Actuaries and Data Scientists: how our Professionalism and Training keeps us ahead

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Education and CPD issues

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Outline

1. Basic Actuarial Education in Europe (Core Syllabus)
2. CPD to keep up to date or to expand professional activity
3. Conclusions. Some considerations around “Actuaries and/as Data Scientists” with a training focus

Core Syllabus for Actuarial Training in Europe

- Essential instrument for the Mutual Recognition Agreement in the AAE
- Member associations of the AAE had to implement the requirements of the current AAE Core Syllabus latest by the end of 2022 ⟹ Audit process run by the AAE Education Committee
- Defined/amended in 1998, 2002, 2005, 2011, 2019
- For the first time, the Core Syllabus 2019 includes a learning area on Data and Systems in the basic actuarial education:

1. Statistics
2. Economics
3. Finance
4. Financial Systems
5. Assets
6. **Data and Systems**
7. Actuarial Models
8. Actuarial Risk Management
9. Personal and Actuarial Professional Practice

Core Syllabus for Actuarial Training in Europe

Initial (1998)

1. Mathematics
2. Probability and Statistics
3. Stochastic Processes
4. Computing
5. Economics
6. Accounting and Financial Reports
7. Structures and Legislative Instruments of the European Union
8. Communication Skills
9. Language Skills
10. Financial Mathematics
11. Survival Models
12. Actuarial Mathematics
13. Risk Mathematics
14. Investment
15. Life Insurance
16. General Insurance
17. Pensions
18. Living Benefits

Current (2019)

1. Statistics
2. Economics
3. Finance
4. Financial Systems
5. Assets
6. Data and Systems
7. Actuarial Models
8. Actuarial Risk Management
9. Personal and Actuarial Professional Practice

Core Syllabus for Actuarial Training in Europe

- Aditional to the basic actuarial education, the Core Syllabus includes:
  - ✓ Advanced Skills (where one of the areas of actuarial practice is Data Science)
  - ✓ Foundation Mathematics (prerequisite)

6. Data and Systems:

Aim: To enable students to apply methods from statistics and computer science to real- world data sets in order to answer business and other questions, in particular with application to questions in long and short term insurance, social security, retirement benefits, healthcare and investment.

6.1. Data as a resource for problem solving

6.2. Data analysis

6.3. Statistical learning

6.4. Professional and risk management issues

6.5. Visualizing data and reporting

Core Syllabus for Actuarial Training in Europe

- Also for the first time, the depth of coverage is illustrated through the Model Of Learning Objectives (based on Bloom‘s Taxonomy)

Verbs Objects	1. REMEMBER Recognize, Recall	2. UNDERSTAND Interpret, Exemplify, Classify, Summarize, Infer, Compare, Explain	3. APPLY Execute, Implement	4. ANALYZE Differentiate, Organize, Attribute	5. EVALUATE Check, Critique	6. CREATE Generate, Plan, Produce
A. Factual Knowledge	A1	A2	A3	A4	A5	A6
B. Conceptual Knowledge	B1	B2	B3	B4	B5	B6
C. Procedural Knowledge	C1	C2	C3	C4	C5	C6
D. Metacognitive Knowledge	D1	D2	D3	D4	D5	D6

Core Syllabus for Actuarial Training in Europe

6.1. Data as a resource for problem solving (a deeper look)

6.1.1 Describe the possible aims of a data analysis (e.g. descriptive, inferential, predictive). (B2)

6.1.2 Describe the stages of conducting a data analysis to solve real-world problems in a scientific manner and describe tools suitable for each stage. (C2)

6.1.3 Describe sources of data and explain the characteristics of different data sources, including extremely large data sets. (B4)

6.1.4 Describe common data structures and data storage systems. (A1)

6.1.5 Describe and explain measures of data quality. (B2)

6.1.6 Use appropriate tools for cleaning, restructuring and transforming data to make it suitable for analysis. (C3)

Core Syllabus for Actuarial Training in Europe

6.2. Data analysis (a deeper look)

6.2.1 Describe the purpose of exploratory data analysis. (B2)

6.2.2 Use appropriate tools to calculate suitable summary statistics and undertake exploratory data visualizations. (C4)

6.2.3 Use Principal Components Analysis to reduce the dimensionality of a complex data set. (C4)

6.2.4 Use a computer package to fit a statistical distribution to a dataset and calculate appropriate goodness of fit measures. (C4)

6.2.5 Use a computer package to fit a single or multiple linear regression model to a data set and interpret the output. (C4)

6.2.6 Use a computer package to fit a survival model to a data set and interpret the output. (C4)

6.2.7 Use a computer package to fit a generalized linear model to a data set and interpret the output. (C4)

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6.3. Statistical learning (a deeper look)

6.3.1 Explain the meaning of the terms statistical learning and machine learning and the difference between supervised learning and unsupervised learning. (B2)

6.3.2 Explain when machine learning is an appropriate approach to problem solving and describe examples of the types of problems typically addressed by machine learning, explaining the difference between discrete and continuous approaches. (B2)

6.3.3 Describe commonly used machine learning techniques in each of the four areas defined by the supervised/unsupervised and discrete/continuous splits. (B2)

6.3.4 Use an appropriate computer package to apply neural network and decision tree based techniques to simple machine learning problems. (C3)

Core Syllabus for Actuarial Training in Europe

6.4. Professional and risk management issues (a deeper look)

6.4.1 Explain the ethical and regulatory issues involved in working with personal data and extremely large data sets. (B2)

6.4.2 Explain the main issues to be addressed by a data governance policy and its importance for an organization. (B2)

6.4.3 Explain the risks associated with use of data (including algorithmic decision making). (B2)

6.5. Visualizing data and reporting (a deeper look)

6.5.1 Create appropriate data visualizations to communicate the key conclusions of an analysis. (C6)

6.5.2 Explain the meaning and value of reproducible research and describe the elements required to ensure a data analysis is reproducible. (B2)

CPD to keep up to date or to expand professional activity

- AAE CPD Guidelines
  - Principles Based
    - ✓ Staying fit & proper and being long-life employable
    - ✓ Evidence based (documentation)
    - ✓ Proper assessment (content and format; actuary's development plan)
    - ✓ Flexibility and proportionality
  - Requirement
    - ✓ Self assessment of the outcomes and review by a third party
    - ✓ Specified minimum number of hours of CPD activity (at least 45 over a 3 years period)
- Each MA has it's own CPD Scheme, but they need to have the AAE CPD Guidelines implemented by 1-1-2024
- New requirement to benefit from the Mutual Recognition Agreement

CPD to keep up to date or to expand professional activity

- MA's are offering CPD seminars and even more structured courses on DS/AI
- CPD seminar/courses contents are on:
  - ✓ Techniques, methodologies (basics and applications)
  - ✓ Governance
  - ✓ Professionalism
- Some associations have already introduced their own certifications or credentials as "Actuarial Data Scientist"
- The AAE Education Committee is working on CPD Guidelines for DS & AI (principles, contents, etc)

Conclusions. Some considerations around “Actuaries and/as Data Scientists” with a training focus

- Regarding training, data scientists’ education doesn’t include…
  - Basic Education (Core Syllabus)
    1. Statistics
    2. **Economics**
    3. **Finance**
    4. **Financial Systems**
    5. **Assets**
    6. Data and Systems
    7. **Actuarial Models**
    8. **Actuarial Risk Management**
    9. **Personal and Actuarial Professional Practice**
  - **CPD Guidance: Principles, Requirement**

Conclusions. Some considerations around “Actuaries and/as Data Scientists” with a training focus

- Data Scientist is not a profession: the 3 pillars are necessary, and each of them complete
  - Education
  - Code of Conduct
  - Standards
- More and more actuaries, in their activity, frequently performs tasks and functions included in the area of data science and artificial intelligence, but it doesn´t define what an actuary is. An actuary is much more than a data scientist, and a data scientist cannot be considered as an actuary.
- Arthur Bailey (1881): “*An actuary then must be a mathematician, but a mere mathematician will be a very incompetent actuary*” ⟸ Try substituting “mathematician” by “data scientist”…

Questions - Discussion

Thank you very much

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