



## State of the Art Virtual Portfolio Management: Building Skills that Matter

There are many ways for students to play “stock market games” or more generally, participate in a virtual portfolio simulation: nearly every exchange, trading firm, and financial website offers such a capability. Academic simulations add back-office support, particularly the ability to compare student performance (by market value, by Shape ratio, or other measures) and so simplify the grading process for instructors.

**The FTS Real Time System differs from other educational virtual portfolio simulations in one fundamental way: it focuses on the application of analytical techniques in the investment management process.** It comes with a [teaching guide and detailed projects](#) and exercises that help reinforce the understanding and practical application of concepts.

### Here are some examples:

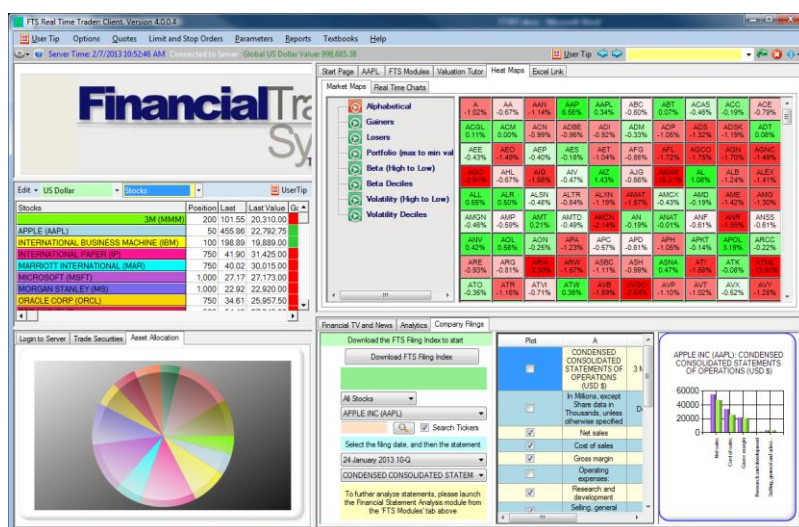
- **Fundamental analysis and stock selection**
  - Without FTS, you can download research reports or use a stock screener.
  - With FTS, you can do a fundamental analysis of a company from first principles, i.e. conduct the analysis yourself, not just download read other peoples analysis.
  - Examples:
    - [The Value Investing Project](#)
    - [The Earning and PEAD Project](#)
    - [The Accruals Anomaly project](#)
- **Portfolio diversification**
  - [Portfolio Diversification Project](#)
  - [International ETF Diversification Project](#)
  - [The Black-Litterman Model](#)
  - [Equity Portfolio Rebalancer](#)
    - Without FTS, you have to manually rebalance your portfolio and probably don't understand the cost of rebalancing
    - With FTS, you can see exactly what rebalancing entails.

- **Hedging risk with options and Futures**
  - Without FTS, you may have no way to understand the risk of your portfolio
  - With FTS, our beta-weighted option deltas and other hedge parameters, calibrated in real time to your portfolio using implied volatilities, lets you see exactly how portfolio-wide hedging works in practice.
  - The [Option Analyzer](#) lets you study the impact of proposed trades, including the effect on risk and the cost of implementing the trades. It can even execute the trades for you.
  - Example: [Hedging with Options Project](#)
  - Example: [Hedging with Futures Project](#)
- **Interest rate risk management**
  - This is very hard to do without analytical support
  - FTS has built in analytics that calculate, for example, the dollar duration and convexity of your bond portfolio in real time. This lets students experience firsthand how effective these tools are in managing risk.
  - Example: [The Interest Rate Risk Project](#)
- **Algorithmic Trading Strategies**
  - Advanced students can develop their own algorithms and implement them in our system. The [algorithms are built in Excel using VBA](#). They can create virtually any dynamic trading strategy they like, including:
    - Pairs trading
    - Delta neutral strategies
    - Basket trading
    - Optimal trade execution
    - Statistical arbitrage
- **Detailed analysis of trades**
  - Students, and instructors, have access to every detail of the trading history, and can generate a [variety of reports](#).
  - Everything can be exported to Excel for further analysis.
  - Without FTS, this level of analysis would be practically impossible.
- **For instructors, [complete access to student performance reports](#)** and the detailed trading history of every student at any time

The algorithmic trading capability lets your advanced students understand and work with technology appropriate for today's markets. If your trading simulation does not have this capability, they cannot monitor multiple markets or get an understanding of quantitative strategies, whether it is pairs trading or other statistical arbitrage, optimal order execution, dynamic rebalancing, or any other strategy that requires periodic monitoring of multiple markets and is impossible to do manually. They will be limited to manual trades (and simple limit and stop orders), reminiscent of the 1990's, but not anywhere close to what is possible in today's world.

The FTS Real Time System is based on a series of trading cases and a series of projects or exercises that take students, step-by-step, through the investment management process. Student gain familiarity with securities and markets, but go far beyond that: they understand what techniques can be used for what purpose and they can evaluate for themselves how well these techniques work. The algorithmic trading capabilities give them an understanding of how markets work today, how computerized trading lets you go far beyond the simple strategies of the past.

**In summary, the FTS Real System is a “virtual portfolio management system”** in which students manage the risk and return of a virtual portfolio with trade settlement at real-time prices with strong emphasis on the use of analytical techniques and modeling.



The basic goal is to let students experiment with techniques that are taught, like financial statement analysis, equity valuation, interest rate risk management valuation, risk and return, diversification, statistical arbitrage, dynamic trading strategies, derivative pricing and hedging, and learn how they are used in practice and how they work. By thinking about and developing algorithmic trading strategies, they can develop a keen understanding of the financial markets of today.

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. Students’ progress from [simple](#) to [intermediate](#) to semester-long or capstone projects such as our [Value Investing Project](#). The projects show you what the students learn and how they learn, including how they develop their modeling skills in Excel.

The algorithmic trading capability is implemented via Excel. The trading algorithm is written in VBA, and the system executes their trading strategy. This is a unique capability, different from “back-testing.” The strategy they create (and adjust over time if needed) is a live forward test, just like the real thing.

The [mobile version of the application](#) can be used on any smart device. The following [video](#) 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 also described at the end of this document.

# Highlights of the System

Real time position updates

Your Logo

Heat Maps show current and historical performance along multiple dimensions

The screenshot displays the Financial Trading System interface. Key features highlighted include:

- Real time position updates:** A callout points to the 'Stocks' table showing positions for AAPL, IP, and MARIOTT INTERNATIONAL.
- Your Logo:** A callout points to the 'Financial Trading System' logo at the top of the interface.
- Heat Maps:** A callout points to a grid of stock performance data, where colors (red for negative, green for positive) represent performance along multiple dimensions.
- View company filings:** A callout points to a window showing the filing date '24 January 2013 10-Q' and the document type 'CONDENSED CONSOLIDATED BALANCE SHEETS (USD \$)' for Apple Inc. (AAPL).
- Enter market and limit orders:** A callout points to the 'Trade Server' window, which includes a search bar and a 'Submit Order' button.

Your Logo

Dig deeper with the FTS Modules and online texts

The screenshot displays the Financial Trading System interface. At the top left, there's a menu bar with options like 'User Tip', 'Options', 'Quotes', 'Limit and Stop Orders', 'Parameters', 'Reports', and 'Textbooks'. Below this is a table of stock holdings:

Stocks	Last Value	Gain/Loss	Avg Cost	Total Cost
3M (MMM)	20,527.08	173.08	101.77	20,354.00
APPLE (APPL)	24,099.20	1,869.26	444.00	22,230.00
INTERNATIONAL BUSINESS MACHINE (IBM)	20,001.00	780.00	192.21	19,221.00
INTERNATIONAL PAPER (IP)	31,631.25	118.70	42.40	31,800.00
MARRIOTT INTERNATIONAL (MAR)	30,847.50	607.50	40.32	30,240.00
MICROSOFT (MSFT)	27,770.00	130.00	27.84	27,640.00
MORGAN STANLEY (MS)	23,335.00	215.00	23.12	23,120.00
ORACLE CORP (ORCL)	26,130.00	345.18	35.30	26,475.00
REDFHAT (RHAT)	27,230.00	1,565.18	58.19	29,095.00

Below the table is a pie chart representing asset allocation. To the right, a teal callout box lists various modules:

- Valuation Modules
  - The Financial Statement
  - FBS Valuation Tutor
  - FBS Valuation Tutor, Advanced
- CAPM Tutor Modules
  - Efficient Portfolio Module
  - Factor Models
- Bond Tutor Modules
  - Treasury Calculator
  - Interest Rate Risk Module
  - BDT Module
  - Bond Immunization Lesson
  - Principal Components Lesson
  - The Original Bond Tutor
- Option Tutor Modules
  - Option Payoffs Module

At the bottom right, there's a detailed analytics table for an Index Model (CAPM):

	Value	Beta	Exp Return	Volatility	Share	
Overall Position	244,839.90	1.0731	0.0734	0.1482	0	
Weight* (SS)	1.8499	0.1130	0.2428	0	0	
Weight* (no SS)	1.8485	0.1129	0.2426	0	0	
Ea Weighted	1.1670	0.0782	0.1534	0	0	
Benchmark	1.0000	0.0666	0.1313	0	0	
Position (Raw)	1.2451	0.0821	0.1789	0	0	
Name	Value	Beta	Risk P	Risk Free Rate	Equity Premium	Exp P
AARONS INC	10,448.94	1.0600	1.0600	0.0186	0.0510	0
ABBOTT LABORATORIES (A	0.00	1.3200	1.3200	0.0186	0.0510	0
ABBROUMBIE & FITCH (A	0.00	0.4700	0.4700	0.0186	0.0510	0
ACCENTURE (ACN)	0.00	1.2400	1.2400	0.0186	0.0510	0
ACE (ACE)	0.00	2.0600	2.0600	0.0186	0.0510	0
ACME PACKET INC	0.00	1.2400	1.2400	0.0186	0.0510	0
4T	0.00	0.7800	0.7800	0.0186	0.0510	0
	0.00	0.8400	0.8400	0.0186	0.0510	0
	0.00	0.7800	0.7800	0.0186	0.0510	0

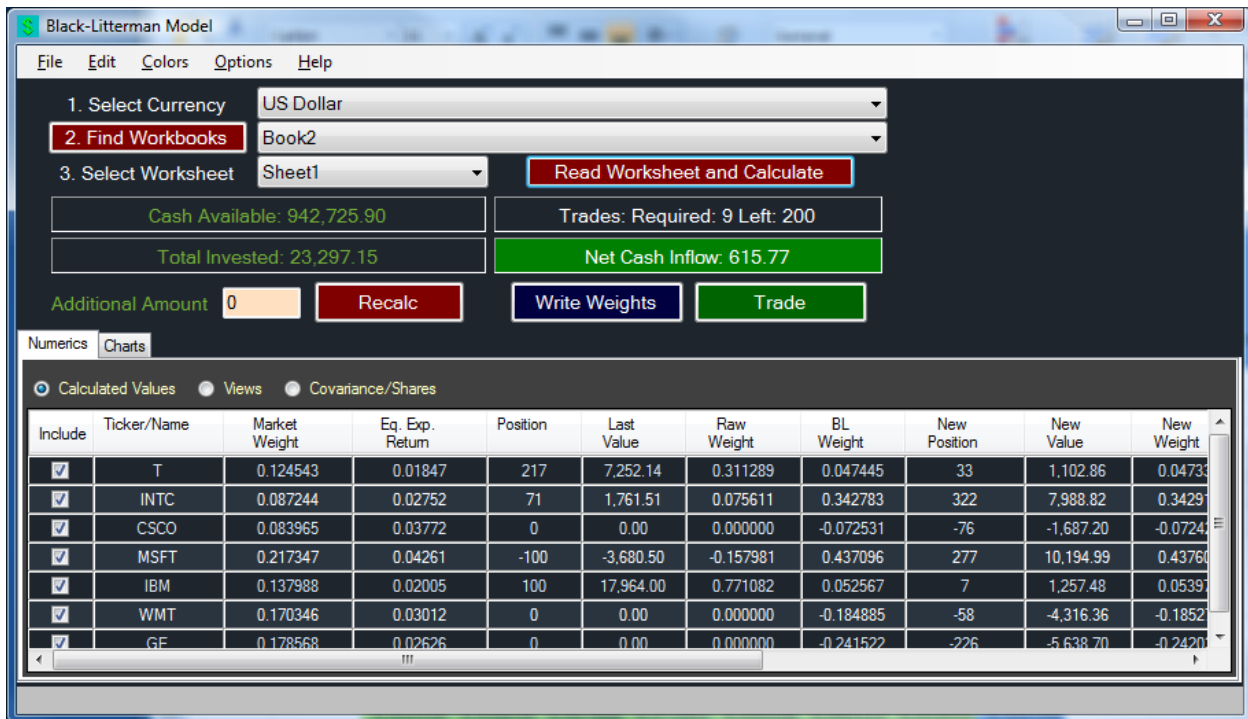
Asset allocation and performance attribution

Analytics updated in real time, including performance measures, bond analytics, option analytics, intrinsic value models

## The Option Analyzer



## The Black-Litterman Model Interface



# The FTS Real Time Teaching Guide

- [Help, what do I do?](#)
- **For Instructors**
  - [Overview](#)
  - [Student Performance Reports](#)
- [Quick Introduction to the FTS Real Time Client](#)
- [Video: How to use the FTS Real Time Client](#)

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- **Equity Projects**
  - [How Securities are Traded](#)
  - [Understanding Risk and Return](#)
  - [Understanding Beta](#)
  - [Performance Measures](#)
  - **Fundamental Analysis Projects**
    - [Understanding Operating Risk](#)
    - [Understanding Financial Risk](#)
  - **Portfolio Diversification Projects**
    - [FTS 30 Stock Case](#)
    - [Australian Stocks Case](#)
- **Bond Projects**
  - [Duration and Interest Rate Risk](#)
- **International Projects**
  - [Trading Currencies](#)
  - [International Diversification](#)
- **Futures and Options Projects**
  - [Introduction to Stock Index Futures](#)
  - [Managing Risk with Futures](#)
  - [The Cost of Carry Model](#)

Students can access their trading history and generate reports at any time

Instructors can track student performance and ranking at any time

The history is refreshed when you trade or want to refresh history. Last retrieved at: 2/2/2013 10:00:00 AM

	Alpha	Beta	Treynor	Daily VaR (%)
Tracking Error	0.00589141			
Risk Free Rate	0.00005178			
Sharpe Ratio	-0.16671917	0.06988240		
Beta	0.01871536	1		
Treynor	-0.00124147	0.00041952		
Daily VaR (%)	0.00022995	0.00990525		

You can also see the detailed history of any student; select the student name and download the student's history; each student's history will appear in a new window

Select Student: [Dropdown]

Download History of Student

Market value history processing complete

Alpha	Tracking Error	Information Ratio	Daily VAR %
0.00000	N/A	N/A	0.00883
0.00086	0.00535	-0.16088	0.00005
0.00082	0.00528	-0.15575	0.00068
0.00047	0.00491	-0.09566	0.00319
0.00109	0.00549	-0.19936	0.00229



# Building Depth

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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 to 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.

# Accessibility

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Students can access the system 24/7 from anywhere with an internet connection. You can choose to use the full Windows application or our [mobile application](#) that allows access from tablets and smart phones.

# FTS Real Time Cases

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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.
- Real time data for trade settlement<sup>i</sup>
- 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<sup>1</sup>, 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 in 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

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<sup>1</sup> 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.

“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.
  - 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

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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.
- 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.

# 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:

The screenshot displays the FTS Real Time Trader Client interface. The top menu includes 'User Tip', 'Options', 'Quotes', 'Limit and Stop Orders', 'Parameters', 'Reports', 'Textbooks', and 'Help'. The main window is divided into several sections:

- Top Left:** 'Financial Trader' logo and a 'UserTip' button.
- Top Right:** 'Server Time: 2/6/2013 6:29:48 AM' and 'Connected to Server: Global US Dollar Value:1,005,474.31'.
- Center:** A 'Select the application and click "Run Selected Application"' dialog box listing various modules:
  - Valuation Modules: The Financial Statement Analysis Module, FTS Valuation Tutor, FTS Valuation Tutor, Advanced Visualization (32 and 64 bit)
  - CAPM Tutor Modules: Efficient Portfolio Module, Factor Models
  - Bond Tutor Modules: Treasury Calculator, Interest Rate Risk Module, BDT Module, Bond Immunization Lesson, Principal Components Lesson, The Original Bond Tutor
  - Option Tutor Modules: Option Payoffs Module, Binomial Tree Module, Limit of Binomial Module, Option Calculator
- Bottom Left:** A table showing stock positions:
 

Stocks	Position	Last	Last Value	Gain/Loss	Avg Cost
3M (MMM)	100	101.49	10,149.00	978.00	91.71
ACE (ACE)	100	85.66	8,566.00	1,246.00	73.20
ADOBE SYSTEMS (ADBE)	100	38.51	3,851.00	568.00	32.83
AGILENT TECHNOLOGIES (A)	100	45.00	4,500.00	301.00	41.99
ALCOA (AA)	100	8.91	891.00	4.00	8.87
- Bottom Right:** A table showing performance metrics for the 'Index Model (CAPM)':
 

	Value	Beta	Exp Return	Volatility	Sharpe	Treynor	Jensen	M2
Overall Position	22,192.02	1.1639	0.0925	0.1644	0.4496	0.0635	0.0000	
Weight* (SS)		1.6923	0.1261	0.2322	0.4628	0.0635	0.0000	
Weight* (no SS)		1.6911	0.1260	0.2320	0.4628	0.0635	0.0000	
Eq Weighted		1.1281	0.0903	0.1550	0.4622	0.0635	0.0000	
Benchmark		1.0000	0.0821	0.1372	0.4628	0.0635	0.0000	
Position (Raw)	27,957.00	1.1315	0.0905	0.1611	0.4588	0.0635	0.0000	

**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.



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

Trading History

User Tip Edit Options Refresh History

Select Report Performance Report

The history is r  
trade or want t  
Refresh H

Last retrieved at: 2/

Table

Average Return

Volatility

Alpha

Tracking Error 0.00589141

Risk Free Rate 0.00005178

Sharpe Ratio -0.16671917 0.06988240

Beta 0.01871536 1

Treynor -0.00124147 0.00041952

Daily VaR (%) 0.00022995 0.00990525

Generate Report

Export Table to Excel

All History

Performance Report

End of Day Market Values

P&L Report of All Securities

P&L Report of (select security)

Daily Position Summary

Daily Position Values

History of (select security)

Market Value Report of (select security)

All Trades

History of Limit Orders

History of Transaction Costs Paid

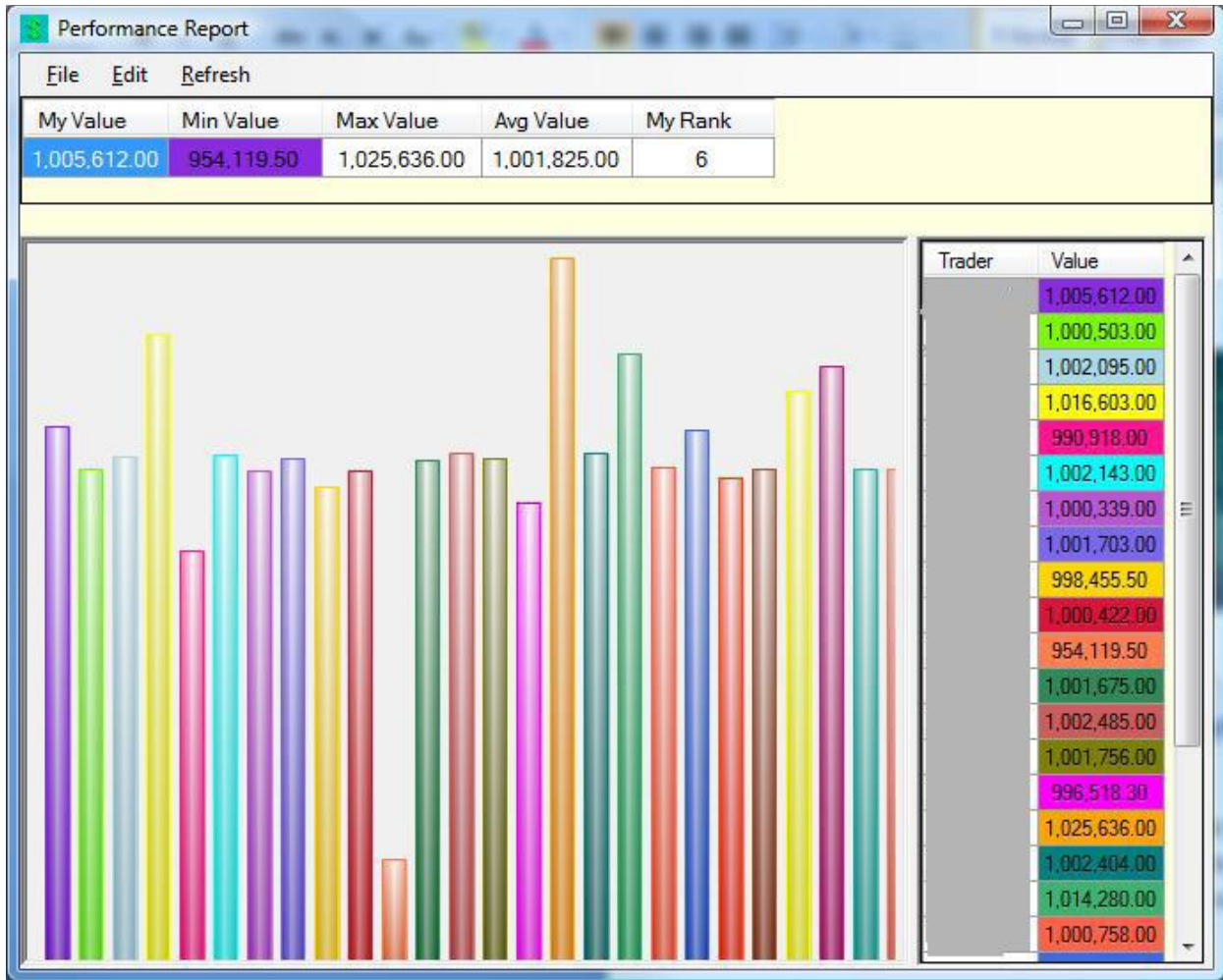
All Margin/Short Sale Activity

Margin/Short Activity of (Select Security)

VaR Excessions

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





**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.

Click the data to download. Then select the report from the dropdown and click "Generate Report"

You can also see the detailed history of any student; select the student name and download the student's history; each student's history will appear in a new window

Viewing: Performance Summary Market value history processing complete

	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

# Operational Details

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To try out a case or cases, or to set up student accounts, contact us at [ftsweb@gmail.com](mailto: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 necessarily interrupt the system to make any such changes while markets are open. These requests will be met if they are feasible.
- We perform backups every night. In the worst case scenario, we will restore everything to the previous backup.

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<sup>i</sup> 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.