In the FTS Real Time System, students manage the risk and return of positions with trade settlement at real-time prices. The projects and analytical support system integrates theory and practice by taking students through the steps required to take the concepts you teach to practice.

The setting is real world exchanges and real world securities; the basic goal is to let students experience how techniques that are taught, like financial statement analysis, equity valuation, bond valuation, notions of risk and return, diversification, derivative pricing and hedging, are used in practice and how they work. The system is designed to teach, reinforce, and demonstrate practical applications of concepts in finance.

Theory and Practice

Students evaluate companies, develop strategies, and manage portfolios where they have to apply the techniques, understand how they work, and evaluate their effectiveness. Along the way, they also learn about how markets work, how they react to information, economic policy, geopolitical events, and they also become familiar with terminology that is otherwise difficult to master.

All this brings them closer to understanding the complexities of real world markets and brings them closer to understanding the practice. The teaching guide for the FTS Real Time System contains detailed exercises and assignments that help your students bridge the gap between textbook learning and the practical application and use of concepts and techniques; the next section provides a quick overview of

©2010 OS Financial Trading System

the system and teaching applications. Our website has a video that explains some of the features of the system. An instructor can monitor the performance of the students at any time, and can obtain reports on performance, including rankings on various dimensions at any time, as explained in the instructor documentation. Some features of the system are described at the end of this document.

In conjunction with the trading system and its built in analytics, **The FTS Modules** help build depth of understanding. For example, ***The Financial Statement Analysis Module*** makes students work with raw company filings and learn how construct and interpret various financial ratios from first principles. This goes far beyond "downloading key ratios" from a financial website, and many of the ratios they construct are much deeper in nature, such as those relating to the quality of a company's earnings. ***Valuation Tutor*** lets them learn how to implement valuation models; besides the usual dividend and free cash flow model, it also lets them analyze the residual income model and the abnormal earnings growth model, from first principles if they want to. The ***Interest Rate Risk Module*** provides a deeper understanding of interest rate risk, including backtesting of strategies based on duration and convexity. The ***Efficient Portfolio Module*** is an extremely intuitive way to understand diversification. The options modules provide visual illustrations of option pricing theory. While these modules complement the Real Time Trading System, they can also be used separately.

The system can also be used by students on their own, including student investment clubs. It can also be used to run trading competitions.

FTS Real Time Cases

The FTS Real Time System is organized around what we call "FTS Real Time Cases." The objective of a case is to let your students experience real world market dynamics while learning. Trading is exciting, especially with real time settlement, and the FTS Real Time System brings to life and provides a practical implementation of tools and techniques that are taught in many finance and accounting courses, and in some economics courses. In these cases, we handle the entire back office operation, including running and maintaining the servers and so on. If you have a trading room and subscribe to real time feeds, you can create your own cases and run your own simulations. Please contact us for details.

This section briefly describes an FTS Real Time Case, lists cases we typically run and provides some examples on how to integrate the system into different courses. Some operational details are provided below. The course integration information below is only suggestive. Most instructors go through a web-based meeting with us to discuss how best to integrate the system into their course.

An FTS Real Time Case consists of:

- A set of securities that are traded
- A set of trading exercises: assignments and projects that are linked to your course content
- Analytical tools to support the trading exercises that provide the link between theory and practice. The learning takes place by understanding the concepts behind the analytics. Every student can personalize the inputs into the analytics, allowing each student to learn by doing. The inputs are stored by the system, allowing students, including all members of a team, to access the inputs simultaneously from different locations.

©2010 OS Financial Trading System

- Real time data for trade settlement[i]
- Extensive reporting capabilities allow students and instructors to monitor and assess performance, across students as well as relative to the benchmark.

Cases we typically run include the following:

- US Equities
    - The FTS 30 Stock Case consists of large US industrial companies, the FTS 100 Stock Case has 100 large US companies, and FTS 500 Stock case has 500 large US companies[1], and the largest one is the FTS 1000 case. These cases let you choose the scale of the problem; it is obviously more difficult for a student to manage a portfolio of 500 stocks than one of 30 stocks, especially if the focus is not just on stock picking but on analyzing the companies is a deeper way.
        - Besides introducing students to secondary markets, the built-in analytics are designed to reinforce understanding of risk and return, performance measures, diversification and CAPM, market efficiency, and various models of equity valuation.
    - Sector ETF's and International ETF's
        - These allow for sector allocation and risk return exercises across international markets.
- Global Equities
    - We run cases with major European stocks, Australian, and Asian stocks.
    - These can be combined, so for example you could run a global asset allocation exercise with stocks in multiple countries and the corresponding exchange rates.
- Index Futures and Options
    - This case can be run with futures only, options only, or both. One variation is to start with futures and then add the options when the course coverage of options begins (or the other way around). That is, you can select the sequence by which you introduce different markets within a case.
    - The analytics include the cost of carry model for futures and American and European option pricing models, with real-time calculation of the implied basis and the option "Greeks" (for every option as well as of the portfolio) . This support includes volatility exposure calculations and value-at-risk calculations.
- Fixed Income Securities
    - These include Treasury bonds, Fed Fund futures, and Euro-Dollar futures. These can be run in combination or separately.

[1] The set of stocks in these cases is similar to but need not be the same as the stocks in major stocks indexes. The stocks in our cases remained fixed during the academic year. We also create index values for these stocks that should be approximately the same as the indexes they follow, but need not coincide with them.

©2010 OS Financial Trading System

    - Analytical support includes duration and convexity calculations for the bond portfolio, implied LIBOR curves, and the system also calculates probabilities of monetary policy changes from the Fed fund futures.
- Currencies, with or without currency futures and with or without currency options
    - These cases are designed to provide an introduction to currency risk. The spot currencies include the major traded currencies and some smaller ones.
    - The options and futures support allows hedging of currency risk.

Course Integration

You can use multiple cases in a course. Some examples of how to use the cases in standard courses are below.

- **Example**: Introduction to Financial Markets
    - The goal of this course is usually to provide a wide exposure to financial markets and instruments.
    - Start with the industrial stock case and the "how securities are traded" assignment; this requires the least preparation of the students.
    - After this, add cases with other asset classes, say bonds, then futures, perhaps options, and finally currencies. The assignments can vary; you can continue with the "how securities are traded" theme, or ask them to reflect on news and information and the impact on financial markets
    - In a semester long course, this allows your students to experience each case for two to three weeks, thus gaining familiarity with a variety of markets and instruments. Along the way, they will also learn the mechanics of trading, start gaining an understanding of risk and return, and start to appreciate news as it relates to different financial markets.
- **Example**: Investments
    - There are several distinct ways in which the real time system can be integrated into an investments course. What you choose will depend on what you want to emphasize in the course.
    - Start with the one of the equity cases and the "how securities are traded" exercise. This will introduce your students to the mechanics of trading and understanding order types.
    - Move on to the discussion of risk and return in your lectures, and continue to the portfolio diversification and discussion of the CAPM. You will want to teach performance measures, such as the Sharpe ratio, at this point as well. The diversification exercise shows students how to create diversified portfolios, how to track performance, rebalance, and so on.
    - You then have several choices. One is to let the case continue, and start exploring security valuation, including one stage and two stage models and their application. A second to move to bonds, with an immunization project, and maybe come back to security valuation. In the second part of the course, you can either continue with valuation or introduce options and/or futures.

©2010 OS Financial Trading System

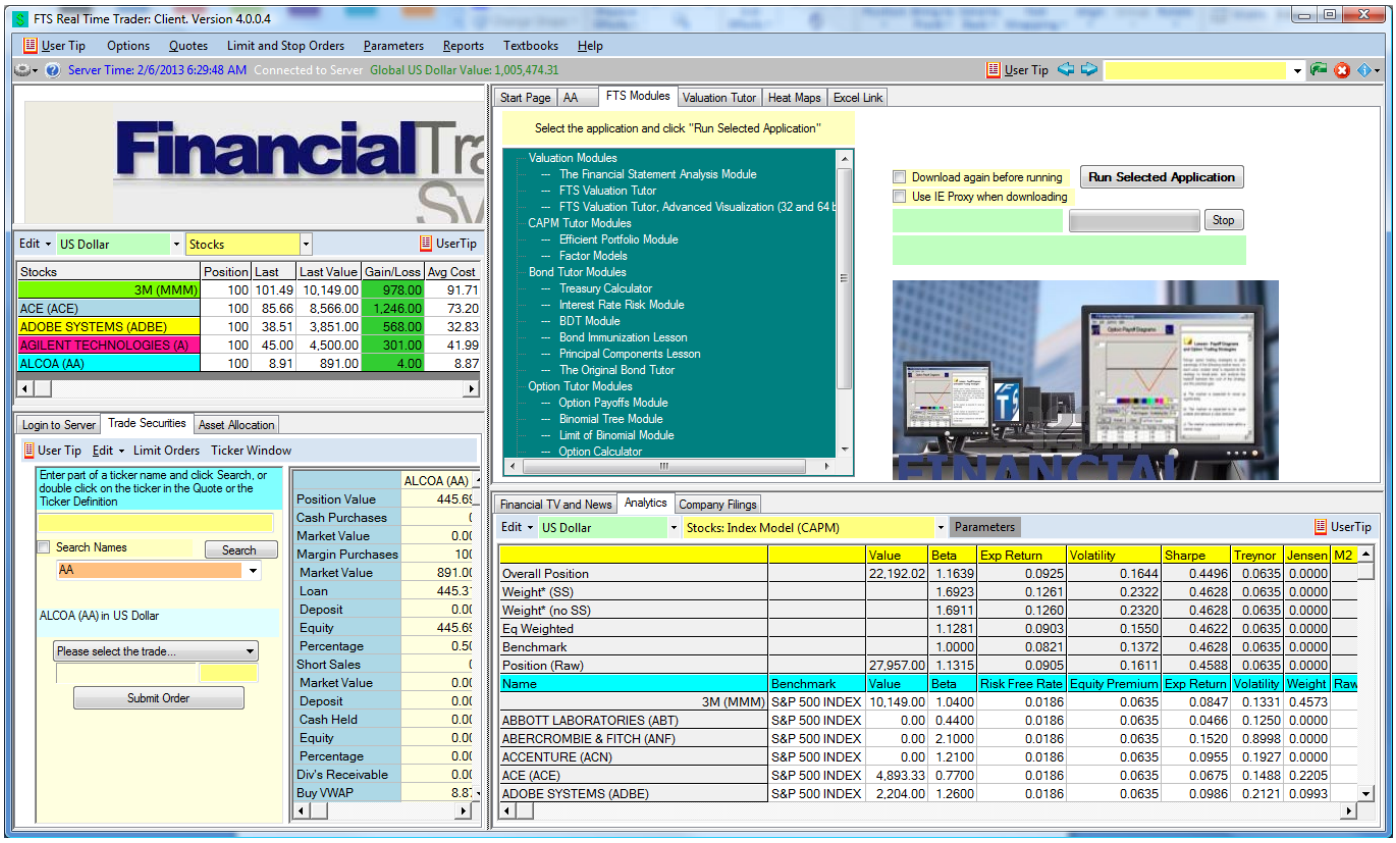
- One thing to keep in mind is that to evaluate performance, you will need to run some exercises for at least four weeks. So doing too many exercises across too many asset classes may not be a good idea. Similarly, there is a tradeoff between breadth and depth. If you explore something in detail (e.g. relate valuation models to financial statements, or discuss alternate bond immunization strategies), then it is better to concentrate on those topics rather than go for breadth of coverage.

- **Example**: International Finance/International Business
  - The goal here is to understand exchange rates and their determinants in the context of economic policies, trade flows, geopolitical risk, country risk, and so on.
  - Start with the spot currency case, and initially, let them understand the nature of currency markets, including understanding quotation systems, how interbank markets differ from exchanges, and so on.
  - As you discuss factors that affect exchange rates, have them identify sources of information on these factors and then monitor the impact of this information on exchange rates.
  - Depending on the focus of the course, you could move on to the use of currency futures to hedge exchange rate risk; add stocks in a few countries (or ETF's to keep it simple) to see how stock markets and exchange rates reach to information; or have them work on hedging equity risk and exchange rate risk in a global risk management exercise.
- **Example**: Options and Futures
  - The applications here are fairly straightforward. The goal is to reinforce the understanding and implementation of pricing models, such as the cost of carry model and the Black Scholes model, and the application of these to arbitrage, hedging, and risk management.
  - To accompany the index futures case, we suggest both an arbitrage exercises (trying to benefit from mispriced futures contracts) and the traditional exercise on hedging as equity portfolio.
  - The index options case lets them explore the volatility smile/surface, learn to use the hedge parameters ("Greeks"), and also work on exercises managing the value at risk of their portfolio.
  - The futures case and the options case can be run sequentially or you can have all the options and futures available to them at the same time.
- **Example**: Valuation/Financial Statement Analysis
  - This may not be your initial impression, but the FTS Real Time System is a powerful way to teach valuation and to get students to understand and work through financial statements. In fact, we provide a wide array of projects that let students work through the statements to understand company valuation.
  - These include free cash flow to equity models as well as earnings and residual income based model.
  - There are several different ways to motivate the exercises; these include identifying mispriced securities, understanding what equity analysts do, even active portfolio management, and so on. The goal though is fairly straightforward: use the trading to motivate working through financial statements and learning how different valuation techniques are applied.

©2010 OS Financial Trading System

Features of the system

Example 1: **Some of the built in features**. This screen shows your position, the market orders tab with a link to the limit orders tab, real time performance measures for your portfolio, the benchmark, the naively diversified portfolio, and two "optimal" portfolios. The Tab on the top provides direct access to the FTS Modules that let students gain a deeper conceptual understanding:

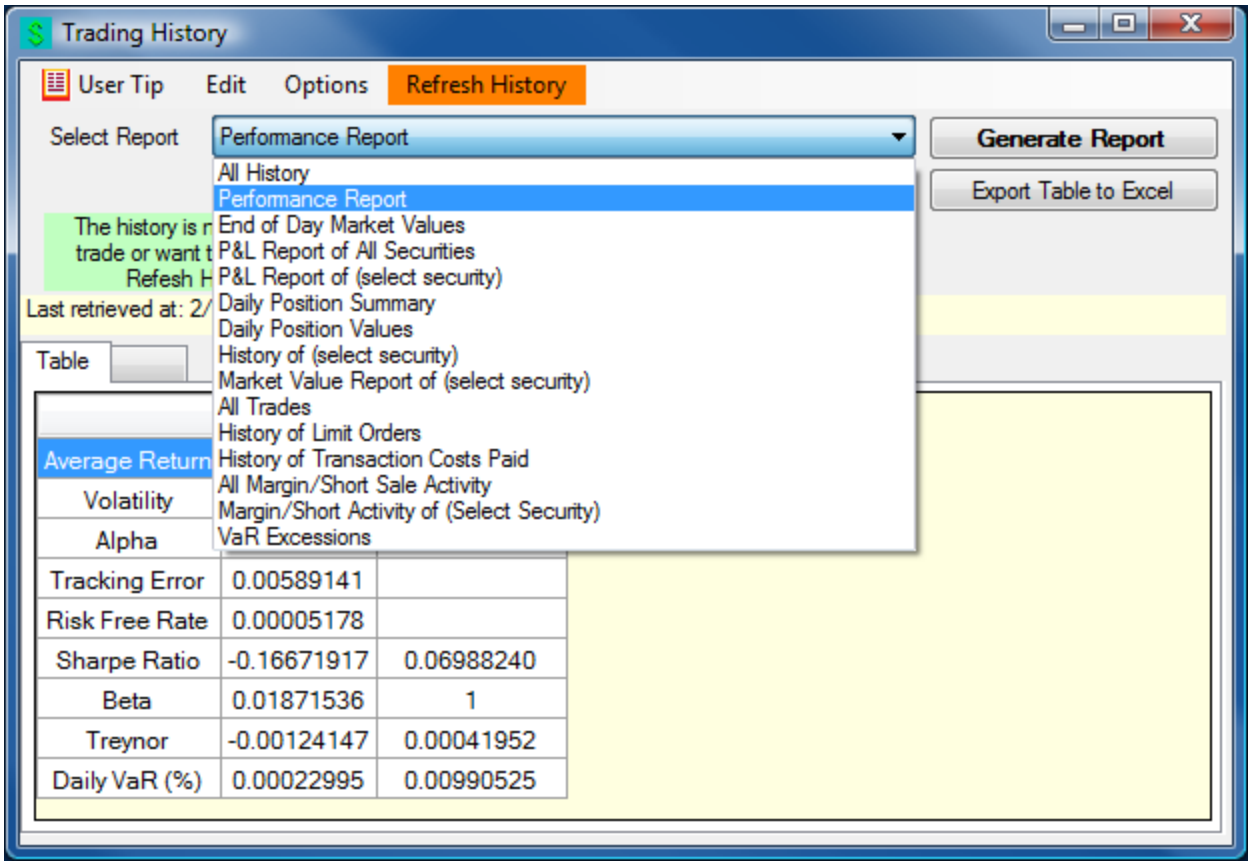


Example 2: **Market Information**. The heat maps provide visual information about market movements. Below the map is the built in financial statement viewer: you can view and plot items from company statements. To dig deeper, students can conduct their own analysis of financial statements using the Financial Statement Analysis Module and/or Valuation Tutor.

©2010 OS Financial Trading System

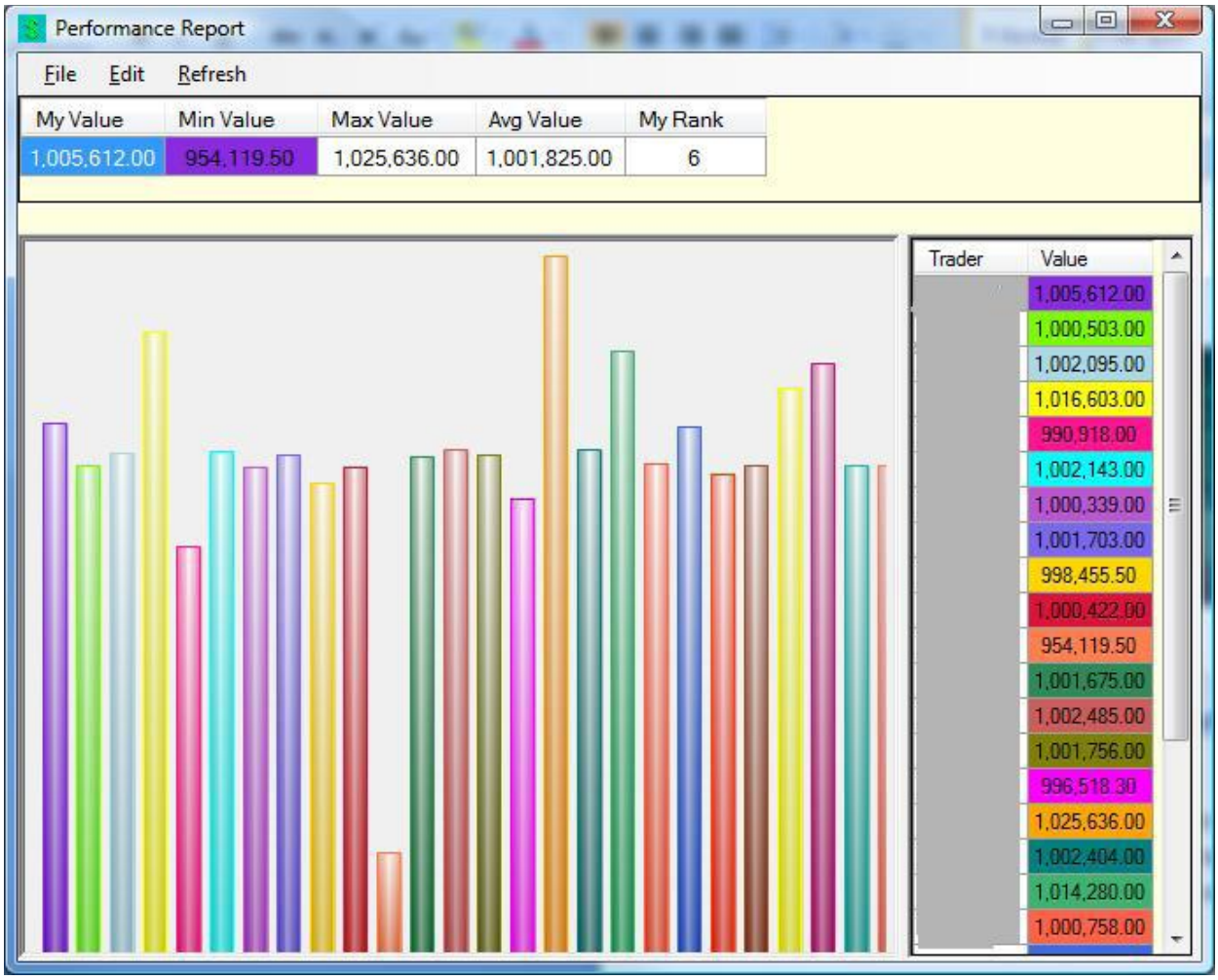
Example 3: Performance Analysis: Students can obtain a range of reports, including the profit and loss of each security.

©2010 OS Financial Trading System



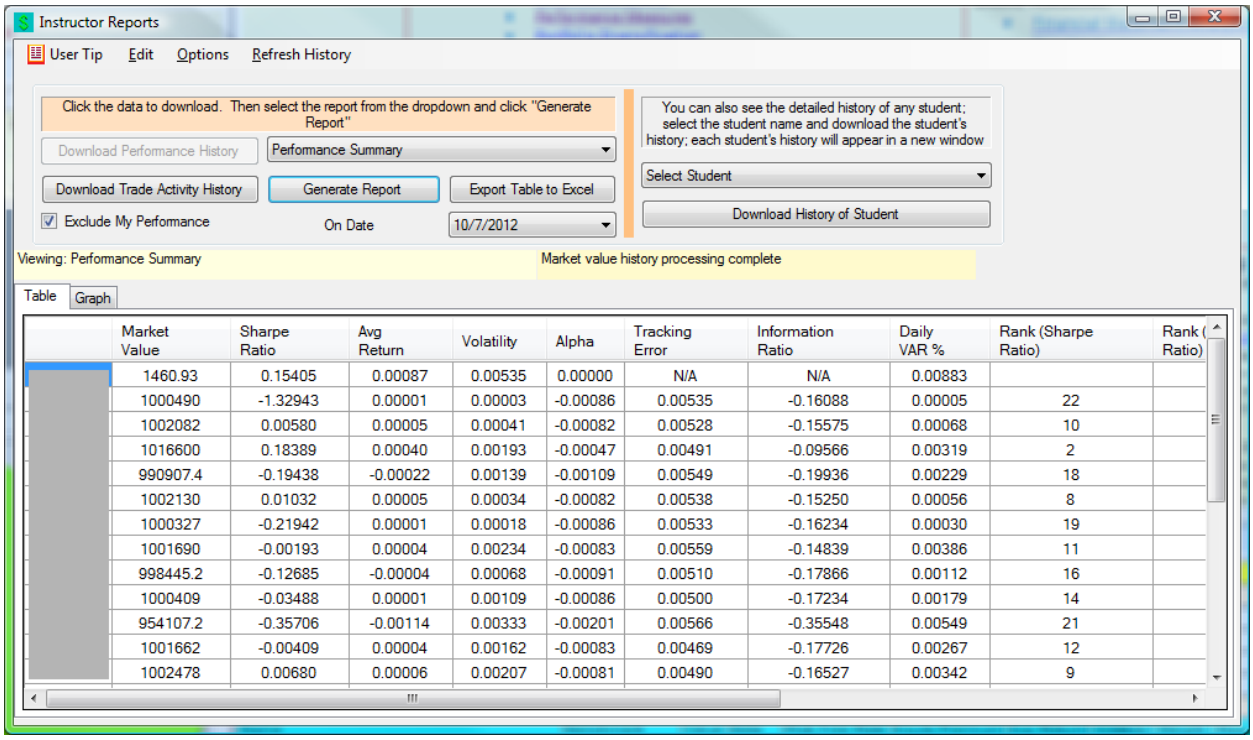
Example 4: Performance Comparisons: available at any time to instructors and students

©2010 OS Financial Trading System



Example 5: Instructor reports. You can see the rank of each student along different performance dimensions. You can download and analyze the history of any student at any time.

©2010 OS Financial Trading System



	Market Value	Sharpe Ratio	Avg Return	Volatility	Alpha	Tracking Error	Information Ratio	Daily VAR %	Rank (Sharpe Ratio)	Rank (Ratio)
	1460.93	0.15405	0.00087	0.00535	0.00000	N/A	N/A	0.00883		
	1000490	-1.32943	0.00001	0.00003	-0.00086	0.00535	-0.16088	0.00005	22	
	1002082	0.00580	0.00005	0.00041	-0.00082	0.00528	-0.15575	0.00068	10	
	1016600	0.18389	0.00040	0.00193	-0.00047	0.00491	-0.09566	0.00319	2	
	990907.4	-0.19438	-0.00022	0.00139	-0.00109	0.00549	-0.19936	0.00229	18	
	1002130	0.01032	0.00005	0.00034	-0.00082	0.00538	-0.15250	0.00056	8	
	1000327	-0.21942	0.00001	0.00018	-0.00086	0.00533	-0.16234	0.00030	19	
	1001690	-0.00193	0.00004	0.00234	-0.00083	0.00559	-0.14839	0.00386	11	
	998445.2	-0.12685	-0.00004	0.00068	-0.00091	0.00510	-0.17866	0.00112	16	
	1000409	-0.03488	0.00001	0.00109	-0.00086	0.00500	-0.17234	0.00179	14	
	954107.2	-0.35706	-0.00114	0.00333	-0.00201	0.00566	-0.35548	0.00549	21	
	1001662	-0.00409	0.00004	0.00162	-0.00083	0.00469	-0.17726	0.00267	12	
	1002478	0.00680	0.00006	0.00207	-0.00081	0.00490	-0.16527	0.00342	9	

Example 6: Real time option support. The hedge parameters are updated in real time, including the calculation of implied volatility (though you can use your own estimate if you want). The images below show the calculations at a portfolio level as well as per contract. Analytical support is also included for futures contracts, including Eurodollar deposit futures and Fed Fund futures.

Delta	Gamma	Vega	Theta
862.5671	0.6862	265,298.8000	-8,544.6440

Contracts	Imp Vol	User Vol	User Price	Implied Delta	Implied Gamma	Implied Vega
5	0.2179	0.1627	391.4171	0.9295	0.0004	153.6786
0	0.2043	0.1627	297.0201	0.8769	0.0006	257.4559
0	0.1783	0.1627	252.7531	0.8593	0.0008	287.0568
5	0.1869	0.1627	211.3856	0.7957	0.0010	376.9190
0	0.1822	0.1627	173.5833	0.7363	0.0012	441.3222
0	0.1635	0.1627	139.8680	0.6765	0.0015	490.0499
0	0.1507	0.1627	85.7128	0.5026	0.0018	552.3296
0	0.0700	0.1627	85.7128	0.4687	0.0040	551.5936
0	0.1193	0.1627	35.6940	0.1929	0.0016	383.2881

©2010 OS Financial Trading System

Operational Details

To try out a case or cases, or to set up student accounts, contact us at ftsweb@gmail.com and we will set up a trading account for you.

Once you have selected the cases you want for your class, you need to:

- Tell us the cases you want to run
- When you want run which case (for example, you may start with a stock case and then move to a futures case)
- How many students are in each section (performance measures are section specific)
    - We will set up a trading account for each student or student team, as well as an instructor account that lets you monitor your students' performance.
- As the course progresses, tell us whenever you want to reset all positions to the initial position
    - This usually happens after an exercise or project is completed.

There are some technical requirements: all your students must have access to a Windows-based computer or a recent (post 2006) Macintosh computer. There are also some requirements relating to networks and firewalls that allow their computer to access our servers and send and receive data; we work with your tech group to convey the system requirements when we set up your accounts.

Important caveats:

- All requests, including resetting portfolios, requesting student accounts, requesting non-standard securities in a case, etc. have a minimum of a 24-hour turnaround. Human nature is such that these requests often happen at the last minute but please understand that we cannot interrupt the system to make any such changes while markets are open. These requests will be met if they are feasible.
- We perform daily backups. In the worst case scenario, we will restore everything to the previous day's backup.

[i] We do not broadcast real time prices to students due to licensing restrictions, but provide links to indicative quotes from public sources. However, **all trades are settled at real time prices** received by our servers. All limit orders are also monitored continuously. Note that your students can obtain real time quotes from a variety of sources, including web sites like Yahoo finance and can also subscribe to a real time feed themselves.

©2010 OS Financial Trading System