Exhibit F

Expert Notice of Peter Vinella

UNITED STATES DISTRICT COURT
SOUTHERN DISTRICT OF NEW YORK

UNITED STATES OF AMERICA	:	S6 22 Cr. 673 (LAK)
v.	:	
SAMUEL BANKMAN-FRIED,	:	
Defendant.	:	

EXPERT WITNESS DISCLOSURE
FOR DR. PETER U. VINELLA

I. QUALIFICATIONS

1. I am a Managing Director at PVA Toucan International, LLC ("PVA"), an expert services and consulting firm that provides independent litigation support and advisory services to corporations, government agencies, and regulatory bodies involved in the financial services industry.

2. In addition to providing general advisory services, I frequently provide expert testimony regarding customs, practices, and standards of care used in the financial services industry covering a wide variety of topics including management and governance, trading and investments, lending, operations, administration, risk management, and quantitative analysis.

3. I have nearly forty years of experience in the financial services industry through the following positions:

a. I was the chief executive and president of an affiliate of a nationally-chartered bank (Wilmington Trust Company) which offered corporate trust and fund administration services to issuers of and investors in structured financial products such as residential mortgage-backed securities ("RMBS") and collateralized debt obligations ("CDOs");

b. I was a senior executive at two major broker-dealers, Smith Barney Shearson ("Smith Barney") where I held the positions of Chief Information Officer for Capital Markets, head of proprietary taxable fixed income trading, and head of over-the-counter ("OTC") interest rate

derivatives trading and sales and Drexel Burnham Lambert ("DBL") where I was head of US government securities research and then head of taxable fixed income research overall;

c. As the chief executive of a consultancy, I have advised over 150 financial services clients around the world, including central banks, government agencies, and top-tier commercial banks, broker-dealers, and institutional investors. This includes working with a number of organized exchanges and industry regulators;

d. Of particular significance to this matter, I have a deep understanding of the technology commonly used in the financial services industry, including that used by FTX. I began coding in 1970 and receive my AB in applied mathematics where I focused on computer solutions to complex math problems. Additionally, I designed and developed some of the first automated trading systems used in the financial services industry in the mid-1980's. Further, I was the founder and head of two software development companies which built proprietary financial applications involving trading, investments, risk management, and securitization. I continue to provide technology-related consulting; and

e. I have also been involved with more than a dozen financial services startups as a principal or as an advisor. This includes several startups that provided services similar to those offered by FTX although using traditional financial products such as bonds and OTC derivatives.

4. Over the last three years, I have developed a deep understanding of the philosophical, operational, and technical aspects of cryptocurrencies and decentralized finance more generally. This includes developing a formal framework to measure the practicality, utility, integrity, and safety of financial services generally and crypto-based financial services in particular.

5. I have testified before the U.S. Congress regarding over-the-counter, fixed-income derivatives trading and the potential regulation thereof. I also authored a whitepaper regarding the vulnerability of the U.S. financial system that was read into the U.S. Congressional record shortly after 9/11. Additionally, I have worked with the U.S. Congress and Government Accountability Office ("GAO") on a variety of issues involving the U.S. financial system. I also have coauthored a book on operational risk management, and I have authored numerous articles in the areas of finance, technology, litigation, and mathematics.

6. I have Ph.D. and MA degrees in mathematics and an AB degree in applied mathematics, all from the University of California at Berkeley. My current research involves cryptocurrencies and decentralized finance, the mathematics underlying mathematical finance and economics, partial differential equations, infinite dimensional analysis, and optimal control theory. I am also currently a research affiliate of the U.C. Berkeley Center for Risk Management Research as well as a member of the editorial review board of the academic journal, *Financial Innovation*, a Springer Nature publication.

7. A copy of my *curriculum vitae* (including a list of all relevant publications that I authored in the last ten years and a list of all cases in which I testified as an expert at trial or by deposition in the last four years) is attached as EXHIBIT A hereto.

8. I have no financial interest in the outcome of this case. My fees in this case are not contingent on the opinions presented herein or on the outcome of these legal proceedings. All opinions expressed herein are solely mine and are based on my professional and academic experience and a review of the record in this matter.

II. ASSIGNMENT

9. In this matter I have been asked by Counsel for Defendant to offer opinions regarding various alleged acts by Defendant in connection with the operations of the online trading platform commonly referred to as FTX. Specifically, I have been asked to offer opinions on the following:

a. The customs, practices, and standards of care used in traditional and decentralized financial systems relevant to this matter; and

b. Launching and operating a financial services startup.

10. All references to FTX refer to the time from its inception until November 2022 unless otherwise noted. All references to customs, practices, and standards of care refer to the incumbent financial services industry unless otherwise noted. The first use of a term of art from that industry is in bold, italic font. Also note that I have used terms of art from crypto markets and the cryptocurrency industry even if they have a meaning different from that in the incumbent financial services industry.

11. My opinions offered herein are based on my own academic and professional education, training, and personal experience over 40 years working in the financial services industry. Additionally, my opinions are based on reviewing publicly available academic literature, public news articles and commentary, and documents filed in this case and other legal proceedings relating to FTX, including:

a. Superseding Indictment, *United States v. Bankman-Fried*, S5 22 Cr. 673 (LAK) (S.D.N.Y.)
b. Diplomatic notes
c. Complaint, *SEC v. Bankman-Fried*, No. 22-cv-10501 (S.D.N.Y.)
d. Amended complaint, CFTC v. Bankman-Fried Case No. 1:22-cv-10503-PKC (S.D.N.Y.)
e. Complaint, *Cabo v. Fenwick & West LLP*, Case No. 3:23-cv-03944 (N.D. Cal.)
f. FTX interim report 1, *In re FTX Trading Ltd.*, Case No. 22-11068, ECF No. 1242 (JTD) (D. Del.)

g. FTX interim report 2, *In re FTX Trading Ltd.*, Case No. 22-11068 ECF No. 1704 (JTD) (D. Del.)
h. FTX Terms of Service and Institutional Margin Agreement (SDNY_02_00291737, SDNY_03_00377009, SDNY_06_00888433)
i. Intercompany agreements, including Payment Agent Agreement, Software License Agreement and Services Agreement (SDNY_09_00459121, SDNY_02_00137551, SDNY_02_00237845)
j. Archived materials from the FTX website
k. Explanations of FTX deposits and withdrawal procedures provided to FTX's auditors (SDNY_03_00682722, SDNY_03_00760672)
l. Sam Bankman-Fried's testimony before the U.S. Senate Committee on Agriculture, Nutrition and Forestry
m. Sam Bankman-Fried's planned testimony before the U.S. House Committee on Financial Services (SDNY_02_00450503)
n. FTX Audited Financial Statements (SDNY_02_00259271, SDNY_03_00758737)
o. FTX investor pitch materials (SDNY_02_01443809, SDNY_02_01675802, SDNY_02_01683455, SDNY_03_00018397, SDNY_03_00219834)
p. Internal documents on valuing FTX equity (SDNY_08_00536881, SDNY_08_00582432)
q. FTX Share Purchase Agreements and Investor Rights Agreements (SDNY_02_00006105, SDNY_02_00006213, SDNY_02_00127987, SDNY_02_00133119, SDNY_02_00133427, SDNY_03_00382529, SDNY_03_00382624)
r. Correspondence from Sullivan & Cromwell LLP to the CFTC (SDNY_02_00012108, SDNY_02_00012130, SDNY_02_00012644); and
s. Market Maker Agreements (SDNY_02_00239148, SDNY_08_00478557)
t. Market Maker Program materials (SDNY_06_00224425, SDNY_06_01281204, SDNY_06_01298540, SDNY_06_01304331, SDNY_06_01329396, SDNY_06_01451255)
u. Internal notes on the VIP Program (SDNY_02_00164018)
v. CLP Risk Agreement (SDNY_02_00354447)
w. Latency Disclosures (SDNY_06_00784177, SDNY_06_01446674)
x. FTX Data (SDNY_08_01243236)
y. *Brady* Disclosure Letter dated May 4, 2023
z. NY Federal Reserve Bank publication "The Financial Stability Implications of Digital Assets"
aa. Bitcoin: A Peer-to-Peer Electronic Cash System

III. OPINIONS

A. The Development of a New Financial Product, Service, or Means of Delivery Is Often Built on the Fly and Through Trial and Error

1. Innovation Is a Main-Stay of the Financial Services Industry

12. In my experience, the financial system is constantly evolving due to the advent of new financial products, services, new means of delivery; new types of service providers; and new laws and regulations. Such financial innovation is often attributable to the following factors which includes (without limitation):

a. Consumer demands;

b. Competitive pressures;

c. Pressure from shareholders and early-stage investors;

d. Technology innovation; and

e. New and evolving laws and regulations.

13. Based on material I reviewed, it is my opinion that FTX was subject to all of these forces.

2. Challenges and Roadblocks

14. Based on my experience, rolling out a new financial service or service provider paradigm usually involves a vision, planning, and significant trial and error in development and initial production. There are typically few guideposts for innovators to follow in launching a new type of financial product, service, or means of delivery. Financial service innovators and startups often face significant obstacles, including, without limitation, the following:

a. Insufficient resources, including the absence of traditional management structures, often forcing founders to wear many hats inside and outside of their expertise;

b. Founders who lack the sufficient experience with and knowledge of the customs, practices, and standards of care in the incumbent financial system, including with respect to the particular product, service, or means of delivery subject to innovation;

c. The time required to develop bespoke software which, in my experience, can take several years to complete;

d. A lack of suitable third-party software capable of adequately supporting new financial products, services, or means of delivery. For example, at the time of FTX's development, no third-party software packages were on the market that, to my knowledge, could adequately

support a business similar to FTX out-of-the box such as accounting, margin, and cash management systems;

e. The absence of comparable products, services, or means of delivery from which to learn from or emulate;

f. The absence of developed, or in some cases any, customs, practices, and standards of care applicable to the new financial products, services, or means of delivery;

g. The absence of clarity regarding applicable laws, regulations, and rules; and

h. The need to meet customer demand (which often changes in a new market) as well as overcome competitive forces and operational failures often lead to shortcuts and short-term workarounds.

15. Based on material I reviewed, it is my opinion that FTX was subject to all of these issues.

3. Key Success Factors

16. The success of a new financial product, service, or means of delivery often depends on quickly a) developing an initial early production version of the application (which can be improved upon later on as time and resources allow), b) gaining market acceptance, and c) capturing market share. This is especially true of financial utilities such traditional and alternative exchanges which depend on liquidity. In my experience, innovators often recognize the importance of key success factors, which include, without limitation:

a. Correctly identifying the opportunity and market demand;

b. Establishing a realistic, yet flexible business development plan and a financial *pro forma*;

c. Having sufficient financial and human resources and using them effectively;

d. Quickly getting to market and capturing material market share;

e. Quickly adapting to changes in consumer sentiment and market events;

f. Making use of what is available on-hand including third-party products, services, advice, and other resources even if they do not fit the bill completely;

g. Using short-cuts and workarounds;

h. Learning as you go; and

i. Reinvesting profits to augment and improve functionality, performance, operational efficiency, and controls as well as replace short-cuts and workarounds over time as able.

17. Bringing a new financial product, service, or means of delivery to market quickly often requires using "short-cuts" and workarounds to develop the version in the short-term and replacing them with longer term solutions over time as time and money allow. The goal is to get a functioning offering to market as quickly as is practicable while providing a sound foundation for future development.

18. In some ways, this balancing act is analogous to flying a plane while still building parts of it. While this is a widely used business development strategy, in my experience, it requires a deep understanding of the application set, its underlying technology, performance requirements, and applicable customs, practices, and standards of care, including relevant laws and regulations. It also requires experience launching innovative products and services into uncharted waters.

19. Based on material I reviewed, it is my opinion that Mr. Bankman-Fried and the FTX founders and developers' general business development strategy reflects the approach above.

4. Some Examples of Successful Financial Innovation

20. In my opinion, many of the issues experienced in the crypto industry are comparable to the early-stage development of other financial innovations that had difficult early stages that are now widely considered to be core financial products and services, a few of which are described below. All of these significantly changed the *status quo* and virtually all experienced significant setbacks before becoming widely used and accepted. Many of these mirror many aspects of FTX's experience.

a. **Hedge funds** – although the first hedge fund was launched in 1969, it took almost fifteen years for these alternative investment funds to obtain widespread acceptance. Despite its name, hedge funds typically take sizable risk both in terms of ***investment risk*** as well as ***leverage***. In the early days, a hedge fund with $50 million of ***assets under management*** ("AUM") was considered significant and by pledging assets as collateral to borrow additional capital, it is not unusual for a hedge fund in those days have ***leverage ratios*** as high as 100-to-1 (*i.e.*, one hundred dollars in investments for every dollar of initial capital).

Such high leverage ratios greatly increase potential returns, but also significantly increase the fund's ***liquidity risk*** since a leveraged fund is dependent on its lenders and the terms of its loans to maintain its leverage. For instance, lenders typically have the right to value any pledged collateral. If the value of that collateral drops in their sole *opinion*, they typically have the right to make a margin call or call the loan altogether. This, in turn, would typically force the fund to sell assets. Since this situation typically arises in ***bear markets***, such a sale would result in a ***realized loss*** thereby further eroding the creditworthiness of the fund. While hedge fund managers use leverage to attract investors with the promise of higher returns, it comes at the cost of higher risk and volatility.

Despite the amount of leverage many of these early hedge funds employed (and, thus, risk they took), the vast majority of such funds were not regulated in the US. This was partly because hedge funds were typically set up offshore outside of US legal and regulatory jurisdictions to meet the needs of foreign investors. Unsurprisingly, as the number and size of hedge funds dramatically grew over the next two decades, there were a number of high-profile collapses, that resulted in action by lawmakers, policymakers, and regulators.

Following such regulatory action, hedge funds are now considered commonplace in incumbent financial systems, with many of the funds having more than $1billion in AUM. Additionally, fund managers with US investors are generally registered with SEC as investment advisors and the maximum amount of leverage and risk they can take must be disclosed in the fund's prospectus. Further, the amount of leverage they can actually employ is indirectly regulated by regulations put on their lenders.

b. **Automated trading** – automated trading became possible with the advent of networked computing and digital market data starting in mid-1980's. At the time, most exchanges (with the exception of NASDAQ) and the ***over-the-counter*** markets ("OTC") were ***voice markets***. Although there were many initiatives to launch alternative, automated markets over the subsequent decades, not until the aftermath of 9/11 did the vast majority of exchanges and OTC markets become fully automated or at least offer some form of automated execution.

Prior to 9/11, most domestic exchanges did not offer automated execution and only a handful of broker-dealers and ***proprietary trading shops*** (a.k.a. ***prop trading shops*****)** engaged in a practice commonly referred to as ***program trading*** (a.k.a. ***algorithmic trading***). Over time, more traditional and alternative exchanges offered greater support for automated trading. This and the advent of low-cost, yet powerful computing led to a boom in algorithmic trading.

Despite the relatively small number of players involved in algorithmic trading in the early day, it was blamed for a number of market crashes, including the crash of the New York Stock Exchange on October 19, 1987. In response to these market crashes, the growing automation of exchanges and other financial utilities, and the growing popularity of automated trading overall, regulators began to implement a number of rules governing the use of automated trading such as circuit-breakers, trading limits, and testing requirements.

Today, much, if not most trading is fully automated including most exchanges, market making, and prop trading which is all subject to governmental and industry regulation.

c. **Swaps** – another innovation from the 1980's, swaps revolutionized ***interest rate*** and ***foreign exchange*** ("FX") risk management and arguably led to persistently lower interest rates and more stable credit and foreign exchange markets. However, in the beginning, the market for swaps was plagued with numerous administrative and operational problems.

A swap is an agreement between two parties to exchange future cashflows. In the case of an ***interest rate swap***, one ***leg*** is typically ***floating*** (*i.e.*, the interest rate used to compute

a payment can vary over time) while the other leg is ***fixed*** (*i.e.*, the interest rate is fixed over time). Importantly, swaps take the form of a legal agreement between the parties. In the early days, there were no widely-accepted conventions and each agreement took a great deal of time and care to negotiate and memorialize which often led to numerous operational failures and lawsuits.

This dramatically changed with the advent of the first version of what is commonly referred to as the ISDA Master Agreement, a standardized contract produced by the industry consortium, the International Swaps and Derivatives Association or ISDA and used industry-wide. Using this agreement, counterparties merely had to agree to the financial terms of the swap, relying on the ISDA Master Agreement to supply the necessary legal protections and operational details. As a result, the swap market boomed and ISDA became the *de facto* regulator of the global swaps market.

However, the boom in the swap market led to another problem. Most of the processing and accounting systems at time could not correctly process swaps. And given the state of technology at the time, developing suitable software could take several years. Consequently, many financial institutions used various manual and automated workarounds, many of which were incorporated in spreadsheets. This led to numerous operational failures that spurred government and industry regulators to promulgate rules and regulations governing swap processing and the use of spreadsheets.

The government bailout of the US insurance giant, AIG, immediately following the collapse of the Lehman Brothers in September 2008, again brought problems in the swap market to the fore. In addition to providing commercial and retail insurance, AIG was the largest player in what is commonly known as ***credit default swap*** or ***CDS*** market. CDS are special a type of swap through which counterparties *swap* the credit risk of a pool of obligations such as loans and other financial products in exchange for an upfront payment (it is analogous to insurance). As swaps, CDS are entered into as legal agreements and, at the time, any cash payments were made directly between the parties. Unbeknownst to the market and regulators, AIG had a huge exposure to CDS and if it collapsed, it could not meet its obligations which would ripple through the entire global financial system.

In the aftermath of the collapse of AIG and Lehman Brothers, US Congress enacted a number of laws some of which governed the use of CDS and swaps more generally. Additionally, government and industry regulators introduced a number of new regulations, rules, and guidelines including establishing a central clearinghouse for swaps similar those used to trade made on an exchange. Since these actions, the CDS market and the swap market more generally have been relatively stable.

d. **E-Commerce** – During the dot.com boom of the late 1990's, it appeared that e-commerce applications that facilitated direct peer-to-peer payments would replace *brick and mortar* financial institutions and disrupt the entire *status quo*. Billions of dollars in early-stage

investment capital was invested in unrealistic startups, and fintech was born (*i.e.*, technology companies that provided financial services).

In many cases, the founders of these startups often had little knowledge or experience delivering financial services. Moreover, many did not even have meaningful experience developing complex computer applications or delivering services via such applications. At the same time, regulators failed to quickly implement regulations, rules, and guidelines governing e-commerce business and technology practices. Not surprisingly, within a short amount of time, many of these startups failed and financial markets around the world collapsed.

Despite these setbacks, today, e-commerce is widely used and considered to be generally safe which, in my opinion, can be largely attributed to the lessons learned during the burst of the dot.com bubble along with prevailing laws and regulations. Moreover, it is my opinion that the growth in the number of financial services delivered by alternative providers and fintech more generally is a direct result of this.

B. The Philosophy, Practices, and Rules of Crypto-Markets Are Radically Different from Those of a Traditional Financial System and They Are Still Evolving

21. It is widely accepted that crypto markets represent a radical departure from traditional financial systems. Accordingly, many widely accepted customs, practices, and standards of the incumbent financial system do not fit or apply to crypto markets. To better understand the differences, it is worthwhile to briefly examine some of the core elements of crypto markets and the cryptocurrency industry.

1. Origins

22. From their very beginnings, crypto markets and decentralized finance ("DeFi") more generally were designed to replace key components of traditional financial systems, if not the entire system altogether. Like many innovations in the financial services industry, their origins coincided with the advent of new technologies. Specifically, the introduction of networked computing and the availability of relatively inexpensive personal computers both of which offered the promised direct, peer-to-peer e-commerce without the need for intermediaries or other central authorities including regulators and the courts.

23. **The Crypto-Anarchists:** The origins of crypto markets and decentralized finance can be traced as far back as the late 1980's when an IBM engineer by the name of Timothy May, launched what is often referred to as the "crypto-anarchist movement". In a brief manifesto entitled, "The Crypto Anarchist Manifesto", May envisioned a future in which computer-based applications replaced traditional financial systems and, in the process, transfer economic and political power from the privileged few to the public at large.

24. **Satoshi Nakamoto and Bitcoin:** While May laid the philosophical foundations for crypto markets and decentralized financial, a whitepaper published in 2008 by a rather mysterious author with the *nom de plume*, Satoshi Nakamoto, provided the first technical and operational specification for a service envisioned by May. The paper, entitled, "Bitcoin: A Peer-to-Peer Electronic Cash System", laid forth key aspects of a fully digital, decentralized payment system based on what is generally considered to be the first meaningful cryptocurrency, bitcoin ("Nakamoto whitepaper"). Importantly, the paper provided the specification for a shared, fully distributed, immutable ledger referred to as a ***blockchain*** in which transactions were recorded following a ***proof-of-work*** consensus protocol based on highly secure, cryptographic methods.[1] Additionally, the Bitcoin application operates in the public domain at no cost and free of ownership while the code is open-ware, free to all users to access and modify in accordance with Nakamoto's whitepaper.

25. As of the date of this disclosure, there are over one hundred million ***wallets*** holding bitcoins and the total aggregate value of all bitcoins as of November 2021 exceeded $1 trillion.[2]

26. **Ethereum Tokens and Smart Contracts:** Despite Bitcoin's success, it is currently very limited in its financial application insofar as it supports essentially a single financial product (*i.e.*, bitcoin) and a single financial transaction (*i.e.*, the simple transfer from bitcoins between users). Recognizing this, the inventors of Ethereum introduced ***tokens*** as a means of creating more complex crypto products and a special type of token known as ***smart contracts*** to support more complex financial transactions. While the underlying technology is similar to the Bitcoin blockchain, the consensus validation method was changed from a proof-of-work protocol to a ***proof-of-stake*** protocol which is more efficient, but possibly less secure.

2. Core Tenets

27. May and Nakamoto pictured a utopian vision of financial services, one whose delivery relied almost entirely on technology, and which promoted societal benefits over corporate profits. This has been commonly referred to as the "democratization of financial services" and which includes the following tenets:

a. Services are extra-legal by design and intent and delivered and consumed without the need for central authorities including governments, regulators, the courts, and even system administrators;

b. In particular, there is no need for intermediaries or financial utilities such as banks, brokerages, exchanges, clearinghouses, security depositories, or even regulations;

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[1] From a technical perspective, a blockchain is essential a type of database commonly referred to a ***linked-list*** whose data elements are referenced using a cryptographic index known as a ***hash***.

[2] A wallet is an application external to the blockchain that is accessible only to a particular user which allows that user to access the blockchain.

c. Transactions take place directly between pseudonymous users operating under a terms of use agreement that is enforced by the software and the consensus of the user community;

d. A service can be launched and operated without registration or licensing with a governing body;

e. Services are open to all users without the need of vetting or external supervision;

f. The democratization of the financial markets is achieved by giving each user equal authority, permission, and access on the system;

g. The system is governed directly by the user community which is responsible for establishing operating rules;

h. Such rules are encoded in and enforced by software and can only be amended by modifying the existing code after the fact;

i. Financial products do not represent a legal claim, but are pure computer science constructs created pursuant to rules embedded in software;

j. Safety and security implemented through the use highly sophisticated cryptology rather than legal and regulatory frameworks;

k. The underlying software is open-ware and not owned or controlled by a legal entity and is available to all users for inspection and even modification; and

l. Such a service is essentially free of ownership and fully resides on every computer regardless of location.

3. Operational Features

28. Crypto-market and DeFi applications generally share many operational features that are generally aligned with those proposed in the Nakamoto whitepaper. This includes, without limitation:

a. All financial transactions take place and are recorded purely in digital form via an open, peer-to-peer computer application;

b. Such applications are free of any form of ownership and are freely available as open-source software that typically operates under a very limited terms-of-use agreement;

c. All financial transactions are made directly by the counterparties pursuant to the terms of use and rules embedded in the code without the need for central authorities in the form of intermediaries, regulators, or the courts;

d. Financial transactions are validated via user-driven consensus mechanism prior to entry into a shared, fully distributed ledger (*i.e.*, the blockchain);

e. All financial records are immutable and are fully accessible to the entire user community at all times;

f. Operating rules are embedded directly in software and not imposed or enforced by a central authority; and

g. The user community is ultimately responsible for governance of the use and maintenance of the applicable as well as the solution of any and all and disputes.

4. Legal and Regulatory Frameworks

29. While policymakers and regulators have discussed and, in some cases, proposed a number of legal and regulatory frameworks to govern crypto markets, there are few legal or regulatory underpinnings governing them even to this day. In part, this can be attributed to the fact that these markets by intent and design do not fit neatly into any existing framework.

30. For instance, incumbent financial products typically represent legal claims and as such, they are subject to legal action in the event of a dispute. However, crypto products are purely virtual constructs that generally lack any legal basis other than possibly the terms of use of a relevant application.

31. Additionally, incumbent financial services are typically delivered by financial institutions, which are subject to regulations, rules, and guidelines promulgated by government and industry regulators. In crypto markets, these institutions have essentially been replaced by software which often lacks a real or beneficial owner and operates without express application of prevailing laws and regulations in specific jurisdictions.

32. This lack of legal and regulatory clarity, in my opinion, is one of the leading causes of the volatility of crypto markets as well as the failure of many fintech startups. It is also my opinion that based on material I reviewed, the lack of clear applicable laws and regulations contributed to the events at FTX.

C. The Services Provided by FTX Exist at the Crossroads Between Traditional and Decentralized Finance

33. Based on material I reviewed, FTX appears to have been a functioning crypto-exchange (as opposed to a shell), one that offered its customers truly innovative products and services at the time. I base this opinion on the following factors.

1. The Generally Chaotic State of Crypto Markets Prior to the Launch of FTX

34. Even today, crypto markets are often described as "unregulated" in which service providers generally set their own rules with little regard (if any) for customs, practices, and

standards of care used in the delivery and use of incumbent financial services. The general state of crypto markets during the relevant period can be described as follows:

a. There are few widely-accepted customs, practices, and standards of care beyond the basic operating tenets first presented by Nakamoto and incorporated in Bitcoin and Ethereum;

b. There is little legal or regulatory oversight of the operations of many crypto or fintech applications and generally no restrictions on: who can launch or operate them; how they operate or are governed; who they deliver services to; and where they operate.

c. Financial products and services were highly siloed with little or no commonality or integration;

d. While bitcoin and ether (*i.e.*, Ethereum's underlying cryptocurrency) are the dominant cryptocurrencies, it is estimated that there were as many as 12,000 other cryptocurrencies available to the public as of 2022; and

e. There were only a few crypto-utilities prior to the launch of FTX other than public blockchains and certain universal wallet applications.

35. These factors, among others, have, in my opinion, significantly contributed to the highly volatile nature of most crypto markets.

2. Defendant's Advocacy for Crypto Markets Including Regulation

36. Mr. Bankman-Fried's public commentary identified opportunities to develop more established crypto markets that would enhance financial potential and bring order to prevailing confusion in crypto markets.

37. At Alameda Research, Mr. Bankman-Fried and his colleagues earned significant returns in a short amount of time by identifying arbitrage opportunities in the chaos that characterized most crypto-markets at the time. These market conditions, in my opinion, were partly due to the lack of well-developed legal and regulatory frameworks or widely accepted customs, practices, and standards of care other than Nakamoto's core principles referred to above. However, in his public statements, Mr. Bankman-Fried advocated that for crypto markets to grow and remain viable in the long-run, change was needed, including certain regulatory oversight of crypto markets.

38. Further, FTX's centralized operating model represents a departure from the Nakamoto principles in that it was not decentralized but acted as an intermediary between buyer and sellers as well as borrowers and lenders (*i.e.*, as a central authority or market utility). Additionally, FTX also vetted potential users prior to giving them access to the application and it governed the use of the application, all major deviations from a strict decentralized model and which appear to have been adopted to help stabilize crypto markets.

3. FTX's Value Statement

39. Based on material I reviewed, it is my opinion that FTX offered innovative, customer-centric services. I based this opinion on the following factors, without limitation:

a. A better user experience;

b. A suite of innovative products and services including derivatives and margin trading;

c. Robust enough to support professional trading and intuitive enough for first-time users;

d. Sufficient and consistent liquidity through contractual arrangements with market makers;

e. A global presence segregated applications, one dedicated to US citizens and the other to non-US citizens; and

f. Put into practice many the core principles of cryptocurrency and DeFi:

i. FTX appeared to balance the radically different philosophy and practices of decentralized finance with those of a traditional financial system;

ii. FTX apparently offered a suite of integrated services under one umbrella that are traditionally provided by an amalgam of service providers as discussed more fully in section III.C.5 herein;

iii. The development of FTX's overall service delivery model appears to be generally aligned those of previous alternatives to established order execution and exchange-like services; and

iv. FTX had broad appeal in the market and widely considered a success until the collapse of crypto markets.

4. Innovative Products and Services Offered by FTX

40. Based on material I reviewed, FTX International and FTX.US each separately provided a number of crypto products and services which, in my opinion, are innovative, substantive, and which provide value to consumers. This includes without limitation:

a. Fully automated spot and futures trading in over three hundred cryptocurrency pairs with real-time settlement;

b. Fully automated bitcoin and ether options trading;

c. Integrated with other blockchains;

d. Proprietary crypto products;

i. FTT (FTX's cryptocurrency);

ii. Derivatives;

iii. Leveraged tokens; and

iv. Move contracts;

e. User could buy into the exchange by purchasing FTT;

f. Spot and derivatives margining with intraday true-ups;

g. Cross-margining; and

h. Peer-to-peer lending.

41. In short, the scope and breadth of these innovations reinforce my opinion that FTX's operations reflected a genuine and viable financial services provider.

5. FTX's Competitive Position

42. Based on material I reviewed, FTX offered services that other leading crypto exchanges, such as Binance, Coinbase, Kraken, and Okex, at the time did not, such as:

a. Cross-margining – FTX calculated margin collateral across assets, allowing traders to utilize their margin balances across all of their accounts to satisfy margin requirements. Some other exchanges only considered individual margin positions and would liquidate users even if the users' total collateral was still above the required margin minimum;

b. Integrated spot and futures trading – FTX enabled users to trade in spot markets and futures markets in the same account. Some other exchanges required users to shuffle assets between accounts when trading in spot markets versus futures markets;

c. Fully flexible subaccounts – FTX allowed users to create an unlimited number of subaccounts, and permitted users to trade in various asset classes within those subaccounts. Some other exchanges required users to create separate logins or limited the types of trading that could be done in specific subaccounts;

d. FIX, REST, and websocket APIs – FTX made available various formats for establishing API feeds. Some other exchanges only enabled a subset of these;

e. Direct access bypassing Cloudflare for all users (as of October 2022) – Cloudflare is a program that monitors web traffic and prevents denial of service attacks, but in doing so slows down the connection to the exchange. FTX permitted trusted users to become whitelisted and bypass Cloudflare.

f. Native fungibility of USD and stablecoins – FTX treated US dollar-denominated stablecoins as equivalent to US dollars, whereas some other exchanges and lenders did not.

6. FTX Provided the Services of Multiple Financial Utilities Under One Umbrella

43. Based on material I reviewed in this matter, FTX provided a number of services that would be typically provided by multiple financial utilities which was to be expected given the dearth of such utilities in crypto markets. It is also my opinion that this was made possible through FTX's multiple commercial relationships with Alameda Research, which included:

a. User;

b. Market maker (which decreased significantly over time);

c. Backstop liquidity provider of last resort; and

d. Cash management agent.

44. In the incumbent financial markets, trades can be executed on exchanges, cleared via a central clearinghouse, and settled at banks and/or a central securities depository. Additionally, brokers and clearinghouses can provide margin loans to customers while excess cash can be automatically ***swept*** into money market funds and excess collateral can be pledged as collateral in stock lending and repo programs. Funds can be wired from one financial institution to another using payment systems such as SWIFT and ACH.

45. As of November 2022, these utilities simply did not exist in crypto markets in any meaningful way. Consequently, it is not surprising that FTX had to supply similar services itself. For instance, in addition to acting as a peer-to-peer trading platform, FTX acted as the clearinghouse for derivative trades, the central depository for all customer assets, and a cash management agent. It also provided both spot and derivative margin loans as well as facilitating peer-to-peer lending.

46. In short, the services that FTX provided its customers were essentially equivalent to those provided by NASDAQ and the Chicago Mercantile Exchange (the "Merc"); the NSCC and CME Clearing;[3] the DTC;[4] banks, and brokerages. FTX had to develop most if not all of these services.

47. The closest analogy in the incumbent financial services may be that of a ***prime broker***. Despite its name, a prime broker is typically not a legal entity itself but operates somewhat autonomously within a licensed financial institution. In the US, this is typically an SEC-registered

[3] The National Securities Clearing Corporation or "NSCC" and CME Clearing are the primary central clearinghouses for securities and listed derivative, respectively, in the US.

[4] The "DTC" or the "Depository Trust Company" is the primary central securities depository in the US.

broker-dealer. Prime brokers were created to provide various services that, at the time, were uniquely attractive to hedge funds.

48. Essentially, a prime broker facilitates consumer trades much like a retail broker. In this regard, the prime broker can execute customer orders *as principal* or route them to one or more external execution facilities. Often, prime brokers go so far as to guarantee execution, even in the case of illiquid instruments. Additionally, the prime broker typically performs all the processing associated with clearing and settling customer trades along with custodying customer assets and cash. Prime brokers also allow customers to trade on margin and provide collateral to cover open short positions.

49. Again, these are all equivalent to some of the services provided by FTX and, to my knowledge, unique to FTX in the cryptocurrency space.

7. FTX Appeared to Have Been Successful Prior to November 2022

50. Based on material I reviewed, FTX operated a successful business prior to November 2022. In particular, it is my opinion that:

a. FTX appeared to balance the radically different philosophy and practices of decentralized finance with those of a traditional financial system

b. FTX apparently offered a suite of integrated services under one umbrella that are traditionally provided by an amalgam of service providers (*see* discussion in section III.C.5 above);

c. The development of FTX's overall service delivery model appears to be generally aligned those of previous alternatives to established order execution and exchange-like services; and

d. FTX had broad appeal in the market and was widely considered a success until the collapse of crypto markets:

i. It was the third largest crypto exchange with more than one million users;

ii. It had a peak daily trading volume of $21 billion and a peak annual trading volume of over $4 trillion; and

iii. It generated net profits of nearly $400 million on revenues of more than $1 billion.

51. Again, these statistics reinforce my opinion that FTX was designed as a genuine and viable financial services provider.

D. Lack of Clarity Concerning Potentially Applicable Legal and Regulatory Frameworks.

1. Laws and Regulations Typically Lag Behind the Introduction of a New Financial Product, Service, or Means of Delivery

52. Based on my experience, laws and regulations in the financial services industry are typically enacted several years after the advent of a new financial product, service, or means of delivery. This usually follows one or more major market disruptions, the collapse of an established financial institution, sizeable losses to retail consumers, a front-page news coverage, or other events that affect the general public's confidence in the financial system. It can take even longer if the innovation does not fit neatly into an existing regulatory framework.

53. Regulations are often implemented following major market disruptions to address the risks made apparent by the disruptive event. Once the need for safeguards is identified, regulators consult with industry experts to develop best practices to address the identified risk.

54. To understand the complexity of regulating a new service provider such as FTX, it is necessary to consider that it provided services similar to those offered by banks, brokerage, and commodity traders all under a single legal entity and across jurisdictions outside the US, while also providing a series of new and immature financial products. During the relevant period, no existing US regulations expressly applied to international cryptocurrency exchanges. To my knowledge, there had never before been a cryptocurrency trading platform that had been licensed in the US, so there was no guidebook for how one would apply them.

55. The delayed promulgation of regulations, rules, and regulatory guidelines presents a significant challenge for innovators. Without a firm legal and regulatory framework, widely-accepted customs, practices, standards of care, laws and regulations are typically unavailable (and inapplicable) for innovators to follow.

2. Laws and Regulations Regarding Cryptocurrency Applications such as FTX Were (and Still Are) in a State of Flux

56. Without offering an opinion as to whether or not FTX was subject to US or state laws or regulations, the general lack of clarity on this subject further complicated matters for crypto service providers which persists to this today. As mentioned above, many crypto services were intended to function globally and outside of traditional financial regulatory regimes by design and, as such, do not fit neatly into existing legal or regulatory framework for industry practitioners.

57. Based on my experience, I would expect that even a knowledgeable person with material experience with traditional financial services (much less someone with primarily crypto experience) would have trouble navigating the numerous US regulatory regimes in the context of launching a new product, service, or means of delivery. This is especially acute if the new offering

crosses multiple jurisdictional boundaries (such as FTX) and it is not clear *a priori* what regulations would or wouldn't apply.

58. For example, banking-like services might be regulated by the Federal Reserve, the OCC, and/or the FDIC and possibly one or more state banking regulators; spot trading might be regulated by the SEC and FINRA along with one or more state agencies while commodity and listed derivatives trading might be governed by the CFTC and the FMA and, again, one or more state agencies.[5] As of today, none of these regulators (or international regulators for that matter) have expressly established regulations, rules, and guidelines that apply to crypto services and/or service providers to my knowledge. In fact, in most cases, they have not even defined the extent of their regulatory authority over these services and providers.

59. Based on my experience, this regulatory uncertainty is considered to be a major problem by many fintech or DeFi service providers. Importantly, this legal and regulatory uncertainty is not merely a philosophical question. It has deep practical implications since these regulatory regimes have drafted their own particular assemblage of regulations which, in my experience, can conflict and occasionally do. Given the fact that legal and regulatory frameworks generally inform the operations of a financial services provider, it is my opinion that the lack of legal and regulatory clarity in the US and internationally is leading cause of the numerous operational failures in crypto markets.

3. FTX Was Domiciled Offshore and FTX International Operated Outside of the US

60. The issue of what are the propriate legal and regulatory is further complicated by the fact that FTX was domiciled in Antigua with operations first in Hong Kong and then in the Bahamas, where the latest iteration of its terms of service was governed by English law as I understand. As discussed in section III.H herein, although the Government suggests in the indictment that operating in the various locations and providing services through various legal entities has the appearance of impropriety, this is rather commonplace in the financial services industry. Without offering an opinion as to whether or not FTX (or any other crypto application) operated under existing US or state laws or regulations at the time, based on my opinion that this operating model which crossed numerous boundaries in numerous ways further complicates the issue of what are prevailing legal and regulatory jurisdictions.

[5] FINRA, or the "Financial Industry Regulatory Authority", is the primary industry body regulating SEC-registered broker-dealers. The FMA, or the "Futures Merchant Association" is primary industry body regulating CFTC-registered commodity futures merchants.

4. The US Legal and Regulatory Frameworks Governing the Delivery and Use of Financial Services is Very Complex

61. Based on experience working in numerous countries for a wide variety of financial institutions, the financial legal and regulatory frameworks in the US is among if not the most complex in the world. There are numerous federal and state agencies as well industry bodies tasked with supervising various portions of the US financial system. This are generally siloed by:

a. The financial market;

b. The financial products;

c. Type of services; and

d. Type of consumer.

62. A large financial holding company might be regulated by as many as five dozen regulators in the US alone.

63. Much of this is due to a handful of acts enacted by Congress during the Great Depression following the Crash of 1929 which were enacted to help protect customer assets and the overall interests of customers more generally. At the time, it was the general consensus a fundamental cause of the crash and the following economic depression was caused by excessive speculation by financial institutions using customer assets.

64. To address this, Congress passed what is commonly referred to as ***Glass-Steagall*** which segregated commercial and investment banking. Customer deposits were still considered to be part of a bank's operating capital and virtually no restrictions were put on the funds other than those governing the bank's own capital. Further, relevant financial actors implemented the provisions of Glass-Steagall and subsequent legislation by limiting the amount and type of speculation that they could undertake.

65. Brokerages, on the other hand, were prohibited from holding customer cash which had to be deposited in segregated account a regulated bank in the name of the brokerage but designated as holding customer funds. Further, brokerages were prevented from unilaterally using customer funds and they were also restricted as to the amount and type of speculation that they could undertake. However, brokerages were allowed to lend customer securities they held for their own benefit, usually as pledged collateral against their various obligations.

66. To complicate matters further, in 1979, Congress enacted additional legislation which created CFTC with the responsibility of regulating commodities trading including organized commodities exchanges such as the Merc. However, ***financial futures*** were (and continue to be) traded on these exchanges as well. Consequently, the CFTC authority extends to certain financial products used by financial institutions that are also regulated by the securities and banking regulators.

67. On top of all this, lawmakers, policymakers, and regulations have generally adopted what is commonly referred to as ***prudential regulation***. As opposed to *rules-based regulation* in which specific actions are prescribed, under *prudential regulations* regulated entities operate within various policy objective set by regulators. While such a regulatory scheme has many benefits, it also makes it much more difficult to determine what actually is or is not permitted.

68. Based on my experience, navigating the US financial legal and regulatory frameworks in the context of launching a new financial product, service, or means of delivery is difficult at best even for highly experienced and knowledgeable innovators. And, in my opinion, launching a crypto-product, service, or means of delivery magnifies this challenge.

E. FTX's Operational Workarounds, Programming Bugs, and Other Shortcomings Were Predictable

69. As I understand, FTX suffered from a number of operational problems. However, many of the challenges that FTX suffered through are not unique to FTX but are quite common to providers offering new financial products and services. This is especially true of fintech providers more generally whose founders often lack the necessary skills, experience and knowledge of the customs, practices, and standards of care widely accepted in financial services industry. Based on material I reviewed in this matter, many of FTX's operational problems were, in fact, predictable from the perspective of operation in incumbent finance.

70. For instance, FTX appears to have relied on a number of concepts from traditional finance which are not typically found in crypto markets and did not necessarily transfer to crypto markets. This includes, without limitation:

a. **Acting as a central clearinghouse for derivative transactions** – this is a financial utility which stands between buyers and sellers to facilitate the settlement of future payments. This was not widely accepted in the crypto world during the relevant time period for the simple fact that such a utility is a central authority and thus, antithetical to the tenets of decentralized finance. Consequently, this function is not supported by the typical blockchain application. On the other hand, commercially available products did not support crypto products at the time and regardless, based on my experience, they were not well suited for use by FTX in any event; and

b. **Spot and derivatives trading on margin** – these two features, which represent very different processes, are not commonly found in crypto markets. And, as in case of clearinghouse functionality above, margin processing is not native to blockchains and what commercially margin software was available at time, it is unlikely that it could have adequately supported FTX in my opinion.

71. As both these examples show, FTX was faced with having to develop this functionally essentially *de novo*. However, building a fully functioning, robust application delivering such functionality be, in my opinion, a huge task for the FTX management and its development

team, especially in light of their apparent lack of experience and knowledge in this subject. As such, I would expect that such an application would suffer from a host of functional and performance problems.

72. Based on material I reviewed in this matter, one such FTX workaround exemplifies this. As I understand, FTX provided Alameda Research a substantial line of credit. This in-and-of-itself is not unusual as discussed in subsection (h) below. However, this size of the credit line was part of a workaround to prevent the failure of a particular piece of code that could possibly have brought down the FTX system. In other words, as I understand, FTX never intended to give such a large credit line to Alameda Research and data in this matter reflects that Alameda Research never drew amounts close to this limit. Rather, than an actual credit line, this was part of short-term workaround.

F. Senior Executives Who Are Not Software Engineers Typically Do Not Know or Direct the Inner Workings of their Company's Software

73. Based on my experience, it is unlikely that a single person (such as Mr. Bankman-Fried) could develop, launch, and operate a business as large and as complex as FTX on their own. Typically, this requires a team providing a broad suite of skills and expertise who also have a deep knowledge of the subject matter. This is generally more than a single person can provide.

74. Additionally, it is not generally accepted practice for any senior manager of a financial services provider (much less a CEO) to have intimate knowledge of the inner workings of its overall operations much less its software. Moreover, as I understand, Mr. Bankman-Fried at the time was not a computer programmer. As such it is unlikely that he would have been able to independently detect the existence of potential problems with the code used to deliver FTX's services.

75. In my opinion, it is unlikely that Mr. Bankman-Fried or any other senior executive with limited technical skills could code or detect malware or bugs independently on their own. Rather, it is my opinion that such a senior executive would need to rely on the representations of his staff barring any suspicions or concerns.

G. FTX took Commercially Reasonable Steps to Protect the Interests of US Consumers

76. Based on material I reviewed in this matter, it is my opinion that FTX apparently used commercially reasonable measures to protect the assets and other interests of its customers. This includes, without limitation, that FTX International apparently executed customer trades on a first come/first served, best price basis without preferential treatment. Moreover, Defendant openly advocated for many of the societal aims of May and Nakamoto (*cf.* section III.B.1 herein) and publicly called for the regulation of crypto markets which included FTX at the time (*cf.* section III.C.2 herein).

H. Many of the Allegations Set Forth or Implied in the Indictment Are, in Fact, Widely-Accepted Practices in the Financial Services Industry

77. Based on my experience, the indictment and commentary from critics of FTX and Mr. Bankman-Fried have made a number of allegations concerning FTX that are either at odds with or misrepresent widely-accepted customs, practices, and standards of care in the financial services industry, including, without limitation, the following:

a. **Using Third-Party Agents.** It is common practice for financial institutions to use third parties (including subsidiaries and affiliates) as service providers on an agency basis. For instance, large brokerages often provide execution, processing, and custody services to smaller brokerages in the capacity of what is commonly referred to "correspondent broker". Banks also deposit money at other banks under a similar correspondent relationship. In most cases, such services are provided on what is commonly referred to as a "white-label" basis in which the correspondent is not publicly disclosed.

b. **Commingling of Customer Assets.** It is common practice to hold customer assets at other financial institutions as well as commingle those assets with their own – for instance, customer deposits become part of a bank's deposits held at the Federal Reserve while customer securities are custodied at the DTC in the name of the brokerage along with securities owned by the brokerage.

c. **Unrestricted Use of Customer Assets.** It is common practice for financial institutions to use customer assets for their own benefit with no consideration accruing to the customer. For instance, customer deposits become part of a bank's general operating capital by regulation. Moreover, there are typically little or no restriction on how those deposits may be used other than those which apply to the bank's own capital. In connection with this practice, financial institutions commonly pledge customer assets as collateral to obtain loans from third parties on a secured basis for the benefit of the institution as is the case with US brokerages which typically have rights to use customer securities held by the brokerage for its benefit. In both cases, financial or other considerations typically do not accrue to the customers.

d. **Customer Assets Held at Other Financial Institutions.** The indictment claims that customer funds held by FTX that were deposited in a bank account held in the name of Alameda Research were part of Defendant's alleged fraud. Based on my experience, this is neither unusual nor eye-raising in-and-of-itself. For instance:

i. It is common practice for financial institutions to have numerous bank accounts with numerous banks in numerous legal jurisdictions and to carry out customer business in those accounts. This is often done through a correspondent banking relationship, or via an agency service agreement, or by simply opening accounts. Regardless of the nature of the relationship, these financial institutions often deposit customer money in those bank accounts; and

ii. In the US, brokerages settle and custody customer trades in accounts in its name at the DTC. Additionally, brokerages hold customer cash in bank accounts opened in the name of the bank.

In both cases, customers wire money to the principal's accounts at the correspondent using the name of the principal.

e. **Diversification.** It is common for financial institutions to broadly diversify their investments to reduce ***concentration risk***. For instance, it is common for banks to invest in long-dated securities, commercial real estate, and alternative investment funds in addition to maintaining a more liquid portfolio of short-date cash equivalent investments. By way of further example, banks often own large art collections as an offset to inflation and invest in high risk/high return opportunities such as venture capital.

f. **Short-Term Workarounds.** It is common practice to rely on short-term workarounds to overcome operational problems and system bugs, with the intention to replace those workarounds with more permanent solutions in the future – first, the indictment refers to the problems that FTX had in opening bank accounts with a US bank that ultimately led to using bank accounts opened in the name of Alameda Research. Financial institutions often use banks accounts that are often at other financial institutions. The indictment references FTX's alleged use of "loopholes" in its software for nefarious purposes although it unclear exactly what these alleged backdoors entailed or how they implemented. Ignoring the overall negative connotation of the term, as I understand a few short-term workarounds were implemented to address problems with the software.

g. **Numerous Subsidiaries and Affiliates.** It is common practice to have numerous subsidiaries and affiliates. Financial institutions, especially those with offshore operations, often have dozens of subsidiaries and affiliates for a wide variety of reasons.

h. **The Segregation of Services and Service Delivery to US and Offshore Customers.** It is common practice to segregate US and non-US customers and provide differentiated services through independent legal entities – many non-US customers do not want US authorities to have access to their data or be required to US withholding taxes. Additionally, local regulatory authorities often have operating and licensing requirements that are not aligned with those in the US.

i. **Preferential Treatment Provided to Certain Customers.** It is common practice in the financial services industry to provide favorable treatment and other benefits to preferred customers. Financial institutions often provide direct financial benefits which, again, typically are not disclosed to the public, including, without limitation:

i. Incentive fees and discounts;

ii. Preferential trade execution such a better prices and faster execution;

iii. Larger lines of credit at preferred rates;

iv. Free agency services such as settlement, clearance, and custody; and

v. Access to internal research.

j. **Financially Incentivizing Participants to Provide Liquidity and Stability.** The key to success for any exchange or exchange-like service is liquidity. Quite simply, liquidity attracts participants which, in turn, more participants. However, achieving liquidity is a "chicken or egg" problem. With participants comes liquidity and with liquidity comes participants but they will only come if there is sufficient liquidity.

To overcome this dilemma, it is common practice for exchanges or exchange-like services to attract liquidity providers through financial incentives such as those outlined in subsection (i) above. For instance, it is common practice to financially incent participants to post bids and offers in order to increase liquidity.[6] Additionally, exchanges or exchange-like service providers also commonly enter into legal agreements with certain participants to act as ***market makers*** under which they agree to post bids and offers throughout the trading day thereby further increasing liquidity. This is critically important for a new exchange or exchange service such as FTX since liquidity attracts more liquidity.

In my experience, such new services often rely on a handful of market makers at the outset which, in turn, represent a huge portion of the initial volume (in fact, I know of situations in which there was only a single market maker which is typically affiliated with the service provider in some way). If the service is successful, the transaction volume of these early market makers generally decreases as overall liquidity increases. For instance, based on material I reviewed, Alameda Research was FTX's first market maker, essentially representing one hundred percent of liquidity or close to it. However, from May 2019 through August 22, Alameda Research's transaction volume on FTX dropped significantly as additional market makers began trading on the exchange.

In a similar vein, such service providers commonly enter into legal agreements with certain participants to act as a ***backstop liquidity provider*** under which they agree to stand ready to take the other side of trades. This is especially important with regard to thinly traded assets, which is commonly the case with crypto-assets. This is especially important in the case of new exchange or execution service.

For instance, Alameda Research and FTX entered into a legal agreement under which Alameda Research agreed to act as the backstop liquidity provider of last resort in the event of stalled ***liquidation trades*** in the case of ***margin close outs***. Based on my experience, this was a highly valuable service given the fact that FTX also acted as the clearinghouse for derivative trades and as a new execution service had limited capital.

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[6] Such participants are commonly known as ***makers***.

Established clearinghouses typically have the financial resources to dispose of seized collateral over time and any resulting losses are often spread over the member firms on a *pro rata* basis. Under said agreement above, FTX essentially transferred both the liquidity risk as well as losses for having to dispose of any seized assets at below market rates to Alameda Research.

In my experience, financial institutions do not generally agree to act as a backstop liquidity provider for free and expect some sort of consideration which may be in the form of financial compensation and/or payment in kind. This includes a line of credit which not only benefits the backstop provider but also the clearinghouse since it helps the former to fulfill its duties.[7]

k. **Using Affiliated Market Makers to Provide Liquidity.** Based on my experience, it is not unusual for new exchanges or execution services to rely on third-party market makers to provide liquidity as discussed at (j) above. It is also not unusual for such market makers to be affiliated in some way with the exchange. For instance, I worked on a number of initiatives to automated various OTC markets, many of which were sponsored by a consortium of financial institutions. In all of the instances, the sponsors pledged that their trading desks would make active markets to provide liquidity.

l. One such example was known as the "EJV" or the "Electronic Joint Venture" which was a consortium of the six largest primary dealers in the early 1990's.[8] To maintain anonymity, prime dealers at the time used intermediaries commonly referred to *interdealer brokers* or *IDB* which charged commissions. The EJV was attempt to displace the IDB to save on the commissions and market data fess as well as sell its market data to other broker-dealers and institutional investors. As part of their commitment, each of the founding dealers agreed to have their government securities trading desks make markets in all of the outstanding US government securities on a continuous basis. While the EJV was successful in lowering commissions and market data for the founders, it eventually became a predominately a voice broker like the other IDB primarily due to the traders' general aversion to computerized services at the time.

m. **Memorializing Verbal Agreements Later in Time.** It is common practice, particularly among startups, to begin operating on the basis of verbal agreements and formalize such agreements in writing on a later date. In my experience, the effective date of the agreement often reflects the as of the date that the original agreement was made.

n. **Lines of Credit.** As discussed above, it is common for financial institutions to receive extensive lines of credit with other financial institutions and financial utilities. These are typically collateralized credit facilities although unsecured lines are not uncommon as well. Either way, the credit limit is typically based on creditworthiness of the obligor and, if collateralized, the lender's valuation of the pledged collateral. In the indictment, the Government points to the size of

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7 Alameda Research's line of credit with FTX is discussed in more detail at subsection (n) below.

8 A *primary dealer* is a dealer that is allowed to participate in the auction of the US Government securities.

the line of credit that FTX provided to Alameda Research on its face as an alleged indication of some form of an improper relationship. I disagree with this allegation for the following reasons based on the information currently available to me:

i. This credit line was large, but it was collateralized and, at the time, I understand that Alameda Research had substantial assets;[9]

ii. As discussed in subsection (j) above, a credit line could be viewed as consideration for Alameda Research agreeing to act as an FTX backstop liquidity provider. Regardless, a credit line was beneficial to FTX in that it helped Alameda Research to provide such services; and

iii. As discussed in subsection (e) above the size of this credit line was to prevent the execution of problematic code that could have rendered FTX virtually useless for all users.

o. **Loans to Founders.** It is common for founders to receive loans secured by their ownership in the company. This often is done in lieu of a distribution for tax reasons.

p. **Share Buybacks and Burning Tokens.** In my experience, equity in a company is considered to be dear. Consequently, it is common practice for companies to use some of their profits to buy back shares from the market, in the case of a public companies, or from investors, in the case of a private companies.

Similarly, it is common practice in the crypto industry to ***burn*** tokens and cryptocurrency as part of controlling supply and hence, value. This is a form of monetary policy analogous to retiring fiat money or increasing interest rates.

Respectfully submitted

Peter Vinella

Pietro (Peter) Vinella, Ph.D.

[9] I am also not aware of any evidence that it was ever fully drawn down.

PVAToucan

Curriculum Vitae

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SUMMARY

Peter U. Vinella has nearly 40 years of experience in the financial industry as a consultant and as a senior executive with leading financial institutions. Dr. Vinella has extensive testifying experience acting as an expert for both plaintiff and defendant over more than fifty engagements. Over the course of these engagements, Dr. Vinella has worked with some of the most prestigious law firms, including, Bernstein Litowitz, Boies Schiller, Hogan Lovells, Jones Day, Kirkland Ellis, McKool Smith, Mourant Ozannes (Cayman Islands), Quinn Emanuel, Sterne Kessler, William Fry (Ireland), Williams & Connolly, and Wilson Sonsini in addition to the SEC and the DOJ. He has authored over sixty expert reports, declarations, and affidavits and has given over 350 hours of arbitration hearing, trial, and deposition testimony in state, federal, and international courts and before arbitration panels. In addition to the U.S. (where he has been qualified to testify in state and federal courts), Dr. Vinella has also provided testimony in the Philippines, the Cayman Islands, and Ireland. Additionally, Dr. Vinella has and continues to provide consulting services to central banks and government agencies as well as major financial institutions.

His areas of expertise include trading and investment management, risk management, quantitative analyses, operations, trading and investment-related accounting, technology (including software development), trust administration, fund administration, mathematics, probability, and statistics. He has first-hand experience with a wide range of investment products, including equities, debt securities, repo and securities lending, listed and OTC derivatives (such as options, futures, and swaps), commercial and consumer loans, and structured credit products such as CLOs, Asset-Backed CDOs, ABCP, and RMBS. He has also developed business plans and strategic marketing plans for leading financial institutions and their vendors, including JP Morgan, Daiwa Securities, Smith Barney, ADP, Sun Microsystems, Perot Systems, and Sybase. Additionally, he has extensive experience in international markets and has worked extensively outside of the United States.

Prior to forming PVA Toucan with his partner, Dr. Jeanette Jin, Dr. Vinella was a managing director first at LECG and then Berkeley Research Group (BRG) where he provided expert testimony and advisory services in regard to a host of matters primarily involving financial services and technology matters. At LECG, Dr. Vinella was also responsible for managing the firm’s financial services practice, which consisted of over 125 individuals and generated 20 percent of the company’s profits.

Prior to his work in litigation support and dispute resolution, Dr. Vinella was a founder, co-owner, and CEO of Wilmington Trust Conduit Services (WTCS), a subsidiary of Wilmington Trust Corporation, the Federal Reserve–regulated bank holding company of Wilmington Trust Company. He was responsible for overseeing all aspects of WTCS, including business administration, sales, operations, research, production technology, and software development. WTCS provided a wide range of administrative, trustee, custodial, operations, accounting, and risk management services to issuers and managers of and investors in credit and structured credit transactions. WTCS also provided fund administration services to hedge funds and private equity funds investing in loans, distressed assets, and structured products. WTCS had offices in New York City, the Cayman Islands, Dublin, and Luxembourg.

Before joining Wilmington Trust in 2006, Dr. Vinella was the founder and CEO of PVA International/Toucan Partners, a New York-based consultancy focused on capital markets and risk management. During his 11-year tenure, PVA/Toucan was engaged in more than one hundred projects with more than fifty clients on four continents, including money center banks, international brokerages, central banks, government agencies, and investment managers.

Having begun his career in finance in the early 1980s at the risk management boutique BARRA (now part of Morgan Stanley), Dr. Vinella has also held a number of senior positions at leading Wall Street firms, including trader and trading manager, chief information officer, and head of fixed income research. Earlier in his career, he founded Berkeley Investment Technologies (BIT), an early pioneer in algorithm trading and one the first financial services firms to employ UNIX-based distributed systems, relational database management systems, object-oriented architecture, and real-time analytical systems.

Dr. Vinella is a member of the U.C. Berkeley Center for Risk Management Research which promotes research in and education about serious issues in the field of financial risk management. He holds a Ph.D. and master's degree in mathematics and a bachelor's degree in applied mathematics from the U.C. Berkeley (Cal). At Cal, he frequently presents seminars on various aspects of mathematical finance, optimization and optimal control theory, stochastic dynamical systems, and non-linear analysis. His current academic research also includes decentralized finance, quantum computing, and non-linear data analysis. Dr. Vinella also taught mathematics at California State University at Hayward and was a NASA Junior Research Fellow.

Dr. Vinella has coauthored two books with Jeanette Jin (the COO of WTCS) on governance and operational risk management, one published through Risk Waters and the other in manuscript form. He has authored numerous articles in the areas of litigation, finance, technology, and mathematics, including a solicited op-ed piece for the *New York Times* on algorithmic trading. Additionally, he is often quoted in the mainstream and trade press, including an appearance on *ABC Nightly News* with Peter Jennings in regard to the vulnerability of the U.S. financial system to terrorist attacks. He has also worked with the U.S. Congress and GAO on a variety of issues including TARP/EESA, program trading, derivatives regulations, and the impact of September 11 on the U.S. financial system.

EDUCATION

University of California, Berkeley
Ph.D., Mathematics, 2021.
M.A., Mathematics, 2015.
A.B., Applied Mathematics, 1978.

UC Berkeley Executive Education
Blockchain and Cryptocurrencies: Technologies, Strategic Applications, and Emerging Trends Certification, 2022.

PRESENT EMPLOYMENT

PVA Toucan LLC, Oakland, California
Managing director, January 2015–present.
Consultant providing advisory services to financial services companies, financial institutions, and government agencies.

U.C. Berkeley Center for Risk Management Research, Berkeley, California
Affiliated graduate student, October 2012–present
Member of the research team exploring various quantitative methods to measure and control risk in financial markets, and the extension of these quantitative methods to other contexts.

PREVIOUS POSITIONS

Berkeley Research Group, Oakland, California
Managing director, October 2010–December 2014
Member of the senior professional team providing expert testimony and advisory services, primarily in the areas of financial services and technology.

LECG, Emeryville, California
Managing director, 2009–2010.
Member of the senior professional team providing expert testimony and advisory services primarily in the areas of financial services and technology. Also managed the company's financial services practice, which consisted of over 125 individuals and generated 20 percent of the company's profits.

Wilmington Trust Conduit Services, LLC, New York, New York
President and CEO, 2006–2009
A founder and owner of WTCS, responsible for overseeing all aspects of Wilmington Trust Conduit Services. WTCS was a roughly125-person operation that was a subsidiary of Wilmington Trust Corporation, the bank holding company of Wilmington Trust Company, a regional bank located in Wilmington, DE providing retail banking, wealth management services, and corporate trust services to clients in the US and Europe.

WTCS provided a wide range of administrative, trust, custodial, operations, accounting, reporting, and risk management services to issuers and managers of and investors in credit and structured credit transactions.
Also, was responsible for overseeing WTCS's technology and software development effort that consisted of a staff of 10 production support engineers and 45 developers, 35 of whom were located in Tianjin, China.

Toucan Partners/PVA International, Inc., New York, New York
CEO, 1995–2006
Founder and CEO of a 30-person, $3- to $5-million-a-year management consulting firm focusing on critical capital market issues concerning trading, risk management, operations, and technology. Managed and/or took part in over 100 projects for over 50 leading financial institutions on four continents, many with project budgets of over $60 million.
Major assignments included the pre-acquisition assessment and valuation and post-acquisition integration planning in regard to Bankers Trust's acquisition of Nat West Markets equity and OTC derivatives businesses; supervising the launch of a primary dealership for Société Générale; acting as the interim CEO in a joint venture with a subsidiary of CEMEX; acting as the interim CEO of an online treasury service joint venture between JP Morgan, Citi, and Cargill, and developing a five-year, strategic fixed income business plan for ADP, which resulted in approximately $300 million of acquisitions.
Oversaw and led the development of a detailed project execution and management methodology that included outsourcing risk and cost analysis, vendor vetting and selection, and project risk management.

Smith Barney Shearson, New York, New York
March 1993–August 1995
Trading manager and Arbitrage trader, Taxable Fixed Income Department, 1994–1995
Reported to the head of Capital Markets and was responsible for identifying and executing proprietary trades, primarily in the interest rate cash and derivatives markets. Developed and implemented the group's analytic tools and support systems. Liaised with the sales force and clients to communicate trade ideas. Was responsible for developing a new business unit within the division (the Portfolio Strategies Group) as well as launching the Interest Rate Derivatives Trading and Sales unit. Also responsible for training the sales staff and MBA recruits in fixed income and derivatives trading and quantitative analysis.
Chief information officer, Capital Markets Division, 1993–1994
Reported to the head of Capital Markets and was responsible for overseeing the planning, implementation, and delivery of technology-based services supporting the global capital markets businesses. Was responsible for managing a $250 million budget.
Additionally, headed the planning, budgeting, and fitting out of four large trading floors comprising more than 1,200 trading seats.
Managed the post-acquisition integration of the Shearson fixed income businesses, operations, and technologies. This included implementing comprehensive MBS trading and research capabilities.

Berkeley Investment Technologies, Inc./Drexel Burnham Lambert, Berkeley, CA, Lafayette, CA, and New York, NY, 1986–1993
Co-founded and managed an independent consultancy specializing in risk management, quantitative analytics, automated statistical-based trading, and trading systems development, primarily in equity cash and derivatives markets.
In the fall of 1988, BIT became an independent operating unit within Drexel Burnham Lambert (DBL), providing advanced technology services to DBL's primary dealer. Over time, BIT expanded these services to included fixed income research and extended these expanded services to other DBL fixed income trading desks and its institutional clients. Its clients included over 200 top-tier institutional investment managers, such as Fidelity, Putnam, the World Bank, and the Bundesbank.
The company was later integrated into another DBL legal entity, Nameloc, which was essentially an internal hedge fund run by several DBL traders. Finally, BIT, along with other assets of Nameloc, was spun-off just prior to DBL's bankruptcy and the company, again, operated under the BIT brand. At the time of my departure in 1993, the company had stabilized at 45 employees and about $7 million in annual revenues.

Executive vice president, BIT, director of Business Development, 1990–1993
Co-managed daily operations of the firm. Directed all sales and marketing activities. Acted as the primary management consultant and client liaison as well as the principal software architect and quantitative analyst. Oversaw all software development.

Executive vice president, Nameloc, 1989–1990
Responsible for managing the technology, fixed income research, and business development activities of an internal DBL hedge fund with $50 million in trading capital.

Head of Taxable Fixed Income Research, DBL, 1990
Responsible for overseeing the day-to-day analysis, operations, and technology of DBL's Fixed Income Research Department, which had a staff of more than 150 professionals, 200 institutional clients, and an annual budget of over $70 million.

Principal and senior scientist, BIT, 1986–1989
Managed the daily operations of the firm. Principal quantitative analyst and chief software developer.

BARRA, Berkeley, California
Senior quantitative analyst, 1984–1986
Performed a number of quantitative analysis and software development duties focusing on the computer application of Modern Portfolio Theory. Specialized in international equity markets, including those in the United Kingdom and Japan.

California State University, Hayward
Lecturer/assistant professor, Mathematics and Computer Science, 1982–1984
Taught both graduate and undergraduate courses in pure and applied mathematics.

Virtual Microsystems, Berkeley, California
Programmer/Analyst, 1982–1984
Developed system-level code supporting virtual and physical coprocessors running on a variety of mini-computers and operating systems produced by Digital Equipment (DEC). The work involved developing device drivers under the RSTS, RMS, and RT11 operating systems interfacing with Z80 and 8088 coprocessors along with developing I/O and memory management facilities for the coprocessors.

University of California, Berkeley, California
Teaching assistant, 1980–1981.
Taught undergraduate calculus courses for non-majors.

NASA Ames Research Center, Mountain View, California
Junior research fellow, Computation Fluid Dynamics Division, 1980–1981
Research topic was the application of holographic interferometry to modeling transonic airflow.

Data Dynamics, Mountain View, California
Senior mathematician, 1978–1980
Civilian contractor to the National Security Administration (NSA) and the U.S. Air Force responsible for the development and implementation of mathematical models and algorithms simulating satellite orbits and n-body celestial mechanics.

CURRENT AND PAST PROFESSIONAL MEMBERSHIPS

American Mathematical Society
Institute of Electrical and Electronics Engineers
Society of Industrial and Applied Mathematics
International Association of Quantitative Finance
The Charter Hill Society (UC Berkeley)
Friends of Berkeley Mathematics (UC Berkeley)
Berkeley Science Network (UC Berkeley)
Securities Industry and Financial Markets Association (past)
European Securitization Forum (past)
Loan Syndication and Trading Association (past)
International Swaps and Derivatives Association (member of the FpML Loan Agent Bank Communication Working Group) (past)

EXPERT TESTIMONY

- *Mid-Atlantic Finance Co., Inc. ("Plaintiff") v. Prime Asset LLC d/b/a Texas Dealer Solutions, et. al. ("Defendants"), Cause No. D-1-GN-19-000954*, in the District Court of Travis County, Texas, 250th Judicial District (June 2022-present). Provided expert testimony on behalf of plaintiffs in the form of an expert report in connection with the alleged misappropriation of intellectual property involving the pricing of auto loan portfolios in the secondary market.

- *In re Robinhood Outage Litigation, case number 3:20-cv-01626-JD*, U.S. District Court, Northern District of California (April 2021–present). Provided expert testimony on behalf of plaintiffs in the form of deposition testimony and an expert report regarding generally accepted retail brokerage customs, practices, and standards in connection with the Robinhood's March 2020 system outages.
- *In Re Citibank August 11, 2020 Wire Transfers, Case No. 20-cv-6539 (JMF)*, U.S. District Court, Southern District of New York (November 2020–December 2020). Provided expert testimony on behalf of defendants in the form of trial and deposition testimony and a reply expert report regarding various aspects of loan administration in regard to a disputed payment.
- *Raza Khan, et al. v. Vishal Garg, et al., Index No. 652334/2013.* Supreme Court for the State of New York, County of New York (July 2020–present). Provided expert testimony on behalf of plaintiffs in the form of deposition testimony and two expert reports in a matter alleging the misappropriation, misuse, and improper disclosure of intellectual property regarding loan origination, servicing, securitization, and asset management.
- *Trading Technologies International, Inc. v. IBG LL, et al. Case No.: 10 C 715.* U.S. District Court, Northern District of Illinois, Eastern Division (April 2019–present). Provided expert testimony on behalf of defendants in the form of written declarations regarding a patent dispute involving electronic trading systems.
- *The Water Works Board of the City of Birmingham, et al., v. US Bank National Association. Civil Action No. 17-4113.* U.S. District Court, District of South Dakota (April 2019–October 2020). Provided expert testimony on behalf of plaintiffs in the form of deposition testimony and two expert reports regarding various aspects of trust administration with regards to fixed-income securities issued by a tribal entity.
- *Several related patent disputes between Investors Exchange LLC. and Nasdaq, Inc.* before the Patent Trial and Appeal Board of the U.S. Patent and Trademark Office (all November 2018–November 2019). Provided expert testimony on behalf of the patent owner in the form of written declarations and depositions regarding the technical design and functionality of electronic order routing and matching systems.
    - *CBM2018-00029* (patent 7,747,506)
    - *CBM2018-00038* (patent 7,895,112)
    - *CBM2018-00039* (patent 7,933,827)
    - *CBM2018-00041* (patent 8,244,622)
    - *CBM2018-00042* (patent 8,386,362)
    - *CBM2018-00045* (patent 7,647,264)
    - *CBM2019-00001* (patent 8,280,797)
    - *IPR2018-01796* (patent 8,117,609)
- *Several related patent disputes between Miami International Securities Exchange, LLC., et al. and Nasdaq, Inc.* before the Patent and Appeal Board of the U.S. Patent and Trademark Office (all November 2018-2019). Provided expert testimony on behalf of the patent owner in the form of written declarations and depositions

regarding the technical design and functionality of electronic order routing and matching systems.

  - *CBM2018-00020* (patent 8,386,371)
  - *CBM2018-00021* (patent 6,618,707)
  - *CBM2018-00030* (patent 7,921,051 B2)
  - *CBM2018-00031* (patent 7,246,093)
  - *CBM2018-00032* (patent 7,933,827)

- *Defender Ltd. v. HSBC Institutional Trust Services (Ireland) Ltd. Record No 2013/12439P.* The High Court (Commercial), Dublin, Ireland (August 2017–April 2021). Provided expert testimony on behalf of plaintiffs in the form of deposition testimony and an expert report about various aspects of custody services in regard to an investment fund managed by Bernie L. Madoff Securities.
- *Bangko Sentral ng Pilipinas v CCK Financial Solutions Pty Ltd* (May 2017–November 2017). Provided expert testimony on behalf of defendants in the form of two expert reports and hearing testimony regarding a failed software installation.
- *Lehman Brothers Holdings Inc., in its capacity as Plan Administrator on behalf of Lehman Brothers Special Financing Inc. v. Federal Home Loan Bank of New York, Adv. No. 15-01110 (SCC).* New York Southern Bankruptcy Court (October 2014–April 2017). Provided expert testimony on behalf of defendants in the form of a declaration, two expert reports, and deposition testimony regarding the replacement value of a portfolio of over 350 interested swaps.
- *Lynn Tilton, et al, (Respondents). SEC Administrative Proceeding File No. 3-16462* (August 2016–November 2016). Provided expert testimony on behalf of respondents in the form of an expert report and trial testimony on behalf of respondents regarding generally accepted corporate trust customs and practices with regard to CLOs.
- *Primeo Fund v. Bank of Bermuda (Cayman) Limited et al. Cause No: FSD 30 OF 2013 – AJJ.* Grand Court of the Cayman Islands (July 2015–January 2017). Provided expert testimony on behalf of plaintiffs in the form of two expert reports and deposition and trial testimony about various aspects of custody services in regard to a hedge fund managed by Bernie L. Madoff Securities.
- *Jackson Square Partners, LLC. v. Delaware Investment Partners*. American Arbitration Association (May 2015–August 2015). Provided expert testimony on behalf of plaintiffs in the form of a declaration in a dispute regarding fund administration industry standards of care in connection with a management buy-out.
- *Fixed Income Shares: Series M, et al. v. Citibank N.A. Case No. 14-cv-9373-JMF.* U.S. District Court, Southern District of New York (January 2015–present). Provided expert testimony on behalf of plaintiffs in the form of deposition testimony and an expert report regarding various aspects of trust administration, securitization, secondary loan markets, valuation, and custody in regard to a RMBS issuance.
- *Peterson, et al. v. Islamic Republic of Iran, et al. Case No.: 13 CIV 9195 (KBF).* U.S. District Court, Southern District of New York (June 2014–present). Provided expert

testimony on behalf of plaintiffs in the form of two declarations regarding various aspects of international payment systems and correspondent banking.

- *EPLG, LLC (as trustee for the QR liquidating Trust) v. Citibank, N.A. and U.S. Bank. N.A. Case No. 09-10589 (MTW), Jointly Administered, Adv. No. 11-50603 (MTW).* U.S. Bankruptcy Court for the District of Delaware (April–September 2013). Provided expert testimony on behalf of defendants in the form of an expert report and deposition testimony regarding various aspects of municipal securities issuance, credit enhancement, and trust administration in regard to a defaulted obligor of an industrial revenue bond.
- *UBS Securities LLC and UBS AG. (London Branch) v. Highland Capital Management, L.P. et al. Index Nos. 650097/2009, 650752/2010 and 652646/2011 (I.A.S. Part 60, Friedman, J.).* Supreme Court of the State of New York, County of New York (January 2013–July 2018). Provided expert testimony on behalf of defendants in the form of two expert reports, deposition testimony, and trial testimony regarding various aspects of trust administration, securitization, secondary loan markets, valuation, and custody in regard to a hybrid CLO warehouse.
- *Research Associates, LLC v. Wisdom Tree Investments, Inc. et al., Case No. SACV11-01846 DOC (ANx)*. U.S. District Court, Central District of California, Southern Division (June–November 2012). Provided expert testimony in the form of declarations on behalf of plaintiff with respect to alleged patent violations in regard to financial index and portfolio construction based on fundamental data.
- *Residential Capital, LLC et al. ("Debtors"), Case No. 12-12020 (MG).* U.S. Bankruptcy Court, Southern District of New York (April 2012–January 2014). Provided expert testimony on behalf of a creditor, Financial Guarantee Insurance Corp (FGIC), in the form of an expert report regarding various aspects of trust administration, securitization, valuation, and monoline insurance in regard to the issuance of 190 CDOs.
- *Kenneth M. Krys and Christopher Stride as Joint Liquidators of Sphinx Funds et al. v. Robert Aaron; Guy Casanova; Derivatives Portfolio Management LLC et al., Case No.: 1:14-cv-02098.* U.S. District Court for the District of New Jersey (January 2012–June 2015). Provided expert testimony on behalf of plaintiffs in the form of an expert report and trial and deposition testimony on behalf of plaintiffs regarding various regulatory aspects and standards of care with regard to fund administration.
- *UFCW et al. v. Wells Fargo, N.A. et al., Case No. 2:2009-cv-00668.* U.S. District Court for the District of New Jersey (August 2011–January 2012). Provided expert testimony in the form of a declaration, reports, and deposition testimony on behalf of plaintiffs regarding various duties and responsibilities with respect to the discretionary investment of complex securities including RMBS and CMBS.
- *Leveraged Innovations et al. v. NASDAQ OM Group Inc. et al., Civ. No. 1:11-cv-3203 (KBF).* U.S. District Court, Southern District of New York (June 2011–February 2013). Provided expert testimony in the form of declarations on behalf of plaintiff with respect to alleged patent violations in regard to leveraged electronic traded funds.
- *Lehman Brothers Holdings, Inc. et al., Debtors and Lehman Brothers, Inc., Debtor (Chapter 11. Case No. 08-13555 and Case No. 08-01420 (JMP) SIPA), Customer*

Claim No. 900007799 of Westernbank Puerto Rico (Account No. 6670010), Customer Claim No. 900007798 of Westernbank International, a division of Westernbank Puerto Rico (Account No. 6813650). U.S. Bankruptcy Court, Southern District of New York (July 2010–July 2011). Provided expert testimony on behalf of the FDIC regarding various aspects of customer accounts and repurchase agreements in support of the bank's efforts to recovery Westernbank funds seized by Lehman Brothers' Trustee.

- *Prophet Capital Management, LTD v. Prophet Equity, LLC and Robert Epstein, Civil Action No. A 09 CA 316 LY.* U.S. District Court, Western District of Texas, Austin Division (July 2010–March 2011). Provided expert testimony on behalf of plaintiffs in the form of reports and deposition testimony regarding name confusion, prime brokerage, risk management, and trading related to hedge funds.
- *Ezra K. Nilson et al. v. JPMorgan Chase Bank, N.A. et al., Case No. 1:09-cv-00121.* U.S. District Court, District of Utah, Northern Division (April 2010–November 2011). Provided expert testimony in the form of a declaration and deposition testimony on behalf of plaintiffs, regarding various aspects of syndicated loan and loan administration practices and procedures.
- *Deutsche Bank, N.A. v. Bank of America, N.A. et al. Civil Action No. 09-cv-9784 (RWS)* and *BNP Paribas v. Bank of America, N.A. et al. Civil Action No. 09-CV-9783 (RWS).* U.S. District Court, Southern District of New York (January 2010–April 2015). Provided expert testimony on behalf of plaintiffs in the form of an expert report and deposition testimony regarding various aspects of trust administration, securitization, secondary mortgage markets, and custody in regard to a defaulted ABCP program.
- *Lehman Brothers Holdings, Inc. et al., Debtors and Lehman Brothers, Inc., Debtor (Chapter 11. Case No. 08-13555 and Case No. 08-01420 (JMP) SIPA).* U.S. Bankruptcy Court, Southern District of New York (November 2009–July 2010). Provided expert testimony on behalf of Barclays Capital, Inc. in the form of expert reports and deposition testimony regarding various aspects of SEC Rule 15c3 in support of the Trustee's Motion for Relief Pursuant to Sales Order.
- *Lehman Brothers Holdings, Inc. et al., Debtors and Lehman Brothers, Inc., Debtor (Chapter 11. Case No. 08-13555 and Case No. 08-01420 (JMP) SIPA), Customer Claim No. 900007799 of Westernbank Puerto Rico (Account No. 6670010), Customer Claim No. 900007798 of Westernbank International, a division of Westernbank Puerto Rico (Account No. 6813650).* U.S. Bankruptcy Court, Southern District of New York (November 2009–May 2010). Provided expert testimony on behalf of Westernbank in the form of declarations regarding various aspects of customer accounts and repurchase in support of the bank's efforts to recover funds seized by the Lehman Brothers' Trustee.
- *Jeffery E. Schuss et al. v. Penfield Partners, L.P. et al* (*C.A. No 3132-VCP)*. Chancery Court of the State of Delaware, New Castle County (November–December 2009). Provided expert testimony on behalf of defendants in the form of a report and a deposition with regard to an alleged breach of fiduciary duties on the part of a hedge fund's managing partner concerning payment-in-kind distributions.

- *Citadel Investment Group et al. v. Mikhail Malyshev and Jace Kohlmeier*. American Arbitration Association (December 2009–August 2010). Produced hearing and deposition testimony on behalf of plaintiffs in a dispute regarding misappropriation of intellectual property and trade secrets by ex-employees. Testified before the arbitration panel and in depositions. Specific issues for opinion included: finance theory and underlying mathematical techniques supporting high-frequency trading, trading and risk management strategies, software development, and trading management.
- *Several related Controladora Comercial Mexicana matters.* Provided expert testimony through affidavits, declarations, and expert reports on behalf of defendant with regard to the defendant's defaulting on a number of exotic derivative transactions. Spoke to the appropriateness of such transactions, their inherent risk and return, and general market practices regarding derivatives sales to corporate clients. Additionally, developed over a dozen exotic valuation models in connection with verifying plaintiffs' damages claims. The work was performed in connection with the following suits (all September 2009–September 2010):
    - *Barclays Bank PLC v. Controladora Comercial Mexicana S.A.B. DE C.V*. Supreme Court of the State of New York, County of New York
    - *J. Aron and Company v. Controladora Comercial Mexicana S.A.B. DE C.V*. Supreme Court of the State of New York, County of New York
    - *JPMorgan Chase v. Controladora Comercial Mexicana S.A.B. DE C.V*. Supreme Court of the State of New York, County of New York
    - *Merrill Lynch Capital Markets AG and Merrill Lynch Capital Services, Inc. v. Controladora Comercial Mexicana S.A.B. DE C.V.* Supreme Court of the State of New York, County of New York
- *Cantor Fitzgerald, L.P. v. Iris Cantor, Market Data Corporation, Rodney Fisher, and CFI. Chancery Court of the State of Delaware, New Castle County* (November 1998–August 1999). Provided expert testimony in court and through depositions on behalf of the defendants with regard to the alleged theft and improper use of intellectual property. Defendants were accused of improperly copying the designs and specifications of an automated bond and financial futures trading system.
- *O'Connor and Associates v. David Garbaze et al. U.S. District Court, Northern District of Illinois* (August 1988). Provided expert testimony in court and through depositions on behalf of the defendants with regard to the alleged theft and improper use of intellectual property by ex-employees. Defendants were accused of improperly copying and using option valuation and risk management algorithms along with system designs and specifications.

CONGRESSIONAL TESTIMONY AND ADVISORY

- *Government Accountability Office* (October 2008–January 2009). Facilitated several conferences with GAO staff helping to educate them on various economic and operational aspects of structured financial products in connection with the Troubled Asset Purchase Program.
- *Government Accountability Office* (November 2001–March 2002). Performed research and analysis for the GAO in regard to the September 11 terrorist attacks and the resulting impact on the U.S. financial system and infrastructure.

- *House Subcommittee on Communications Technology and the Internet* (November 2001). Prepared a whitepaper on the vulnerability of the U.S. financial system to terrorist attack. Read into the Congressional Record by Congressman Ed Markey (D-MA).
- *House Subcommittee on Telecommunications* (September 1995). Testified before the committee on the uses of over-the-counter derivatives in regards to possible regulation.

REPRESENTATIVE PUBLICATIONS

(1) *Some of the Challenges Facing DeFi for Mass Adoption*, co-authored with Jeanette Jin, PVA Toucan International Working Paper, June 2022.
(2) *Coefficient Optimal Control for Elliptic PDE*, doctoral dissertation, University of California, Berkeley, May 2021.
(3) *Survey of the Mathematical Foundations of Continuous-Time Finance*, master's thesis, University of California, Berkeley, December 2015.
(4) *Corporate Governance and Operational Risk Management – A Practical Guide*, Peter Vinella and Jeanette Jin, J. Wiley and Sons (not released).
(5) *Operational Risk—Practical Approaches to Implementation*, Ellen Davis (ed.), with Jeanette Jin (Chapter 6), Risk Books, March 2005.
(6) Reprint of the *Operational Risk 101* Series (translated into Chinese), *Banking Today* (Hong Kong), November 2005.
(7) Reprint of the *Operational Risk 101* Series, *Derivatives Portal* (online journal), June 2005.
(8) Reprint of the *Operational Risk 101* Series, *Banking Risk* (online journal), June 2005.
(9) *Operational Risk 101 – Management by Fact* (part 6 of a series), GT News, April 2005.
(10) *Operational Risk 101 – Roles and Responsibilities* (part 5 of a series), GT News, March 2005.
(11) Solicited Comments to the Draft Agency White Paper on the Sound Practices to Strengthen the Resilience of the U.S. Financial U.S. System, GT News, March 2005.
(12) *Operational Risk 101 – Tackling Basel II* (part 4 of a series), GT News, February 2005.
(13) *Operational Risk 101 – Operational Risk in terms of Operational Performance* (part 3 of a series), GT News, January 2005.
(14) *Operational Risk 101 – Demystifying KPI and KRI* (part 2 of a series), GT News, December 2004.
(15) *Operational Risk 101 – Basic Definitions* (part 1 of a series), GT News, November 2004.
(16) *Describing a Formal Foundation for KPI and KRI*, Operational Risk, November 2004.
(17) *Protecting the U.S. Financial System from Terrorist Attacks,* Bank Systems and Technology (Reprint). Read into the Congressional Record by U.S. Congressman Edward Markey during a hearing the House Subcommittee on Finance and Telecommunications, March 2002.
(18) *Protecting the U.S. Financial System from Terrorist Attacks*, GT News (reprint), February 2002.
(19) *The Trading and Risk Management ASP Directory,* Derivatives Strategy, December 2000.
(20) Online Risk Management: A Theory of eVolution, MiddleOffice, Spring 2000.

(21) *One e Too Many,* FOW, March 2000.
(22) [No title], FOW, December 1999.
(23) *Whoaaaah,* MiddleOffice, Winter 1999.
(24) *Bank Bashing,* FOW, October 1999.
(25) *Rio Aggrandisement,* FOW, September 1999.
(26) *Joseph Jett's Phantom Bets,* Derivatives Strategy, May 1999.
(27) *Mathematica for Dummies,* Derivatives Strategy, February 1999.
(28) So, You're in the Market for a Risk Management System, FOW, September 1998.
(29) *Black and White on Wall Street Review,* Derivatives Strategy, April 1998.
(30) *JP Morgan's FourFifteen,* Derivatives Strategy, December 1996.
(31) *Suggestion for Financial Derivative Regulation and Legislation,* PVA White paper. Presented to the House of Representatives Subcommittee on Finance and Telecommunications, June 1994.

REPRESENTATIVE PRESENTATIONS

(1) *The Challenges of LIBOR-Related Litigation*, Association of Corporate Counsel, April 24, 2012
(2) *LIBOR – What is It, How Does it Work, and Why is it Important?* Financial Institutions Committee, State Bar of California, August 8, 2012
(3) Panelist, *The Future of Structure Products "What's Next?"* European CLO and Structured Product Summit, October 2008, Monte Carlo, Monaco
(4) Panelist, *Investor Reporting and Deal Surveillance*, Global ACBP and SIVs Summit, September 2007, Paris, France
(5) Panelist, *Basel II Impact on CDOs, Credit Derivatives and Structured Credit Products in Europe*, European CDOs, Credit Derivatives and Structured Credit Products Summit, September 2007, London, England
(6) Panelist, *Views on the Loan Market and Trends in Collateral***,** CDO World 2007, March 2007, New York, NY
(7) Conference co-chair and panelist, *The CDO Secondary Market: Liquidity and Transparency*, European CLO and Structured Product Summit, October 2008, Monte Carlo, Monaco
(8) Panelist, 7th Annual CDO Summit, December 2007, Dana Point, CA
(9) Panelist, 6th Annual CDO Summit, December 2006, Dana Point, CA
(10) *Corporate Governance as a Key Value Driver,* SAS Financial Services Executive Summit, June 2005, Cary, NC
(11) Integrating Corporate Governance and Operational Risk Management, Enterprise Risk Management Symposium, May 2005, Chicago, IL
(12) *Establishing a Formal System of Internal Control for Modeling Operational Risk,* Financial Engineering Practitioners Seminar (Columbia University), March 2005, New York, NY
(13) *Op Risk Management and Streamlining Trade Processing,* BEA Financial Services Seminar, February 2004, New York, NY
(14) *September 11th and the Possible Regulatory Response,* Wall Street and Technology's Disaster Recovery and Business Continuity Conference, February 2002, New York, NY
(15) *The Need to Apply Quality Systems to Risk Management Practices*, 3rd Annual Derivatives Expo, May 2001, New York, NY

(16) Panelist, 2000 Derivatives Hall Fame Roundtable, August 2000, New York, NY
(17) Personal remarks, Managed Funds Association – Annual Forum, July 2000, Chicago, IL
(18) Panelist, Derivatives Strategies ASP Roundtable, May 2000, New York, NY
(19) *Will the Internet Put You Out of Work? (Oh Yeah and Sooner Than You Think),* 9th Annual International Derivatives Exhibition, March 2000, Frankfurt, Germany
(20) *The Global Risk Management Decision,* Merrill Lynch Risk Conference, January 1999, New York, NY
(21) *Risk Management Issues – Part 2,* Informix Risk Management Seminar, November 1998, New York, NY
(22) *Risk Management Issues,* Informix Executive Dinner, December 1997, New York, NY
(23) Presentation to the FIS Sales Force and Account Management Team, ADP/ICI *iMPACT* Product Premier, September 1996, New York, NY
(24) *Betting the Ranch,* Risk Management Seminar – Securities Industry Institute, Wharton Business School, University of Pennsylvania, March 1996, Philadelphia, PA
(25) *Automated Trading and Pre-Trade Compliance,* NASDR Technology Forum, December 1995, Washington, DC