition. The job of a custodian bank involves many complex tasks, some of which require emotional intelligence. Financial intermediaries act as agents on behalf of investors. Rather than requiring investors to have robust knowledge of investment portfolios themselves, investors are confident that each intermediary will provide competent service on their behalf. Having a competent agent in place to oversee investments preserves the principle of investor protection.

Regulators should consider smart contract technology's effects on the financial intermediary sector because doing nothing "leaves a legal gap and increases uncertainty for market actors."[141] While efficiency-minded regulators may want regulation to move quickly there are a number of problems regulators should contemplate. To the extent financial intermediaries are replaced with smart contracts in the future, regulators should consider what principles will positively affect investors.

This section addresses three possible paths regulators could explore. First, regulators could elect to wait-and-see what the future holds for smart contracts. Under this approach, regulators remain inactive while allowing the market to decide which regulations are relevant. Under this wait-and-see approach, regulators may even adopt a laissez-faire attitude and choose not to regulate smart contracts within financial trading. Second, regulators could heavily regulate the industry, anticipating every derivative or consumer protection issue. Under this approach, regulators would not only address smart

139. *See generally Someone Transferred a Billion Dollars*, *supra* note 11.

140. *See, e.g.,* THE CLEARING HOUSE, THE CUSTODY SERVICES OF BANKS iv (2016), https://www.davispolk.com/files/20160728_tch_white_paper_the_custody_services_of_banks.pdf (stating that custodians have the ability to help clients with liquidity problems).

141. Agnikhotram & Kouroutakis, *supra* note 69, at 304.

contracts, but would also proactively place restrictions on smart contracts before the technology gains extensive adoption.[142] Third, regulators could adopt a moderate approach by maintaining derivative regulations and consumer protections while simultaneously introducing smart contract exceptions for limited intermediary functions. This approach allows for increased efficiency through smart contracts' low cost, high-speed, and high transparency. Limited smart contract utilization would also allow the incumbent intermediary industry to continue providing protections to investors while maintaining the current market share. Ultimately, investors would benefit from a moderate approach because lower fees produce increased investor returns.

A. The Wait-and-See Approach

Under the wait-and-see approach regulators would employ a hands-off approach to smart contracts until the financial, technological, and regulatory environments are more certain.[143] Regulators may also want to let the dust settle before regulating a cutting edge technology due to the aftereffects of a global pandemic.[144] Adoption rates of smart contracts within the financial industry and use cases for smart contracts may change following the unique challenges of the post-pandemic world.

Regulators may want to hold off on regulating smart contracts until the technology offers more features which make adoption inevitable.[145] Currently, regulators are not facing political urgency to address smart contracts because the general public's smart-contract

142. Shiv, *What is Technology Adoption Life Cycle and Chasm?*, MEDIUM (Feb. 3, 2017), https://medium.com/@shivayogiks/what-is-technology-adoption-life-cycle-and-chasm-e07084e7991f (stating "[t]he most difficult step [for a given technology to gain adoption] is making the transition between early adopters and [a] majority [of users]. This is the chasm . . . [i]f a successful firm can create a major effect in which enough momentum builds, then the product becomes a standard").

143. *See generally* ZHOUDAN XIE, RISING POLICY UNCERTAINTY UNDER COVID-19, REG. STUD. CTR. 2 (2020), https://regulatorystudies.columbian.gwu.edu/sites/g/files/zaxdzs3306/f/downloads/Commentaries/GW%20Reg%20Studies%20-%20COVID%20Regulatory%20Uncertainty%20-%20ZXie.pdf.

144. *See generally id.*

145. Horn, *supra* note 69.

use is minimal. In comparison, Congress enacted Dodd-Frank after the failures of the Great Recession received immense media attention. It is less likely that smart contracts will be in a similar place within the public consciousness as the Great Recession was.

Nevertheless, remaining silent on smart contract regulation may indirectly lead to further unregulated use by non-professionals.[146] Provisions in Dodd-Frank set out to regulate new-for-its-time investment vehicles unaddressed by past regulatory frameworks.[147] Due to the silence of the pre-Dodd framework, unregulated investments spread pervasively throughout the global financial market. Although the result was disastrous, we should not overlook the lessons learned from the speed with which those new technologies gained adoption.

If financial regulators wait, those same regulators may act too late, after widespread adoption of this new technology occurs.[148] Without regulation in the short-term, misuse of smart contracts may arise in ways regulators could not anticipate.[149] The financial market would benefit if regulators acted and did not wait-and-see.[150] If timely regulations are soon adopted, then funds would enjoy increased efficiency and regulators could ensure consumer protection for investors from the outset of smart contract adoption. Regulators could begin with crafting laws aimed at consumer financial products which already utilize smart contracts.[151]

146. *Id*.

147. David S. Huntington et al., *Summary of Dodd-Frank Financial Regulation Legislation,* HARV. L. SCH. F. CORP. GOVERNANCE (July 7, 2020), https://corpgov.law.harvard.edu/2010/07/07/summary-of-dodd-frank-financial-regulation-legislation/ ("The Act introduces significant direct regulation of [over-the-counter derivatives] transactions").

148. *See* Horn, *supra* note 69 (noting DeFi's rising popularity); *but see* Agnikhotram & Kouroutakis, *supra* note 69, at 305, 327 (concluding that smart contracts should be construed as very narrowly fitting within the current legal landscape).

149. Horn, *supra* note 69.

150. Agnikhotram & Kouroutakis, *supra* note 69, at 305 ("While possibly good for innovation, 'waiting and seeing', leaves a legal gap and increases uncertainty for market actors").

151. *See generally* Horn, *supra* note 69.

The crypto industry's DeFi niche currently uses smart contracts.[152] The fact private individuals across the world are acting as solo central banks and hedge funds should not be dismissed. Dwarfed are the many risks addressed in the discussion of the non-transparent financial intermediaries by risks incurred by individuals trading in the DeFi space.[153] Some DeFi platforms constitute the most exotic investments American citizens can meander into.[154] By waiting, regulators allow DeFi space users to operate within a wild west playground, complete with some of the most volatile assets in existence.[155] Staying silent on the use of smart contracts could also have unintended consequences for retail investors who entrust their money with unregistered portfolio managers. Allowing hedge funds to use smart contracts as a supplement to current intermediaries would be more efficient, and it would preserve consumer protection. Ultimately, the opportunities for everyday investors within the crypto sector of finance are numerous. There is excitement about the potential yield on various DeFi investments. Nevertheless, substantial risk awaits early adopters. Blockchain technology is a positive innovation for American society. However, the lack of regulation on smart contract technologies within finance would allow blockchain's drawbacks to go unrestrained. If regulators do not act, the large-scale rewards for engaging in this new and exciting field may never exceed the risks.

B. Preventative-Regulation Approach

Regulators could also preemptively seek solutions which dampen the use of smart contract technology before adoption gains

152. *Id*.

153. *Id*.

154. Daniel Cawrey, *Meet the People Who Do Yield Farming*, COINDESK (Oct. 11, 2020), https://www.coindesk.com/meet-people-who-do-yield-farming-defi-cryptocurrency.

155. One example of an extremely volatile asset that DeFi investors are exposed to is Ampleforth. Ampleforth is a cryptocurrency which—by design—gained and lost 70% of its value on multiple instances within a week's time due to the wait-and-see approach. COINMARKETCAP, https://coinmarketcap.com/currencies/ampleforth/ (last visited Mar. 7, 2021).

momentum.[156] This approach would allow independent agencies, like the Consumer Financial Protection Bureau (CFPB) or the Commodity Futures Trading Commission (CFTC), to have jurisdiction over smart contracts.[157] Due to the CFPB's consumer and banking jurisdiction, smart contract regulations could be enforced on consumers using smarts contracts within the DeFi niche.[158] Additionally, the CFTC could have jurisdiction over smart contracts because the CFTC enforces regulations on swaps, futures, and certain option trades.[159] If the CFPB or CFTC heavily regulated smart contracts, so that smart contracts could never be feasibly adopted as a supplement to intermediaries, then the problems of inefficiency, expense, and non-transparency would remain.

First, under the preventative-regulatory approach, smart contracts would likely never gain adoption to supplement financial intermediaries and increase efficiency for investors.[160] Smart contracts execute quickly, and fees to use smart contracts are nominal.[161] Under this approach, the most probable solution to the inefficiency problem is for intermediaries to internally increase efficiency and affordability. If the recent history of the financial sector is any indication, then the probability of financial intermediates innovating to help reduce fees for investors is low.[162]

Financial intermediaries benefit from the current regulatory setup because their fees are mandatory. While incentives for intermediaries to run as profitably as possible are present, there is also incentive to bill as much as possible in fees (to increase revenue). Intermediaries wanting to increase fees and investors wanting to decrease fees creates a conflict. The current regulatory framework gives intermediaries an advantage because firms within the intermediary sector must reduce fees to compete with other intermediary firms). Introducing smart

156. Agnikhotram & Kouroutakis, *supra* note 69, at 304 (noting a common skeptical viewpoint against smart contracts: "the European Banking Institute, the European Parliamentary Service and United Kingdom's Chief Scientist expound unassailable risks").

157. Chen, *CTFC*, *supra* note 13. Probasco, *CFPB*, *supra* note 14.

158. Chen, *CTFC*, *supra* note 14.

159. Probasco, *CFPB*, *supra* note 14.

160. Shiv, *supra* note 143.

161. Ream, *supra* note 90.

162. Judge, *supra* note 4, at 577.

contracts would help shift the advantages towards investors. If no disruptive technology has a feasible chance of entering the intermediary market, then the intermediary incumbents would benefit.

Finally, concerns over the lack of transparency are also not likely to improve for investors.[163] While investors would be protected, like they are today, from poor decision making on behalf of portfolio managers, investors would also have to endure the risk that custodial banks are lending out their capital. Smart contracts, due to the public view of blockchain technology, can solve this problem. Under the preventative-regulatory approach, smart contracts would not have the opportunity to present itself as a viable solution to the transparency problem. Barring further regulation of custodial intermediaries, investors would suffer from adverse effects stemming from lower transparency.

C. Moderate Approach

A final approach to regulating smart contracts preserves the consumer protection effects of Dodd-Frank and increases the efficiency for investors. Efficiency-minded regulators like the results of consumer protection regulations but do not like the associated costs.[164] Regulators could craft a moderate approach which simultaneously maintains Dodd-Frank consumer protections and allows pooled investment funds to use smart contracts in a limited capacity.

A moderate approach avoids the problematic wait-and-see outcomes[165] and the preventative-regulation concerns regarding efficiency. Moreover, it does not result in high intermediary fees. Regulators can balance efficiency and consumer protection by using smart contracts as supplements to the advisory expertise financial intermediaries already provide.

Further, this approach keeps current regulations in place and authorizes smart contracts for a handful of uses, such as safekeeping

163. *See* Judge, *supra* note 4, at 611; *see also* Kaaru, *supra* note 43.

164. *See* Zywicki, *supra* note 20, at 927 (asserting that greater efficiency—rather that increased cost and bureaucracy—helped mitigate a "thriving class of loan sharks").

165. *See* Horn, *supra* note 69; *see also* Agnikhotram & Kouroutakis, *supra* note 69, at 304.

investor capital in a smart contract rather than a custodial bank. Smart contracts could also reduce investor's fees.[166] Under this approach, current intermediaries would not be replaced fully.

Additionally, regulators could choose to expand consumer protections to address unregulated smart contract use within the DeFi niche.[167] Remember, the public is currently operating as unlicensed, solo central banks or hedge funds with no disclosure requirements.[168] To address this, regulators should require the public to register or obtain minimal training before advertising themselves as financial agents. In addition to authorizing limited smart contract use within pooled investment fund operations, regulators should also broadly sculpt a comprehensive framework for smart contract use in multiple domains. Legislators can shape new regulations to fit the existing framework by considering the consumer protections already in place.

One concern with a moderate approach is that intermediaries will lose market share or be constrained by the introduction of smart contracts.[169] Intermediaries' fees earned from services currently offered could be reduced if funds execute a portion of those services with smart contracts. The intermediary firms would see lower revenue, but those same firms could also employ less staff to offset or mitigate the reduction in revenue. While intermediary firms could experience less profitability in the future, their market share relative to direct competitors would be unaffected because the moderate approach would impact each intermediary and its direct competitors equally. In other words, while intermediary firms prefer the current regulations over the moderate approach,[170] intermediaries would overcome the moderate approach's negative effects.

166. Ream, *supra* note 90.

167. Horn, *supra* note 69.

168. *See* Horn, *supra* note 69 (noting how Defi has provided the public with the following results: "Voting that is nothing more than a poll that project developers may choose to execute — or not; and [b]ig sacks of tokens pre-mined by founders at the expense of the community"); *see also* Eng-Tuck Cheah, *supra* note 71 ("Regulators are having to weigh the delicate balance between stifling innovation and failing to protect society from such risks as individuals putting their money into an unregulated space").

169. *See generally* Judge, *supra* note 4, at 592–593.

170. *Id.* at 578 ("intermediaries may use these same informational and positional advantages to promote and entrench high-fee institutional arrangements").

Another concern with the moderate approach is the job loss the financial intermediary industry would experience due to automation. The effects of automation on intermediary jobs could mirror the effects automation had on manufacturing jobs. With the moderate approach, workers losing their jobs to smart contracts are likely better positioned to recover from automation than the average manufacturing worker under a similar automation phenomenon.[171] Assuming white-collar workers can recover, introducing smart contracts into the intermediary sector will lead to increased returns for investors via lower fees incurred by pooled investment funds. This outcome, although theoretical, could lead to increased equity for a greater number of people.

Regulators should preserve the rules of the road established by Dodd-Frank. Increased consumer protections safeguard investors from the surrounding risks to their capital investments. This increase in consumer-protected contracting should remain in American commerce. However, there is also an opportunity to help investors on another front. If regulators use a moderate approach to smart contract regulation, they will strike a balance between efficiency and consumer protection within the domain of pooled investment fund regulation.

CONCLUSION

There is a problem with the current pooled investment fund industry. Although intermediaries are slower, less efficient, and less transparent than smart contract technology, smart contracts are not yet able to supplement financial intermediaries. The result is higher fees when using pooled investment funds. While implementing smart contracts into the financial sector may seem like a good idea to entrepreneurs,[172] America must first address smart contacts' many

171. *See generally* Michael Lucci, *Divergence: White-Collar Jobs Up, Manufacturing Jobs Disappearing in Illinois*, ILL. POL'Y (June 22, 2015), https://www.illinoispolicy.org/divergence-white-collar-jobs-up-manufacturing-jobs-disappearing-in-illinois/; *see also* Bahrat Ramamurti, *The Shift Toward Remote Work Could Leave Blue-Collar Workers Behind*, CNN (Sept. 16, 2020), https://www.cnn.com/2020/09/16/perspectives/remote-work-blue-collar/index.html (discussing the effects of COVID-19 on the workforce).

172. *Melon as a Solution*, MELON, https://melonprotocol.com/docs/solution/ (last visited Mar. 7, 2021); *What is Enzyme Finance*, MESSARI, https://messari.io/asset/enzyme-finance/profile (last visited Mar. 7, 2021).

challenges. Such challenges include the current shortcomings of the technology; striking a proper balance between efficiency and consumer protection; and the implications that follow from staying silent.

The legal industry's status quo is tough to penetrate.[173] A broader discussion, coupled with fulfilled potential in smart contract technology, could change a lot of dynamics in securities law. Automation has benefits across many industries, but regulators should be wary of changing too much too fast. Dodd-Frank's increase in consumer protection will aid in preventing further problems that led to the Great Recession. Regulators should not toss aside the hard-fought principles within Dodd-Frank in sole favor of efficiency and profitability.

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173. *See generally* Holderman, *supra* note 68 (noting the legal profession's difficulties in adapting to new technologies and paradigm shifts).

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