Introductory Data Analytics Project for Financial Accounting: Basic Analysis of the Earnings – Stock Price Relationship

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ABSTRACT

Data analytics are expected to be commonly utilized by future accountants. This paper showcases an introductory assignment that allows the student to be acquainted with the concept of data analytics and walks the student through the process of examining a basic relationship introduced in intermediate financial accounting – the earnings to stock price relationship – using statistical analysis tools on Excel, a platform that the student is most likely to already have some experience with and thus lower the perceived barrier to entry to data analytics for students early in their accounting education. This case has been used for several years in Intermediate Financial Accounting classes at a midsized state university in the southeast of USA as well as a midsized state university in the west of USA with a significant level of success.

Keywords: Data Analysis, Data Analytics, PE Relationship, Price-to-earnings, Excel, Univariate Regression

INTRODUCTION

This project provides an opportunity for students of Intermediate Financial Accounting I to utilize financial accounting information in a simulation of a real-world setting. In addition, this practice serves to alert students to the foundational skills that they would need for future coursework in intermediate accounting, as well as familiarize students with the usage of spreadsheet software. Although the Excel functions utilized in this exercise are basic, many students may not be familiar with these functions. The instructions provided are intentionally vague to encourage students to acquire the skills to look up guides and articles and learn independently.

This practice set involves the analysis of fundamental financial accounting information in a setting in a manner that is more in-depth than typically at the intermediate financial accounting level. In addition, it also goes beyond the introductory level of principles of accounting by having students study the results of their financial data analysis, think critically in terms of selecting metrics, and then provide investment strategies for their firm.

SCENARIO

Students as Financial Analysts: Analyzing firm fundamentals and providing investment insights

Background

You have just started your career in a small rural bank's investment department. The department is new and does not have much experience participating in stock markets. Your manager has assigned you to conduct some financial analysis to learn more about the relationship that stock prices have with the fundamental characteristics of a firm and also provide some recommendations as to which stocks to invest.

Your firm is interested in purchasing some stock with the intention of holding for 1 year and selling them at the end of the year, thus benefiting from capital gains. You are given the task of analyzing the relationship between the earnings of a firm and its stock price to provide insight to help the department decide on which firms to invest in. Your manager has provided you with the stock price and earnings information for a cross-section of firms in the market this year for use in the analysis (Appendix A). Each firm is assigned a unique firm number. Use this firm number when recommending firms for investment.

Instructions

As part of this assignment, you will need to utilize some formulas in Excel to calculate the required variables. Some excel guidance is provided in the appendices. You should look up tutorials if you run into Excel problems or are unfamiliar with basic Excel functions.

You are required to submit a soft copy of the report as described in point 8 of the requirements section below by the assignment deadline.

Requirements (Do them in numerical order)

1. Utilize excel to calculate the following for each firm:
    a. Total EPS (Assume that for the firms in our sample, there is no value-irrelevant EPS)
    b. Permanent Earnings ratio (Perm EPS / Total EPS)
2. Find the relationship between the total EPS and stock price by these variables in Excel and using a straight-line fit (Univariate regression). Enable Excel to display the equation of the best-fit line as well as the goodness of fit statistic (r-square).
    a. Plot Total earnings per share (EPS) (X axis) against Stock price (Y axis)
    b. Look up articles on univariate regressions and goodness of fit to understand what the equation tells us about the relationship between Earnings
3. Comment on the relationship between earnings per share and stock price.
    a. Is it a positive or negative relationship, or no relationship?
    b. On average, how does stock price change for a unit change in EPS?
    c. What do your findings tell you about how the importance of earnings to equity market participants?
4. Using Excel, split the data up into two separate datasets – 1) firms with permanent earnings ratios that are higher than the median for the entire 100 firm sample (high permanent earnings firms) and 2) firms permanent earnings ratios that are lower than the median for the entire 100 firm sample (low permanent earnings firms). Utilizing the =IF() function in Excel is a good way to go about it. Assign a firm to be in the high median group if the firm's permanent earnings ratio is greater than (>) the median. You should end up with two separate datasets on two distinct sheets.
5. Utilize Excel to plot the Total EPS (X axis) vs. Stock price (Y axis) for both samples. Enable Excel to display the equation for the best-fit line, including R2 a goodness-of-fit statistic.
    a. Compare the relationship between stock price and EPS and observe if this relationship differs between high permanent earnings firms and low permanent earnings firms. Comment on any differences.
    b. Comment on why there may be such a difference in the relationships between the stock prices of high permanent earnings firms and low permanent earnings firms.
    c. Read up on goodness-of-fit and the r-squared statistic related to a univariate regression analysis. Explain what these are. Compare the goodness of fit of the best-fit lines when done for all the firms as one sample vs when done with the firms split into two different samples based on permanent earnings ratios.
6. Using the Projected next year Earnings per share (given), and the gradients for the appropriate best-fit line equations (from your previous graphs), calculate the projected stock prices that high permanent earnings firms and low permanent earnings firms will have next year. In case you are considering this approach: you are not supposed to simply use the permanent earnings ratio to do your projection.
7. Subsequently:
    a. Calculate the Projected returns (for buying and holding the stock for one year) for each stock.
    b. Calculate the Projected Return on Investment (ROI) for investing in each high permanent earnings and each low permanent earnings firm

8. Recommend the top 10 most profitable firms for investment. Be sure to analyze both high permanent earnings firms and low permanent earnings firms. Consider ROI. Explain your picks.
9. Prepare a memo detailing all your findings (points 1 to 7) for presentation to management. Be sure to explain the relationships using plain English and include the best-fit graphs as tools to supplement your written explanations. You may use simple equations to illustrate your explanations. Include an appendix where you provide all the previously calculated variables for these 10 recommended firms. Limit your memo to 6 double-spaced pages. In your memo, be sure to include the following graded items:
    a. Professional language and presentation
    b. Comment on the general Price-to-earnings relationship for the full sample. Accuracy of your equations will be considered. Include a visualization of your graph and utilize it to explain your findings in detail.
    c. Indicate how the Price-to-earnings relationship differs for the above median permanent earnings ratio group vs the below median permanent earnings ratio group. Include visualizations of your graph for each subsample and utilize them to explain your findings in detail.
    d. Explain whether it would be better to use the relationship derived from the whole sample for prediction or if it would be better to use the relationships derived from the two subsamples for prediction. Explain why.
    e. Explain why you selected the 10 firms you recommended.
    f. Explain how you calculated the projected stock price, and your metric of choice
    g. Provide the projected returns for your recommendations.
    h. Submit before the deadline.

Definitions:

1. Total EPS = Permanent EPS + transitory EPS
2. Price-to-earnings ratio = Stock price / EPS
3. Permanent earnings ratio = Permanent EPS / Total EPS
4. Projected Returns = Projected Stock Price – Stock Price
5. Projected ROI = Projected Returns / Stock Price

TEACHING NOTES

This project provides an opportunity for students of Intermediate Financial Accounting to utilize financial accounting information in a simulation of a real-world setting. In addition, this practice serves to alert students to the foundational skills that they would need for future coursework in intermediate accounting, as well as familiarize students with the usage of spreadsheet software. This practice set involves the analysis of fundamental financial accounting information in a setting that is more realistic than typical textbook practice sets. In addition, it also goes beyond the introductory level of principles of accounting by having students study the resultant financial data and provide investment strategies for their firm. This assignment can be undertaken on an individual basis, or on a small group (2-3 students in a group) basis.

This assignment was created to help instructors introduce students to the concept of data analytics early in their accounting education. Early exposure to data analytics, coupled with a lower barrier to entry through the use of Excel instead of other platforms with which students are likely to be less familiar with, is crucial for students to successfully integrate data analytics into how they approach decision-making, and this exercise will help students achieve the following learning outcomes in the CPA Evolution Model Curriculum (Part I CPA Evolution Core, Section 1 Accounting and Data Analytics Core, Module 8 Financial Data Analytics):

- "Identify appropriate conditional logic statements in financial analysis." (Topic 1, Logical thinking)
- "Identify what conditions are met in a conditional statement related to financial analysis." (Topic 1, Logical thinking)
- "Identify basic concepts of financial data analytics." (Topic 2, Financial data)
- "Identify methods to cleanse, prepare, and transform structured financial raw data." (Topic 2, Financial data)
- "Describe correlations, patterns, and anomalies in structured financial data." (Topic 3, data mining of structured financial data)
- "Determine and interpret appropriate diagnostic data analysis, correlations, patterns, and anomalies." (Topic 4: Analysis of financial data)
- "Demonstrate written communication skills (i.e., memos, emails, social media, reports, disclosures)." (Topic 6: Communicating accounting data results)
- "List assumptions used in analysis of data for financial decisions." (Topic 6: Communicating accounting data results)
- "Identify targeted audience and scope of analysis." (Topic 6: Communicating accounting data results)
- "Demonstrate visual communication skills (i.e., interpretation, mind maps, infographics, choosing appropriate visualizations, design best practices)." (Topic 6: Communicating accounting data results)

Although the case is set up for data analysis using the univariate regression function of Excel, the same analysis can be conducted using Tableau or Power BI. However, Excel is recommended since most students are familiar with this tool and the usage of this tool lowers the perceived difficulty and exoticness of the task, causing students to be more confident about independently learning how to undertake the analysis without explicit video walkthroughs.

This case has been used for several years in Intermediate Financial Accounting classes at a midsized state university in the southeast of USA as well as a midsized state university in the west of USA with a significant level of success. Students have reflected that this assignment is

interesting and introduces a novel way of decision-making. They also appreciate the practical usage of Excel to manipulate and analyze data. A snapshot showcasing the structure of the case data, as well as samples of expected visualizations that students will include in their submissions are included in the attached appendix.

Data Availability

The data to be utilized for the assignment (including data solution) is available upon request. Please email the author at nianlimlee@cpp.edu for a copy.

REFERENCES

AICPA and NASBA. (2021). CPA Evolution Model Curriculum. https://nasba.org/wp-content/uploads/2021/06/Model-curriculum_web_6.11.21.pdf

APPENDIX

Figure A1: Low PE Sample Plot

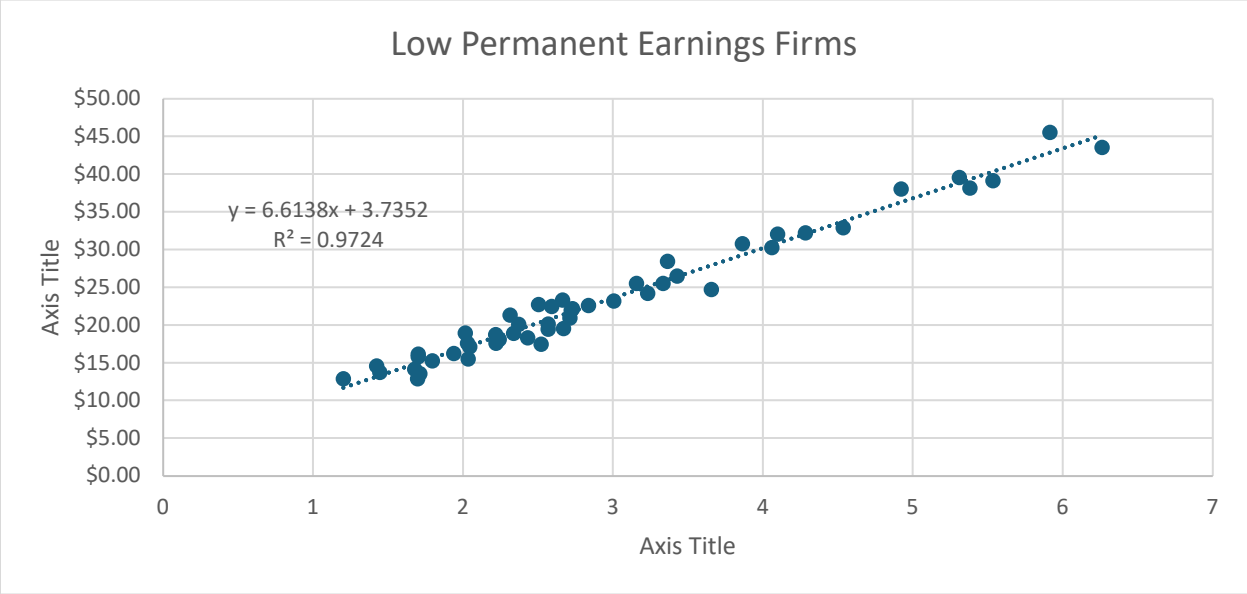
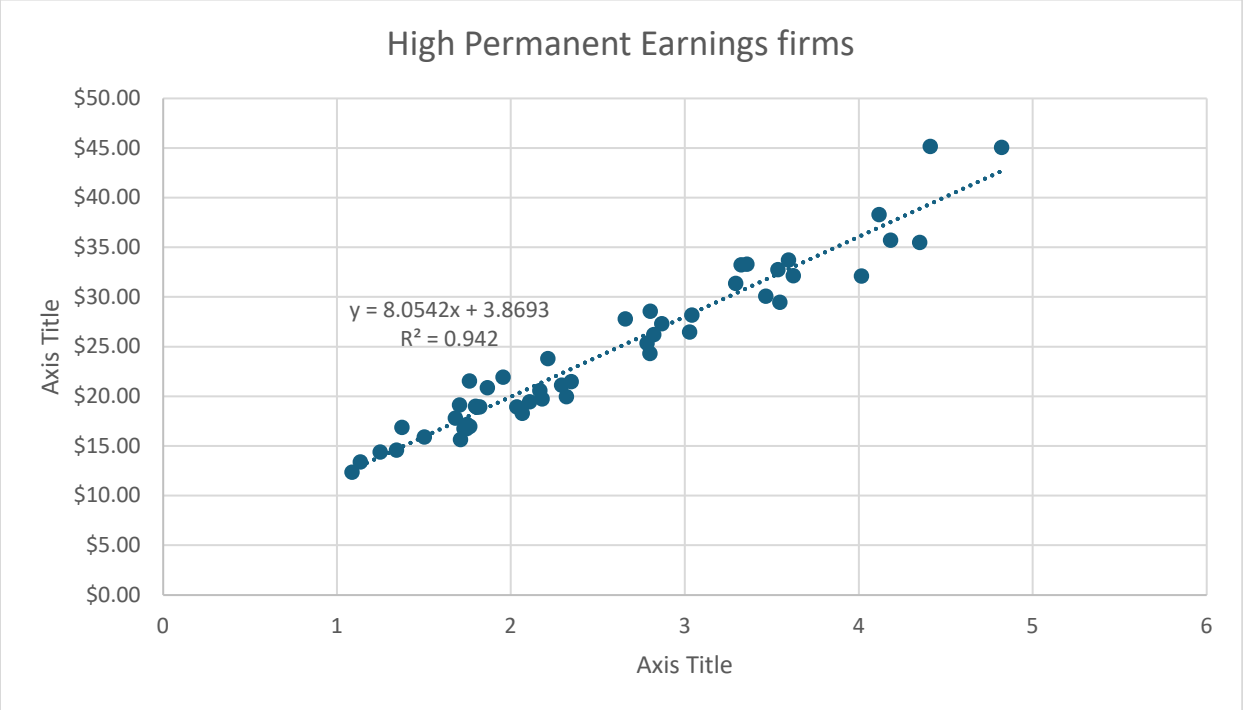


Table A2: High PE Sample Plot



Note: A student is required to include visualizations such as the ones in Figure A1 and Figure A2 above as part of their assignment submission.

Table A1: Snapshot of data

Firm ID number	Stock price	Number of shares outstanding	Permanent Earnings	Transitory Earnings	Total earnings	Permanent Earnings Ratio	EPS	Projected next year Earnings	Projected EPS	Projected Stock Price	Projected returns	Projected ROI	High Earnings?
1	$27.04	15224	48664	13725	62389	0.780009	$4.10	64822.2	$4.26	$26.90	-$0.15	-0.54%	0
2	$14.99	42554	79074	19651	98725	0.800952	$2.32	106632.4	$2.51	$19.05	$4.06	27.07%	1
3	$13.93	35181	52051	11428	63479	0.819972	$1.80	68684.1	$1.95	$14.59	$0.66	4.76%	1
4	$11.99	48490	67938	17603	85541	0.794216	$1.76	92334.8	$1.90	$14.21	$2.21	18.46%	1
5	$18.30	36357	74828	22069	96897	0.772243	$2.67	92407.32	$2.54	$15.55	-$2.75	-15.05%	0
6	$15.10	22770	40766	17732	58498	0.696879	$2.57	56867.36	$2.50	$15.25	$0.15	0.98%	0
7	$10.77	47679	58114	23049	81163	0.716016	$1.70	80581.86	$1.69	$9.91	-$0.85	-7.92%	0
8	$30.74	19046	67614	12067	79681	0.848559	$4.18	86442.4	$4.54	$35.42	$4.69	15.25%	1
9	$11.22	37597	52492	20418	72910	0.719956	$1.94	67660.8	$1.80	$10.64	-$0.59	-5.23%	0
10	$13.30	24432	41302	18129	59431	0.694957	$2.43	56539.86	$2.31	$14.04	$0.75	5.61%	0
11	$10.94	41376	54247	7897	62144	0.872924	$1.50	67568.7	$1.63	$12.02	$1.08	9.85%	1
12	$16.52	26761	50938	11860	62798	0.81114	$2.35	67891.8	$2.54	$19.30	$2.78	16.86%	1
13	$12.18	36886	54502	9927	64429	0.845923	$1.75	69879.2	$1.89	$14.13	$1.95	15.97%	1
14	$14.48	44846	78658	15893	94551	0.831911	$2.11	102416.8	$2.28	$17.26	$2.79	19.25%	1
15	$33.31	15560	56499	7566	64065	0.881901	$4.12	69714.9	$4.48	$34.96	$1.65	4.94%	1

Note: Table A1 showcases a snapshot of the data, including the fields to be calculated by the students filled in green.