Andy Hillier   **August 15th, 2021**
Risk Assessment Associate
Brown & Associates, LLP

ATTN: **George Brown**, Partner

RE: Legacy Company Audit | Results of Analytical Risk Research for Audit Planning

Mr. Brown,

The results of the requested analyses detailing potential risks associated with Legacy Company's audit in regard to the probability of their future return on total assets violating their debt covenant requirements is presented below. We hope our team has adequately detailed and explained these results as well as our interpretation and thoughts such that they may be useful for the upcoming audit planning. If you have any questions or concerns regarding these results, please reach out to Mr. Hillier at ajh103@uakron.edu for more information and we will address your concerns as soon as possible.

INTRODUCTION

The issue posed by Mr. Brown was that the return on total assets for the Legacy Company may be conflated intentionally within a component of profit or by a misappropriation of assets. In order to develop a proper context through which to view the possibility of this, we decided to try to develop an understanding of not only Legacy Company's control environment, but the specific risks that are posed in regard to potential violation of their debt covenants. It is clear based on historical financial data that Legacy Company has had rapidly declining revenues in recent years that have not been completely offset by the reduction in their cost of goods sold or their selling, general, and administrative expenses. Additionally, it is clear that the company has been highly financially levered, with a debt-to-equity ratio that has never been below 2, and in the prior year was 2.3. Additionally, their debt-to-capital ratio is at 70% and has historically only been higher.

Figure 1: Historical Capital Structure and Leverage Ratio Analysis

Year	Debt to Capital Ratio	Debt to Equity Ratio	Assets to Equity Ratio
2018	0.70	2.33	3.33
2017	0.72	2.52	3.52
2016	0.71	2.49	3.49
2015	0.75	2.97	3.97
2014	0.76	3.09	4.09
2013	0.86	6.17	7.17
2012	0.93	13.64	14.64
2011	0.91	9.86	10.86
2010	0.90	9.39	10.39
2009	0.89	8.13	9.13
2008	0.93	13.90	14.90
2007	0.83	5.03	6.03
2006	1.04	-23.47	-22.47
2005	1.00	213.07	214.07
2004	1.00	226.11	227.11

Given this data, it is clear that Legacy Company is highly dependent on debt to pay for its assets and meet its obligations, which is also reflected in its high assets-to-equity ratio. It seems as if Legacy Company has been trying to slowly readjust its capital structure but is still highly dependent on it's debt. For this reason, there is a potential going concern issue, should declining or inadequate profits and return on total assets cause Legacy Company to violate its debt covenants, creating a high potential risk for Legacy Company's shareholders that may need to be addressed within the audit report and letter to management. This is very pertinent as, If the ratio averages less than 8% in the most recent three years, then the bank will recall the loan. Additionally, the inability to finance new assets or invest in new research and development in order to attempt to increase revenues, and the declining profits and stagnant overall financing are worrying. On top of leverage risk, competitor marketing could seemingly easily cause profits to plummet due to brand indifference.

In order to gain more context on the risk of not only potential fraud, but the potential violation and damage to the company's highly levered capital structure, we had decided to perform analytical procedures to forecast the company's 2019 earnings and assets in order to gain an understanding of the probability of debt-covenant violation. This would allow us to approach the audit with an adequate amount of professional skepticism, and well-thought-out data to back it up.

ASSUMPTIONS AND LIMITATIONS

In order to develop an approach for forecasting finances and generating summary statistics on our available data sources, we first made some assumptions about Legacy Company's position, as well as internal statistics and operational data that correlates to their financial performance. Certain assumptions that lead to forecasted financial data can be generally categorized into two broad categories: top-down and bottom-up.

Top-down forecasting involves using data at an industry or market-segment scale (focuses on total available market, serviceable available market, etc.) in order to compare companies that, in theory, should have similar financial performance when scaled to the specified business. Industry or market segment ratios provide a baseline by which we can assess how well a company performs relative to the rest of the industry as a measure of risk. Bottom-up forecasting is often more directly tied to the specified business and the aggregated historical financial data and can be more accurate as it leverages data generated internally within the company, or data on a scale in which the company has notable relevance, such as market data in which a company holds a large market share. Bottom-up forecasting generally sets a company's forecast to a scale that is more realistic for the specified business, not taking into account competition or addressable/obtainable market share or industry trends. This approach can be advantageous due to accuracy and the ability not to 'overshoot', so that forecasts may be more conservative than ambitious.

For the sake of this analysis, the risk management's data team believed it was more advisable to take a forecasting approach that is primarily bottom-up. This was due to not only to historical data availability and our firm's assured accuracy and applicability of the data, but the general lack of readily available information we had about Legacy Company's addressable or serviceable markets. In line with a bottom-up approach, the data team believed that a simple linear regression model measuring historical financial data over time is suitable for this analysis. Although accuracy could likely be increased by doing

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a multiple linear regression and providing additional data by which to correlate finances, this method leveraged existing data and is data that we as an audit firm can attest to as subject matter experts in accounting and finance, as opposed to website traffic or sales-specific metrics.

Limitations that should be noted for our bottom-up approach are the large amplification of clerical errors, temporary volatility, and inaccuracies at a level of fine detail becoming large when scaled and applied to a larger trend to forecast future financials. As we have not had Legacy as an audit client, we may not be able to personally attest to financial accuracy, but as a public company we can rest assured that their previous-year audits have been conducted such that a reasonable amount of assurance has been obtained by professional accountants as has been stated in the audit reports of their public filings.

Additionally, we made an assumption that the balance of assets are going to generally remain stagnant in the short term due to the capital structure of the business, and the businesses' recent increase of equity and lowering of debt as it slowly adjusts it's capital structure leading to a 'balancing out' of available extra financing to purchase assets. We also predicted a continued lowering of profit due to the stagnation of assets, and the loss of momentum in being able to develop new business due to the stagnation in overall financing (liabilities & shareholder's equity).

METHODOLOGY

The data team had decided to tackle the issue of data loading, processing & computing, and preparation of data using python3 (an object-oriented programming language) in a Jupyter Notebook environment with a locally stored SQLite3 database (a relational database management system). SQLite was used to store client-provided historical financial data provided in csv format into a single database and schema with tables generated via provided table and column names. This was performed by connecting the database to our python interpreter at runtime using sqlite3's sqlite3.connect() method

and by dynamically loading csv data into local memory by python via a query executed using sqlite3's cursor.execute() and cursor.fetchall() methods.

This SQLite database was then queried, and the data processed for our simulation, summary statistics, and outputs. Graphs were generated using seaborn, a graph plotting library built on top of the popular matplotlib library used for displaying statistical data. Summary statistics, means, standard deviations, and linear equations were calculated using the numpy and scikitLearn python libraries. The python3 code was displayed and annotated within this Jupyter notebook's input blocks. The SQL query data and results are shown within the output blocks, described by formatted markup sections within the notebook. These markup sections also go into further detail regarding the construction of functions and logic of the code as scripted.

A linear regression was performed on the queried financial data in order to fit a trend line to a plot of each account's value (y-values) from 2004 to 2018 (x-values). The y-intercepts were generated, and an equation of the linear trendline calculated using its slope. This line equation was then used to predict the value of the account in question by finding the y-intercept of the trendline at 2019. The mean and standard deviation of the points were calculated and stored within local memory for python to use later in the analysis. Graphs were generated, displaying scatterplots of finance-over-time points and their associated trendlines.

Based on the forecasted data points for 2019 and the calculated standard deviation of our dataset, we used the numpy library's np.random.normal() method in order to perform a Monte Carlo Simulation and generate a defined set of simulated possible results (50,000 for our simulation) assuming a normal probability distribution. We then used matrix addition for each set of 50,000 results to calculate a same-sized list of simulated results for the return on total assets. Lastly, we calculated how many of the simulated possible results are greater than the 8% threshold that is required for the Legacy Company to not violate its debt covenants.

RESULTS

Figure 2: Results of Linear Forecast and Summary Statistics via Simple Linear Regression
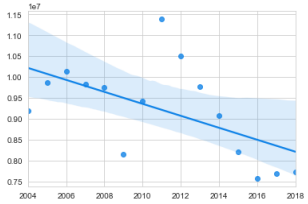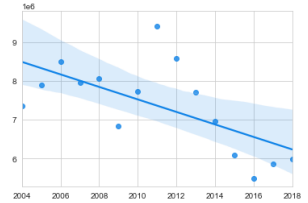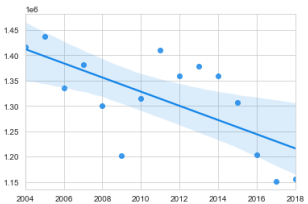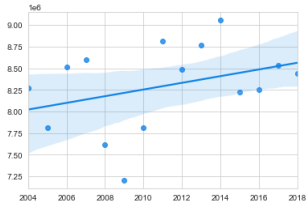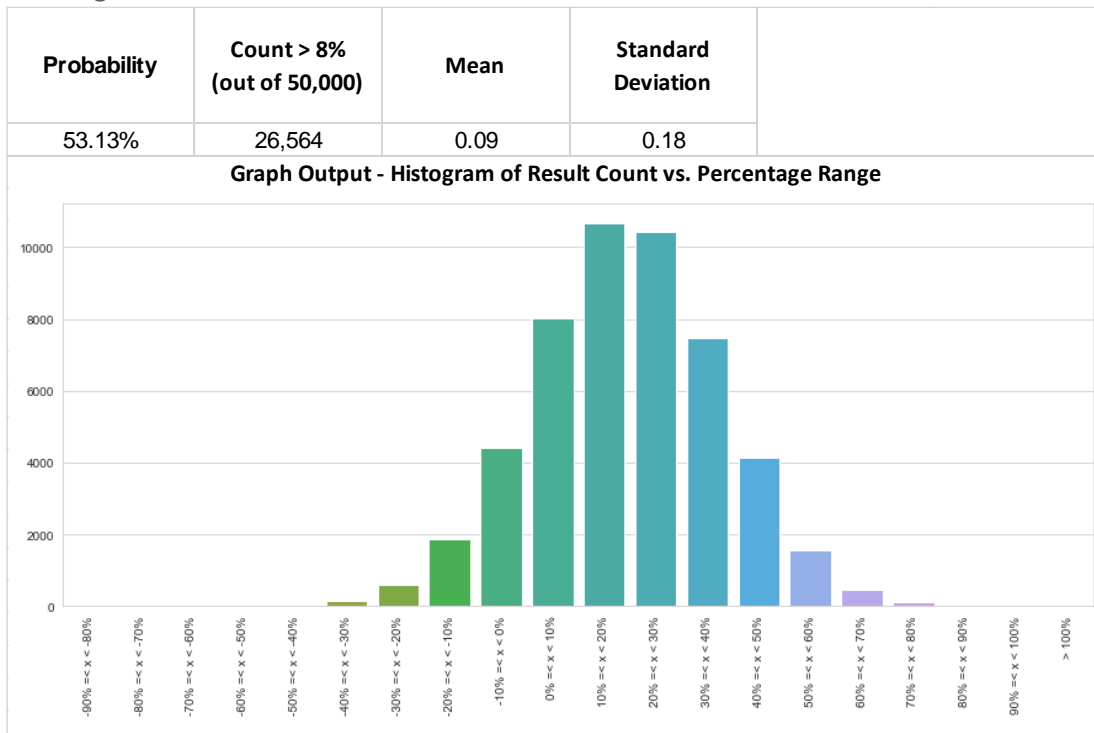
Account	Equation of Trend Line:	Coefficient of Determination	Coefficient of Variation	Prediction for 2019 value	Mean	Standard Deviation	Graph Output (seaborn)
Revenue	y = [-6.99e-06]*x + b	0.32	11.86	$8,073,168	$9,216,880	$1,093,175	
COGS	y = [-6.21e-06]*x + b	0.4	14.94	$6,070,853	$7,360,073	$1,099,640	
SG&A	y = [-7.14e-05]*x + b	0.44	6.95	$1,202,245	$1,314,270	$91,297	
Assets	y = [2.59e-05]*x + b	0.12	5.78	$8,601,213	$8,292,343	$478,946	

Figure 3: Results of Monte Carlo Simulation for Possible Return on Total Assets

Probability	Count > 8% (out of 50,000)	Mean	Standard Deviation	
53.13%	26,564	0.09	0.18	

Graph Output - Histogram of Result Count vs. Percentage Range

INTERPRETATION

The results of the linear regression analyses predict a small increase in revenues, a similar cost of goods sold, a small increase in SG&A expenses, and a slight increase in assets at the y-intercepts of those accounts for 2019. Although coefficients of determination generally only show a loose fit of the trendline to the data points, a low coefficient of variance gives some credence to the predictions of these trends due to a low overall variation from the mean taking into account the standard deviation. Profit/Loss accounts generally show a prediction below the mean, while the assets account shows a prediction above the mean. In general, trend lines show a historical decrease in profit and loss accounts, but a slight increase in assets.

The Monte Carlo Simulation shows a mean of 9% and a standard deviation of 18%, with most simulated results falling into the 0% to 10%, 10% to 20%, 20% to 30%, and 30% to 40% bins, with a bell-curve shaped normal distribution. There is a little over a 50% chance of a value under 8% occurring in our analysis. These results generally correlate with our predictions of lowering profit and stagnation of increase in assets in the short-term based on our analysis of Legacy Company's capital structure.

DISCUSSION

Given the relatively high probability that Legacy Company won't be able to generate a high enough return on total assets to meet the requirements of their debt covenant, there is a high going concern issue for the company, considering their highly levered capital structure. This means that there is a significant management incentive to misappropriate assets or misstate their profit and loss accounts. Given that misappropriation of assets is one of the most common fraud risks and that the risk for the company is an issue of going concern, extra care should be taken to perform more sampling and sampling techniques and auditing for profit and loss areas as well as assets to account for the increased audit risk.

Additionally, given these results, the risk management team believes that Mr. Brown should meet directly with the management to address this potential going concern issue.

ERROR ANALYSIS AND CONCLUSION

It is likely that our results could come out differently as a result of several variables within our simulations. For one, our forecasted profit and assets could be inaccurate. For this exercise we used a simple linear regression utilizing historical data, checking the data's correlation to our assumptions, but other variables could have been taken into consideration that represent the industry as a whole, such as market-wide increases or decreases in the value of services or products sold by Legacy Company. We could have taken several variables and performed a multiple linear regression to more accurately reflect the local & industry-wide markets or used bottom-up analytical data such as website traffic statistics or recent sales numbers in order to adjust our forecast alongside expert opinions regarding their reliability.

Additionally, we could have made extra assumptions about the probability distribution of the data. A uniform or lognormal probability distribution may have been more suitable for the individual accounts, although this would likely need to be determined by a subject matter expert who understands the micro and macro-economy in which Legacy Company operates, such as an economist or mathematician who is familiar with econometric modeling.

In conclusion we believe the issue posed by Mr. Brown, that the return on total assets for the Legacy Company may be conflated intentionally within a component of profit or by a misappropriation of assets, is a significant issue that poses a great risk to the firm if not handled correctly, and one that adds additional risk to the audit. The results of these analyses should be discussed with the Legacy Company, the audit budget adjusted accordingly during planning for the increased work in the areas of greater risk, and a consideration made to issue a disclaimer of going concern.