



UCHICAGO MIDWEST TRADING COMPETITION

2019



THANK YOU TO OUR SPONSORS!



WELCOME

On behalf of the University of Chicago and the UChicago Financial Markets program (FM), we are pleased to welcome you to the 7th Annual UChicago Midwest Trading Competition! We are excited to have you as part of our largest competition to date. Thank you to our FM student case writers and platform developers, the Polsky Exchange, and most importantly, our corporate sponsors for their leadership and support.

This trading competition could not be possible without the generous support of our corporate sponsors. This year's sponsors include: AQR, Belvedere Trading, BP, Chicago Trading Company, Citadel, DRW, Eagle Seven, Flow Traders, Group One, IMC, Optiver, Peak6, Susquehanna, Virtu, Volant Trading and Wolverine.

We are delighted to have four platinum sponsors this year: Citadel, DRW, IMC, and Optiver. Each platinum sponsor has planned a unique event to get to know competition participants. Starting Friday afternoon, participants will have the opportunity to attend Optiver's Trading Immersion and IMC Financial Markets' Networking Reception. On Saturday Citadel will host a cocktail reception and awards ceremony, followed by a poker night at DRW.

The trading competition will begin at 8:00am on Saturday, April 13th at the Polsky Exchange near the University of Chicago campus in Hyde Park. The focus of this event will be algorithmic trading, with three cases covering the following themes – curve trading, options market-making, and factor investing. Please read through the remainder of this packet to find the three trading cases, a tentative schedule of events, and additional event logistics. As a reminder, **each team must bring at least one laptop to the competition on Saturday**.

Each case requires preparation before competition day, and we recommend you prepare your algorithms well in advance. Cases 1 and 2 will require draft code submission due on April 1st, with the final code being run live on the day of the competition. Case 3 will be run in advance of the competition and will require final code submission due on April 1st, see case descriptions for further detail. Separately, BP will conduct a Crude Oil Trading Simulation on the day of the competition. **This simulation requires no preparation in advance of the competition and will be scored independently of the other two cases.**

Along with the educational value that this event cultivates, it also brings together like-minded students from across the country, provides a great networking platform for our sponsors, and showcases the robust financial markets industry in the city of Chicago. If you have any questions regarding the competition, contact Julia Bishop at juliabishop@uchicago.edu or Vishal Jain at vishaljain@uchicago.edu. We look forward to hosting you in April.

Good Luck!

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SCHEDULE OF EVENTS

Friday, April 12

3:00PM

Optiver Trading Immersion

Prudential Plaza – 130 East Randolph, Suite 1300



5:30PM

IMC Financial Markets Networking Reception

Willis Tower – 233 South Wacker Drive, Suite 4300



Transportation will be available from Optiver to IMC and from IMC to the Hyatt. Transportation will not be provided from the Hyatt to Optiver as the Hyatt is a 5 minute walk from Optiver. Photo ID required for all check-in. Business casual attire.

Saturday, April 13

7:30AM – 8:00 AM

Shuttle Bus Departure

Hyatt Regency: 151 E Wacker Dr, Chicago, IL 60601

8:00AM – 9:00 AM

Check-in & Breakfast

Polsky Exchange North – 1452 East 53rd Street

Breakfast and networking. Photo ID required for check-in. Formal business attire.

9:00AM – 9:15 AM

Welcome Remarks and Trading Platform Introduction

9:15AM – 10:15 AM

Case 1: Curve Trading

10:15AM – 10:30 AM

Break

10:30 AM – 11:30 AM

Case 2: Options Market-Making

11:30 AM – 11:45 AM

Break

11:45 AM – 12:30 AM

Case 3: Portfolio Investing

12:30 PM – 1:45 PM

Sponsor and Competitor Lunch

1:45 PM – 3:30 PM

BP Crude Oil Trading Simulation | Career Fair

4:00 PM – 5:30 PM

Citadel Reception & Award Ceremony



5:30 PM – 6:00 PM

Bus to DRW Office

6:30 PM – 7:00 PM

DRW Poker Night



***** All sessions are required for participants to be eligible for prize money *****

PARTICIPANTS

We are pleased to announce that over 100 students across the United States will participate in this year's competition. The following institutions will be represented:

- Amherst College
- Baruch College
- Carnegie Mellon University
- Columbia University
- Cornell University
- Duke University
- Grinnell College
- Harvard College
- Indiana University - Bloomington
- Massachusetts Institute of Technology
- Northwestern University
- Princeton University
- Rice University
- Smith College
- St. Bonaventure
- The University of Chicago
- The University of Texas at Austin
- University of California – Berkeley
- University of California – Los Angeles
- University of Colorado – Boulder
- University of Kansas
- University of Michigan
- University of Notre Dame
- University of Pennsylvania
- University of Wisconsin – Madison
- Washington University in St. Louis

AWARDS

Awards will be announced during the awards ceremony hosted by Citadel. Cash prizes will be awarded to the winning team of each individual case and the top three overall winners based on aggregate scores across all cases. Participants must attend all sessions on Friday and Saturday to be eligible for prize money. Please be sure to make arrangements to be in Chicago through Saturday night to enjoy the city and attend all of the planned events.

ATTIRE

Business casual attire is requested for Friday's events at Optiver, and IMC Financial Markets. Business formal attire is expected for the competition on Saturday. Jeans, gym shoes, tee shirts, or casual clothing are not permitted for any events. Thank you!

LOGISTICS

Friday, April 12

Optiver

Prudential Plaza – 130 East Randolph, Suite 1300

IMC Financial Markets

Willis Tower – 233 South Wacker Drive, Suite 4300

A shuttle bus will be provided from the Optiver to IMC and from IMC to the Hyatt. No transportation will be provided from the Hyatt to Optiver, as the hotel is a 5-minute walk from Optiver. Photo ID required for all check-in. Business casual attire.

Saturday, April 13 **Polsky Exchange North (formerly CIE)**

1452 East 53rd Street

The Polsky Exchange is near the UChicago main campus in Hyde Park (approximately 20 minutes from downtown Chicago). The entrance is located on 53rd street. Enter through the double doors and head up to the 2nd floor. Photo ID required. Business formal attire.

Award Ceremony hosted by Citadel

DRW Poker Night

540 W Madison Street - Suite 2500

Parking

The following parking options are available at the Polsky Exchange:

- **Harper Court Garage**, located between 52nd and 53rd on South Lake Park Avenue. The garage entrance is on the west side of Lake Park Avenue, north of 53rd Street and is now accessible to both northbound and southbound traffic.
- **Hyatt General Public Lot**, immediately west of the Hyatt Hotel.
- **Street Parking**, There is limited free street parking northwest of the Polsky Exchange.

Hotel

A block of rooms has been reserved at the Hyatt Regency located at 151 E Wacker Dr, Chicago, IL 60601. Participants are encouraged to stay both Friday and Saturday night. Please click on the following link to make a reservation by **Friday, March 22nd**.

[UChicago Midwest Trading Competition Room Block Link](#)

Airport Information

Transportation to and from the airport will not be provided. Taxi and Ubers are available at both Midway and O'Hare airports. Alternatively, the Orange line serves the downtown Chicago area from Midway Airport, and the Blue line serves the downtown Chicago area from O'Hare Airport.

Questions regarding logistics should be sent to Erwin Paderanga – erwinp@uchicago.edu



Competition Technology

The University of Chicago Financial Markets Program (FM) is excited to debut its in-house trading platform χ -Change built by senior members of the FM program for the 7th Annual UChicago Midwest Trading Competition! Cases 1 and 2 for the competition will be run live utilizing this platform. Case 3 will be run before the competition and results will be played back at the event.

In the next few weeks, you will receive emails detailing instructions on accessing the trading platform and practice data and on accessing Piazza, which will be used to address competitor questions and provide important case and platform updates. The FM case writing team will respond to questions within 24 hours of posting on Piazza.

Algorithm Development

Competitors may develop their algorithms in any computing language, however, Python will be the only officially supported language. No other languages will receive explicit support from the case writing team. On the day of the competition, one user from each team will be responsible for manually starting the team's algo at the beginning of each case round. Additional details on rules and requirements for each round can be found in the case descriptions.

Competition Preparation & Training Sessions

Training sessions and live webinars/Q&A sessions will be held before the competition by our FM platform development team. Details on dates and times will be communicated via Piazza. A live practice session will be held on Tuesday, April 2nd.

Case Submission Dates

For Cases 1 and 2, all competitors must submit a draft of their code by Monday, April 1st. Competitors will run their finalized algorithms locally on the day of the competition.

For Case 3, competitors' final algorithms must be submitted by Monday, April 1st. This case will be run in advance of the competition. Teams will not run their algorithms live on the day of the competition. Final scores will be announced on the day of the competition.

If you have not received the email invitation to join the trading platform or Piazza channel by Monday, March 4th, please contact uchimwtc@gmail.com.

CASE 1: CURVE TRADING

Introduction

The relationship between prices of assets driven by a common fundamental usually displays a consistent pattern through time. This stable relationship might be temporarily upset by the actual conditions on the market, but as time goes on the expectation of these minor fluctuations is zero. In this case, we will dabble in the ripples of asset relationships by trading an interest rate yield curve.

UC rate future, a fictional instrument, measures the lending rates offered by banks in Chicago. The yield curve is captured by prices of futures at different maturities (see below), and it is your job to uncover the mechanics behind the price relationship. Note that you should not assume or attempt to predict the direction of price movement itself. It is how they diverge or converge that we are interested in and can be assured of. In addition, beware that these are fleeting opportunities preyed on by a swarm of traders. You need a solid execution strategy to realize the profits.

Successful competitors will:

- 1) Identify the price relationship discrepancy
- 2) Demonstrate a careful use of limit and market orders to compete with the peers

Case Specifications

You will have access to the May – October contracts designated with the following symbols:

Code	Month
K	May
M	June
N	July
Q	August
U	September
V	October

Participants will trade futures contracts that will expire at the end of each available month. These instruments are priced such that if buyers hold the contract to maturity, they will receive $100 * (1 + \text{UC rate at the time expiry})$. For our purposes, we may treat the pricing mechanism as a black box that abstracts away the complexities of futures and enables us to trade them just like a regular asset. The focus is on relative price movement. At the end of each round, your accumulated positions will be liquidated as specified in the Penalty Section.

Your trades will be executed on the χ -Change platform. Orders from each team will be placed in a common pool subject to priority constraints and could interact with one another. An additional privileged bot will place orders so as to dictate price movements and market conditions. The market microstructure will be laid out with detailed documentation during our subsequent platform and devkit release.

Teams have the choice to build their algorithms using whichever programming language that implements gRPC binding; however, Python will be the officially supported language. No other languages will receive explicit support from the case writers. Manual trading is not permitted and not possible.

The asset code for each future is IDX#UC[month of expiry]. For example, the future expiring at the end of July would be signified by IDX#UCN and the future expiring at the end of September would be IDX#UCU.

Round Specifications

There will be two 15-minute rounds. You will have around five minutes between each round to make changes to your algorithm if you so choose.

Positions and PnL are not carried over between rounds.

Data and platform simulation will be provided so that you can train your algorithm prior to the competition. The market fundamentals are consistent between the training data and the two rounds. Note that the rounds are independent of each other.

Rules

1. You may take long or short positions in all futures available in a round
 - a. There is a risk limit in this competition in terms of units of outright exposure. This is calculated as:
$$\text{outright exposure} = |\# \text{ of long contracts} - \# \text{ of short contracts}|$$
 - b. If you exceed the maximum outright exposure at any time during the round, all future orders will be rejected, and you will be disqualified at the end of the round
2. There is a maximum order size in this competition. Exceeding it will result in the rejection of your entire order.

The maximum order size, outright exposure, and any other relevant parameters will be provided in a more detailed case documentation during our platform release.

Penalties

At the end of each round, your open positions will be liquidated automatically at the midpoint of the best bid and ask.

We reserve the right to disqualify teams if we think that they are making uninformed directional bets. The discretion will be exercised sparingly. Disqualification, if any, will more often result from outright exposure significantly outside the limits set in the previous section or by teams aggressively attempting to influence the order book with orders they do not intend to see filled.

Scoring

At the conclusion of each round, each team will receive points corresponding to their PnL. The team with the highest PnL in each round will receive 40 points, the team with the second-highest PnL will receive 39 points, and so forth. Any team disqualified during a round will receive 0 points for that round.

Code Submission

We will require a preliminary submission by Noon (12:00PM CST) on Monday, April 1st. The final code will not need to be submitted and will be run from your local computer on the day of the competition; however, we reserve the right to inspect competitors' final code.

Case Materials/Data

A development toolkit, detailed documentation and training data will be released together with the trading platform. Announcements will be made on the UChicago Trading Competition Piazza.

Questions

For questions regarding Case 1, please post in the UChicago Trading Competition Piazza in the “case1” folder.

CASE 2: OPTIONS MARKET MAKING

Introduction

In this case, you will make markets for options on the (fictional) Phoenix Index PHX, a broad-based market measure. You will manage a book consisting of various option strikes, and the goal of this case is to provide liquidity to the options markets and profit against your competitors while controlling risk exposure. You are to build an algorithm that can handle and automatically adjust to various market conditions.

Successful competitors will:

- 1) Provide liquidity to the market and help price discovery by tightening the bid-ask spread
- 2) Identify profitable trading opportunities in the market and capitalize on them
- 3) Hedge risk and manage inventory as necessary

Case Specifications

There will be three fifteen-minute rounds. Each round will be traded on the χ -Change platform. Orders from each team will be placed in a common pool subject to priority constraints and could interact with one another. An additional privileged bot will place orders so as to dictate price movements. The market microstructure will be detailed in our subsequent platform release. You will have around five minutes between each round to make changes to your algorithm if you so choose.

Teams have the option to build their algorithms using any programming language that implements gRPC bindings; however, Python will be the officially supported language. No other languages will receive explicit support from the casewriting team.

You will be trading European option contracts in each round on strikes closest to, and symmetrical about, the at-the-money strike (\$100 at the beginning of each round). The contract multiplier for options contracts is 1, so the contracts are cash-settled at $\max\{S_T - K, 0\}$ for calls and $\max\{K - S_T, 0\}$ for puts, where K is the strike and S_T is the value of the index at expiry. All contracts will expire and be settled at the end of each round. The risk-free interest rate is zero and the underlying index does not pay dividends. In all rounds, you will trade on a single expiry and you are expected to hedge with the underlying (asset code IDX#PHX). We assume for simplicity that you are able to trade the index as if it were any other asset. Positions and PnL are not carried over between rounds.

During each round, “fundamental investors” interested in taking directional bets on the Phoenix Index will regularly send options orders to the exchange, taking available liquidity. Your algorithm should provide liquidity against these orders and manage the associated risk.

You should not expect the underlying to move in a certain way, and your algorithm should take into account all possibilities of an underlying move. Your algorithm should also be able to handle major market moves (e.g. sharp changes in volatility and underlying price that may result from news events shocking the market). Teams obviously not attempting this (i.e. their algorithm is simply making a directional bet) will be disqualified.

Rules

1. You will be subject to portfolio delta and vega risk limits. We take delta to mean the change in option price resulting from a \$1 move in the underlying; we take vega to mean the change in option price resulting from a 1 point change in implied volatility. We will not automatically hedge your positions and will not force any purchase or sale of contracts during each round to get you within the risk limits. A Python library will be provided to help calculate the Greeks (delta, vega, etc.). You will be able to write your own risk calculator if you desire, but note we will use the provided library to determine your exposure on the day of the competition. Please check to make sure that your implementation works and is consistent before the day of the competition. Penalties will be imposed for breaking risk limits – see the “Penalties” section below.
2. The exchange will enforce absolute position limits in each market. Any orders placed that would cause you to exceed position limits if they were filled will be automatically rejected.
3. Accumulated positions for the underlying at the end of the round will be valued at the midpoint of best bid and best ask and do not need to be manually liquidated. Options contracts will be automatically exercised if in-the-money.

Penalties

You will be penalized if you break the delta or vega limit and don’t hedge to get within limits. We will be taking snapshots of your risk profile periodically. For each snapshot you are outside delta or vega limits, you will incur a penalty to your final PnL that is proportionate to the violation.

The exact parameters for the penalty calculation will be detailed in our subsequent platform release.

Scoring

At the conclusion of each round, each team will receive points corresponding to their adjusted PnL. Each team’s adjusted PnL is their raw PnL less any penalties incurred in the round. The team with the highest adjusted PnL in each round will receive 40 points, the team with the second-highest PnL will receive 39 points, and so forth. To reward teams for consistent performance, there will be an end-of-case bonus awarded to each team.

Code Submission

We will require a preliminary submission by noon (12:00PM CST) on Monday, April 1st. The final code will not need to be submitted and will be run from your local computer on the day of the competition; however, we reserve the right to inspect competitors' final code.

Case Materials/Data

A development toolkit, detailed documentation and training data will be released together with the trading platform. Announcements will be made on the UChicago Trading Competition Piazza.

Questions

For questions regarding Case 2, please post in the UChicago Trading Competition Piazza in the “case2” folder.

CASE 3: Optimizing Portfolios with Factor Models

Overview

The University of Chicago has made fundamental contributions toward shaping the modern landscape of quantitative finance. Our rigorous, precise understanding of portfolio theory, asset pricing and factor models, imperfect as they are, have to be attributed to the tireless research by generations of scholars confronting the uncertain winds of the market and the city. Let us sample a share of their work.

In this case, each team is required to manage a long-short portfolio in a hypothetical stock market over a given time period, adjusting exposure to these stocks in order to maximize risk adjusted returns.

You will be provided with time series data for a number of stocks in this market. In addition to its price, each stock is associated with some specific “features” such as P/E ratio, Market Cap, and more. Common macroeconomic features, for instance GDP, will also be provided at each timestamp. The return of each stock, and in turn their risk, is driven by several factors that are derived from these provided features. The exact factors are not given, and it is your job to hunt them down through sound statistical analysis. Note that each stock might react differently to a particular factor, and thus a “beta” can vary across stocks and factors. In our hypothetical market, discovering all the factors would imply the exhaustion of “alpha”. Beware of noise and overfitting.

The next step is to make investment decisions that take into account both risk and return, which requires estimating the covariance/correlation matrix for the stocks listed. If we perfectly knew the covariance matrix of the stock returns, we could estimate the variance (and thus risk) of any potential portfolio, and formulate an optimization problem to determine asset allocations that negotiate the risk-return tradeoff.

The naïve approach to estimating the covariance matrix is to just compute sample covariance over a historical period. However, the number of observations you have pales in comparison to the size of the covariance matrix (the number of parameters you need to estimate), which increases quadratically with the number of stocks. Decomposing market returns through factor models provides the advantage of viewing this wilderness from a disciplined, parameter-efficient lens.

Successful competitors will:

- 1) Survey literature to understand the principles behind factor models and portfolio optimization
- 2) Analyze training data to discover the factors at work
- 3) Dynamically allocate portfolio weightings to maximize return and minimize risk, as reflected by the Sharpe ratio

Case Specifications

The χ -Change trading platform will not be used for this case. Teams are expected to develop their strategies using our Python toolkit and submit the code before the competition. We will run the simulation with test data.

You will be allowed to trade on a universe of stocks on a daily basis. The training data will contain time series information for each of the stocks in the universe, along with values for several features describing macroeconomic data as well as common individualized statistics about a stock.

At each timestamp, given a vector of feature values, your algorithm will return a weight vector containing the percentage allocation for each stock. This investment allocation vector will be automatically L1 normalized.

Round Specifications

We will run each competitor's portfolio allocation algorithm on a test dataset that represents the years immediately following the training data. There will be one round, the results of which will be computed prior to the competition and played back during the competition as if unfolding in real time. As such, you must submit your final code to the case writers beforehand.

Scoring

Competitors will be scored by their Annualized Daily Sharpe Ratio, which can be calculated as:

$$[\text{mean}(\text{daily_return_series}) / \text{std}(\text{daily_return_series})] * \text{SQRT}(252)$$

Case Materials/Data

A development toolkit, detailed documentation and training data will be released later. Announcements will be made on the UChicago Trading Competition Piazza.

Code Submission

We are requiring the **final** code for this case to be submitted by noon (12:00 PM) Monday, April 1st. Note that this is different from Cases 1 and 2, as we will be computing the results of this round prior to the competition. Code submitted past this deadline will not be accepted, and we reserve the right to disqualify any competitors who submit incomplete code or miss this deadline.

Questions

For questions regarding Case 3, please post to the UChicago Midwest Trading Competition Piazza in the "case 3" folder.



AQR is a global investment firm built at the intersection of financial theory and practical application. We strive to deliver concrete, long-term results by looking past market noise to identify and isolate the factors that matter most, and by developing ideas that stand up to rigorous testing. By putting theory into practice, we have become a leader in alternative strategies and an innovator in traditional portfolio management since 1998.

At AQR, our employees share a common spirit of academic excellence, intellectual honesty and an unwavering commitment to seeking the truth. We're determined to know what makes financial markets tick – and we'll ask every question and challenge every assumption. We recognize and respect the power of collaboration, and believe transparency and openness to new ideas leads to innovation.

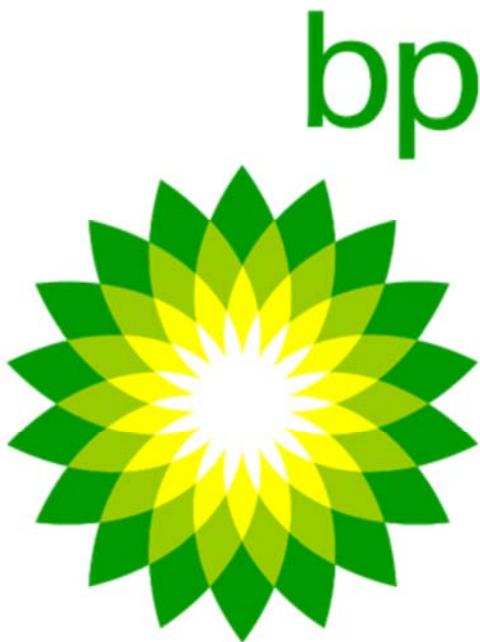


Who we are:

Founded in 2002, Belvedere Trading is a leading proprietary trading firm that specializes in equity index and commodity derivatives. Belvedere Trading's employees act as market makers, ensuring liquidity by laying two-sided markets to help provide an orderly market place for the products we trade. We trade electronically from our headquarters in downtown Chicago and have traders on the floors of multiple exchanges. Our technology and trading experts collaborate to develop and continually enhance Belvedere's high-performance, low-latency proprietary technology. Belvedere is always looking for the best, brightest, and most motivated talent to help us in our continued success.

What we offer:

Rated as one of the Top 25 Best Places to Work for Recent Grads by Simplicity, Belvedere Trading places a great emphasis on an employee's overall well-being. We offer a casual work environment that promotes innovation and creativity. Our employees' health is important, so we provide full benefits and a robust wellness program including: in-office yoga, health seminars, and discounted gym memberships. Belvedere also recognizes the positive effects of a strong work-life balance by having an unlimited, paid time off policy. Most importantly, Team Belvedere likes to have fun, both inside and outside the office walls!



BP is a leader in the Global Energy Trading Market. We trade a varied range of products including oil, natural gas, liquefied natural gas, currencies, metals and financials derivatives.

Experience realism and pressure of a world-class trading organization by participating in our trading simulation for prizes.

- Manage your positions and determine your trading strategy.
- Compete in a fast-paced real-time market against your peers
- Use state of the art technology

Come join us and learn how BP positions itself in the commodities trading space and where we extract value for our business. The game will bring to life some of the decisions we face every day.



Chicago Trading Company (CTC) is a highly analytical, team oriented derivatives trading firm that employs a dynamic, disciplined approach to trading across a variety of products and strategies. We take decisive action to position ourselves at the forefront of the financial markets.

We actively trade in a broad spectrum of asset classes that include Equities, Interest Rates, and Commodities. We have grown dramatically since our inception in 1995 and are recognized as a leading provider of liquidity and pricing on numerous derivatives exchanges globally.

We are an equal opportunity employer and value diversity at our company. We do not discriminate on the basis of race, religion, color, national origin, gender, sexual orientation, age, marital status, veteran status, or disability status.



Analyzing global markets with discipline and focus, we employ a diverse range of strategies in an effort to bring capital to its fullest potential and deliver consistent investment returns of our clients. We do this by working harder, seeing farther, and by empowering the world's most talented minds with the tools and culture they need to achieve peak performance. Our firm is guided by its core values of championing honesty, rewarding excellence, continuously learning, solving problems together, and earning the win.



Citadel securities is an award-winning global market maker across a broad array of fixed income and equity products. Its unique set of capabilities and tools are designed to drive down the cost of transactions, helping to meet the liquidity needs of asset managers, banks, broker-dealers, hedge funds, government agencies, and public pension programs. Our firm is guided by its core values of championing honesty, rewarding excellence, continuously learning, solving problems together, and earning the win.



DRW is a diversified, technology-led principal trading firm. What sets us apart is our diversified approach—trading across many asset classes and instruments, in markets around the world, with horizons from seconds to years.

We trade for our own account in major markets across the globe. No outside investors. No third party funds. So we can be innovative and nimble, while using our deep experience to prudently manage risk. As the markets have evolved over the past 25 years, so have we – growing to include real estate investing, cryptoassets, venture capital and successfully completing several industry acquisitions.

Our employees work hard to solve interesting problems, and their results are rewarded. We value continuous learning—from our outcomes, from the environment and from each other. It's a place of high expectations, deep curiosity, and constant collaboration, with some of the smartest, most passionate people you'll meet.

Headquartered in Chicago, with offices in Austin, Houston, London, Montreal, New York and Singapore, we're looking for bright young professionals with strong analytical and quantitative skills to join our team as traders, developers and quantitative researchers.



Eagle Seven is a privately held proprietary trading firm specializing in providing liquidity to financial markets in the US and around the world. We combine the latest technology with sound risk management principles to successfully employ a disciplined and adaptable approach to trading across a diverse range of asset classes. Using our own capital, our traders execute various trading strategies across listed derivatives and securities markets. We are committed to continually exploring new markets and generating new strategies to capitalize on emerging opportunities.

We understand the importance of technology within the industry and its evolution from being desirable to a necessity. Our software and infrastructure is built to respond to the needs of a constantly evolving and competitive trading environment by providing speed, accuracy, and transparency. Our technology gives us the ability to effectively implement a vast array of complex strategies, from sophisticated algorithms to outright trading. As we continue to grow, we look to leverage the latest technology to further enhance our systems and provide us with the edge required to consistently thrive in today's dynamic trading environment.

Our team of talented traders and technologists share a vision guided by common principles - collaboration, communication, and innovation – to create an environment that is committed to establishing a culture and workplace where people want to be and will have the greatest opportunity for impact and success.

FLOW ■ TRADERS

Flow Traders is a leading global technology-enabled liquidity provider specializing in exchange traded products (ETPs). Headquartered in Amsterdam, The Netherlands, with trading offices in Amsterdam, Hong Kong, New York and Singapore, Flow Traders provides continuous liquidity in ETP markets, while seeking to stay market neutral at all times and without having directional opinions. As a technology company operating in a financial environment, Flow Traders uses principal technology platform to quote bid and ask prices in over 6,000 ETP listings across the globe, tracking all underlying asset classes, including equities, fixed income, commodities and currencies with access to over 109 trading venues in 40 countries around the world.

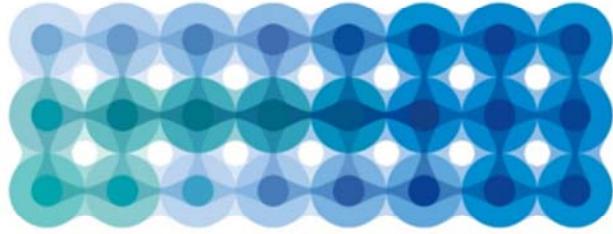
Founded in 2004, Flow Traders fosters an entrepreneurial and team-oriented culture which rewards people for their contributions to the company as a whole, rather than only in their direct area of responsibility. This non-hierarchical approach stimulates innovation and development. Flow Traders values creative minds and out-of-the-box thinkers and challenge them to make full use of their capacities. To ensure this, they provide employees with the best working environment, the latest technology and continuous support. For more information about the exciting global employment opportunities at Flow Traders, visit: www.flowtraders.com.

GROUP ONE

T R A D I N G

Established in 1989, Group One Trading, LP is one of the leading proprietary option trading firms in the country. Headquartered in Chicago, our traders make markets in over 3,200 listed equity and equity index options.

Armed with expertise developed through a rigorous training program, our traders provide competitive liquidity across a broad range of securities. At present, Group One is an options market maker and/or specialist with every major exchange group and continues to expand its presence on exchanges as the options trading space grows and evolves. Our unique understanding of pricing and special situations, combined with real time risk management and keeping a strong focus on software development, allow us to stay a step ahead of the markets.



IMC

A technology-driven trading company, IMC has been setting the pace for the evolution of trading for over 25 years. We bring the best people together to develop innovative technology and use advanced trading systems to buy and sell securities on over 100 of the world's best regulated trading venues. Our traders and technologists are constantly learning, working together in local and international teams to solve complex problems. They play their part in making financial markets more efficient by providing meaningful liquidity. Our people are driven by the best ideas, not by hierarchy, so we're able to maintain our position at the forefront of technology.



Over thirty years ago, Optiver started business as a single trader on the floor of Amsterdam's European Options Exchange. Today, we are a leading global electronic market maker, focused on pricing, execution and risk management with offices in Amsterdam, Chicago, Shanghai and Sydney. We provide liquidity to financial markets using our own capital, at our own risk, trading a wide range of products: listed derivatives, cash equities, ETFs, bonds and foreign currencies. Our independence allows us to objectively improve the markets and provide efficiencies for end investors.

With over one thousand Optiverians globally, our mission to improve the market unites us. Thriving in a high performance environment, we pioneer our own trading strategies and systems using clean code and sophisticated technology. We achieve this by attracting, developing and empowering top talent, in order to sustain our future.



PEAK6 is a Chicago-based investment firm focused on technology. Matt Hulsizer and Jenny Just started the company in 1997 with a simple premise: to apply technology to make the options market operate more efficiently—and to realize great financial returns in the process. Early on, we recognized the need in the market to develop sophisticated, proprietary technology and were one of the first firms to deliver.

Today, our trading firm continues to create new opportunities through technology, and we've done everything from transforming a flagging clearinghouse that now powers the future of fintech to teaming up with U.S. Soccer on analytics to building a billion-dollar digital options brokerage from scratch.



SIG is a global quantitative trading firm founded with an entrepreneurial spirit and analytical approach to decision making. We are problem solvers that analyze the financial markets and process vast amounts of data to identify profitable trading opportunities. Our traders, quants and technologists work side-by-side to develop and implement new strategies.



VOLANT TRADING

A BETTER WAY TO MAKE MARKETS

Volant is a leading global proprietary trading firm specializing in automated electronic options market-making. We provide liquidity for more than two dozen financial markets by partnering trading talent and experience with state-of-the-art technology. We recruit the best and brightest, recognizing that our most valuable asset is our team. As a small firm, we pride ourselves on our agility and flat structure, enabling our team to work collaboratively and pivot quickly.

From a trading perspective, our goal is to be the top liquidity provider on every exchange we trade. To accomplish this goal, we focus on implementing predictive pricing models, fine-grained risk management tools, and competitive execution platforms. Our team of traders drive innovation in all areas of the firm, constantly striving to improve, automate, and simplify. We're looking for smart problem-solvers who are excited to attack the challenges we face on a daily basis and are ready to think outside the box to come up with creative and elegant solutions.



Founded in 1994, the Wolverine companies comprise a number of diversified financial institutions specializing in proprietary trading, asset management, order execution services, and technology solutions. We are recognized as a market leader in derivatives valuation, trading, and value-added order execution across global equity, options, and futures markets. With a focus on innovation, achievement, and integrity, we take pride in serving the interests of both our clients and colleagues. The Wolverine companies are headquartered in Chicago with offices in New York and San Francisco and a proprietary trading affiliate office located in London.