Developing applied analytical skills in business students – experience with spreadsheet-based modelling courses in finance

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Abstract

This article relates the teaching experience of dedicated spreadsheet modelling and programming courses within the finance curriculum of a New Zealand university. These courses put the design and construction of spreadsheet models and data analysis exercises into the centre of class activity. Based on the results of a student survey, these courses appear to facilitate the understanding of concepts in finance. They are perceived as useful for a future career as the job market demands good applied analytical skills from business graduates. Accordingly, it is argued that such spreadsheet-modelling based teaching methods would be of great benefit to quantitative business school subjects in general.

Keywords: Teaching, Finance Education, Spreadsheets, Computer Modelling, Excel

JEL Codes: A20, A22, A23

1 Introduction

The use of spreadsheets in teaching business school students is nothing new and they are typically used to deploy data for assignments or to illustrate textbook concepts by means of pre-programmed model sheets. It means this teaching tool is in fact often not fully utilized to help develop applied analytical skills in business students even though its power has been documented repeatedly in the constructivist learning literature such as Maddux, Johnson, & Willis (1997) [as cited in Boethel & Dimock (1999) p. 17]. It has been found that spreadsheets are particularly useful if they give the user control and textbook authors like Holden & Womack (2000) advocate the use of spreadsheet models which are built from scratch by the students as opposed to pure templates which simply allow them to alter the input values.

This article relates the teaching experience of dedicated spreadsheet modeling and programming courses within the finance curriculum of a New Zealand university. These courses put the design and construction of spreadsheet models and data analysis exercises into the centre of class activity. Assignments and cases are based on model concepts and data from the area of finance even though such applied model building skills might just as well be developed with models and data from other business school subject areas such as economics, accounting or marketing. In the following, the article will first present the structure and summarized content of these modeling courses before it reports on the teaching experience including the results of a multi-year student survey which provides insights into participant experience and motivations to attend these courses.

2 Courses in financial modelling

The financial modelling curriculum presented in this section specifically focuses on the structure of two computer and spreadsheet modelling courses as they are currently taught at this author's university. This not to say that creative modelling would not also take place in other more text-book based courses but these typically do not take centre stage. The following subsections first cover the undergraduate and then the graduate teaching level courses.

2.1 Undergraduate financial modelling course

This is a dedicated fourth year financial modelling paper at an undergraduate level which uses MS Excel spreadsheets as a medium of instruction. The majority of students take this course as an elective module as part of their finance major but there are also a great number of business students from other subject areas attending. Classes are held as computer lab sessions (2 times 2 hours per week) with each student allocated his/her own personal work station. Due to large student numbers the paper is taught concurrently in two adjoining labs. General introductions to a topic are often presented in one of the labs to the whole class after which the groups split up to work through the class exercises.

A typical session will provide the student with a starting spreadsheet, e.g. containing data or a basic model, on which some analytical task has to be undertaken. As an example, the screenshots of the spreadsheet shown in Figure 1 and Figure 2 contains the base data and prices linked to real time source of a set of government bonds for which the student is required to use the spreadsheet functionality to calculate bond yields and plot a yield curve and, as a further exercise, determine credit spreads of some corporate bonds over this yield curve. A tutor will work through the example step by step on a projector, allowing the students enough time to follow the "construction" process in their own spreadsheets. After each stage of the analytical

process, students are provided with a benchmark solution which they may use as a starting point for a next task until they are granted access to the full solution at the end of the session.[1]

Table 1 provides an overview of the topics covered in this course broken down into two groups. Firstly, it shows the actual finance topics, most of which the student would have learned about in previous finance courses. This course thus deepens and expands on known models and concepts and, accordingly, there are usually no dedicated lectures on these topics but self-study material and optional refresher tutorials are offered. The second part of Table 1 then lists the specific applied spreadsheet modelling and analysis skills that are to be developed. They are not taught as separate modules but are rather embedded in the solution of analytical problems mentioned above. As can be seen from Table 1, this course goes beyond simple spreadsheet modelling. Applying the Excel integrated programming language VBA for repetitive tasks and some more advanced financial functions adds another tool to the box of a proficient financial analyst.

The course does not follow a prescribed text book but uses proprietary teaching models and handouts on specific topics. Students are, however, strongly advised to acquire one of either the Benninga (2006) or Benninga (2008) financial modelling textbooks as a resource. These books provide further example models and, equally important, explain the background of financial modelling concepts implemented in more depth.

The grade assessment of this course is based on three individual class tests and five project assignments. The tests are timed and supervised in the computer labs. Students are given a starting spreadsheet template together with the required analytical tasks to be completed in two-hours. At the conclusion, they use a web-based file submission facility to submit their solutions. This enables the instructor to check and track submitted work and can also be used to return marks and comments to the students.

[1] Note that the example workbook of Figure 1 and Figure 2 is the full solution to the modeling problem (including the sheets containing the questions) handed to students at the end of the session.

Significant assessment components of the course are the project assignments as summarized in Table 2. Their importance is highlighted by the fact that their cumulative weight for the overall course mark exceeds the weight allocated to the tests. While the tests require completion of well defined tasks, projects are more open-ended. This means there will generally be a minimum requirement which, if completed satisfactorily, is rewarded with a medium level passing mark. Beyond this, there are optional and creative elements for which students are faced with increasing modelling effort and complexity. Because there is a wide range of spreadsheet and also quantitative skill levels in the class, the base requirements for most projects will not require VBA programming but pure spreadsheet solutions.

Each project shown in Table 2 has a different emphasis but the presentation of results in an intuitive and commonly understandable manner is always a key assessment criteria. The firm valuation project, completed as a team of up to 3 students, is a particular example in this respect. Based on historical financial data retrieved from published accounts, the students derive a discounted cash flow (DCF) firm valuation from proforma financials they model in this project. A thorough understanding of the interdependence of financial statements and accounting concepts is essential and challenging for some students when they complete this first part of the task. Of equal importance, however, is the communication of results for this valuation project. Students must draft an accompanying appraisal report which explains the main findings including a well based rationale of key assumptions. This report is then presented to the class, hypothetically assumed to be the key shareholder of the company seeking an investment banker to advise on the sale of its stake. The team has to convince this shareholder that it possesses the valuation skills and industry expertise for this advisory role.

Programming a mortgage calculator would not seem particularly challenging for students in their final year of undergraduate finance studies but this project is characterized by a particularly large creative component. Students have to individually design a mortgage calculator with some required minimum features but any additional meaningful design component and user

friendliness are rewarded with additional marks. The mortgage calculator presented as a screenshot in Figure 3 is a potential solution for this assignment. It includes graphs depicting cash flow patterns that will change dynamically with alternative mortgage terms chosen. Note that this calculator can be programmed without the use of VBA as a spreadsheet only solution.

Figure 1 Overview page of example teaching model on bond yields and credit spreads

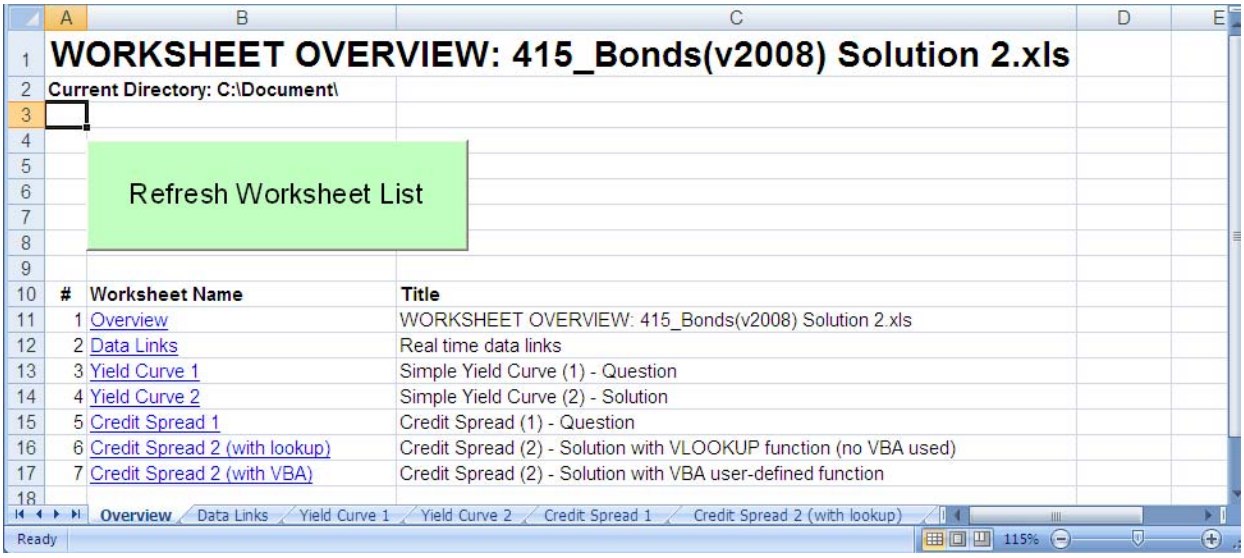
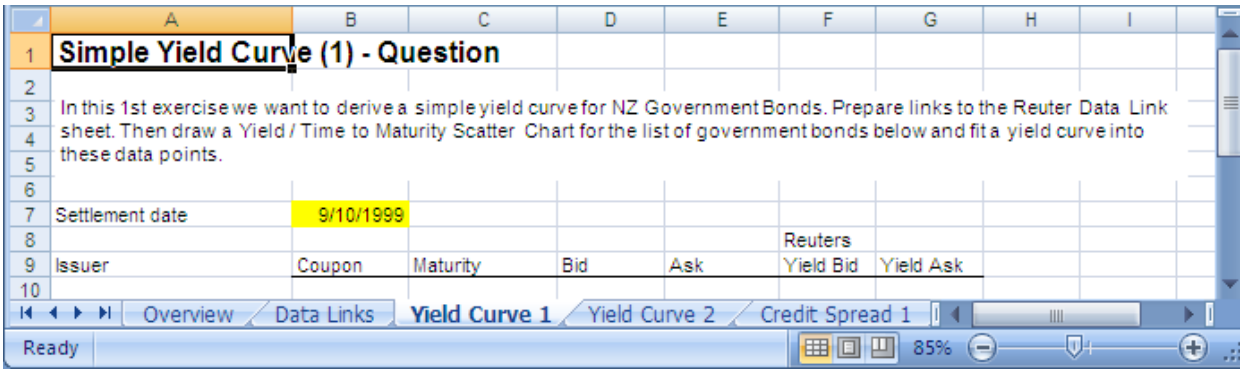


Figure 2 Sample question and solution page of teaching model on bond yields and credit spreads



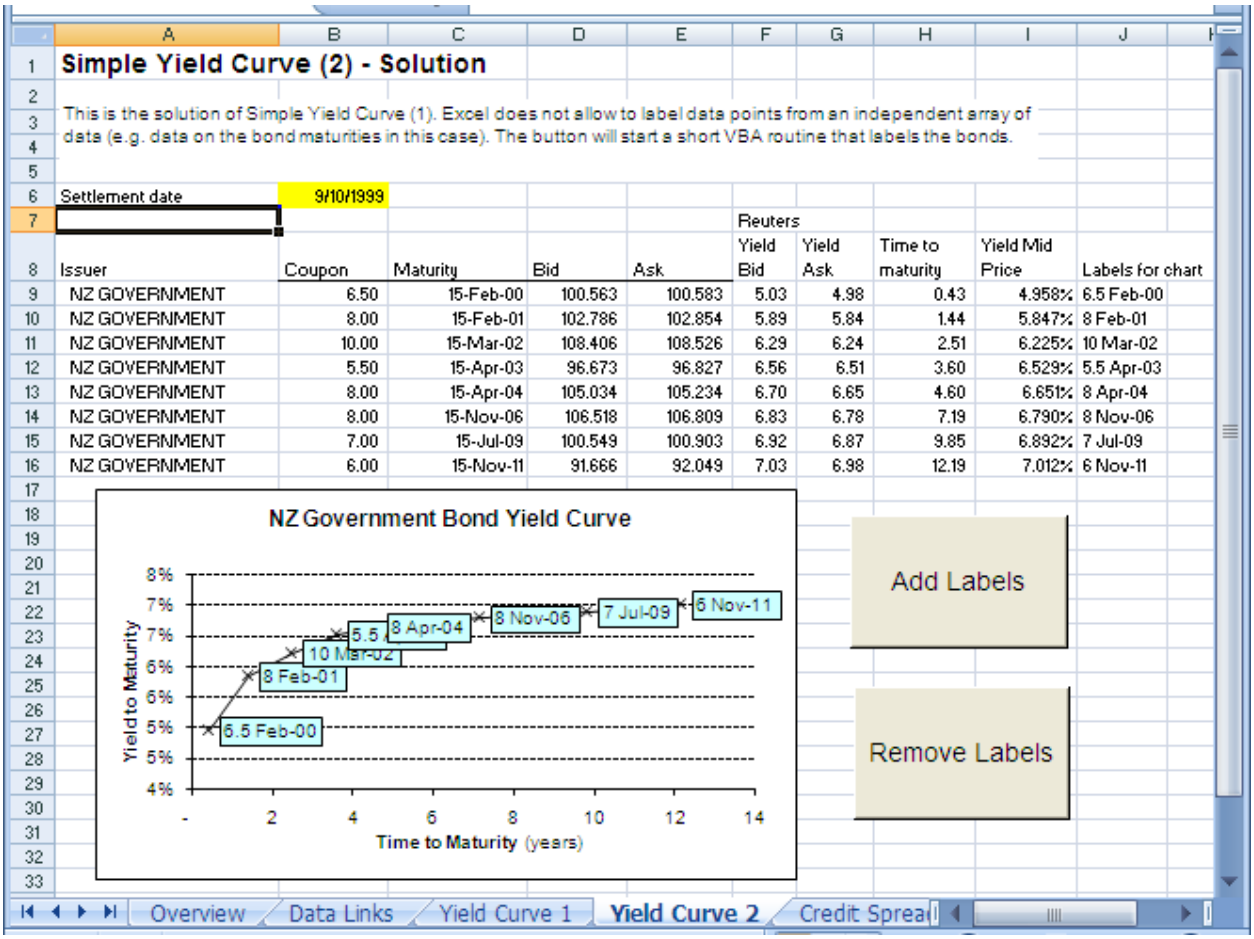


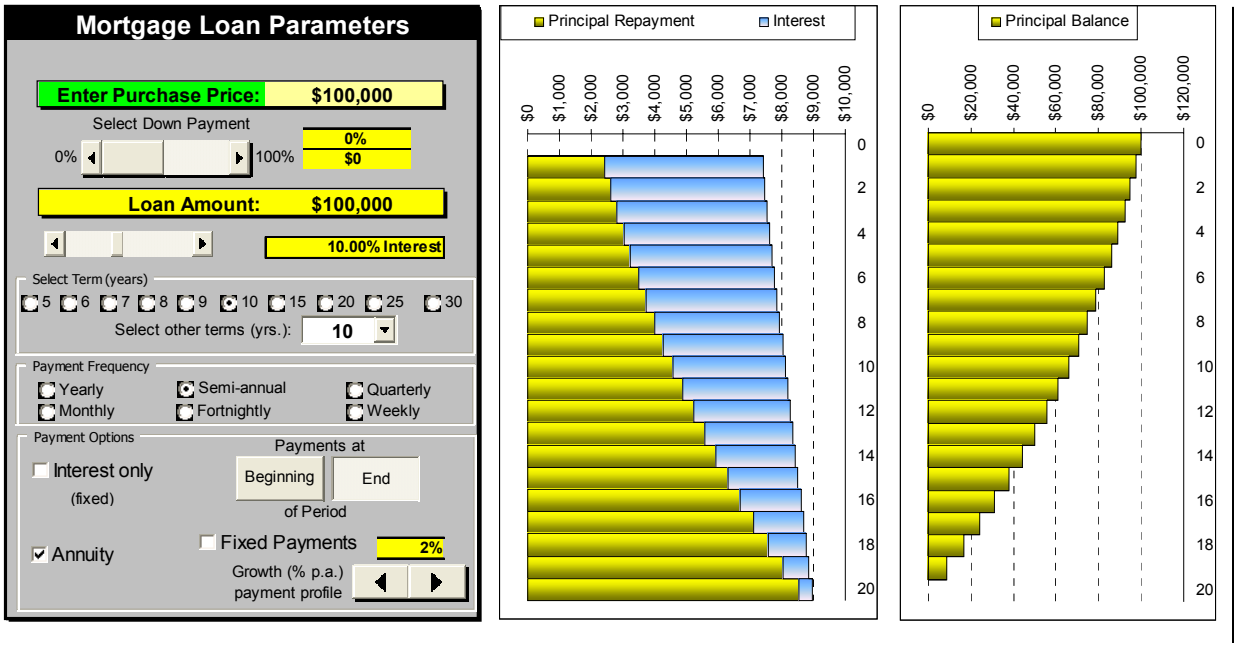
Table 1 Undergraduate course computer modelling in finance: finance & spreadsheet topics

Finance topics	
Time value of money problems	Modeling solutions of standard time value of money problems (e.g. project finance, lease vs. buy, etc.)
Company financial modeling	Practical development of proforma financial statements. Starting point are the published historical financials of a listed company. Use this company model to derive a valuation (DCF, DDM) and other types of financial analyses (e.g. EVA, credit analysis)
Fixed income analytics	This is a specialty topic treated in some depth. Bond yield, duration, convexity, spreads Topics in term structure of interest modeling
Models in portfolio theory and statistics	Meaning of basic statistical parameters. Regressions applied to CAPM, APT problems. Two, respectively multi-asset portfolio optimization problems: efficient frontier, minimum variance and optimal portfolio.
Applied analytical skills	(using MS Excel /VBA spreadsheet terminology)
Spreadsheet structuring and handling	General layout and structuring of workbooks to keep them manageable and consistent, avoid redundancies. Freezing, splitting panes. Working with several sheets (group mode). Hyperlinks for efficient navigation. Auditing/debugging of spreadsheets. Use of interactive control elements, e.g. spin buttons, combo boxes. Automating repetitive tasks (VBA).
Data analysis	Data analysis functions and features such as filters, pivot table data analysis, sensitivity analysis with data tables, built in statistical tools. Financial and statistical functions. Programming of simple user-defined custom functions (VBA).
Visualization of data & results	Effective use of print set-up, cell formatting, charting and graphing features to support effective communication of results.

Table 2 Undergraduate course computer modelling in finance: project assignments

Project	Description
Company valuation project	Student teams build a company valuation model (DCF method) for a listed company. They have to present their results to a key shareholder in an investment bankers "beauty contest" in order to gain an advisory mandate for the disposal of this strategic stake.
Spreadsheet automation	Short VBA program to rearrange a set of financial data to be used for further empirical analysis
Mortgage calculator	Students design an interactive mortgage calculator to advise bank clients on optimal financing solutions. The calculator in its basic version can be implemented as a spreadsheet solution but some optional features may require VBA programming. Figure 3 provides a screenshot of a potential solution to this assignment.
Cash flow valuation	Project involves bootstrapping zero rates from quoted swap rates (real time data source) and the valuation of a series of cash flows. No VBA is required but some additional marks are given for VBA based functions.
Simulation of feasible portfolios	Random simulation (Monte Carlo) of a large number of feasible portfolios composed of 6 stocks to identify minimal variance and optimal portfolio. Visualization of results which allows for user interaction. Optional check of solution with alternative methods. Basic solution does not require VBA programming.

Figure 3 Screenshot of potential solution for the mortgage calculator modelling project



2.2 Graduate modelling course

The finance department also runs an advanced modelling course for graduate students whose focus is slightly different, however. The undergraduate module emphasises applied spreadsheet techniques particularly useful for analysis in a business environment. Conversely, the graduate course introduces students to model building and analysis problems as they would encounter them in a research project of empirical or quantitative nature. Accordingly, this course uses spreadsheet modelling as a starting point only but then turns to exercises which develop actual programming skills and the efficient use of specialized econometric software (Eviews). Ideally, graduate finance students would have acquired the basic spreadsheeting skills at the undergraduate level but they are also admitted to the course if they provide proof of good computing and quantitative skills acquired in another context.

Table 3 provides an overview of selected topics covered in the course. The top part gives an overview of the type of finance models implemented (or just shown in some instances), while the second half lists the technical components taught. As a finance course, models applied to the area of derivative valuation and risk management are the focus. The smaller class size nonetheless allows for some flexibility. Most of the models, an example is shown in Figure 4, are implemented in Excel/VBA and some of them have been inspired by textbooks which explain these models and then provide Excel/VBA implementation scripts. Examples of such textbooks include Jackson & Staunton (2001), Wilmott (2006) and (2007), Haug (2007) but also Benninga (2008) (mentioned in the previous section), whose models are sophisticated and equally well suited for graduate level classes.

While Excel/VBA based models are easier to implement and very illustrative in a learning environment, productive models in the finance industry are often implemented with either lower level computer languages for performance or dedicated mathematical languages such as Gauss or Mathematica. It would not be sensible to burden students with exercises in any of these languages but some illustrative examples are shown in the course. Empirical methods are employed in much, if not most academic research in economics and finance and many of the students enrolled in this course are themselves involved in such projects. Accordingly, the course includes a segment on the proficient use of automation languages embedded into modern econometric software tools. Their use greatly increases the speed of scenario generation and facilitates presentation of results.

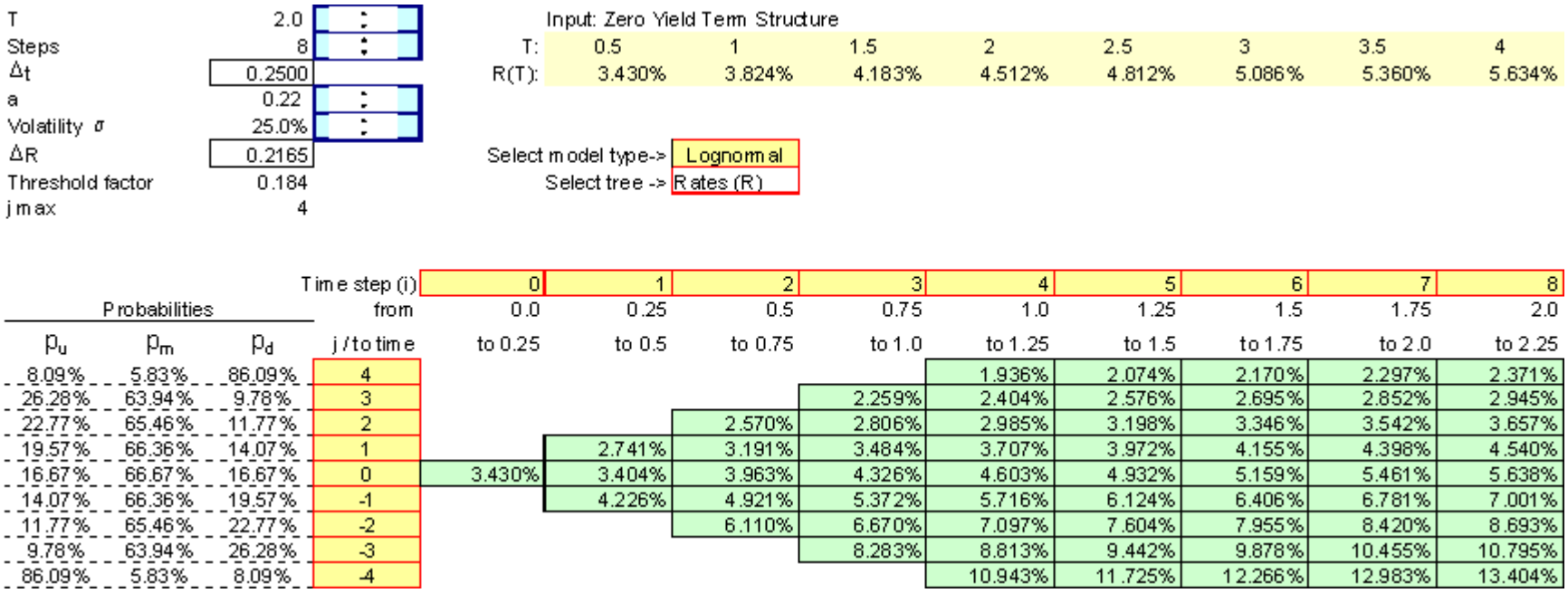
The assessment in this course consists of 3 smaller defined assignments and one major modelling project. Moreover, to ensure minimal computer literacy, there are two tests similar to the ones for the undergraduate computer modelling course. Students must pass these tests to continue on with the course. The assignments are set to help develop mainly technical skills and include an advanced data analysis exercise, the programming of financial functions applied to the Monte Carlo valuation of options and a portfolio optimization problem. Students are quite free to

formulate their own topic for the main project which is submitted as a model (software component) and an accompanying report. Depending on their interests and strengths, they might choose more technical subjects, e.g. implementing a complex numerical algorithm, or a more holistic topic, e.g. the review and implementation of a family of models in finance for which programming solutions are publicly available and can be used as a starting point.

Table 3 Graduate course advanced computer modelling in finance: selected topics covered

	Description
Finance topics	
FOREX arbitrage	Develop cross-currency foreign exchange arbitrage tool fed by real time bid/ask exchange rate data.
Options	Analysis of ASX traded warrants: pricing, the "Greeks", volatility smiles etc. (2007; Wilmott, 2007)
Simulations	Simulation of stock price paths (Brownian motion, jump diffusion). Monte Carlo simulation for option valuation. Programming exercise: replication of Longstaff & Schwartz (2001) plain vanilla American option valuation. Company valuation with stochastic parameters (Schwartz & Moon, 2000)
Numerical methods	Finite differences and lattice models to value options, convertibles etc. (Hull, 2006; Wilmott, 2007)
Risk Management	Market risk models (e.g. value at risk), portfolio insurance, credit risk models (e.g. JP Morgan CreditMetrics as presented in Crouhy, Galai, & Mark, 2000)
Technical topics	
Advanced programming	VBA programming of complex control structures for the implementation of simulations and numerical models.
Alternative programming languages	For reasons of performance and ease of programming, advanced finance models are often not implemented in Excel/VBA but with more dedicated tools. Some alternative tools are briefly shown (C+, Gauss, Mathematica etc.).
Econometric software	Efficient use of econometric software package Eviews by means of using its command language for automation.

Figure 4 Graduate course: screenshot of an example teaching model on Hull & White trinomial interest tree building procedure



T	2.0
Steps	8
Δt	0.2500
a	0.22
Volatility σ	25.0%
ΔR	0.2165
Threshold factor	0.184
j max	4

Input: Zero Yield Term Structure

T:	0.5	1	1.5	2	2.5	3	3.5	4
R(T):	3.430%	3.824%	4.183%	4.512%	4.812%	5.086%	5.360%	5.634%

Select model type-> Lognormal

Select tree -> Rates (R)

Probabilities				Time step (i)	0	1	2	3	4	5	6	7	8
				from	0.0	0.25	0.5	0.75	1.0	1.25	1.5	1.75	2.0
p_u	p_m	p_d	j / to time		to 0.25	to 0.5	to 0.75	to 1.0	to 1.25	to 1.5	to 1.75	to 2.0	to 2.25
8.09%	5.83%	86.09%	4						1.936%	2.074%	2.170%	2.297%	2.371%
26.28%	63.94%	9.78%	3					2.259%	2.404%	2.576%	2.695%	2.852%	2.945%
22.77%	65.46%	11.77%	2				2.570%	2.806%	2.985%	3.198%	3.346%	3.542%	3.657%
19.57%	66.36%	14.07%	1			2.741%	3.191%	3.484%	3.707%	3.972%	4.155%	4.398%	4.540%
16.67%	66.67%	16.67%	0		3.430%	3.404%	3.963%	4.326%	4.603%	4.932%	5.159%	5.461%	5.638%
14.07%	66.36%	19.57%	-1			4.226%	4.921%	5.372%	5.716%	6.124%	6.406%	6.781%	7.001%
11.77%	65.46%	22.77%	-2				6.110%	6.670%	7.097%	7.604%	7.955%	8.420%	8.693%
9.78%	63.94%	26.28%	-3					8.283%	8.813%	9.442%	9.878%	10.455%	10.795%
86.09%	5.83%	8.09%	-4						10.943%	11.725%	12.266%	12.983%	13.404%

See Hull (2006, p. 662-669) and Hull & White (1996) for more details on this tree-building procedure.

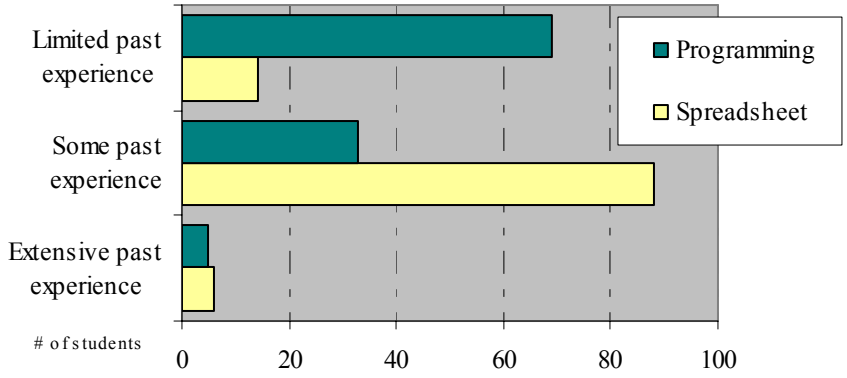
3 Teaching experience and student feedback

This section discusses some of the issues that have arisen in the actual teaching of these modelling courses. The review is based on experience of teaching staff and results of a student online survey conducted for the class streams 2005 to 2007. The focus of this discussion is on the undergraduate course with a total of 168 students enrolled in the 3-year period of which 108 students provided their feedback. Many of the issues discussed here are however also relevant to the graduate class (44 students).

3.1 Spreadsheet and programming skills

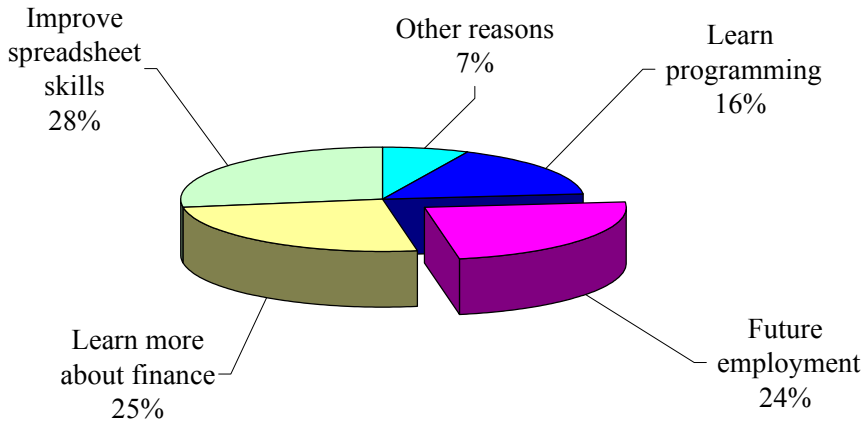
The actual teaching of spreadsheet skills absorbs an important part of the first few weeks of the term even though this had not been foreseen in the original course design. There is a quite diverse background in computing skill of students enrolling in this class, as shown by their self-assessment in the survey (see Figure 5). This required the introduction of an online spreadsheet fitness module to be completed by the students in the first 3 weeks of the course, which, while mandatory, does not count towards the overall course mark. More advanced spreadsheet problems are then embedded into the exercise models and by the time they complete the course they should be able to tackle challenging analytical tasks as they would encounter them in a business environment.

Figure 5 Undergraduate class: spreadsheet and programming skills prior to enrolling



There are indications that this goal of providing valuable real-world analytical skills is actually achieved as more then 95% of students in the survey endorsed the statement that their newly acquired spreadsheet skills would be very useful for their future work and research projects[2]. Former students working in industry have repeatedly provided anecdotal feedback that they have been able not only to apply this advanced spreadsheet expertise in their jobs but also to transfer some of their know-how into their organizations. It has also been reported that good marks in the course have been a door-opener to some students as employers are keen to hire such "can do" business graduates. The expected boost to employment prospects is also reflected in the survey results. Students were asked to pick the single most important reason for selecting this undergraduate computer modelling course. As shown in Figure 6, 24% of respondents list improved job prospects as the most significant motivating factor.

Figure 6 Undergraduate class: single most important motivation to attend the course



[2] 95.4% of respondents either "agreed" or "strongly agreed" with the statement: "I believe the spreadsheet skills acquired in this course will be very useful for my future work and research projects".

While the emphasis of this undergraduate course is on common spreadsheet techniques applied to models in finance, students are also introduced to VBA, a computer language embedded in MS Excel. As can be seen in their declared level of pre-course programming experience in Figure 5, it is the first time for many of these undergraduate students to actually write a computer program. Many are apprehensive and, after completing the course, not all are convinced of its benefits as only 67% of respondents thought the programming skills would be useful in their future work and almost half the students saw only "marginal value" in the use of VBA. This unease among some students manifests itself in a certain polarization in the class. There is a majority group that will do fine with basic spreadsheet handling but will touch VBA programming only as much as required. Conversely, there are the fewer programming aficionados who seem to spend substantial time on their projects, adding VBA code supported bells and whistles to their spreadsheet. It does, however, not mean that these keen programmers in fact achieve higher marks as they often use VBA in a very inept way, e.g. by replicating commonly available spreadsheet functionality in VBA through error prone code. As they lose control of their software development, they sometimes find it hard to satisfy even the basic requirements of an assignment. It is still pleasing to see that there are a number of students who actually seem to have discovered a hidden programming talent in this course which led them into jobs at the interface of the finance and the IT industry such as a financial data provider.

3.2 Time management and communication skills

It is a common complaint among students that they have to spend too much time on the projects and in particular the VBA programming component where they experience the common frustrations of a computer programmer such as interpreting unintelligible error messages. Accordingly, 75% of students state that they had to spend more time on the assignments than anticipated. Moreover, some find it particularly hard to meet due dates as it is often impossible to quickly finish that all important model in an all night shift before the submission date. Software

development typically requires exchange with colleagues and help from tutors which would not be available at 2am in the morning of the submission date. The characteristics of the modelling assignments nevertheless provide valuable real life lessons in terms of time management. It teaches student to deliver what they can cope with within a given time frame and in line with their level of technical expertise, i.e. a lesson on the balancing of ambitions with its own means. A failure to balance these two aspects becomes more apparent here than in traditional paper-report based courses. Fundamental flaws in models are harder to dispute, e.g. assets and liabilities which no longer "balance" in a proforma balance sheet model when one of the model input parameters is changed. A valuation derived from such a model would then simply not be credible.

Besides pure time management issues, aspects of prioritising work poses a major challenge to many students. Often they appear to get lost in modelling details thereby losing sight of the ultimate purpose of work, particularly in view of the need to communicate their results. An example is the team valuation project we presented earlier in this article. Most of the effort seems to be directed towards the model building itself as students hope a more sophisticated design will fetch them higher marks. In the process, they fail to prioritize their work, for example devising complex inventory forecasting for an airport operations company where inventory represents only a minute portion of total assets. With all the many parameters affecting the model results, students find it hard to discriminate between key drivers of firm value and secondary technical assumptions. This means they are lacking the big picture view which is essential for the effective communication of model results in a business environment.

It has thus proven very difficult to refocus students away from pure spreadsheet building and programming. Realistically, there is probably just not enough time to cover such more qualitative communication aspects. These would in turn require more assessment effort as it is generally simpler to mark models on purely technical criteria. The best that can be done in this course is to introduce students to a range of presentation and visualization techniques which

students can then apply at their future workplace and for other course and research work. As financial modellers and analysts, they will face the common challenge of conveying complex facts and results which is not too dissimilar to the one facing engineers and scientists in other technical disciplines. There is an apparent need to develop such communication skills as many private training providers seem to be active in this area. Within a university curriculum, one could argue for covering this subject within a dedicated communication module. It is questionable however whether undergraduate students would have a true awareness of these issues before themselves actually doing analytical work in a business environment. There no lecturer will mark their analysis but management, and the organization in general, need convincing of the results' relevance.

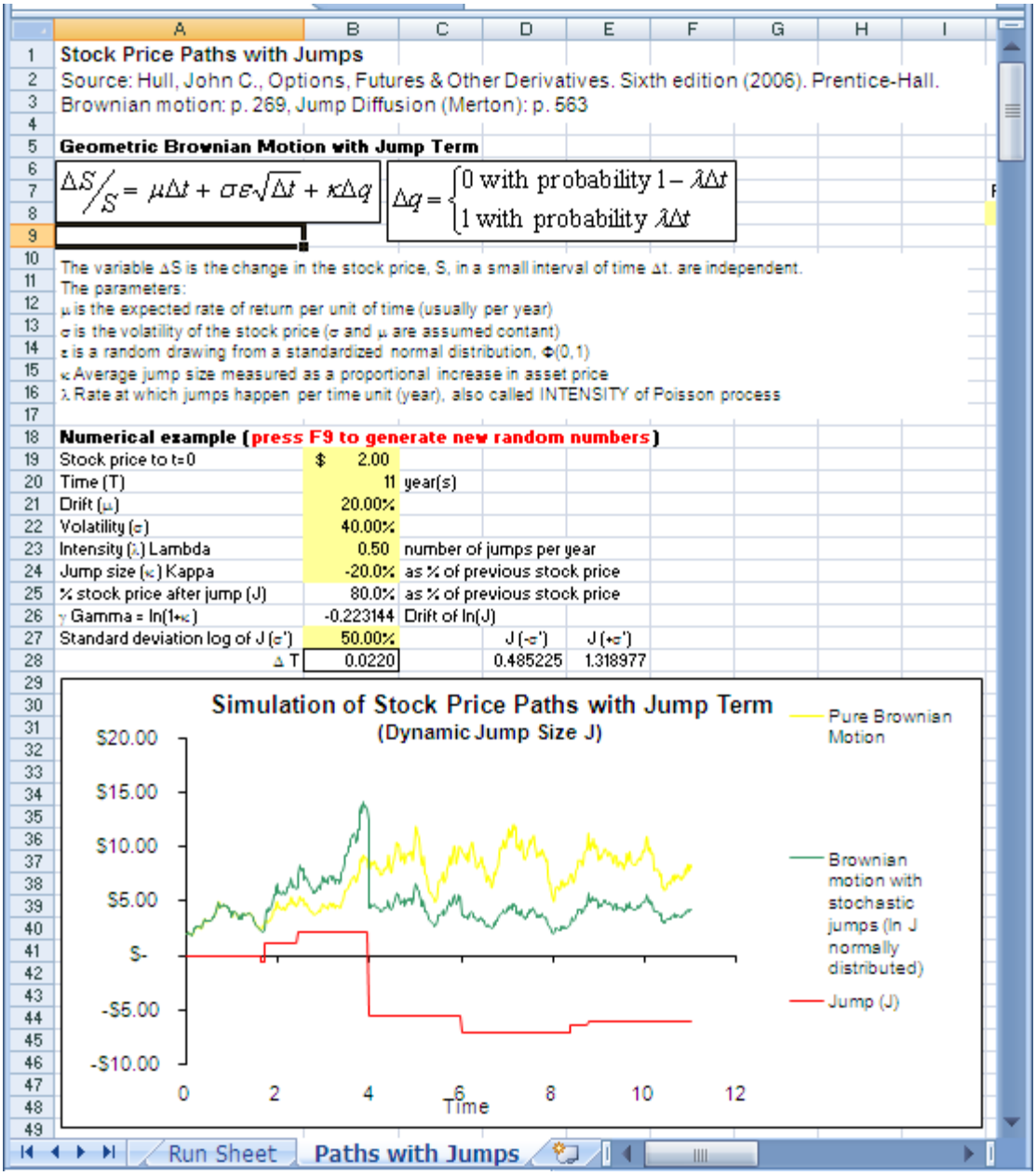
3.3 Spreadsheets as teaching tool in finance

Should this course with all its emphasis on spreadsheet and programming techniques really be considered as a finance course? Holden & Womack (2000) affirm this and argue that adopting a more narrow perspective on finance as suggested by above statement is tantamount to saying: "I teach financial theory. They have to figure out how to do it. Whether they really learn what they need to know to do finance is not my job". It is clear that teaching finance cannot stop with theories but one needs to illustrate their application.

Given the quantitative nature of many concepts in finance, application often means deciphering and interpreting the maths behind them. Here a spreadsheet offers itself as a teaching tool to overcome "equation-phobia" of many business students and fill mathematically demanding theories with life. Not just solving time value of money problems on spreadsheets is more intuitive in a tabular format. Benefits are particularly great for more advanced concepts. If one takes derivatives pricing theory as an example, the significance and implications of stochastic processes underlying standard option pricing models become much clearer once implemented in a discrete form on spreadsheets. The screenshot of an illustrative teaching model

on geometric Brownian motion and jump diffusion shown in Figure 7 is inspired by the treatment of the subject in Hull (2006) and other books on derivatives.

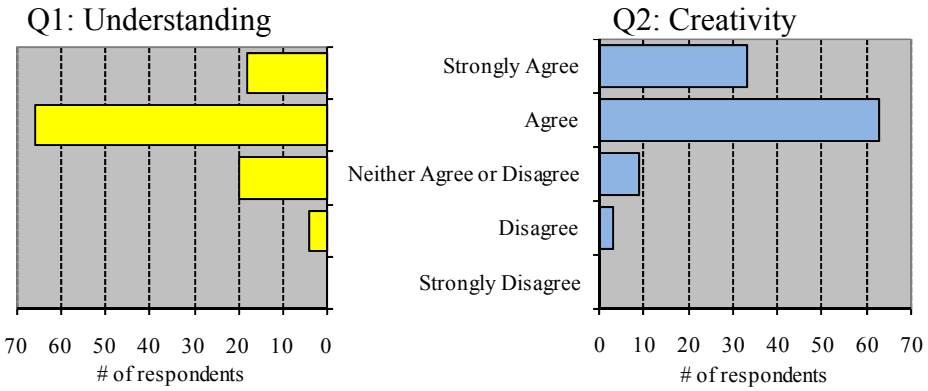
Figure 7 Teaching model on geometric Brownian motion and jump diffusion processes



The advantages of spreadsheets for teaching quantitative concepts to business students have also been documented in the related fields of econometrics (Craft, 2003) and operations

research (Ólafsson, 1998). Craft (2003) in particular argues against the use of pre-programmed econometric software in teaching which present black box solutions without providing learners the insight. Similarly, there are many websites and text books in finance which just supply financial calculator type software to students. These might allow an exploration of model sensitivities but conceal the fundamental mechanisms. Accordingly, students often comment that while they had coped with theories in earlier courses in the sense that they successfully answered the standard textbook questions, only the implementation of spreadsheet models has given them a true insight into these theories. Figure 8 reports on students' appraisal of such benefits both with regard to the support in understanding concepts and creativity.

Figure 8 Survey results on benefits spreadsheets for learning and creativity



Q1: In hindsight, it would have been more useful to use spreadsheet-based teaching in other courses (including finance, economics, accounting). I would now understand these subjects much better

Q2: I believe the use of spreadsheet modelling as a teaching tool encourages creativity in students.

Facilitating the understanding of finance concepts through spreadsheets also leads to benefits for their subsequent application in a business and research environment. Financial theories and models provide the foundation of analytical work but we would argue that the pure finance component in the work of a financial analyst is often not the one that absorbs most of his/her brain power. While there are the very few true "finance quants", typically recruited from science and maths degrees, who might be involved in the development of advanced analytics, an

“ordinary” financial analyst’s work is in fact much less mathematical. They will spend much of their energy retrieving, rearranging, and analysing information. In the process, they detect missing, conflicting and inconsistent data items that need cleaning and filtering. Likewise, the suitable presentation of results will be more challenging and time consuming than the actual financial model in between data and results. This is not to say that we should convert finance classes to computing courses but if we can pass on such essential computer skills in the process of teaching finance, we achieve two objectives at the same time.

4 Summary and conclusions

Freshly minted business school graduates are expected to possess a sound knowledge of spreadsheets because these programs enable users to conduct financial analysis in an efficient and sophisticated manner. In teaching finance, economics and accounting such spreadsheet software provides an excellent tool for understanding the computational intricacies involved in financial modeling. By integrating spreadsheet modeling into the teaching of finance and accounting, one will actually achieve two goals at once: students find it easier to understand finance concepts and become more employable as they pick up valuable real-world skills.

Accordingly, this article advocates (1) an increased integration of spreadsheet exercises into regular course work and (2) dedicated modelling classes for quantitative business school subjects such as finance, economics or accounting. This form of teaching is undoubtedly more challenging for faculty as it requires expertise beyond their closer subject field.

On the whole, the teaching of such modelling courses has been a very rewarding experience as students generally enjoy the alternative approach compared to traditional lecture based courses. They seem motivated to refine their spreadsheet skills despite the time consuming nature of these courses. Good spreadsheet skills will certainly have a benefit in their future career but the somewhat playful nature of spreadsheet modelling appears to have an appeal on its own.

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