



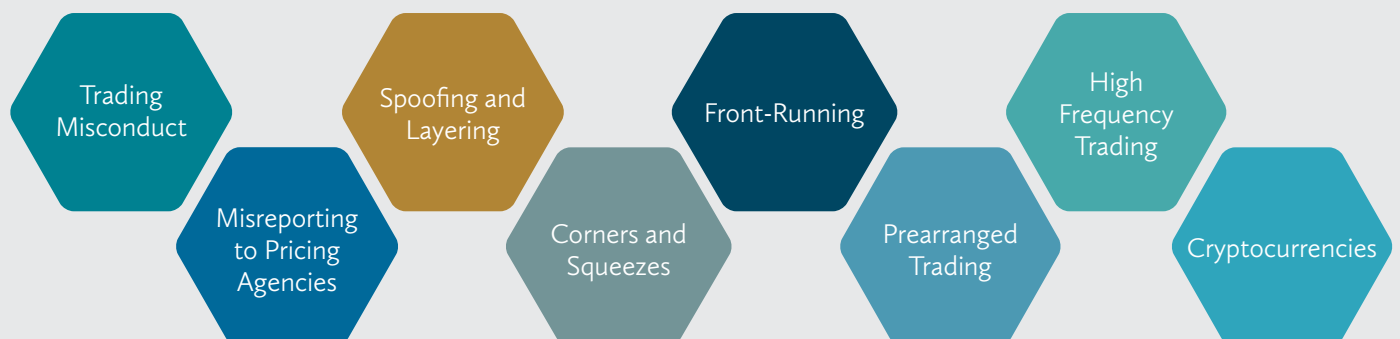
CORNERSTONE RESEARCH
Economic and Financial Consulting and Expert Testimony

Market Manipulation



Cornerstone Research works with clients on high-profile market manipulation litigation and regulatory matters. Our external and internal experts have academic expertise and practical experience across the range of markets. This, together with our staff's deep knowledge of economics and finance, enables us to support experts and clients with a robust, multidisciplinary approach.

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Market Manipulation: State-of-the-Art Analytics and Economic Evaluation

Cornerstone Research conducts detailed analyses in a range of matters involving benchmark manipulation, spoofing and layering, corners and squeezes, and wash trading allegations. We work with clients to determine the appropriate analyses for each matter, applying advanced modeling techniques and econometric methods to address complex issues.

We bring substantial experience handling big data, complex source code, and forensic analysis of data and documents. Using large public datasets and proprietary company information, we offer insightful and effective analyses. We combine technical expertise with a deep knowledge of litigation and regulatory issues.

PRODUCTS	MARKETS	AREAS OF SPECIALIZATION
Agricultural Commodities	Cash and Derivatives	Class Certification
Crude Oil and Refined Products	Domestic and International	Criminal Matters
Cryptocurrencies and Digital Assets	Electronic Exchanges and Over-the-Counter	Joint Defense Groups
Electricity	Futures and Exchanges	Litigation
Equity Investments and Derivatives	Physical and Financial	Private and Internal Investigations
Fixed-Income Securities and Derivatives	Primary Offerings and Syndication	Regulatory and Governmental Enforcement Actions
Foreign Exchange	Wholesale, Intermediary, and Retail Markets	Research and Analysis
Interest Rate Products		
Natural Gas and Natural Gas Liquids		
Precious and Base Metals		



Benchmark Manipulation: Trading Misconduct

Reference rates of financial and real assets are widely used in the global financial system as benchmarks for a range of transactions and financial products and contracts. Benchmarks, however, can be set in a variety of ways. For example, they may be calculated using voluntary versus mandatory trade reports or survey-based versus transaction-based data.

Alleged misconduct around benchmarks often takes one or both of two forms: (1) manipulation through direct conduct in the relevant markets prior to or during benchmark-setting periods, or (2) manipulation through misreporting trade prices, volumes, or other marketing information to price reporting agencies (PRAs) with the intent to distort the published benchmark.



Trading Misconduct

Evaluate allegations of trading behavior allegedly impacting or attempting to impact closing prices of different products and contracts.

Analyze detailed trade and order book data from proprietary and nonproprietary systems covering multiple years and spanning multiple trading desks to investigate allegations at issue.

Reconstruct daily positions, estimate exposure to market price movements, calculate portfolio values, and evaluate risk management metrics.

Analyze the instruments' market structure, market-wide volatility and liquidity conditions, and market trading behavior.

Assess trading behavior in the context of intraday hedging, market making, and risk exposure.

Evaluate economic impact of the alleged conduct on market prices and on other market participants.

Highlighted Case Study

Foreign Exchange

In several matters on behalf of global financial institutions, Cornerstone Research has analyzed allegations of front-running large client trades across multiple FX products. We have assessed alleged collusive trading and front-running of client orders before fixing benchmarks, triggering of stop loss orders, the alleged impact on in-the-money or out-of-the-money status of vanilla options, the impact on barrier triggers of exotic options, as well as trading and hedging around expiration of binary options and in proximity to barriers. We have also performed qualitative analysis of chat room discussions, audio transcripts, and other communications describing trading activity in the context of traders' underlying positions and trading behavior.

Selected Experience

Interest Rates and Swaps Products

In ISDAFIX investigations, we have analyzed chat room discussions, audio transcripts, and other communications describing trading activity in the context of traders' underlying positions and behavior. Cornerstone Research has helped clients understand how traders evaluate their risk exposure created by client orders and expiring option positions around benchmark-fixing processes as well as the trading strategies traders might employ to hedge these risks.

Agricultural Commodities

Cornerstone Research has worked on agricultural commodity matters involving alleged misconduct affecting the publication of agricultural price benchmarks and related futures contracts. In these matters, we analyzed trading data to investigate price impact and materiality.

Crude Oil and Associated Products

Cornerstone Research has analyzed misconduct allegations relating to trading in international crude oil, gasoline, and natural gas. These cases involved allegations of misconduct by the oil majors' trades and orders that were incorporated into the assessments conducted by Platts and other PRAs and subsequently into the published benchmarks.

Assessing Regulatory Claims

On behalf of several of the oil majors, Cornerstone Research has analyzed data related to subpoenas received from international regulators relating to trading in international crude oil products, domestic crude oils, domestic gasoline, and domestic natural gas as well as potential impacts on petroleum price benchmarks. In these matters, Cornerstone Research reviewed trading records and market data to assist in developing a response strategy and to evaluate potential claims relating to oil majors' conduct in the trading markets around benchmark-setting periods.



Benchmark Manipulation: Misreporting to Price Reporting Agencies

PRAs collect, aggregate, and distribute information on the prices of products transacted in physical and financial markets. The methodologies used by the PRAs vary considerably. For example, some PRAs apply largely subjective approaches based on the trading experience of their reporters; other agencies rely almost entirely on mechanical approaches based on consummated transactions or estimates directly observed in the market or submitted by traders.

Misreporting to Price Reporting Agencies

Evaluate trading data and positions to assess allegations of strategic misreporting of trade data to PRAs in order to benefit market positions.

Analyze purported trading strategies and objectives to evaluate whether actual trading activity is consistent with stated objectives and economic rationale.

Review chat room discussions, instant messages, emails, phone recordings, and other forms of communications to analyze trading conduct, price reports, and benchmark outcomes.

Analyze data from both physical and relevant financial markets, such as whether observed quantities and qualities of the commodity at issue are in line with the underlying contract and reported quantities and qualities.

Evaluate the allegedly impacted benchmark relative to alternative rate or price measures to develop an understanding of the expected benchmark level but for the alleged misconduct.

Utilize available datasets to formulate and quantify alleged ill-gotten gains and damages exposures for financial institutions and trading firms.

Highlighted Case Study

Interest Rate Benchmark Investigations and Civil Litigation

In interest rate benchmark cases, we have evaluated allegations of antitrust violations and market manipulation. Cornerstone Research has assessed submitted rates relative to alternative measures of rates. We have analyzed chat room comments and other forms of communications, conducted statistical analyses of the factors affecting submitted rates, and examined whether deviations generated by statistical models are consistent with relevant communications.

Selected Experience

Crude Oil and Associated Products

Cornerstone Research was retained to assess allegations of misreporting to PRAs in propane, butane, naphtha, and associated products. The analysis involved evaluating other market participants' trading activity, quality and quantity of the products, location and shipping terms, and price movements.

Natural Gas

In natural gas price misreporting investigations, Cornerstone Research has analyzed company and market data to determine the number and characteristics of trades made by the company, whether these trades might have been considered reportable at the time they were made, and whether these trades or the related market conditions were accurately represented in reports to PRAs. We also conducted detailed analysis of company, desk, and trader positions to analyze the potential incentives or disincentives to misreport trade prices.

We have analyzed purported trading strategies and objectives to evaluate whether actual trading activity is consistent with stated objectives and economic rationale.



Spoofting and Layering

Allegations of spoofing and layering can arise in a wide range of market settings, whether on electronic platforms or voice-brokered markets. They can involve all financial instruments as well as physical assets. A deep understanding of market microstructure is critical to these cases.



Spoofing and Layering

Conduct forensic analysis of large proprietary financial datasets to identify potential problematic conduct (both manual and algorithmic), assess the scope of conduct in question, and analyze trading patterns.

Clean, process, and analyze large datasets with tick-level order and trade data, such as financial institutions' internal order-level data, exchanges' publicly available market depth data, and trading venues' proprietary audit trail data.

Assess allegations of multiple traders' coordinated spoofing conduct and evaluate their trading behavior in the context of chats and other documentary evidence.

Analyze the alleged trading behavior in the context of varying market conditions, as well as financial institutions' risk management and market-making activity.

Utilize available datasets to formulate and quantify alleged ill-gotten gains and damages exposures for financial institutions and trading firms.

Investigate the potential impact in correlated markets or products.

Highlighted Case Study

Fixed Income

In a consulting matter for a global bank responding to requests from two different international regulators, Cornerstone Research analyzed a large message-level database of government bond futures transactions. We assessed the state of the order book when the allegedly suspicious orders entered the market as well as their alleged impact on prices and quantities.

Selected Experience

Metals

We have been retained by global financial institutions in numerous matters involving spoofing allegations. We have conducted forensic analyses of precious and base metals futures markets to investigate traders' trading strategies in varying market conditions. Our staff and experts have also assessed financial institutions' risk management and market-making activity.

Index Derivatives and Foreign Exchange

In matters involving spoofing allegations of index derivatives and FX markets, we have developed algorithms to identify potential order activity of interest. We have performed in-depth analyses to examine order activity in the context of markets and traders' trading strategies, risk management, and market-making activities. Our experience also covers cross-market spoofing activity between spot (cash) markets and the related derivative markets.

We have conducted analysis of large proprietary financial datasets to identify potential problematic conduct, assess the scope of conduct in question, and analyze trading patterns.



Corners and Squeezes

Corners and squeezes are the inappropriate exercise of market power in either an asset or the futures or forward contract referencing that asset. Allegations of corners or squeezes may require analyzing the evolution and size of portfolio positions and holdings of the relevant contracts and physical commodities. We put these positions into the context of the conditions affecting the physical supply and demand of underlying assets as well as factors impacting trading and pricing of the relevant contracts across multiple electronic and exchange trading venues.



Corners and Squeezes

Assess outstanding short positions before relevant events as well as changes to short positions during relevant events.

Provide microstructure analysis of price changes underlying corners and squeezes (e.g., existence of abnormal prices).

Assess potential factors leading to corners and squeezes, such as market participants' trading and/or macroeconomic events.

Analyze potentially related markets and their role in relevant events.

Assess trading behavior in the context of intraday hedging and risk management, market making, and the execution of client orders.

Analyze the physical market for the delivered asset to determine deliverable supply.

Highlighted Case Study

Crude Oil and Associated Products

On behalf of a multinational oil and gas company, Cornerstone Research analyzed allegations that the company had cornered the market for propane. Our analysis involved evaluating physical and financial positions relative to market conditions and price movements.

Selected Experience

Agricultural Commodities

Cornerstone Research has analyzed allegations of commodities market manipulation through trading activity in both futures and OTC markets, for example, Commodity Futures Trading Commission (CFTC) Rules 180.1 and 180.2. We examined data and reports from proprietary trading systems, as well as publicly available data from the U.S. Department of Agriculture (USDA), the Chicago Mercantile Exchange (CME), the CFTC, and other third-party sources. We also analyzed allegations of improper exercising of market power to create an artificial price.

Non-Agricultural Commodities

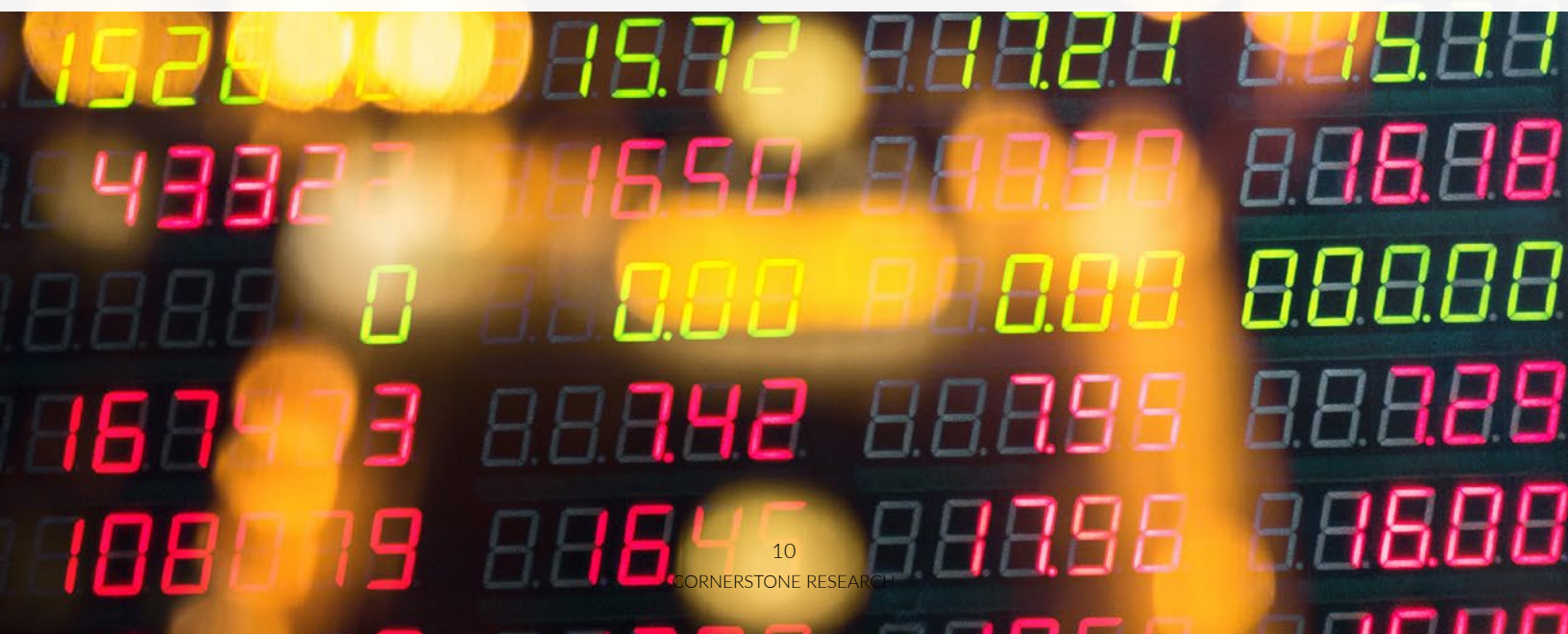
Cornerstone Research has evaluated claims of manipulative exercise of market power in light of existing supply and demand conditions. In particular, we evaluated the alleged impact of delivery through the futures contract delivery mechanism compared to taking physical possession of the underlying commodity. These analyses also assessed whether an abnormal price existed during the relevant time period.

Our staff and experts have utilized audit trail, order book, and transaction-level data to analyze trading in derivatives and their respective underlying products.



Front-Running and Pre-Hedging

Allegations of front-running can occur for a variety of financial instruments, and multiple recent high-profile white collar litigation and regulatory matters involve such claims. Front-running refers to the practice in which a dealer with advance, private knowledge of an imminent client order places orders for the dealer's own account with the intent to impact the price of the security at issue. Pre-hedging, on the other hand, is a legitimate trading strategy and common practice where a dealer takes a hedge position in anticipation of an incoming trade.



Front-Running and Pre-Hedging

Provide detailed analysis of client transactions and the associated, often complex, hedging transactions or contemporaneous trading in the market.

Analyze the trading behavior surrounding pricing calls, barrier trigger events, or other key pricing events in connection with execution of hedging strategies.

Analyze timing, pricing, and volume of trading based on order book and transaction-level data across a range of exchanges and trading platforms (voice, hybrid, electronic).

Assess traders' conduct with electronic communication, risk management reports, or other documentary evidence.

Assess the potential market and value impact of the trading in question.

We have provided detailed analysis of client transactions and the associated, often complex, hedging transactions or contemporaneous trading in the market around pricing events.

Selected Experience

Interest Rate Derivatives

Cornerstone Research consulted to broker-dealers facing regulatory investigations of alleged manipulative trading to influence the pricing of complex interest rate derivatives entered in conjunction with large bond issuances. Our analysis involved dissecting the transactions and evaluating the risk the bank takes on when entering into these complex derivatives, determining what trading strategies might be used to hedge the risk, and assessing whether the trading in the relevant markets leading up to and during any pricing calls was consistent with prudent risk management strategies. In connection with the trading data analysis, we have analyzed electronic communications and pricing calls information.

Foreign Exchange

Cornerstone Research has analyzed allegations that traders at a multinational bank's FX trading desk traded ahead of a large client order. Our analysis involved evaluating bank internal data on the desk's and individual traders' profits and losses, assessing transactions in instruments related to the relevant currency, and assessing transactions in relevant related currencies. We assessed the potential market impact of the trades in question by analyzing publicly available order book and transaction data from all relevant FX trading venues.

A background image featuring a stylized candlestick chart in shades of teal and light blue, set against a dark blue grid. The chart shows an upward trend with several candlesticks, some of which are highlighted with a glowing effect. The overall aesthetic is modern and financial.

Wash, Round-Trip, and Prearranged Trading

Allegations of wash trading can occur for every market and financial instrument. Wash trading (also referred to as “round-trip trading” or “prearranged trading”) creates the appearance of purchases and sales without incurring market risk or changing the trader’s market position.

Wash, Round-Trip, and Prearranged Trading

Assess and quantify alleged damages as well as evaluate other potential explanations for observed trading behavior.

Evaluate pairs of similar trades to assess how they fit with purported trading strategies and techniques.

Utilize proprietary and publicly available data to assess in-depth trading behavior in the context of varying market conditions, as well as financial institutions' risk management and market making activity.

Evaluate any potential impact of alleged trading on other market participants.

Assess the impact of market participants' trading on the underlying products.

Analyze trading behavior in the context of intraday hedging and risk management, market making, and the execution of client orders.

Evaluate volume integrity of exchanges and markets.

Highlighted Case Study

Energy

Cornerstone Research evaluated and rebutted allegations of Commodity Exchange Act (CEA) violations resulting from allegedly improper burst and churn trading by a large energy trading firm on a prominent electronic trading platform. For several energy trading firms, Cornerstone Research has investigated allegations of CEA violations through improper wash or round-trip trading. This analysis involved evaluating inadvertent or intentional trades and the potential impact of alleged trading.

Selected Experience

Equity Index

On behalf of financial institutions and trading firms, Cornerstone Research has analyzed allegations of wash trading in equity index futures markets and treasury futures markets. The allegations at issue pertained to both voice trades and trades on electronic platforms. Our analysis focused on estimating the potential market impact of the events at issue.

Cryptocurrencies and Digital Assets

Cryptocurrencies and digital assets can be traded like other financial products. While the regulatory landscape for crypto exchanges continues to evolve, many exchanges have imposed their own rules to prevent abusive trading conduct. In addition to trading on centralized exchanges, market participants can transact cryptocurrencies and digital assets through decentralized finance (DeFi) liquidity pools that exist on blockchains. Cornerstone Research understands the market structures underlying these exchanges and analyzes all facets of the trading conduct occurring on these venues.

Fixed Income

Cornerstone Research has investigated and analyzed patterns of potential round-trip trades among several traders of fixed-income instruments. These complex structures involved three or more parties and multiple trades of varying sizes and at different prices. While they increased the parties' market volume statistics, when viewed in aggregate, the structures appeared to comprise sets of transactions with no net change in positions. Using algorithmic coding, we were able to identify the occurrences of the structures at issue and analyze how they fit into the marketplace and impacted relevant positions and trading.



High Frequency Trading

We have experience working on various aspects of high frequency and low latency trading, performing assessments of trading strategies, trading algorithms, and the impact of HFT trading on market dynamics, as well as broker-dealers and trading platforms' order handling algorithms in the HFT environment.

High Frequency Trading

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Analyze a hedge fund's HFT algorithms and respond to a Securities and Exchange Commission (SEC) investigation into market manipulation.
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Reconstruct interactions among market participants' order activities, including high frequency trading in temporary market dislocations.
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Assess "last look" practices in the FX markets, including the order handling protocols of multiple FX dealers and Electronic Communication Networks (ECNs) and the low latency trading algorithms of hedge funds.
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Work on trade secret cases involving the alleged theft of HFT algorithms.
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Assess order flows and order handling algorithms by alternative trading systems (ATSs) and broker-dealers.
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Highlighted Case Study

Algorithmic Execution

Cornerstone Research consulted with an equity broker-dealer that offered various routing algorithms to programmatically execute orders across both "lit" platforms (i.e., buyers' and sellers' orders are displayed) and "dark" venues (i.e., market participants' trading interest is not displayed prior to execution). We analyzed different measures of execution quality for individual "child" orders (i.e., a large block of shares sliced into smaller lots) sent to various platforms to explain why the algorithms chose to direct orders to different platforms at different times. Our analysis also assessed how different algorithms executed "parent" orders as a whole to meet investor demands, for example, maximizing speed of execution versus minimizing price impact.

Selected Experience

Alternative Trading Systems

ATSs are SEC-regulated electronic trading platforms that match orders for buyers and sellers of securities. After exchanges, ATSs account for the majority of equity trading volume in the United States. Cornerstone Research consulted with an ATS to review its trading records in order to evaluate price impact from different types of order flow, the interaction of different types of market participants, and the prevalence of certain HFT strategies such as latency arbitrage.

FX Last Look

Cornerstone Research has analyzed FX dealers' and ECNs' order handling protocols and trade acceptance practices in the context of regulatory investigations and litigation related to "last look." Last look refers to the practice of giving liquidity providers a final opportunity to examine and reject a client order after the client commits to trade at a quoted price, with the decision sometimes depending on the changes in market price since the quote was streamed. We analyzed the impact of "last look" on different market participants, how "last look" affected dealers' overall pricing for different market participants, and the interaction of dealers' trade acceptances algorithms with latency arbitrage and other aggressive HFT trading strategies.



Cryptocurrencies and Digital Assets

Cryptocurrencies and digital assets can be traded like other financial products. While the regulatory landscape for crypto exchanges continues to evolve, many exchanges have imposed their own rules to prevent abusive trading conduct. In addition to trading on centralized exchanges, market participants can transact cryptocurrencies and digital assets through decentralized finance (DeFi) liquidity pools that exist on blockchains. Cornerstone Research understands the market structures underlying these exchanges and analyzes all facets of the trading conduct occurring on these venues.



Cryptocurrencies and Digital Assets

Analyze liquidity, price impact, and limit order book market depth on crypto platforms.

Evaluate crypto volume and market quality metrics.

Compare price discovery across crypto platforms.

Address wash trading and other market manipulation allegations.

Assess market making and arbitrage algorithms.

Analyze price dynamics of tokens under changing market conditions (e.g., circulating supply, liquidity changes, etc.).

Process blockchain and DeFi data involving “on-chain” algorithmic stablecoin transactions, including mint-and-burn mechanisms and other stablecoin swap facilities.

Assess DeFi liquidity pool trading for tokens of various blockchains, including Ethereum, Terra, and Cosmos.

Highlighted Case Study

In a consulting matter, Cornerstone Research analyzed the market events surrounding the de-pegging of an algorithmic stablecoin. Our analyses covered trade and order book data across more than ten cryptocurrency exchanges, multiple blockchain liquidity pools (DeFi exchanges), and the forensic tracing of tokens across blockchains. We identified a number of wallet addresses that made large sequential trades on the blockchain and correlated the actions of those wallets across blockchains and to centralized crypto exchanges. We presented our analyses to U.S. regulators.

Selected Experience

Wash trading is a prominent example of a potentially abusive trading strategy that crypto exchanges address in their self-regulatory frameworks. This strategy has been alleged to artificially inflate trading volume on crypto exchanges, thereby fraudulently attracting more market participants.

On behalf of crypto exchanges and market participants, Cornerstone Research has examined the exchanges’ volume integrity, including potential instances of wash trading. These investigations include assessing trading behavior in the context of varying market conditions as well as highlighting potentially prearranged trades.

We have analyzed stablecoin trading patterns occurring simultaneously on DeFi platforms (“on-chain”) and centralized exchanges (“off-chain”), both to assess potential price impact and determine whether such trading was consistent with coordinated activity among market participants.

Our staff have presented these and other crypto market analyses to U.S. regulators at the SEC, CFTC, Department of Justice (DOJ), Office of Foreign Assets Control (OFAC), and the Financial Crimes Enforcement Network (FinCEN).

Cornerstone Research provides detailed analyses of trading patterns associated with proprietary algorithmic trading bots on leading crypto exchanges.



Other Market Microstructure Topics

Securities and commodities industry participants strive to innovate and compete within an environment of constant regulatory and technological changes and ever-evolving market structures. These dynamics have led to conflicts over the interpretation of rules, often manifesting in the form of regulatory investigations, disciplinary proceedings, and private litigation. Such actions have involved nationally registered exchanges, clearing agencies, alternative trading systems, broker-dealers, investment advisors, institutional investors, and both professional and retail traders.



Other Market Microstructure Topics

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Analyze market quality in OTC stock markets, pursuant to a pilot rule change, and submit on behalf of a regulator with eventual submission to the SEC.
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Analyze trading records and failed delivery data for a group of large clearing firms faced with allegations of improper clearing and settlement procedures in connection with short selling in equity markets.
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Evaluate whether customer orders were properly executed by analyzing trades in actively traded NASDAQ securities.
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Help a stock exchange respond to an SEC enforcement investigation on issues related to Securities Information Processor (SIP) trade reporting.
.....

Conduct studies of market quality in option markets to evaluate the impact of various SEC and self-regulatory organization (SRO) rules.
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Work on white papers connected to SEC rulemaking in the market structure space.
.....

We have analyzed trading records and failed delivery data for a group of large clearing firms faced with allegations of improper clearing and settlement procedures in connection with short selling in equity markets.

Selected Experience

Market Quality Study

The SEC's Division of Economic and Risk Analysis (DERA) retained Cornerstone Research in a matter related to a pilot program that allows certain exchange-traded options to be quoted in reduced price increments. Our analysis used quoted and effective spreads as measures of market quality. This research sought to assist DERA staff in evaluating whether the program should be expanded (or contracted) by examining the spreads of pilot option classes vis-à-vis matched controls.

Exchange Competition

In an antitrust lawsuit between two exchanges in the futures market, Cornerstone Research evaluated allegations that one exchange illegally blocked the entry of the other exchange by lowering transaction fees to predatory levels. We supported an expert in evaluating whether plaintiff and plaintiff's experts articulated a methodology for calculating the impact of the defendants' alleged anticompetitive actions on the probability of success of the entrant. Using hundreds of gigabytes of audit trail and order book data, we analyzed the likelihood of competition in a highly centralized, order-driven market. Our analysis also involved assessing how electronic trading changed the market at issue at the time of the entry attempt and how liquidity network effects can impact competition.

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