



Exploring Entrepreneurship

The Chicago Futures Trading Industry

An analysis of the challenges and opportunities for entrepreneurial ventures in the Chicago futures trading industry

April 2006

POLSKYCENTER 
FOR ENTREPRENEURSHIP

CHICAGO  **GSB**

Acknowledgements

The publication of this analysis of the Chicago futures trading industry and the accompanying 2006 Exploring Entrepreneurship conference could not have been possible without the support of our sponsors.

We would like to thank the following organizations for their support of this research initiative.



Supporting Organizations



Exploring Entrepreneurship

The Chicago Futures Trading Industry

An analysis of the challenges and opportunities for entrepreneurial ventures in the Chicago futures trading industry

Table of Contents

Letter from the Polsky Center	2
Executive Summary	3
Exploring Entrepreneurship	6
Student Researchers	31
Sponsors	back cover

Letter from the Polsky Center



Linda Darragh

April 2006

The Polsky Center for Entrepreneurship at the University of Chicago's Graduate School of Business is pleased to sponsor and present the Exploring Entrepreneurship Series. The purpose of this year-long program is to explore a specific industry that is key to the economic growth of the region. Through this program, students, faculty, and members of the industry are brought together to study both the challenges and opportunities facing an industry's ability to grow and maintain leadership.

The Exploring Entrepreneurship series is part of the GSB entrepreneurial curriculum, which is a unique blend of theory and practical application. This program provides students a framework to analyze and interact with a changing industry in order to understand the opportunities and challenges surrounding entrepreneurial ventures. For this year's project, students analyzed the trends in the futures trading industry. Students conducted interviews with trading industry leaders as well as small businesses, gathered to discuss their findings with each other as well as some industry experts, and then proposed recommendations. Student groups wrote sections of the White Paper and the Polsky Center integrated and edited these sections. The deliverables for the Exploring Entrepreneurship Series are this White Paper as well as a conference on May 2, 2006.

The benefit of this project for the students is multi-faceted. They have learned how to analyze a particular industry sector and identify potentially high-growth opportunities to establish or grow a business. This experience further enhanced their interviewing skills and increased their network within this industry.

We hope this White Paper creates discussion around the opportunities and challenges facing the derivatives trading industry. We can no longer look at economic development in a regional or national context. Chicago is part of a global economic community and our future depends on growing core industries that have preeminence in the world economy. Currently, Chicago is the world leader in futures trading industry. We hope that the information and recommendations contained in this White Paper will help sustain this global reputation.

Sincerely,

Linda Darragh

Director of Entrepreneurship Programs, Polsky Center for Entrepreneurship

Executive Summary

The history of the futures trading industry in Chicago mirrors the growth of Chicago itself. Futures trading started in Chicago in the mid 1800s as a way of managing the seasonal risk of agricultural commerce in the region. Now, Chicago is the global leader in this industry. This ranking is not only based on the volume of trades but also on Chicago's leadership in innovation. The Chicago exchanges—Chicago Mercantile Exchange, Chicago Board of Trade, and the Chicago Board Options Exchange—have led global innovation with respect to new derivative products, services, and systems. This environment of innovation has spread beyond the exchanges as well. Chicago is the home of many entrepreneurial businesses that develop technologies to leverage and support the trading industry.

The futures trading industry is undergoing rapid change as electronic trading usurps open outcry or pit trading. The confluence of advanced financial models with Internet and broadband technologies provides traders with the ability to identify infinitesimal spreads and execute an order in a millisecond from their desktop. These changes to the futures trading industry have significant implications for Chicago.

Change in an industry is a signal for entrepreneurial opportunity. In the last decade, there are many new businesses that have started in Chicago to leverage the capabilities of electronic trading. Businesses have created 1) new trading platforms for both the institutional and the individual investor, 2) post-trade settlement and management systems, and 3) technologies that help manage the challenges of security, storage, and analyzing large volumes of market data. There has also been a rapid increase in the number of hedge funds and proprietary trading firms. These entrepreneurial firms are built upon advanced mathematical models that capture unique trading strategies.

The entrepreneurial activity occurring in this industry is critical to the economic expansion of Chicago and Illinois. The software technologies that have been developed, or are currently in the process of development, indicate that Chicago has a core competency for the world in the field of financial services technology. The local educational institutions, the financial sector, and the public sector should encourage growth and innovation in this area.

The futures trading industry generates the most individual wealth of any industry in Illinois. This individual wealth circulates back into the local economy to

create other types of jobs. This source of wealth could also provide opportunities for other entrepreneurial businesses in Illinois. Given the lack of early-stage capital in the state, tax incentives and entrepreneurial education could be used to encourage investment in local high-growth industries. In this manner, the successes of the trading industry would be magnified across the local economy.

However, with the restructuring of an industry, there are also challenges. The future of the trading industry in Chicago will be affected by the availability of human capital, advances in the capacity and reliability of the technological infrastructure, and the ability to entice a virtual industry to remain in Illinois.

The job description of a trader is rapidly evolving. The pit trader is now being replaced by sophisticated computer programmers and advanced mathematicians. Institutions of higher education need to provide a continuous stream of students to service the needs of this industry. There is also the immediate issue of retraining and redeploying the existing pit traders. Some of these traders have made or are making the switch to electronic trading. However, there are others that are seeking new forms of employment. Given that this group has capital and possesses attributes of successful entrepreneurs, such as high risk tolerance, it is important to integrate these traders into the entrepreneurial community.

The volume of market data from trading is doubling every year. Larger and more reliable bandwidth is in constant demand. Illinois is a global leader in grid computing. The marriage of the technological advances in grid computing with the trading industry could be a key factor for Chicago to retain its global prominence in the trading industry for the foreseeable future.

Given that trading has moved from the pit to the desktop, a trader's workplace can be located in a trading firm in downtown Chicago, at home in the suburbs, or in a sunny location in the southern states. Information exchange that was once initiated by hand signals on the trading floor has been replaced by instant messaging and chat rooms in the virtual world. Will trading activities continue to be based in the south loop or will they migrate to locations outside of Illinois? How can we insure that this innovative and entrepreneurial community continues to grow in Illinois?

Recommendations

The purpose of this report is to raise the awareness of the challenges and opportunities facing the local futures trading industry. To insure its continued success in Illinois, this report offers several recommendations.

1. Strengthen and grow educational programs that produce the highly skilled experts for the futures trading industry.
2. Continue to develop office locations in the Chicago area that have the technological infrastructure for trading and offer a congenial and conducive atmosphere for traders.
3. Market and promote Chicago's global prominence in the derivatives trading industry.
4. Retrain and redeploy the floor traders into the entrepreneurial fabric of the community.
5. Create tax incentives to direct the wealth generated in this industry to other entrepreneurial sectors of the Illinois economy.
6. Create a private and public sector leadership committee to monitor the key indicators of this industry in Chicago and make ongoing recommendations as necessary.

The Growth and Impact of the Futures Trading Industry on Chicago

The Early Days in Chicago

According to some accounts, the history of derivatives or futures trading can be traced back to civilizations in the Fertile Crescent as well as to the Dutch tulip market and the Japanese rice market in the 1600s. However, today's US trading industry began in Chicago in the mid 1800s, when the city was fast becoming a prominent commercial destination. Specifically, Chicago was known as a center for the storage and distribution of grain from the Midwest region. Demand for grain storage facilities would exceed supply in the fall season. In the springtime, demand for storage dropped. Significant volatility in spot prices for grain was the result.¹

"A group of grain traders created the 'to-arrive' contract, which permitted farmers to lock in the price and deliver the grain later. This allowed the farmer to store the grain either on the farm or at a storage facility nearby and deliver it to Chicago months later. These to-arrive contracts proved useful as a device for hedging and speculating on price changes. Farmers and traders soon realized that the sale and delivery of the grain itself was not nearly as important as the ability to transfer the price risk associated with the grain. The grain could always be sold and delivered anywhere else at any time. These contracts were eventually standardized around 1865, and in 1925 the first futures clearinghouse was formed. From that point on, futures contracts were pretty much of the form we know them today."²

Chicago, the Global Leader

The epicenter of the Chicago trading industry is the three major exchanges: the Chicago Mercantile Exchange (CME), the Chicago Board of Trade (CBOT) and the Chicago Board Options Exchange (CBOE). Over a decade ago, exchange-traded futures and options on futures grew significantly

in other parts of the global marketplace. Whereas, the US exchanges collectively accounted for 54% of the derivatives industry over a decade ago, they represent 36% of global derivatives trading in 2005. Over time, the industry has continued to grow globally, and Chicago continues to lead the world as the center of derivatives activity.

Top 2005 Global Derivatives Centers

(by volume of trades)	<i>in billions</i>
Chicago	2.24
Frankfurt/Zurich	1.25
New York	0.89
London	0.54
São Paulo	0.47
Paris	0.24
Philadelphia	0.16
San Francisco	0.14
Mumbai	0.13
Amsterdam	0.12

Source: World Business Chicago, 2005

Economic Impact on Chicago

The impact of the trading industry on Chicago is significant with respect to job and wealth creation. Between 2003 Q3 and 2004 Q3, the growth in employment across all industries in Illinois was only .5%. In the same period, the growth in employment for the industry sector that includes most of the trading industry increased by 2.9%. (NAIC code: 523 Securities, Commodity Contracts, and Other Financial Investments and Related Activities).³

The average monthly earning per employee for all privately-held industries in this same time period was \$3,597. In comparison the average monthly earning per employee for the trading industry was \$11,434. This industry has the highest ranking among all industries for average monthly earnings in Illinois. (The second ranked industry has an average monthly earning of \$6,702.)⁴

These statistics underestimate the true impact of the trading industry in Chicago. This industry is also generating

employment and wealth creation in many other industries that serve securities and futures trading. The migration from floor to electronic trading has led to the growth of companies that are developing new technologies to support this industry. One of the most successful businesses in this area is Trading Technologies International. Currently over 70% of all electronic futures trades are performed on their software platform. Yet this business is classified by the census bureau as a Software Publisher (NAIC code: 51121) and therefore is not counted in the employment statistics for the trading industry that were stated above. Many other companies are also developing software for this industry in the areas of order taking, order routing, risk analysis, settlement of trades, and other back-office functions. Software applications are also being developed to increase the speed and throughput of market data as well as manage the storage and security of the data. This growth in technology companies serving the trading industry is not reflected in the traditional census bureau data for Industry 523.

The economic impact of the trading industry reaches deep into other sectors of the Chicago economy as well. A significant portion of the commercial real estate in the South Loop is owned or leased by businesses in the trading industry. Personal wealth created through trading is invested in real estate for both residential and investment purposes. Moreover, one must consider all the businesses that serve the trading industry through consulting, accounting and legal services, facility management, restaurants, personal services, and more. According to World Business Chicago, it is estimated that the multiplier effect for the financial services sector is 2.5. In other words, for every 100 new jobs in financial services, another 150 jobs are created in the overall regional economy.

In summary, the Chicago futures trading industry is an important economic driver for the Chicago and Illinois economies. The growth and stability of this industry has a direct relationship to the future of the regional economy. Also, given that the Chicago trading market is a significant part of a global marketplace, Chicago is a critical center for leadership and innovation for this industry worldwide.

Changes in the Exchanges

The Formative Years

In 1848, the Chicago Board of Trade (CBOT) was established with 'to arrive' contracts for future delivery in flour, timothy seed, and hay. Less than two decades later, the CBOT developed standardized agreements called 'futures contracts' and required performance bonds called 'margin' to be posted by buyers and sellers in its grain markets. Soon after, in 1878, the first trading pit was opened and subsequently patented.⁵ Twenty years later, the Butter and Egg Board was established, later becoming known as the Chicago Mercantile Exchange (CME). For the next seventy years, the Chicago exchanges, though they grew in their volume of contracts, they did not deviate from their core business—agricultural futures contracts.

In the late 1960s, two milestones occurred in the exchanges that would launch the CBOT and CME from their Midwest roots to the global marketplace. The first achievement was the addition of automatic electronic price display boards on the trading floors. Before, price changes were signaled through Morse code telegraphy and then were written by hand on chalkboards. The new electronic system reduced price reporting time to seconds.⁶ This race to decrease transaction speed is still a major impetus behind many of today's innovations in this industry.

The second milestone was the initiation of the first non-grain product—a precious metals contract—in 1969. Soon after, the creation of new volatility in the global monetary system led to the development of additional non-grain products. The Bretton Woods system that had been initiated in 1944, obligated each country to adopt a monetary policy that maintained the exchange rate of its currency within a fixed value. In 1971, the US abandoned the gold standard, so that the US dollar was no longer a fixed currency, and most of the world's currencies followed suit. New futures products were developed by CME and CBOT to hedge global currencies and interest rates. With the rapid success and

acceptance of financial futures, both the CBOT and CME experienced unprecedented growth. In 1975, members of the CBOT founded the Chicago Board Options Exchange (CBOE). The CBOE trades a broad range of products including index options, equity options, interest rate options, etc.

Out of the Pits

For years the process of trading contracts was based on open outcry trading where traders stand in a trading pit and call out prices and quantities that indicate their willingness to buy or sell. Traders often use hand signals to convey information since it can be difficult to hear if everyone is shouting at once. Whether traders are shouting or signaling, the objective is 'price discovery' to arrive at the best prices given the supply and demand for a given contract at a given point in time.

With the advent of the Internet and advances in information and communication technology, the process of trading has changed dramatically in the last decade. In 1992, CME offered the first global electronic trading platform, CME® Globex®, for the purpose of conducting after-hours trading. The other two exchanges followed suit soon after. In 1997, CME developed a new derivative product that was only traded electronically—E-mini® S&P 500 contracts.

A decade ago, Chicago was not the leader in electronic trading. The trend to move activity from the floor to electronic platforms started in Germany first and the UK second. The US was one of the last big markets to embrace electronic trading because the members of the exchanges were resistant to dilute their membership privileges, which provided exceptional trading opportunities on the traditional trading floor. Nevertheless, this innovation was finally adopted in the US as both a defensive measure to prevent entry into the US market by the European exchanges and as a vehicle to drive volume growth.

It did not take long for traders to value the benefits of electronic trading. New platforms provided a neutral, liquid, and efficient electronic marketplace right on the trader's desktop. The need for a physical location was no longer

of critical importance. Buyers and sellers could electronically exchange indications of interests as well as negotiate from a remote location. Transactions moved from the pit to a worldwide community of buyers and sellers. In addition, electronic trading allowed for more thorough risk analysis as well as immediate clearing and settling of trades.

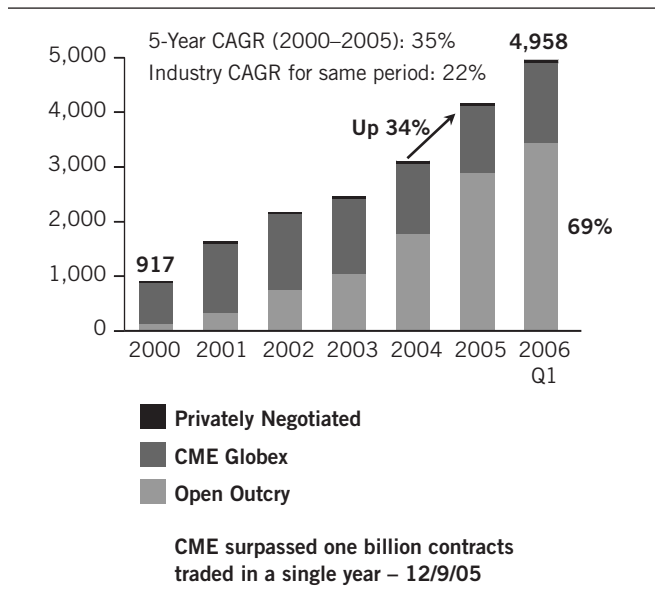
This democratization of information allowed new players to enter. Membership requirements for trading on CME Globex were eliminated in 2000, giving virtually every market participant access to products traded on the system. Market data had previously been priced for large institutions. Under the new system, CME restructured its pricing policies to encourage wider adoption of products traded on GLOBEX. In 2001, the equities industry moved from fractional pricing to pricing in decimals—narrowing spreads and reducing costs for investors. Competitive spreads and widely available information marked the dawning of a new age for individual investors.

Chicago exchanges currently offer 'side-by-side' trading for most of their contracts. With the open outcry system and electronic trading platform operating concurrently, users are able to decide where they prefer to have their order executed. This gives the customer enhanced flexibility for order execution, while allowing the Exchange to capture the transaction over either system. The CBOE has attempted to blend the screen-based and floor-based trading environments with their hybrid trading system, which incorporates desired bid and ask information from the floor into their electronic system.

However, efforts to provide both platforms may only be a temporary bridge from the pit trading of the past to the future virtual world of trading. Each month, the volume of electronic trades increases dramatically. On March 1, 2006, *Crain's Chicago Business* reported that the average daily volume on CME Globex electronic trading platform in February was 30% higher than a year ago. Currently, 68% of all the exchange trading at CME is through electronic trading platforms. At the end of 2002, only 35% of all exchange trading was electronic.

CME Average Daily Volume

(round turns to 000's)



Source: CME

In addition to the traditional exchanges that began on the floor, new online exchanges are capturing market share. One of the most successful online exchanges is Chicago-based Archipelago. After partnering with the Pacific Exchange, Inc. (PCX®) in 2000, Archipelago became the first totally open, all-electronic stock market in the United States. In March 2006, the merger between Archipelago and the New York Stock Exchange (NYSE) was completed and the NYSE became a publicly traded company. It also led to bringing the world's largest equities market (NYSE) into the world of electronic trading. Although Archipelago is focused on equities and not futures, "[t]he deal also increases the exchange's market share in exchange-traded funds and derivatives trading."⁷

Another new exchange, OneChicago, launched in 2002 as a joint venture of the three major Chicago exchanges. This all-electronic exchange trades single-stock futures and other security futures products, and saw an increase in average daily volume of 188% from 2004 to 2005. The technology behind the new exchange is a combination of

CME's GLOBEX system and the CBOE*direct* match engine, which powers the electronic side of CBOE's hybrid trading platform.

Another online exchange has created competition for the CBOE. The International Securities Exchange (ISE) launched the first fully electronic exchange for option trading in 2000. The ISE was demutualized in 2002 and became the first US options exchange to offer shares to the public. The ISE experienced explosive growth after its founding and has threatened the CBOE's market leadership. It now controls roughly the same slice of the industry as the much-older CBOE does. As a response to the competition from the ISE and other electronic trading firms, the CBOE revamped its online platform and transitioned to a hybrid trading system in mid 2003. The introduction of the hybrid trading system led to improvements by providing a tighter bid-ask spread, speedier access, and deep liquidity. With this transition, the CBOE regained lost ground and ended 2005 slightly ahead of the ISE in market share.

In addition, the CBOE recently made a strategic investment in HedgeStreet, an online exchange for trading futures and options. HedgeStreet is located in California and has its own clearinghouse. HedgeStreet's products are primarily attractive to individuals. The CBOE will feature HedgeStreet products on its Web site and the two exchanges will collaborate on the development of new products.⁸

Growth Strategies for the Future

In the face of growing domestic and global competition, the Chicago exchanges are well positioned to retain and expand their prominence in global derivatives trading. The key factors for current and continued growth are centered on organizational structure, innovation, and user expansion.

Demutualization

Historically, the Chicago exchanges focused on developing financial products marketed to the domestic investment community that would be heavily traded and cleared locally.

They sought to maximize fee income. The large volume traded in the pits strengthened trader and broker earnings and kept the exchange seat prices high, which made the members happy. The CBOT and CME basically behaved as a duopoly, each making a strong profit with limited head-to-head competition.

With the growing acceptance of electronic trading, CME wisely realized that their existing structure was not conducive to a new strategy that would enable them to compete globally and expand their electronic trading platform. They had strong products, but the encumbered membership structure did not allow for nimble and opportunistic moves that would be crucial moving forward. The days of the 'club' environment were numbered, and CME would need to demutualize and transform itself into a for-profit company, while spending large amounts of money on building their electronic platform. This was a drastic departure from the existing structure and a bold move as they were the first of the exchanges to complete this transformation. Yet the original member-owners of CME voted strongly in favor of the change.

On December 6, 2002, CME issued Class A shares and began trading on the New York Stock Exchange (ticker CME), becoming the first US financial exchange to be traded publicly. The process of restructuring from a privately-held to a publicly-traded company took about two and a half years. The length of the transition was due primarily to the complexity of the re-organization, which involved demutualizing, developing and implementing the new electronic trading technology, and globalizing. In addition to electronic trading, CME also enhanced its own clearing house and market surveillance mechanisms, which helped strengthen its competitive advantage. Currently, CME's shares are trading at about 13 times greater than the IPO price of \$35.

Recently, the CBOT made its own transition from a membership, not-for-profit entity into a for-profit publicly traded organization. CBOT Holdings conducted its IPO in

October 2005 on the NYSE (ticker BOT), and has also realized very impressive results. Although not nearly as strong as CME's stock appreciation, the CBOT IPO was priced at \$54 per share and currently trades at a 100% premium.

Although the CBOE is still privately held, with a general industry trend of demutualization and going public, the CBOE could be the next candidate.

New Products

All the Chicago exchanges have been world leaders in innovation and bringing new products to market. "[T]he Exchanges are adding more new products, so not only do we have more volume, we have outstanding liquidity."⁹ Each of the Chicago exchanges has its own unique products for trading. The key financial futures products for the CBOT have been the 30-year bonds and the 10-year and 5-year notes. CME developed several successful contracts, most notably currency futures, Eurodollar futures, and the S&P 500 and Nasdaq-100 index futures. The CBOE's most popular products include the S&P 500 and the NASDAQ 100 index options and other index and equity options.

There seems to be no limit to the potential applications of futures market technology. The Chicago Climate Exchange (CCX) is the world's first and North America's only voluntary, legally binding rules-based greenhouse gas emission reduction and trading system. CCX's founder, Richard Sandor, created the company to trade a commodity that would soon be scarce. In order to commercialize this innovation, the CCX received a series of grants from the Joyce Foundation, a Midwest-based foundation seeking to improve the quality of life in the Great Lakes Region, in 2000. The new venture took approximately nine years (1995–2003) from when the idea was first proposed to when the exchange opened with 14 members.

In the first quarter of 2006, CME introduced a new derivatives product—Housing Futures and Options. This product is a vehicle for institutional and individual inves-

tors to gain exposure to real estate risk and diversify. Housing is a \$19 trillion market as compared to a \$15 trillion equities market and a \$24 trillion fixed income market. Yet there has been no viable derivatives market until now. The product is based on the Case-Schiller indexes that provide a market-specific time series designed to track residential home values. Users of this new product will likely include home builders, home buyers, holders of mortgage portfolios, and investors.

In June 2006, CME will launch energy derivatives on its Globex platform in the response to a growing demand for electronically traded energy derivatives. CME tried to introduce energy derivatives in the 1980s, but failed as the market used the NYMEX floor to trade futures contracts and the OTC to trade customized contracts. Enron was a big contributor to the size and growth of the energy OTC market. In a post-Enron world, Wall Street investment banks have absorbed the void left by Enron's disappearance and now are the biggest traders in the energy market. These new players are not married to the NYMEX and prefer the more transparent and open electronic market. In the past few years, the relationship between NYMEX and CME over energy futures has been turbulent. However, as of early April 2006, NYMEX and CME are once again in discussions. "The Merc wants to buy into an exchange that is expert in energy futures, while Nymex needs better technology to 'withstand the fierce onslaught from ICE [the all-electronic IntercontinentalExchange Inc]'"¹⁰

Innovation is such a high priority at CME, it launched the Center for Innovation in 2003 "to identify, showcase, and help foster continued innovation and creative thinking."¹¹ The Center sponsors awards for innovative ideas, products or services, organizes educational forums on innovation in the trading industry, and has created the Competitive Markets Advisory Council (CMAC) that consists of financial experts including Nobel Prize winners who serve as a 'think tank' to develop and provide advice on significant market issues.¹²

This history of innovation and success has created a brand and a competitive advantage in the development of new derivative products for Chicago. Although derivative products can be duplicated elsewhere, it is exceedingly difficult to wrestle away product volume once it has been established at a particular exchange. The real challenge is creating a product that the investment community will trade in large numbers and then being the first to bring it to market.

Internal Expansion

Recently, CME's Clearing House, the largest derivatives clearing entity in the world, has increased capacity so that it could be more responsive to customer demand. While the Clearing House helped build a competitive advantage for CME, it also boosted profits. In April 2003, CME signed an agreement to clear exchanges made at the CBOT as well. In clearing trades for both CME and the CBOT, the Clearing House processes over 85% of all futures trades that are made in the US.¹³

On March 9, 2006 when the New York Stock Exchange began trading as NYSE Group, John Thain, NYSE Group chief executive, was asked to compare his company with CME. Thain said flatly: "CME has a better business." He not only praised CME's diverse product mix, but he also praised CME's "virtual monopoly" over the contracts that change hands on its exchange. This monopoly that Thain alluded to is the fact that CME owns its own clearinghouse. "No wonder CME last year earned \$76 million, more than the NYSE and Archipelago combined, and on much less revenue."¹⁴

Global Expansion

The key to future expansion is increasing the number of users worldwide. Already CME has strategic alliances with other international exchanges and has three products that serve as global benchmarks for valuing and pricing risk. With over \$900 million in free cash and marketable securities, CME is in a very strong position to further increase

market share through potential acquisitions and/or mergers as a result of predicted market consolidation.¹⁵

Like CME, the CBOT is focusing on global expansion and has signed agreements with more than 16 countries to trade CBOT products. To foster this international growth, the CBOT has recently added a new hub in Singapore that they hope will serve as a gateway to Asia. In addition to Singapore, the CBOT has hubs in London, Paris, Gibraltar, and New York and two in Chicago to maximize electronic trading.

The CBOE is also actively seeking international opportunities and has formed strategic alliance with exchanges in China and other countries.¹⁶

Linked to the Exchanges

Individuals who want to gain exposure to the futures markets can either invest with hedge funds or retail brokers or join a proprietary trading firm as an active trader. All of these vehicles are very entrepreneurial and provide opportunities for the creation of new firms.

Proprietary Trading Firms and Arcades

As professional traders have moved off the floor, some have launched trading arcades and proprietary trading firms where they can expand their investment portfolios through electronic trading. These off-floor trading firms provide traders access to more markets and asset classes and thereby increase liquidity. Proprietary trading firms and arcades attract traders through their ability to provide capital, technology, and instruction. The primary distinction between arcades and proprietary trading firms is for whose account the individual trader is trading. In an arcade, traders trade for their own account while in a proprietary trading firm, traders trade for the firm's account.¹⁷

There are a number of factors to consider in analyzing the entrepreneurial opportunities in this part of the futures trading industry: 1) market dynamics and barriers to entry, 2) recruitment of talent in a competitive environment, and 3) strategies to grow revenues, both organically and through new ventures.

The proprietary trading environment is highly competitive and has few barriers to entry. New firms can easily license software and trading platforms and only need to find two very important yet basic commodities: capital and trading talent. Once in operation the trading environment is highly competitive and cannibalization occurs, chasing out the weaker firms.

There is a large range in the size of firms. Firms that focus on unique trading strategies to capture edge and profits typically are limited in size and scalability. If these firms

grow too large they lose their ability to be nimble and alter their strategies to new market forces. Larger firms often rely on proprietary established technology, looking to leverage experience and resources to 'touch' as many products as possible. The challenge in scaling proprietary trading firms and arcades is the ability to continually add trading talent, or to develop talent in house, as well as manage risk across an increasing number of traders and trading strategies.

Recruiting trading talent is the most important challenge to a new firm in proprietary trading. A new firm must focus on finding experienced traders that can profit right out of the gate, while established firms use a more balanced approach to find both experienced traders and new talent. The key to recruiting experienced traders is a combination of technology and compensation. Experienced traders have confidence in their trading abilities but realize that in order to leverage their expertise they need the best technology available. Consequently, firms market their cutting edge strategies and technology to attract traders. In addition, many proprietary firms market their unique trading environments that create some of the atmosphere that traders enjoyed while trading in the pits. One firm, Rho Trading, describes their environment as "dynamic, friendly, and focused".¹⁸ Compensation based on trading salaries and profit cuts varies greatly in the industry. One firm that was interviewed offers traders a minimal salary but tries to provide incentives by giving a generous cut of the potential profits derived from trading.

To better understand this phenomenon, the project interviewed a local proprietary trading firm, PEAK 6. Like other proprietary trading firms, PEAK 6 has focused its efforts not only on finding experienced traders but also on making an effort to diversify its workforce by hiring individuals that are not typical experienced floor traders or clerks. They have found that a diversified group can find unique ways to capitalize on trading opportunities. Once the talent is recruited the firm must have a strong training program in place to help new hires develop and learn the unique strategies of the firm. The quality of the training

program is also a factor in recruitment.¹⁹ "Just as the floor used to be the major training ground, it's these 'Prop Shops' that are becoming the next major training ground for the industry. Probably the biggest reason for the success of the Prop Shops has been that they have the knowledge to teach and instruct."²⁰

As mentioned above, growth in a trading business is not only dependent on recruiting talent but also leveraging technology and managing risk. Trading platforms are not easily scalable and can become unstable with too many traders or too many products. As more traders are added to a firm and the firm extends its strategy into more products, the systems must not suffer with respect to speed. Successful trading often depends on the speed of the lines with the exchange. PEAK 6 has developed a unique way of handling risk which they believe is one of the most crucial keys to PEAK 6's success. They have developed a system of stackable units, each desk managed individually with the ability to literally stack the positions to measure how much risk the firm is exposed to. This system also gives the traders the ability to manage their own P&L and develop management skills within their units.²¹

Growth for a trading firm also means increasing revenues through new opportunities that are not related to increasing the number of products traded. PEAK 6 has developed two ways to grow its business vertically, creating new sources of revenue for the firm. The first is licensing its technology. PEAK 6 has developed in-depth trading tools to analyze positions, find opportunities in the market place to trade, as well as measure risk on an individual trading basis. All of these are important for individuals that may want to license PEAK 6 software to trade. The second way they are growing their business is through joint ventures with order flow providers who do not have trading desks established to internalize their flow. One example of this is a joint venture PEAK 6 has with Jeffries that combine Jeffries' sales force and option flow with PEAK 6's trading talent to fill orders. The challenge here lies in finding these opportunities and

establishing a basis for revenue, however the upside potential is significant.²²

So who are the new entrepreneurs in this space? One student interviewed a trader in his early 30s, who recently started his own proprietary trading firm. This person started in the trading industry 12 years ago after receiving an undergraduate degree in finance. He then spent over eight years working in a proprietary trading firm well known in the industry. However, he knew that any good trader in the industry eventually starts his own firm due to the difficulty of making money outside of a partnership. So, he went out alone for a year, proved his strategy and success rate and then was able to recruit three additional traders, one clerk, and a computer programmer. When asked what a person needs to open the door of a new firm, he verified that there are low barriers to entry. He stated that the capital required to start a venture can be as low as \$100,000. One needs a T1 line, which costs about \$4,000/month, \$1,000 worth of software, a clearing-firm, which requires money to open up an account, and knowledge of trading. Since geographical location does not impact his business as long as he can connect to an exchange, this person has chosen to locate in his home so he can be close to his family.

Additional entrepreneurial firms based in the Chicago area that have achieved success as proprietary traders and market makers in the electronic trading space include: Avidus Equity, BOTTA Trading, CTC, Geneva Trading, Getco, Hull Trading (now part of Goldman Sachs), Infinium Capital, Kingstree Trading, Marquette Partners, O'Connor & Associates (now UBS O'Connor), Rho Trading, SMW Trading, Spot Trading, Stafford/Letco Trading (now part of TD Options), and Wolverine Trading, among others.

Hedge Funds

The hedge fund industry recently has experienced significant growth in both the number of hedge funds and in the amount of assets under management. Based on current estimates, 6,000 to 7,000 hedge funds operate in the United States managing over \$1 trillion in assets. The

explosive growth in hedge funds was initially the result of investors looking for alternative investment classes as a result of the poor stock market performance during 2001–2003. Another factor contributing to their growth is the low barriers to enter the business. Essentially, one needs a Bloomberg account and capital (which has not been hard to raise in the past few years given the relatively low returns in the broader markets). The formation of the legal structure is also fairly easy to establish and can cost as little as a few thousand dollars. Lastly, investment banks are more than willing to provide clearing/back operations support (often times for free) so long as the fund uses them as their primary broker.

Hedge funds typically employ a single investment strategy or several different strategies (i.e. multistrategy funds). The most common strategy is that of long-short which allows for the ability to not only buy securities, but also short securities. Other strategies include: event driven, merger arbitrage, fixed income, distressed, market neutral, speculation on macroeconomic factors, energy trading, and reinsurance among others.

As hedge funds have continued to amass record inflows of capital in the past few years, and as the number of funds continues to increase, competition has continued to be fierce. This has resulted in a decline in the returns relating to traditional hedge fund investment strategies (i.e. too much money chasing the same investment strategies). As a result, several hedge funds have expanded into private equity type investments that are not correlated with the hedge funds' other investment strategies.

Another trend affecting the industry is the evolution of some of the bigger hedge funds (e.g. Citadel Investment Group) into financial institutions. The intent here is that the companies will continue to exist even after the founder leaves the business. More importantly though, hedge funds are expected to cater to retail investors in the future and therefore need the additional infrastructure to do so competitively.

Although hedge fund investment advisers are subject to the antifraud provisions of the federal securities laws, they

are not subject to any reporting or standardized disclosure requirements, nor are they subject to examination by the US Securities and Exchange Commission. Consequently, the SEC has only indirect information about these entities and their trading practices. But hedge funds are facing new pressures and there is a demand for greater transparency because of the change in their client mix.²³ Recently, the SEC mandated rules requiring hedge funds to register with the SEC as an “investment adviser”. However, this rule primarily only applies to those funds that have less than a 2 year lock-up on investors’ capital. This registration process allows the SEC to conduct inspections of those registered funds as it sees fit.

Hedge Funds are usually located in proximity to trading centers. Many hedge funds are managed by people who previously were traders. These people are usually middle aged and have families established in the area. This is a deterrent to moving hedge funds to other locations.

Examples of hedge funds and other fund management firms founded by Chicago area entrepreneurs include Calamos Investments, Citadel Investment Group, O’Connor & Associates (now UBS O’Connor), and Ritchie Capital Management, among others.

Retail Brokerages

Retail Futures Brokers and Futures Commission Merchants (FCM) have been a mainstay of the futures industry as they assist individuals to execute trades and receive a commission or fee for this service. The brokerage industry is often described as having two distinct segments—the discount brokers and the full-service firms. An August 2005 *Smart Money* article stated that asset growth with discount brokers is 16% annually while asset growth with full-service brokers is trailing at 11% annually. Nonetheless the discount houses have a long way to go. Assets under management with the full-service firms and individuals are at \$6.2 trillion while \$1.4 trillion is being held at the discount brokers. Baby boomers are the largest share of the customer base for full-service firms like Merrill Lynch.

In addition to the financial powerhouses there are many boutiques and individual brokers that cater to the individual customer. These boutiques are quite often started by ex-employees of full-service brokerage firms who desire more take-home pay and offer a greater variety of products to their customers. These professionals who become independent are more than just brokers; they are entrepreneurs faced with the issues of managing a business.

With the onset of electronic trading, assistance to individuals has moved from relationships with specific brokers to the anonymity of online brokers. As Internet penetration in the retail market increases, transactional costs decrease and commission rates come under pressure. The business model of traditional retail brokerages is becoming less viable. Higher demands for operating capital are creating opportunities in innovation for some firms, but declining margins are squeezing labor. Highly skilled, technology-oriented jobs are replacing traditional brokerage-based jobs and increases in trading volume are making up for the decline in margins.

To understand the changing nature of competition in this area, students interviewed Russ Wasendorf, President of Peregrine Financial Group (PFG). The experience of PFG over the past several years, sheds light on the changes affecting traditional retail brokerages. Mr. Wasendorf relocated his business to Chicago from Iowa in 1995. The proximity of the exchanges benefited PFG as Mr. Wasendorf developed relationships with the Chicago Board of Trade and the Chicago Mercantile Exchange. He traveled to other financial centers like Frankfurt where electronic execution was challenging the traditional operations of many exchanges. One trip to the German Bourse in the late 1990s is all it took for him to understand how the role of the human would change in the electronic marketplace of securities, exchange-traded derivatives, and other publicly traded assets.

Mr. Wasendorf has not only ramped up technology and bandwidth, but he has focused on how to differentiate his firm. Educating investors on the benefits of futures,

options, and other alternative investments has been a way in which PFG works to maintain a loyal customer base in the online sector. One of their strategies is to reach the novice futures trader with educational materials before they enter the world of online derivatives trading with another firm. The stock trader interested in derivatives trading presents a potential long-term opportunity for cash flow. Chicago brokerage firms are at the forefront of working to serve equity investors interested in diversifying their holdings.

Chicago has been an innovator in financial products and an educator in these products for years. As more mediums become available, targeting customers will be a critical endeavor. PFG targets potential customers by publishing a magazine on the psychological aspects of trading. Other firms use newsletters to attract customers interested in the trends of the market as opposed to just fast executions or the latest multi-asset trading platforms. Innovative marketing techniques including Web casting and pod casting may also prove effective. Traditional methods such as public speaking and presentations are still a popular way for representatives of firms and exchanges to generate interest and new business.

Another way in which an entrepreneurial firm could gain traction with retail investors using derivatives is by leveraging these products within an overall asset management business focused on high net worth individuals. Innovative Chicago-based financial advisory services such as U.S. Fiduciary are emerging to compete with the large, traditional Wall Street based brokerage firms using such an approach. U.S. Fiduciary augments this approach by catering to independent brokers by providing back-office services, consultation, research and marketing.

The variety of other Chicago-area firms that have achieved success in targeting retail investors demonstrates the diversity of potential approaches to competition in this arena. Such firms include Alaron Trading, American Options Services, Infinity Brokerage Services, Investrade, Lind-Waldock (now a division of Man Financial),

OptionsXpress, Thinkorswim, and Terra Nova Trading, among others.

The challenge facing the city of Chicago in this segment is that the online world makes it possible for brokerage firms to locate in places like Florida and Texas where lower real estate value and tax incentives encourage startups. Mr. Wasendorf sees little need to keep his operations in Chicago as efficiencies in operations continue to grow exponentially. In addition, more customers are being served by fewer operators, though this may leave room for firms to specialize in customer service. Still the trend is likely to involve more investment capital going to online systems and allocation of bandwidth.

Technology for Trading

Where there is change or pain in an industry there are entrepreneurial opportunities. The trading industry has undergone massive change in the past decade and as a result, many new entrepreneurial businesses have been created and continue to emerge. This section highlights some of the areas of this industry that are generating new businesses. Specifically, this section will analyze the technologies developed to enhance the buy-side of trading as well as post-trading management and technologies that cope with the increasing volume of market data that is being generated through electronic trading.

Buy-Side Technologies

With the advent of the Internet and advances in computing technology, speed, analytics, and accuracy have become the drivers of entrepreneurial activity in the futures trading industry. Phone clerks and floor brokers have given way to sophisticated trading platforms and complex mathematical models. In addition, trading has migrated from a domestic to international marketplace. The globalization of the world economy requires each exchange to trade its products with markets throughout the world. All these trends have created tremendous entrepreneurial opportunities in starting businesses that provide technologies for the buy-side of the market so traders can bypass the limitation of time and place.

Buy-Side Trading Platforms

Buy-side trading platforms provide a fully-functional front end as well as direct access to the trading systems of major exchanges. Customers typically use the front-end interface to review market situations such as real-time quotes; perform market analysis with research tools often provided by the same system; and submit orders that will be routed through the trading platform into the trading system of

various exchanges. Customers pay fees based on the usage of those services.

Since these buy-side trading platforms can directly access the trading systems of exchanges, involvement of this industry has been constrained by regulation and requirements of the major exchanges. For example, exchanges often require that platforms connecting to their trading systems pass conformance tests and are developed using the standard Application Program Interfaces (API). Furthermore, in order to achieve maximum speed and minimize latency, these trading platforms tend to connect to exchanges through direct access lines. Obtaining direct access to exchanges often requires approval from exchanges' clearing or member firms. Currently, there is ability to connect with the domestic exchanges. However, complexities often arise due to the differentiation of security trading regulations across other nations and regions.

As the demand for customization increases, more niche markets and entrepreneurial opportunities have been created in the realm of trading platforms. The success stories of many new businesses also encouraged more entrepreneurs to step into this landscape. The firms that provide proprietary front-end trading systems can vary in size from having thousands of employees to only a few employees, can have business with all major exchanges or with only a few selected exchanges, and can offer trading in all derivatives products or just certain futures and options.

Many entrepreneurs in this industry have had extensive experience in the derivatives trading industry, either directly in trading-related activities as dealers or brokers, or in the development of trading systems, or both. Other entrepreneurs have worked in the management team of exchanges and the trading units of large financial institutions, thereby having the necessary network connections and customer base to start their own businesses. Previous experience in the trading industry is important since these entrepreneurial ventures must understand the customer experience and the factors that contribute to the success of a trading platform.

CHICAGO ENTREPRENEURIAL VENTURES

In this section, a few examples of successful Chicago businesses will be highlighted. It is understood that there are many other entrepreneurial companies in this industry and that a comprehensive list of such companies would be of value. The focus of this project is to elucidate the changes in the marketplace and the types of entrepreneurial opportunities that can arise as a result of these changes rather than attempt to achieve a comprehensive listing. Specific firms are therefore profiled below as illustrative examples.

Trading Technologies International, Inc. Trading Technologies is the industry leader with more than 70% of all electronic futures transactions coming through its software platform. This is up from 50% as of two years ago.²⁴ The goal of Trading Technologies is to provide a "single screen across the markets." With a single access point, a trader can connect to the major global exchanges that account for 60-80% of the world's transaction in this space and see both the depth and prices.

Trading Technologies currently employs about 380 people, up from 200 people just one year ago. The company was originally established in Frankfurt, Germany in 1994 when electronic trading was in its infancy. In 1996, Trading Technologies relocated its headquarters to Chicago in order to be part of the world's largest market for futures trading. Today, Chicago continues to serve as the firm's corporate headquarters, housing 100% of the research and development efforts. To support a global client base, Trading Technologies also has regional sales and support offices in New York, London, Frankfurt, Sydney, and Tokyo.²⁵

The location of Trading Technologies in Chicago has been critical to the development of new products and the growth of the business. Many of the executives, engineers, product managers, sales managers, and support personnel are former traders and have brought their experience to the business. The CEO of Trading Technologies is Harris Brumfield, a veteran of the Chicago trading industry. After using Trading Technologies' software for more than a year,

Harris was so excited by the results, he became an investor in Trading Technologies. He then used his insight into the trading business to contribute to the design of many of the key features of Trading Technologies' products. Harris joined Trading Technologies officially in the capacity of CEO in January of 2003.²⁶

The most recent reports indicate that over 60% of Trading Technologies' net income is channeled back into research and development. Trading Technologies' competitive position in the market is largely a result of its software design and its patents. Trading Technologies has been awarded two patents from the US Patent and Trademark Office for its MD (Market Depth) Trader concept and subsequently obtained two patents from the UK Patent Office in November 2004. With 80 more patents waiting in the wings, various industry participants have been working to adjust to the impact these developments will have on their businesses.²⁷

As of 2006, Trading Technologies has achieved settlements in several lawsuits it filed alleging infringement of its patents and is facing additional legal battles going forward. Brumfield has proposed to give all Trading Technologies' current and future intellectual property to the industry for free if the exchanges will pay Trading Technologies 2.5 cents on every trade permanently.²⁸ To date, the exchanges have not shown interest in making such payments. Regardless of the legal outcomes, however, Trading Technologies already has captured the majority of market share for this part of the trading industry. Competition that numbered around 30 businesses a few years ago has now been reduced to a handful.

RedSky Financial, LLC Given the dominance of Trading Technologies in this industry, the opportunities for new entrepreneurial ventures lie in the customization and special services that can be offered around a trading platform. RedSky Financial LLC, founded in 2000, is a broker/dealer that has also developed a trading platform. Its trading platform, R3, connects to 28 exchanges and enables customers

to trade all range of securities: equities, futures, options, bonds, and Forex. RedSky differentiates itself from other competitors' products not only by its ability to trade multiple asset classes and its connections to a large number of exchanges, but it also offers 'one stop' services. RedSky can provide everything from trading GUI software, clearing, settling, and even an office. The target customers for RedSky Financial are hedge funds, boutique trading shops, and other institutions that do not have their own trading platforms or technical resources. The goal at RedSky Financial is "to combine industry leading technology with a high level of customer support."²⁹

FUTURE ENTREPRENEURIAL OPPORTUNITIES

Customers will continue to demand features and benefits that will push the evolution of trading platforms. One of the key drivers of innovation has been speed – how fast you can identify an opportunity through market data feed and then execute on that order. Another driver is market breadth—maximum access to all the major domestic and international exchanges as well as the ability to trade a wide diversity of futures products. Superseding these drivers is the demand for improved customer experience, especially as speed and breadth become increasingly common offerings available on most trading platforms. As the front end interface becomes more complex, customers are demanding more user-friendly features. In addition, the entire system must be easy to upgrade and maintain. Given the advances in achieving the goal of speed (currently 100 millisecond trades) the focus will continue to shift towards functionality and ease of use.

Additionally, new models of service delivery in this area, such as an outsourced Application Service Provider (ASP) model, may provide opportunities for competitive differentiation. The success of Chicago-based startup Quantitative Analytics Inc. (QAI), recently acquired by the Thomson Corporation, shows that there are also entrepreneurial opportunities for firms that can develop value-added

approaches to the access, display and graphical rendering of market data for trade analytics. Finally, new-generation trade management functionality is likely to be of interest to buy-side customers, such as the ability to dynamically allocate trade volume among a variety of execution providers based on user-customizable criteria and the buy-side firm's various soft-dollar commission arrangements.

Algorithmic Trading

Algorithmic, automatic or 'black-box' trading is based on complex "mathematical models that analyze every quote and trade in the market, identify liquidity opportunities, and turn that information into intelligent trading decisions."³⁰ The models have the ability to identify infinitesimal spreads and then execute an order in a millisecond. These types of trades may be naked to the human eye and may be lost opportunities if they relied on human reflexes.

Although it would appear at first glance that the computers might eliminate the need for human traders, humans continue to be the 'brains' behind the models and they will ultimately control the override function if an unusual event occurs. A local trader confided his reticence regarding automated electronic trading systems and their inability to manage a major political or economic event that could shock the global markets. As the global markets moved en masse, it would be necessary to have humans to intervene quickly enough to neutralize positions and cancel bids and offers. During the Futures Industry Association's 2005 Expo in Chicago, Dieter Marlovics, Chief Information Officer of the Gelber Group described traders as the 'pilots' of the futures industry. It is still necessary to have human creativity to construct the models. Machines can not do that, at least at this point in time.

"Hedge funds still make up the largest segment of algorithmic users; however, to the surprise of many, traditional asset managers are adopting the practice in large numbers, particularly if they trade in index funds that measure their results against benchmarks."³¹ Algorithmic trading models

are currently being developed by large financial services firms such as Credit Suisse First Boston, Goldman Sachs, and Morgan Stanley as well as independent proprietary trading firms and hedge funds. The strategies behind the algorithms are the 'secret sauce' of these firms. A strategy that continues to be successful will attract more traders to a proprietary trading firm or investment funds to a hedge fund. According to one report, in 2006 it will cost a firm at least \$13 million a year to build and maintain algorithms, hire quantitative analysts or financial engineers, and build the required market-data infrastructure.³²

What are the entrepreneurial opportunities in algorithmic trading? It would appear that expertise in the development of financial models continues to be in high demand. Proprietary trading firms and hedge funds are built around the unique trading strategies and algorithms making mathematical models continually more complex. Novel approaches to enhancing firms' risk management capabilities as they deploy a wider array of algorithms are another promising area for development.

Online Trading

For years, derivatives trading presented a number of barriers to the individual investor. Investment decisions were therefore usually managed by a full-service retail brokerage business. However, with the advances of electronic trading, new innovative firms have brought derivatives trading directly to the individual investor. Broker-assisted services have been a traditional way for firms to collect commissions, but as Internet penetration in the retail market increases, transactional costs decrease and commission rates come under pressure. Brokerages must continue to innovate if they want to compete successfully for online business.

CHICAGO ENTREPRENEURIAL VENTURES

optionsXpress One of the notable success stories in online trading is optionsXpress Holdings, Inc. optionsXpress is an online brokerage that provides a customized interface for trading stocks and options to retail customers located throughout the United States and the world. optionsXpress pioneered online automatic trading for the retail investor through a platform that provides an array of differentiating trading tools, allowing investors to identify, analyze, and execute a range of investment strategies. In 2004, optionsXpress launched a subsidiary, brokersXpress LLC, to extend its services to brokers and institutional investors.

Located in Chicago, optionsXpress benefits from its location and proximity to the financial exchanges, specifically the Chicago Board Options Exchange. David Kalt, James Gray, and Ned Bennett who had over 30 years combined experience in the options marketplace, launched optionsXpress in December 2000. The company went public three years later and was ranked by Inc. Magazine in 2005 as one of the top 10 Fastest Growing Companies in the nation.

thinkorswim Another Chicago-based online trading firm is thinkorswim. thinkorswim is an online brokerage, investment management, and software development firm with an expertise in options. It is the largest private retail specialty options broker in the US. This company has differentiated itself by not only having a state-of-the-art trading platform, but the company also offers comprehensive options education and free broker-assisted order entry and support. The firm was founded in September 1999 and launched the online retail brokerage platform in November 2001. "In Barron's 2006 "Annual Review of Online Brokers" thinkorswim was the **only** broker to achieve a 4½ star rating (the highest) for both Web-based and software-based platforms."³³

FUTURE ENTREPRENEURIAL OPPORTUNITIES

According to a *Smart Money* article written in August of 2005, the spread between commissions charged by premium online brokers and basic discount brokers narrowed to \$6, a 67% decrease in two years. As many firms compete to offer the best features, better customer service, and user-friendly interfaces, the line is becoming blurred as differentiation among platforms becomes increasingly difficult for firms. Leveraging their ability to scale, more banks and discount financial service firms are offering online brokerage in equities, equity options, cash management, bonds, futures and futures options. The myriad demands of the retail investor spur these online brokers to constantly innovate but customer loyalty is difficult to achieve and margins have become thinner as the marketplace gets crowded. Consolidation among the on-line brokers is a natural result of these developments. The experience of optionsXpress, however, demonstrates that a focused competitor able to identify and exploit an underserved niche with an innovative offering can still achieve significant success in this marketplace.

Post-Trade Settlement and Management Systems

Once a trade has been executed, post-trade processing moves from trade matching to allocation, confirmation, and settlement. Post-trade processing manages cash for institutions and their customers, ensures compliance with regulatory rules as well as tracks customer's trading activities and the resulting profit and loss. "Core functions, such as real-time position management, consolidated position ledgers, the introduction of new and complex instruments, billing, allocations, and trade reporting, can today only be achieved through an expensive and convoluted mix of manual processes, non-integrated applications and point-to-point communications."³⁴

Businesses that require these functions have electronic systems developed by different vendors or developed

in-house. Even though the industry has been seeking an end-to-end solution for post-trade management, this solution has been hindered by the lack of standards in technology and business process. Large players that have already invested in a particular software platform face significant risk in converting to any new standardized system. The switching costs to a new system will be very high (training costs and data conversion costs) and the payback may not be immediate. Additionally, adopting a new system is always risky since the transition period may involve disruptions that put customer relationships and regulatory compliance processes at risk. Incentives to adopt a standardized system do exist. The costs of transactions, for example, would likely decrease, potentially resulting in increased trading volumes and higher profits.

Of note in this regard are the efforts of SunGard, an established leader in back-office solutions for the financial services industry. In May, 2005, they announced the launch of MINT Trade Management, which can be customized to fit business processes and consolidates allocation, confirmation, and settlement services onto a single platform.³⁵ SunGard was acquired by a consortium of private equity investment firms in August, 2005 and delisted on the New York Stock Exchange. It is unclear as to the strategy and direction that the new owners will take SunGard.

CHICAGO ENTREPRENEURIAL VENTURES

Firm 58 Firm 58 provides post-trade management services by consolidating middle and back office functions. All of the solutions are delivered on an on-demand basis via the Internet and include all software, maintenance, and upgrades. The business employs a subscription-based 'pay-as-you-go' revenue model with no subscription fees until a solution is accepted and is running in production.³⁶

ENTREPRENEURIAL OPPORTUNITIES FOR THE FUTURE

Some of the large players in the market will likely continue to acquire small companies that can fit into holes of their portfolios resulting in further consolidation. This could

lead to higher barriers to entry for new ventures except in niche markets, such as add-on middleware modules for real-time risk and position management. One area that seems to offer some opportunities is in the middle office area—matching actual orders between different firms. As messaging standards, which prescribe the details of a trade or an order, evolve and consolidate, the middleware software that provides exchange of trade messages between corporations or divisions within a firm are becoming commoditized. This presents an opportunity to provide an open source product.

The open source model has been successful in markets where products and services are commoditized. Open source development relies on a strong and loyal community of developers who can fix bugs or issues and can deliver new functionality that users want. This community of developers is motivated by problem-solving and not on being rewarded financially. Companies providing open source software rely on future service or maintenance contracts as their source of revenue. Venture capital is rapidly flowing in the open source market and thereby stimulating innovation and the development of startups that provide new financial technology products and services based on the open source development model. In particular, there is activity with startups that are looking to provide middleware or order management software. Although getting a consensus for standardized messaging software across different enterprises will be a challenge, this will likely be an interesting space to watch in the near future.

Technological Infrastructure

As indicated in the first section of this paper, the volume of electronic transactions is increasing at a rapid pace. “[Messages per second are] doubling almost by the year. To handle that volume of market data, to manage it, store it, analyze it, look for correlations—it’s going to be an overwhelming task.”³⁷ There are also issues of security that

must be addressed. Since electronic trading has tied the world markets together, security breaches in electronic trading networks could have negative consequences on a global scale.

‘Bandwidth’ is a necessity in the trading industry and due to the increasing volume of market transactions, larger and more reliable bandwidth is in constant demand. The State of Illinois I-Wire project has linked its research universities, national laboratories, and various consortia to a high capacity optical-fibre network which is then linked by TeraGrid to a supercomputer in California. In addition, Chicago “is also home to Starlight, a major international communications exchange for the next Internet generation, linked to counterparts in 14 other cities around the world.”³⁸ These developments in the network infrastructure of Illinois, have positioned Chicago at a unique advantage to manage the data from the trading industry into the foreseeable future.

A variety of entrepreneurial opportunities surround these infrastructure challenges to the trading industry. Some of the emerging entrepreneurial ventures have technologies that have been in development for several years and they are realizing that a key customer for their technology is the trading industry. Other technologies are being developed specifically for the industry.

CHICAGO ENTREPRENEURIAL VENTURES

Aleri Aleri is a venture-backed company in Chicago that has developed a powerful platform. The Aleri Streaming Platform is designed to help application developers cope with increasing data volumes and update rates while addressing the business needs for ‘instant information.’ This processing engine can obtain the latest information from a variety of disparate systems, process that information as it arrives, maintaining data sets that are always current and providing streaming output in milliseconds or even microseconds. At the heart of the platform is a 64-bit multi-threaded application designed for performance and

scalability. A single processor running on a 2 CPU machine is capable of processing well over 100,000 incoming messages per second.³⁹ Aleri has recently formed a new division called Aleri Labs that is located in Chicago. Aleri Labs was created to focus on the development of high performance stream processing technology.

Univa Univa's solution to managing the increasing volume of data is based on 'Grid Computing'. Grid Computing enables "the sharing, selection, and aggregation of a wide variety of geographically distributed computational resources—such as supercomputers, computer clusters, storage systems, data sources, instruments, and people—and presents them as a single, unified resource for solving large-scale computations and data-intensive computing applications."⁴⁰ "Grid computing has finally hit the tipping point," states a Celent senior analyst who authored a report titled *Grid Computing: A Guide for Financial Services Firms*. "The technology is fundamentally changing the ability of firms to model risks and perform other tasks that are computationally intensive, and is giving early adopters a significant competitive advantage."⁴¹

Univa's technology was developed at Argonne Laboratories and is known as Globus® software. It is an open source solution. Univa delivers a commercial enterprise version of open source Globus® software that can be customized and supported. Univa recently received venture funding from a number of local venture capital firms. The financial services and the trading industries are being targeted by Univa as a key customer base.

Cleversafe Cleversafe offers a technology that can address the data storage and security issues facing the trading industry. This company has developed a technology that can store data on a geographically distributed grid that is secure, reliable, and cost effective. Traditional back-up systems generate redundant copies of data that in essence increases the probability of security breaches. With Cleversafe's technology, data is divided between different locations and then

recombined when needed. Cleversafe is currently located in the incubator at IIT and tapping IIT's software engineering students.

ENTREPRENEURIAL OPPORTUNITIES FOR THE FUTURE

The demand for technology products and services to support the trading industry will only continue to grow as the industry grows. Given that the size of the players in this market ranges from small proprietary trading firms to large financial services firms, there will be many opportunities to develop products and provide customized solutions and services to serve the IT needs of this industry. Various niche service-only business models and value-added-reseller approaches in the area of IT and infrastructure may also be of interest to entrepreneurs. For example, the Chicago-based startup YJT Solutions provides IT infrastructure management services focused exclusively on customers in the trading industry.

Changing Job Descriptions for the Trading Industry

The New Versus the Old

“On a recent Friday, the foreign currencies and exchange floor looked like nothing so much as a large frat party without beer... Runners in yellow jackets gave each other back-rubs, frisked each others pockets for bid cards, and flung waste paper aside while traders flung themselves around the pit, conducting their business by the time-honored means of ‘open outcry’.”⁴²

As few as six to eight years ago a trader would ideally be physically large, command a presence in the pit, and be able to react very quickly to ever-changing market conditions. Now the game has changed, and to be successful, traders need to have solid analytical skills, be comfortable at a computer, and think creatively.⁴³ The skills required to be successful trading on the screen are different than what is required on the floor. As Russell Wojcik, head of the trading strategy concentration at the Illinois Institute of Technology (IIT) Stuart Graduate School of Business states, “the trader profile is changing from football player to geek.”

Given the metamorphosis of the trading industry, it is imperative to understand changing human capital requirements in order for Chicago to retain its global position. There is an ongoing demand, for example, for expertise in software programming and advanced financial math, but there is also an immediate problem of retraining and re-deploying open outcry traders.

There is considerable debate on the characteristics and skills required for the new electronic trader. A partner in a local proprietary trading firm discussed their hiring policies as follows. He stated that there are two distinct and imperative skills to nurture in new traders and that it was easier in his experience to teach “trading sense and discipline” to new employees than it was to teach the technical aspects and computer skills necessary to successfully

enter and cancel orders on an electronic trading platform. Trading floor success does not necessarily translate into electronic trading success as there are different trading skills and instincts involved and the electronic skills often have to be developed from scratch.

Another proprietary trading firm also confirmed the desire to hire people with relatively little trading experience. They stated that the age and experience level of their average trader had changed substantially over the last few years. Whereas the average trader at their firm was quite experienced five years ago, most of the traders today are relatively young and have only one to two years of experience. Regarding this change in trader profile, they have observed that experienced traders are reticent to undertake the relatively large amounts of risk necessary to make smaller amounts of money in the current market. In the last few years, the trader’s share of the profits has fallen in percentage and absolute terms.

There is one more reason provided as to why trading firms are hiring the young. “The video game generation guys are great at trading,” says Mr. Wojcik of IIT. With electronic trading, the ability to process information quickly can determine success. “They come to us trained in the most important skill set.” The skill set he refers to is the ability to click at the right thing at the right time on the right computer screen.

But there is an opposing view that gives more credit to experienced floor traders. Nick De Fina, a trainer at the Globex Learning Center (GLC) at CME, said that there are two types of traders that come to the GLC to experiment. Roughly 60% of visitors are new and relatively young traders and clerks interested in trying electronic trading. Many of these people are freshly out of school and have not been working in the trading business. The remainder of GLC students are established floor traders who are trying to convert to electronic trading. According to De Fina, the older floor traders have better trading instincts, know how to cut their losses and let their winning trades run, and are better capitalized. Once they master the technical aspects of enter-

ing and canceling orders, they re-orient fairly quickly. The younger, inexperienced traders on the other hand have to master the technical aspects and the general survival skills of trading before their capital runs out. De Fina's conclusion is that the thought processes and instincts of experienced traders proved to be more important than the other skills involved in mastering electronic trading.

CME has focused considerable resources on retraining experienced pit traders. The Globex Learning Center was created to facilitate the learning processes of floor traders and employees interested in moving from floor trading and open outcry to the electronic trading world. There are approximately 50 seats available for self-training. Each position is equipped with a left- and right-hand workstation. On the left side are various charting and technical analysis software programs running with real-time data feeds and on the right are various order entry platforms similarly equipped with real-time price feeds. The GLC configuration is very similar to the way many electronic traders set up their actual working environment in an office or home. Access is free to CME and CBOT members, employees, and interested third parties.

More broadly, the industry demands an increasingly knowledge-based workforce to remain on the cutting edge. Complex mathematical models are required to analyze price quotes and trade data in order to identify market opportunities and turn that information into intelligent trading decisions. The competition is often no longer between individual traders but rather between competing software-based trading algorithms. Increasingly, the best program can make the best trader.

Developing these trading programs requires the blending of two advanced skill sets. One category of expertise is advanced financial math. Typically, this requires MBAs and PhDs who can develop the requisite advanced mathematical strategies and models. The other skill sets required are those of the computer programmers and IT personnel who can program and maintain the applications. Currently, Chicago excels in training new talent in both of these areas.

Many academic institutions in the Chicago area are involved in developing the talent needed to ensure Chicago's competitiveness in the global market. This paper profiles two of the schools that focus on the needs of the trading industry.

University of Chicago

The University of Chicago Graduate School of Business (Chicago GSB) has a global reputation as a leader in finance and derivatives research. Several of the faculty are known for both their research and their leadership on the Exchanges. For example, Robert Hamada, a finance professor and former Chicago GSB Dean, was a director of the CBOT for many years. Professor Merton H. Miller, the Nobel Prize winner for Economics in 1990, wrote frequently on topics concerning derivatives, financial markets, and the economics and regulation of the financial services industry (particularly in the area of securities and options exchanges). Professor Miller was also a public director of CME in the 1980s. He served as Chairman of CME's special academic panel to conduct the post-mortem on the Crash of October 19-20, 1987.

Myron Scholes, the Nobel Prize winner for Economics in 1997, is a Chicago GSB graduate and was a member of the school's faculty for many years. While at Chicago GSB, Scholes co-authored the famous Black-Scholes equation which introduced a new method to determine the value of derivatives. The model provides the fundamental conceptual framework for valuing options, such as calls or puts, and has become the standard in financial markets globally. Scholes is currently a director of CME.⁴⁴

Currently, there are several professors at Chicago GSB who focus on derivatives and risk analysis theory. Classes that are offered to students include: Futures, Forwards, Options & Swaps: Theory and Practice; Structured Finance and Alternative Risk Transfer; and Mathematical Models of Option Pricing and their Estimation. In addition, a recent group of MBA students from Chicago GSB's Management Lab worked directly with CME on the development and launch of a new derivatives product. Not surprisingly,

Chicago GSB alumni can be found in jobs throughout the trading and financial services industry. Recent graduates have taken positions as traders or building financial models to spot arbitrage or other trading opportunities for hedge funds, proprietary trading firms, and the trading desks of the big banks. More senior alumni serve as functional and general managers at the exchanges, the larger banks, brokerage firms, and increasingly in the larger hedge funds.

Illinois Institute of Technology

IIT's Stuart Graduate School of Business Center for Financial Markets offers three Masters degree programs: Masters in Finance, Masters in Financial Markets, and Masters in Mathematical Finance. The enrollment in these programs accounts for half of the enrollment in the business school. Students in these programs typically matriculate with highly quantitative backgrounds. Most are engineers and they often come to IIT from outside the United States. At IIT these engineers learn how to build trading programs and model financial markets. IIT also offers a co-op education program and an experiential learning class where students work directly with trading firms on specific projects.

The Trader of the Future

The combination of computer programming skills and trading expertise is critical for many of the entrepreneurial ventures in the trading industry. Lovetta Houston, assistant director of career development at IIT explains that "there is a benefit to have the trader and programmer work together because they both need to help each other and learn from each other. Currently, there is a growth of IT service providers that serve trading firms.

Fred Hoch, President of the Illinois IT Association stated that there is an emerging trend for experienced IT staff from established trading firms to develop their own entrepreneurial ventures. These firms typically serve the trading industry by developing new trading programs and

software. However, many trading firms are building their own IT departments and in-house computer expertise. Houston foresees that the next step in the evolution of the trader will be "one person on board who can do both pieces equally well." Both Hoch and Houston, believe that these new traders will be the programmers trained in finance. Houston remarks, "it is more expensive to teach the finance person the technology piece. It is cheaper and easier to teach the tech guy trading. The trader doesn't have the patience to develop the program but they can learn how to use the stable technology."

Women in Trading

With a quick look around most trading floors, it becomes fairly obvious that trading tends to be a male-dominated industry. In traditional open outcry trading, not only did women face obstacles with regard to physical attributes, but the cultural environment was often not friendly to women. With the advent of electronic trading, however, these obstacles have largely been removed. Women can now trade in their homes or from a desk in a proprietary trading firm. The risks and rewards of this industry are increasingly open to women.

Several female Chicago GSB students contributed to this project. Between their personal experiences and those of other women in the industry, they generated a number of insights regarding the challenges and opportunities for women who want to develop careers in trading. Here, for example, is one story:

"It was so exciting to be down there on the floor in the midst of all the action. It was, at first, flattering to be stared at and hit on, but when I became serious about this as a career, it was a big annoyance. I definitely felt like I was the only woman in a boy's locker room. Normal expected behavior in business and in public, for that matter, just does not seem to apply on the floor... I, too, felt that when I traded, I was judged on a different scale than the men I worked with. I also learned to love sports... since that was

the only thing talked about all day long. In this world I felt like I had to learn how to relate to men without turning into one, if that makes any sense. It was often that I would go out after work for drinks and be the only female around, I learned how to play poker and I definitely joined the fantasy football leagues. You have to. This is a business that is almost 100% about connections. I knew that if I wanted to move on, I needed to have men that I could call for future trading opportunities.

In late December [one of the market-makers in my crowd] let me know that his firm was hiring and specifically looking to hire female traders. My first thought was, “that’s weird” because I’d never known a firm that would go out to specifically hire women. The response I got was that the company was co-founded by a man and his wife and that she looked out over their trading floor and was disappointed by how few women worked there as traders. She could not fathom the reason and knew that there had to be a way to get women to come to interview... I didn’t have exactly the experience level that the firm was looking for, so they created a hybrid position for me... I entered the firm as a trader, but will go through an abridged version of the training program and learn their style of trading and then begin to trade a few months later. I’m very excited about my new company and the flexibility that the position will eventually have, including satellite trading. I plan to continue with the MBA, but I am so glad to have moved to this new arena. This is in part because floor trading is viewed as a negative thing now.”⁴⁵

Forces Affecting Location

The derivatives trading industry has until recently been tied to a specific location, namely the trading floor. Traders and the support services that served the trading industry were located in a relatively small geographic area surrounding the trading floors of the major exchanges. With the adoption of electronic trading, however, most trading is no longer tied to a specific location. It is conceivable that within the next decade the trading floors of the Chicago exchanges will fall silent.

Even the communications process between industry participants has been revolutionized. Hand signals, shouting and talking in the halls were the time-honored ways to exchange information and intelligence. That verbal order giving and taking, relationship building, and vocal trade execution has largely been replaced by the sound of a keyboard. Now, people rely on instant messages, e-mail and screens lit up by CNN and Bloomberg. America On-Line’s Instant Messaging service (AOL IM) has become a particularly popular communications vehicle in recent years.

A CME and CBOT panel on June 7, 2005 brought some experienced traders together to describe the challenges of moving from floor to electronic trading. Steven Wollack, an independent trader described it as a “culture shock” when he first left the trading floor because he missed “the pulse of the market”. However, he soon found a replacement for the floor-based community of traders – electronic chat rooms. He has participated in one such chat room for six years with five other electronic traders. “[W]e’re constantly in communication with each other each day...we exchange information and we exchange trades. I found that this was a good way to help stimulate me, help give me some interpersonal connection, get a little market information that I didn’t have access to, and to discuss trades.”⁴⁶

If trading is fast becoming an industry characterized by interactions among virtual participants, are there sufficient incentives for businesses to remain in Chicago, or will they migrate to other locations? In New York, many of the hedge

funds have relocated to Greenwich, Connecticut where they are in many cases closer to the homes of hedge fund executives. With respect to online retail brokers, there are a number of firms that have relocated to or started in Florida and other southern locations. Given this trend, what might prevent Chicago-based employers in the trading industry from relocating to the sunbelt or other locations?

Human capital is the critical resource for this industry. As discussed previously, experts in financial mathematics and software engineering are in high demand in order to develop the next generation of algorithms and platform technologies. In addition, industry leaders are required to understand the changing needs of the customer and continually analyze competitive trends in order to identify market opportunities and guide their firm's strategic investments. Attracting and retaining skilled human capital to the Chicago area will require proactive planning and stewardship from educational institutions, businesses and leaders in the public sector.

With the right investments and leadership over the next decade, there is every reason to believe Chicago can remain the recognized global leader in cutting edge derivatives trading. Our future vision should be of a dynamic, growing local economy that is built on world-class institutions of education and training, sophisticated financial and technology services firms and entrepreneurial ventures that push the boundaries of financial modeling and technological innovation. The nightmare we want to avoid is waking up ten years from now and wondering why there are so many vacant offices in the south loop.

So what can we do **now**?

Recommendations

1. Strengthen and grow educational programs that produce the highly skilled experts for the futures trading industry.

Local universities and representatives from the trading industry should form a task force to critically assess the types and number of experts that are required for this industry over the next decade. Recommendations should be developed that cover curriculum, experiential learning, mentoring, and other partnerships that will enhance the instruction of the next generation of traders, technologists and industry leaders.

2. Continue to develop office locations in the Chicago area that have the technological infrastructure for trading and offer a congenial and conducive atmosphere for traders.

Already there are certain buildings in the Loop that have become the home of trading businesses. These 'trader towers' or 'hedge fund hotels' offer bandwidth and reliability for traders in contiguous and column free space. Further research is required to understand if these 'trader towers' could retain the trading business in the Loop, and if so, if the private sector views this as a market opportunity.

3. Market and promote Chicago's global prominence in the futures trading industry.

If one took a poll of educated people in Chicago or the rest of the nation and asked them to identify the industry in which Chicago is a global leader, it is likely that very few people would say the 'derivatives trading industry'. It is hard to imagine that there is such little awareness of an industry that generates such significant wealth and employment in the Chicago economy. The City of Chicago and State of Illinois, working in partnership with industry leaders, should develop a targeted communications strategy and promotion plan to highlight Chicago's 'Number 1' position in the world in the trading industry.

4. Retrain and redeploy the floor traders into the entrepreneurial fabric of the community.

A significant number of floor traders do not want to be retrained for the new world of electronic trading. However, these individuals have a high tolerance for risk and many have capital. There may be an opportunity to provide entrepreneurship training to this group of traders so they can increase their business skills and either join, start, or invest in an entrepreneurial venture. The Chicago GSB should investigate the potential for such a course as part of its Executive Education program.

5. Create tax incentives to direct the wealth generated in this industry to other entrepreneurial sectors of the Illinois economy.

The trading industry has the highest average monthly salary of any industry in Illinois. A considerable amount of this wealth has been channeled to real estate and other investment vehicles. Given the lack of capital for early-stage businesses in Illinois, wealth from the trading industry could be a vital source of investment capital for entrepreneurial ventures in other sectors. The existing Orphan Tax Credit is an example of a tax credit that has already attracted traders and other wealthy individuals. This tax credit provides a credit that is equivalent to 50% of the investment into clinical testing expenses of orphan drugs (drugs that work on rare diseases) that large pharmaceutical companies rarely target. It is recommended that the State of Illinois consider a similar tax credit for investment in specific industries in Illinois.

6. Create a private and public sector leadership committee to monitor the key indicators of this industry in Chicago and make on-going recommendations as necessary.

Given the importance of this industry to Chicago and Illinois, a public/private sector partnership would provide leadership and visibility for the industry, and promote understanding by leading public officials and economic development experts. As situations arise, the leadership committee and the trading community in Chicago can thereby react proactively rather than reactively to stay ahead of the competition as the needs of the global trading industry evolve.

Endnotes

- 1 *Financing Engineering News*, www.fenews.com. Don Chance is a professor of finance at Louisiana State University He can be reached at dchance@fenews.com
- 2 Ibid
- 3 US Census Bureau, Labor Employment Dynamics
- 4 Ibid
- 5 www.cbots.com
- 6 Ibid
- 7 *Crain's Chicago Business*, www.chicagobusiness.com, February 28, 2006
- 8 *Crain's Chicago Business*, www.chicagobusiness.com, "CBOE Makes a Strategic Investment in HedgeStreet," February 22, 2006
- 9 "Screen Insights: Electronic Trading 2005 – A Panel Discussion," June 7, 2005, co-sponsored by CME and CBOT, p. 10
- 10 *Chicago Tribune*, April 1, 2006, Merc, Nymex deal reported, By Susan Diesenhouse
- 11 CME Web site, www.cme.com, Center for Innovation
- 12 Ibid
- 13 CME Web site, www.cme.com, presentation at Credit Suisse 2006 Conference
- 14 "Ring Your Bell," by Peter A. McKay, online *Wall Street Journal*, March 9, 2006; Page C1
- 15 Ibid
- 16 Ibid
- 17 Futures Industry Association Web site, www.futuresindustry.org, *Futures Industry Magazine*, Jan/Feb. 2005, The E-Trader Factor: Arcades and Prop Shops Grow in Number and Influence, by Leslie Sutphen and Mary Ann Burns
- 18 *Proprietary Trading Firm and Trading Arcade Directory*, published by CME and CBOT, May 2005
- 19 Interview with George Ruhana of PEAK 6
- 20 "Screen Insights: Electronic Trading 2005 – A Panel Discussion," June 7, 2005, co-sponsored by CME and CBOT, p. 27
- 21 Interview with George Ruhana of PEAK 6
- 22 Ibid
- 23 Web site: Always On; Hedge Funds Still in the Dark, by Eric Janszen, March 2006
- 24 *Crain's Chicago Business*, Jan. 16, 2006, Kate Ryan
- 25 www.tradingtechnologies.com
- 26 Ibid
- 27 *Futures Industry Magazine*, January/February 2005
- 28 Ibid
- 29 www.RedSkyFinancial.com
- 30 *Wall Street & Technology*, February 04, 2005, "Algorithmic Trading" By Ivy Schmerken
- 31 *Wall Street & Technology*, Jan 24, 2006, "The Buy Side Buys In" by WS&T staff
- 32 Ibid
- 33 www.thinkorswim.com
- 34 www.firm58.com
- 35 *Wall Street & Technology*, May 17, 2005, "Investment Management Newsflash: SunGard Launches MINT Trade Management for Investment Managers and Broker-Dealers" by WS&T staff
- 36 www.firm58.com
- 37 *Futures Industry Magazine*, Summer 2005
- 38 "A Survey of Chicago," *Economist*, March 18, 2006, p. 6
- 39 www.aleri.com
- 40 www.gridcomputing.com, Grid Computing Info Center
- 41 www.celent.com, Recent Research publications
- 42 www.pbs.org/itvs/openoutcry/trading.html
- 43 Interview with George Ruhana, Senior Partner, PEAK 6 Capital Investments
- 44 <http://en.wikipedia.org/wiki/Derivative>
- 45 Carolyn Elizabeth Matuga
- 46 "Screen Insights: Electronic Trading 2005 – A Panel Discussion," June 7, 2005, co-sponsored by CME and CBOT, p.7

Student Researchers

Name	Graduation Year and Program*	Former or Current Employer	Areas of Expertise
Manish Aggarwal	2007 / PT	Stark Investments	Analytic Finance, Strategy, Accounting
Anurag Bhardwaj	2007 / FT	Tata Consultancy Services Limited	IT systems
Michael J. Busch	2006 / PT	Self Employed, CBOT Futures Trader	Floor Trading, Exchange Operations
Jen (Qin) Cai	2008 / PT	Motorola	Technology
Hugo Cruz	2007 / FT	McKinsey & Co.	Strategy Consulting
Amir Friedman	2007 / FT	Chevron Corporation	New Products, Housing Derivatives
William M. James	2006 / PT	Neumark Technology Group	Information Technology
Tasmeen Kapadia	2007 / PT	Abbott Laboratories	Consulting, Supply Chain Management
Khloe Karova	2006 / PT	Townsend Analytics	Electronic Trading
Ramakrishna Katuri	2008 / PT	Walgreen Company	IT Project Manager
Brett I. Ladendorf	2007 / PT	RJ O'Brien and Associates	Sales, Trading, Risk Management
Chau Ly	2007 / FT	Banc of America Securities	Equity Research
Sriram V. Madapura	2007 / PT	IBM Corporation	Technology Consulting
Raj Majumder	2007 / FT	Morgan Stanley, Alternate Investment Partners	Private Equity in Financial Services, Technology; Healthcare
Siddhartha Malhotra	2007 / PT	Citadel Investment Group	Hedge Funds
Carolyn E. Matuga	2007 / PT	Peak 6 Investments, LP	Options Trading
Sanjay Mehta	2007 / FT	Goldman, Sachs & Co.	Trading Platforms, Financial Technology
Megan Morgan	2006 / FT	Lehman Brothers	Finance
Barbara Passy	2007 / PT	Creditflux	Derivatives Markets
Nimesh Patel	2007 / PT	Chicago Mercantile Exchange	Technology, Project Management
James Quinn	2007 / PT	MTI Consulting	Derivatives Trading

* **FT** indicates students in the Full-Time Program at Chicago GSB; **PT** indicates students in the Evening and Weekend Part-Time Program.

Name	Graduation Year and Program*	Former or Current Employer	Areas of Expertise
Hamza Rampurawala	2007 / FT	Citadel Investment Group	Investment Management/ Investment Products
Steven Rosen	2007 / PT	Peak 6 Investments, LP	Equity Derivatives, CBOE (Proprietary Trading)
Anuj K. Singhal	2007 / PT	Convergys	IT Strategy, Finance
Jason Starr	2007 / FT	BoldTech Systems	Enterprise Software, Supply-Chain Management, e-Business
George Stein	2008 / PT	Chicago Mercantile Exchange	Futures, Futures Options, Spot and Forward Forex
Hao Sun	2008 / PT	UTStarcom	Software, Telecommunication
Daniel Sun	2007 / PT	S-Logic, Inc.	Statistical Analysis/Programming, Asset Pricing
Hendra Susanto	2008 / PT	DRW Trading	Risk System Development
Ekin Turesay	2007 / PT	The John Henry Company	Operations
Hong Yan	2007 / PT	World Richman Mfg. Corp	Accounting
Willie Yao	2008 / PT	Federal Home Loan Bank Chicago	Financial Engineering, Risk Management System
Charles Yoo	2008 / PT	Federal Home Loan Bank Chicago	Financial Engineering, Risk Management System

* **FT** indicates students in the Full-Time Program at Chicago GSB; **PT** indicates students in the Evening and Weekend Part-Time Program.

Special Thanks

Christopher Krohn

Adjunct Assistant Professor of Marketing, Chicago GSB
Formerly with OneChicago LLC, and CME

Ellen Rudnick, '73

Clinical Professor of Entrepreneurship, Chicago GSB
Executive Director, Michael P. Polsky Center for Entrepreneurship

Steven Mendes

Paradigm Real Estate Services, LLC
Formerly member of CME, Founder of SRG Financial

Starr Marcello

Assistant Director, Michael P. Polsky Center for Entrepreneurship

Sponsors

Chicago Mercantile Exchange

CME is the largest and most diverse financial futures and options exchange in the world. Founded in 1898, we serve the risk management needs of customers around the globe with the widest range of benchmark financial products available on any exchange, traded via our CME Globex electronic trading platform and on our trading floors. Our innovative products cover major market segments including interest rates, equities, foreign exchange, commodities and alternative investment products. In addition, our clearing house matches and settles all trades and guarantees the creditworthiness of every transaction that takes place in our markets. CME, the first financial exchange in the United States to go public, is traded on the New York Stock Exchange and NASDAQ under the symbol "CME."

Illinois Department of Commerce and Economic Opportunity

The Department of Commerce and Economic Opportunity (DCEO) is charged with enhancing Illinois' economic competitiveness by providing technical and financial assistance to businesses, local governments, workers and families. As the state's lead economic development agency, DCEO works to capitalize on Illinois' strengths as a center of transportation, manufacturing and technology development. DCEO is committed to forging partnerships with the private sector in an effort to build upon Illinois' reputation as a center for business and industry.

Sevin Rosen Funds

Since its inception in 1981, Sevin Rosen Funds has established a reputation for success. SRF's impressive track record is, in large measure, based upon its team approach. At the core of all our ventures are technology and ideas that have the potential

to effect fundamental changes in the marketplace. SRF's emphasis on very early stage investments has demanded that our partners work closely with entrepreneurs in what we know is the real long term team sport: building companies. Our emphasis is on what will happen next, what will succeed, and then, what will endure.

Michael P. Polsky Center For Entrepreneurship

The Entrepreneurship Center was organized in 1998 through a grant from the Ewing Marion Kauffman Foundation and became an endowed center in 2002 through the generous commitment of Michael P. Polsky, '87, a successful entrepreneur and inspiration to our students and alumni.

The Polsky Center's mission is to create entrepreneurial leaders through a broad range of experiences, including classroom learning, experiential learning, leading-edge research, and community outreach. Visit ChicagoGSB.edu/entrepreneurship.

Hamer Small Business Initiative

In 2004, Donald W. Hamer, '58, established the Hamer Small Business Initiative at Chicago GSB's Polsky Center for Entrepreneurship. The funds from this endowment are used to develop curriculum and educational programs targeted specifically to the small business community.

Mr. Hamer is founder and chairman of State of the Art, Inc., a small business that manufactures chip resistors, surface mount networks, and custom circuits. He started the company in 1969. Over the years, Mr. Hamer has cultivated not only a strong business but also a philanthropic way of living. He is an active environmentalist, serving on the board of a local conservancy in his home state of Pennsylvania, and he currently serves on the Polsky Center's Entrepreneurship Advisory Board.

Supporting Organizations

Chicagoland Entrepreneurial Center

The Chicagoland Entrepreneurial Center (CEC) is a nonprofit affiliate of the Chicagoland Chamber of Commerce helping entrepreneurs and high-growth businesses build viable, sustainable, and profitable enterprises. Visit www.chicagolandec.org.

World Business Chicago

World Business Chicago (WBC) is a not-for-profit economic development organization promoting metropolitan Chicago. Visit www.worldbusinesschicago.com.



Michael P. Polsky Center for Entrepreneurship

The University of Chicago

Graduate School of Business

5807 South Woodlawn Avenue

Chicago, Illinois 60637