DETAILED SYLLABUS FOR BA870 – Spring 2022

Boston University Questrom School of Business

BA870 – Topics in Financial and Accounting Analytics
Sections A1 and A2

Revision Date: April 7, 2022

Who?

Instructor: Professor Peter Wysocki
E-mail: wysockip@bu.edu
Office Hours: Times of office hours will be updated and posted each week on the ***BA870*** class site on *QuestromTools*.

When?

Section A1 (In person):
- Tuesdays and Thursdays, 8:00am - 10:45am
- Classroom # HAR 224

Section B1 (In person):
- Tuesdays and Thursdays, 12:30pm - 3:15pm
- Classroom # HAR 316

What?

Primary Objective: The primary objective of this course is to introduce *Questrom MSBA* students to key **financial and accounting (F&A)** concepts, data sources and data analytics tools to solve real and important F&A problems. The course builds on *Questrom MSBA* students' prior statistical, data science and programming courses for F&A applications and problems. In addition, we introduce new complementary tools and data sources to students' analytics toolkit using *Python* applications and databases (including *BERT, ScikitLearn, Google Colab, WRDS, Yahoo Finance, and SEC_Edgar*). The course is designed for business-focused data scientists/analysts who will have to identify, gather, parse, analyze and present F&A data to understand, solve and communicate solutions for real business problems. The course is designed to be "hands on" and involves many example applications and cases.

Learning Approach

- Each Lecture will Cover 3 Main Areas:
  - ***Concepts***
    - Financial and Accounting Terminology, Ideas, Definitions, Formulas, Institutional Details.
  - ***Data***
    - Sources of key data for financial, accounting and stock market analyses.
    - What the data means and how to access the data
  - ***Tools***
    - Data Science, Machine Learning and Deep Learning methods using Python.
    - How to manipulate data and present data using Python code and libraries.
    - Particular focus on using Python on Google Colab Cloud (including GPUs).

Learning Goals (with tools and approaches)**:**

- Apply Python programming methods for finance and accounting applications
  - Python 3 using Jupyter Notebooks and Google Colab Notebooks
- Use cloud computing resources and tools
  - Google Colab and other platforms
- Introduce and apply machine learning and deep learning tools
  - ScikitLearn, Hugging Face Transformers
- Introduce and apply Python-based NLP and textual analysis tools for finance/accounting problems
  - BERT, Transformers, Loughran-McDonald Finance Dictionary
- Review key finance & accounting concepts from a data science/analytic perspective
  - Fluency with finance/accounting vocabulary, concepts & ratios
  - Reading financial statements, financial statement analysis, capital markets concepts
- Outline key finance and accounting data sources
  - WRDS (Compustat, CRSP), SEC Edgar, Yahoo Finance
- Use various analytics tools to solve finance and accounting problems
  - Cases and assignments using ScikitLearn, Hugging Face Transformers, etc.
- Practice framing and solving financial and accounting data analytics problems
  - Cases analyses to avoid common mistakes when using financial & accounting data
- Consider opportunities/needs/constraints of analytics in finance/accounting functions
  - Situations where data analytics may be less applicable (Efficient capital markets)
- Reinforce critical thinking when it comes to finance & accounting problem
  - Understanding human incentives in finance and accounting
- Communicate technical information effectively
  - Student presentations; effective data visualization using Tableau
- Demonstrate ethical reasoning skills and understand professional responsibilities
  - Cases and discussions of data ethics in finance & accounting

How?

Background reading for BA870: Suggested reading after Lecture #1:

- After Lecture #1, you should skim over the following *Investopedia* webpages that provide a quick primer on Financial Statements :

  Main Overview of Financial Statements:
  https://www.investopedia.com/terms/f/financial-statements.asp

  More Detailed Information on 3 Main Parts of Financial Statements:
  https://www.investopedia.com/terms/b/balancesheet.asp
  https://www.investopedia.com/terms/i/incomestatement.asp
  https://www.investopedia.com/terms/c/cashflowstatement.asp

Class Materials on the Web: Class lecture slides and handouts (plus other supplemental materials) will be posted on the BA870 class website on ***QuestromTools*** (https://questromtools.bu.edu | Click on BA870). If you are missing lecture notes/handouts for a class, please obtain them from QuestromTools.

Important: All in-person classroom lectures will be recorded on "Echo360" videos and posted on the BA870 site on QuestromTools.

Preparation for Class: Before each lecture, students should do the following:

(1) Access the BA870 website on ***QuestromTools***, then click on "Resources tab", and then open the lecture folder the relevant lecture (i.e., folder Lecture 1 for Lecture #1)
(2) On days with an assigned case, read the materials and be prepared to discuss in class.
(3) You should skim the any recommended reading materials (see each lecture folder on ***QuestromTools***) before class and read in detail after class. These items are posted on ***QuestromTools*** under the *"Resources"* tab).

Classroom Approach: Classes will consist of lectures, case examples, programming examples and tasks, and problem solving using real world examples. If a concept or problem is not understood, feel "raise your hand" at any point during the online lecture for clarification. You are also welcome to ask questions during the weekly "Office Hours".

Textbooks:

There is no required textbook for this class. All lecture materials, programming examples, assigned reading and assignments will be posted on BA870 website on *QuestromTools*.

Grading:

Assessment:	**What is Evaluated?**	**Grade Weight**
5 On-line Assignments	Lecture and Reading Content Count only your best 4 of 5 Assignments. ***See note below**	200 pts (50 pts each)
1 In-Class Quiz	Lectures, Reading & Assignments.	200 pts
Individual Project (Due July 7, 2021)	Submitted Colab Notebook, Presentation slides and your Zoom presentation	500 pts
Class Contribution	Class Participation, Answering Questions When Asked in Class, *Suggestions for Coding Solutions and Useful Libraries*	100 pts
Total points:		**1000 pts**

Your final letter grade in BA870 will be based on your performance relative other students registered in BA870. The distribution of final grades for BA870 will follow the BU Questrom School of Business graduate course grading policies.

On-Line Assignments:** There are 5 **On-line Assignments** during the course. For some Assignments, not all students will have exactly the same questions (and corresponding correct answers) for these On-line Assignments. Each Assignment must be submitted by time and due date of the Assignment. To access the instructions for an Assignment, click on the **Assignments** tab on ***QuestromTools. Late submissions will receive a score of zero. Discussion of general concepts and procedures is allowed with other BA870 students currently taking the course, but no sharing of specific answers or joint work is allowed for the **"Individual Assignments**". I will count only your best 4 of 5 Assignment scores (4 * 50 points = 200 points max).

Quizzes: There 1 in-class Quiz (see schedule below). The Quizzes are "open book", but you should not communicate, contact or share information about your Quiz answers with any other student (either during or after the lecture). The Quiz covers all lecture materials and readings. Example/practice Quiz questions and solutions will be distributed the week before the in-class Quiz.

Individual Financial Analytics Project: Instructions for the Project will be provided in Lecture #3 and will also be posted on *QuestromTools.* You will be given an applied financial analytics problem to solve using the tools from BA870. You must submit a documented *Colab Notebook* including Python code with your programming solution to the problem. You will present your solution to the problem during

lectures #11 and #12. The submission due date for the individual project (commented *Colab Notebook* and Presentation slides) is at 5:00pm (Boston time) on Wednesday, April 27, 2022.

Recorded Lectures: The in-person lectures for BA870 will be video recorded (Echo360) and posted on the BA870 site on ***QuestromTools***. In addition, there are additional videos of BA870 tutorials. All videos will be posted on ***QuestromTools***.

IMPORTANT:

- If you cannot attend a lecture, you should view the recorded lecture videos. Please note that the recorded lectures may not appear around 6pm on the date of the lecture on **QuestromTools***.*

Technology in Class:

- Like your previous *Questrom MSBA* courses, you should have a laptop or similarly-equipped computing device for use during the lectures.

IMPORTANT: PLEASE READ THE FOLLOWING *BA870* POLICIES – IT IS YOUR RESPONSIBILITY TO KNOW & UNDERSTAND THESE UNIVERSITY, BUSINESS SCHOOL & COURSE POLICIES.

(1) **Masks in class:** As of March 7, 2022, the Boston University policies for masks are as follows: "*Face masks are required in all classrooms being used for lectures or instructional purposes. However, an individual faculty member, lecturer, TA, or student speaking at the front of a classroom may choose to remove their mask while they are speaking*." Please see the following link for details:

https://www.bu.edu/back2bu/campus-life-undergraduates/student-health-safety/face-coverings/

The University recommends that you use high-quality filtering masks (not bandanas).

(2) **Unexpected issues arising from Covid19:** Obviously, there is a lot of uncertainty about Covid19 and it may affect the plans and schedule for this course. Please email me if you have any conflicts, problems or concerns. I will try to accommodate these uncertain and unexpected problems. Whatever may happen, we will still have fun and do many interesting things in BA870!

(3) Attendance and completion of course requirements (under normal circumstances):

(a) If you miss a class, you should obtain the class materials (lecture videos, lecture notes, required readings, assignment questions) from ***QuestromTools***. You should also view the lecture videos on the ***QuestromTools*** BA870 website. Click on the relevant lecture webpage (i.e., Lecture01.html under the **Resources** tab). Please note that the recorded lectures may not appear for 4 hours after the end of the lecture on ***QuestromTools***.

(b) All **On-line Assignments** must be submitted by the due date/time listed in the BA870 Class Schedule. There are no extensions or makeups and late submissions will receive a score of zero.

(4) **Religious Observance Policy:** In accordance with BU policy "students are required to inform instructors, in writing, of conflicts with the course schedule and requirements due to their religious observance as early as possible in the semester, and in any case no later than one week in advance of conflict, so that accommodations can be made." For more information, refer to: http://www.bu.edu/ctl/university-policies/policy-on-religious-observance/

(5) **Disability and Accessibility Resources**: The BU Office of Disability Services (ODS) provides academic accommodations to qualified students with disabilities. All students seeking academic accommodations for a disability must register with ODS (http://www.bu.edu/disability/new-students-

disability-accommodations/). According to BU ODS procedures "once you are approved (through ODS), it can take up to three weeks to set up services. We (ODS) need to have accommodations approved by your Academic Dean and have letters written for each of your professors."

(6) **Diversity:** In developing this course, I have aim to include content, examples and assignments that cover a wide and diverse range of industries, events, regions and business situations. If you have suggestions and/or examples of others, then please let me know.

(7) **Questrom Academic Code of Conduct:** All students assume the responsibilities of the BU community of scholars in which everyone's academic work and behavior are held to the highest academic integrity standards. Academic misconduct compromises the integrity of the University. Cheating, fabrication, plagiarism, unauthorized collaboration, and helping others commit these acts are examples of academic misconduct, which can result in disciplinary action including a failing grade, disciplinary probation, or suspension. Please refer to http://questromworld.bu.edu/acc/ . The following matrix provides ground rules and ethical guidelines for BA870:

BA870 – Specific Guidance on Code of Conduct

	Materials							People				
BA870 Topics in Financial and Accounting Analytics	Approved calculator	Laptop / other electronics	Communicating on internet	Current BA870 class materials	Past BA870 course martials	Past exams / problem sets	Internet content / other outside materials	Learning team / approved work team	Other student(s) in same section	Student(s) in other sections (same term)	Questrom student not taking the class this term	Person outside Questrom
Individual Project	A	A		A			A	D	D	D		
On-line Assignments	A	A		A			A	D	D	D		
In-Class Quiz	A			A								
	A = Allowed material Shaded Cell = Not allowed							W = Allowed to work together D = Discussion of general concepts is allowed but no sharing of answers. Shaded Cell = Not allowed				

The information above covers many common situations but will not cover every circumstance. Remember:
The **Questrom Academic Code of Conduct** requires, among other things, that you represent yourself and your work honestly, don't try to gain unfair advantage over other students, follow the instructor's guidelines and respect confidentiality of your work and the work of others. If you have questions, please contact the Professor.

(8) **Extra Credit:** The grading policies for BA870 are listed in the "Grading" section. There are no extra credit assignments or quiz "re-do's" in BA870 (no exceptions). This policy is applied consistently and equally to all students.

(9) **Syllabus Changes**: If you see a possible error in this syllabus, then please alert the instructor. Thank you. Any changes to this syllabus and the lecture schedule will be posted on *QuestromTools* and announced during lectures.

Financial and Accounting Analytics (BA870 – Sections A1 & B1)

COURSE SCHEDULE (Spring 2022) (Updated – April 6, 2022):

UPDATE NOTE: Regular Class on Tuesday, April 19, 2022

Class	Date	Topic	Details
1	Tues 3/22	Course Overview. Data Analytics Application to Accounting and Finance Financial Accounting Concepts I	**Concepts**: Annual Report, I/S, B/S, SCF **Data:** Yahoo Finance: (i) Financial Variables – Revenue and Assets, (ii) Business Description **Tools:** Overview of Google Colab Notebooks; Introduction to BERT for NLP (Sentiment Analysis)
2	Thur 3/24	Financial Accounting Concepts II Data Sources & Applications of Financial Accounting – Retrieving & Cleaning Data Brief Intro to Transformers Models for NLP	**Concepts**: (i) Earnings, Cash Flows, Assets and Liabilities; (ii) Transformers Models (BERT) for Deep Learning **Data:** Scraping Data from Yahoo Finance & Google Finance **Tools:** Case Study of DistilBERT for Classifying Asset Intensity based on Business Description Text
3	Tues 3/29	Data Sources & Applications of Financial Accounting – Other Sources Performance Measures & FSA I	**** Assignment #1 Due** **** Introduction and Directions for Individual Project** **Concepts:** Analysis of Financial Ratios **Data:** WRDS Data for Financial Statements (Compustat); Company Identifiers **Tools:** Regression Fixed Effects (Industry)
4	Thur 3/31	Performance Measures & FSA II Data Sources & Applications of Performance Measures & FSA (Analytics)	**Concepts:** Pitfalls of Performance, More Ratios, and FSA Measures; Accounting Manipulations/Fraud **Data:** SEC Edgar **Tools:** Accessing SEC XBRL data
5	Tue 4/5	Investment Concepts Examples with WRDS and Yahoo Finance	**Concepts:** Stock Returns, Volume, Dividends, Risk, Indices **Tools:** Statsmodels, YFinance (Yahoo Finance API) **Data**: WRDS CRSP, Yahoo Finance
6	Thur 4/7	Investment Concepts Examples with WRDS and Yahoo Finance	**** Assignment #2 Due** **Concepts:** Stock Returns, Volume, Dividends, Risk, Indices **Tools:** Statsmodels, YFinance (Yahoo Finance API) **Data**: WRDS CRSP, Yahoo Finance
7	Tue 4/12	Corporate Finance Concepts	**** Assignment #3 Due** **Concepts:** Stocks Markets, Stock Prices and DCF (PV, Cash Flows, Valuation & Valuation Ratios) **Data:** Analyst Forecast Data from WRDS I/B/E/S, Yahoo Finance **Tools:** YFinance
8	Thur 4/14	Textual Analysis of Disclosures "Old School" Textual Analysis Tools	**Concepts:** SEC Financial Data; XBRL; NLP: Tone, Similarity, Readability **Data:** Edgar 10-K Filings; Yahoo Finance, WRDS **Tools:** YFinance, Textual Analysis Measures
9	Tue 4/19	**UPDATED: WE WILL HAVE REGULARLY SCHEDULED CLASS ON THIS DATE** Textual Analysis of Financial Disclosures & Media	**Concepts:** Transformers for NLP in Finance **Data:** Textual Data Sources for NLP **Tools:** BERT, Roberta, DistilBERT, GPT-3
10	Thur 4/21	Applications to Investment Prediction; Explainable AI	**** Assignment #4 Due** **Concepts:** The Pitfalls of Trying to Beat the Market with Machine Prediction; Explainable Machine Learning **Tools:** Explainability/Interpretability methods: Probing and Masking; LIME methods
11	Tue 4/26	Capstone Review of Concepts; Ethics and Bias in Financial Analytics	**** Assignment #5 Due** **** In-Class Quiz** **** Preparation for Project Presentations** **Concepts:** Capstone Review of Concepts; Ethics and Bias in Financial Analytics
	Wed 4/27	**Due Date for Project**	***Colab* Notebook and Presentation Slides must be submitted on QuestromTools by 5:00pm (Boston time) on April 27, 2022.**
12	Thur 4/28	Project Presentations	**Project Presentations**
13	Tue 5/3	Project Presentations	**Project Presentations**
