MOTIVATIONS AND OBJECTIVES

Understanding and forecasting customer activity is a critically important exercise for all firms. In this course, we will learn:
1. Simple yet powerful models that use readily available customer activity data to capture underlying patterns in customer behavior;
2. How to use these models to provide accurate forecasts for what these customers will do in the future;
3. How to use these forecasts to inform customer management strategies and to estimate company valuation.

We will start by learning a few basic ideas and models in the initial sessions. These will serve as the building blocks for advanced models to calculate managerial, actionable quantities such as Customer Lifetime Value and for Customer-Based Corporate Valuation. Throughout the course, we will ascribe to and discuss the philosophy of customer centricity, i.e., how to identify and focus on the right customers for strategic advantage. We will learn how the developed tools will enable a manager to develop a robust customer-centric strategy.

The course will equip the sophisticated manager with a set of statistical tools that can help to analyze a wide variety of typical business situations. To ensure that the models that we learn in class are relevant and transparent to managers, they have been carefully developed and selected to: (a) offer actionable marketing insights, (b) work with data that are available in a simple, manager-friendly format, and (c) be fully implementable in a standard spreadsheet package (like Microsoft Excel).
Each class will start with a representative real-life problem which we will solve by the end of the class. Some of the problems that we will discuss in class are:

- How to project customer retention rates, such as in cell-phone contract renewals
- How to choose your target customers in a direct marketing program
- How to plan a reward program
- How to calculate the future profit from customers from early activity data
- How to tie the value of a firm’s customer base to its overall financial valuation

The techniques discussed are easily portable to applications outside marketing and we will consider several such examples. Time permitting, we will also throw in some fun examples, e.g., ranking sports stars by developing a procedure to estimate their true abilities given their performance statistics, predicting Tweeting behavior using real Twitter data, etc.

**PREREQUISITES**

Students need sufficient mathematical background to handle the tools that will be introduced and discussed. To this end, an introductory probability/statistics course and exposure to basic integral calculus would be very helpful, but is not necessary.

**COURSE ORGANIZATION AND MATERIALS**

Most of the classes will be lecture-based, with a strong emphasis on real-time problem solving, including analytical exercises on the board and numerical investigations using Microsoft Excel. Central to the development of the skills associated with probability modeling is hands-on experience. To this end, a set of homework exercises will be assigned for some sessions. There is no formal textbook for the course, but lecture notes covering the material presented in class will be distributed on a session-to-session basis. Excel spreadsheets used in class will be made available to the students, and some journal articles will be suggested as illustrations/applications of some of the techniques discussed. While it is expected that students will read and review all of these materials thoroughly, there will be no pre-class readings assigned for most sessions.

**EVALUATION**

*Homework Exercises (60%)*: These exercises, which will be given weekly in the early part of the course, will give you practice in applying concepts studied in class. All of the numerical work can be completed using Excel (although students are welcome to use other software packages if they wish).

*Take Home Final Exam (20%)*: This will be a challenging and thought-provoking final exam will involve careful and creative application of the concepts studied in the course.

*Class Participation (20%)*: While there are no formal case discussions, every class will start with a real-life problem which we will solve and implement in Excel by the end of the class. Students
are encouraged to be actively engaged in the lectures and to contribute actively in developing the solution.

TENTATIVE COURSE SCHEDULE

<table>
<thead>
<tr>
<th>Class topic</th>
<th>Due</th>
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<tr>
<td>Week 1  Choice Models</td>
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<tr>
<td>Week 2  Count Models</td>
<td>HW 1 on Choice Models</td>
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<tr>
<td>Week 3  Empirical Bayes Methods</td>
<td>HW 2 on Count Models</td>
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<td>Week 4  Customer Lifetime Value</td>
<td>HW 3 on Empirical Bayes</td>
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<tr>
<td>Week 6  Customer-Based Corporate Valuation</td>
<td>HW 4 on CLV</td>
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DETAILED COURSE CONTENTS

Note: Each lecture is 3 hours long.

Introduction and Models for Choice Data (1 lecture)
Motivating problems:
• Forecasting customer retention for subscription-based services at My Mobile.
• Forecasting magazine readership.

Tools and Concepts:
• General discussion about the philosophy and objectives of probability modeling.
• Comparisons to traditional regression-based models: “curve-fitting” vs. “model-building.”
• Highlights of the course.
• Careful derivation of a parametric model for choice (the shifted-geometric) and introduction to a parametric mixture model (the shifted-beta-geometric).
• The binomial distribution, the beta distribution as a mixture model, the beta-binomial model.
• Generalizing the model to allow for “spikes” at 0 or 1.
• Coverage of maximum likelihood estimation and the Microsoft Excel Solver tool.

Models for Count Data (1 lecture)
Motivating problem:
• Estimating advertisement exposures in a media campaign.

Tools and Concepts:
• The Poisson process, the gamma distribution as a mixture model, the negative binomial distribution.
• Evaluating goodness-of-fit.
• Alternative estimation approaches (e.g., method of moments).
• Generalizing the model to allow for “spikes” at 0 or 1.
• Choice vs. counting.

Empirical Bayes Methods (1 lecture)
Motivating problem:
• Gleamo: Understanding Customer Behavior Over Time

Tools and Concepts:
• Conditional distributions and expectations for choice, count and timing processes.
• Combining population information (“priors”) with observed data for individuals.
• Regression-to-the-mean.

Customer Lifetime Value (CLV) (2 lectures)
Motivating Problems:
• CLV and “The Perils of Ignoring Heterogeneity.”
• “Buy till you die” at CDNOW.
• Can we accurately estimate CLV but preserve customer privacy?
• Case: CLV and Customer Management Strategy at Blue Apron

Tools and Concepts:
• Combining the basic building blocks to create integrated models to estimate customer lifetime value and related concepts.
• Classification of customer bases along dimensions of contractual or non-contractual relationship with the firm:
  1. CLV in a contractual setting – BG/BB
  2. CLV in a non-contractual setting – BG/NBD
• Other related models (Pareto/NBD and PDO models).
• Adapting basic models to privacy-preserving data formats (RCSS).

Customer-Based Corporate Valuation (CBCV) (0.5 lecture)
Motivating Problem:
• How to tie the value of a firm’s customer base to its overall financial valuation
• Guest lecture by Prof. Dan McCarthy (Professor of Marketing at Emory University; Co-founder of Theta Equity Partners and Zodiac; the world’s #1 CBCV expert)

Tools and Concepts:
• Models to combining CLV calculations across customers and across years

Summary and Conclusion (0.5 lecture)