UNIVERSITY OF LETHBRIDGE
FACULTY OF MANAGEMENT
Finance Area
Lethbridge, AB, T1K 3M4

MGT4850b&zvc: FINANCIAL TRADING AND MARKET MICRO-STRUCTURE SPRING 2010
Fridays, 13:00-15:50hrs in L950, Library of University of Lethbridge; simultaneous video-broadcast in Edmonton

Prof. Cornelis A. Los, PhD
Office hours: Fridays 16:00-18:00hrs
Office: University of Lethbridge, E441, 4401 University Drive, Lethbridge, AB, Canada T1K 3M4
Tel: (403) 317-2888
E-mail: cornelis.los@uleth.ca
URL: http://www.uleth.ca/management/staff/cornelis-los

Abstract
This topical course is designed for Senior and Master students, who want to understand how financial markets operate, who are interested in financial market trading, and want to observe the influence of market microstructure on pricing and trading flows.[1] Junior students need the Instructor's permission. Trading is all about converting an investment decision into a desired portfolio position. One wants to do this at the least possible cost and in a timely fashion. Trading is also about finding pricing discrepancies in the market, jumping on them, and realizing a profit. Students are introduced to the theory and practice of financial trading in exchanges, in upstairs dealer networks, and via alternative trading systems and to the latest developments of high-frequency or algorithmic trading. The readings, assignments and class lectures are appropriate for students who do not have any market experience, although a basic understanding of investments and the financial markets is required. Game-playing and assessing competitive trading performance in computer trading simulations using TraderEX Trading and Market Simulation software is a major part of the course. The networked and web-based simulation exercises form a valuable tool for increasing understanding of how the structure of trading influences actual trading behavior. Prices in the marketplace can move with startling velocity in brief intervals of time. So, students will learn to quickly select, make decisions and respond, under pressure, to complex trading opportunities that arise from micro-structural market interactions and limitations, as well as to reduce the costs associated with trades, so as to enhance the overall investment performance for investors. It takes training to gain the experience needed to think and act instinctively. Professional traders are good only after lengthy training with trading simulators, like pilots after extensive training with flight simulators. They need to learn to be high-performance day traders, buy-side traders, and market makers, both as individuals and as members of teams, in normal market conditions and in bubbles and crises. This training should be simplified, precise, focused and realistic, and measured by recognized performance metrics.

[1] This course was initially modeled after the course taught by Bruce Weber, Professor of Information Management at the London Business School, whom I met at the Equity Markets Microstructure Seminar on "Using Trading Floors and Teaching Microstructure," on the Wasserman Trading Floor in the Subotnick Center of Baruch College in New York City, November 12 – 14, 2008.

Topics to be covered are:

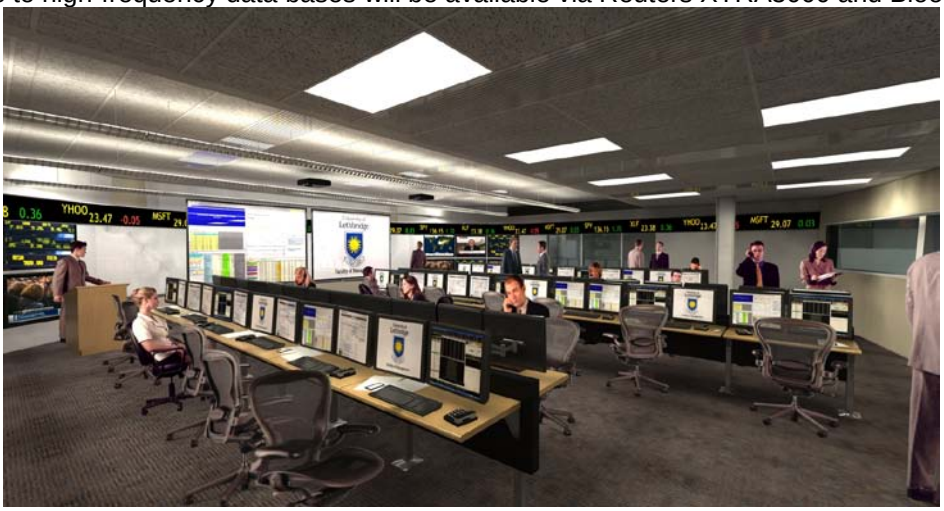
- Why people trade
- How buy and sell orders are transformed into trades in alternative market structures (like continuous limit order books, dealer networks, iceberg and block trading, etc.)
- Tactical decision-making on trading desks
- Why equities, bonds, currencies, and derivatives markets are organized as they are
- The determinants of price efficiency, trading returns, volatility, and liquidity
- The principles of market making and proprietary trading
- How trading is changing in response to IT innovations and inter-market competition
- High-frequency or algorithmic trading
- Trade clearing and settlement, and the straight-through processing trend
- What exchanges and regulators do to facilitate trading efficiency and market fairness
- The role of public policy in the markets and regulatory challenges

This course is designed to add value for students, who are planning to work in the securities industry - at trading desks of asset management or hedge fund firms, as sell-side brokers or dealers -, in specialized investment implementations or in proprietary algorithmic trading, in IT and management consulting for firms active in the markets, or who want to become active individual traders. They will learn how to compete and how to measure their own trading performance, so that they know how well they are trading by being skillful versus by chance. The examples for this course will focus on trading of agribusiness, energy commodities and weather derivatives in the Province of Alberta.

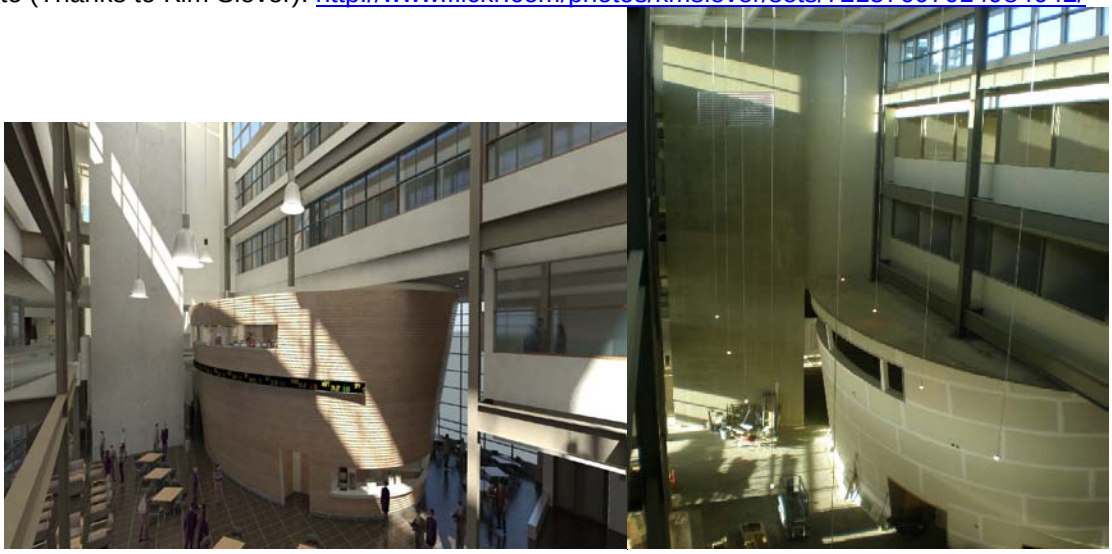
At the end of this course, students will be able to:

- Differentiate between investing, speculating, hedging, arbitraging, trading and gambling
- Identify the advantages of alternative trading mechanisms
- Assess and measure transaction costs and market quality
- Solve trading and order placement problems
- Recognize different trading styles
- Evaluate trading performance
- Design market mechanisms
- Lobby and influence policy-makers on market (micro-)structure issues

The expectation is that the course will have several guest speakers from the financial communities of Lethbridge, Calgary, Edmonton, Winnipeg and Toronto, in connection with the realization of the on-campus high-tech trading room in Markin Hall in July 2010. This trading room will function as our on-campus “flight-simulator” for the practical “pilot-training” of traders, where also links to high-frequency data bases will be available via Reuters XTRA3000 and Bloomberg.



Follow the progress of the construction of Markin Hall and its Trading room on the following web site (Thanks to Kim Siever): http://www.flickr.com/photos/kmsiever/sets/72157607014984642/

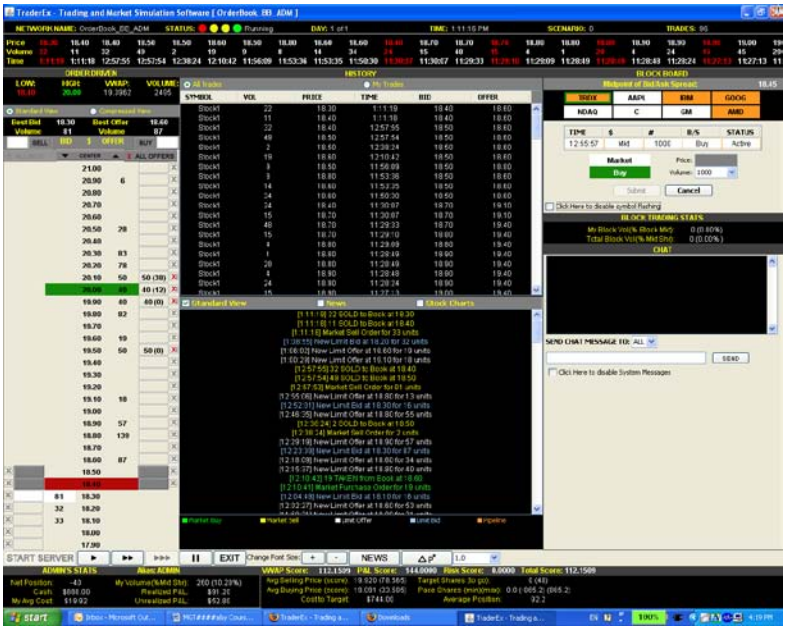


Pre- or corequisite

The only pre- or co-requisite is MGT3412 Fundamentals of Investments. Students who don't satisfy this prerequisite or co-requisite are advised to consult with their Student Advisor and with Professor Los. This course requires a positive attitude towards quantitative, mostly numerical, challenges, and a fair amount of laboratory practice and, of course, sheer hard work. Students are expected to read the assigned readings before each class meeting and to get deeply involved in the simulation exercises. To benefit most from this course by being able to connect to the real world, students are required to follow the daily news events, while regular reading of the *Wall Street Journal*, *Barron's*, or the *Financial Times*, and *The Economist* is strongly recommended.

Trading Simulations

Trading simulations using web-based TraderEX of Baruch College in New York City will be used to obtain hands-on experience with making fast tactical decisions in different market structures. A standalone version of TraderEX Trading and Market Simulation (TMS) software for at-home practice will also be made available. However, most trading practice (and fun!) will be obtained from the internet-based, networked, competitive trading simulation games we'll play in the computer laboratory of the UoL Library (later to be replaced by the Trading Room).



The TraderEX TMS (cf. the order-driven screen below) is an interactive simulation model developed by Professors Robert Schwartz (Baruch College) and Bruce Weber (London Business School) and implemented as internet-based networks by software developer/instructor Greg Sipress (Baruch College).

It enables its users to enter various kinds of orders into a computer-driven market that generates order flow for a generic tradable instrument and that directly responds to participants' orders. Such simulations will deepen a student's understanding of how the (micro-) structure of markets influences actual trading behavior and the resulting order flows and cash flows (= net transfer of cash values between investors). The two basic market micro-structures in TraderEX are Order Driven and Quote Driven. In addition, TraderEX includes a dark liquidity pool and "Pipeline" for negotiated block trades It also allow participant to trade in periodic call auctions. TraderEX also produces a hybrid market, which is a combination of a basic structure with either a dark pool or call auction.

To complete these computer-generated market simulations, we'll also enable the students to access the real world markets with virtual money and to obtain an appreciation of the real world value volatility of various financial instruments, we'll also provide access to the OS Financial Trading System (FTS) of Carnegie-Mellon University in Pittsburgh and to the upgraded 2nd edition of StockTrak Global Portfolio Simulation, aka FastTrak. These are a very different kind of portfolio investment simulations, where no influence can be exerted on the financial markets, since the portfolio values are computed from current real-time prices (with 15 seconds delay). Students can form their own investment portfolios of assets and their derivatives and observe how their traded portfolios change value according to the current prices generated by the real-world markets. They cannot influence those real-world market valuations; only dispassionately and scientifically observe them. Therefore, they cannot obtain a detailed understanding of how market (micro-) structures influence actual trading behavior and their resulting order and cash flows.

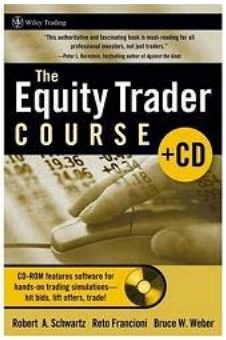
However, the combination of TraderEX, FTS and FastTrak provides the students with a trading simulation experience akin those of pilots in flight simulators. With TraderEX we can pre-program extreme market conditions and adjustments to condition and train the traders for such circumstances. With FTS and FastTrak we can observe the real world markets, but cannot pre-program extreme adjustment conditions. With TraderEX we can pre-program various market micro-structures and see how students will trade within the limitations of those micro-structures so that they become aware of such limitations and influences on order flows, cash flows and trading profits. But with FTS and FastTrak we have to accept the existing real world market micro-structures and can only select which instrument to trade and in which market, to build a portfolio that reflect the historical gyrations of those existing markets.

Both FTS and FastTrak will be used by the students to realize the two required case study projects.

Required Readings

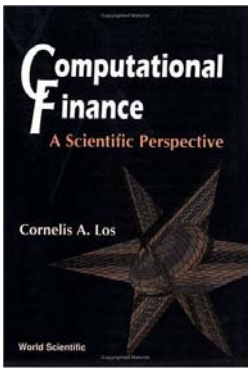
Students are strongly advised to start reading the required literature immediately, so as not to fall behind with their laboratory preparations and to enable themselves to speedily become active traders during the competitive market simulation games.

The required textbook for this trading course is:



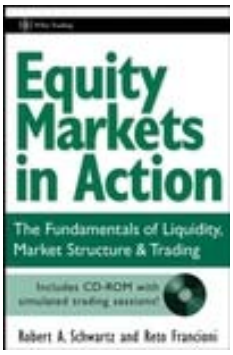
[SFW] Schwartz, Robert, Reto Francioni and Bruce Weber (2006), *The Equity Trader Course*, John Wiley & Sons, Hoboken, NJ, (ISBN: 978-0-471-74155-8).
Note; Despite its title, this book is devoted to market exchange trading in general and covers stock, bond cash and derivatives markets. Agribusiness and commodity futures and various weather derivatives are traded on market exchanges and are, therefore, also covered by this textbook. The textbook examples will be complemented with examples from those business sectors for the benefit of students in Alberta.

In addition, I will make references to my own compendium/textbook to familiarize students with issues such as the mathematical modeling and valuation of financial instruments, modeling risk and measurements of market performance, such as average return, risk and, in particular, liquidity, which more recently have come to the foreground. Since I'm also working on a 2nd edition of this book for 2009, comments and suggestions for improvement (like finding the typos!) will be welcomed and acknowledged in the Preface of its 2nd edition:

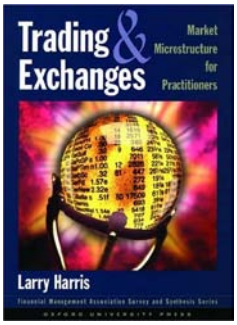


[CAL] Los, Cornelis, A. (2001), *Computational Finance: A Scientific Perspective*, World Scientific Publishing Co., Singapore (ISBN: 981-02-4497-7, paperback).
Note: Investment strategies of pension and insurance funds, and more and more of large international corporations, are nowadays based on mathematical models of both financial instruments and of financial markets. Computational finance is somewhat broader term for financial engineering, the technical cross-disciplinary field, which relies on mathematical finance, numerical methods and computer simulations to make trading, hedging and investment decisions, as well as facilitating the risk management of those decisions. Using various methods, practitioners of computational finance aim to precisely determine and value the actual financial risk and additional market liquidity that certain financial instruments create. My book is used by traders and investors in London, who follow a course in "Computational Finance" at the University of London. There exists now also an excellent academic *Journal of Computational Finance*.

Optional Readings (not required)
Three optional (non-required) books, with additional references, to which I may occasionally refer, are:



Schwartz, Robert A., and Reto Francioni (2004), *Equity Markets in Action: The Fundamentals of Liquidity, Market Structure and Trading*, John Wiley & Sons, Hoboken, NJ, 480 pages (ISBN: 978-0-471-469223).
Note: Robert A. Schwartz, PhD (New York, NY), is Marvin M. Speiser Professor of Finance and University Distinguished Professor in the Zicklin School of Business, Baruch College, CUNY and a strong promoter of strategic call auctions at opening and closing times in addition to Central Limit Order Books (CLOBS) to reduce the disequilibrium uncertainty of price discovery and thus a promoter of exchanges with hybrid micro-structures. Reto Francioni, PhD (Zürich, Switzerland), is President and Chairman of the Board of SWX, the Swiss Stock Exchange, and former co-CEO of Consors Discount Broker AG, Nuremberg. This is a comprehensive, up-to-date handbook and reference on how markets work and the nuances of trading. It includes a CD with an interactive trading simulation, which was the DOS-based precursor of the current inter-net based TraderEx simulation.



Harris, Larry (2002), *Trading and Exchanges: Market Microstructures for Practitioners*, Oxford University Press.
Note: Larry Harris is considered the foremost expert on the institutional aspects of market microstructure. His book is about trading, the people who trade securities and contracts, the marketplaces where they trade, and the rules that govern it. You will learn about investors, brokers, dealers, arbitrageurs, retail traders, day traders, rogue traders, and gamblers; exchanges, boards of trade, dealer networks, ECNs (electronic communications networks), crossing markets, and pink sheets. Also

covered in this text are single price auctions, open outcry auctions, and brokered markets limit orders, market orders, and stop orders. The book covers program trades, block trades, and short trades, price priority, time precedence, public order precedence, and display precedence, insider trading, scalping, and bluffing, and investing, speculating, and gambling.

Skeete, Herbie (2009) The *Future of Financial Exchanges: Insights and Analysis from The Mondo Visione Exchange Forum*, Elsevier Science, Amsterdam.
Note: Herbie Skeete, the former Head of Equities Content and Head of Exchange Strategy of Reuters (now reuters-Thomson) is a globally recognized expert on financial exchanges. He edits the industry-standard *Handbook of World Stock, Derivative & Commodity Exchanges*, and operates the exchange information web site www.exchange-handbook.com
This book is an edited summary of the Mondo Visione exchange Forum of 2008 and indicates the recent fundamental transformation of trading platforms and of the "plumbing" of trading, mostly in response to faster and more efficient trading technologies.

Required Journal Articles and Handouts
Further (more up-to-date) article readings, handouts, assignments, data sets, and solutions will be posted on this course's web site.

Grading
Grading practice and scaling will adhere to University of Lethbridge policy.

A+ = 95 – 100	C+ = 70 – 73
A = 90 – 94	C = 66 - 69
A- = 86 – 89	C- = 62 - 65
B+ = 82 – 85	D+ = 56 - 61
B = 78 – 81	D = 50 - 55
B- = 74 – 77	Less than 50 = Solid F (no plus or minus)

Grades will be determined on student performance throughout the semester and are not subject to negotiation during or at the end of the semester. There will be no substitute or make-up exams, unless there is a very legitimate and documented reason (severe illness, evidenced by a physician's report: the common flu isn't enough reason!). Student grades will be determined using the following weights:

1. Two equally-weighted Exams (individual; 2 x 20% =) 40%
2. Two assigned case studies (group; due in Weeks 4 and 7; 2 x 20% =) 40%
3. Student trading competitions (ranked performance) 20%

TOTAL: 100%

CLASSES FRIDAYS 13:00-16:00PM	**TOPICS**	**REQUIRED READINGS & ASSIGNMENTS**
Week 1 Jan 8	MARKET FUNCTIONS AND TRADING ORDERS Trading versus investing; quoting a market; reading market data displays; ticker symbols, order types and order placement; three generic market models: order-driven, quote-drive, periodic call auctions. Market-driven trading	SFW: Chapter 1 "Getting a Grip on Trading" Handouts: *Technical Specifications*

		Video-Conference Etiquette *Users Guide to TraderEX A Trading and Market Structure Simulation*, 2008 *WLF Trading Guide for Beginners*, 2009 Software: TraderEX, 2005 (Version 051024)
Week 2 Jan 15	FINANCIAL INSTRUMENTS AND INDICES Measurement of returns and risks; inter-valuing effect; computing intrinsic values of stocks, bonds, futures, options; put-call parity as a valuation tool; comparing intrinsic and market values: buy, hold and sell signals Indexes: composition, calculations, and trading requirements in index replication. Trading room/PC laboratory: sign-up for the Financial Trading System (FTS) by licensed username and FastTrak by individual subscription	SFW: Appendix "Prices and Returns" CAL: Chapters 1 – 3 (Review of basic finance formulas) Video: "Comparing Trading Strategies: Futures and Options" Website: futures contract specifications
Week 3 Jan 22	ORDER-DRIVEN TRADING Trading motives and price discovery; impact of inside/asymmetric information; measures and evidence of market illiquidity. Introduction to internet-based TraderEX Trading room/PC laboratory: order-driven market simulation with user playing role of buy-side trader with a large order to execute. Order placement decisions and performance attribution in block trading; traders see their results in real-time, and analyze them with the instructor after play	SFW: Chapter 2 "All About Liquidity" Software; networked, internet-driven TraderEX, 2006 TraderEX Simulation #1 Case study project #1 (due in Week 6)
Week 4 Jan 29	TACTICAL TRADING DECISIONS Order-driven trading in practice: NYSE – roles, market rules, and emerging hybrid market structures. Movie clips about trading: *Trading Places*, 1983; *Wall Street*, 1987; *Rogue Trader*, 1999	SFW: Chapter 3 "How to Use Limit and Market Orders" Presentation: Order Entry
Week 5 Feb 5	QUANTITATIVE TRADING ALGORITHMS The Efficient Market Hypothesis (EMH) in light of high frequency data and observed market activities; block trades and pipelines; market frictions, serial autocorrelations, long memory and persistence; and path dependence; bases technical analysis; trading algorithm designs based on put-call parity; option trading in markets with various degrees of persistence. High-frequency or algorithmic trading;	SFW: Chapter 6 "The Road to Technical Analysis and algorithmic Trading" Handouts: Los (2003), Chapter 2; Chan (2009), Chapter 3

	Movie clip about high-frequency trading	
Week 6 Feb 12	INTERMEDIATED AND PROPRIETARY TRADING Market intermediaries: brokers, dealers, market makers and specialists; theory of market making; market-maker risks; delta-hedging and its mathematics; understanding market-maker's profits; order flow control by quote-setting; inventory control; risk measurement and performance assessment for liquidity providers; market-making in fixed income, currency and derivatives, in particular futures, trading; market maker obligations and privileges Trading laboratory/PC laboratory: traders play market maker roles in trading against order flow with varying volatility and market singularities	SFW: Chapter 5 "Market Intermediaries" Hand-outs: MacDonald (2006), Chapter 13; Los (2008b) & Eun & Resnick (2003)
Week 7 Feb 19	**READING WEEK: No Class**	
Week 8 Feb 26	**MIDTERM EXAM**	Covers materials from week 1 - 6
Week 9 Mar 5	QUOTE-DRIVEN TRADING Alternative trading systems and transaction cost control; POSIT crossings Trading laboratory/PC laboratory: traders play market maker roles in trading against order flow with varying volatility and market singularities **Professor Los presents paper at the Southwestern Financial Management Association meeting in Dallas, TX and will teach this class via Skype (video) and using the TraderEx (internet-based) trading simulation, or, when technologically challenged, reschedule this class**	Web site: www.itginc.com Hand-out: Schwartz, Sipress and Weber (2009) Website: Alaron's futures quotes TraderEX Simulation #3 (class competition) Case study project #2 (due in Week 12)
Week 10 Mar 12	CALL AUCTIONS AND HYBRID MARKETS Institutional investors and their trading needs; institutionalization of trading, block trading using Pipeline, "upstairs" liquidity, the problems of executing large buy and sell orders; alternative order placement strategies; dark pools and iceberg orders; call auction transparency and market liquidity: the "Shanghai experience," Trading laboratory/PC laboratory: call auction and dark pool markets; handling large orders in a market with call auctions and alternative block trading facilities	SFW: Chapter 4 "Choosing Between Continuous Trading and Periodic Call Auction" Hand-outs: Ying and Los, 2006; Gerace, Gang Tian and Zheng, 2009 TraderEX Simulation #4
Week 11	**No class: Professor Los attends R.I.S.E. Forum**	

Mar 19	**in Dayton, OH with a two AMF competition winners from MGT4412a (http://www.sba.udayton.edu/rise/index.asp)** ASSESSING TRADING PERFORMANCE Profit and Loss (P&L) and Value-at-Risk (VaR) adjustments; idiosyncratic (non-systematic or market) contribution; Transaction Cost Analysis (TCA) tools and insights. **Read SWF Chapter 7!**	SWF Chapter 7 "Performance Measurement"
Week 12 Mar 26	TRADING PRACTICES: PRINCIPAL VS. PROGRAM TRADES Basics of clearing, settlement, give-ups/step-outs, matching, DKs, QTs/out-trades, fails, confirmations, allocations. Straight-through Processing (STP); expanding connectivity in trading operations: pre/post-trade data flows; messaging standards and protocols: FIX, SWIFT, ISO 15022 and 20022; futures and options trading on crude oil	Hand-out: "Prehedging" Video: "Introduction to Futures and Options Trading on Crude Oil"
Week 13 Apr 2	**GOOD FRIDAY: No Class**	
Week 14 Apr 9	MARKET QUALITY, TRANSACTION COSTS Economic imperfections in securities markets and trading (externalities, free-riding, systemic risks); competition vs. consolidation; views of different market constituents; hybrid markets and integration of quotes in a consolidated order book; derivatives and multi-asset trading; market quality and market structure; changing needs of institutional investors; needs of a proprietary trading firm; combining different trading structures to construct a superior trading environment Trading laboratory/PC laboratory: hybrid market trading	Hand-outs: Los (2003); "Exchanges – mutuals vs. shareholder governance" Website: www.saxonfinancials.com TraderEX Simulation #5
Week 15 Apr 16	Trading laboratory/PC laboratory: hybrid market trading NEXT-GENERATION INNOVATIONS & REVIEW Impact of technology on the development of trading systems and market structure: where is trading technology taking the markets? The re-current popularity of high-frequency trading; Integrating the investment and trading decision process; concluding topics Review – example exam questions	TraderEX Simulation #6 (class competition)
Week 16 Apr 23	**FINAL EXAM** **(tentative date, time and venue: Apr 23, 1:00-15:50hrs in L950; proctored in Edmonton)**	Covers materials from week 9 - 14

Useful Trading Glossary
http://www.trading-glossary.com/num.asp

Heatmaps (not required)
http://screening.nasdaq.com/heatmaps/Heatmap_100.asp

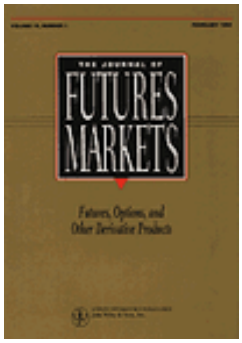
Indicative Journals (not required)

Journal of Computational Finance ((http://www.journalofcomputationalfinance.com/)

Journal of Energy Markets (http://www.journalofenergymarkets.com/)

Journal of Investment Management (https://www.joim.com/index0.asp)

Journal of Futures Markets (http://www3.interscience.wiley.com/journal/34434/home)

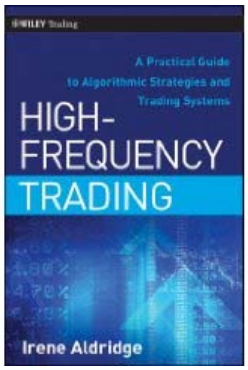


Journal of Risk (http://www.thejournalofrisk.com/public/showPage.html?page=jor_index)

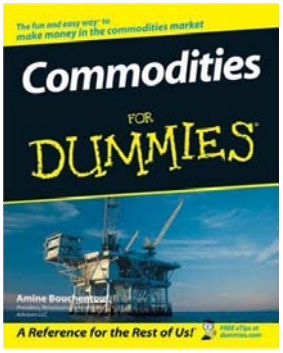
Journal of Trading (http://www.iijournals.com/JOT/DEFAULT.ASP?)

Review of Futures Markets (*http://www.theifm.org/index.cfm?inc=rfm.inc*)

Additional Recommended References (not required)

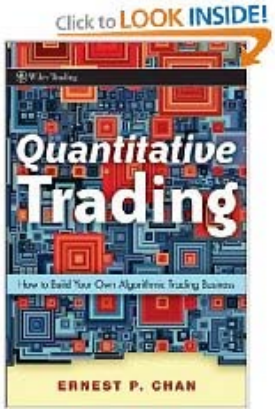


Aldridge, Irene (2009) *High-Frequency Trading: A Practical Guide to Algorithmic Strategies and Trading Systems*, Wiley and Sons, Hoboken, NJ352 pages (ISBN: 978-0470563762; hardcover)
Note: Interest in high-frequency trading has exploded in the past two years. High-frequency trading now means trading in a few micro-seconds = a few millionths of a second = a few 1000 nanoseconds. This is the first hands-on guide to algorithmic high-frequency trading. Financial markets are undergoing rapid innovation due to the continuing proliferation of computer power and algorithms. This book covers all aspects of high-frequency trading, from the business case and formulation of ideas through the development of trading systems to application of capital and subsequent performance evaluation. It also includes numerous quantitative trading strategies, with market microstructure, event arbitrage, and deviations arbitrage discussed in great detail. Interest in high-frequency trading has exploded over the past year. Industry-expert Aldridge discusses the history and business environment of high-frequency trading systems; reviews the statistical and econometric foundations of the common types of high-frequency strategies; examines the details of modeling high-frequency trading strategies; describes the steps required to build a quality high-frequency trading system; and addresses the issues of running, monitoring, and benchmarking high-frequency trading systems



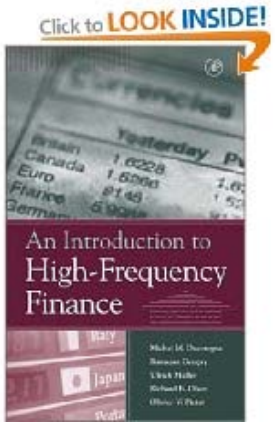
Bouchentouf, Amine (2007) *Commodities for Dummies*, Wiley Publishing, Indianapolis, IN, 360 pages (ISBN: 978-0-470-04928-0; paperback).

Note: **s**ince 2002, commodities have outperformed every other asset class including stocks, mutual funds and real estate. This plain-English guide gives you the basics to trade in the commodity markets, presenting a wide range of trading and investing strategies. It will help you diversify your portfolio and see how commodities stack up against other other investment vehicles. You learn how to identify, manage, and overcome risk; recognize the pros and cons of futures, equities, ETFs and mutual funds; acquire specific techniques for analyzing and trading in commodities; identify opportunities for profits in energy—crude oil, natural gas, coal, nuclear, and newer alternatives, like hydro, wind, tidal and thermo power as well as biofuels; and you learn how to grow your portfolio with farm products. Bouchentouf is President and CEO of Renaissance Investment Advisors, LLC, headquartered in New York City, providing long-term strategic advice to individuals, institutions, and governments around the world.



Chan, Ernest (2008) *Quantitative Trading: How to Build Your Own Algorithmic Trading Business*, John Wiley and sons, Hoboken, NJ, 182 pages (ISBN: 978-0470284889; hardcover).

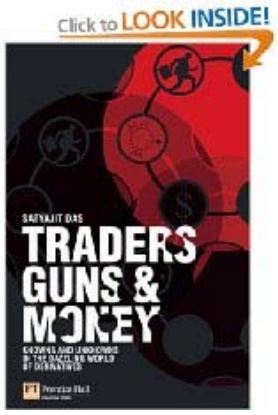
Note: By some estimates, quantitative (or algorithmic) trading now accounts for over one-third of total trading volume in the United States and 70% of its equity trading. While institutional traders continue to implement quantitative (or algorithmic) trading, many independent traders have wondered if they can still challenge powerful industry professionals at their own game. The answer is "yes." This practitioner's book is for the entrepreneurial, independent traders, who want to build quantitative trading businesses on their own. Thus, it addresses how to: find a viable trading strategy; back test your strategy—with Excel, MATLAB®, and other platforms—to ensure good historical performance; build and implement an automated trading system to execute your strategy; scale up or wind down your strategies depending on their real-world profitability; manage the money and risks involved in holding positions generated by your strategy; incorporate advanced concepts that most professionals use into your everyday trading activities.



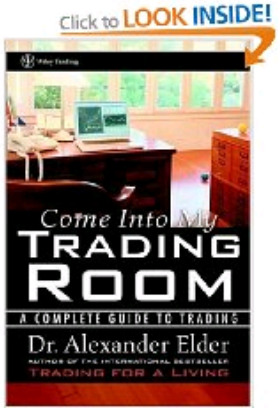
Dacorogna, Michel M., Ramazan Gençay, Ulrich Műller, Richard B. Olsen and Olivier V. Pictet (2001) *An Introduction to High-Frequency Finance*, Academic Press, London, UK, 383 pages (ISBN: 0-12-279671-3; hardcover)

Note: These authors were the first to shape the field of empirical high-frequency (HF), *i.e.*, tick-by-tick data for usage in finance. This introduction by the research team from Olsen & Associates is a presentation of their research work over the period 1985-2000. The volume includes details of data handling, filtering methods, scaling procedures, volatility models, automatic market making and trading rules that for many years were proprietary information. This study of financial prices provides an indispensable bridge between the financial and academic communities, in particular between trading rooms and finance faculty. "This group and its alumni have also analyzed their own data. That work, which I often quote, has now been collected and extended in a book. I shall

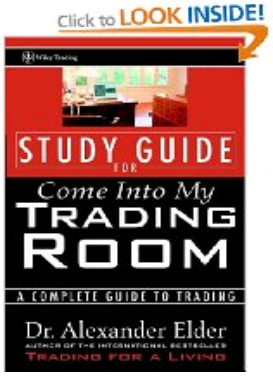
wear it out by constant use and it is a delight to recommend it to the emerging rational finance community." -- BENOIT B. MANDELBROT, Sterling Professor of Mathematical Sciences, Yale University.



Das, Satiyajit (2006) *Traders, Guns & Money: Knowns and Unknowns in the Dazzling World of Derivatives*, Financial Times Press, London, UK, 330 pages (ISBN: 978-0273704744, paperback).
Note: Warren Buffet once memorably described derivatives in a vastly exaggerated fashion as "financial weapons of mass destruction." Modern financial management applies derivatives to enhance and insure returns by transferring risk. But nowadays everybody is exposed to derivatives, from the price discovery in commodity futures markets affecting the gasoline price at the pump to the placement of limit and market orders in daily trading. This is Das' wry and wickedly comic exposé of the culture, games, and pure deceptions played out every day in trading rooms around the world, usually with "other people's money" (or OPM, according to Danny DeVito's "Larry the Liquidator" in his eponymous corporate take-over movie). But make no mistake: Das is a leading and well-published international authority in the area of financial derivatives and treasury management. He was the treasurer for the TNT Group on Australia for six years. Prior to this he worked in the Commonwealth Bank of Australia, Citicorp Investment Bank and Merrill Lynch Capital Markets). Das is not against the use of derivatives, but he correctly warns against the uninformed and untrained use of leveraged financial instruments.

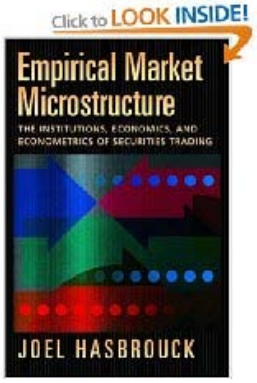


Elder, Alexander (2002) *Come into My Trading Room: A Complete Guide to Trading*, Wiley and Sons, NJ, 2002, 320 pages (ISBN: 978-0471225348; hardcover)
Note: Shifting focus from technical analysis to the overall management of a trader's 3Ms – Mind, Method and Money – Dr. Elder takes us from the fundamentals to the identification of new, relative unknown indicators that can produce substantial profits. He reviews the basics of trading stocks, futures, and options as well as crucial psychological tactics for discipline and organization—with the goal of turning anyone into a complete and successful trader. Alexander is a professional trader, technical analysis expert, and practicing psychiatrist. He is the founder of Financial Trading Inc.



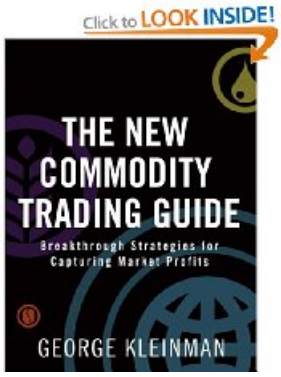
Elder, Alexander (2002) *Study Guide for Come into My Trading Room: A Complete Guide to Trading*, Wiley and Sons, NJ, 2002, 208 pages (ISBN: 978-0471225409; hardcover)
Note: This study guide parallels the previous book, challenging students at every step with questions and tests that make you focus on all the important areas of trading. Some tests are pencil-and-paper, others have you work with charts, but all prepare you to make crucial decisions. This Study Guide quizzes you on the essentials of trading – choosing the markets to trade, finding holes in the Paul Samuelson's and Eugene Fama's Efficient Market Theory; makes you aware of psychological blind spots that lead to losing; tests your knowledge of

charting and computerized indicators; explores trading systems, day-trading, and advanced concepts, such as Impulse trading and SafeZone stops; asks questions about money management, record-keeping, and managing time; and, most importantly, challenges you with eight case studies where you choose entry and exit points and get graded for your performance.



Hasbrouck, Joel (2007) *Empirical Market Microstructure: The Institutions, Economics and Econometrics of Securities Trading*, Oxford University Press, 208 pages (ISBN: 978-0195301649)

Note: The interactions that occur in securities markets are among the fastest, most information-intensive, and most highly strategic of all economic phenomena. Professor Hasbrouck of the Stern School of New York University, discusses the statistical methods of using and interpreting the vast amount of information that these markets produce. The empirical methods discussed in the book draw on the power of multivariate linear time series analysis. In this analysis, the tools of random-walk or Geometric Brownian Motion decomposition and co-integration emerge as important tools to specification and interpretation. The statistical specifications don't simply arise, however, as progressively more refined descriptive models; they have strong underpinnings in financial-economic theory from asymmetric information, inventory control, and the strategies of their participants. From a practical viewpoint, many of these models are statistically calibrated to real-world trading strategies. Some market participants will be trying to discern strategies that generate profits from short-term trading. A much greater number, though, will be trying to accomplish trades that help diversify, hedge or reallocate a portfolio. Trading is not, for these agents, their primary economic purpose. They are simply trying to satisfy their trading needs at a minimal cost. The final part of the book discusses how these costs are measured, and strategies to minimize them--both by splitting orders over time, and by the judicious use of limit orders.



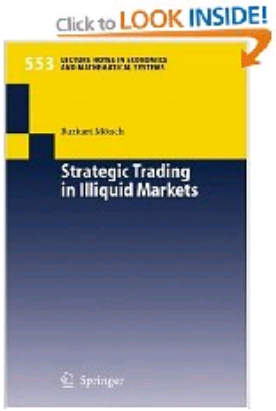
Kleinman, George (2009) *The New Commodity Trading Guide: Breakthrough Strategies for Capturing Market Profits*, Financial Times/ Prentice Hall, 2009, 192 pages (ISBN: 978-0137145294; hardcover).

Note: commodities are basic essentials for life and, because of increasing global demand, commodity trading is heating up. More investors are trading commodities with unprecedented opportunities to earn huge profits, but commodities markets have changed radically in recent years. This book provides traders with strategies for today's electronic, global commodity markets. Over the long term, commodities prices are expected to rise based on massive increases in global demand. Fundamental changes in the commodities markets have occurred that have major implications for investors. For instance, century-old "open outcry" trading floors have now been replaced with computerized trading. Kleinman, one of the world's top experts in commodities trading, provides techniques designed specifically for today's electronic trading of commodities.

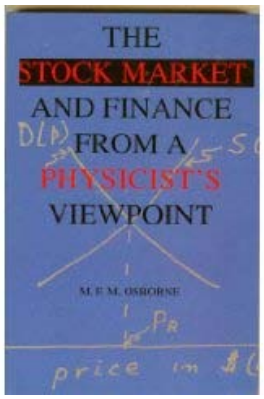
Los, Cornelis A. (2003) *Financial Market Risk: Measurement and Analysis*, Routledge/ Taylor&Francis Group, 460 pages (ISBN: 9780415278669, hardcover; ISBN: 9780415771139, paperback, August 2006; ISBN: 9780203987636, electronic, August 2006).

Note: this was my first attempt at measuring the degrees of persistence of the price diffusion in various financial markets

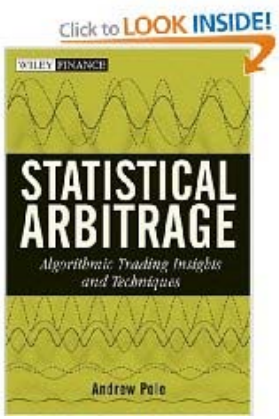
in a truly scientific fashion, using wavelet multi-resolution analysis (MRA), a modern form of engineering signal analysis and identification. These measurements are used to identify multi-fractal information processes that, for example, underlie the dynamics of many forward and future pricing curves in the energy and agribusiness commodity markets. This new stochastic pricing process identification underlies also the new high frequency trading used in the latest statistical arbitrage. (I'm working on the 2nd edition for World Scientific Publishing Co. in Singapore. Any student finding a substantial number or typos, mistakes or has serious suggestions for improvement, will be acknowledged in the Preface to this 2nd ed., to be published in 2010 or 2011).



Mönch, Burkart (2005) Strategic Trading in Illiquid Markets, Springer-Verlag, Berlin Heidelberg, 166 pages (ISBN: 3-540-25039-5; paperback)
Note: One of the very few theoretical financial-economics books on trading strategies in illiquid markets. In this PhD thesis, Mönch first presents an innovative approach to investigate the interactions between the trading activities of a large investor, the stock price, and liquidity. By introducing a stochastic liquidity factor existing models are generalized and the approach is illustrated by the pricing of a liquidity derivative. Next he focuses on a new pragmatic approach to determine optimal liquidation strategies if an investor uses market orders to unwind large security positions in an illiquid market. Finally, special attention is devoted to iceberg orders. He provides a parsimonious model that allows the analysis of the rationale for the use of this special order type by assessing the costs and benefits of this trading instrument.

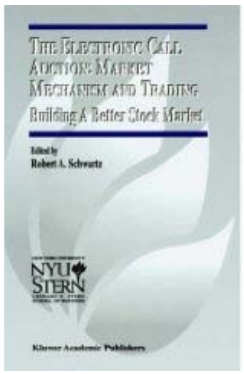


Osborne, M. F. M. (1977) *The Stock Market and Finance from a Physicist's Viewpoint*, Crossgar Press, Minneapolis, MN, 381 pages (ISBN: 0-9646292-0-8, paperback).
Note: the first attempt to truly scientifically measure and analyze, instead of assuming, stock market pricing processes, following the example of Alfred Cowles in the 1930s. (American Alfred Cowles was one of the three founders of the Econometric Society. The other two were the Swedish Ragnar Frisch and the Austrian Joseph Schumpeter). This book is based on a series of lectures originally produced for graduate students in business administration. This happened when, in the fall of 1972, the professional physicist Maury Osborne was a visiting lecturer in the graduate school of Business Administration at the University of California in Berkeley, teaching two courses labeled "Security Markets and Investment Policies" and "Seminar in Investments." Osborne's seminal 1959 *Operations Research* article "Brownian Motion in the Stock Market" is in the same category as the Louis Bachelier's 1900 doctoral mathematics thesis applying the Brownian motion model to French Rentes, thereby preceding Einstein's paper on Brownian motion by half a dozen years!

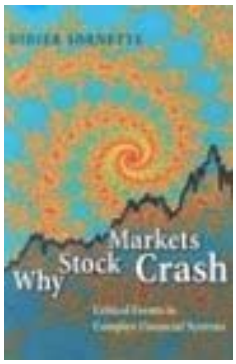


Pole, Andrew (2007) *Statistical Arbitrage: Algorithmic Trading Insights and Techniques*, Wiley Finance, NJ, 230 pages (ISBN: 978-0470138441; hardcover).
Note: While statistical arbitrage has faced some tough times in the past decade, as markets experienced dramatic changes in dynamics beginning in 2000, very recent new

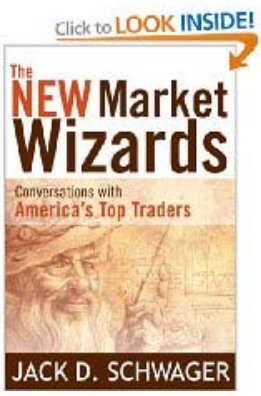
developments in algorithmic trading, using more sophisticated stochastic process models, have allowed it to re-emerge in the new form of high-frequency trading. Based on the results of Pole's own research and experience running a statistical arbitrage hedge fund for eight years in partnership with a group whose own history stretches back to the dawn of what was first called *pairs trading*, this book provides detailed insights into the nuances of a proven dynamic statistical arbitrage investment strategy.



Schwartz, Robert A. (Ed.) (2001) *The Electronic Call Auction: Market Mechanism and Trading, Building a Better Stock Market*, Kluwer Academic Publishers, Boston, 462 pages (ISBN: 0-7923-7256-5).
Note: a persuasive call to auction! Schwartz convincingly argues that hybrid market micro-structures offer the best chance to help build smooth-working, but innovative markets, which do transmit the most informative price signals. It's an example of the latest "financial engineering" approach to building a better institutional microstructure for trading.



Sornette, Didier (2003) *Why Stock Markets Crash: Critical Events in Complex Financial Systems*, Princeton University Press, Princeton, NJ, 421 pages (ISBN: 0-691-09630-9, hardcover).
Note: empirical measurement and modeling of financial bubbles and market crashes by this brilliant French mathematician, a specialist of the modeling of ultra-persistent earthquakes, while he lectured at the University of California in Los Angeles and the University of Southern California. The whole focus of the book is on the persistent and ultra-persistent financial markets, like the stock and real estate markets, respectively. But, unfortunately, Sornette focuses on inefficient markets and completely ignores the simultaneous existence of neutral (efficient) and anti-persistent (ultra-efficient) financial markets, like anchor (Yen/US dollar and Euro/US dollar) currency markets, as well as the emergence of ultra-highly liquid high-frequency trading, allowed for by the futures and option markets.



Schwager, Jack D. (2008) *The New Market Wizards: Conversations with America's Top Trader*s, Marketplace Books, New York, 2008, 614 pages (ISBN: 978-1592803378; hardcover).
Note: In these interviews with star performers in the financial markets, Schwager humanizes the mechanics and psychology behind billion-dollar daily world trading in such sophisticated instruments as currencies, stock options, commodity futures, and mutual-fund accounts by individuals, investment firms and group-trading computerized "money machines." One trader focuses on market response to news events, another calculates mathematical probabilities--one even listens to the noise level on the exchange floor (There exist several Journal of Finance articles about that observable phenomenon of excitement). All rank assiduous research, self-confidence, a specific plan and the courage to cut losses among essentials to success. Few consider their work gambling, but Schwager argues that a successful trader still needs many of the qualities of a "good poker player."

Other Internet-based Market Simulators (not required)

http://www.howthemarketworks.com/trading/join.php?src=yahoo&a=6

This is another stock simulator. You can sign up for a free virtual stock exchange account, which allows you to practice buying and selling real stocks using virtual money for the purpose of gaining experience with stock trading. This is also known as paper trading or fantasy trading. You can practice trading, buying long and short-selling, stocks and indices in the US & Canada, penny stocks, pink sheet stocks, mutual funds, ETFs, place both market orders and limit orders, suing real stock quotes.

http://www.forexyard.com/uk/open-demo-account-forex-course

This provides a risk-free FOREX demo account and introductory trading course to familiarize you with FOREXYARD trading software, as well as test your knowledge and strategies under real market conditions. You will receive the same real-time quotes and charting as FOREXYARD live traders, but without the risk of market exposure. This free trading tutorial will introduce you to the basics of the FOREX trading and is a great place to start if you are new to the FOREX market.

Recommended Websites (not required. Students are encouraged to recommend additional sites for inclusion into this list and to assist writing concise, indicative blurbs for them!)

http://www.tradingacademy.com/canada/index_canada.htm

In 1997 the Online Trading Academy built the single largest electronic trading floor West of the Mississippi in Irvine, California: the Strategic Trading Center. Within six months it had 180 traders, who were transacting about 500 million dollars in trades per day, who needed to be educated. Since 1997 it has provided professional trader education with 3-7 day courses on stock, FOREX, futures (E-Minis and commodities), and options trading, with an emphasis on market-driven trading. Under CEO John O'Donnell and Education Directorship of Mike McMahon, the Online Trading academy is now considered the leading trading school in the world, since it trains thousands of traders through a network of 28 centers (23 within the US and 5 abroad in Canada, France, Great Britain, Dubai and Russia) (http://www.tradingacademy.com/aboutus.htm; http://www.tradingacademy.com/news.htm). Its courses focus on trading fundamentals, technical analysis, risk management, and developing skills of execution for virtually any trading instrument. All their classes are fully reimbursed by their dealer/broker partners. (Online Trading Academy is a DBA of Newport Exchange Holdings, Inc). (http://www.tradingacademy.com/aboutus.htm; http://www.tradingacademy.com/news.htm).

http://www.futurestraining.com/index.htm

This is the official website of Alaron's Futures Training division, which was developed so that its clients may have the tools, knowledge and experience of the seasoned futures trader, since education and experience are the cornerstones of success in trading, Alaron Trading Corporation is a Chicago-based Futures Commission Merchant with a highly diversified client base. Alaron is a clearing member of the Chicago Mercantile Exchange, the Chicago Board of Trade, New York Board of Trade, OneChicago and the Minneapolis Grain Exchange. Alaron is also a member firm of the Kansas City Board of Trade, the Climate Exchange and the Merchants' Exchange. It provides institutional clearing, and introducing brokerage services along with managed, broker- and self-directed retail trading accounts. Clients may trade online 24 hours a day on multiple high-speed trading platforms including AlarOnline, CQG Trader, J-Trader, Ninja Trader, Strategy Runner and TradeNavigator. All platforms offer direct-to-the market trading of E-Minis, Bonds and Notes, Liffe, Eurex, Simex and more. For Alaron's research http://www.alaron.com/research.aspx
For Alaron's quotes: http://www.alaron.com/quotes_charts.aspx

http://www.epchan.blogspot.com

This is Ernie Chan's useful quantitative (algorithmic or pairs) trading blog (See his earlier referenced book), where you can ask him questions. For some examples of MATLAB and EXCEL programs, see his http://www.epchan.com/subscriptions accessible with "sharperatio" as both username and password. This web site contains articles of a more advanced nature, as well as backtest results of several profitable strategies. Ernie worked for investment banks (Morgan

Stanley, Credit Suisse, Maple Securities) and hedge funds (Mapleridge Capital, Millennium Partners, MANE Fund Management).

http://wwww.nasdaq.com
National Association of Securities Dealers Automatic Quotation (NASDAQ) exchange, for, for example, high-tech company stock

http://www.nyse.com/attachment/amex_landing.htm
NYSE Euronext (= NYSE + AMEX = New York Stock exchange + American Stock Exchange), the classic stock market

http://www.nymex.com
New York Mercantile Exchange (NYMEX), where one trades: gold, silver, platinum, palladium, aluminum, copper, coal, crude oil, gasoline, heating oil, natural gas, propane, electricity

http://www.lme.com
London Metals Exchange (LME), where one trades aluminum, copper, lead, nickel, tin, zinc

http://www.cme.com
Chicago Mercantile Exchange (CME), where one trades: butter, milk, feeder cattle, frozen pork bellies, lean hogs, live cattle and lumber

http://www.cbot.com
Chicago Board of Trade (CBOT), where one trades: corn, ethanol, oats, rice, wheat, gold and silver

http://www.nybot.com
New York Board of Trade (NYBOT), where one trades cocoa, coffee, cotton, frozen concentrated orange juice, sugar, ethanol

http://www.londonstockexchange.com
London Stock Exchange (LSE)

http://www.tsx.com
Toronto Stock Exchange

http://www.cboe.com/
Chicago Board of Exchange

http://www.bmv.com.mx/
Bolsa Mexicana

https://www.theice.com/homepage.jhtml
ICE = Intercontinental Exchange, the leading operator of regulated futures exchanges, OTC markets and clearing houses serving the global markets for agricultural, credit, currency, emissions, energy and equity index markets. ICE Futures Europe trades half of the world's crude and refined oil futures. ICE Futures U.S. and ICE Futures Canada list agricultural, currency and Russell Index markets. ICE offers trade execution and processing for the credit derivatives markets through Creditex and clearing through ICE Trust and ICE Clear Europe. A component of the Russell 1000 and S&P 500 indexes, ICE serves customers in more than 50 countries and is headquartered in Atlanta, with offices in New York, London, Chicago, Winnipeg, Calgary, Houston and Singapore. One trades here: coal, crude oil, natural gas and electricity

http://www.instinet.com
Instinet, a leader in electronic, algorithmic, trading, for 40 years. It creates technology-driven agency brokerage solutions for the buy side.

http://www.msci.com
Morgan Stanley Capital International (MSCI) stock market indices are used to measure the performance of global and international investment portfolio managers against

http://www.ishares.com
Barclays Global Investors' fashionable ishares

http://www.sifma.org/
This is the web site of the Securities Industry and Financial Markets Association (SIFMA). Its mission is "To champion policies and practices that benefit investors and issuers, expand and perfect global capital markets, and foster the development of new products and services. Fundamental to achieving this mission is earning, inspiring and upholding the public's trust in the industry and the markets." It has many interesting links and you can see the dynamic current US Treasury yield curve and compare it with its values of one week and a few weeks ago. The US "risk free" yield curve is the basis for all valuation in the world, but its very credibility has recently come under severe stress, because the Federal Reserve has put some very non-transparent assets on its books, while it is printing money.

http://www.iafe.org
The International Association of Financial Engineers is a not-for-profit, professional society, dedicated to fostering the profession of quantitative finance by providing platforms to discuss cutting-edge and pivotal issues in the field. Founded in 1992, the IAFE is composed of individual academics and practitioners from banks, broker dealers, hedge funds, pension funds, asset managers, technology firms, regulators, accounting, consulting and law firms, and universities across the globe. It also has a job board and a very good quarterly *IAFE Newsletter*. *The Journal of Derivatives* (edited at New York University) is now its very high quality quarterly flagship publication and since 1999 the successor of the earlier *Journal of Financial Engineering* (1992-99). This IAFE website has a wonderful archive of videos of speeches by financial professionals.

http://www.garp.com/
The Global Association of Risk Professionals administers the Financial Risk Manager (FRM) certification exam. It provides training workshops, the largest digital library in the world dedicated to the risk management profession, publishes the *Risk Professional* journal, runs a career center, has chapters to connect and network with other financial risk professionals in your local area and has established an online community to network with financial risk professionals from around the world.

http://www.prmia.org/
The professional Risk Manager International Association administers a similar Professional Risk Manager (PRM) certification exam for professional risk managers, like CROs (Chief Risk Officers). Established in 2002 by a volunteer group of risk industry professionals, PRMIA's mission is to provide a free, open, global forum for the promotion of sound risk management standards and practices, serving emerging as well as more developed markets. The PRMIA currently has more than 64,404 members in over 193 countries represented by nearly 60 chapters worldwide.

Recruiters and Placement Opportunities
http://www.ultimateplacements.com
Ultimate Placements, LLC, MRI network with Executive Recruiter Brent Stansen (bstansen@4whitetiger.com)

University Policies Applicable to all Students in this Course:

Plagiarism and Cheating (with thanks to Dr. Chris Holsworth, Geoffrey Kneller and Dr. Kelly Williams. I was a member of the Committee on Plagiarism and Cheating at the Nanyang Technological University in Singapore, so I take this VERY seriously)
Plagiarism is defined as "to steal and pass off the ideas and words of another as one's own" (Webster's Dictionary). Plagiarism and cheating, *e.g.,* on exams, will not be tolerated, will automatically result in a zero grade for the submission, and will be reported. Any student caught plagiarizing or cheating may also be subject to additional University sanctions. Special care should be taken to understand and avoid Academic Offenses of Plagiarism and Cheating listed in the Student Discipline Policy. For the current University Policy on Cheating and Plagiarism, please, consult pages 74 – 75 of the 2008 – 2009 University of Lethbridge calendar. The University of Lethbridge subscribes to a plagiarism detection service. Students may be required to submit their written work in electronic form for plagiarism checking.

Make-up Exams
Students who fail to write Final Exams must provide satisfactory evidence of illness or other serious extenuating circumstances AND must have the approval of the Dean for a makeup exam. For missed exams, a grade of F (0 marks) will be given.