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STRENGTHENING ESSENTIAL SKILLS THROUGH A FINANCE EXERCISE: CALCULATION OF BETA

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ABSTRACT

An exercise for an introductory finance class is described. Although the assignment is to calculate the beta coefficient and the Capital Asset Pricing Model, the goals of the assignment are more far reaching. In addition to learning financial concepts, the exercise strengthens essential writing skills, computer competency and quantitative skills.

INTRODUCTION

Although college students take courses in computer, communication and analytical skills, the business community decries the dearth of functional literacy in college graduates, Rubenstein (1998). The problem goes beyond course content and delivery; these fundamental skills must be reinforced throughout the curriculum.

Advocates of "writing across the curriculum" urge us to not blame the Freshman English teachers for our students' poor writing skills. Rather, incorporate language skills throughout the curriculum and clear writing will take on importance; good grammar will be more than a workbook assignment. Similar arguments can be expected from introductory computer instructors. If students are to graduate with appropriate professional competencies, professors must use the essential skills introduced in other classes. This requires careful sequencing of courses and prerequisites, which is beyond the scope of this paper. Rather, this paper provides a multi-objective exercise for use in an introductory level finance class to strengthen computer, written and analytical skills while teaching the financial concepts.

OBJECTIVES

This exercise requires students to use algebra, graphing, statistics, grammar, presentation skills, software and the Internet. The financial concepts include: stock market indices, rates of return, beta coefficient, the capital asset pricing model, annual percentage rate, effective annual rate, and sensitivity analysis. The exercise demands active participation on the part of the student and patience on the part of the professor but the "ah-ha" factor (an indicator of comprehension recommended by the Nobel Laureate, Fritz Machlup) makes the exercise worth the effort.

PREPARATION

Two assignments precede this exercise, one to establish the level of writing competency required and the second to refresh Excel skills. The first assignment requires a literature search on an assigned topic and a concise summary and analysis of a *relevant* article. The difference between analysis and summary is clarified along with appropriate writing practice. This establishes a language arts benchmark while exercising their brains.

The second case is a very simple Excel exercise. The students download a data set from my website, use cell addresses to create and copy simple formulae, and graph a data series. Once the level of acceptable writing is established and the spreadsheet refresher completed; students are ready for the "beta case".

THE "BETA CASE"

The students each choose a stock listed on the NYSE and obtain pricing information for this

stock, as well as the relevant stock market index, from the Internet. They then download the data into an Excel spreadsheet. The students enter formulas to calculate rates of return for the stocks as well as for the stock market index. Performing regression analyses on these returns, the students calculate the Beta coefficient for their stocks. The students then graph the resulting rates of return and regression lines.

The students estimate the other parameters of the Capital Asset Pricing Model (CAPM), and with the calculated Beta coefficient, find the required rate of return for the chosen stock. The required rate of return is then compared to the expected rate of return. For these calculations, the students must convert the weekly rates of return to annual figures using either the formula for Effective Annual Returns or Annual Percentage Rates (APR). Finally, sensitivity analysis of the capital asset pricing model shows how sensitive the calculation of the required return is to various assumptions regarding inflation and market risk premiums. This could also be graphed.

The write-up requires that students demonstrate an understanding of the data analysis and the use of such analysis in financial decision making. Equipment permitting, students present brief PowerPoint demonstrations where counter-cyclical stocks and high/low beta's can be compared and the associated firm discussed.

RESULTS

For the students:

Remarkably, not every college student uses the Internet. Those who are Internet-wary will discover its usefulness when faced with the alternative of searching the library shelves and entering weekly prices and indices covering three to five years into a spreadsheet. Finding the data on the Internet introduces the student to downloading which is generally quick and easy.

Embedding the formulas, performing the regression analysis, and creating the graph develop the student's ability to use Excel as a powerful tool. In the introductory computer class, one often can not exploit Excel's power to this extent. This exercise requires students to develop some facility on their own. Those students unfamiliar with statistics can easily handle regression analysis and others generally gain a new appreciation for the material that they learned in their statistics course.

Although the book and professor discuss rates of return endlessly (seemingly), it is surprising how few students immediately grasp the meaning of $(P_1 - P_0) / P_0$. Using actual prices to calculate a rate of return makes this key concept very clear. The size of the data raises protests; "Do I need three years worth of prices? Five?" These questions lead to a useful discussion of the relevance of the past for predicting the future. Selecting an index makes the differences between indices relevant. Dealing with actual data prompts the student to *initiate* meaningful discussions, which is a far more effective pedagogy than lecturing.

Much of the write-up concerns the beta coefficient, specifically what it reveals about the nature of the stock (and firm) under analysis with regard to risk. Substitution into the capital asset market then demonstrates the usefulness of beta for decision-making. Comparing our calculated required return to the expected return leads into an understanding of how one forms expectations. The ensuing discussion highlights the differences between the Effective Annual Rate of return and APR that is more memorable than the exercises from the text on these calculations.

Students generally under-estimate the task of doing the write up. Here clumsy language and tortuous phraseology are clear indicators of non-comprehension. Clarity of expression is the main criteria for grading. In the classroom presentations, the explanations are quite indicative of whether the student only figured out which key to punch or actually "got it".

For the professor:

As a finance professor, does the use of this case mean the professor must teach a spreadsheet program, Internet access and verb conjugation in addition to an ambitious finance syllabus? Theoretically, the answer is no. There are learning support centers on campus for writing and computer lab assistants for computer assistance. The professor need only establish the requirement that students be competent in the skills that others will have taught in the earlier classes. This entails sequencing courses and appropriate prerequisites. Scheduling can become tricky for freshman classes but upper level classes ought to be able to require freshman level competence in English and successful completion of an introductory computer class.

In reality, more work does fall on the professor's shoulders. The students may have taken English classes but one still needs to explain *why* the paper is rejected, i.e. what is redundancy and how does one write in the present tense. According to complaints from various students (in panics induced by computer illiteracy), computer lab assistants are apparently chosen from the most unpleasant, incompetent creatures on campus.

One should not have to "waste" time explaining graphing, regression analysis and $(P_1 - P_0) / P_0$ but expect this. The time is not really wasted if by using these constructs they achieve relevance and, once grasped, are not easily forgotten.

TIMING

Deadlines must be flexible to allow for students who have trouble finding or downloading data, as well as network problems originating with the University. The plethora of problems is unimaginable, including diskettes that have been sat on, or otherwise lost, and system crashes. Due to the numerous difficulties, I assign "should" and "must" deadlines, i.e. you *should* have your data by Wednesday, if you have a problem, tell me Wednesday; you *must* have it by Friday. Using this data, you should have rates of return by Monday, you must have them by Wednesday. I break down the tasks into these assignments:

1. Download data
2. Calculate rates of return
3. Calculate beta coefficient
4. Graph regression line and rates of return
5. Write-up

The total time requirement is probably two hours if you know what you are doing. I allow two weeks to complete the first four steps and require the paper in the third week. If students fall behind, it is difficult to catch up independently, as they can't grasp the regression work if they aren't clear on the rates of return. Thus the incremental steps seem necessary, at least for the weaker students. Thus this exercise does not replace the regular homework assignments but are additional.

CONCLUSIONS

Although the Capital Asset Pricing Model is only briefly treated in the text, it is used here as a focal point due to the linkage of many aspects of finance as well as the incorporation of various and sundry skills. One advantage is that it builds on fundamentals such as calculating rates of return. Do not assume that the students can do this just because they have been reading about rates and doing calculations with them the entire semester.

The exercise progresses from simple to sophisticated concepts and these are now comprehended rather than memorized. A lot of grumbling accompanies the beginning of the project but once results start to emerge the students relent and admit that the work can be rewarding.

The student assignment for this case follows. Use it with the author's blessings but please send notification of its use and any feedback or suggestions.

CASE #3

Data:

Using the Internet, obtain pricing information for any stock of your choosing that is listed on the New York Stock Exchange (NYSE). Record closing prices for the end of the week for at least a three-year period. This should give you about 156 data points. If there is a holiday, use the closing price for the previous day; do not enter zero. An easily accessible site is http://investor.msn.com. Also download the appropriate stock market index for the same time frame.

An alternative for those who are absolutely unable to use the Internet is to visit the Reference section of the library and use the Standard and Poor's (S&P) Daily Price Quotations for the New York Stock Exchange. This will involve a significant amount of data entry (over 300 4-digit numbers) from 12 different volumes. Note that prices are recorded as fractions of a dollar, not dollars and cents. Thus you must convert the fraction (in eighths) to decimals (cents). For example, if the price is 10-02, this means ten dollars and two eighths, which should be converted to $10.25. Use the S&P Composite Index for the measure of the Market's overall performance. This can be found in the front of the book of price quotations.

Analysis:

Calculate the rates of return for your stock and for the market index.

Using these rates of return calculate the Beta coefficient for your stock by regressing the stock's return on the market's performance. This can be done in an Excel worksheet, using the Tools menu, under Data Analysis (Regression) OR using the function wizard, and specifying the statistical function: slope.

Create a scatter graph of rates of return, with the Market rates of return on the X-axis and the Stock's rate of return on the Y-axis, as shown in the textbook. Reference the textbook appendix for chapter five, pg. 222, Weston, Besley and Brigham (1996).

Write-up:

- Explain the key concepts: rate of return and Beta coefficient.
- Report your results and explain their implications. Attach your data sets as well as the scatter diagram.
- What is the required rate of return for your stock? Explain the parameters used in your calculations.
- Given the required rate of return, recommend a buy/sell decision for an investor and explain the basis for your recommendation.
- Using sensitivity analysis, determine the sensitivity of your required return to changes in risk-aversion and then to changes in T-bill rates.

Please use correct grammar and spelling. Organize your presentation and proof read your paper. It should be about one page in length.

Presentation:

Prepare either PowerPoint slides or overhead projection transparencies to briefly explain your results to the class.

REFERENCES

Rubenstein, E. S. (1998). The College Payoff Illusion. *American Outlook*, Fall, 14-18.

Weston, J.F., Besley, S. & Brigham, E.F. (1996). *Essentials of Managerial Finance.*, 11th Edition, Fort Worth, TX: Dryden Press.