A DATA ANALYTICS EXERCISE USING TABLEAU TO PERFORM TESLA'S COST-VOLUME-PROFIT ANALYSIS

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Introduction

To align with the evolving demands of the accounting profession, college accounting programs need to implement a fully integrated curriculum that combines core accounting principles with advanced data analytics and critical thinking skills (Dow, Jacknis & Watson 2021). According to the recently updated AACSB Accounting Standards A5 (AACSB 2025), accounting degree programs should integrate: *"Data analytics including, for example, statistical techniques, clustering, data management, modeling, analysis, text analysis, predictive analytics, learning systems, or visualization."*

Our exercise responds to calls from AACSB and the accounting profession. In this exercise, students are guided to use one of the most widely adopted and powerful visual analytics platforms, Tableau (Hoelscher & Mortimer 2018), to clean data, conduct regression and predictive analyses, and create data visualization to help them perform cost-volume-profit (CVP) analysis and make decisions. Students can work in teams and present their findings to the class. After completing this exercise, students can strengthen their understanding of CVP analysis, improve their critical thinking and communication skills, and develop a data analytics mindset, which are crucial skills for future accounting professionals. This exercise is designed to be used in a Principles of Managerial Accounting or Cost Accounting course to expose accounting and business major students to data analytics tools and how data analyses can be used for decision-making.

The authors developed the exercise for class discussion rather than to illustrate either effective or ineffective handling of the situation. The exercise and its accompanying instructor's manual were anonymously peer reviewed by the ***Journal of Case Research and Inquiry***, a publication of the Western Casewriters Association. Qualified educators may request the instructor's manual at editor@jcri.org. Contact Xiangge Wang, 5151 State University Drive, Los Angeles, CA 90032, USA, xwang65@calstatela.edu

In the following sections, we outline the learning objectives, summarize implementation guidelines, and discuss the effectiveness of the exercise, followed by concluding remarks. Two appendices are included at the end: Appendix A contains the student exercise handout, and Appendix B provides the grading rubric. A detailed instructor's manual, along with the two Excel data files, is available upon request.

Exercise Learning Objectives

This exercise aligns with higher-order learning goals based on Bloom's Taxonomy (Bloom 1956; Anderson *et al.* 2001). Bloom's Taxonomy is a widely used educational framework that outlines six levels of progressive learning: remember, understand, apply, analyze, evaluate, and create. These levels represent a hierarchy of learnings that moves from basic memorization to developing more complex critical-thinking skills.

The purpose of this exercise is to expose students to data analytics by using critical-thinking skills to apply visualization techniques to real-world data of Tesla and analyze the CVP relationship. Specifically, students are required to use Tesla's quarterly financial data, quarterly delivery, and production data to accomplish the following learning objectives, aligned with Bloom's Taxonomy framework, as shown in Exhibit 1.

Exhibit 1. Exercise Learning Objectives Aligned with Bloom's Taxonomy Framework

Source: Authors' Note

Bloom's Taxonomy	Exercise Learning Objectives
Bloom level 3 **Apply**	1. Identify the appropriate variables for cost, volume, and profit in CVP analysis. 2. Use Tableau to perform data analysis and create visualizations to determine the break-even point. 3. Use Tableau to conduct linear regression analysis.
Bloom level 4 **Analyze**	4. Analyze the impact of cost and volume on profit using Tableau.
Bloom level 5 **Evaluate**	5. Assess Tableau outputs to determine logical interpretations and arguments.

Cost behavior and cost estimation are among the most important concepts that students must grasp in managerial/cost accounting (Stout 2015). These concepts are the foundation for learning CVP analysis, cost prediction, budgeting, variance analysis, etc. After completing the exercise, students learn to identify the appropriate variables for the different components of CVP analysis. By observing the trendline of the Cost of Goods Sold, Operating Income Before Depreciation, and Selling and Administrative Expenses, students are able to determine the cost behavior (whether they are variable costs, fixed costs, or mixed costs) of each variable and the break-even point. Exhibit 2 demonstrates the cost behavior of variable and fixed costs and how to identify the break-even point. Exhibit 3 is a YouTube video that uses Airbnb as an example to explain the details of the CVP analysis.

Exhibit 2. CVP Graph

Source: Weygandt, Kimmel & Mitchell (2021)

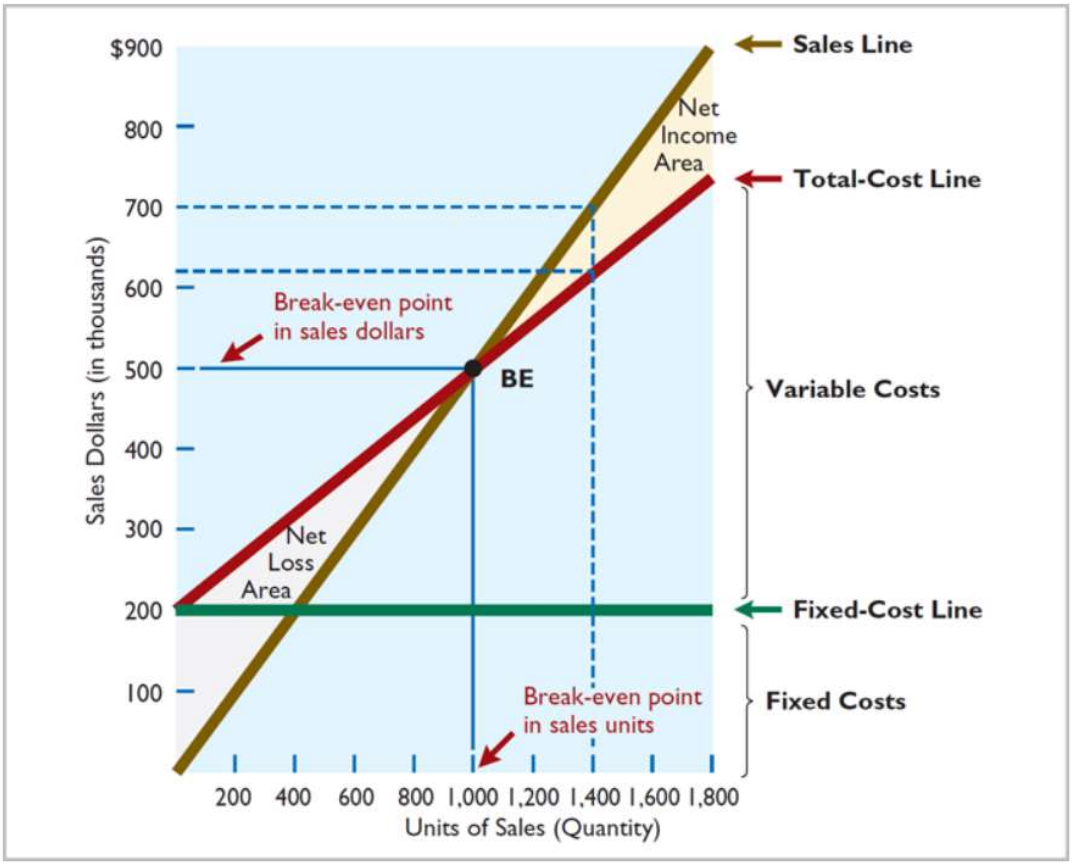
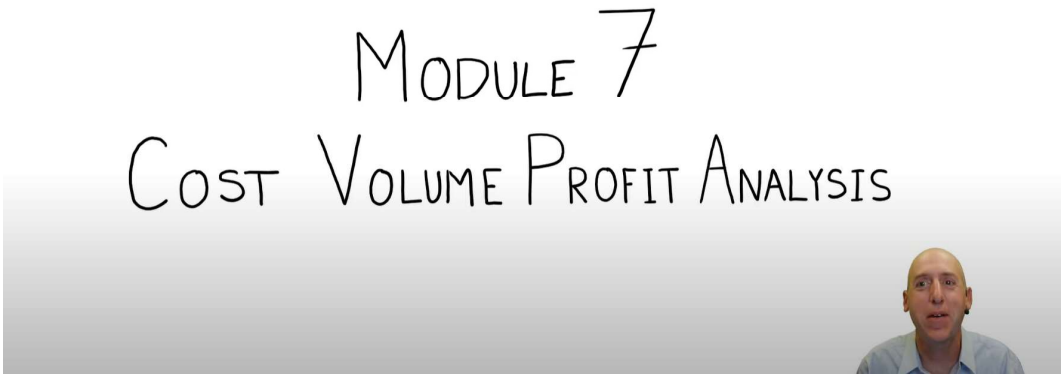


Exhibit 3. Breakeven Point and CVP Analysis

Source: Bell (2022)

https://www.youtube.com/watch?v=tuKLU6aQnJg



Students in managerial/cost accounting courses usually learn the relatively simplistic methods of estimating cost functions, e.g., scatter plots and the high-low method. However, the coverage of regression analysis in the textbooks tends to be incomplete and superficial (Stout 2015). It is important to develop data analytics skills to use large datasets to conduct regression analysis.

Exhibit 4 compares the cost equation lines from the regression analysis and high-low method. The regression analysis tries to find a line that best fits the dataset by minimizing the total distance between the line and all data points. While the high-low method only uses two data points, which may be easily affected by outliers. Therefore, regression analysis can better explain the relationship between variable and fixed cost components and the total costs. It can also predict the total costs based on the value of the predictors. More information about regression analysis can be found on the website https://www.graphpad.com/guides/the-ultimate-guide-to-linear-regression.

Exhibit 4. Comparison of Cost Equation Lines from Regression Analysis versus High-low Method

Source: Weygandt, Kimmel & Mitchell (2021)

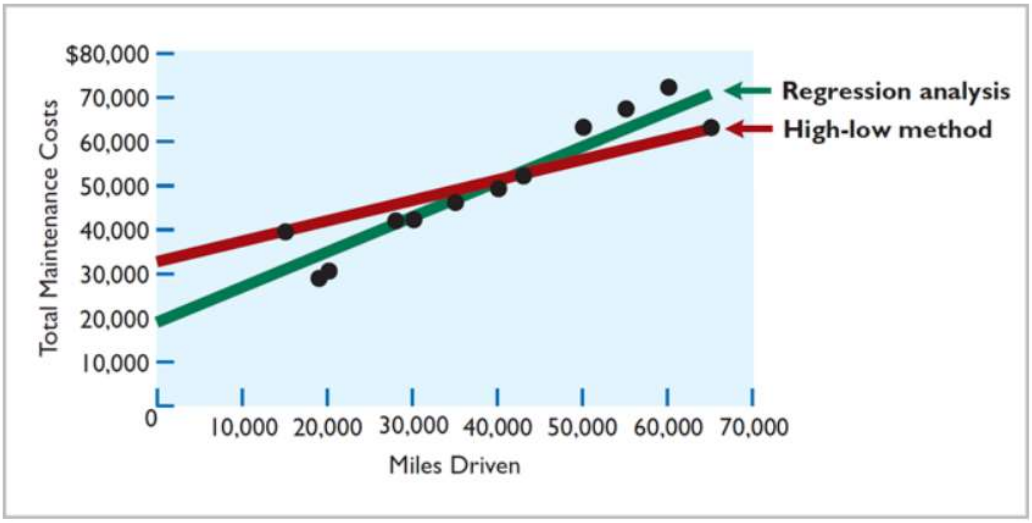


Exhibit 5 provides a good explanation of the output report from the regression analysis generated in Excel. Through this exercise, our goal for students is to use Tableau to conduct regression analyses to estimate the variable costs and fixed costs components for two time periods and create a table with the quarterly cost data to observe the change in costs and profit over the decade. Lastly, students learn to interpret financial data and data visualizations to explain Tesla's business model and success.

Exhibit 5. Cost Behaviors: Using Regression Analysis

Source: ProfAlldredge (2018)

https://www.youtube.com/watch?v=dAD6fGKrcQo

Exercise Implementation Guidance

We expect instructors with no experience using Tableau to be able to teach this exercise with minimal training. Before the semester starts, the instructor can request the free instructor and student licenses at the following website: https://www.tableau.com/academic/teaching. At the beginning of the CVP analysis chapter, the instructor can provide students with the exercise scenario, instructions, and videos showing how to visualize and analyze data in Tableau. Students are told to install Tableau on their computers using the student licenses and watch free Tableau training videos on page https://www.tableau.com/learn/training/20212, in the Creator section.

- Watch the following three videos in Getting Started (9 videos):
    - Getting Started (1 min)
    - Connecting to Data (2 min)
    - The Workspace Area (2 min)
- Watch "Connecting to Data" Video (17 min)

The exercise package for students to download from the course website includes the exercise document, an Excel file containing quarterly product and delivery data, and another Excel file with quarterly performance information. The quarterly product and delivery data are manually collected and the quarterly performance data are obtained from the Compustat database. Students are given Tesla's company information and instructed to use Tableau software to analyze cost behavior and perform a CVP analysis for Tesla. Two key questions addressed are: when did Tesla break even, and how have its costs and profits evolved over the past decade?

To guide students to find answers to these questions, we created two assignments for this exercise. Assignment 1 is worth 30% and requires students to use the provided data to identify the cost, volume, and profit variables for the CVP analysis. Assignment 2 is worth 70% and requires students to use Tableau to create data visualizations, conduct regression analyses, and assess Tesla's profitability.

For Assignment 1, we suggest the following discussion questions:

- Explain how you will use the data to conduct the CVP analysis. Specifically, identify the variables that will represent cost, volume, and profit, and define the profit equation using these variables.
- The dataset uses Operating Income before Depreciation. Explain why using Operating Income before Depreciation, rather than Operating Income after Depreciation, is more appropriate for Tesla's CVP analysis.
- Discuss how conducting a CVP analysis with historical data can provide insights into future performance.

For Assignment 2, we suggest the following discussion questions:

- Use Tableau to visualize the operating income trend and identify the break-even point where Tesla began the positive profit trend.
- What contributes to the success of Tesla? Please use Tableau to support your argument.
    - Is it because of the lower manufacturing cost?
    - Is it because of increased production capacity and delivery?
    - Will Tesla continue its growth in the next year?

The instructor can ask students to work in groups so that students can learn this new data analytics tool together and share what they find with group members. The instructor can ask each group to present one part of the assignment to the class in the last three weeks of the semester, which helps students practice their presentation and communication skills.

In each class session, two groups can present their findings, their learning progress, and how they use Tableau to create the graphs or visualizations. In this way, students have the chance to share the challenges they face and how they overcome them, and the whole class can join the discussion.

Student Feedback on the Exercise

Students enrolled in an undergraduate cost accounting course at a large state university completed the exercise during the Spring 2024 semester. This exercise was assigned as a group project. The instructor asked students to form groups of three to four students and provided six weeks between the initial exercise introduction and the due date. This group project represented 10 percent of students' overall grade.

The instructor asked students to complete a pre-exercise survey before introducing the exercise in class and complete a post-exercise survey after students turned in their work. Student participation was voluntary and anonymous.

For the pre-exercise survey, the instructor asked students "*How much do you know (accounting) data analytics?"* 52% of the students had zero to minimum knowledge and 41% took at least one relevant course. Only 7% of the students had some working experience in data analysis. The results highlight the need for the integration of more data analytics exercises into the accounting curriculum. Another question asked students *"Have you used Tableau before?"* 93% of students did not have any experience of using Tableau before. Our exercise provides a great opportunity to learn this new data analytics tool.

The same seven questions on both surveys are on a seven-point Likert scale where 1 is *"not strong at all"* and 7 is *"very strong."* Exhibit 6 presents the results from the two surveys.

Exhibit 6. Pre-Exercise and Post-Exercise Survey Results

Source: Survey Data Collected by the Authors

Question	Pre-Exercise	Post-Exercise
My current working knowledge of Tableau is:	1.54	4.67
My current working knowledge of how to classify costs into variable costs, fixed costs, and mixed costs is:	3.84	5.00
My current working knowledge of how to perform a Cost-Volume-Profit (CVP) analysis and identify the break-even point is:	4.05	4.86
My current working knowledge of how to calculate the unit cost to manufacture a product is:	4.27	4.67
My current working knowledge of how to use regression analysis to estimate a firm's variable costs and fixed costs is:	3.11	4.64
My current working knowledge of how to use Tableau to run regression analysis is:	2.11	5.00
My current working knowledge of how to use Tableau to create data visualizations, e.g., graphs, pie charts, tables, etc. is:	2.50	5.71

The survey results showed that students' working knowledge of Tableau, using Tableau to run a regression analysis and create visualization increased significantly. The exercise also deepened

students' understanding of identifying variable, fixed, and mixed costs, and how to conduct CVP analysis. These results indicate the exercise was effective at achieving the learning objectives.

In the post-exercise survey, we asked some qualitative questions to students to gather their feedback and perceptions on the exercise. Students were asked *"This exercise will help me in my career. If so, how? If not, why not?"* Below are some of their responses.

> *"This project provided a beginner experience on a new tool that will allow me to analyze data on a large scale and help me make decisions based on the data provided."*
>
> *"It will allow me to say I have proficient experience in Tableau in job interviews, which can be a deciding factor in whether I get hired or not."*
>
> *"Yes, it helps to get some working knowledge of this program and will be a good jumping off point to working more deeply with it."*
>
> *"I believe it will, knowing how to turn data into a presentable form for other departments to understand I believe is vital and very useful for accountants"*
>
> *"I believe it will help my career because it has given me options to make complicated data easier to read."*

Overall, students believed that this exercise helped them with data analytics skills and their future job applications. Then students were asked "*What I liked about this project was that …"* Below are some responses:

> *"It allowed me to use this program in a well-detailed and guided manner which was low stakes for a first run."*
>
> *"It was a fun exercise to understand the use of tableau and how a company like Tesla came to have great success by dialing their costs down"*
>
> *"Learning a new program and being able to try something practical and being given a project like as if I was in a meeting. It was fun doing something outside of our usual class work"*

Students also mentioned that they hoped this exercise was introduced earlier in the semester. When introducing this exercise, an instructor can give eight or even ten weeks for students to learn Tableau and complete this exercise.

Peer Instructor Feedback on the Exercise

Two accounting professors specializing in managerial accounting instruction were invited to review this exercise and provided positive comments. One notable comment is that this exercise can bolster accounting students' academic understanding of the fundamental cost-volume-profit analysis, particularly the break-even analysis. Students can gain a deepened understanding of the interrelationship between revenue, costs, production capacity, and profitability, helping them make better CVP analyses and managerial accounting decisions. Additionally, the regression analysis in this exercise helps students develop skills in utilizing linear regression models in future accounting research and case analysis courses.

Another notable comment is that this exercise strengthens students' critical thinking and problem-solving skills in professional accounting settings. Applying real-world Tesla scenarios, this practice offers students valuable strategic analysis training with hands-on data analysis and visualization experience. Students utilize Tableau functions to transfer raw data into credible analysis and forecast reports to identify Tesla's business success factors in its electric vehicle manufacturing processes. This hones students' technological and managerial accounting proficiencies, which will be crucial for their future accounting careers, which are changing rapidly with the development of high technologies (AICPA 2024).

Conclusion

This comprehensive exercise combines CVP analysis with data analytics skills using Tableau. It equips future accounting and business professionals with the required technical skills and highlights their ability to apply these skills in strategic decision-making, reporting, and performance. Through data visualization and dashboards, accountants and managers can gain insights into cost structures, break-even points, and profitability, enhancing control over the financial aspects of the business.

This exercise uses publicly available data from a real-world business – Tesla, to spark students' interest in using data analytics to apply cost, profit, and volume relationships acquired in managerial and cost accounting. It encourages students to delve deeper, fostering critical thinking skills as they uncover underlying factors. Moreover, it provides an opportunity for students to enhance their proficiency in utilizing the widely adopted visualization tool, Tableau.

This exercise addresses the pressing need in accounting curricula to provide instruction on regression analysis and predictive analytics. As the accounting profession undergoes a technological shift, predictive analytics skills are frequently identified as areas where educational programs fall short or where professionals need to catch up (Dawkins 2023).

Finally, this exercise can be further developed to ask students to explore the role of government support in Tesla's success, prompting them to consider ESG reporting and how regulators can incentivize firms to achieve these goals.

Appendix A. Student Materials and Instructions

Purpose

In this assignment, you will have the opportunity to analyze Tesla's production and financial data using Tableau to conduct a Cost-Volume-Profit (CVP) analysis. This assignment enhances your understanding of a key managerial accounting concept by applying it to a real-world business scenario – Tesla Inc. Additionally, it addresses the critical need for students to develop and acquire data analytics skills.

Learning Outcomes

You can expect to:

1. show the appropriate variables for cost, volume, and profit in CVP analysis.
2. use Tableau to perform data analysis and create visualizations to determine the break-even point.
3. use Tableau to conduct linear regression analysis.
4. analyze the impact of cost and volume on profit using Tableau.
5. assess Tableau outputs to determine logical interpretations and arguments.

Background of Tesla

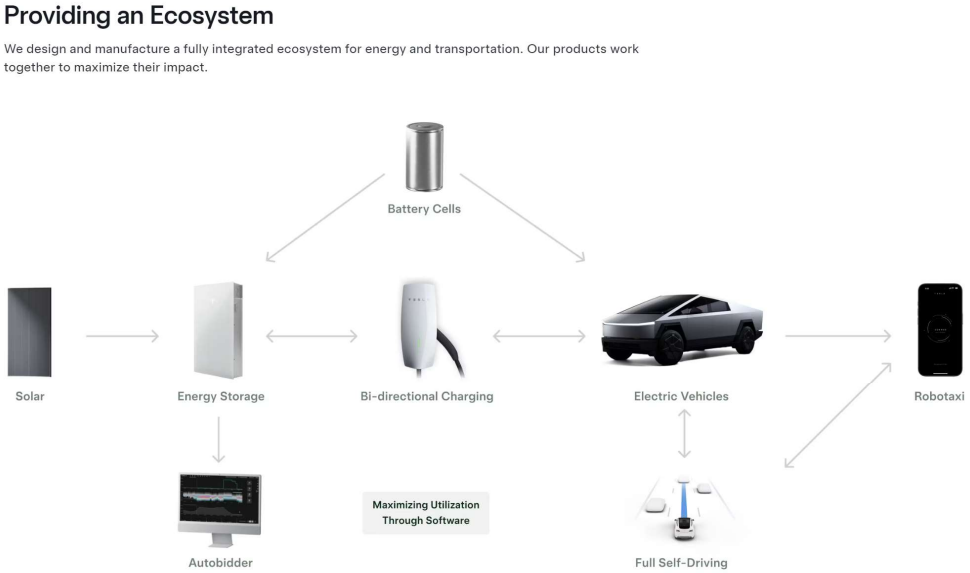
Tesla, Inc., headquartered in Austin, Texas, is a multinational automotive and clean energy company. Founded in July 2003 by Martin Eberhard and Marc Tarpenning as Tesla Motors, the company gained significant momentum when Elon Musk joined as its largest shareholder in February 2004 and later became CEO in 2008. Tesla has played a pivotal role in the automotive industry's shift from traditional motor vehicles to electric vehicles (EVs).

Tesla went public through an initial public offering (IPO) on NASDAQ on June 29, 2010. In the same year, Tesla began the production of the Model S sedan. In 2015, Tesla began the production of the Model X SUV. Both models are expensive luxury cars. The company then shifted its strategy to produce more affordable, high-volume vehicles, such as the Model 3 sedan in 2017 and the Model Y crossover in 2020. In June 2021, the Model 3 became the first electric car to surpass 1 million units sold globally (Shahan 2021). In 2023, the Model Y became the best-selling vehicle of any kind worldwide (Munoz 2024). Recently, Tesla launched the Tesla Semi truck in 2022 and the Cybertruck pickup in 2023.

In addition to electric vehicles, Tesla's subsidiary, Tesla Energy, has developed, built, sold, and installed solar energy generation systems and battery energy storage products for residential, commercial, and industrial customers. The company's mission is to *"design and manufacture a fully integrated ecosystem for energy and transportation, with all our products working together to maximize their impact."* (About | Tesla) Exhibit 1 presents Tesla's main products and the integrated ecosystem.

Exhibit 1. Tesla's Main Products and the Integrated Ecosystem

Source: https://www.tesla.com/impact



Tesla also invested heavily in expanding its production capacity, constructing five Gigafactories worldwide. In March 2023, Tesla announced plans to open Gigafactory Mexico in 2025. Exhibit 2 presents the location, number of employees, and the products produced of Tesla's primary facilities.

Exhibit 2. Tesla's Primary Facilities

Source: https://en.wikipedia.org/wiki/Tesla,_Inc.#Energy_products

Primary facilities operated by Tesla

Opened	Name	City	Country	Employees	Products
2010	Tesla Fremont Factory	Fremont, California	United States	22,000	Model S, Model X, Model 3, Model Y
2016	Gigafactory Nevada	Storey County, Nevada	United States	7,000	Batteries, Powerwall, Semi
2017	Gigafactory New York	Buffalo, New York	United States	1,500	Solar Roof, Supercharger
2019	Gigafactory Shanghai	Shanghai	China	20,000	Model 3, Model Y, Supercharger
2022	Gigafactory Berlin-Brandenburg	Grünheide	Germany	10,000	Model Y
2022	Gigafactory Texas	Austin, Texas	United States	12,000	Model Y, Cybertruck

Tesla has had a transformative impact on the automotive industry and contributed to the worldwide effort for a greener environment. The road reliability of Tesla EVs, the revolution of enhancing EV performance by software updates, and the direct-to-consumer sales model have not only made Tesla a significant competitor but have also redefined the automotive industry.

As of 2023, it stands as the world's most valuable automaker—an impressive feat for a company that's still relatively young. In 2022, Tesla achieved a significant milestone by dominating the battery electric vehicle market, securing an impressive 18% market share. The company's exceptional performance has translated into substantial growth in production and sales. In 2023, Tesla reported delivering approximately 1.8 million vehicles, representing a staggering 38% increase over the previous year. Cumulatively, by April 2023, Tesla had sold a remarkable 4 million electric cars, solidifying its position as an industry leader.

Tesla's Financial Success and Controversy

Tesla has received tremendous business success over the past decade. Exhibit 3 provides a quick summary of Tesla's performance in the ten-year period from 2013 to 2022. In 2013, Tesla delivered 22,442 vehicles, generated $2,013 million in revenue, and earned $45 million in operating income. Fast forward ten years to 2022, Tesla delivered 1,313,851 vehicles, generated $81,462 million in revenue, and achieved an operating income of $17,579 million. Tesla's deliveries increased 60 times, revenue increased 40 times, and operating income increased 390 times. When dividing the operating income by the number of delivered vehicles, Tesla's operating income per delivery was $2,023 in 2023 and jumped to $13,379 in 2022.

Exhibit 3. Comparison of Tesla's Key Performance Indicators in 2013 and 2022

Source: Created from the Financial Statements of Tesla

	2013	2022
Total Delivery	22,442	1,313,851
Revenue	$2,013 million	$81,462 million
Operating income	$45 million	$17,579 million
Operating income per delivery	$2,023	$13,379

On the other hand, Tesla has faced lawsuits, government scrutiny, and journalistic criticism. Elon Musk, in particular, has been criticized for repeatedly delaying both the production and release dates of Tesla products. Additionally, Tesla has received significant government subsidies over time. Exhibit 4 summarizes Tesla's government subsidies since its inception. These federal, state, and local government subsidies and incentives, primarily in the form of tax credits and loans, have positively impacted Tesla, particularly during its early stages. Critics argue that these subsidies have played a major role in Tesla's growth and expansion.

Exhibit 4. Summary of Tesla's Subsidies Since 2000

Source: https://subsidytracker.goodjobsfirst.org/parent/tesla-inc

Subsidy Tracker Parent Company Summary

Parent Company Name: Tesla Inc.
Ownership Structure: publicly traded (ticker symbol Nasdaq: TSLA)
Headquartered in: California
Major Industry: motor vehicles
Specific Industry: motor vehicles and energy

SUBSIDY SUMMARY	SUBSIDY VALUE	NUMBER OF AWARDS
State/Local	$2,496,769,455	29
Federal (grants and allocated tax credits)	$333,086,039	80
TOTAL	$2,829,855,494	109
LOAN / BAILOUT SUMMARY	**TOTAL FACE VALUE**	**NUMBER OF AWARDS**
State/Local loans, bond financing and venture capital	$0	0
Federal loans, loan guarantees and bailout assistance (not including repayments)	$466,500,000	2
TOTAL	$466,500,000	2

Time Period for Federal Awards: FY2000 to the present

Assignment

In this exercise, you will analyze production and financial data from Tesla to conduct a Cost-Volume-Profit (CVP) analysis and use data analytics to support your argument on whether Tesla's growth is driven by its own success or government support. The exercise is divided into two parts: **Assignment 1** and **Assignment 2**.

- **Assignment 1** (30 points): Answer three discussion questions related to CVP analysis.
- **Assignment 2** (70 points): Use the provided data and Tableau to analyze Tesla's profit.

Detailed instructions for both assignments are provided below.

Assignment 1 – Conceptual understanding of CVP Concept

The quarterly financial data of Tesla and quarterly delivery and production data from 2013 to 2022 are provided in two files. The variables in the two files are summarized in Exhibit 5.

Exhibit 5. Variable Descriptions

Source: Authors' Notes

File Name	Variables	Description of Variables
production.xlsx	Earnings Date	Date of releasing financial results
production.xlsx	Datadate	Fiscal period end date
production.xlsx	Year	Fiscal period-year
production.xlsx	Quarter	Fiscal period-quarter
production.xlsx	Production_S_X	Production quantity of Model S/X
production.xlsx	Production_3_Y	Production quantity of Model 3/Y
production.xlsx	Total Production	Total production quantity
production.xlsx	Deliveries_S_X	Delivery quantity of Model S/X
production.xlsx	Deliveries_3_Y	Delivery quantity of Model 3/Y
production.xlsx	Total deliveries	Total delivery quantity
financial.xlsx	datafqtr	Fiscal year and quarter
financial.xlsx	COGSQ	Quarterly cost of goods sold
financial.xlsx	OIBDPQ	Quarterly operating income
financial.xlsx	REVTQ	Quarterly revenue
financial.xlsx	XOPRQ	Quarterly operating expenses
financial.xlsx	XSGAQ	Quarterly selling and administrative expenses

Required:

1. Explain how you will use the data to conduct the CVP analysis. Specifically, identify the variables representing cost, volume, and profit, and define the profit equation using these variables. (10 points)
2. The dataset uses Operating Income before Depreciation. Explain why using Operating Income before Depreciation rather than Operating Income after Depreciation is more appropriate for Tesla's CVP analysis. (10 points)
3. Discuss how conducting a CVP analysis with historical data can provide insights into future performance. (10 points)

Assignment 2 CVP analysis assisted by Tableau

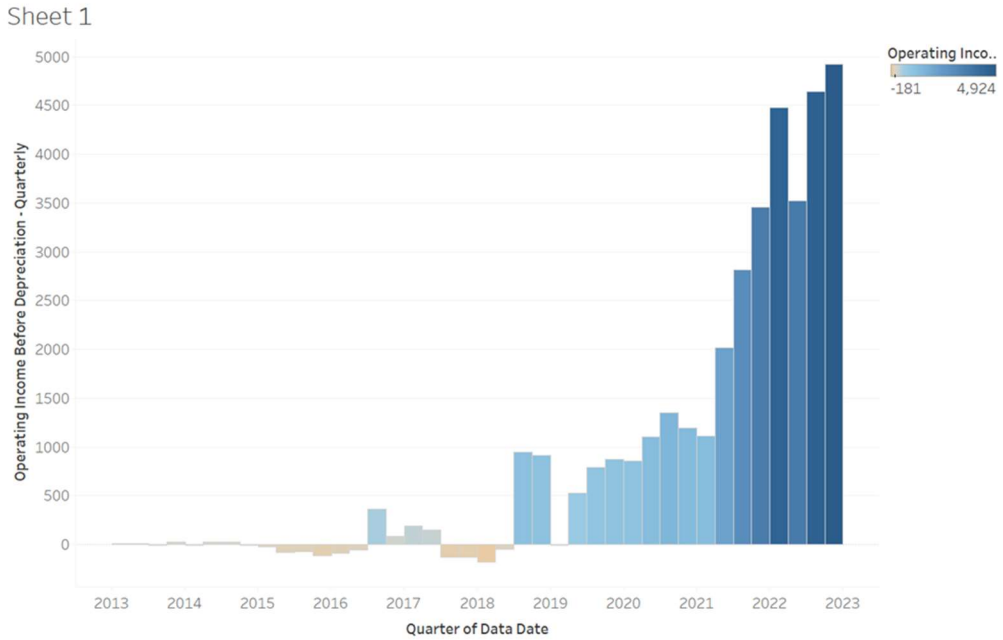
Tableau is a leading data visualization software. Tableau Desktop is required for this project. A free instructional license is available. You will use Tableau to perform data visualization and data analysis to answer questions related to Tesla's break-even point, cost trend, cost behavior, the impact of volume on business, and business forecast.

Required:

1. Use Tableau to visualize the trend in operating income similar to Exhibit 6 and identify the break-even point when Tesla started its positive profit. First, use Tableau to join the two datasets, clean the data if necessary, and create operating income bar charts similar to the example shown (note that you're not limited to producing the exact same graph—other meaningful visualizations are welcome). Then, explain and interpret your visualization in relation to Tesla's break-even point. (20 points)

Exhibit 6. Tesla's Quarterly Operating Income from 2013 to 2023

Source: Created by Authors in Tableau



2. Your next task is to use Tableau to analyze data and identify the factors that contribute to Tesla's growth. Follow the steps below to conduct a CVP analysis in Tableau, and for each step, provide a brief interpretation of your Tableau visualization. (50 points)

a) Use Tableau to create a graph plotting Revenue, Cost of Goods Sold, Selling and General Administrative Expenses, and Operating Income against Total Deliveries.

b) Plot linear regression graph in Tableau to examine the Cost of Goods Sold for the entire period, as well as for two sub-periods: from Q1 2013 to Q2 2017, and from Q2 2018 to Q2

2022. Before Q3 2017, Tesla only produced high-end vehicles, the Model S and Model X. Tesla introduced the lower-end Model 3 and Model Y, beginning production and delivery in Q3 2017, with scaling of production and deliveries starting in Q2 2018. Due to the significant difference in unit costs between high-end and low-end vehicles, as well as the low delivery volume of Model 3 and Model Y in their initial quarters, you can exclude a few transitional quarters when defining the sub-periods.
The linear regression model is Y = a *X + W
Y= cost of goods sold
X= variable cost per vehicle
W=quarterly fixed cost

c) Perform various analyses and visualizations to compare costs and revenue in relation to total deliveries:
- Create a visualization to show the trend of total deliveries over the data period.
- Calculate and present a table showing the average COGS and average SG&A costs for each year.
- Calculate and present a table showing the year-over-year percentage change in average COGS and SG&A costs.

Describe the cost behavior of COGS and SG&A with the increase in total deliveries.

d) Use Tableau's "Forecast" function to predict the Operating Income for the next year. From the forecast visualization, determine the projected Operating Income for Q1 2024.

Appendix B Assignment Grading Rubrics

Assignment 1 Grading

Discussion Questions	Excellent (90-100%)	Satisfactory (70-89%)	Needs Improvement (< 70%)
1. Explain how you will use the data to conduct the CVP analysis. Specifically, identify the variables representing cost, volume, and profit, and define the profit equation using these variables. (10 points)	Thoroughly identifies and explains all relevant cost, volume, and profit variables, including distinctions between financial and managerial accounting profit equations. Clearly describes the use of delivery quantity as volume and explains how fixed and variable components are identified.	Identifies most cost, volume, and profit variables, with a reasonable explanation of their relevance. Mentions delivery quantity but may lack detail in differentiating fixed and variable costs or connecting to the profit equation.	Fails to identify key variables or provide clear explanations. Omits critical aspects, such as the distinction between fixed and variable costs or the rationale for using delivery quantity.
2. The dataset uses Operating Income before Depreciation. Explain why using Operating Income before Depreciation rather than Operating Income after Depreciation is more appropriate for Tesla's CVP analysis. (10 points)	Provides a logical explanation of why Operating Income before Depreciation is appropriate, emphasizing Tesla's growth, capital intensity, and the clarity it offers for CVP analysis. Distinguishes between the operational focus of CVP and the role of fixed costs like depreciation.	Offers a reasonable explanation, highlighting the relevance of Operating Income before Depreciation, but may miss context about Tesla's growth or capital intensity.	Explanation is incomplete, unclear, or fails to connect the use of Operating Income before Depreciation to CVP analysis or Tesla's context.
3. Discuss how conducting a CVP analysis with historical data can provide insights into future performance. (10 points)	Clearly articulates how historical data informs future profitability, including cost behavior analysis, break-even insights, and efficiency evaluations.	Demonstrates an understanding of how historical data informs future profitability, but with limited detail or examples of specific cost behavior, break-even analysis, or efficiency insights.	Provides vague or incomplete discussion of historical data's use, with little to no explanation of how it informs future profitability or decision-making.

Assignment 2 Grading

Tableau Analysis Criteria	Excellent (90-100%)	Satisfactory (70-89 %)	Needs Improvement (<70%)
1. Use Tableau to visualize the trend in operating income and identify the break-even point when Tesla started its positive profit (20 points)	Successfully loads data in Tableau. Accurately creates a bar chart of Tesla's operating income trend. Correctly identifies Quarter 2 of 2019 as the stable break-even point, referencing data trends and profitability consistency. Recognizes alternative interpretation (e.g., Q3 2018).	Imports, cleans, and joins datasets in Tableau. Produces a bar chart of operating income trend, but may have formatting issues or inconsistencies. Provides a reasonable explanation of the operating income trend, but lacks depth or contains minor inaccuracies. May identify Q3 2018 as the break-even point without discussing Q2 2019's stability.	Imports, cleans, and joins datasets in Tableau. Produces a bar chart of operating income trend, but may have formatting issues or inconsistencies Explanation is unclear, lacks sufficient detail, or fails to identify a plausible break-even point. Little to no connection to the visualization.
2. Your next task is to use Tableau to analyze data and identify the factors that contribute to Tesla's growth. (50 points)	Successfully creates all required visualizations (e.g., revenue, cost, deliveries trends, linear regression, forecast). Accurately interprets visualizations and provides detailed, logical explanations of trends, cost behavior, and forecast results.	Creates most visualizations correctly, with minor errors or omissions. Interpretations are clear but may lack depth or precision in explaining trends, cost behavior, or forecast results.	Fails to create accurate or complete visualizations, and interpretations are vague, unclear, or missing key insights.

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