SOA Exam Update

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History of ASA's Curriculum Changes

- The ASA Curriculum Review Task Force began a complete review of the ASA curriculum in August 2015.

- The Task Force circulated a draft proposal to "key sections, employers, academic institutions, other associations, and the SOA's member and candidate survey panel."

- Roughly 80 percent of those surveyed said they "favored" or "strongly favored" the proposal.

- In June 2016, SOA's Board of Directors approved the proposal and the accompanying transition rules for implementation.

Why Change?

- Predictive Analytics
  - Actuaries need to know more than the basic regression and time series methods that were tested in the past.
  - Personally, I'm curious to see what the SOA thinks "predictive data analytics" means and how they test it.
- Short-term/Long-term Insurance Balance
  - Short-term (health and general insurance) coverages are increasing in importance.
  - The new curriculum will provide a better balance between short-term and long-term topics.
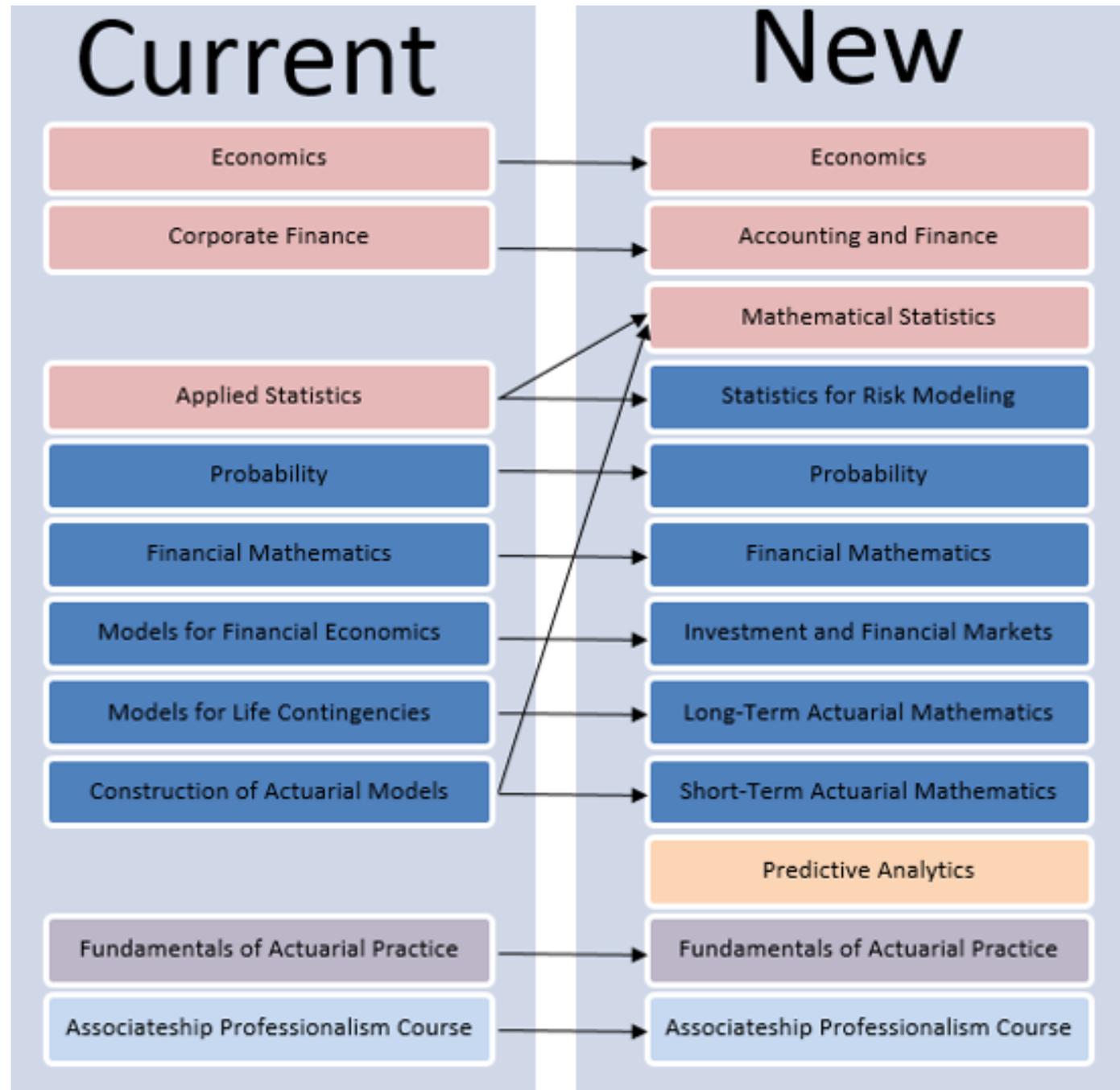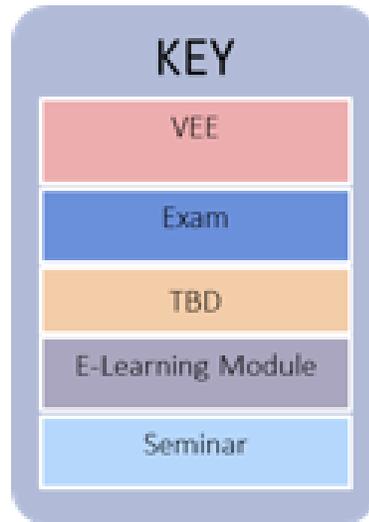
New VEE Requirements

- **Economics** stays the same.

- **Accounting and Finance** requires topics from an accounting course and from a finance course. For Clemson, our finance course had an accounting course prerequisite. So, no changes here.

- **Mathematical Statistics** replaces Applied Statistics. This will most likely be satisfied by a one-semester course in "statistical theory," which will have a prerequisite of the course in calculus-based probability that is used to cover the objectives for Exam P. For Clemson, we required that course anyway. So, nothing will change here either.

Exams P, FM, and IFM

- P – Stays the same. Three hours. Thirty MC questions. CBT. No changes to learning objectives.
- FM – Three hours. Thirty-five MC questions. CBT.
  - Almost exclusively interest theory.
  - Interest rate swaps and determinants of interest rates.
  - No financial economics (no forwards, puts, calls, etc.)
- IFM ("new MFE") – Three hours. Thirty MC questions. CBT.
  - Finance – Mean-Variance Portfolio Theory, Asset Pricing Models, Market Efficiency and Behavioral Finance, Investment Risk and Project Analysis, and Capital Structure.
  - Financial Economics – Futures, Forwards, Options, Binomial Pricing Models, Black-Scholes Formula, Option Greeks, and Risk Management.
  - No Stochastic Calculus or Brownian Motion.

Short-Term Actuarial Mathematics Exam (STAM)

- "New C" – Three-and-a-half hours. Thirty-five MC questions. CBT.

- Continued C Topics – Severity Models, Frequency Models, Aggregate Models, Coverage Modifications, Risk Measures, Construction and Selection of Parametric Models, and Credibility.

- Discontinued Topics – Construction of Empirical Models, Estimation of Decrement Probabilities from Large Samples, and Simulation.

- New Topics – Insurance and Reinsurance Coverages (5 – 10%) and Pricing and Reserving for Short-Term Insurance Coverages (15– 25%).

Long-Term Actuarial Mathematics Exam (LTAM)

- "New MLC" – Four hours of multiple-choice and written response questions. Fifteen-minute read-through period.

- Prerequisites: probability (as covered in Exam P), mathematical statistics (as covered in VEE Mathematical Statistics) and interest theory (as covered in Exam FM).

- Continued MLC Topics: Survival Models, Present Value Random Variables, Premium Calculation, Reserves, and Pension Plans and Retirement Benefits.

- Added Topic: Long-Term Insurance Coverages

Statistics for Risk Management (SRM)

- New. Three-and-a-half hours. Thirty-five MC questions. CBT.

- Covers linear models (40 – 50%) and time series material that was covered in the courses used for the Applied Statistics VEE.

- Not just linear regression models. Lasso regression, ridge regression, and the *k*-nearest neighbor algorithm.

- New Topics: Principal Component Analysis, Decision Trees, and Cluster Analysis.

- "For this exam, ability to solve problems using the R programming language will not be assumed. However, questions may present R output for interpretation."

Predictive Analytics Exam (PA)

- New. First offered in December 2018. Administered as a **five-hour project** requiring analysis of a data set in the context of a business problem and submission of a written report.

- During the exam, candidates will have access to a computer equipped with Microsoft Word, Microsoft Excel, and RStudio.

- Report submitted electronically.

- Prerequisites: selected analytical techniques as covered in Exam P, Exam SRM, and VEE Mathematical Statistics.

- **Credit for Exam SRM is required to take the PA exam.**

- To help students prepare for this exam, the SOA has published nine modules available to students to work through.

Predictive Analytics Exam (Page 2)

- The exam will consist of a project in which the candidates will be given a "vague" business problem and data relevant to the problem.

- Candidates must analyze the problem:
  - Translate the problem into something that can be analyzed.
  - "Scrub" data.
  - Use **R** to construct meaningful visualizations of the data.
  - Use commands in **R** to apply appropriate combinations of Generalized Linear Models, Decision Trees, and Cluster and Principal Component Analyses.

- Finally, candidates must develop and justify a solution, and communicate that solution.

Conclusions

- First, in a small, informal survey that I conducted, everyone supported the SOA's decision to change the exams because they said that the profession is moving in a data analytics direction.

Conclusions

- Secondly, and coincidentally, I made a presentation at the Annual Meeting of the Institute for Operations Research and the Management Sciences (INFORMS) in Phoenix last week. This organization is all about analytics. In fact, they have developed a "Certified Analytics Professional" certification program. I believe that there can be more collaboration between actuaries and members of INFORMS.

Conclusions

- Thirdly, in light of these curriculum changes, I have begun to ponder the university's role in actuarial education. Specifically, how can Clemson University best serve its students who want to become actuaries, given a limited amount of space in the academic program? I believe our strength is teaching students probability, stochastic, and analytics topics, such as generalized linear regression and clustering, as opposed to topics on the two Actuarial Mathematics (LTAM and STAM) exams.

Conclusions

- Finally, as an academic adviser to Clemson University students, I have seen students who would normally be prime candidates to be actuaries find data analytics or financial analyst positions. The skills that students in actuarial programs acquire make those students attractive to other professions as well. Some of these students have passed actuarial exams, gotten internships, etc. I am concerned that by adding two more exams (SRM and PA), the SOA has made the path to becoming an ASA even more intimidating to potential actuaries. The unintended consequence may be that talented students turn to other professions.