Blockchain Applications and Fee Structure Developments in Private Investment Funds

Wulf A. Kaal*

Abstract

The traditional 2/20 fee structure of private investment funds has come increasingly under pressure in the last ten years. Typical factors considered to explain the pressure on fees in the industry include the inadequate performance of the private investment fund industry, the ability of large investors to negotiate special terms, the withdrawal of private investment fund investments by large institutional clients and public retirement funds, and the consolidation of the industry, among several other market-driven factors. This article explores an additional factor that contributes to the pressure on fees, one that has largely been ignored by commentators: private fund advisers' use of blockchain technology, artificial intelligence, and big data.

Using a dataset of private investment fund advisers that utilize blockchain technology in their investment strategy or internal operations (N=[98]), this article shows that the fund advisers who use the new technology are often able to charge lower fees overall. The article explores the reasons for lower fees in those funds and examines possible future applications of the technology in the private investment fund industry. While the overall proportion of strategies of private investment funds that apply modern technologies, including blockchain technology, is still small, as the use of blockchain technology grows in the private investment fund industry, the pressure on the fee structure is likely to continue to grow.

Key Words: Blockchain, Big Data, Meta Data, Data Scientist, Hedge Fund, Private Equity, Fees, Fee Structure

JEL Categories: K20, K23, K32, L43, L5, O31, O32

*Associate Professor, University of St. Thomas School of Law (Minneapolis), United States of America. The author is grateful for outstanding support from librarian Ann Bateson.

Electronic copy available at: https://ssrn.com/abstract=2959730

Table of Content

Electronic copy available at: https://ssrn.com/abstract=2959730

I. Introduction

The traditional 2/20 fee structure of private investment funds has come increasingly under pressure in the last ten years. Several market factors help explain the pressure on the fee structure of the private investment fund industry. Private fund investors withdrew $70.1 billion from the private investment fund industry in 2016.[1] In 2016 a total of 1,057 private investment funds closed down, exceeding the 1,023 liquidations of private investment funds in 2009, and falling just shy of the record 1,471 closures in 2008.[2] According to some observers the market is oversaturated which increases pressure on private investment fund managers' performance[3] and results in compromise fee arrangements, such as paying fees on invested capital only.[4] Other factors that help explain the pressure on fees in the industry include the inadequate performance of the private investment fund industry,[5] the

---

[1] *HFR: Hedge Fund Industry AUM Crests to 3T to End 2016*, FINALTERNATIVES (Jan. 20, 2017, 8:12 PM ET), http://www.finalternatives.com/node/34475.

[2] William Watts, *1,057 Hedge Funds Shut Down Last Year—the Most Since the Financial Crisis*, MARKETWATCH (Mar. 20, 2017, 8:51 AM ET), http://www.marketwatch.com/story/hedge-funds-closed-down-last-year-at-a-pace-unseen-since-2008-2017-03-17. "Some industry watchers have put the withdrawals closer to $100 billion. The shutdown total was 10.4 percent worse than 2015, bringing the total number of remaining hedge funds to 9,893, according to HFRI's estimates." Jeff Cox, *Hedge Fund Fees Are Falling As Shutdown Hits a Post-Crisis High*, CNBC (Mar. 17, 2017, 12:40 PM ET), http://www.cnbc.com/2017/03/17/hedge-fund-fees-falling-as-shutdowns-hit-a-post-crisis-high.html.

[3] " 'The market is oversaturated,' said Don Steinbrugge, managing partner at Agecroft Partners, a hedge fund marketing firm. 'It's highly competitive, and for a hedge fund manager to raise money they can't have any flaws.'" Cox, *supra* note 2.

[4] "Edmund Truell, another veteran dealmaker and former chairman of the London Pensions Fund Authority, also advocates the idea of paying fees on invested capital only. Mr Truell, who founded Duke Street Capital, the private equity firm, in 1997, says the LPFA now pays fees on invested capital alone through its co-investment programme with Adveq, the Zurich-based private equity firm. He adds that he has seen 'compromise' arrangements elsewhere in the industry, whereby investors agree to pay fees on invested capital as well as a minimal management fee over a four-year period. He says: 'My sense is that even the bigger [buyout] funds coming out next year are going to work with this sort of arrangement: fees based primarily on invested capital.' There are clear signs of investor discontent with current fee practices. More than three-quarters of 151 private equity firms and investors polled by Sungard, the software company, believe fees will fall in the next two years." Madison Marriage, *Guy Hands: Private Equity Fees Are 'Driving Investors Away*,' FIN. TIMES (Oct. 3, 2015), https://www.ft.com/content/1cd7cff2-67aa-11e5-a57f-21b88f7d973f.

[5] *See generally* EILEEN APPELBAUM & ROSEMARY BATT, ARE LOWER PRIVATE EQUITY RETURNS THE NEW NORMAL? (2016), http://cepr.net/images/stories/reports/private-equity-performance-2016-06.pdf. "While median private equity buyout funds once beat the S&P 500, they have not done so since 2006 – despite industry claims to the contrary." *Id*. at 1.

Electronic copy available at: https://ssrn.com/abstract=2959730

ability of large investors to negotiate special terms,[6] the withdrawal of private investment fund investments by large institutional clients and public retirement funds,[7] and the consolidation of the industry, among several other market-driven factors.[8]

A factor contributing to the market pressure on the fee structure that has not been examined by commentators pertains to the increasing use of use of blockchain technology, artificial intelligence, and big data by private fund advisers. Anecdotal evidence suggests that the majority of private fund advisers that use blockchain technology, artificial intelligence, and big data in different aspects of their operations or strategy have a substantially lower fee structure than those who do not use them. Prominent examples of lower fee structures driven by the use of blockchain technology include those of Lending Robot's Lending Robot Series, and platforms for blockchain-enabled fund management, such as those offered by Melonport or Drago, among others.[9]

---

[6] *See, e.g.,* Chris Flood, *Private Equity Clings to '2 and 20' Fee Model*, FIN. TIMES (Aug. 12, 2016), https://www.ft.com/content/f7dc242c-58a9-11e6-9f70-badea1b336d4; Madison Marriage & Attracta Mooney, *Hedge Funds and Private Equity Pressured to Cut Fees*, FIN. TIMES (Feb. 21, 2106), https://www.ft.com/content/07867a66-d737-11e5-8887-98e7feb46f27; Sam Sutton, *CalPERS Pays Lower Fees, Carry for a Third Year*, PEHUB NETWORK: BUYOUTS (Nov. 14, 2016), https://www.pehub.com/buyouts/calpers-negotiates-lower-fees-carried-interest-for-third-straight-year/.

[7] *See, e.g*., Randy Diamond, *CalPERS' Private Equity Program Size Declining Despite Top Performance*, PENSIONS & INVESTMENTS (Nov. 8, 2016, 4:21 PM), http://www.pionline.com/article/20161108/ONLINE/161109897/calpers-private-equity-program-size-declining-despite-top-performance; PEW CHARITABLE TRUSTS, STATE PUBLIC PENSION FUNDS INCREASE USE OF COMPLEX INVESTMENTS (2017), http://www.pewtrusts.org/~/media/assets/2017/04/psrs_state_public_pension_funds_increase_use_of_complex_investments.pdf. "While the allocation to hedge funds has increased in the aggregate, the rise in hedge fund investing by pension funds is slowing overall, and some funds are exiting these investments altogether. In 2014, for example, CalPERS eliminated its $4 billion hedge fund investment program, citing high costs. Likewise, the board of the New York City Employees' Retirement System voted in April 2016 to withdraw from all hedge fund investments due to underperformance and cost." [Footnote references omitted.] *Id*. at 21.

[8] *See* Judy Gross, *SEC Releases Data on Private Funds; Big Picture of US Private Fund Industry Emerges*, FORBES (Oct. 26, 2105, 5:46 AM), https://www.forbes.com/sites/judygross/2015/10/26/sec-releases-data-on-private-funds-big-picture-of-us-private-fund-industry-emerges/#227a174393e5.

[9] *See, e.g.*, Berenice Magistretti, *LendingRobot Launches Automated Hedge Fund Secured by Blockchain Technology*, VB (Jan. 26, 2017, 8:00 AM), https://venturebeat.com/2017/01/26/lendingrobot-launches-automated-hedge-fund-secured-by-blockchain-tech/; *Melonport*, https://melonport.com/ (last visited Mar. 30, 2017); Jim Manning, *Melonport Brings Digital Asset Management to Polkadot's Multi-Chain Framework*, ETHNEWS (Nov. 14, 2016), https://www.ethnews.com/melonport-digital-asset-management-polkadot-multi-chain. *See generally* Attracta Mooney, *Blockchain Could Be Totally Transformative for Fund Industry*, FIN. TIMES (May 22, 2016), https://www.ft.com/content/bca31b78-1d02-11e6-b286-cddde55ca122; OLIVER WYMAN & J.P. MORGAN, UNLOCKING ECONOMIC ADVANTAGE WITH BLOCKCHAIN 10–12 (2016), http://www.the-blockchain.com/docs/joint-report-by-jp-morgan-and-

Electronic copy available at: https://ssrn.com/abstract=2959730

Using a dataset of private investment fund advisers that utilize blockchain technology in their investment strategy or internal operations (N=[98]), this article shows that the fund advisers who use the new technology are able to charge overall lower fees. The article explores the reasons for lower fees in those funds and examines possible future applications of the technology in the private investment fund industry. While the overall proportion of strategies of private investment funds that apply modern technologies, including blockchain technology, is still small, as the use of blockchain technology grows in the private investment fund industry, the pressure on the fee structure is likely to continue to grow.

II. Changing Fee Structure

The fee structure of private investment funds has changed substantially in the last ten years. Traditionally, the hedge fund industry has charged fees to investors based on the so-called "2/20" formula.[10] This means that most fund advisers were paid monthly or quarterly an annualized 2% management fee based on assets under management and a 20% annual performance or incentive reallocation based on net fund profits.[11] Similarly managers of private equity funds generally used to charge an annualized 2% management fee based on committed capital and most commonly received a 20% commission on returns over a designated amount (referred to as the carry) as incentive compensation. However, the historical fee of 2% of commitments through the reinvestment period, then 2% on the cost basis for the investments/value of fund has shifted in recent years closer to 1.0% for new managers and 1.5-1.8% for established managers with an adequate track record.[12]

---

oliver-wyman-unlocking-economic-advantage-with-blockchain-A-Guide-for-Asset-Managers.pdf.

[10] *Two and Twenty*, INVESTOPEDIA, http://www.investopedia.com/terms/t/two_and_twenty.asp (last visited Mar. 30, 2017).

[11] *Id*. Such fees are typically used by managers to pay for salaries, rent, and equipment. The remainder goes to the partners. *See, e.g.*, Houman B. Shadab, *The Law and Economics of Hedge Funds: Financial Innovation and Investor Protection*, 6 BERKELEY BUS. L.J. 250 (2009), http://scholarship.law.berkeley.edu/cgi/viewcontent.cgi?article=1066&context=bblj; *Hedge Fund Performance and Management Fees*, HEDGECO.NET (Aug. 5, 2009), https://www.hedgeco.net/hedgeducation/hedge-fund-articles/hedge-fund-performance-management-fees/.

[12] *See* Irwin Latner, *Trends for Early-Stage Investing in Emerging Managers*, HEDGE CONNECTION: THE EDGE (July 24, 2015, 7:59 AM), http://hedgeconnection.com/blog/?p=5071; *Funds Forced to Reduce Fees and Increase Transparency*, CITCO, https://www.citco.com/our-thinking/thoughts/funds-forced-to-reduce-fees-and-increase-transparency/; Amanda Cantrell, *The Beginning of the End for High Hedge Fund Fees?* INSTITUTIONAL INVESTOR (Sept. 15, 2016), http://www.institutionalinvestor.com/article/3585979/banking-and-capital-marketsdaily-agenda/the-beginning-of-the-end-for-high-hedge-fund-

Electronic copy available at: https://ssrn.com/abstract=2959730

It has become increasingly common in recent years for investors to negotiate fees with fund managers, particularly with newer fund managers who may be more willing to engage in such negotiations to induce seed investors at the time of fund formation.[13] Alternative fee arrangements include but are not limited to modified highwater marks, incentive hurdles, and triggers, as well as clawbacks.[14]

First-time or new managers are particularly affected by the new fee structure. Unlike in the recent past, first-time managers are now often forced to share the business budget (rent, employee salaries, etc.) to justify the 1.5% management fee. Moreover, the industry is increasingly seeing contested track records for new managers, i.e., the new firm cannot get a consensus from the new manager's old employer about the manager's track record with that employer. Another phenomenon that affects first-time managers pertains to early limited partnership investors who increasingly throw their weight around to negotiate tough terms on fees.

III. Factors Creating Downward Pressure on Fees

For the better part of the last ten years, the inadequate performance of the private investment fund industry created substantial pressure on its traditional 2/20 fee structure. A prominent example, exemplifying the pressure on the fee structure given the performance of the industry, is the wager between Warren Buffet and Ted Seides. In 2007 Warren Buffet entered into a wager with Ted Seides of Protégé Partners, betting $500,000 that a purely passive investment strategy, that is passively tracking the S&P 500 Index, over a ten-year period would beat any hedge fund portfolio over the same time period.[15] Buffet asserted that the fees of the private investment fund industry (2/20) were too high for hedge funds given the returns of the industry and did not justify the fees continuing existence.[16] To show his commitment, Buffet

---

fees.html#/.WORK7fkrKUl. According to Hedge Fund Research, Inc., the average management fee for funds launched in 2016 was 1.33. https://www.hedgefundresearch.com/sites/default/files/articles/4Q16_HFR_MMIR_FINAL.pdf. According to Prequin, the average hedge fund earned 1.57 in management fees in 2016. Press Release, Prequin, Investors Increase Pressure on Hedge Funds to Lower Fees (Sept. 22, 2106), https://www.preqin.com/docs/press/HF-Fees-Sep-16.pdf

[13] *See, e.g.,* Latner, *supra* note 12.

[14] *See, e.g.*, TOWERS WATSON, HEDGE FUND INVESTING OPPORTUNITIES AND CHALLENGES 16–18 (2012), https://www.towerswatson.com/en/Insights/IC-Types/Survey-Research-Results/2012/04/Hedge-Fund-investing-opportunities-and-challenges; *7 Differences Between Private Equity and Hedge Funds*, ARTIVIST (Dec. 1, 2014), https://artivest.co/blog/7-differences-between-private-equity-and-hedge-funds/.

[15] *See* Letter from Warren Buffet, Chairman of the Board, Berkshire Hathaway Inc., to Hathaway Berkshire Shareholders 21–22 (Feb. 25, 2017), http://berkshirehathaway.com/letters/2016ltr.pdf.

[16] *See id*. at 23–24.

Electronic copy available at: https://ssrn.com/abstract=2959730

selected a Vanguard S&P Index Fund, passively tracking the S&P 500 Index, while Seides chose five hedge funds of funds. Seides's hedge funds of funds had collectively invested in over 100 hedge funds.[17] The wager was on the higher of the respective funds' compounded annual return for ten years (2008-2017) net of fees.[18] Seides entered into the bid despite a huge disadvantage—hedge funds have a much higher fee structure and the wager pertained to compounded annual interest net of fees. A year before the end of the wager, Buffet's nine-year result is a 7.1 % compounded annual return compared to Seides's 2.2%.[19] Buffet has opined that the great majority of managers are not skillful enough to outperform the S&P 500, noting that "a good record quickly attracts a torrent of money . . . huge sums invariably act as an anchor on investment performance [and that] most managers will nevertheless seek new money because of their *personal* equitation – namely, the more funds they have under management, the more their fees."[20]

The increasing pressure on the traditional fee structure manifests itself in several new fee-related outcomes affecting private investment fund managers. In recent years, private investment fund management fees can deviate from the market rate of 1.5%–2% of the fund's capital commitments because affiliates or other employees of the investment manager who invest in the fund are not charged management fees, and funds with fewer oversight and monitoring requirements typically charge lower management fees. [21] The new fee structure is also the result of fund managers foregoing market rate management fees, larger investors requiring reduced management fees to induce investment, side-by-side vehicles attracting investors in the co-investment entities by charging less than 2% management fees, real estate funds charging management fees based on the amounts invested in properties, and different investors in the same fund being charged different management fees. [22] Charging different management fees because of the aforementioned pressures on the industry can make it more difficult

---

[17] *Id.* at 22.
[18] *See id.*
[19] *Id.*
[20] *Id.* at 24.
[21] Barry Steinman, *Private Equity Fund Fees*, DUANE MORRIS 5, 7 (Aug. 2014), https://www.duanemorris.com/site/static/private_equity_fund_fees.pdf. Various company ADV reports and brochures illustrate reduced or waived management fees for employees and others. *See, e.g.*, FIG LLC, *U.S. Sec. and Exch. Comm'n Form ADV, Part 2A: Firm Brochure*, Mar. 30, 2016, at 5, http://ir.driveshack.com/Cache/33858446.PDF?O=PDF&T=&Y=&D=&FID=33858446&iid=4040318; Neuberger Berman LLC, *Client Brochure*, Jan. 1, 2016, at 8, https://www.morganstanley.com/wealth-investmentsolutions/pdfs/adv/neubergerbermanadv.pdf; LeoGroup, *U.S. Sec. and Exch. Comm'n Form ADV, Part 2: Client Brochure* (Mar. 15, 2016), at 6, http://leogroupllc.com/wp-content/uploads/2015/05/LeoGroup-ADV2-2016-03-15.pdf.
[22] Steinman, *supra* note 21.

Electronic copy available at: https://ssrn.com/abstract=2959730

for fund advisers to market a fund, especially a fund where investors receive "most favored nations" rights. [23]

Several market factors help explain the pressure on the fee structure of the private investment fund industry. Private fund investors withdrew $70.1 billion from the private investment fund industry in 2016.[24] In 2016 a total of 1,057 private investment funds closed down, exceeding the 1,023 liquidations of private investment funds in 2009, and falling just shy of the record 1,471 closures in 2008.[25] According to some observers the market is oversaturated which increases pressure on private investment fund managers' performance[26] and results in compromise fee arrangements, such as paying fees on invested capital only.[27]

Other important factors for the downward pressure on the incentive fee side include blackened carried interest and changes in the calculation of hurdle rates. Some industry observers are now talking about a movement towards blackened carried interest, meaning a private investment fund manager cannot collect carry until all limited partner investors have had their capital returned within the lifetime of the private equity model. A similar trend is observable in the hedge fund industry. Moreover, hurdle rate calculations have changed substantially. Inflation-indexed hurdle rates are now calculated on a monthly not a quarterly basis. For managers with pension plan limited partners that often means instead of an 8% hurdle rate the manager gets 5% plus inflation.

IV. Blockchain Technology

Blockchain technology has been defined in many different ways, and no truly uniform definition seems to exist. Some refer to it as a giant worldwide, distributed, immutable "google spreadsheet" for transactions.[28] Others define blockchain by focusing on its central elements, e.g., it is a transaction ledger, electronic, decentralized, immutable, and provides cryptographic verification, among several others.[29] Vitalik Buterin, the founder of Ethereum, perhaps most prominently defined blockchain as follows:

---

[23] Steinman, *supra* note 21, at 7.
[24] *HFR: Hedge Fund Industry AUM Crests to 3T to End 2016*, *supra* note 1.
[25] Watts, *supra* note 2; Cox, *supra* note 2.
[26] "The market is oversaturated," said Don Steinbrugge, managing partner at Agecroft Partners, a hedge fund marketing firm. "It's highly competitive, and for a hedge fund manager to raise money they can't have any flaws." Cox, *supra* note 2.
[27] Marriage, *supra* note 4.
[28] Jonathan Shieber, *Colu Aims to Bring Blockchain Technology Everywhere*, TC (Jan. 27, 2015), https://techcrunch.com/2015/01/27/colu-aims-to-bring-blockchain-technology-everywhere/; Craig Leppan, *Who Is Blockchain Going to Affect the Most*, OVATIONS (July 29, 2015), http://www.ovationsgroup.com/blockchain/.
[29] *See, e.g.*, ALAN MORRISON, BLOCKCHAIN AND SMART CONTRACT AUTOMATION: BLOCKCHAINS DEFINED, PWC (2016), http://www.pwc.com/us/en/technology-

Electronic copy available at: https://ssrn.com/abstract=2959730

> Public blockchains: a public blockchain is a blockchain that anyone in the world can read, anyone in the world can send transactions to and expect to see them included if they are valid, and anyone in the world can participate in the *consensus process* – the process for determining what blocks get added to the chain and what the current state is. As a substitute for centralized or quasi-centralized trust, public blockchains are secured by cryptoeconomics – the combination of economic incentives and cryptographic verification using mechanisms such as proof of work or proof of stake, following a general principle that the degree to which someone can have an influence in the consensus process is proportional to the quantity of economic resources that they can bring to bear. These blockchains are generally considered to be "fully decentralized".[30]

Rather than attempting to agree on a mutually acceptable phraseology for a definition, a description of the core elements of ledger technology can help define the blockchain. As such, a blockchain is a shared digital ledger or database that maintains a continuously growing list of transactions among participating parties regarding digital assets –

---

forecast/2016/blockchain/pwc-smart-contract-automation-definition.pdf; Alistair Dabbs, *What Is Blockchain, and Why Is It Growing in Popularity?*, ARSTECHNICA (Nov. 6, 2016, 8:00 AM), https://arstechnica.com/information-technology/2016/11/what-is-blockchain/; Lee Grant, *Blockchain – Definition, Origin, and History*, TECHBULLION (Sept. 6, 2016), http://www.techbullion.com/blockchain-definition-origin-history; DELOITTE, BLOCKCHAIN ENIGMA. PARADOX. OPPORTUNITY 4–7 (2016), https://www2.deloitte.com/content/dam/Deloitte/uk/Documents/Innovation/deloitte-uk-blockchain-full-report.pdf.

[30] Vitalik Buterin, *On Public and Private Blockchains*, ETHEREUM BLOG (Aug.7, 2015), https://blog.ethereum.org/2015/08/07/on-public-and-private-blockchains/, contrasting public blockchains (the original idea) with consortium blockchains and fully private blockchains: "Consortium blockchains: a consortium blockchain is a blockchain where the consensus process is controlled by a pre-selected set of nodes; for example, one might imagine a consortium of 15 financial institutions, each of which operates a node and of which 10 must sign every block in order for the block to be valid. The right to read the blockchain may be public, or restricted to the participants, and there are also hybrid routes such as the root hashes of the blocks being public together with an API that allows members of the public to make a limited number of queries and get back cryptographic proofs of some parts of the blockchain state. These blockchains may be considered 'partially decentralized.'" *Id*. "Fully private blockchains: a fully private blockchain is a blockchain where write permissions are kept centralized to one organization. Read permissions may be public or restricted to an arbitrary extent. Likely applications include database management, auditing, etc [sic] internal to a single company, and so public readability may not be necessary in many cases at all, though in other cases public auditability is desired." *Id*.

Electronic copy available at: https://ssrn.com/abstract=2959730

together described as "blocks."[31] The linear and chronological order of transactions in a chain will be extended with another transaction link that is added to the block once such additional transaction is validated, verified, and completed.[32] The chain of transactions is distributed to a limitless number of participants, so-called nodes,[33] around the world in a public or private peer-to-peer network.

Blockchain technology removes fraudulent transactions. Compared with existing methods of verifying and validating transactions by third-party intermediaries, blockchain's security measures make blockchain validation technologies more transparent and less prone to error and corruption. While blockchain's use of digital signatures helps establish the identity and authenticity of the parties involved in the transaction, it is the completely decentralized network connectivity via the Internet that allows the most protection against fraud.[34] Network connectivity allows multiple copies of the blockchain to be available to all participants across the distributed network.[35] The decentralized, fully-distributed nature of the blockchain makes it practically impossible to reverse, alter, or erase information in the blockchain.[36] Blockchain's distributed consensus model, e.g., the network "nodes" verify and validate chain transactions before execution of the transactions, makes it extremely rare for a fraudulent transaction to be recorded in the blockchain.[37] That model also allows node

---

[31] *See, e.g.*, Michele D'Aliessi, *How Does the Blockchain Work?* MEDIUM (June 1, 2016), https://medium.com/@micheledaliessi/how-does-the-blockchain-work-98c8cd01d2ae#.w76hifcu2; Monica Pearson, *Blockchain Is the New Buzzword*, EXPERIAN, (Jan. 31, 2016), https://www.experian.com/blogs/insights/2016/01/blockchain-is-the-new-buzzword/.

[32] *See, e.g.*, D'Aliessi, *supra* note 31; Pearson, *supra* note 31.

[33] *See, e.g.*, D'Aliessi, *supra* note 31. Participants can be individuals, organizations, and even things. *See, e.*g., Hemant Saxena, *Blockchain Technology and Microsoft's Plan to Develop Blockchain As a Service*, WINDOWS CLUB (Feb. 16, 2017), http://www.thewindowsclub.com/blockchain-microsoft-plans-develop-service?utm_source=feedburner&utm_medium=feed&utm_campaign=Feed%3A+TheWindowsClub+%28The+Windows+Club%29; Sloane Brakeville & Bhargav Perepa*, Blockchain Basics: Introduction to Distributed Ledgers*, IBM: DEVELOPERWORKS (May 9, 2016; updated Dec. 15, 2016), https://www.ibm.com/developerworks/cloud/library/cl-blockchain-basics-intro-bluemix-trs/. The only condition for participants is the necessity of an Internet connection. *See, e.*g., D'Aliessi, *supra* note 31.

[34] *See, e.g.*, Brakeville & Perepa, *supra* note 33. For an in-depth, nuanced discussion of this point, *see* PETER VAN VALKENBURGH, OPEN MATTERS: WHY PERMISSIONLESS BLOCKCHAINS ARE ESSENTIAL TO THE FUTURE OF THE INTERNET 3–4, 23–26 (2016), https://coincenter.org/files/2016-12/openmattersv1-1.pdf. .

[35] *See, e.g.*, D'Aliessi, *supra* note 31.

[36] *See, e.g.,* Brakeville & Perepa, *supra* note 33; Antony Lewis, *A Gentle Introduction to Immutability of Blockchain*, BITS ON BLOCKS (Feb. 29, 2016), https://bitsonblocks.net/2016/02/29/a-gentle-introduction-to-immutability-of-blockchains/.

[37] *See, e.g.*, Francois Janinotto, *The Blockchain Explained to Web Developers, Part 1: The Theory*, MARMELAB BLOG (Apr. 28, 2016),

Electronic copy available at: https://ssrn.com/abstract=2959730

verification of transactions without compromising the privacy of the parties and is therefore arguably safer than a traditional model that requires third-party intermediary validation of transactions.[38]

Cryptographic hashes further increase blockchain security. Cryptographic hashes are complex algorithms that use the details of all previous transactions in the existing blockchain before adding the next block to generate a unique hash value.[39] That hash value ensures the authenticity of each transaction before it is added to the block. The smallest change to the blockchain, even a single digit/value, results in a different hash value. A different hash value makes any form of manipulation immediately detectable.[40]

Smart contracts and smart property are blockchain-enabled computer protocols that verify, facilitate, monitor, and enforce the negotiation and performance of a contract.[41] The term "smart contract" was first introduced by Nick Szabo, a computer scientist and legal theorist, in 1994.[42] An often-cited example for smart contracts is the purchase of music through Apple's iTunes platform.[43] A computer code ensures that the "purchaser" can only listen to the music file on a limited

---

https://marmelab.com/blog/2016/04/28/blockchain-for-web-developers-the-theory.html; Razvan Peteanu, *Fraud Detection in the World of Bitco*in, BITCOIN MAG. (Mar. 26, 2014, 5:50 AM EST), https://bitcoinmagazine.com/articles/fraud-detection-world-bitcoin-1395827419/ (noting, "Fundamentally, detecting fraud is hard precisely because it is rare, dynamic and not necessarily obviously fraudulent.").

[38] For a discussion of privacy on the blockchain, *see* Valkenburgh, *supra* note 31, at 33–40. For an overview of various consensus mechanisms *see* SIGRID SEIBOLD & GEORGE SAMMAN, CONSENSUS: IMMUTABLE AGREEMENT FOR THE INTERNET OF VALUE (2016), https://assets.kpmg.com/content/dam/kpmg/pdf/2016/07/kpmg-blockchain-consensus-mechanism-channel-islands.pdf; Valkenburgh, *supra* note 31, at 15-40.

[39] *See, e.g.*, Lewis, *supra* note 36.

[40] *Id*.

[41] *See e.g.*, ALAN MORRISON, BLOCKCHAIN AND SMART CONTRACT AUTOMATION: INTRODUCTION AND FORECAST, PWC (2016), http://www.pwc.com/us/en/technology-forecast/2016/blockchain/pwc-smart-contract-automation-introduction.pdf; Nicolette Kost De Sevres & Bradley Cohen, *The Blockchain Revolution, Smart Contracts and Financial Transactions*, DLA PIPER (Apr. 26, 2016), https://www.dlapiper.com/en/czech/insights/publications/2016/04/the-blockchain-revolution/.

[42] *Smart Contracts: The Blockchain Technology That Will Replace Lawyers*, BLOCKGEEKS, http://blockgeeks.com/guides/smart-contracts/ (last visited Mar. 18, 2017); *Not-So-Clever Contracts*, ECONOMIST, July 30, 2016, at 53, http://www.economist.com/news/business/21702758-time-being-least-human-judgment-still-better-bet-cold-hearted.

[43] *See, e.g.*, HORSTEN KOEPPL & JEREMY KRONIK, BLOCKCHAIN TECHNOLOGY—WHAT'S IN STORE FOR CANADA'S ECONOMY AND FINANCIAL MARKETS? 15 (2017), https://www.cdhowe.org/sites/default/files/attachments/research_papers/mixed/Commentary_468_0.pdf; R. Douglas Vaugh & Anna Outzer, *Understanding How the Block Chain Could Impact the Legal Industry*, LAW 360 (Jan. 11, 2017), https://www.law360.com/articles/879810/understanding-how-blockchain-could-impact-legal-industry.

Electronic copy available at: https://ssrn.com/abstract=2959730

number of Apple devices.[44]

More complex smart contract arrangements in which several parties are involved require a verifiable and unhackable system provided by blockchain technology.[45] Through blockchain technology, smart contracting often makes legal contracting unnecessary as smart contracts often emulate the logic of legal contract clauses.[46] Ethereum, the leading platform for smart contracting, describes smart contracting in this context as follows:

> Ethereum is a decentralized platform that runs smart contracts: applications that run exactly as programmed without any possibility of downtime, censorship, fraud or third party interference. These apps run on a custom built blockchain, an enormously powerful shared global infrastructure that can move value around and represent the ownership of property. This enables developers to create markets, store registries of debts or promises, move funds in accordance with instructions given long in the past (like a will or a futures contract) and many other things that have not been invented yet, all without a middle man or counterparty risk.[47]

V. Private Investment Funds' Use of Blockchain Technology

A recent trend in the private investment fund industry pertains to the increasing use of blockchain technology to facilitate investment and process optimization. Several private investment funds have spearheaded the implementation of blockchain technology and smart

---

[44] Vaughn & Outzer, *supra* note 43; Jeffrey Glazer, *Smart Contracts Are a Future*, U. WIS. – MADISON: LAW & ENTREPRENEURSHIP CLINIC (Sept. 14, 2015), https://www.uwle.org/blog/smart-contracts-are-a-future.

[45] *See, e.g.*, ETHEREUM, https://www.ethereum.org/ (last visited Apr. 17, 2017); Gavin Wood, *Ethereum: A Secure Decentralised Generalised Transaction Ledger*, http://gavwood.com/paper.pdf; Luke Parker, *Industry Research Papers Highlight Blockchain Technology's Disruptive Potential*, BRAVE NEWCOIN (July 3, 2016), https://bravenewcoin.com/news/industry-research-papers-highlight-blockchain-technologys-disruptive-potential/.

[46] Mark Anderson, *Smart Contracts and Blockchain Technology*, IP DRAUGHTS (June 18, 2016, 12:14 PM), https://ipdraughts.wordpress.com/2016/06/18/smart-contracts-and-blockchain-technology/. *See generally* Josh Stark, *Making Sense of Blockchain Smart Contracts*, COINDESK (June 4, 2016, 18:39 GMT), http://www.coindesk.com/making-sense-smart-contracts/; Josh Stark, *How Close Are Smart Contracts to Impacting the Real World of Law?*, COINDESK, (Apr. 11, 2016, 14:00 GMT), http://www.coindesk.com/blockchain-smarts-crntracts-real-world-law/; Ted Mylnar & Ira Schafer, *Why Smart Contracts Will Need 'Smart Term Sheets' to Match*, COINDESK (Dec. 9, 2016, 14:36 GMT), http://www.coindesk.com/smart-contracts-will-need-smart-term-sheets-match/. For an example of what startups hope to accomplish with smart contracting, *see* Legalese, https://legalese.com/ (last visited Apr. 17, 2017).

[47] ETHEREUM, *supra* note 45.

Electronic copy available at: https://ssrn.com/abstract=2959730

contracting in their business model. While some funds simply focus on trading bitcoin and other cryptocurrencies to avoid market fluctuations, others invest in and/or acquire companies that use blockchain technology to provide synergies to their other portfolio companies. Yet others go much further by fully automating a hedge fund secured by blockchain technology, using blockchain technology to improve administrative procedures of private equity deal making, or using cryptocurrencies as incentives for data scientists' competitive models that facilitate investment analysis efficiencies. Examples include private investment funds such as Polychain Capital,[48] the Northern Trust[49] in cooperation with IBM, Numerai,[50] LendingRobot,[51] and Intellisys Capital LLC,[52] Melonport,[53] among many others.

Several private investment funds have spearheaded and continue to expand the implementation of blockchain technology and smart contracting in their business models. In February 2017, Northern Trust and IBM entered into a partnership for the commercial use of blockchain in the private fund industry. The partnership provides an enhanced and efficient approach to private equity administration.[54] The implementation of the Northern Trust and IBM blockchain is intended to increase the efficiency, transparency, and speed of private equity transactions, improve security, and bring innovation to the private equity market by simplifying the complex and labor-intensive transactions in the private equity market. While the current legal and administrative processes that support private equity are time-consuming, expensive, lack transparency, and involve lengthy, duplicative, and fragmented investment and administrative processes, the partnership's solution delivers an enhanced and efficient approach to private equity administration. [55] More specifically, unlike the current deal practice in private equity, which requires parties to reconcile multiples copies of the documents that form the deals to understand the greater picture, the blockchain program announced by Northern Trust and IBM allows all involved parties in an equity deal to look at a single compiled version of the transaction and all other data relating to the deal.[56]

Another example of the use of blockchain technology for private investment funds is Numerai. Numerai is a private investment fund with

---

[48] Polychain Capital, https://angel.co/polychain-capital (last visited Apr. 17, 2017).

[49] Northern Trust, https://www.northerntrust.com/ (last visited Apr. 17, 2017).

[50] Numerai, https://numer.ai/ (last visited Apr. 17, 2017).

[51] LendingRobot, https://www.lendingrobot.com/#/ (last visited Apr. 17, 2017).

[52] Intellisys Capital LLC, http://www.intellisys.ai/ (last visited Apr. 17, 2017).

[53] Melonport, https://melonport.com/, (last visited Apr. 17, 2017).

[54] *See* Press Release, IBM, Northern Trust and IBM Pioneer Use of Blockchain Technology to Help Transform Private Equity Administration (Feb. 22, 2017), http://www-03.ibm.com/press/us/en/pressrelease/51655.wss.

[55] *See id.*

[56] *See id.*

Electronic copy available at: https://ssrn.com/abstract=2959730

a global equity strategy that will go live on the blockchain later this year.[57] Numerai operates on the Ethereum blockchain, utilizing a cryptocurrency called "Numeraire." Numerai uses artificial intelligence to convert financial data into machine learning problems for data scientists. On February 21, 2017, Numerai, announced: "[Today] 12,000 data scientists were issued 1 million crypto-tokens to incentivize the construction of an artificial intelligence hedge fund."[58] Using data scientists for investment analysis creates efficiency through a synthesis of data. Data scientists working in this model work to solve the same problems in their own unique way with different strategies. Numerai synthesizes these models to create a meta-model out of all the predictions from the data scientists.[59] In the Numerai model, the use of artificial intelligence ultimately helps achieve the goal of efficiency and optimum capital allocation by reducing overhead costs because there is no cost of human capital.[60] In addition, Numerai eliminates barriers to entry because users do not need capital or any special finance or data knowledge.

LendingRobot's LendingRobot Series is a fully automated hedge fund secured by blockchain technology.[61] Unlike other blockchain-based hedge funds that invest specifically in cryptocurrency, such as Global Advisers and Polychain Capital, the LendingRobot Series invests in lending marketplaces— Lending Club, Prosper, Funding Circle, and Lending Home.[62] Its trading is determined by an algorithm based on the investor's risk preferences. Once the investor has created a trading profile, LendingRobot selects and executes trades that are recorded in the blockchain public ledger on a weekly basis. Unlike traditional hedge funds that are rather secretive, the LendingRobot ledger shows detailed holdings and provides a "hash code" signature as evidence that the data is tamper-proof in the blockchain.[63]

---

[57] *See* Laura Shin, *This Is the World's First Cryptocurrency Issued by a Hedge Fund*, FORBES (Feb. 21, 2017, 7:00 AM), https://www.forbes.com/sites/laurashin/2017/02/21/this-is-the-worlds-first-cryptocurrency-issued-by-a-hedge-fund/#61dcf68560b6.

[58] *A New Cryptocurrency for Coordinating Artificial Intelligence on Numerai*, MEDIUM (Feb. 21, 2017), https://medium.com/numerai/a-new-cryptocurrency-for-coordinating-artificial-intelligence-on-numerai-9251a131419a.

[59] *See* Shin, *supra* note 57.

[60] *See* Interview with Richard Craib, Founder, Numerai, Crowdsourcing a Machine Learning Hedge Fund, TECHEMERGENCE (Nov. 10, 2016), https://www.techemergence.com/crowdsourcing-a-machine-learning-hedge-fund/.

[61] Press Release, deBanked, Introducing LendingRobot Series: One-Stop Investing in Alternative Lending (Jan. 26, 2017), http://debanked.com/2017/01/introducing-lendingrobot-series-one-stop-investing-in-alternative-lending/; Dan Cummings, *LendingRobot Introduces Robo-Fund LendingRobot Se*ries, ETHNEWS *https://www.ethnews.com/lendingrobot-introduces-robo-fund-lendingrobot-series*.

[62] Press Release, deBanked, *supra* note 61; Cummings, *supra* note 61.

[63] Press Release, deBanked, *supra* note 61.

Electronic copy available at: https://ssrn.com/abstract=2959730

Established private investment fund managers may consider implementing blockchain technologies in the foreseeable future. Most large fund advisers in the private equity and hedge fund industry have not yet considered implementing blockchain technology in combination with big data applications and artificial intelligence. This, however, may change in the foreseeable future if and when larger managers realize that their smaller competitors who utilize these technologies gain substantial operational efficiencies and cost savings and are able to substantially diversify their portfolio holdings via such technologies. The threshold for change for bigger managers may be dictated by the implementation cost of such new technologies. If and when the long-term benefits of using the technologies exceed the implementation cost, which are much larger for larger managers than for the smaller managers who are currently experimenting with such technologies, larger managers are incentivized to start the innovation process as well.

VI. Blockchain-Enabled Pressure on Fee Structure

Blockchain technology enables managers to charge per-transaction fees which undermines the existing 2/20 fee model. Blockchain technology facilitates a seamless and efficient calculation of management fees per transaction. In contrast to the traditional settlement and calculation of fees in a per-transaction model that created a prohibitive amount of work making such operations very difficult to execute, blockchain technology overcomes all of these restrictions. It enables the fully automated allocation of the appropriate fee to the correct executed trade and associated client account without any manual reconciliation or settlement.[64] While normally the use of this type of fee is prone to human errors that occur during manual calculation or settlement, these errors are removed through the use of blockchain technology which performs the required calculations and settlement procedures automatically and seamlessly. The blockchain enabled per-transaction fee can be pre-determined or modified by the manager in cooperation with clients. It also can be publicly available which allows the private fund adviser to determine the applicable fee in a competitive market.[65] Accordingly, clients who invest in a more transaction-prone strategy will be able to agree upfront to higher fees whereas clients who invest in a less transaction-rich strategy will pay overall lower fees.

---

[64] *See id*. at 1–2.

[65] See generally *Northern Trust Using Blockchain for Private Equity Administration*, ISF (Feb. 22, 2017, 2:00 PM), https://globalinvestorgroup.com/Articles/3663824/Northern-Trust-using-blockchain-for-private-equity-administration; Nick Ayton, *Blockchain Means the End of Asset Management As We Know It*, INNOVATION ENTERPRISE (July 29, 2016), https://channels.theinnovationenterprise.com/articles/blockchain-will-revolutionize-asset-management.

Electronic copy available at: https://ssrn.com/abstract=2959730

While not all blockchain-enabled private investment funds charge per-transaction fees, the majority of private fund advisers that use blockchain technology, artificial intelligence, and big data in different aspects of their operations or strategy charge their investors lower fees. Prominent examples of lower fee structures driven by the use of blockchain technology include those of LendingRobot's LendingRobot Series, the Logos Fund, and platforms for blockchain-enabled fund management, such as those offered by Melonport or Drago, among many others.

Investors in LendingRobot's Lending Robot Series, the fully automated hedge fund secured by blockchain technology,[66] unlike investors in traditional hedge funds, can withdraw funding on a weekly basis at no additional cost to the investor. Because LendingRobots' business model removes the investment adviser, overhead costs, and legal fees associated with each investor agreement, LendingRobot is able to charge a mere 1% management fee and a maximum 0.59% fund expense fee per year.[67] Other factors that help keep the fee low include the increased transparency that allows LendingRobot to expense fewer resources on auditing the fund. LendingRobot claims an average performance of from 6.86% to 9.66% depending on the investment strategy selected by the clients.[68] As of March 2017 an analysis of a broad range of traditional hedge funds shows an average of 8.89% annualized return.[69] The increased transparency, reduced costs, and competitive performance enabled by LendingRobot's use of blockchain technology may give it a competitive advantage in the private fund industry that could continue to exert pressure on fees charged by competitor funds.

The Logos Fund is an alternative investment fund that invests in blockchain and cryptocurrency-related investments.[70] It aims to make blockchain-based currencies accessible to professionals and a broad range of investors by investing in the mining of blockchain-based cryptocurrencies as well as into such currencies directly.[71] To cover base costs and administration, the Logos Fund charges an administrative fee of between 1.2% and 1.92% depending on the size of the

---

[66] Berenice Magistretti, *LendingRobot Launches Automated Hedge Fund Secured by Blockchain*, VB (Jan. 26, 2017, 8:00 AM), http://venturebeat.com/2017/01/26/lendingrobot-launches-automated-hedge-fund-secured-by-blockchain-tech/.

[67] *Id.*

[68] LendingRobot Series, https://www.lendingrobot.com/#/series/ (last visited Apr. 17, 2017).

[69] Eurekahedge Hedge Fund Index, EUREKAHEDGE, http://www.eurekahedge.com/Indices/IndexView/Eurekahedge/473/Eurekahedge_Hedge_Fund_Index (last visited Apr. 17, 2017).

[70] LOGOSFUND, http://logos-fund.com/wordpress/the-logos-fund/(last visited Apr. 17, 2017).

[71] *Id.*

Electronic copy available at: https://ssrn.com/abstract=2959730

investment.[72] The fund management also charges a performance-related fee of from 9% to 21% plus investment surcharges and redemption surcharges in accordance with market practices.[73]

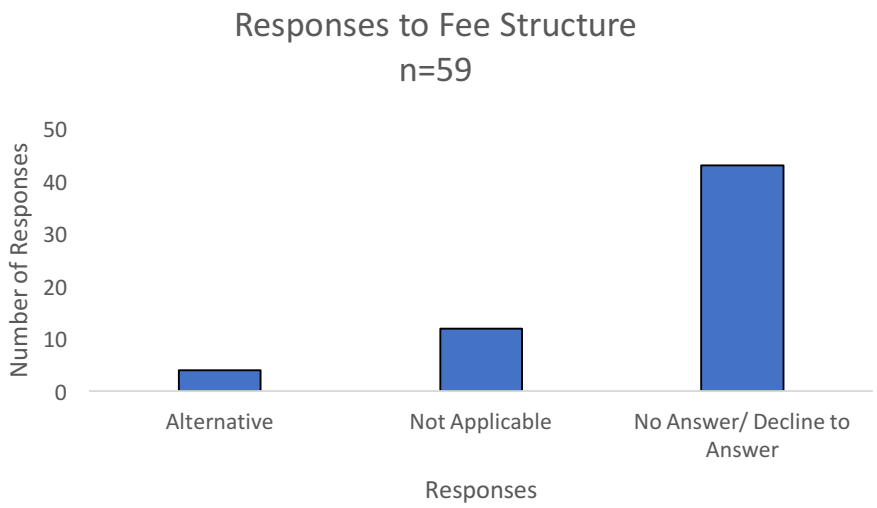
Blockchain-enabled platforms for setting up a private investment fund cause significant pressure on the existing fee structure of the private investment fund industry. Platforms such as Melonport or Drago enable competitive gains for their clients through fewer costs and time barriers to setting up and running a private investment fund.[74] While such competitive gains will benefit the majority of private investment fund managers and investors, the lower operating costs enabled by the platform models will especially enable new and future managers to enter the market because the start-up costs and compliance costs can be significantly reduced. By enabling low set-up requirements and low costs of running a portfolio, platform models may be able to create an unprecedented competitive environment for asset management strategies. The cost of running a private fund adviser portfolio on the blockchain equals the core usage fees, modular commissions, and the infrastructure costs to be paid on the Ethereum platform.[75] The usage fees are determined by the protocol, and the modular fees are set by the module developers and are a fraction of a cent or a fraction of the trade volume for each usage.[76]

The dataset for this article comprises a representative sample of private investment funds that utilize blockchain technology in either their strategy or operations (N=[98]). The author and a team of two research assistants hand-coded individual use of blockchain technology for each fund in the dataset.

---

[72] *Frequently Asked Questions*, LOGOSFUND, http://logos-fund.com/wordpress/faqs/.
[73] *Id.*
[74] "The costs and complexity of setting up a portfolio using the Melonprotocol are lower than they are with traditional asset management [funds], seconds and cents versus months and millions." RETO TRINKLER & MONA EL ISA, MELON PROTOCOL: A BLOCKCHAIN PROTOCOL FOR DIGITAL ASSET MANAGEMENT: DRAFT 4 https://bravenewcoin.com/assets/Whitepapers/melonprotocol.pdf.
[75] *Id.*
[76] *Id*.

Electronic copy available at: https://ssrn.com/abstract=2959730



The graph illustrates that the fee structure of those private investment fund advisers that use blockchain technology (and responded to the survey) deviates from the traditional 2/20 model. While the author was unable to get responses from all managers in the dataset, those who responded suggested that they were able to use an alternative fee structure that benefited their clients.

VII. Conclusion

The meteoric rise of blockchain technology and the abovementioned prominent applications of blockchain technology utilizing artificial intelligence and big data serve as prominent examples of the impending seismic shifts in the private investment fund industry. The paper has illustrated that the rise of blockchain applications in private investment funds can exacerbate the already changing fee structure of the industry. Private investment funds that use blockchain technology in combination with artificial intelligence and big data are able to lower their fees. As the use of modern technologies increases in the industry, the fee structure is likely to be further affected.

Electronic copy available at: https://ssrn.com/abstract=2959730