

The General Insurance Market Instructional Computer Simulation

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Abstract

Within the Bachelor of Commerce degree offered at Deakin University students have the option of taking a major sequence of studies in the field of Insurance. Within this major students must understand the relationships between the business decisions made by an insurance company and the financial operation of the business as expressed in the profit and loss statement and the balance sheet.

To develop and assess students' learning in this regard they are required to submit a written assignment explaining the relationship between the operational decisions of a such a company and the end of year accounts. Typically these exercises suffer from a number of problems. Firstly, giving all students the same data potentially leads to a degree of plagiarism but generating individual assignments is excessively time consuming for the instructor. Secondly, students have little feel for the numbers presented to them, having no initial insight into the rationale behind the decisions made.

In an attempt to alleviate these difficulties a Windows based experiential learning exercise has been developed. In this program, known as The General Insurance Market Instructional Computer Simulation (G.I.M.I.C.S.), groups of students make business decisions (such as premium, commission, credit terms and reinsurance levels) in competition with one another and a market simulation model processes these decisions and presents the participants with their companies' end of year financial position, along with the year's operating decisions for all of the companies in their market. This approach solves the problem with little instructor effort and gives the students an interest in their companies' success and hence a better feel for the numbers and relationships which they must describe.

This paper presents the structure, operation and use of the GIMICS program.

Keywords

simulation, insurance, academic gaming, business

1. Introduction

The Insurance major of the Bachelor of Commerce contains a unit that deals with aspects of financial management of an insurance company. The subject requires that students not only understand the individual aspects of the unit but also the cumulative effect of decisions on the company's profitability. In assessing the students it is necessary to establish that this understanding has been achieved. A problem that arises is that giving students a case study based problem to test their understanding provides the opportunity for plagiarism. It is inevitable that students will discuss aspects of a problem and a certain amount of discussion is beneficial and part of the learning process. However, the problem arises when this results in common or copied answers.

The proposed solution to this problem was to give students case studies with individualised data and so a method was sought to efficiently generate consistent, useable financial data and it was decided that a computer based business simulation should be used. Such simulations are widely used in commercial education and training in Australia (McKenna, 1991), the U.S.(Faria, 1987) and Britain(Burgess, 1991).

The basic principle beyond such simulations is that students act as senior managers making decisions about the operation of their company for the upcoming financial period. A computer based market model analyses these management decisions and produces data on market demand which and hence financial statements can be generated for the participating companies. Generating financial data in this manner has the added advantage that it gives students a stake in the data and aids in their understanding of the their company's operation.

While there are a large number of business simulations commercially available they concentrate primarily on areas such as manufacturing (such as Cotter and Fritzsche, 1991), production management (Greenlaw, Hottenstein and Chu, 1991) or strategic portfolio management (Priesmeyer, 1992). There appears to be no commercially available simulation devoted to the insurance industry. For this reason GIMICS (A mnemonic for General Insurance Market Instructional Computer Simulation) was developed.

GIMICS is a computer simulation of an insurance market where each student controls an individual insurance company competing in a common, closed market. The students make a number of strategic decisions relating to the operation of their company for the coming year and these act as input to the simulation. The simulation's output is individual end of year results for each of the companies in the market. The student must then write a paper analysing their own company's results taking into account their own inputs and those of the others in the market.

This allows for the testing of the students understanding and, as all results are different, common or copied analyses are eliminated.

2. Design Philosophy

Designing such simulations is generally a balance between including a realistic level of detail and avoiding so much detail that the didactic focus of the exercise is lost in a cloud of complexity. Early versions of the program endeavoured to mirror 'real life' to too great an extent by introducing a large number of random variables at different points and allowing these to have a fairly large range. This resulted in two significant problems:

- the effects of the students' decisions became 'lost' in the effects of the random elements which resulted in reduced teaching effectiveness of the program; and

- from time to time unusual results would be produced that were quite unrealistic. This came about in situations where a number of extremes in the random factors occurred at the same time. Not only was the student not able to see the results of their decisions but the figures on which they had to base their report were so extreme that they became meaningless.

While excellent arguments could be advanced for the use of these random factors they detracted from the program rather than enhancing it. As a result the number of random factors was reduced considerably in the latest version.

3. The Market

To set up the simulation it was first necessary to decide the factors that play a part in the operation of the market. These were seen to be:

- Type of insurance transacted;
- Students' input;
- Number of companies in the market;
- Size of the market; and
- Allocation of policies to companies.

3.1 Type of insurance transacted

The market must be kept relatively uncomplicated so the results of decisions can be clearly seen. This dictates that the market be confined to one class of business and that class of business be one that has a high volume without great variation in the size of losses. This approach provides the best opportunity for the students to see the effects of their decisions. The class of insurance chosen was motor vehicle property damage which fitted these requirements well.

3.2 Student decisions

The students make decisions in eight areas. These are:

- Premium to be charged;
- Commission to be paid to agents;
- Credit terms to be allowed to the policy holder;
- Annual amount to be spent on advertising;
- Reinsurance (portion is to be shared with other insurers);
- Amount to be spent on a computer system (which results in a reduction in management expenses);
- Percentage of investment funds to be placed in fixed interest securities; and
- Share market investments.

3.3 Number of companies in the market

A 'real life' market would have quite a number of insurers. A large number of companies in the market would produce a situation where the effects of decisions could become buried and the students unable to see the effect of their decisions. Bearing this in mind it was decided that the market would comprise four companies. Thus students are divided into groups of four and a separate simulation (and hence separate markets) run for each group.

3.4 Market size

The next step was to decide on the size of the market and the factors that could influence its growth. The market was set at 200,000 policy holders with possible growth to 250,000 depending upon the strategies adopted by the participating company.

There are several factors that could affect the size of the market with advertising seen to be dominant. Actual market experience was drawn upon to establish the extent of this effect and it was established that below \$500,000 annual expenditure it had virtually no effect. Above that amount the increasing expenditure increases overall market size.

Other factors considered are policy premiums and commission paid to agents. Lower premiums have the effect of bringing the policy within the reach of more customers and thus increasing the size of the market. Agents commission could also be seen to be effective in this regard, the higher the commission the more active the agent. The result would be to bring into the market policy holders who had not previously participated. However, it was felt that these matters would only cloud the effects of students decisions and as their effect on the total market size would be minimal it was decided to have advertising as the only factor that would influence the total market size.

4. Determining Market Share

Once the market size is established the sales are then divided between the four participating companies in proportions determined from students' decisions on

Premium Commission Credit terms Advertising.

The decision variables are listed above in order of decreasing effect on market share. To elaborate on each.

Premium

In practice, the policy premium is the major factor influencing a consumer's choice of company. GIMICS allows for a premium range of \$300 to \$400 with the mid point being the level at which there is no effect. Premiums below that amount are assigned a positive sales factor and above it a negative factor.

Commission and Credit terms

Conversely, the higher the commission paid the greater the effort by the agent to attract business to the company. While this may not always occur it is generally true. A sliding scale of sales factors is used to determine the effect for each company. The longer the credit terms granted the greater the number of customers attracted. Once again there is a sliding scale for the factors with the range decreasing further.

Advertising

Just as the market as a whole was affected by advertising the number of policyholders of a specific company is also affected. The magnitude of the effect is less than the three preceding items and again a scale is used.

The final market share for each company is then determined in proportion to the sum of these four sales factors for each company and thus the total sales for each company is calculated as:

$$\frac{\text{Sum of Sales Factors for Company } \times \text{ Total Market Size}}{\text{Total Sales Factors for All Companies}}$$

5. The Simulation

The simulation assumes an existing market so each company starts out with an established Profit and Loss Account and Balance Sheet. These are identical for all companies in the market. The student provides the input for the year's trading and from those inputs the results are calculated and a Profit and Loss account and updated Balance Sheet are produced following the year's trading.

To achieve this it is necessary to recalculate each of these items in the accounts based on the inputs from the students and adjusting the figures from the past year to reflect the year end results. The following is a general description of the steps necessary.

5.1 Premiums

This is simply the premium set by the student multiplied by the number of policies sold. However, the student has the option to specify if they wish to pass off some of the risk to another insurer (reinsurance). This is done by indicating the percentage to be reinsured. If this option is selected the appropriate proportion of premium revenue is deducted to allow for this reinsurance cost. As premiums are usually for policies covering a 12 month period, at a company's balance date many of the policies still have some time to run before they expire. Inevitably there will be claims occurring under these policies so part of the premium calculated needs to be set aside to allow for these future claims. The proportion is fixed in the program. This is a Balance Sheet item, "Unearned Premium Provision". A calculation is made for this amount and an adjustment made against last years provisions.

5.2 Acquisition costs

This relates to the cost of acquiring the business. The items involved here are commissions and advertising. The commissions is the percentage specified by the student applied to the premium income and the dollar amount of advertising specified by the student.

5.3 Claims

This remains constant regardless of the student inputs. In a real life situation the amount of the loss is not affected by the decisions the company makes. These remain unknown until after the accident has happened. One can however look back to past years, establish the patterns that occurred there and use those to predict what will occur in the coming year. The program includes two factors that are significant to this calculation.

- A factor for claims frequency - how many losses will occur in the year?
- A factor for claims severity - the average size of losses that will occur.

Both of these factors have a random element built in so that each time the program is run the number of losses and their average size will fluctuate within a fairly narrow range. This ensures a different result each time and is more realistic.

The frequency factor is applied to the number of policies issued to give the number of losses. The resulting amount is applied to the severity factor to give the total amount in claims for the year.

A further calculation is made at this point for outstanding claims. This is the amount of losses at balance date that have not been paid out. This is a Balance Sheet item that is calculated by taking a percentage of the calculated claims figure and adjusting the figure shown for the past year. Any difference must be included in the Profit and Loss account.

5.4 Investment income

Apart from premiums, an insurer's other main source of income to meet claims is investment income. In this section the amount available to invest is calculated and then allocated between the areas of investment indicated by the student.

There are several steps involved. The process starts with the amount invested last year and to this several adjustments are made to arrive at the amount available for investment this year. These adjustments are:

- The results of the current years trading are added (or deducted);
- Any change in the level of trade debtors;
- Any computer purchase reduces the funds available for investment and thus must be deducted.

The resulting amount is then divided in accordance with the students investment input selections.

At the start of the program the instructor specifies the fixed interest rate. The share investment rate fluctuates using a random factor either 1% above or below the fixed interest rate. The rate of return is applied so that the investment income amount is reached.

5.5 Other calculations

The remaining calculations are straightforward. Depreciation , profit , tax and the like. The program now has sufficient information to be able to print out the current year's Profit and Loss account and Balance Sheet.

6. Evaluation

The real test of any program is the response of the users. Interviews were held with both students and the lecturers involved in using GIMICS.

6.1 Students

A cross section of students who have completed the unit was interviewed to obtain their reaction to the way the assignment was handled. The unanimous opinion was that the assignment brought together many topics that they had covered while undertaking the insurance major and in so doing they gained a better understanding of the relationships between each of these topics. Another common response was that they found the assignment challenging. It was one thing to look at the topics individually but the assignment required that they understand and explain why their inputs

produced the results they did as this necessitated understanding the relationships between their own inputs and also those of the other companies in the market. Quite a number indicated that at the end of the assignment they felt they had a much better understanding of these relationships.

The full time students seemed to obtain greater benefit from the assignment which is understandable as they have never worked in the market. Some comments specifically from the full time students were - "the assignment was very beneficial" - "it enabled me to see the effects of their decisions and the effects on their decisions of the outside influences (other companies)" - "completing the assignment was very helpful for the final exam preparation".

One criticism emerged and this related to those who received the output from an earlier version of the program. Some complained that the program gave unrealistic figures. This was not a general problem and appeared to relate to the use of random factors in the program which, ironically, was intended to make it more realistic. However, when a number of these factors hit their 'high point' in the same simulation the result became unrealistic. This problem has been remedied in the current program.

6.2 Lecturers

The lecturer found the program beneficial from two aspects:

- Students were forced to apply themselves to a unique set of figures so they each had to produce the results of their own analysis. Group discussions helped to further their understanding of the results but they then had to apply the knowledge gained from those discussions to their own unique situation. This allowed students to learn from their group discussions but still meant that they had to demonstrate their own abilities by analysing their unique results;
- The analysis advanced the students' understanding of the subject. The lectures produce a theoretical understanding but the analysis meant they had to apply this theoretical knowledge to a 'real' situation. By using their own inputs and analysing the results leads to the student gaining a much better understanding of the topic.

7. Summary

The GIMICS simulation has been successfully used in the teaching programme within the Faculty of Management at Deakin University and the end result has been pleasing to all involved. The students have an assignment into which they have had some input which produces more interest on their part. The teaching staff in the course have an assessment mechanism which adequately tests the students' understanding and is unique so that the risk of common or copied papers is eliminated. The only drawback is that the marking of the assignments takes longer because they are different for each student but for the benefits gained this is seen by those involved to be a small price to pay.

8. References

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