

BOSTON COLLEGE
Carroll School of Management

OPER 6610.01: Sports Analytics (Fall 2014)
Fulton Hall 423: M (4:30 – 6:50)

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Maloney Hall, 337
Hrs: M 6:50 PM & by appt.
x2-8058

Course description: This course is about working with data. Our focus will be on the development and use of quantitative methods (particularly mathematical and statistical models) that are widely used to assist in decision making and tactical analysis at all levels in the management of professional sports organizations. We work with sports data because there's so much of it, and it's so much fun to work with. But the techniques and insights developed could just as easily come from working with more traditional business data (if only they were so readily available).

Analytic approaches: The analytic focus will largely be on univariate and multivariate statistics and regression analysis, optimization methods, game theory and if time permits, matrix methods.

Prerequisites: A working knowledge of basic probability and statistics as well as strong Excel skills. Almost all of the analytic work in this course will be done with Excel. To brush up on your Excel skills, you might look at the materials assembled by the ITS department:
http://www.bc.edu/offices/its/tandc/training/course_materials.html .

Unfortunately, the features offered by Excel differ somewhat across platforms and over time. For this course, you may need to install the *Analysis ToolPak* and the *SolverAdd-in* if your Excel does not already offer those features. Let me know if you need help with these installations.

Data, data, data: We will be working with publicly available data from the four major North American professional sports leagues (MLB, NBA, NHL and NFL), as well as the NCAA (collegiate athletics) and the European professional football leagues. The datasets come in very different sizes. The smaller datasets will have observations numbered in the 1,000's; the largest datasets will have several million observations. While this is not a *Big Data* course per se, we will spend some time on Big Data quantitative methods.

Topics: This course is data-driven and built around a series of quantitative analyses, which address a wide variety of sport-related topics. The following list provides some sense the sorts of topics that we might cover:

- performance drivers (e.g. Pythagorean Theorem; corner kicks)
- strategy and tactics (e.g. play/shot selection; *icing* kickers; 3-0 fastballs; penalty kicks)
- performance assessment and forecasts (e.g. the RPI; other ratings models)
- pricing in risk markets (e.g. the efficiency of wagering markets)
- referee/umpires bias (e.g. home field advantage; called balls and strikes; fouls, cards and stoppage time)
- player compensation (e.g. valuing performance; *superstar* effects)

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- peer effects (e.g. valuing player synergies)

This is not a sports history or trivia class. It is a data analysis course. It just so happens that we work with sports data.

Texts:

- Wayne Winston, **Mathletics: How Gamblers, Managers, and Sports Enthusiasts Use Mathematics in Baseball, Basketball, and Football**, Princeton University Press (paperback), 2012.
- Tobias Moskowitz and Jon Wertheim, **Scorecasting: The Hidden Influences Behind How Sports Are Played and Games Are Won**, Three Rivers Press (paperback), 2012.

We will closely follow the Winston text; the Moskowitz/Wertheim text will come into play from time to time.

BlackboardVista *err* Canvas: Everything distributed in class, and more, will eventually be posted somewhere... said *where* yet to be determined. Stay tuned.

Accommodations: If you are a student with a documented disability seeking reasonable accommodations in this course, please contact Kathy Duggan (x2-8093; dugganka@bc.edu) at the Connors Family Learning Center regarding learning disabilities and ADHD, or Paulette Durrett, (x2-3470; paulette.durrett@bc.edu) in the Disability Services Office regarding all other types of disabilities, including temporary disabilities. Advance notice and appropriate documentation are required for accommodations.

Academic Integrity: You will be held to Boston College's standards of academic integrity. If you have any questions as to what that means, please go to <http://www.bc.edu/offices/stserv/academic/integrity.html>.

Class Structure: We will be following the topics and analysis in Winston's text fairly closely. Classes will typically divide into two parts: In the second half or so we'll be discussing new material from the Winston text. There will be a *weekly* assignment based on that material (typically involving updated datasets), which will be discussed in the first half of the following class. The pace will certainly vary over the course of the semester; I anticipate that we'll cover three-four chapters of the Winston text per week.

Course Structure: There are three components to the course (%'s of course grade are in parentheses). They are:

1. Weekly short assignments (25%)
2. Exercises (35%)
3. Term paper and presentation (40%)

1. Weekly Short Assignments: There will be ten or so weekly short assignments, which build on our discussion of the Winston material and typically involve some sort of replication of that

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analysis with updated datasets. These graded assignments are primarily intended to give you some practice applying the analytic skills developed in class (as opposed to breaking new ground). They will count equally towards your course grade, with the lowest score dropped in the course grade calculation. Feel free to work with others on these, but please submit your own work product. Final grades on weekly short assignments (which count towards 25% of your course grade) will be curved.

2. Exercises: Exercises count equally towards 35% of your course grade. Exercises will count equally towards your course grade. We may drop one of these Exercises if we get behind in the schedule. To protect you from yourselves, Exercises will have Answer Sheets. Feel free to collaborate on the exercises, but please prepare your individual submissions independently.

Subject to revision, here's the proposed set of Exercises and the schedule (you will typically have two weeks to complete each Exercise).

#1: Pythagorean Theorem (distributed: 9/15; due: 10/6)

#2: Run and Win Expectancy (and Leverage) (distributed: 10/6; due: 10/20)

#3: Game Strategy (Play Selection) (distributed: 10/20; due 11/3)

#4: Sports Team Ratings and the RPI (distributed: 11/3; due 11/17)

#5: Wagering Market Efficiency (distributed: 11/17; due 12/1)

In many cases, there are faster and slower ways to complete the exercises. Let me know if progress is painfully slow, and I'll be happy to make suggestions to help speed things up. Final grades on exercises are curved.

2. Term Paper: The term paper is an empirical project and counts towards 40% of your course grade. This is a team assignment, with two students per team (I will assign teams in early October). Your topic is your choice, but it should feature the sorts of analytic techniques that we develop and implement over the course of the semester. We'll set aside one mid-semester class to allow students to present their term paper topics in class and discuss progress to date. I'll be happy to work with you if you are having trouble developing a topic.

Term papers should have six parts:

1. Introduction (description of topic and summary of results)
2. Brief literature review
3. Description of your analytic model and nature of analysis
4. Discussion of data
5. Presentation of results
6. Conclusion

There is no page requirement, though it is hard to do a good job covering all of these dimensions of the assignment without writing 15-20 pages or so (remember, shorter is always better!). Empirical work is slow going. Be sure to leave yourself enough time to complete the assignment to your satisfaction.

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Students will present their term papers in-class at the end of the semester on Dec 8th. Presentations should last no more than eight minutes (talk fast!) and not feature more than 10 or so slides. Please submit your presentation with your term paper. Both submissions are due in hardcopy form by the end of the day, Dec 10th (so you'll have a couple days to clean things up after your presentation).

Some urls, perhaps of interest:

- Sports Business Daily: <http://www.sportsbusinessdaily.com/Daily.aspx> (expensive but informative; two week trial subscription; student rates (still expensive))
- Sports Business Journal: <http://www.sportsbusinessdaily.com/Journal.aspx> (I believe the library has acquired a subscription to this journal)
- SportsBiz: <http://thesportsbizblog.blogspot.com/>
- Sports Law: <http://sports-law.blogspot.com/>
- Journal of Quantitative Analysis in Sports (JQAS): <http://www.degruyter.com/view/j/jqas>
- Rodney Fort: <https://sites.google.com/site/rodswebpages/codes>
- John Vrooman: <http://www.vanderbilt.edu/econ/faculty/Vrooman/sports.htm>
- and <http://www.cmaxxsports.com/misc/misc.html> (you'll find useful web pages (more or less up to date) devoted to MLB, the NBA, the NCAA, the NFL, and European football/soccer... and more)