Simul-e: a simulator designed for learning financial economics and accounting

S.H. Otal Franco[1] and **R. Serrano García**[*1]

[1] Universidad de Alcalá, Departamento de Ciencias Empresariales, Pl. De la Victoria s/n 28802 - Alcalá de Henares, Madrid, Spain

The aim of this work is to meet the need for tools which, under the requirements derived from the creation of the European Higher Education Area, promote the skills associated with the use of simulators. To achieve this, an integral simulation model for the financial and economic area of a company has been developed on Excel and *VBA*. We have called it `Simul-e` (http://www.simul-e.net).

The application is simple and intuitive and as it is developed on a spreadsheet, very versatile. A large number of current, investment and finance decision making variables have been included in its design. At the same time, the simulation process returns to the user a significant number of output variables, structured in seven interim and annual financial statements: some orientated towards the presentation of accounting information and others towards their analysis. Furthermore, it determines variation rates, structural percentages and ratios, allowing the user to examine all the possible consequences of any decisions made on assets, liabilities and economic and monetary flows. The simulator allows changing time periods to be used (monthly, bimonthly, quarterly,....) and allows the restriction of input that facilitates learning, promotes the sensitivity analysis and offers the user the possibility of designing *ad hoc* reports and documents.

Keywords Financial Analysis; Financial model; Simulation; Spreadsheet; Accounting; Reporting; Learning Accounting

JEL: A20, C60, G30, M20, M41

1. Introduction

At the present time the University is immersed in a process of reform designed, amongst other things, to homogenise the educative systems within the European Higher Education Area. This process is stimulating an organisational and structural change to university education that also affects the teaching model. Some years ago, the AICPA [1] had already become aware of the need to make changes to the way in which accounting was taught in order to affront the new skills that future professionals would need. To this end, Rodriguez [2] pointed out the need to emphasise the processes that the different study materials have in common and Arquero and Jiménez [3] made clear the need to develop non technical skills (communication, team work, problem solving). To achieve this goal requires a multidisciplinary focus and a diversified methodology, in the way that the adequate combination of teaching methods classified by Brown and Atkins [4] would result in the capacitation of students and so increase their motivation and, as a consequence, their acquisition of knowledge and foster a critical attitude to the knowledge acquired.

Within this context, the use of simulation tools in the learning process for disciplines related to business management enjoys the unanimous approval of both teachers and students. In Domingo [5] can be seen the evolution of business simulators and the increase in their use, which according to Faria [6] has been growing in both educational institutions and companies. Their use contributes to the development of skills that allow the student to learn continuously and offer the possibility of combining different teach-

[*] Corresponding author: e-mail: ramiro.serrano@uah.es, Phone: +34 918854293

© FORMATEX 2006

ing methods such as master class, team work, case method and especially that known as Problem Based Learning (PBL), the advantages of which can be seen in Johnstone and Biggs [7]. In the detailed review of the development of tasks using PBL, by Milne and McConnell [8], they conclude that PBL appears to eliminate the existing gap between higher education and professional activity. Monclús and Rodríguez [9] set out their experience of introducing the PBL method to the subject Computerized Accounting Systems, and Redolat [10] shows an accounting simulation developed in the Financial Accounting subject using accounting software.

The construction of simulators for the Financial Economy and Accounting field has changed discontinuously over the years. However, as Mattessich and Galassi [11] show, the widespread use of computers and spreadsheets since the end of the seventies has given the process a considerable boost. Not only spreadsheets, but *ad hoc* tools or specific programming language [Fullana y Urquía [12]] have been used for designing simulators. Leaving out the last of these, some financial models can be found in [13] and must be mentioned [14-19]. Cuervo [15] summarises the role the use of financial simulators has played since the sixties and especially since the nineteen eighties, when new tasks such as the implementation and control of financial strategy were added to traditional financial planning.

This work presents a simulator with the aim of bringing home to students the inherent problems involved in the decision making process within the financial economic sector of a company. Its use helps students become aware of the real life situations that they will encounter in their future professional life. The teaching activities planned with `Simul-e` enable the teacher to take advantage of, amongst other features, the case method, the mathematical analysis of models and the experimental method. Both the tool and the teaching plan have been very well received by students with different educational backgrounds and from a variety of disciplines. Its design has contributed to this, as it is easily adaptable to new situations, such as those encountered in the present day accounting sphere. We believe firmly in its ability to satisfy the needs of those who turn to it for their teaching needs ensuring its continuous amplification and constant updating.

In the following section the features of `Simul-e` are outlined, and in section 3 the different elements that define each simulation project are described. The paper finishes with conclusions and references.

2. Concept and features

`Simul-e` (http://www.simul-e.net) is a simulation tool designed to facilitate the learning of those disciplines involved in the elaboration and later analysis of financial and accounting data and financial planning. From decisions that affect the financial and economic structure of a company, the simulator formulates foreseeable financial statements of results, and supplies the user with financial analysis tools. Furthermore, its design facilitates its independent use by the student, which unlike traditional teaching methods, enables the student to study without the continuous presence of a teacher.

`Simul-e` is a deterministic simulation model that is organised around the accounting and financial variables that make up the financial economic situation of a company. As a consequence it does not provide for chance happenings amongst its variables. The model is discreet, in so far as any changes come from events that modify the model's output variables; and it is open, as the user is able to incorporate new output variables from those generated by the application. The simulation process produces a result, that is clear to the student despite the significant number of input and output variables included.

The program has been developed on Visual Basic for Applications (VBA) and Excel, and it has been equipped with a simple and intuitive interface which does not require advanced knowledge of accounting or computers on the part of the student.

© FORMATEX 2006

To facilitate learning, Simul-e processes the information supplied to the simulator intelligently: dealing with input data logically, not simply assuming the content of each variable is valid (for example, interest rates cannot be negative and shareholders cannot contribute a larger amount of money than that previously agreed upon), but during the preparation of accounting information, disregards those inputs which, having modified a decision in the feedback process, now lack financial economic sense. This quality is especially useful when doing a sensitivity analysis. In the task of validating decisions, chiefly criteria of an economic nature have been taken into consideration, whilst those of a legal nature have been limited.

The learning process is developed thanks to the flexibility of the contents, which are geared towards developing activities rather than solving problems. In this way, knowledge of those disciplines involved in the decision making process is promoted, developing analytical and synthesis of information skills, fostering an increasing commitment to the learning process and developing the ability to evaluate evidence, formulate hypotheses and rationalize.

The simulation model described is necessarily a simplification of the reality it represents and, in line with other financial simulation models referred to in the first section, Simul-e is not, nor does it pretend to be, accounting software.

3. The simulation process and its elements

The simulation process is iterative and comprises the inclusion of the foreseeable decisions for each period that make up the simulation horizon, their correct processing by the simulator, followed by the generation and presentation of the output variables. Depending on the education level of the student, the variables supplied in the initial process must be relatively detailed, which allows decisions made on the basis of financial economic reasoning to be justified. And, to the same degree, it is necessary to guarantee *ex post*, by means of the corresponding explanation and theoretical argumentation, the viability of and necessary adjustments to the pre-established aim of decisions in view of the values produced by the simulation process.

The simulation is carried out on simulation projects and each project comprises the following elements:

a) Identifying data, such as the name of the company, name of analyst and the year in which the simulation horizon is to begin.
b) The company that is to be simulated. This can be one that already exists and has been in business some time and so has its own initial assets, liabilities and equity; or it can be a newly created entity, which would only actually begin doing business if it proved to have a viable future.
c) The simulation horizon is the length of time the evolution of the company is simulated. It is made up of time periods of differing lengths (monthly, quarterly, half-year…) and not necessarily concurrent for all the time periods that make up the simulation horizon. The simulation horizon can be lengthened or shortened whilst the simulation is being carried out.
d) The input variables include all the values included by the student, about the financial economic decisions whose impact is to be analysed. They are variables that can be manipulated and are classified in accordance with the following two criteria:
    1. Depending on their nature, they are classified by current hypothesis (for example, sales, inventory purchases, employees cost, fixed assets depreciation,…); operations management (average inventory period, average collection period, average payments period,…); investing hypothesis (acquisition, transference or derecognition of fixed assets – technical or financial) and financing hypothesis (for example, external funding using the American or constant repayment system, equity increases, pay-out, splits, etc).
    2. With regard to the moment they are modifiable, it is worth distinguishing between intraannual decisions and interannual decisions. The first are supplied in each period, and the sec-

© FORMATEX 2006

ond only in the first period of each natural year (for example the length of the period or the income tax rate).

e) The internal or system variables are the group of variables needed by the simulator to carry out its function correctly, but they are neither modifiable by the user nor do they make up the output of the system. Though circumstances may convert them into output variables in order to facilitate data input.

f) The output variables synthesize the economic and financial decisions taken by the user. They are presented in a structured form as financial statements and indicators that help in the analysis and interpretation of the information produced. The output variables are not limited to those supplied by the simulator: The student can define new ratios or indicators that he considers relevant. The information offered by `Simul-e` can be classified as:
    1. Depending on the period covered by the accounting report: the interim report and the annual report.
    2. Depending on the reason for the report: one designed to present financial statements and one correctly structured for analysis.

4. Conclusions

The European Higher Education Area requires the design and use of new teaching methods, which must come supported by tools capable of laying the foundations on which the new educative scene can grow. Those tools must help the student to approach the learning process by carrying out practices that help to improve their analytical and decision making skills in the economic environment of the company. In this respect, the advantages for teaching staff of the use of simulators have been demonstrated in numerous disciplines. However, in the financial economics and accounting field a greater commitment, by students to the learning process and the acquisition of skills in the evaluation of evidence, the formulation of hypotheses and reasoning is still necessary.

The application that `Simul-e` (http://www.simul-e.net) presents, is made up of an elevated number of financial economic statements about the company, giving an immediate global picture of the flows generated and the variables affected, enabling an accurate sequencing of the decision making process. Nevertheless, the design allows the student to monitor personally the different management areas of the company. In this sense, it is an application that is valid not only for the study of subjects included in more advanced courses, but also for helping students with financial economic reasoning when they first come into contact with the discipline. In its favour is precisely the fact that it is an integral modular application developed in an environment (as are spreadsheets) with which students are already familiar and that the result produced by the simulation is clear. Thus it helps on promoting its progressive use at different levels of the learning process.

The structure of `Simul-e` is based on Excel, making it unnecessary to learn how to use a new application *ad hoc*, thus facilitating its use and guaranteeing that it is continuously updated and adapts immediately to any changes associated with a new accounting standard or framework. Furthermore, this new approach definitely eases the burden of learning, both for the student and the teacher-tutor. Its design, which is specifically oriented towards the formation of professionals, does not, as is the case with tools of a similar nature, only consider a prospective process (one designed to obtain viability or business plans), but allows the student to analyse in detail the consequences any economic or financial decision will have on the assets, income, cash flows and other relevant variables needed to understand and advance the future of the company.

The experience gained in both degree and post graduate courses give good reasons to feel optimistic about its extensive use in disciplines concerned with the production and analysis of financial information, such as the analysis of investments and financial planning. In the last instance, `Simul-e` should help to consolidate the basis of economic and financial reasoning, so that at a later date said knowledge

© FORMATEX 2006

can be applied to company games which will include greater doses of competition and uncertainty. Along this line, the design of the tool for its use on line constitutes one of the more immediate challenges.

References

[1] American Institute of Certified Public Accountants, *Education Requirements for Entry into the Accounting Profession*. (New York, AICPA), 1988.

[2] Rodríguez, J.L., *Didáctica General*. Ed. Cincel. Madrid, 1980.

[3] Arquero, J.L. and Jiménez, S.M., "Influencia del Estudio de Casos en la Mejora del Aprendizaje, Adquisición de Capacidades no Técnicas y Motivación en Análisis Contable". *Revista de Enseñanza Universitaria*, extraordinario, pp. 225-241, 1999.

[4] Brown, G. and Atkins, M., *Effective Teaching in Higher Education.* (Londres: Routledge), 1988.

[5] Domingo, M.A., "Los Juegos de Empresa sobre Gestión de Operaciones en la Formación Universitaria". *Documento de trabajo.* Mimeo, Universidad de Sevilla, 2004.

[6] Faria, A.J., "Business Simulation Games: Current Usage Levels: An Update". *Simulation and Gaming*, vol. 29, pp. 295-308, 1998.

[7] Johnstone, K.M. and Biggs, S.F., *Journal of Accounting Education*, vol. 16, n. 3, 1 September, 407-427, 1998.

[8] Milne, M.J. and McConnell, P.J., Problem-based learning: a pedagogy for using case material in accounting education, *Accounting Education*, vol. 10, n. 1, 61-82, 2001

[9] Monclús, R. and Rodríguez, M.A., Aplicación del *problem based learning (pbl)* en la asignatura de sistemas contables informatizados. *XV Encuentro ASEPUC*. Burgos, 31 de mayo y 1 y 2 de junio, 2006.

[10] Redolat, M.I., "Aprendizaje de la contabilidad financiera, desarrollo de habilidades, actitudes y destrezas mediante la resolución de una simulación contable", *IV Jornada de Docencia en Contabilidad* (Sevilla), 2004.

[11] Mattesich, R. "Budgeting models and system simulation", *The Accounting Review*, 36, 384-397, 1961.

[12] Fullana, C. and Urquía, E., "Los modelos de simulación como herramienta de planificación estratégica y control de gestión en las empresas". *X Workshop en Contabilidad y Control de Gestión "Memorial Raymond Konopka"*, Alcalá de Henares, 2004.

[13] López, E. and Martínez, S., *Iniciación a la simulación dinámica*, (Madrid: Ariel), 2000.

[14] Brealey, R.A. and Myers, S.C., *Principios de Finanzas* (Barcelona: McGraw-Hill), 1995.

[15] Cuervo, A., *Análisis y planificación financiera de la empresa* (Madrid: Civitas), 1994.

[16] Maroto, J. and Mascareñas, J., "PLAFIN II: Un modelo de simulación para la planificación financiera empresarial". *Revista Española de Financiación y Contabilidad*, vol. XV, 49, 223-255, 1986.

[17] Martínez, F., "Un modelo de simulación para la planificación financiera", *Revista Española de Financiación y Contabilidad*, vol. XXVIII, 99, 443-496, 1999.

[18] Mattessich, R. and Galassi, G., History of the spreadsheet: From matrix accounting to budget simulation and computerization", en ASEPUC y Esteban Hernández Esteve, editores, Accounting and history--A selection of papers presented at the 8th World Congress of Accounting Historians, Madrid: Asociación Española de Contabilidad y Administración, pp. 203-2, 2000.

[19] Suárez, A.S., *Decisiones óptimas de inversión y financiación en la empresa*, (Madrid: Pirámide), 2003.

© FORMATEX 2006