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A SIMULATION OF INVESTMENT ANALYSIS, PORTFOLIO MANAGEMENT AND REPORTING USING LOTUS 1-2-3

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ABSTRACT

In this research we have designed a system to facilitate a portfolio management simulation in an Investments course. The Investment Decision Support System (IDSS) provides computer aided instruction for stock selection, modern portfolio theory implementation and performance evaluation, and investment report updates. The emphasis of the IDSS is to improve the students' learning process.

INTRODUCTION

This paper presents an Investment Decision Support System (IDSS) that allows the student in Investments an opportunity to test and apply various finance models and formulas presented in the course. The students must state the investment objectives of their portfolio at the beginning of the semester. This approach encourages them to select combinations of equities which will help them obtain their objectives. Each student is given a fictitious sum of money at the beginning of the semester to construct a personal portfolio. This portfolio may consist of common stocks and cash. The cash can be held in a money market account. The students are provided with descriptions of theories and terms throughout the spreadsheet to teach them new ideas or to prompt their memory.

Students have been constructing and managing simulated portfolios in Investment courses for a long time as a means of learning about the investment process. However, the traditional methods of simulating stock analysis, stock trading and portfolio management can have several drawbacks, which include: the validation and recording of transactions; expensive computer hardware and software; and a lack of all desirable features in an easy-to-use software package. For example, the investment simulation approach has usually been conducted in one of the following formats:

1. The students are responsible for analyzing, selecting, monitoring and reporting their results. They are often permitted to use the reporting aid of their choice, i.e., mainframe, micro, PC, or by hand. Each time the student trades a stock or takes some action they must report it to the professor. The professor spends a lot of time recording and monitoring transactions. In this type of a situation professors often present the student with a limited number of stocks from which to choose their investments in an attempt to make oversight easier. This scenario creates a decision making environment that is unnecessarily artificial, thus diminishing the value of the whole process as a learning experience.

2. There are several programs that are designed for mainframe computer systems, such as the PROSTRAT mainframe simulation by Gitman (1981) and Computer Aided Invested Analysis by Riley and Montgomery (1982). These computer programs require a mainframe system (such as a VAX or IBM), computer accounts, and computer familiarity and accessibility. These programs provide the advantage of emphasizing important concepts that a professor feels the student should consider while performing the assignment. While this attribute is desirable, the procedure can be expensive. There is also the problem of accurately recording and monitoring student transactions, as well as the inability of most of these systems to generate a detailed report.

3. The third option that has been employed entails the use of a microcomputer in conjunction with an investment analysis software package like Modern Portfolio Theory on the IBM PC by Computer Handholders, Inc. This software package, which doesn't have a reporting mechanism, costs $1,000. Many other software packages primarily have only reporting applications.

SIMULATION OBJECTIVES

The primary goal of this simulation is to increase the level of learning that the student attains from the assignment. Learning is a very broad concept. The learning objectives sought in the simulation are listed in the following chart which is adapted from Butler, Markulis, Strong (1985).

Learning Objectives	Description of Learning
1. Basic Knowledge	Student recalls or recognizes information.
2. Comprehension	Student changes information into a different symbolic form.
3. Application	Student discovers relationships, generalizations, and skills.
4. Analysis	Student solves problems in light of conscious knowledge of the relationship between components and the principle that organizes the systems.
5. Synthesis	Student generates unique communication, produce a plan or set of abstract relationships.
6. Evaluation	Student develops ability to

create standards of judgement to weigh evidence and analyze

The performance of the proposed Investment Decision Support System (IDSS) can be evaluated with respect to these particular kinds of learning. The students participating in the simulation are not assumed to have been exposed to many of the investment and portfolio management concepts when they initially state the portfolio's objective/strategy and begin to construct their portfolio. Therefore, the students are forced to read and to understand many of the facts, the terminology, and the concepts of Investments in order to create a statement of objectives, to simply work through the IDSS, and to construct a portfolio.

It is hypothesized that the learning process is facilitated in terms of the students ability to understand and to retain (and only then having the potential to apply the idea or theory) through the application of an idea. This application can help the student to discover the relationships and skills necessary to apply the knowledge introduced in class. The application of Investment theory is required first in the statement of objectives/strategies for the student's portfolio. The second application is in the construction of an investment portfolio which attempts to achieve the portfolio's objectives. The third application is in the monitoring of the portfolio's composition, the rebalancing of the portfolio's individual assets and the analysis of the impact of additional investments on the portfolio's risk-return characteristics.

Dissatisfaction with simulations in economics is usually related to two key factors, design and implementation, according to Gold, Pray and Claridge (1985). The simulation approach with the IDSS encourages the student to consider the tradeoffs and relationships involved with investments. On the other hand, there may be a tendency for users of decision support systems to have too much trust in the information which comes out of the computer. It must be pointed out to the students that the IDSS is for storing, reporting, quantifying, and supporting their decision making, not for actually making the decision. No portfolio manager accepts these too]s as an answer unto themselves. Another consideration for stock valuation methods is the inability of quantitative analysis to incorporate the psychological momentum of the market which can play a significant role in stock price movements. The what if" scenarios and data tables in the IDSS are specifically designed to illustrate the importance of the underlying assumptions made in the models.

Since a critical part of the learning hierarchy is synthesis, the student must produce a unique plan based on a set of abstract relationships with the IDSS. The IDSS requires the student to attempt this process through constructing, trading, and managing their portfolios according to the objectives they have set forth. Evaluations are based on the students' ability to maintain their portfolios in assets that fit their stated objectives profitably. Thus, total return to the portfolio is not the only criterion upon which the grade is based.

THE INVESTMENT DECISION SUPPORT SYSTEM (IDSS)

A desirable decision support system for investment simulation would be one that included the following capabilities: 1) a design to minimize the number of manual calculations; 2) an implementation on a micro- computer, as opposed to an expensive mainframe system; and 3) the incorporation of both stock analysis and portfolio performance reporting within the same applications program. Seyedian and Agazadeh's (1987) approach reported in the 1987 ABSEL proceedings was the starting point to which this IDSS has added several different features.

Students in Investment courses are exposed to many models, formulas and theories. However, the quantitative tools derived from these various theories are rarely applied by the students in a real investment decision making process and environment. The proposed Investment Decision Support System (IDSS) allows the student to simulate managing a portfolio of common stock and cash, to continue to update their portfolio positions, to easily calculate the current market value of their portfolio, and to report their progress. The specific aspects of the IDSS Include:

1. Construct a portfolio.

2. Evaluate the portfolio's performance with respect to the 'market" during the investment horizon using the Standard and Poor's 500 Composite Index as a benchmark.

3. Manipulate the various inputs of the portfolio analysis in order to quantitatively illustrate the effects of various inputs and assumptions on the outputs; e.g., to calculate the beta (market risk)
of an asset considered for inclusion in the portfolio and to calculate the beta of the portfolio if the investment is acquired.

4. Save the student time by calculating the current market value of the portfolio and provide a report of the results. These functions of the IDSS allow the students more time to think about the whole process and, therefore, to gain a better understanding of the material.

5, Illustrate the complexity of applying theories and models in an real investment decision making process.

6. Test the potential use and value of different investment strategies.

This IDSS was designed so that a person who knows nothing about Lotus 1-2-3 or spreadsheet programs can enter the data, perform the analysis, and run the reports successfully. A set of macros (automatic commands) has been used in constructing the IDSS to automate the routine data entry, report generation, and graph preparation functions. The main macro menu has several choices, including a data entry selection. When this entry is chosen it will invoke a macro that will prompt the student for the date. After accepting the date as a text string (an easy format to enter) it is converted to a date value. This allows for an 'if" statement to compare the entered date with the internal date in the computer. If the two dates are not equal, then execution will return to the top of the Enter macro; i.e., the user will have to supply

the proper date or they will be stuck in a loop. Students then turn in portfolio updates each week.

The IDSS procedures are straightforward. Below is an example of the operating instructions the students need to successfully use the IDSS.

1. Insert a DOS diskette in Drive A and enter the date and time.

2. When you get the A> prompt, insert Lotus System Disk (Release 2) and enter Lotus (or whatever the driver file is named), then press the Enter key. You will get a menu; select 1-2-3. Now you will be in the spreadsheet file and you are ready to begin (the automatic File Retrieval will execute the proper file). The spreadsheet begins with a statement concerning the purpose of the IDSS. After you read this information, press the PgDn key one time to proceed to the next step. The comment located at the bottom of the screen prompts this action by the students. (Note: All of the helpful comments are written in capital letters so that they are easy to see.)

3. The Main Menu macro will appear with the following choices:

ENTER	ANALYZE PORT	EVAL PORT	PERIODIC
ENTER DATA	CALCULATE	CALCULATE	REPORT
PRINT	FORMAT	PORTFOLIO	
GRAPH	REPORT	EVALUATION	

   If you have undertaken any transactions or the current market value of your stock has changed, select Enter and press Return.

4. The computer will ask you to enter the date. Enter it in the space provided in the following format: 04/21/87 (MM/DD/YY). If you do not enter the proper date, the program will not continue any further.

5. When the proper date has been entered, the cursor will move to the data entry portion of the worksheet. Input the requested data just like the example. When all the data have been entered, the computer will ask you if the data are OK; press Return to continue if the data are correct. If not, select No then press Return and the cursor will return to the data entry portion of the worksheet allowing you to change the incorrect data.

6. If you would like to see the results of your portfolio progress to date, choose Analyze Port from the Main Menu.

7. To evaluate your portfolio's performance with respect to the market, select Portfolio Evaluation. The cursor will move to an area of the worksheet that explains the Sharpe, Treynor, and Jensen measures of performance evaluation. Read these statements, making sure you understand the concepts and enter the requested data in the spaces provided. When this portion of the spreadsheet is completed, press the Return key and the cursor will return to the Main Menu.

8. To evaluate the performance of your portfolio, select the Eval Port branch of the menu. Step 7 must be completed before this step can be used. Read the comments and enter the data requested in the blank spaces. The output variables will automatically be calculated.

9. The student can easily obtain a periodic report of the vital statistics on their portfolio to date. To print this information, select the Periodic Report branch and invoke the macro by simultaneously pressing the Alt and P keys. Now the first disk of the IDSS has been completely utilized.

The second disk includes some additional analysis that requires more data input. Insert the disk in Drive B with Lotus in Drive A. Press the Home key to get back to the beginning. Read the information and press the PgDn key to further proceed. Get comfortable with the matrices of variance-covariance so that you will understand the output for your variance-covariance matrix. Enter the number of stocks in your portfolio, then go to cell Gi. Input the historical prices of the stock. When all of the data are entered, check it for accuracy. Then proceed to the variance-covariance matrix to view the output. Underneath the matrix are the formula and the answer for the variance measure of your portfolio risk.

Now move to AM1 to analyze the systematic risk of a stock by constructing a characteristic line. Enter the data for a particular stock and the S & P 500. Then simultaneously press the Alt and C keys to invoke the characteristic line macro which will calculate and graph the security's characteristic line. If you want to perform this analysis for other stocks, enter the new data in the same spot. Make sure to print your results before you change the data if you would like to save them. When you have calculated the characteristic line for each stock desired, go to cell Gi. Simultaneously press the Alt and R keys to print a report of the portfolio risk. All of the IDSS has now been completely used. This IDSS will enable students to store, calculate, graph, evaluate, and report the results of their portfolios, as indicated by the remaining Main Menu options. These capabilities are all attractive features of the IDSS.

CONCLUSION

The IDSS has been designed with the purpose of constructing an "effective" pedagogical tool for the student in an Investment course. The IDSS can be evaluated according to the following criteria: 1) the primary objective of facilitating learning through the investment simulation approach; 2) the secondary objectives (which are interrelated with and facilitated by the primary objective) of low cost, ease of use, convenience for instructors, and time-saving benefits; and 3) the effectiveness of the design and implementation of the IDSS as an appropriate method for advancing learning. It is important to also consider the manner in which the instructor has integrated the IDSS as a part of the overall learning process in the Investment course.

This paper has explicitly defined the objectives of the IDSS, the criteria used in its design and implementation, and its limitations. These factors should allow for further research on the effectiveness of the IDSS as a learning tool, its design guidelines, and ability to test the theoretical constructs of the

concepts of learning through computer-based simulation. Now that it has been designed, the next step for the IDSS is for its implementation into the coursework.

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