

# Forecasting student numbers by teaching period

How hard can it be?



# Peter May

Corporate Planning and Analytics Manager  
University of New England



# First, an icebreaker. Thanks Dilbert!



# Outline

- Forecasting HE student numbers in Australia
- Hands-on student number forecasting - the lived experience
- The case for forecasting student numbers by teaching period
- A possible teaching period forecasting algorithm
- Q&A and next steps

# Late 1980s -> Educational Profiles

- In December 1987, the “Dawkins Revolution” (so-called Higher Education White Paper) created the Unified National System (UNS) and introduced “**educational profiles**” as the principal mechanism for agreeing the role and mission of individual universities and for receiving Commonwealth funding.



The Hon. JS Dawkins MP  
Minister for Employment,  
Education and Training

## Late 1980s -> Educational Profiles

- As part of the new Educational Profiles process, the Commonwealth government introduced **computerised data submissions** to modernise data reporting and facilitate the introduction of HECS from 1989.
- The government provided each university with spreadsheet templates which required a **three-year (triennial) forecast of student load** (both commencing and total) by field of study, discipline, course level etc.
- Additionally, a **three-year forecast of course completion numbers** by course was also a mandated part of each institution's annual student statistics return . . . remember STUPAC?
- A new focus by government which granted universities increased levels of devolved responsibility for their own futures but with greater levels of accountability (including through the provision of student data) meant that Universities were increasingly expected to operate like businesses.

# Jump forward 30 years - HEIMS online

- Forecast student load is submitted by Universities twice yearly (in April and October) through HEIMS online.
- Forecast numbers, however, can only be keyed in and must be provided to 3 or 4 decimal places. Go figure.
- More importantly, forecast student numbers are now recognised by most universities for their value in informing internal strategic management purposes as opposed to their original purpose of simply meeting Commonwealth funding agreement requirements. e.g. university-wide budgeting and resourcing, workforce planning, performance management, strategic marketing, enterprise bargaining scenarios, product development, fee strategy, scenario planning (what-if) etc.



The screenshot displays the HEIMS online portal interface. At the top left is the Australian Government logo. A navigation menu on the left includes buttons for HEIMS Online, Return to Portal, Program Funding, CGS/HECS-HELP, CGS Estimates, Estimates EFTSL (highlighted), Campus EFTSL, and Payment Summary. The main content area shows the breadcrumb path: You are here: HEIMS Online > Program Funding > CGS/HECS-HELP > CGS E. Below this is the title 'CGS Estimates - Estimates EFTSL'. The page displays the following information: Provider: The University of New England (3039), Estimates Period: 2019 Period 1, Estimates Due Date: 01/04/2019, and Provider Estimates Status: Signed-off. A 'Download Report' link is present. At the bottom, there are tabs for the years 2019, 2020, 2021, and 2022. The 'Estimates' section is expanded to show a table with a 'Funding Cluster' header and two rows: '1-Law, Accounting, Admin, Econ, Comm' and '2-Humanities'.

2019	2020	2021	2022
▲ Estimates			
Funding Cluster			
1-Law, Accounting, Admin, Econ, Comm			
2-Humanities			

# Late 1980s - The UoW forecast model



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- My working life in higher education began as the Statistics Officer at The University of Wollongong in 1988.
- When the **educational profiles** data requirements landed, we worked with staff in the ADPU (Administrative Data Processing Unit) to **assemble time series historical student data** that informed the design of our first student forecast model.
- The **initial model was implemented in Excel** based on the scope of student data reported to government and adopted the same data elements/segments to ensure consistency with government reporting. For example:
  - Commencing/continuing
  - Fee-paying indicator
  - Attendance type/mode

# Late 1980s - The UoW forecast model



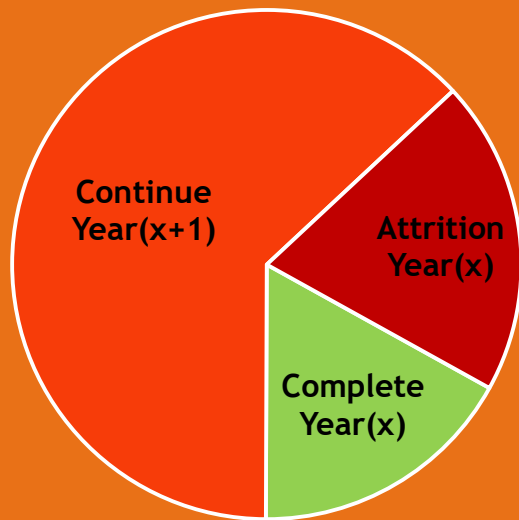
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- The model was relatively simple and based on annual student outcomes (both in terms of enrolment AND course completion).
- The key assumption was that each student enrolment could only result in one of 3 possible outcomes for a particular cohort
  - Either complete their course of enrolment in that year, or
  - Continue in their course of enrolment in the following year, or
  - Neither complete or continue i.e. an attrition
- Important: The quality of the student data collection (and thus the quality of the student forecast) was greatly enhanced through all of the checks (fatal errors, warnings and cross-validations) that were embedded within STUPAC. We were able to leverage the investment in this data.

# Late 1980s - The UoW forecast model

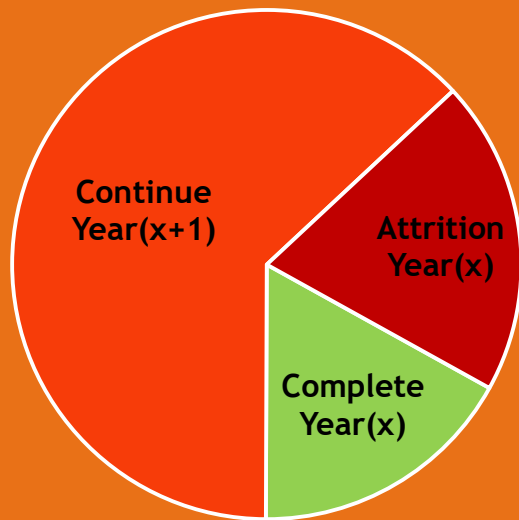


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- Student course enrolments were segmented by:
  - Commence/continue (2)
  - Full-time/part-time (2)
  - CSP / International / Domestic (3)
- $2*2*3 = 12$  different cohorts/segments modelled and calculated independently within each course.

# 1990s - The QUT forecast model



- Essentially the same algorithm as developed at UoW.
- Migrated from Excel to SAS (Statistical Analysis System)
- This greatly increased processing power and enabled quicker turn around on revisions.
- Opened up opportunity (though limited at the time) for increased integration with other corporate data eg. budget \$, staffing FTE etc.
- Eliminated potential errors associated with typical spreadsheet limitations e.g. bad or broken formulas and unrecognised errors embedded in the data.
- Later migrated into an Oracle RDMS/SQL environment.

# 2010s - The current UNE forecast model

level	(All)	▼
attendance	(All)	▼
fee type	(All)	▼
course	(All)	▼

%	outcome			
year	▼	continue rate	other	Grand Total
2014		61.4%	38.6%	100.0%
2015		61.1%	38.9%	100.0%
2016		65.9%	34.1%	100.0%
2017		63.3%	36.7%	100.0%
<b>Grand Total</b>		<b>62.9%</b>	<b>37.1%</b>	<b>100.0%</b>

level	Bachelors	▼
attendance	External	▼
fee type	CSP	▼
course	BA	▼

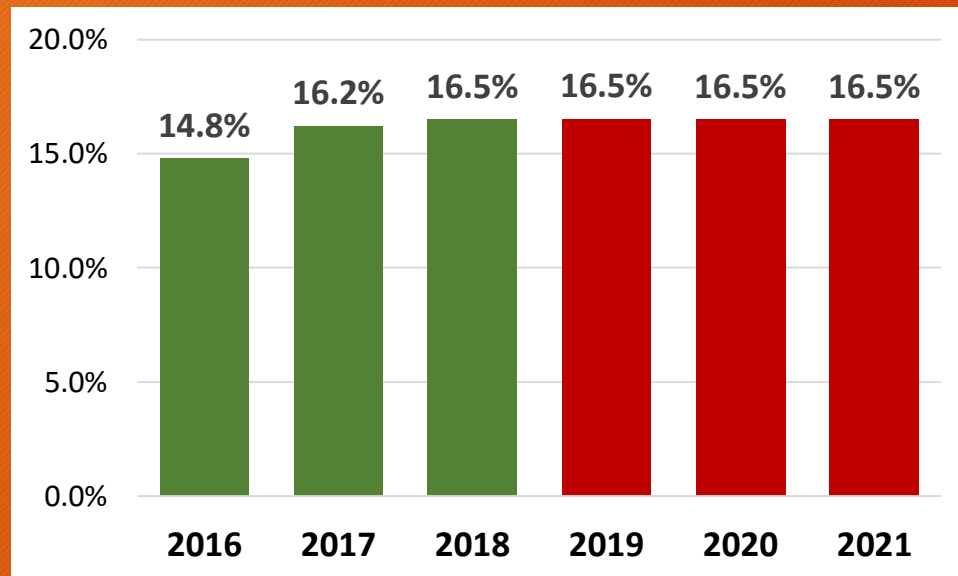
%	outcome			
year	▼	continue rate	other	Grand Total
2014		67.7%	32.3%	100.0%
2015		62.5%	37.5%	100.0%
2016		70.9%	29.1%	100.0%
2017		67.6%	32.4%	100.0%
<b>Grand Total</b>		<b>67.1%</b>	<b>32.9%</b>	<b>100.0%</b>

- UNE has a long established but very different algorithm to the models applied at UoW and QUT
- The forecast model is based on student load, not enrolments and, as was the case at UoW, the forecast is applied over the full year.
- The pipeline of continuing load is determined using the simple ratio of continuing load<sub>(x+1)</sub> divided by total load<sub>(x)</sub>
- Full year course load (commencing + continuing) is then split by trimester, funding cluster and teaching AOU according to the most recently available historical distribution.
- The continuation rate is, at best, a proxy for retention rate.
- Fully integrated with the University's budget both in terms of teaching revenue received and the distribution of load and associated revenue to support expenditure on teaching.

# 2010s - The current UNE forecast model

## UNE Trimester 3 Load as % of total load

Actual 2016 to 2018 and Forecast 2019 to 2021



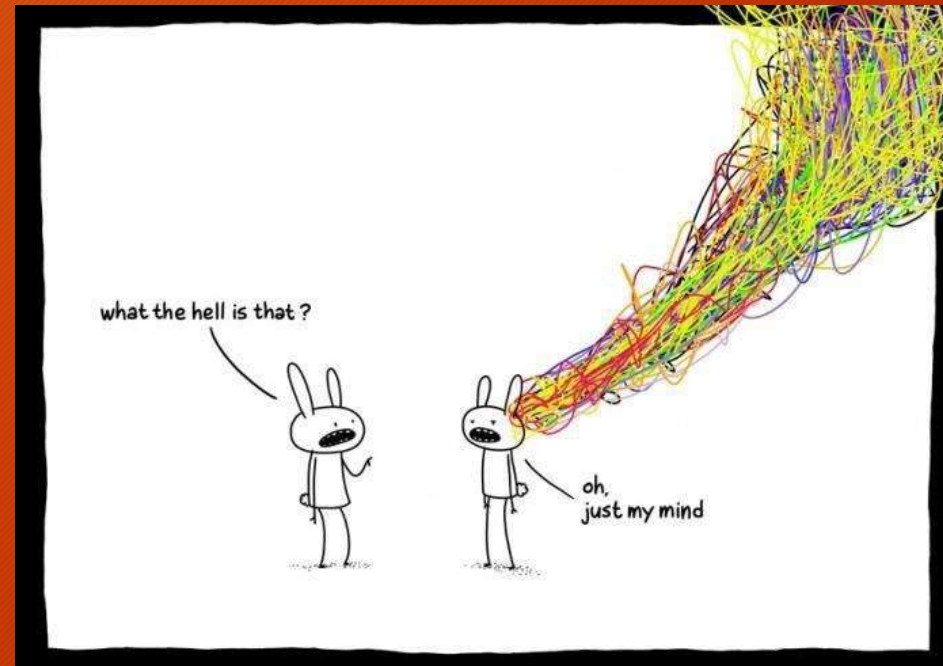
- A fundamental problem with the current UNE forecast - Trimester 3 student load is growing year-on-year.
- Under these circumstances, a student forecast model that relies on the historical distribution of student load by trimester will always understate the future proportion of T3 load
- However, we are not brave enough to assume continued T3 growth in the forecast without appropriate longitudinal modelling of student enrolment behaviour.

# Why forecast by teaching period?

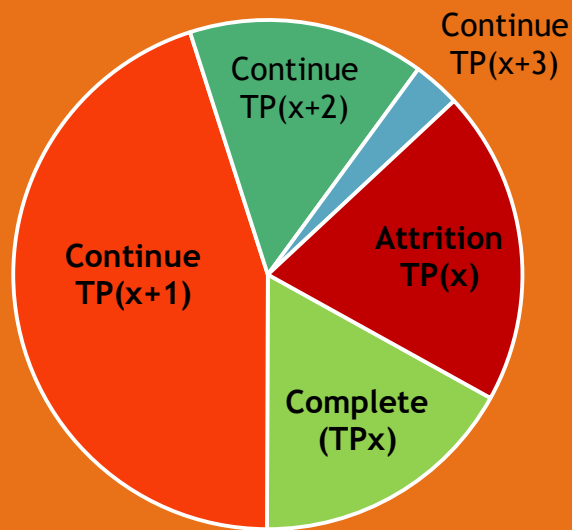


- Here we have a typical cohort of students enrolled at an esteemed institution somewhere in modern Australia in Trimester x.
- How can we model their future enrolment behaviour across a trimesterised academic year?
- Requires a model that is an informed balance between **perfectionism** and **pragmatism**.
- An underlying principle is “fitness for purpose”

# Pragmatism vs Perfectionism

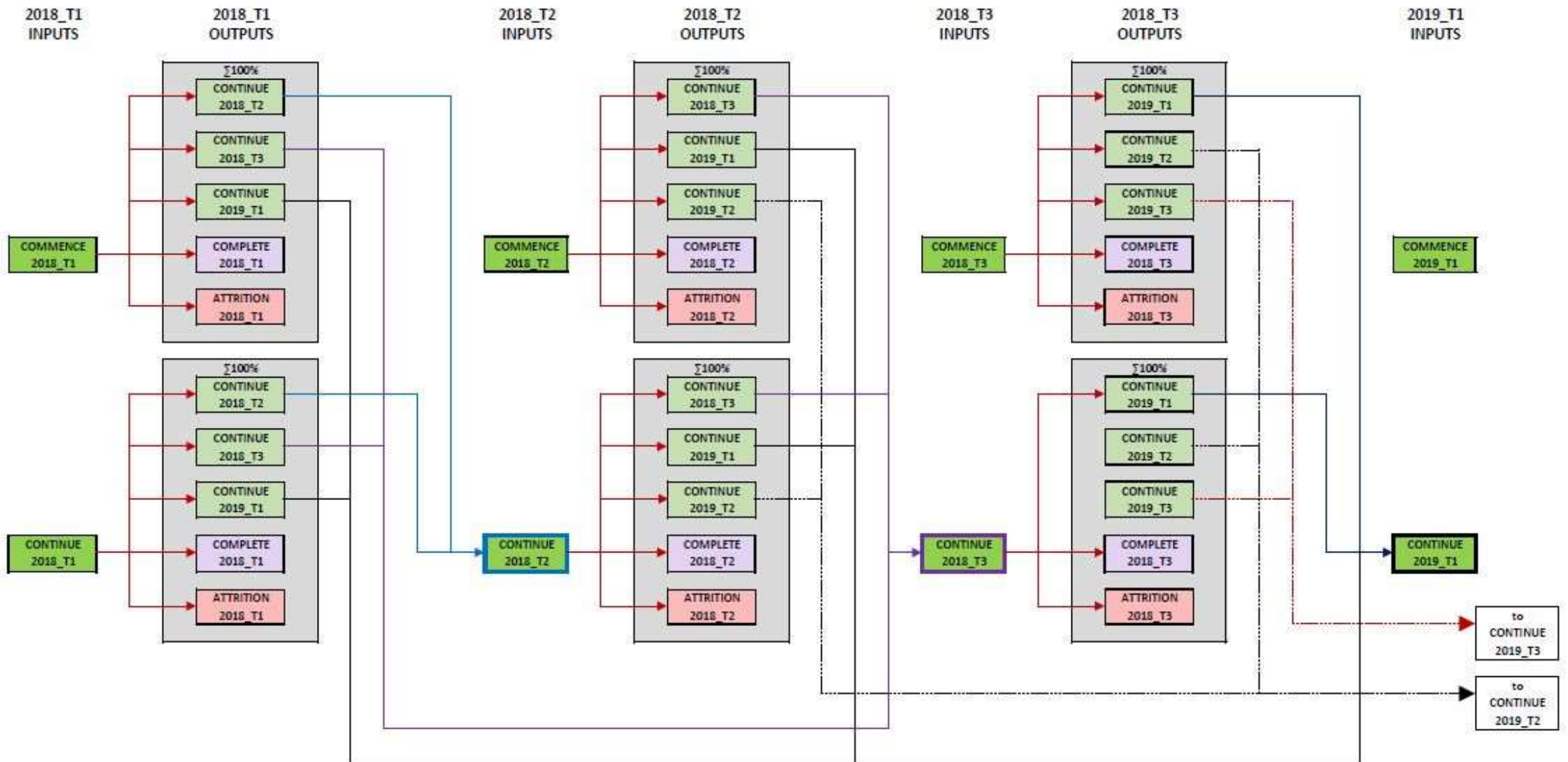


# 2020s - The next UNE forecast model?

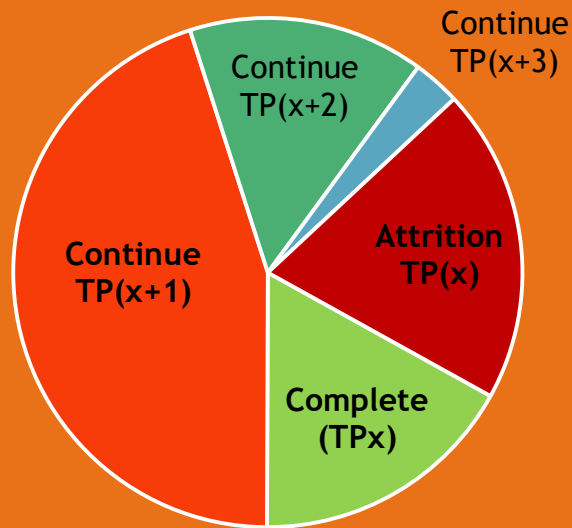


- Move from an annual forecast to a rolling, trimester based forecast that more closely models longitudinal student enrolment behaviour.
- Move from a student load focussed model to a model that is driven by enrolments as an input and which also yields course completions as an output.
- Key requirement is to identify commencing enrolments in each particular trimester not just within the year.
- Importantly, such a model establishes a direct alignment with the admissions process and assists with setting and achieving commencing enrolment numbers in each trimester.
- The observed continuation rate for a trimester is also a potential leading indicator (i.e. an early warning) of the annual retention rate. Provides an early opportunity for corrective action/continuous improvement. Also potentially important in the context of the government's performance funding agenda.

# Trimester based Student Enrolment Forecasting Model - Schematic

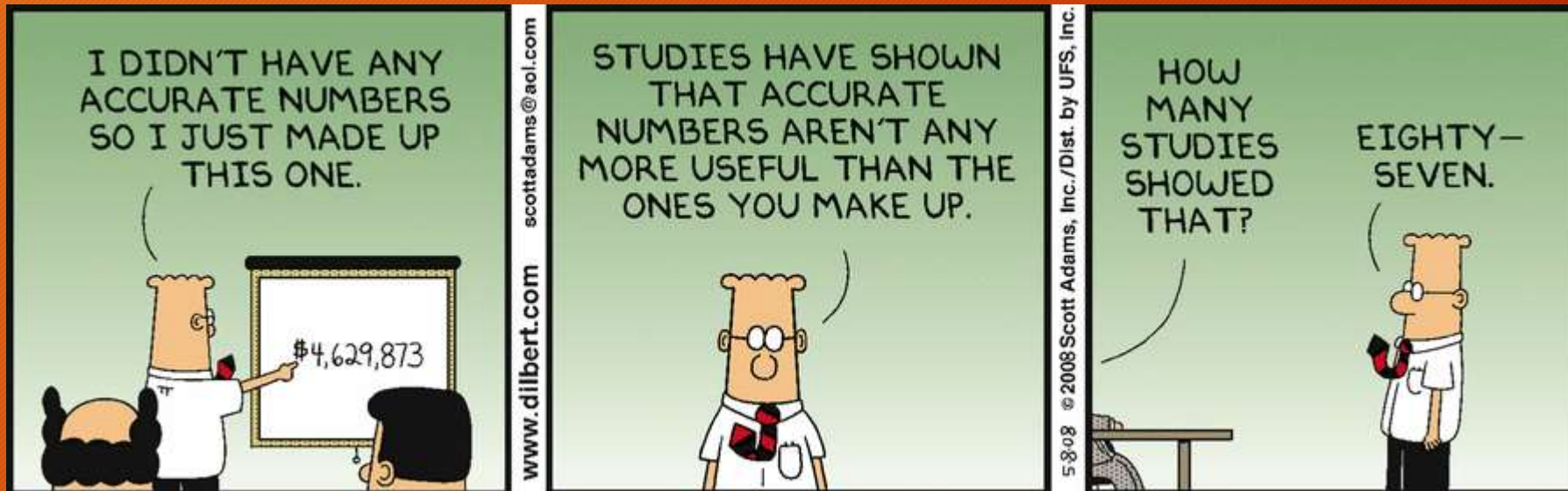


# 2020s - The next UNE forecast model?



- Is this algorithm “fit for purpose”?
- A key question: How many students are not captured within the model? How many students actually return to continue their studies after a break of more than three trimesters? i.e. What % of enrolments does the proposed model capture?
- What other complexities might there be in such a model that would need to be accommodated to achieve the best balance between perfection and pragmatism?

# A pragmatic approach to forecasting . . . Thanks again, Dilbert!



# Q&A and Next Steps

- Do we already have a university with a fit-for-purpose algorithm for forecasting student numbers by teaching period (balanced between pragmatism and perfection) within the Load Management SIG?
- If so, are they willing and able to share expertise in this area to avoid re-inventing the wheel and to foster best practice among members?
- How would we facilitate some useful knowledge exchange in this area?



. . I'm pretty sure this forecast is right!

*Tonights forecast...*

99% CHANCE  
OF WINE

