BUS 211f (1)

Information Management: Financial Data in a Quantitative Investment Framework

Spring 2004

Fridays 9:10am – noon
Lemberg Academic Center, Room 54

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OVERVIEW

This course will provide an introduction to financial data, in a quantitative investment framework. It will deal with the practical issues involved with the data intensive investment world. We will examine the various global sources of the data, and the basic ways to analyze and manipulate the data. We will start with a high level mapping of the data's many dimensions: macro to micro, geographic, asset class, numeric vs. text, and most importantly, time.

Standard investment applications will be reviewed.   Common operational issues will be covered such as, sector, industry, geographic & asset class, relationship and linkage; biases, identification & classification issues; corporate actions, the dynamics of time, and much more. We will review the technologies and software used to analyze and model the data, and a quick overview of the legal and licensing issues involved.

Students will become familiar with the Brandeis Datastream installation as the primary source of pricing, financial and economic data.

After completion of this course, you will know how to assemble data to build models of individual companies and portfolios.

PREREQUISITE: Students must have completed FIN 212a (Accounting and Financial Analysis); also recommended is an introductory course in Economics

REQUIRED READINGS: Readings are assigned weekly.

PROJECTS

One of the main objectives of the class is to convey an understanding of the basic ways to use and model financial and investment data: simple reference, time series analysis, cross sectional analysis, and more complex models.

Three projects will be assigned that will incorporate these concepts. The first, a group project, will teach reference and time series analysis and forecasting; the second, to be done individually, will show cross sectional techniques; the third, a group project, will be a combination and include a presentation in class.

Groups will consist of 3 – 5 students. Progress, status, and other communication should be by email with attachments. MS Office technology should be used (Excel, Word, PowerPoint, FrontPage, etc.); other software must be approved in advance.

Project Documentation: You are free to be very creative, simple or complex in your projects. But, <u>all work must be very well documented</u>, just as your future employers will demand. All assumptions, inputs, outputs, formulae, calculations, algorithms, techniques, math, definitions MUST be documented in the final deliverable files.

Project Groups: The instructor will participate in the formation of groups to ensure a fair distribution of skills in quantitative analysis, economics, and accounting.

I. Industry and company report, analysis and forecast (*group project*)

Build a research report or tear sheet.
1. Pick an industry and company, reason for choice, what data is relevant and needed
2. Start a spreadsheet including: all classification data, country, exchanges, IDs, sector, industry, sub-industry, etc
3. Add current company / industry data
   a. Latest five years of income statement and balance sheet data
   b. Current narrative on the company, industry performance, and relevant economic situation
4. Estimate financial results for current fiscal year, year ahead; and forecast three to five years in the future
   a. Selected income statement, balance sheet and economic time series
   b. Provide narrative of the assumed future micro and macro economic scenario (company, industry and sector assumptions) to support the estimates and forecasts

II. Valuation Model (*individual project*)

Build a model that gives a ranked valuation of all the companies in a universe

1. Pick universe (sector, industry, or other criteria), valuation criteria (multiple)
2. Implement valuation, scoring methodology, or screening techniques
3. Rank, n-tile or present in tabular and graphic form the results; ordered by the value assigned; provide a narrative describing the valuation process.

III. Portfolio Construction (*group project and presentation*)

Construct an investment portfolio based on an assumed investment policy; make group presentation to class

1. Decide on an investment objective and policy
2. Determine valuation criteria to support and implement policy
3. Create a "back of the envelope" diversified and optimal portfolio in line with the investment policy
4. Prepare a theoretical portfolio report with description of investment objective, valuation data, summary statistics and how it meets the objective.

Grades are based on the following:

Projects	%	
Industry and company report, analysis and forecast (group)	20	
Valuation Model (individual)	20	
Portfolio Construction (group)	40	(includes 10% for presentation)
Class Participation	20	
Total	100	

Attendance required: You are expected to come to class having read the assigned reading.

Academic Honesty

You are expected to be honest in all of your academic work. Potential sanctions include failure in the course and suspension from the university. If you have any questions about my expectations, please ask.

Special Accommodation

If you are a student with a documented disability on record at Brandeis and you wish to have a reasonable accommodation made for you in this class, please see me immediately. Please keep in mind that reasonable accommodations are not provided retroactively.

CLASS 1   **Introduction & Dimensions**   **Jan 16**

This will include and introduction to the class, review projects, cases, and grading; a description of the Datastream installation, and a start of the dimensions of financial and investment data.

Course Outline

Projects
- Description / overview of financial & investment data
- Presentations
  - why these are assigned: three basic types of analysis
    - reporting, time series,
    - cross sectional
    - models
- Class will break into groups

Description of the Datastream installation
- What is available, what is not
- How to access
- Help
- In class demo / tutorial

Intro to the dimensions of the data

Scale of data, e.g.: levels of size, macro to micro (degrees of granularity):
- Macro economic
- Industry / sector
- Company level
- Financial instrument level

Numeric vs. text (qualitative vs. quantitative) – we will have more emphasis on numeric
- News
- Text

Geographic
- Global
- Region
- Country (defined by domicile, currency, sales, production, exchanges, etc)
- Currency denomination, exchange freedom, legal, etc

Asset class
- Equity
- Fixed Income
- Derivatives
- Currency
- Mutual Funds
- Alternative
- Commodity

Time
- Historic (time series)
- Scalar (no time dimension)
- Real-time
- Forecast, predictions, estimates
- Interaction of the above: conceptually, logically, mechanically; how to model the real world

CLASS 2   Financial Data Flows: Sources, Manufacture & Applications   Jan 23

We will examine the basic sources of the data: economic, financial, pricing, news and proprietary. We will discuss further the methods of storing, manipulating, analyzing data and mapping the flows.

Ultimate Sources of the data
- Government / quasi-govt. agency - (macro, econ, trade, etc)
- Company (accounting, events, narrative & descriptive)
- Exchanges (formal: traditional & electronic; crossing network, etc)
- Market makers (market info: OTC, non-exchange)
- Financial markets (price, volume, yields)
- News organizations
- Rating, research, tracking and other independent organizations (ratings, rankings, stats, forecasts)
- Brokerage - sell side (comments, recommendations, estimates)

More on applications: primary methods of using and manipulating the data

- Simple reference
  - Income statement, balance sheet
  - Tear Sheets (proprietary, Value Line, S&P, Morningstar)
- Time series analysis
  - Reporting & graphing
  - Regression, correlation & sensitivity analysis
  - Advanced time series analysis – ARCH, GARCH
  - Forecasting, projections, smoothing
- Cross sectional analysis
  - Screening
  - Aggregation: industry, sector, geographic
- Combination – other
  - Models – any combination of the Above
  - Non-linear analysis
  - AI, neural nets, genetic algorithms,

Overview of major data vendors
- Macro economic
- Fundamental financial
- Pricing, yield & returns
- Mutual fund, portfolio, benchmark (index)
- Estimate, forecast, risk & proprietary
- Quote terminals
- Real-time feeds
- News and text services
- Distributors (value added)

CLASS 3   **Time**   **Jan 30**

We will continue to explore the important dimension of time.   We will develop an understanding of the dynamics, structures, frequencies, and relationships of time with financial data and investment analysis.

Project I due at start of class

Time

Time (to predict the future; understand past, present)
- Everything changes over time (companies, benchmarks, portfolios, IDs)
  - "a stock is never 'going up' "
- Historical
- Real-time
- Mixing historical and real-time
- Portfolios & indices – never the same at two points in time
  - What did you know and when did you know it?
  - Where many biases can creep into the analysis
- Accounting time issues
  - Fiscal vs. calendar years and quarters
  - Non US accounting cycles
  - Translation of local financial results to base currency
  - Pricing
- How to manage and convert frequencies
  - Annual to quarterly to monthly to weekly
  - Daily to hourly to minutely to split secondly
  - Period beginning, end, average, fiscal, depends or other
  - Stock vs flow – snap shot or accumulate, balance sheet vs. income statement
- Regulatory time lag – annual vs. quarterly
- Operational time lag – time to put into database and publish

CLASS 4   **Architecture, Data Standards**   **Feb 6**

This will provide an understanding of how corporate, financial, market and economic data is organized, identified, and linked globally.

Financial Data Architecture

- Identifiers and other data– Many different sources, authorities, purposes, uses-dynamic, always change
  - CUSIP, Ticker, SEDOL, GVKEY, RIC
  - Euroclear, Valoren
  - Security master, cross reference, ISID+, files and systems
- Sector, industry, sub-industry, security: must link from top to bottom; across research, management, trading, analysis & reporting.
  - SIC – older, guidelines specified by commerce department
  - GIC – new standard, joint venture S&P – MSCI
- Geographic
  - Country (ISO) defined by:
    - Domicile
    - Sales & manufacture
    - Markets stock is traded on
  - Currency (ISO)
- Asset Classes

CLASS 5   **Logistics and Operations**   **Feb 13**

We will examine logistical and operational issues involved in researching, analyzing, and modeling investment data.

Project II due at start of class

Bias
- Survivorship Bias
- Look Ahead Bias
- Style (and other) Drift
- Normalize data (z-scores)

Corporate actions – Effect on Data, Application & Usage
- When and how, US vs. non-US
- Dividends: Cash, Stock, In kind
- Splits – all pieces, done in same direction: Normal, Reverse, Split all per share items
- Mergers & Acquisitions

CLASS 6   **Technology**   **Feb 27**

This will be an overview of popular technology and software packages used to store, manipulate and analyze financial and investment data.

Software
- Database Management Systems
  - Relational: Oracle, Sybase, MS SQL Server
  - Timeseries: Vision, FAME, TimeSquare
  - Strengths and limitations of each
- Math, Statpaks, Function and Subroutine libraries
  - Excel
  - Matlab,
  - SAS
  - Splus
- APIs
- Artificial Intelligence
  - Neural Nets
  - Genetic Algorithms
  - Fuzzy Logic
- Telecommunications, Internet, Protocols
  - FTP
  - html, xml
  - FIX

CLASS 7   Group Presentations; Legal and Licensing   Mar 5

Groups to present their projects. Time permitting, we will review legal and licensing issues involved with the use, modification and distribution of financial and investment data.

Project III due at start of class

Group Presentations

Review of Legal and Licensing Issues
- Extent of Use
  - Internal Use
  - Limited Redistribution
  - Incorporate into Own Product
  - How much derivation is needed to own the data?
  - Re-sell
- Exchanges – must be paid, even for delayed prices
- Industry schemes – pay royalties
- Index branding & constituents – pay royalties