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The Impact of Cost Stickiness on Firm
Performance in the USA Technology Sector

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Declaration

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Abstract

This dissertation examined the impact of cost stickiness on firm performance for a sample of 20 Technology listed firms in NASDAQ United States of America Stock Exchange from 2015 to 2019. This dissertation assessed the different cost stickiness variables that could impact the firm performance. The linear and multiple regression analysis methodologies were carried out to analyse the quantitative data for the financial reports gathered from the US Securities and Exchange Commission (SEC) Electronic Data Gathering, Analysis, and Retrieval system (EDGAR) database. Two Sticky cost types were examined in this dissertation: cost of goods sold (COGS) and sales, general, and administrative costs (SG&A). The results supported that the listed 20 Technology firms listed in NASDAQ from 2015 to 2019 possess a sticky cost behaviour for the two types of cost examined. In addition, the results showed a significant negative influence of cost stickiness factors used in this thesis on the return on assets (ROA) as a firm performance measure. Results showed that the sticky COGS and SG&A costs influence firm performance significantly.

1.Introduction

Understanding the cost behavior is vital for concise, effective, and efficient business critical decisions. The cost behavior is an essential part in the process of understanding the firm's performance, predicting expenses, and forecasting earnings.

There's an increase demand for better understanding of the cost narrative in order to control and forecast the budget expenditure and the relevant business decisions especially in fast paced and highly competitive business sectors where agility, effectiveness and efficiency are basic managers expectations.

The historical cost behavior patterns estimation has been always an interesting topic for managers to explore. The past behavior examination helps the managers to forecasts and plan the cost in a precise manner and accordingly being able to decide more precisely. The managers and Finance teams understanding for the cost behavior is critical for providing and using the information to make effective decisions.

1.1 Cost Behavior

Brummitt (2017) suggested that Cost behavior is the way the different cost components act in response to change in activity and the different managerial decisions.

“Cost behavior provides crucial information to the manager of an organization. The information allows managers to prepare budgets, to estimate cash flows, to plan dividend payments, and to help in evaluating project profitability. Cost information also provides scientific analysis for the facts and figures and managers pay attention on how to minimize the risks involved in projects. Traditional costing studies rarely examine cost behavior , and its effect on performance despite its importance for managerial decision making” (Maria K. and Rayenda KhK. B., 2018 p.2)

When we examine the cost behavior , It is not accurate to label the behavior as "Positive/Good" or "Negative/Bad". Cost behavior is considered as the sensitivity of the cost components of the different fluctuation either in the volume of sales or the units manufactured.

Cost behavior provides crucial information to managers. Examining the behavior enable the managers to forecast budgets, cash flows, payments of dividend, and support the evaluation of the different products, project, cost centres and production lines profitability. Cost Analysis enable the manager to reduce the decision making risk by relying on scientific analysis. The conventional cost studies seldomly scrutinize the behavior of the cost and the relevant impact on the firm performance in spite of the criticality for managerial decision-making

1.1.1 Traditional Cost behavior overview

In the perspective of managerial accounting, it has been disclosed (Hilton, Maher, and Selto, 2008) that traditional behavior models consider a linear relationship between the activities and the costs. Traditional costing behavior s discriminate between the costs from the nature perspective either as a fixed or variable costs. This dichotomy considers the sensitivity concerning the activities performed by the firm, as the variable cost changes when there is a relevant change in the volume of a certain activity, while the fixed cost is

constant regardless the volume change as long as this change is within certain range. This range is being defined as the “relevant range”. Which means that costs increase or decrease in the same percentage when the volume is increased or decreased.

$$\text{Total cost} = \text{Total Fixed cost} + (\text{Unit Variable cost} \times \text{Number of units})$$

Equation 1 Traditional Cost overview – Total Cost



Figure 1 Traditional Cost overview – Total Cost

Dury (2007) noted that the fixed cost is completely independent to the manufacturing or sales volume while the variable is dependent on the manufacturing and the sales (Figure 2). Practically it is absolutely important to recognize these two cost categories. The cost behavior could be defined as 100% variable costs, 100% fixed and semi-variable and semi-fixed costs.



Figure 2 Traditional Cost overview – Fixed and Variable Costs

1.1.2 Sticky Cost behavior overview

Anderson, Banker, and Janakiraman (2003) suggested that the traditional accounting methodologies basically assume that costs move proportionately or symmetrically with increases or decreases in the activity level, while recent studies by Brewer, Garrison, and Noreen (2015) found that, as a significant portion of operating costs, SG&A costs (selling, general and administrative expenses—are the costs associated with running a business) behave in an asymmetric approach. Meaning that, the operating costs and most

specifically the selling, general and administration costs (SG&A) decrease less when the sales go down compared to their increase when sales go up by an equivalent amount.

“The first study providing empirical evidence of cost stickiness and using a new methodology and model is Anderson et al. (2003). In this study, cost stickiness is explained by managers’ decision to adjust resources. The result of this study shows that selling, general and administrative costs (SGA) rise more whenever there is an increase in the sales than they fall for equivalent decreases, using a large sample of firms from multiple industries. The asymmetric cost-behavior model was just developed firstly by Anderson et al. (2003) stating that the selling, general and administration costs (SG&A) costs are asymmetrically and significantly associated with changes in sales revenues.” (Yosra M., Rania.C, Anis J., 2020 p. 2)

“Many researchers pointed out that the differences between the traditional understanding of the cost behavior and cost stickiness phenomenon depend on the managers decisions and managerial approaches and strategies of dealing with the change in sales revenues. Managerial intervention affects the adjustments of the resources in a company. When there is a decrease in the sales revenue, managers need to decide whether to retain the unutilized costs or to reduce costs into optimal levels. Based on these concerns, managers have to consider market movements, the development of macro economy, the performance of companies in prior periods and the likelihood of fluctuation in sales revenue.” (Yosra M. and Anis J.,2019 p.8).

1.2 Firm performance overview

The modern business environment throughout the previous decade has commenced multiple fast-paced transformations, leading to unprecedented intricacy and ambiguity. In this everchanging fast paced situation, which describes the modern economy, corporates witness harsh competition to do things more effective, efficient, while moving faster and optimizing costs. Firms aim to do things efficiently by accomplishing the desired results with the least possible amount of time and investments. While Effectiveness means that firms need to ensure that whatever being done is impactful and successful enough in producing a desired result.

The increasing number of environmental challenges helped the different firms to enhance their adaptability mechanism with a business as usual continues performance mechanisms. Continuous performance measurement and assessment is the only way the firms are able to move progress and move forward in order to achieve effective and efficient results.

“Assessing the performance of organizations has always been of interest to management teams and researchers. In addition, measuring business performance in today’s economic environment is a critical issue for academic scholars and practising managers. Researchers have extended efforts to determine measures for the concept of performance” Omar T. and Zineb I. ,2019 p.18)

Peterson, Gijsbers, and Wilks (2003) outlined that there are many ways to measure firms’ performance, financial managers and researchers must decide which measures are most appropriate based on the nature of the conducted study. In twenty-first century first decade,

the organizational performance definition was mainly centered on the capabilities of a firm to utilize the available resources in an efficient and effective way in line with the overarching company objective taking the products and service delivered relevancy to the end users.

On the last decade, the firms focused on creating the definitions dichotomy, tools and governance to differentiate between the firms operational efficiency and effectiveness. Firms Efficiency is the ability to utilize least financial and human resources in terms of effort, time and investments to achieve the desired outcomes while the Firm Effectiveness is the degree of certain product or service impact and success against the predefined success criteria. Managers need to understand their actions and decisions impacting the organization success.

Lebans and Euske (2006) suggested that several descriptions could demonstrate the Firms Performance

- A bundle of financial and nonfinancial Key performance Indicators (KPIs) that present clarity about the progress of the Objectives and Key Results (OKRs).
- Performance measurement is not static; it is absolutely dynamic one that demand continuous assessment, interpretation and governance.
- Performance may be demonstrated and anticipated by using models that illustrate the mechanism of how future performance can be impacted by the current actions.
- Performance can be apprehended in a different way based on personal interpretation of those who are assessing the performance.
- In order to define the performance notion, it is mandatory to understand the foundational characteristics of the area of responsibility and what success looks like for this area.
- To report the performance on the firm's level, the result quantification is a in terms of facts and figures.

There are several approaches to measure the overall firm performance including and not limited to the Balanced Scorecard, Malcolm Baldrige Model, Performance Pyramid and Performance Prism. This study is only concerned about the Firm Financial performance which is an integral part of all the performance measurement models.

1.3 Impact of Cost stickiness on Firm performance

Many researchers investigated the relationship between cost behavior and return on investments and argued that the future decline of the firm's profitability is strongly related to cost growth. The higher the cost growth, the lower is the firm's profitability. Their results showed that the General expenses and admiration costs (SG&A) and the Cosy of Goods sold (COGS) have a clear impact on return. Those firms with high growth in the sticky cost of COGS and SG&A are expected to underperform in future. Other researchers concluded that the relationship between cost stickiness and firm profitability is negative. The measure of cost control quality of firm management is the ratio of changes in SG&A. The higher the ratio, the lower is the firm's profitability. Firms must spend more resources when doing sales activities as outlined by Warganegara and Tamara (2014).

However, many studies backed up the agency theory, which showed that the manager (or the Agent) do the sticky cost for the best interest of the business owner (or the principal) because it may influence the firm performance. Managers may retain more COGS materials in a dire economic condition rather than renegotiating with suppliers for a lower price of new

COGS purchase. They hesitate to reduce production when the economy is down because managers find that this dire situation does not last long and prefer to adapt if it is consistent. The reason is that managers may need to bear higher costs for unutilized resources, costs for keeping the raw materials and compensation. Hence, sticky cost behavior leads to lower costs, and consequently, influences firm performance.

2. Objectives

2.1 Research Problem

Maher et al. (2008) stated that the Cost behavior is the way costs react to the activities and decisions changes. Cost behavior understanding is crucial for those who manage the operations and for those who are accountable for the financial accounting to provide and utilize the information that would help them to decide effectively. Horngren (2012) outlined those different stakeholders demand appropriate, accurate and relevant information that feed in the different forecasting, monitoring, controlling, deciding, and evaluating processes.

Lanen et al. (2011) suggested that managers must understand the dynamics of the costs behaviors to make data driven decisions about products budgeting and performance that from management's perspective. Weiss (2010) outlined that from the investors' point of view, investors rely on the financial statements that are officially published. forecasting cost behavior is a mandatory factor of earnings prediction from financial analysts' perspective.

Barandagh (2014) outlined that several studies claimed that while the total costs on average are stable during the sales decrease period, both the selling, General expenses, and admiration costs (SG&A) and the Cost of Goods sold (COGS) changes become less responsive to the change in the sales revenue, and the stickiness of the costs changes but in different tracks. Horngren, Datar & Rajan, (2012) pointed out that other Studies mentioned that one of the important contributing factors to cost stickiness is the manager's perception of underutilized resources during declining sales and adjusting cost later when the sales are back to the forecasted ranges. Even during sales decline, laying off the employee to avoid underutilized resources is an unfavourable and accordingly managers must consider professional out-sourced employees to fulfil the uncertain conditions.

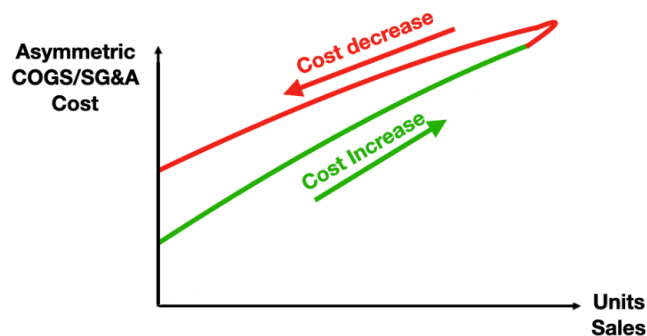


Figure 3 Asymmetric COGS/SG&A cost behavior

There is insufficiency of research focusing on the impact of the cost behavior on firm performance because most of the research focus on the impact of firm size, firm leverage, firm growth, and firm age on firm performance. This research focuses on certain aspect, study the different cost stickiness impacts on firm financial performance among linked Technology companies.

2.2 Research Objective

Advanced understanding of the cost behavior is crucial for firms and stock markets to safeguard the investors' welfare in addition to fulfilling their data needs. To the best of our knowledge, this study is the first on its kind to work on exploring the cost stickiness in the U.S. Tech industry.

Studying how cost stickiness impacts a firm's financial performance among Technology companies might give exciting insights. The study research question is:
Does the Cost Stickiness phenomena has an impact on the firm financial performance in the USA Technology sector?

The behavior of costs needs to be understood, governed and managed. However, many studies claimed that the costs and activities relationship is not always linear. This asymmetric behavior of costs contradicts the conventional assumption of the linear activities costs, known as sticky costs. Sticky costs might affect the firm's performance, which is currently being researched to ensure this relationship exists.

This study investigates if there is a relation between cost stickiness and firm performance using financial key performance indicators. This study is limited to the officially published 20 technology companies in NASDAQ-100 stock market based in market cap as a primary source of data. This study will focus only on the financial results to evaluate the stickiness of the cost SG&A costs (selling, general and administrative expenses, and the impact on the firm financial performance using ROE (Return on Equity). The study will avoid considering 2020 as the COVID19 pandemic has changed the market dynamics so the study will consider 2019 backwards.

The objectives of this study are:

- Investigate the relationship between Cost Stickiness and the performance of the firms in the Technology US sector.
- Investigate the Technology sector cost behavior relationship. This sector was selected as it's the most advanced sector in terms of digitalization and technology usage which positively impacts the managers decisions efficiency and effectiveness.
- Provide recommendations to managers on cost stickiness as an influencing factor on the firm performance to consider hand in hand with the traditional view of cost behavior .
- Introduce more awareness about the cost behavior to safeguard the investors' interests and fulfil their needs for information.

2.3 Research Hypothesis

As the scope of this study is to probe the relationship between the cost stickiness and the firm performance using the financial key performance indicators. The financial performance was analysed based on official NASDAQ performance reports. The primary source of data is the integrated reports officially published in the U.S. NASDAQ stock exchange, which includes the listed 30 technology companies in the period from 2015 to 2019. Based on above research questions, the following hypothesis will be studied:

H1: There is a negative relationship between Cost Stickiness and firm financial performance.

H1a: There is a negative relationship between Cost Stickiness (selling, general and administrative costs SG&A) and firm financial performance (represented by the Return on Assets ROA).

H1b: There is a negative relationship between Cost Stickiness (Cost of Goods Sold COGS) and firm financial performance (represented by the Return on Assets ROA).

3.Literature review

3.1 Cost Stickiness framework

3.1.1 Traditional Cost Behavior

Banker, Basu, Byzalovb, and Chen (2016) suggested that the conventional understanding of the cost behavior discriminates between the fixed and variable costs from a firm activity level stand point. Fixed costs are decoupled from the activity level, while the variable costs are proportionate to the activity level. Opposing to this conventional theory, different researches reached out to an asymmetric cost behavior .

The traditional models as shown in figure 3 assume that costs behave in a symmetric way; that is, variables costs vary in a proportional manner with relevant cost drivers change, while the fixed cost are considered as fixed by being decoupled from any activity level change.

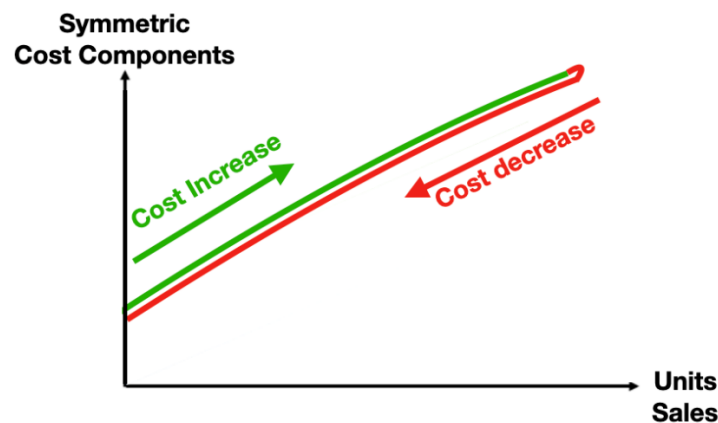


Figure 4 Symmetric cost behavior

Banker et al. (2016) suggested that understanding the symmetric cost behavior is of interest to researchers, managers and accountants, taking into consideration the impact on corporate profits. The behavior of costs change based on its category, as variable costs vary proportionally with the sales volume, and fixed costs remain constant. From the financial perspective, variable costs are variable resources used by the managers in the manufacturing process of either goods or services. That being said, the fixed costs are considered as the capacity of the production and do not vary with output. However; when costs respond in an asymmetric manner to the positive or negative changes of different activities, this behavior is outlined as sticky costs.

The costs can be controllable and uncontrollable. Controlled costs are the cost that could be influenced and governed by the managerial decisions including and not limited to the manufacturing direct materials and direct labour while uncontrollable costs are those that are not under the control of the production managers and imposed on the company level including and not limited to the company-wide advertising cost.

“The success of responsibility accounting system depends on the ability of company to identify correctly which costs each level of management can control. Not all controllable costs are variable. Some fixed costs, such as the cost of lighting during a production shift, are also controllable. A watchful manager may generate cost savings even though costs do not directly relate to output. Conversely, variable costs are not necessarily controllable cost. Costs are controllable by one who monitors them. Costs are only variable when they are a function of output” (Petr, N. and Boris P. ,2014 p92)

In the traditional cost behavior s model, Armanto, Tiono and Suthiono (2015) showed that the manager accountants consistently develop assumptions regarding the cost behavior considering that the change in the activity level of a one cost driver or a single activity, may justify the change in the total costs and the associated cost behavior is approximately by linear relationship governed by a relevant range. The cost that change proportionally to the activity level change is considered as a variable cost while the fixed costs are not proportional to the activity level fluctuation. Many studies proved that mangers can adjust only some of the resources in the short run period.

3.1.2 Sticky Cost behavior

Opposing the conventional view of the symmetric cost behavior, different researches concluded an empirical proof for the cost behavior with asymmetric behavior. The asymmetric cost behavior narrate the relationship between cost and volume depending on the tendency of activity level fluctuations. The new illustrated behavior pointed out to less cost decrease when activity level decline than they rise for an corresponding activity increase.

Several studies by Anderson, Banker, and Janakiraman, (2003); Banker, Byzalov, and Chen (2013), Banker and Chen (2006), and Chen, Lu, and Sougiannis (2012) outlined that as a result of the traditional cost behavior model’s lack of clarity and how complexity and congestion affect the shape of the traditional costing curve, Researches proposed accordingly different slopes that are based on whether the activities are increasing or decreasing. Because the slope of the activity decrease is smaller than the slope of the activity increase, the costs are defined as “Sticky.

In several studies, it has been noticed that the asymmetric cost includes sticky cost in addition another phenomenon called anti-sticky cost. Kama and Weiss (2013) outlined that in case there’s a decrease in the revenues, the share of sales, general and administrative (SGA) costs increase instead of decreasing following the decline in the sales. This is due to the phenomena of asymmetric cost which is known as the sticky cost, while the cost rises less when the activity level increases than when activity level decreases by an uniform amount called anti-sticky cost. Costs do not change with the relevant sales volume change, so there is an asymmetric behavior . In other words, when the sales of the former period were increased, sticky costs appeared, and when the sales of the previous period were decreased, anti-sticky costs appeared.

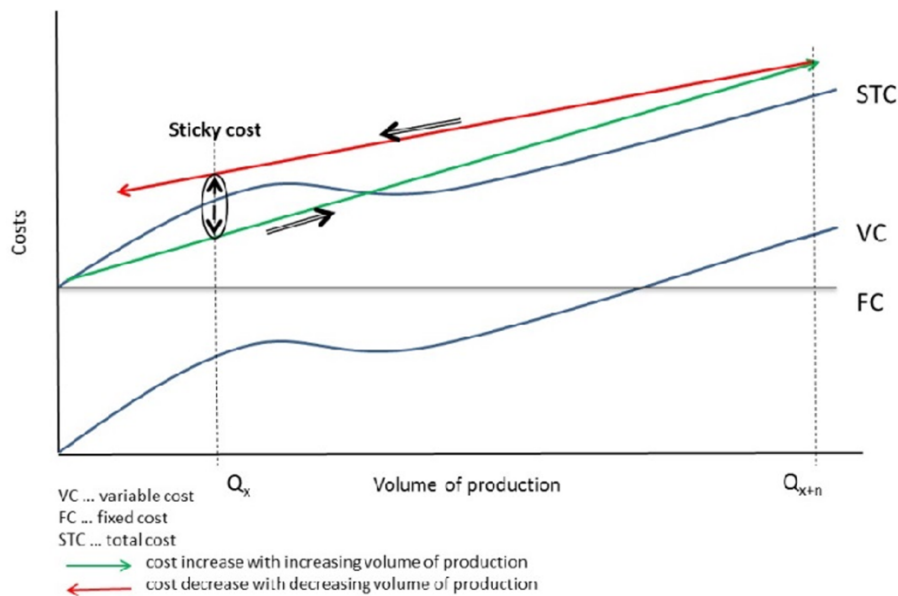


Figure 5 Sticky Cost (P. Novák & B. Popesko, 2014)

One of the very early researches that examined and identified the phenomena of the cost stickiness phenomena was that by Anderson et al. (2003). This research labelled costs as a sticky one when they rise more than they decline for an equal activity level. accordingly, the cost prediction methodologies depends on the symmetric cost hypothesis may not be pertinent to different managerial activities such as budget planning, cost analysis, cost monitoring and cost control. Many conventional methodologies would not provide precise results; for instance the cost-volume-profit analysis, budgeting, and cost-plus pricing. Therefore, it is crucial to deliberate the stickiness phenomena when classifying costs in order to ensure proper competitive advantage for firms in the marketplace.

3.2 Sticky Cost drivers

Kama and Weiss (2013) pointed out that two potential reasons are there for a sticky cost. The managers intentional intervention in the production to accomplish certain personal or private goals could be the first potential reason. The limitation of the technology as companies with imperfect technological evolution could display high sticky costs and this could be the second potential reason. On the opposite, the advanced forms from technological standpoint could display less sticky costs. In several studies, it was observed that fine tuning of resources by managers aiming to accomplish private or personal goals actually prevent sticky cost and favour the symmetric cost.

3.2.1 The Cost of Goods Sold (COGS) and Sales, General and Administration expenses (SG&A) sticky nature

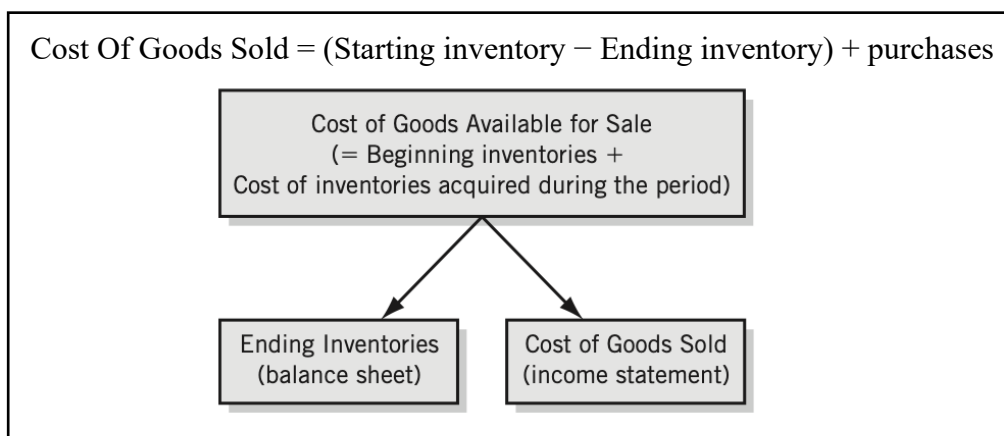
The Cost of Goods sold (COGS) is the summation of all the manufacturing direct cost including the manufacturing material and labour expenditures in addition to the cost of the long term assets over the usage lifetime which is known as the amortization costs. The

Cost of Goods Sold (COGS) doesn't include any sales, distribution and/or marketing costs.

Subramanyam, K. R. (2014) noted that till the products are sold, all relevant costs stay on the balance sheet as inventory. Once the product is sold, the relevant costs are conveyed as cost of goods sold (COGS) into the income statement. The Cost of Goods Sold (COGS) appears on the manufacturing firms income statements and it doesn't appear on the wholesalers or retailers as those incur the cost of Sales. The Cost of Goods sold (COGS) is being used by Managers as an important key performance metric to determine the manufacturing process efficiency as it is subtracted from a company's revenues to determine the form gross profit which evaluates how a firm manages material and labour throughout the production process.

“An important concept in inventory accounting is the flow of costs. If all inventories acquired or manufactured during the period are sold, then COGS is equal to the cost of the goods purchased or manufactured. When inventories remain at the end of the accounting period, however, it is important to determine which inventories have been sold and which costs remain on the balance sheet. GAAP allows companies several options to determine the order in which costs are removed from the balance sheet and recognized as COGS in the income statement.” Subramanyam, K. R. (2014) Financial Statement Analysis, University of Southern California, Mc Graw Hill, pp. 235.

The Cost of Goods sold (COGS) is calculated by summing the delta between the ending and Starting inventory and the purchases as stated in Equation 2



Equation 2 Cost Of Goods Sold (COGS)

The Sales, General and Administration expenses (SG&A) includes all the various daily operating costs needed to run a business other than the good or service production costs. The Sales, General and Administration expenses (SG&A) includes various different expenses, such as utilities, Legal costs, office supplies advertising, facilities rental, marketing and salaries of management and administrative staff who are not related to the product manufacturing costs. It is important to distinguish the difference between SG&A and COGS, SGA does not factor in the goods and services production material and labour costs, which are computed independently as cost of goods sold (COGS). The SG&A doesn't factor in the firm's research and development (R&D) costs. The SG&A costs play a vital function in concluding the firms profitability and the determination of the firm's break-even point where the revenue generated is the same as the incurred expenses.

SG&A has been used by managers as a quick win for boosting profitability and/or reducing losses as cutting these expenses can be easily done without negatively impacting the manufacturing and or the sales processes.

$$\text{Sales, General and Administration expenses} = \text{Selling expenses} + \text{general \& administrative expenses}$$

Equation 3 Sales, General and Administration Expenses (SG&A)

Operating Profit includes cost of goods sold (COGS) and operating expenses (OE) subtracted from the sales revenue. operating expenses (OE) could be categorized as selling, general and administrative (SG&A) expenses, and income taxes accordingly the COGS and SGA together strongly influence the firms Operating profitability.

$$\text{Operating Profit} = \text{Sales Revenue} - \text{Cost of Goods Sold (COGS)} - \text{Operating Expenses}$$

Where

$$\text{Operating Expenses} = \text{Sales, General and Administration expenses} + \text{Others}$$

Equation 4 Operating Profit

Many researchers found evidence that Cost of Goods sold (COGS) and General and Administration expenses (SG&A) costs increase when the activity level increase, but they don't decrease in the same quantity when the activity decreases. In other words, COGS and SG&A are sticky by nature.

Huang, Jiang, Tu, and Zhou (2015) found that the future firm's profitability and the cost growth of the firm (SG&A and COGS) are strongly inversely proportional. The higher the cost growth, the lower is the firm's profitability. The results showed that the COGS and SG&A have a noticeable impact on stock return. Those firms with high growth in the sticky cost of COGS and SG&A will underperform in future. However, the results of these studies argued that SG&A and the COGS do not display sticky cost behavior for insignificant revenue variation. But, when revenue changes by more than 10%, costs display sticky behavior.

For the technology companies, the COGS is the cost incurred by these companies to deliver an end-to-end solution to customer whether this solution is an application or Software as a Service (SaaS). Common COGS Expenses for Technology companies include and not limited to:

- Data Centre hardware, software and space costs that are used to deploy data centres to host the software that customers are using or the cost of hosting if the company is using another company's data centres.
- Any 3rd party Software used to deliver the final product to customers
- Labour costs tied to the employees who design, manage, operate, and run the service including all the THINK, BUILD and RUN activities. THINK activities can be seen as the design and planning, BUILD activities as the implementation and integration while RUN activities are the day-to-day technical operations/ maintenance and the Customer service non-technical team.

For technology companies, the SG&A include direct and indirect selling expenses incurred by these Technology companies that are not assigned to specific solution, application or Software as A Service (SaaS), and therefore are not included in the COGS categories. The technology companies SG&A category includes:

- All Supporting functions costs including and not limited to the human resources, marketing, accounting, security, trust & safety, business integrity enforcement, and IT help desk.
- All the sales commission costs, advertising, general expenses, and promotions.

Most of the technology companies COGS components are not sensitive to the sales decline in the same manner of sales increase. As example, The data centres hardware would need extra investments/costs to upgrade the servers capacity in line with the increase of the active Monthly Active Users (MAU) in a symmetric manner however, the investments couldn't go down symmetrically with the decline of demand as the hardware requires modernization every 3 to 5 years regardless of the demand so the cost of expansion will be eliminated however modernization for the exiting base will be needed leading to an asymmetric behavior. Same Applies for the SG&A, where most of the supporting functions couldn't be fully symmetric with the sales.

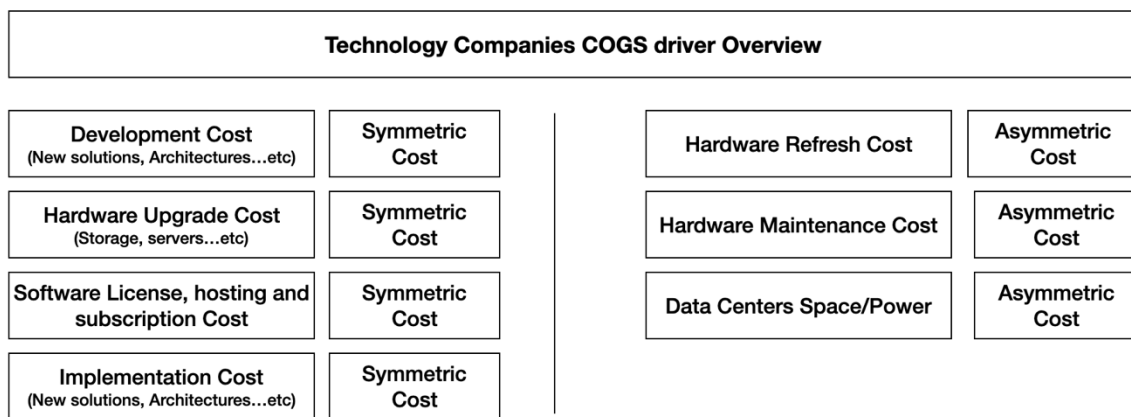


Figure 6 Tech Companies cost driver overview

3.2.2 Managerial Decisions

Awad I. & Amr E. (2017) assumed that the cost stickiness behavior could be as a result of the intentional decision the managers take whenever the sales level decrease. The intentional choices and uncertainty of managers to reduce the resources as a harsh reaction for the reduction in the sales are the crucial motives for the sticky cost. Many managers are stumbling to cut idle human or physical resources when there is a decline in the demand.

“Thereby implying that firms bear the unutilized resources cost that the firms should not bear. However, when demand grows, managers expand resources normally, and thus the related costs increase normally. Therefore, the costs’ decrease when demand declines will be lower than the costs’ increase when demand increases, resulting in sticky costs. Thus,

managers' hesitancy leads to sticky costs, which leads to a question raised by the researcher: why do managers hesitate to cut slack resources when demand declines, while they do not hesitate to hire more resources when demand increases?" (Awad I. & Amr E., 2017 p.17).

From industrial managers perspective, Cost is extremely important but operational efficiency is not less important than the cost optimization. Cutting the slack resources for each and every sales decline may have long and medium term collateral damage on the firm operational efficiency. Reducing the resources symmetrically with the decline in sales even if this decline is temporary and then hire more resources when demand increases may lead to several negative impact on the firm. Not only the resources who left will be impacted but those who didn't leave will be negatively impacted due to the loss of morale, loss of trust in the team's skills and capacity to accomplish and land an impact. There may be another collateral damage on the firm as this may lead to high turnover rate among the existing firm employees as they might feel less secured and more stressed. This might lead to loss of valuable knowledge and experience and may lead to extra trainings, learning and developments cost. Managers may delay the resources cut when there's a decline in the demand for the reason that they consider a trade-off between retiring idle capacity costs and operating with the additional costs of slack resources. This could be other factors justifying why decision makers are uncertain and sceptical to cut idle resources when demand decrease, while they do not think twice to onboard extra resources when demand rise up.

Many studies examined the relation between variable costs and man hours. The result revealed a strong sticky cost behavior for maintenance and restoration costs and remarked that these costs in decreasing activity are higher than in preceding periods of increased level of activity.

There are several factors influencing the managers decisions that could be summarized to the following points

3.2.2.1 Operational efficiency

Occasionally firms avoid layong off skilled calibres and resources who work effectively within team and this is one of the sticky costs potential causes. It can be difficult to hire the same calibres and specialities when the demand is back to the prior levels, and the time needed for a new forming then storming and finally can be long. What applies to the human resources applies for the assets as managers could hold high quality assets despite unutilized. This is very valid reason for this research scope as finding and retaining the calibres in the USA Technology sector is challenging taking into consideration the niche talent markets.

Kama and Weiss (2013) suggested that managers' incentives can mitigate the cost stickiness phenomena. Whenever the human resources compensation philosophy is linked to from profitability and when managers have the motive to achieve certain profitability north star, they are more inspired to optimize the resources when the sales or production levels decline and limit the increase of resources when the sales or production levels start to rise up.

That being said, some studies proved that the cost of the reacquisition and service rebuild, learning, development as well as costs for winding down and building up firm-specific teams could be higher than the inactive capacity costs in a period of having low activity level. Possessing excess human resources capacity can also provide an agile response to any potential demand increase in the near future demand,

3.2.2.2 Contractual and Social obligations

Downsizing resources can be a complicated topic that is governed by internal functions like the policy, supervisory board and/or active labour unions. This is in addition to external prerequisites including and not limited to employment and social legislation.

Anderson et al. (2003) suggested that firm may avoid laying off employees based on its human resources guidelines during the demand decline periods. Social benefits could result in the sticky cost behavior as the layoff of employees couldn't be an option on the table for certain individuals, vulnerable workers, senior citizens, single mothers due to restrictions related to the social benefits and governing laws and regulations.

Calleja, Steliaros, and Thomas (2006) concluded that a valid dismissal reason is a prerequisite for issuing a dismissal notice in certain . The valid dismissal reasons could be such bad conduct or operational redundancy. While Pregnant women, those on paternity or maternity leaves, and persons with disabilities due to restrictions related to the social benefits and governing laws and regulations.

“The manager could agree to cut the resources and bear the adjustment costs. These adjustment costs include severance pay to motivate long-time employees to leave the firm when capacity must be downgraded as well as the costs of searching for, hiring, and training employees when the demand is restored” (Thomas W., Anja R. and Richard R., 2013, p.4”

3.2.2.3 Managers personal self interest

Managers' incentives is related to the individual interests. Theoretically, the managers are the shareholders representatives however the interests of managers may be different from shareholder's interests. Cost reduction, Sales improvement and operational efficiency are always the stakeholders main interests aiming to increase the values of the firms. Managers may have individual interests which make their own individual goals not aligned with the stakeholder's.

Therefore, it is feasible to sort sticky cost manifestation as illustrated in figure 7. The first category illustrates the forecasted adjustment and holding costs high ratio, meaning that the higher the ratio in a time of demand decline, the less possibility and financial drivers could be witnessed to decrease the costs to the level of activity and accordingly mitigate the sticky costs. In the second and third categories, the costs of adjustment are equal to or less than the cost of holding. accordingly, it would be feasible to adapt the variable costs to the lower activity level.

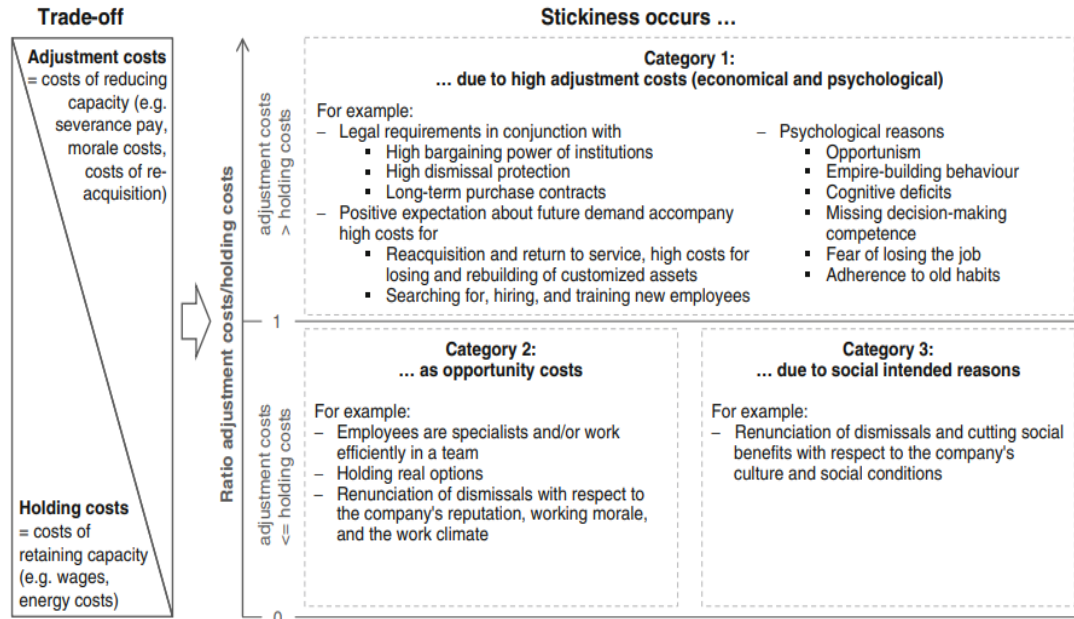


Figure 7 Reasons of Sticky Costs due to Adjustments Costs (T.W. Guenther et al., 2013)

3.3 Firm Performance

Successful firms are one of the developing nations cornerstones. Many economists consider successful firms like an engine that push forward the economic, social, and political development. Performance is a crucial factor enabling firms to survive in such a competitive business environment.

Peterson, Gijsbers, and Wilks (2003) defined the firm performance focusing on the bandwidth and ability of a firm to effectively and efficiently utilize the existing resources to achieve consistent objectives of the company, in addition to respecting the relevance to the end users.

Several researchers including and not limited to Colase (2009) considered the term “performance” as an overarching broad definition as it covers different narratives such as financial performance (Growth, Profitability, return. Etc) in addition to internal operational efficiency, customer relationship, innovation, and competitiveness.

3.3.1 Common Models of Firm Performance Measurement

Researchers have identified different models to measure the firm’s performance. firms ‘performance has been defined generally as the ability to deliberate on customer requirements effectively and efficiently.

Nwankwo, Ewuim, and Asoya (2012) suggested that performance is defined as the impact of activities executed in any business area, focusing on the general productivity, effectiveness, and efficiency. Eniola and Ektebang (2014) noted that other studies stated that the performance is categorised into two parts: financial or sales-based, measured

using indicators such as the level of profitability, the growth rates, the productivity effectiveness, the volume of sales revenue, the percentage of the market share, the return on investments, and added value by the product or service. The second factor is the non-financial or firm-based measured in terms of the people development, CSAT (customer satisfaction), job fulfilment, efficient organisational methods, and processes.

3.3.1.1 The Balanced Scorecard

“The Balanced Scorecard (BSC) model was developed in the early 1990’s by Robert Kaplan and David Norton. The introduction of BSC means that the goals, the indicators, and the strategic actions are assigned to concrete perspectives (Horvath et al., 2004). The Balanced Scorecard translates the mission and the organization strategy into a set of performance indicators that offers a model for the performance measurement system.” Ondrej Zizlavsky, 2013, p6)

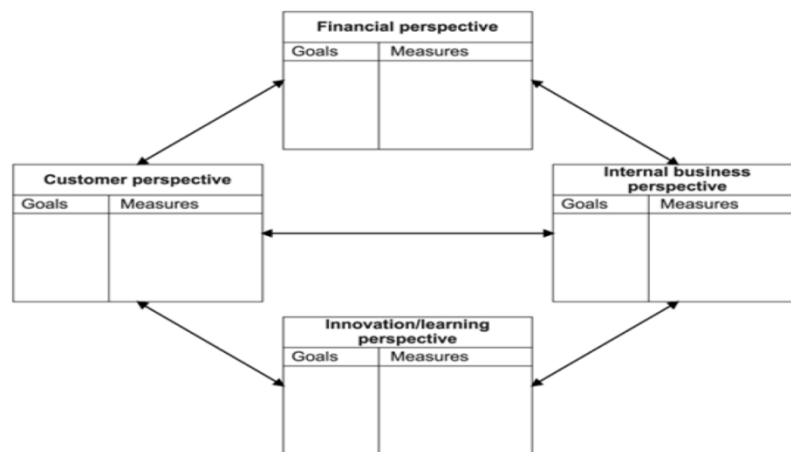


Figure 8 Balanced Scorecard (BSC) (Kaplan et al., 1992)

The BSC model considers four different perspectives:

- **Financial** (From shareholders perspective): Several firms emphasis on the financial results and don't pay much attention to any other perspectives.
- **Customer** (From customers perspective): understanding customers quality, costs and distribution, and future needs from the organization
- **Internal Processes** (From efficiency perspective): understanding how internal processes work.
- **Innovation and Learning** (From development standpoint): The Organizational capability to innovate and develop innovation solutions is linked to the customers, process, and financial efficiency.

3.3.1.2 The Performance Prism

Neely, Adams, and Kennerley (2002) developed the Performance Prism (PP) as an evaluation system tackling the main challenges from business perspective to which a wide variety of organisations will be capable to connect with.

Michaela (2012) considered the performance prism as a second-generation Performance management system. It is used by the managers to govern their thought process. The PP entails 5 interrelated outlooks:

- Stakeholder Satisfaction: What stakeholders need in order to be satisfied.
- Stakeholder Contribution: What does the firm need from stakeholders.
- Capabilities: What are the competences from practices, technology, people, and infrastructure the firm need to be successful.
- Processes: The processes we must develop to set the strategies up for success.
- Strategies: What are the strategies the firm need to adopt in order to ensure the stakeholders requirements are fulfilled?

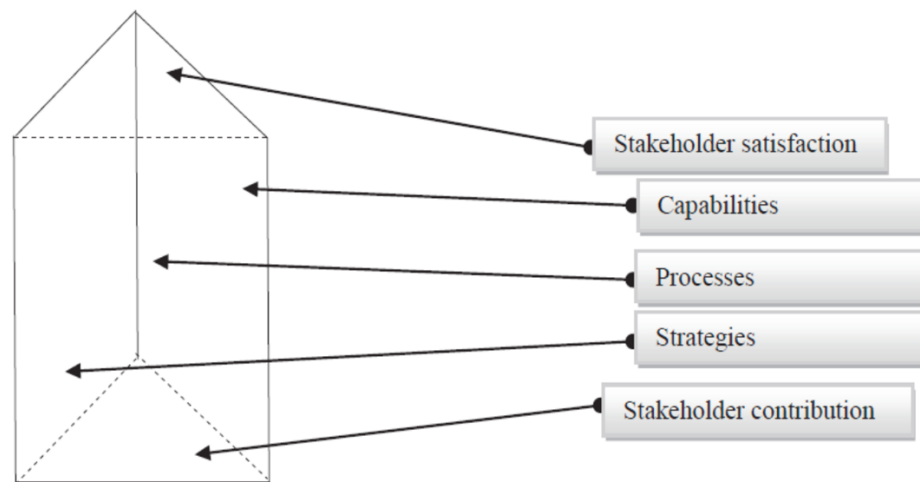


Figure 9 The performance prism (Neely et al., 2002)

3.3.1.3 The Performance Pyramid

Linking the organisation strategy with its operations is the main objective of the performance pyramid. The performance pyramid translates objectives in a top-down approach based in the customer priorities and measures the performance in a bottom-up approach as outlined by Tangen (2004).

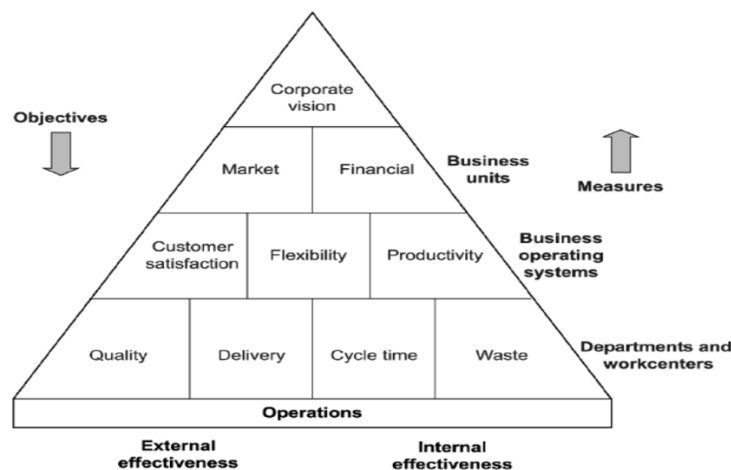


Figure 10 Performance Pyramid (Tangen, 2004)

“The Performance Pyramid contains four levels of objectives that affect the external effectiveness of the organization (left side of the pyramid) and simultaneously its internal effectiveness (right side of the pyramid)” (Tangen 2004, P17).

The Balanced Scorecard (BSC) model considers firms strategy as the north star, which is useful, yet it may lead to some firms biasing the scorecard to certain dimension that supports only their strategic goals leading to an imbalance score card. For instance, Shareholders and investors are interested more in financial card more than the Internal business one so the management could incline to focus more on the financial dimension which could be harmful to the long-term strategic innovation of the firm. The performance prism focuses on the needs of the stakeholders expanding the BSC framework. Yet the Stakeholders satisfactions could be contradicting or at least not aligned on the same success criteria. In addition, this model doesn't make a clear dichotomy between the external and internal stakeholder's interests. The performance pyramid model links the performance KPIs with the business processes. It creates a clear dichotomy between the external stakeholder's interest performance indicators such as market, finance, CSAT (customer satisfaction), quality and delivery and the internal performance indicators such as waste, cycle time, productivity, and Quality. Financial performance measurement is the most used method and considered as a common factor for all the different firm measurements models.

3.4 Firm Financial Performance

Alshamari (2017) suggested that financial performance measurement is a simple and accurate method that utilizes quantitative objectives to measure precisely tangible resources. The financial method could be measured through various financial key performance indicators such as net profit, revenue growth, sales figures, market share, assets utilization, cash flow, and stock price. The financial method provides simple and precise results which are easy to be used, and as a result, it may add value to organisations by providing better performance (Some other studies stated that financial measurements are not good enough on its own to fully capture organisation performance, as it focuses only on the monetary side of the firm. However, it is still an efficient and controllable method to measure the organisation's performance and take decisions based on financial figures.

3.4.1 Return on Equity (ROE)

ROE is the to net profit divided by the shareholder's equity as per the book value. Shareholder's equity generally embraces the reserves values as these could be paid out to shareholders. Shareholder's equity is equal to the firm assets minus its debt, ROE is considered the return on the net assets. This KPI indicates to the investors the revenues on the assets or investments they made. In addition, it gives an indicator of how the money is effectively invested. Therefore, it shows the profitability performance of the organisation.

$$\text{ROE} = \text{Net Income} / \text{Shareholder Equity}$$

Where:

$$\text{Shareholder Equity} = \text{Total Assets} - \text{Liabilities}$$

Equation 5 Return on Equity

3.4.2 Return on Assets (ROA)

Kotrba et al. (2012) defined the return on assets is another indicator to measure the business growth of the firm. It has a broader use than the return on equity. It is the ratio of the firms's net operating profit to the firm's assets. The return on assets indicates the wealth for all the investors, not only for the equity investors, which indicates how the firm manages its assets to produce profits

$$\text{ROA} = \text{Net Income} / \text{Total Assets}$$

Where:
 $\text{Total Assets} = \text{Shareholder Equity} + \text{Liabilities}$

Equation 6 Return on Assets

The way that a company's Liabilities are considered is the main variance between ROE and ROA. Without the Liabilities, the shareholder equity is equal to the total assets. In a nutshell, ROE and ROA would also be exact.

3.4.3 Return on Assets (ROA) Vs. Return on Equity (ROE)

The ROE represents the amount of profit the firm generates from the shareholders investments while ROA is firm earnings from their assets. The debt is the main difference between the 2 indicators as debt is included in the ROA only and accordingly ROA deals with the operation management efficiency while ROE with the financial management of firms. ROE is considered as a gauge of the firm's profitability and how efficiently those firms generate profits. This efficiency measurement is our main interest in this study and accordingly we'll examine the Tech corporates ROA.

3.5 Impact of Cost stickiness on Firm performance

Huang (2015) stated that the relationship between cost and performance is straightforward. However, cost behavior through sticky cost is challenging to predict. Many researchers used the agency theory and internal market hypothesis to explain the sticky cost effect on performance. The interest of agents may differ from the interest of the principals due to certain economic conditions. In a good economic condition, managers and stockholders would want to increase cost stickiness to have higher returns. Therefore, cost stickiness will increase in order to meet demand. This will lead to higher profitability of a firm due to higher sales revenue. However, when demand shows a declining pattern, some managers hesitate to cut because this decision will affect firm performance as the firm needs to bear higher costs for unutilized resources. Moreover, some managers assume that the decline in demand is not permanent, and they prefer to make adjustments after the demand appears to be permanent. Managers fear to make cost adjustments due to the fear of compensation, loss of status, prestige and power, leading to agency costs.

The main sticky cost drivers are the 1) Cost of Goods Sold (COGS) & Sales, general and administration expenses (SG&A) sticky nature and 2) managerial decisions. related to cost growth.

3.5.1 Cost of Goods Sold (COGS)

The direct costs are linked to the products and projects, such as direct materials, direct labour, and packaging costs. Costs embrace obtained assets that increase the value of the products sold, called the cost of goods sold. Therefore, costs are basically linked to the manufacture or service levels and include variable, direct, and semi-fixed inputs. Subramaniam and Weidenmier (2003) concluded that the stickiness of COGS has been attributed to managerial behavior where managers retained more of COGS materials in the event of a decline in revenues rather than incur the cost of renegotiating with the suppliers

Çelik and Kök (2013) used the panel data of Turkish listed firms to test the stickiness of COGS and their effect on firm performance between 1995 and 2011. Their results showed that total costs increased by 0.74% and decreased by 0.41%, COGS increased by 0.84% and decreased by 0.67%.

3.5.2 Sales, general and administration expenses (SG&A)

Awad I. and Amr E. (2017) examined the cost behavior of SG&A using data for 7,629 firms in the USA from 1979-1998. This research concluded that SG&A are sticky. In addition, during the economic growth times and due to the managers optimism, the cost stickiness rises.

Banker et al. (2014) published one of the important papers that studied the relationship between SG&A costs and sales revenue through multivariable regression using data from 198 Brazilian companies in 7 years (1996-2003). The results accepted the main hypothesis, which claimed that the SG&A costs of the studied firms are sticky.

That being said, those studies were neither conducted on digitalized nor Technology enabled firms. According to the above available literature and research, it might be deduced that there is a correlation between cost stickiness of SG&A and firm performance in some sectors or industries, which may match the research hypotheses in this dissertation. Therefore, the hypotheses can be formulated as follows:

H1: There is a negative relationship between Cost Stickiness and firm financial performance.

4. Research Methodology

The previous literature review illustrated a meaningful relationship between cost stickiness and firm performance. The main aim of this study is to investigate this relationship using the financial performance. The financial performance data is based on official performance reports. The primary source of data is the integrated reports officially published in NASDAQ, which includes listed 20 technology companies in the period from 2015 to 2019. The study uses the financial results to measure the stickiness of the cost using Selling, General and administrative costs (SG&A) and the impact on the firm financial performance using ROE. The study research question is:

4.1 Theoretical Framework

The scope of this study is to explore the relationship between cost stickiness and firm performance using financial performance measurements. The financial performance should be analysed based on official performance reports published by firms being investigated. The data gathering was conducted using secondary source. The integrated reports were officially published in NASDAQ100 from 2015 to 2019. Based on the above research questions and the previous literature review, the below theoretical framework has been developed to observe the relationship between cost stickiness (SG&A) and firm performance (ROE):

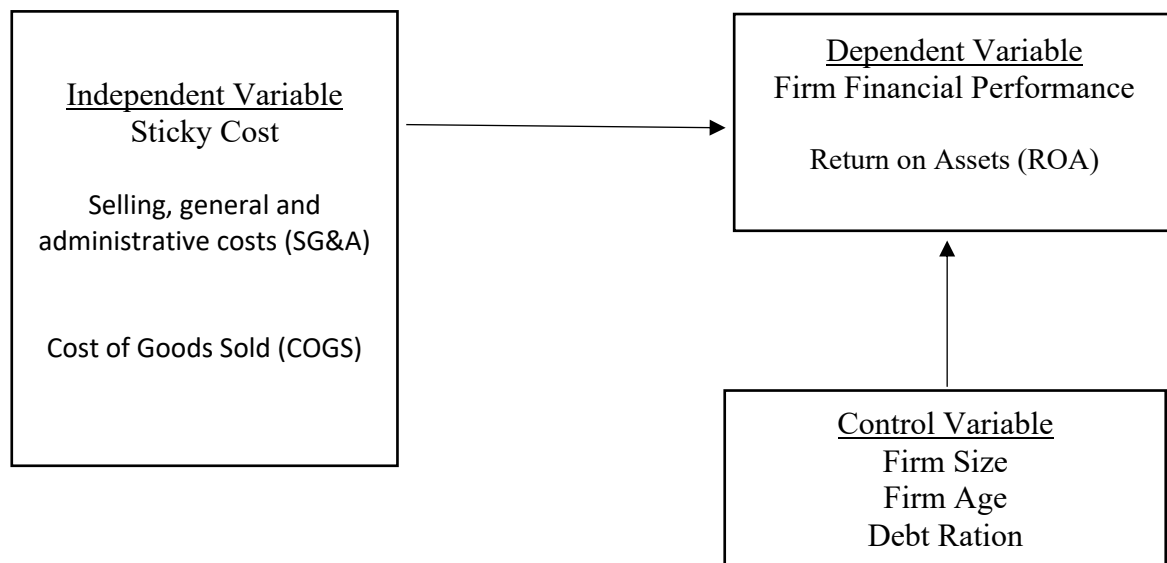


Figure 11 Research Model

4.2 Variables Measurements

The below table illustrated the different variables measurements

Variable		Measurement
Independent Variable Cost Stickiness	SG&A	Selling, general and administrative operating expenses of firm, extracted from financial statement
Independent Variable Cost Stickiness	COGS	Cost of Goods Sold, extracted from financial statement
Dependent Variable Firm Performance	ROA	Return on Asset of firm extracted from financial statement.
Control Variable	Firm Size	Firm's total assets during the study period
	Firm Debt ratio	Firm's total liability/total asset also known as the debt ratio
	Firm Age	Firm's number of years since it was established.

Table 1 Variable measurements

4.3 Time Scale

It was essential to determine the time scale of this research before 2020 and this study focused on 5 years timespan between 2015-2019. Despite this study was carried out in 2021 but 2020 was eliminated intentionally due to the COVID-19 pandemic outbreak that reshaped and reimagined the cost structure of all firms especially the technology ones.

The world economy and in accordance the financial markets have been disrupted severely by the COVID-19 pandemic. Certain sectors showed fragility to the market changes more than others. As the COVID-19 pandemic is still prolonging and the final financial impact is still unknown including the pandemic Macro and Micro bills and relevant changes in the cost and revenues.

“Financial markets. The effects of the COVID-19 crisis on firms and households, and the associated uncertainty, caused disruptions in many financial markets. Even the U.S. Treasury market showed signs of stress in March 2020. Corporate bond markets and money market funds experienced acute stress as well. Crucially, financial markets rebounded quickly. While the S&P 500 Index lost one-third of its value during the COVID-19 crash of February and March 2020, it gained all of it back by August 2020, and it has been rising ever since. Similarly, U.S. corporate bond yields (relative to 10-year Treasury yields) rose sharply during February and March 2020 but have rebounded quickly and returned to precrisis averages within the same year. The quick recovery of financial markets in the United States can be, at least in part, attributed to the Federal Reserve, which took swift actions to avert a full-fledged financial crisis. Still, these patterns led many to wonder about a possible disconnect between

financial markets and the real economy and the relevance of financial market indicators for economic recovery.” (I. Goldstein, Ralph S. J. K. & Holger M. M., 2021 p.3).

This study intentionally neglected the disruptive year of 2020. The impact of COVID-19 on the cost structure and accordingly the cost stickiness could be an interesting study after the end of the global pandemic.

4.4 Sample and Population

The target population included 20 technology operating companies in the National Association of Securities Dealers Automatic Quotations (NASDAQ) United of states stock exchange market. The stocks of U.S companies are found on one of major three stock exchanges; the New York Stock Exchange (NYSE), American Stock Exchange (AMEX) and the National Association of Securities Dealers Automatic Quotations (NASDAQ). This study focused on 20 companies from NASDAQ as the most popular market exchange for the Technology sector in the U.S that includes technology giants like Amazon, Facebook (Meta), Microsoft and Google (Alphabet).

The sample included data about Twenty listed companies in the NASDAQ stock exchange for 5 years from 2015 till 2019. Accordingly, the total number of observations was calculated by multiplying the number of companies by years. So, the sample size was 100 observations.

4.5 Data Collection

This empirical study focuses on the officially published companies in the U.S. NASDAQ stock market (NASDAQ), which includes the listed 20 companies in the period from 2015 to 2019, using the financial results to measure the stickiness of the cost using SG&A and COG While the impact on the firm financial performance was examined using ROA and ROE. The officially published firms reports for the financial data was collected from US Securities and Exchange commission. The financial data was collected for five years and from 20 companies resulting in total of 100 observations.

The sample did not consider the Technology firms that do not have any missing data for the 5 years of the study. The tested data were the Cost components (COGS, SG&A) and the form performance components (ROA and ROE) as independent and dependent variables respectively. The control valuables were the firm size, firm age and Debt ratio. To calculate the control valuables, the total assets, total liabilities and firm age were collected for the duration of this study.

The financial data was collected from the US Securities and Exchange Commission (SEC) which is one of the United States federal government independent agencies. The SEC was created as an enforcement entity against the manipulation in the US securities and exchange markets in addition to facilitating the capital information. The SEC maintains an electronic database named as the Electronic Data Gathering, Analysis, and Retrieval system (EDGAR) where public could access the firm’s financial information filed with the SEC. The data of this study was collected from the 10-K annual reports using the EDGAR system.

The 10-K is an annual report filed by any publicly traded firm outlining its financial Key Performance Indicators. The 10-K report is a mandate requirement of the SEC and it includes the financial statements as the Balance sheet and Income statements, earnings per share,

financial ratios as ROE, ROA, ROI and Organization structure. This report is used by investors to collect the needed financial performance indicators before investing in firm's bonds or before selling or buying shares.

The following financial indicators were collected as shown in table 2.

4.5.1 Sales Revenue

Defined as the total income generated by a firm through the sale of goods and services, royalties, interests, and others. Revenue is listed in the firm's income statement.

4.5.2 Assets

Defined as all the items of cash value possessed by a firm including current assets and Long-term assets (Those that couldn't be converted to cash within a year)

4.5.3 Liabilities

Defined as the firm commitment towards other including Current Liabilities and Long-term Liabilities (Commitments which are not due within the financial year)

4.5.4 Years Established:

Defined as the date of issuance of business licences

4.5.5 ROA

The study dependant value defined in section 3.3.2.2

4.5.6 COGS

The study dependant value defined in section 3.4.1

4.5.7 SG&A

The study independent value defined in section 3.4.2

#	Firm Name	Year	Data Collection (Input)							
			Sales	Assets	Liabilities	Years established	Sticky SG&A	COGS	ROA	ROE
1	Firm X	2019	S19	A19	L19	YE19= 2019- Establishment date	SGA19	COGS19	ROA19	ROE19
		2018	S18	A18	L18	YE18= 2018- Establishment date	SGA18	COGS18	ROA18	ROE18
		2017	S17	A17	L17	YE17= 2017- Establishment date	SGA17	COGS17	ROA17	ROE17
		2016	S16	A16	L16	YE16= 2016- Establishment date	SGA16	COGS16	ROA16	ROE16
		2015	S15	A15	L15	YE15= 2015- Establishment date	SGA15	COGS15	ROA15	ROE15

Table 2 Data Collection & Processing

4.6 Data Processing

The data processed using the following equations to calculate the control variables as illustrated in table 3.

- Firm Debt Ratio equals the Liabilities divided by the assets
- Firm Size is a natural logarithm of Assets
- Firm Age is a natural logarithm of establishment years

#	Firm Name	Year	Data Collection (Input)						DV		IV		Control Variables		
			Sales	Assets	Liabilities	Years established	Sticky SG&A	COGS	ROA	ROE	COGS	SG&A	Debt Ratio	Size	Age
1	Firm X	2019	S19	A19	L19	YE19= 2019- Establishment date	SGA19	COGS19	ROA19	ROE19	COGS19/S19	AGA19/S19	L19/A19	LOG10(A19)	LOG10(YE19)
		2018	S18	A18	L18	YE18= 2018- Establishment date	SGA18	COGS18	ROA18	ROE18	COGS18/S18	AGA18/S18	L18/A18	LOG10(A18)	LOG10(YE18)
		2017	S17	A17	L17	YE17= 2017- Establishment date	SGA17	COGS17	ROA17	ROE17	COGS17/S17	AGA17/S17	L17/A17	LOG10(A17)	LOG10(YE17)
		2016	S16	A16	L16	YE16= 2016- Establishment date	SGA16	COGS16	ROA16	ROE16	COGS16/S16	AGA16/S16	L16/A16	LOG10(A16)	LOG10(YE16)
		2015	S15	A15	L15	YE15= 2015- Establishment date	SGA15	COGS15	ROA15	ROE15	COGS15/S15	AGA15/S15	L15/A15	LOG10(A15)	LOG10(YE15)

Table 3 Data Collection & Processing

5. Analysis

The research was classified in different approaches based on the several methodologies used. In this study, descriptive, Correlation, Correlation and Regression (Linear and Multiple) data analysis methodologies were used.

To check the average compliance score of cost stickiness factors and define the correlation matrix between the study variables, A descriptive analysis was conducted then a correlation analysis. The last step was conducted using SPSS by conducting simple and multiple regression analyses to get the relationship between cost stickiness factors and financial performance.

Firm Performance = f (Cost Stickiness + Controls)

The correlation analysis was used as a primary step to evaluate the relationship between the independent variable of cost stickiness COGS/SG&A and the financial performance factors ROA/ROE as dependent variable. Based on the value of the Pearson coefficient and the relevant sign, the strength, significance and direction of the relationship were evaluated. The simple regression was used to assess how much each independent variable can explain the variance in ROE and ROA as dependent variables. According to the value of R-square, p-value and Beta, the influence of the independent variables on the dependent variables were evaluated. On the other hand, the multiple regression was used to assess how much variance in ROE and ROA is explained by the independent variable safter considering the controlling effect of the control variables: firm size, debt ratio and firm age.

Anderson, Banker and Janakiraman (2003) introduced a Cost Stickiness testing model that was proposed by (Weiss, 2010a) using the univariate tests above using the regression model. There are many past researches that evaluated cost stickiness using the sticky cost regression model. The new measure of cost stickiness at the firm level is proposed by (Weiss, 2010b). Mary and Okelue (2012) and Leahy (2012) developed a Multi regression model to measuring the relationship between integrating Cost Stickiness and the financial performance. The same will be used in this research. This model follows prior studies in performance measurement, which shows that there are important control variables which may influence Cost Stickiness Effect on Firm's Performance aspects in estimating performance, which are: firm size proposed by Yazdanfar (2013), firm age proposed by Vithessonthi and Tongurai (2014), and firm leverage or debt ratio proposed by Hunjra et al (2014).

5.1 Descriptive Analysis

The descriptive analysis represented a succinct descriptive coefficient that outlined the data's fundamental features. The descriptive analysis computed the central tendency including the mean and median. In addition to the variability measurement including the Standard deviation, minimum, & maximum. Table 4 illustrated the descriptive statistics of the variables including the minimum, maximum, mean and standard deviation for the continuous variables of the sample data set.

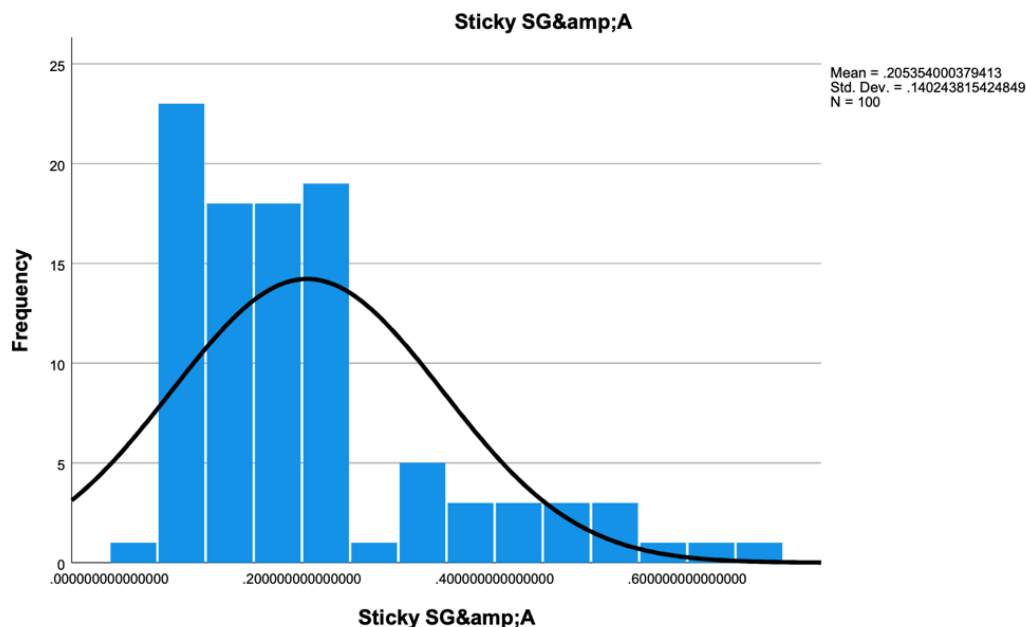
Based on Table 4, the results displayed that most of the numerical scores of the variables in this study had significant variations compared to their mean value. However, overall, the descriptive statistics showed that the variables have good variance. The data showed a 100% validity and an accepted reliability with an Alpha Cronbach's value of 0.74. From the multicollinearity standpoint, the VIF value for COGS and SG&A are 1.512 and 1.512 which is smaller than 10 and accordingly there is no multicollinearity symptoms detected.

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Sticky SG&A	100	.04473803584	.67708839833	.20535400038	.14024381542
COGS	100	.11125379407	.83444543901	.44574243662	.18014980603
Updated ROA	100	-.2140080000	.32561100000	.06635832000	.10143593912
Updated ROE	100	-6.151177000	2.2144530000	.10835017000	.73496717858
Debt Ratio	100	.16764047557	1.9687830728	.64615415613	.33865556884
Size	100	3.3710844945	5.4572095063	4.5714998123	.58132282725
Age	100	1.0000000000	1.8325089127	1.4652130917	.22000607267
Valid N (listwise)	100				

Table 4 Descriptive Analysis

5.1.1 Sticky cost SG&A:

From the table 4 and figure 12, this variable had a mean value of -0.20, and standard deviation value of 0.14, and its range is between minimum -0.044, and maximum 0.677.

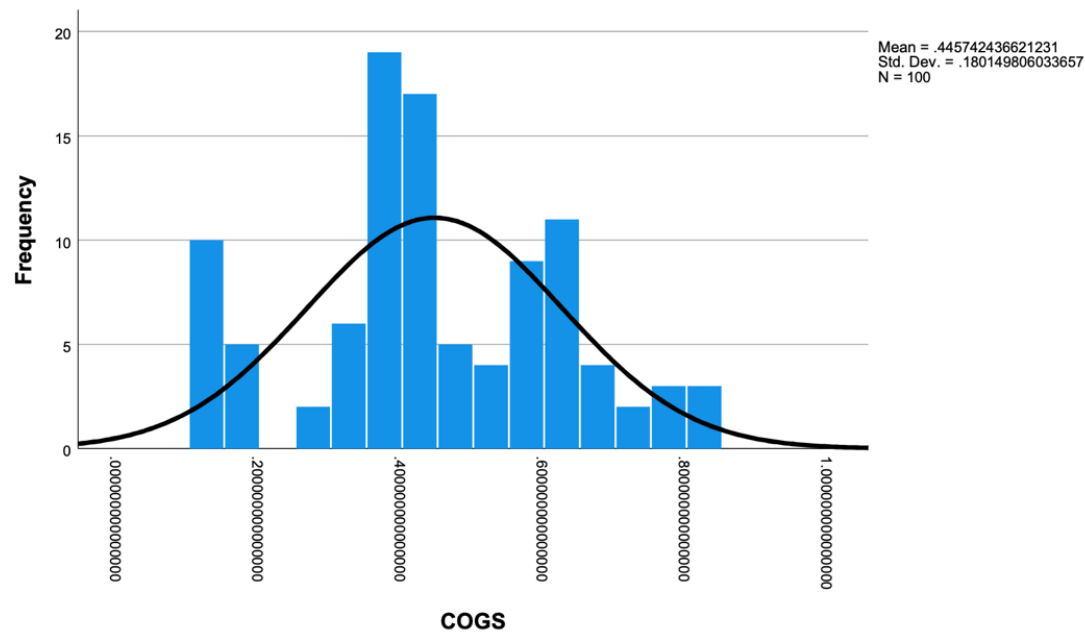


Equation defined in section 3.4.2

Figure 12 SG&A Descriptive Analysis

5.1.2 Sticky cost COGS:

From the table 4 and figure 13, this variable has mean value of 0.44, and standard deviation value of 0.18, and its range is between minimum 0.11, and maximum 0.83.

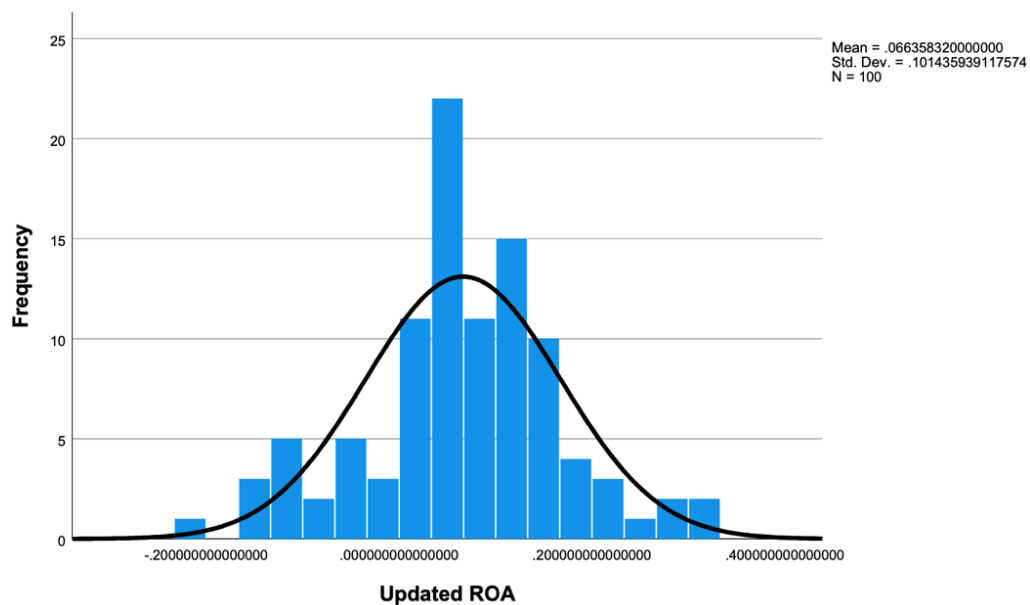


Equation defined in section 3.4.1

Figure 13 COGS Descriptive Analysis

5.1.3 Return of assets (ROA):

From the table 4 and figure 14, this variable has mean value of 0.06, and standard deviation value of 0.10, and its range is between minimum - 0.21 and maximum 0.32.



Equation defined in section 3.3.2.2

Figure 14 ROA Descriptive Analysis

5.1.4 Return of equity (ROE):

From the table 4 and figure 15, this variable has mean value of 0.10, and standard deviation value of 0.73, and its range is between minimum -6.15 and maximum 2.21.

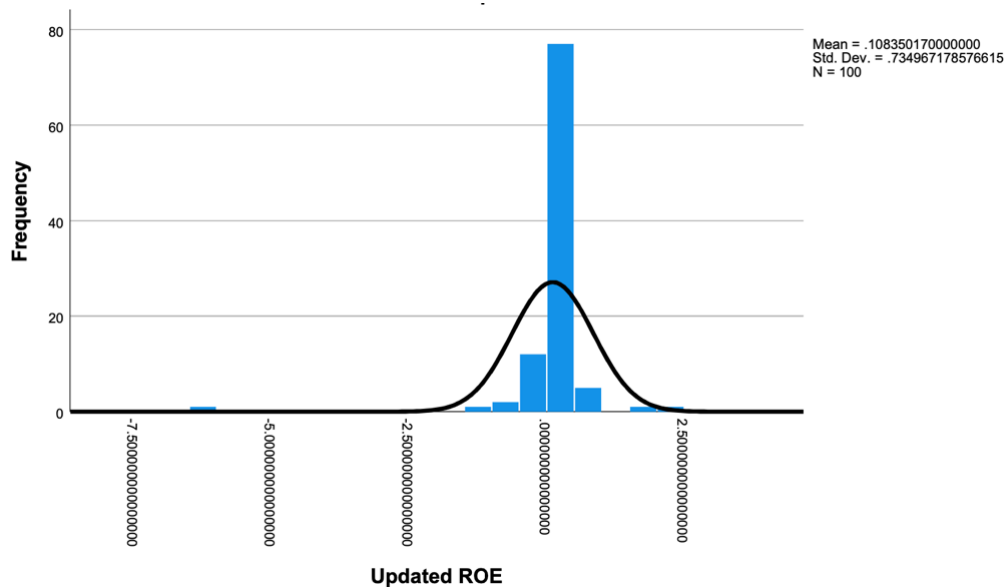


Figure 15 ROE Descriptive Analysis

5.1.5 Debt Ratio

From the below table, this variable has mean value of 0.64, and standard deviation value of 0.33, and its range is between minimum 0.16 and maximum 1.96.

5.1.6 Firm size

From the below table, this variable has mean value of 4.57, and standard deviation value of 0.58, and its range is between minimum 3.37 and maximum 5.45.

5.1.7 Firm age.

From the below table, this variable has mean value of 1.46, and standard deviation value of 0.22, and its range is between minimum 1 and maximum 1.83.

5.2 Correlation Analysis

To examine the relationship between firm performance and cost stickiness, the bivariate Pearson Correlation Coefficient was used. This matrix illustrated below in Table 5 outlined the correlation coefficient between sets of variables, and each of the random variables in the matrix is correlated with each of the other values in the matrix. This helped to know which pairs of these variables have the highest correlation.

Variables	SG&A	COGS	Debt Ratio	Age	Size
ROE	-0.008	-0.087	-0.001	0.151	0.068
ROA	-0.456**	-0.238**	-0.232*	0.319**	0.369**

** Correlation is significance at the 0.01 level (2-tailed)

* Correlation is significance at the 0.05 level (2-tailed)

Note: $r=.10$ to $.29$ (Weak), $r=.30$ to $.49$ (Medium) $r=.50$ to 1.0 (Strong)

Table 5 Correlation Analysis

According to the SPSS, the results showed that all independent variables had a significant weak/medium positive correlation with the ROA dependent variable showing that H1a and H1b are accepted. This correlation results was in line with the hypotheses and the peer reviews mentioned in this research.

5.2.1 ROE Correlation Analysis

The results didn't show any correlation between return on equity (ROE) and the firm performance (either SG&A or COGS) variables. This means that high levels of Sticky SG&A costs are not correlated with high levels of ROE.

5.2.2 ROA and SG&A correlations Analysis

For the correlation between ROA and SG&A, the results showed a Medium negative correlation with a highly significant association between return on assets (ROA) and SG&A variables [$r=-0.456$, $n=100$, $p=.00$], where Sig 2-tailed is less than 0.01. This means that high levels of Sticky SG&A costs are associated with low levels of ROA. In other words, the higher is the SG&A costs incurred by the firm, the lower is the ROA of the firm.

5.2.3 ROA and COGS correlations Analysis

For the correlation between ROA and COGS, results showed a weak negative correlation with a highly significant association between return on assets (ROA) and COGS variables [$r=-0.238$, $n=100$, $p=.00$], where Sig 2-tailed is less than 0.01. This means that high levels of Sticky COGS costs are associated with low levels of ROA. In other words, the higher is the COGS costs incurred by the firm, the lower is the ROA of the firm.

5.2.4 ROA and Debt Ratio correlations Analysis

For the correlation between ROA and firm debt ratio, results showed a weak negative correlation between return on assets (ROA) and firm debt ratio variables [$r=-0.23$, $n=100$, $p=.00$], where Sig 2-tailed is more than 0.02. This could indicate that firm debt affects the return on assets of the firm for the sample studied in this thesis. In other words, the higher is the Debt ratio of a firm, the lower is the ROA of the firm.

5.2.5 ROA and Firm Size correlations Analysis

For the correlation between ROA and firm size, results showed a medium positive correlation between return on assets (ROA) and firm size variables [$r=.37$, $n=100$, $p=.001$], where Sig 2-tailed is more than 0.001. This could indicate that firm size affects the return on assets of the firm for the sample studied in this thesis. In other words, the higher is the Firm size in terms of assets, the higher is the ROA of the firm

5.2.6 ROA and Firm Age correlations Analysis

For the correlation between ROA and firm age, results showed a positive medium significant correlation between return on assets (ROA) and firm age variables [$r=.319$, $n=100$, $p=.001$], where Sig 2-tailed is more than 0.001. This could indicate that firm Age affects the return on assets of the firm for the sample studied in this thesis. In other words, the higher is the Firm age, the higher is the ROA of the firm

5.3 Regression Analysis

In this dissertation, the researcher used the Linear and multiple regression analyses to investigate in more depth the relationship between the independent and dependent variables.

5.3.1 Linear Regression

The linear regression is the basic form of a quantitative analysis that analyses the relationship between independent variable (X) and dependent variable (Y) to examine the empirical relationship between the variables. The following equation describes the simple linear regression model using two variables only.

$$y = a + b_1x_1 + \varepsilon$$

where,

y is the dependent variable (ROA & ROE)

x is the independent (COGS & SG&A)

ε is the error term or disturbance in the relationship, which represents factors other than x that affects y.

a is the intercept parameters (called constant term), which provides the value of y when $x=0$

Equation 7 Simple Linear Regression Model

According to the above, the formula that will determine the relationship between the cost stickiness factors and the firm performance, is as follow:

$$\text{Firm Performance} = f(\text{Cost Stickiness})$$

$$\text{FirmPerformance}_{i,t}(\text{ROA/ROE}) = b_0 + b_1\text{Sticky}_{i,t} + \varepsilon_{i,t}$$

where:

SG&A = sales, general, and administrative expenses of firm i

COGS = cost of goods sold of firm i

Sticky = SG&A_{it}/Sales_{it} or COGS_{it}/Sales_{it}

ε = error term

t = year (time t)

Equation 8 Linear Regression Model of the Study

5.3.1.1 Linear Regression 1: ROA and COGS

Linear regression was performed to assess how much variance in ROE is explained by sticky COGS costs. By checking Table 6: ANOVA, the results showed that the model is significant. $p=0.017$ which is below 0.05 and, therefore, there is a statistical significance.

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.058	1	.058	5.897	.017 ^b
	Residual	.961	98	.010		
	Total	1.019	99			

a. Dependent Variable: Updated ROA

b. Predictors: (Constant), COGS

Table 6 Linear Regression 1 ANOVA

By checking table 7: The model Summary, the results showed that sticky COGS costs explain 5.7% of the variance in ROA.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.238 ^a	.057	.047	.09901667073

a. Predictors: (Constant), COGS

Table 7 Linear Regression 1 Model Summary

The standardized coefficients (Beta) table 8 showed that sticky COGS costs variable is making a negative significant unique contribution to ROA (Beta= -0.238, $P=.017$).

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.126	.027		4.753	<.001
	COGS	-.134	.055	-.238	-2.428	.017

a. Dependent Variable: Updated ROA

Table 8 Linear Regression 1 Coefficients

5.3.1.2 Linear Regression 2: ROA and SG&A

Linear regression was performed to assess how much variance in ROE is explained by sticky SG&A costs. By checking Table 9: ANOVA, the results

showed that the model is significant. $p=0.001$ which is below 0.05 and, therefore, there is a statistical significance.

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.212	1	.212	25.692	<.001 ^b
	Residual	.807	98	.008		
	Total	1.019	99			

a. Dependent Variable: Updated ROA

b. Predictors: (Constant), Sticky SG&A

Table 9 Linear Regression 2 ANOVA

By checking table 10: The model Summary, the results showed that sticky SG&A costs explain 20.8% of the variance in ROA.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.456 ^a	.208	.200	.09074839324

a. Predictors: (Constant), Sticky SG&A

Table 10 Linear Regression 2 Model Summary

The standardized coefficients (Beta) table 11 showed that sticky SG&A costs variable is making a negative significant unique contribution to ROA (Beta= -0.456, $P=.001$).

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.134	.016		8.302	<.001
	Sticky SG&A	-.330	.065	-.456	-5.069	<.001

a. Dependent Variable: Updated ROA

Table 11 Linear Regression 2 Coefficients

5.3.2 Multiple Regression

The Multiple regression is considered as an extension of the simple linear regression model. This kind of analysis is used to predict the dependent variable based on the value of two or more other independent variables. The multiple regression analysis is defined by the equation below:

$$Y = a + b_1X_1 + b_2X_2 + b_3X_3 + \dots + b_kX_k$$

where,
y is the dependent variable (response variable or the predicted variable),
x1 is the independent variable (the predictor variable).
(b1) is the change in y relative to a one-unit change in x1 and holding all other independent variables constant.

Equation 9 Multiple Regression Model

In this section, this dissertation used the below formula to examine relationship with multiple variables and check the effect on firm performance variables.

$$\text{Firm Performance} = f(\text{Cost Stickiness} + \text{Controls}) \text{ Firm Performance } i, t (\text{ROA/ROE}) = b_0 + b_1 \text{Sticky}_{i,t} + b_2 \text{Age}_{i,t} + b_3 \text{Size}_{i,t} + b_4 \text{lev}_{i,t} + \varepsilon_{i,t}$$

Where,
SG&A = sales, general, and administrative expenses of firm i
COGS = Cost of goods sold of firm i
Sticky = SG&A_{it} / Sales_{it} or/and COGS_{it} / Sales_{it}
Debt ratio = a ratio of total liability/total asset in year t
Size = log of total assets in year t
Age = log of the number of years since the firm was established
ε = error term
t = year (time t)

Equation 10 The Study Multiple Regression Model

In the following sections, three models of Multiple regression are provided to examine the cost stickiness and firm performance relationship.

5.3.2.1 Multiple Regression 1: DV (ROA) and IV (COGS and SG&A) relationship without considering the control variables

Multiple regression was performed to assess how much ROA variance is explained by sticky SG&A costs and sticky COGS. The model summary, Coefficient and ANOVA illustrated on table 12,13 and 14 showed that 59.1% of the variance in ROA is explained by sticky COGS costs (Beta=-0.76, P=.001) and sticky SG&A (Beta=-0.89, P=.001). From the ANOVA table, the P=0.001 indicates that the model is significant. The coefficient table shows that sticky SG&A and COGS are Strong predictors for ROA, given the high Beta value (Beta= -0.89 and -0.761.25 respectively). Hence H1 is accepted.

ANOVA ^a						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.602	2	.301	70.115	<.001 ^b
	Residual	.417	97	.004		
	Total	1.019	99			

a. Dependent Variable: Updated ROA

b. Predictors: (Constant), COGS, Sticky SG&A

Table 12 Multiple Regression 1 ANOVA

The ANOVA table shows the regression results between sticky SG&A costs and sticky COGS and ROA and proves that the model is significant ($p=.0001$).

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.769 ^a	.591	.583	.06552768603

a. Predictors: (Constant), COGS, Sticky SG&A

Table 13 Multiple Regression 1 Model Summary

Coefficients ^a						
		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	t	Sig.
1	(Constant)	.391	.029		13.319	<.001
	Sticky SG&A	-.650	.058	-.899	-11.259	<.001
	COGS	-.429	.045	-.761	-9.537	<.001

a. Dependent Variable: Updated ROA

Table 14 Multiple Regression 1 Coefficients

5.3.2.2 DV Multiple Regression 2: (ROA) and IV (COGS and SG&A) relationship considering the control variables

This analysis considered the independent variables, after controlling firm's age, leverage and size. Hierarchical regression was used to assess how much variance in ROA is explained by sticky SG&A costs and COGS after controlling firm's age, debt ratio and size.

Results showed that all the control variables were found to be significant predictors for ROA.

The model summary table 16 showed that 60.3% of the variance in ROA is explained by sticky SG&A costs and sticky COGS.

The model summary table 16 showed that 28.0% of the variance in ROA is explained by Size, age and debt ratio Control variables

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.285	3	.095	12.415	<.001 ^b
	Residual	.734	96	.008		
	Total	1.019	99			
2	Regression	.615	5	.123	28.597	<.001 ^c
	Residual	.404	94	.004		
	Total	1.019	99			

a. Dependent Variable: Updated ROA

b. Predictors: (Constant), Age, Debt Ratio, Size

c. Predictors: (Constant), Age, Debt Ratio, Size, COGS, Sticky SG&A

Table 15 Multiple Regression 2 ANOVA

From the ANOVA table 15, the P=.001 indicates that the model is significant. From the coefficient table 16 also shows that sticky SG&A is the strongest contributor with Beta= -0.861 followed by the COGS with Beta=-0.777. The Control variables showed medium contribution with Debt ratio Beta= -0.287, Age Beta= 0.303 and Size Beta= 0.315

Model Summary^c

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	df1
1	.529 ^a	.280	.257	.08743440293	.280	12.415	3
2	.777 ^b	.603	.582	.06556124596	.324	38.371	2

Model Summary^c

Model	Change Statistics	
	df2	Sig. F Change
1	96	<.001
2	94	<.001

a. Predictors: (Constant), Age, Debt Ratio, Size

b. Predictors: (Constant), Age, Debt Ratio, Size, COGS, Sticky SG&A

c. Dependent Variable: Updated ROA

Table 16 Multiple Regression 2 Model Summary

Coefficients ^a					
Model		Unstandardized Coefficients		Standardized Coefficients	Sig.
		B	Std. Error	Beta	
1	(Constant)	-.334	.084		<.001
	Debt Ratio	-.086	.026	-.287	.001
	Size	.055	.015	.315	<.001
	Age	.140	.041	.303	.001
2	(Constant)	.299	.097		.003
	Debt Ratio	.015	.024	.049	.541
	Size	.020	.013	.113	.126
	Age	-.006	.035	-.014	.854
	Sticky SG&A	-.623	.075	-.861	<.001
	COGS	-.438	.057	-.777	<.001

Coefficients ^a						
		Correlations			Collinearity Statistics	
Model		Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)					
	Debt Ratio	-.232	-.316	-.283	.974	1.026
	Size	.369	.342	.309	.961	1.041
	Age	.319	.326	.293	.936	1.068
2	(Constant)					
	Debt Ratio	-.232	.063	.040	.671	1.489
	Size	.369	.157	.100	.791	1.263
	Age	.319	-.019	-.012	.723	1.383
	Sticky SG&A	-.456	-.650	-.539	.392	2.549
	COGS	-.238	-.623	-.501	.416	2.405

a. Dependent Variable: Updated ROA

Table 17 Multiple Regression 2 Coefficients

The above coefficient table shows that sticky COGS and sticky SG&A costs had nearly the same strength in predicting ROA, given that they had the Beta value of -0.86 and -0.77 respectively. As a result, based on the above multiple regression models, it can be deduced that there is a significant negative relationship between cost stickiness variables and a firm's financial performance variables. Hence, hypothesis H1 is accepted.

6. Main Findings

This section outlines the findings and research results and examine the findings in line with the literature review, research questions and the hypotheses testing. The financial performance was analysed based on official performance reports and the results presented in linear and regression analysis sections confirmed the central hypothesis of this study. The results obtained indicated that the sticky cost represented by the COGS and SG&A is significantly negatively related to firm performance represented by the ROA.

Linear regression analysis measured how much variance occurred in the firm performance (ROA) by each cost stickiness variable (SG&A and COGS). The results showed that sticky SG&A explains 20.8% of the variance in ROA, and sticky COGS explains 5.7% of the variance in ROE. The previous results matched the literature review for the relationship between cost stickiness and firm performance.

Multiple regression analysis results showed a significant relationship between firm performance (ROE) and cost stickiness variables (SG&A and COGS). Two regressions analysis were conducted to measure which variable is more significant on firm financial performance (ROE).

The results showed that 59% of the variance in ROA is explained by sticky explained by sticky COGS costs (Beta=-0.76, P=.001) and sticky SG&A (Beta=-0.89, P=.001).

The results showed that control variables (debt ratio, size and age) were significant, which means that they control the effect of cost stickiness on firm performance on the sample use. The results showed that 28.0% of the variance in ROA is explained by Size, age and debt ratio Control variables.

Analysis	Test	DV ROA	IV1 COGS	IV2 SGA	Results Summary
Correlation	Correlation	X	X		Hypothesis Supported* Weak negative correlation with a highly significant association between ROA and COGS
		X		X	Hypothesis Supported* Medium negative correlation with a highly significant association between ROA and SG&A.
Regression	Linear	X	X		Hypothesis Supported* COGS costs explain 5.7% of the variance in ROA. COGS makes a negative significant unique contribution to ROA (Beta= -0.238, P=.017).
		X		X	Hypothesis Supported* SG&A costs explain 20.8% of the variance in ROA. SG&A costs variable is making a negative significant unique contribution to ROA (Beta= -0.456, P=.001).

	Multiple	X	X	X	Hypothesis Supported* 59.1% of the variance in ROA is explained by COGS and SG&A. The model is significant. SG&A and COGS are strong predictors for ROA without considering the CV.
	Multiple	X	X	X	Hypothesis Supported* 60.3% of the variance in ROA is explained by COGS and SG&A. 28.0% of the variance in ROA is explained by Size, age and debt ratio Control variables. The model is significant. COGS and sticky SG&A costs have nearly the same strength in predicting ROA

* There is a significant negative relationship between cost stickiness variables and a firm's financial performance variables. Hence, hypothesis H1 is accepted.

Table 18 Results Summary

This result matches the past researches outlined in the literature review. This has been expected and this research findings support the agency theory showing that the agent (manager) did the sticky cost for the principal's best interest (owner) because it may induce firm performance. Managers retain more COGS materials in a dire economic condition rather than renegotiating with suppliers for a lower price of new COGS purchase. Managers hesitate to reduce production when the economy is down because they believe that this dire situation does not last long, and they prefer to make adjustments only if the situation is consistent. The reason is that managers may need to bear higher costs for unutilized resources and costs for keeping the raw materials and compensation. Hence, sticky cost behavior leads to lower costs, and as a consequence, induces firm performance.

The results of this research are important for managers and companies at Technology companies who would like to apply cost stickiness and see how it could affect the firm financial performance. Despite the many variables contributing to cost stickiness, the variables included in this research, COGS and SG&A, proved a significant contribution to firm performance for the USA Technology firms in terms of ROA. The findings imply that firms' profitability depends partially on the ability of their managers to adapt their costs of doing business and how it affects the changes in the firm performance. Designing firms' cost structure should consider the cost of goods sold and operations expenses. Firms with high cost stickiness should design their cost structure to be more flexible for changes in the future to maintain high financial performance.

Moreover, from the managerial standpoint, managers crave to understand the costs behavior so they can make data driven decisions, plan for their budgets and perform performance evaluation. As per this research results, SG&A cost and COGS are sticky or asymmetric, so managers need to conclude if they would like to preserve the unutilized costs or optimize the costs to lowest possible levels, depending on the economic situation of the firm, which helps to enhance the firm performance. Consequently, managers should control the sticky cost for the best interest of the firm performance, not for the principal only (which cause the agency problem), because it may affect firm performance.

To conclude, the cost stickiness impact on the firm performance exists as per the research results, and every manager or firm should adjust the firm's cost structure, especially for the operating expenses and cost of goods sold, which may help increase the firm financial performance. For example, in dire economic conditions, managers should reduce COGS materials overhead to the barest minimum and retain more COGS in good economic conditions, which increases the firm's financial results. Usually, managers hesitate to reduce production when the economy is down because they believe that this dire situation does not last long, and they prefer to make cost adjustments only if the situation is consistent, which is hard to predict.

7. Limitations

In this section, recommendations for future researchers and implications are discussed, including the research limitations. This is to highlight the benefit of the research for marketers and focus on the value-added. Limitations and guides for future research are provided and discussed as well.

The first limitation is related to the data collection where it was primarily collected using a convenience technique, focusing on the officially published reports in the U.S. NASDAQ stock market (NASDAQ), which includes the listed 20 Technology companies in the period from 2015 to 2019. This prevents the generalisation of the results as the data was collected for a single market (USA) and a single industry (Technology).

The second limitation is related to the focus of this study, as it examined a limited number of variables for cost stickiness and focused only on the financial variables of the firm performance. So maybe the other explanatory factors have another impact on the firm performance.

The final limitation in this research is that the theoretical framework contains neither mediating nor moderating variables. So, it is better to use corporate governance as a moderator to assess the effect of cost stickiness on firm performance.

Further research and studies are recommended to assess the impact of COVID19 on the cost behavior and firm performance. COVID19 has changed dramatically the business dynamics including the cost and firm performance. Secondly, it is essential to find more variables that can affect the management decision and test their effect in future research, such as its life cycle, culture, strategy, leadership style, and environmental changes. More research is needed with more accurate measures of both managers' expectations and firms' strategies and how they control the effect of cost stickiness on firm performance. A proposal for a research question could be: What is the impact of COVID19 on the level of cost stickiness.

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Appendices

Descriptive Analysis

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Sticky SGA	100	.04473803584	.67708839833	.20535400038	.14024381542
COGS	100	.11125379407	.83444543901	.44574243662	.18014980603
ROA	100	-.2140080000	.32561100000	.06635832000	.10143593912
ROE	100	-6.151177000	2.2144530000	.10835017000	.73496717858
Debt Ratio	100	.16764047557	1.9687830728	.64615415613	.33865556884
Size	100	3.3710844945	5.4572095063	4.5714998123	.58132282725
Age	100	1.0000000000	1.8325089127	1.4652130917	.22000607267
Valid N (listwise)	100				

Frequencies

Statistics					
		Sticky SGA	COGS	ROA	ROE
N	Valid	100	100	100	100
	Missing	0	0	0	0

Correlation Analysis

Correlations								
		Sticky SGA	COGS	ROA	ROE	Debt Ratio	Size	
Sticky SGA	Pearson Correlation	1	-.582**	-.456**	-.008	-.069	-.434**	
	Sig. (2-tailed)		<.001	<.001	.936	.494	<.001	
	N	100	100	100	100	100	100	
COGS	Pearson Correlation	-.582**	1	-.238*	-.087	.438**	.149	
	Sig. (2-tailed)	<.001		.017	.390	<.001	.140	
	N	100	100	100	100	100	100	
ROA	Pearson Correlation	-.456**	-.238*	1	.352**	-.232*	.369**	
	Sig. (2-tailed)	<.001	.017		<.001	.020	<.001	
	N	100	100	100	100	100	100	
ROE	Pearson Correlation	-.008	-.087	.352**	1	-.001	.068	
	Sig. (2-tailed)	.936	.390	<.001		.991	.504	
	N	100	100	100	100	100	100	
Debt Ratio	Pearson Correlation	-.069	.438**	-.232*	-.001	1	.020	
	Sig. (2-tailed)	.494	<.001	.020	.991		.840	
	N	100	100	100	100	100	100	
Size	Pearson Correlation	-.434**	.149	.369**	.068	.020	1	
	Sig. (2-tailed)	<.001	.140	<.001	.504	.840		
	N	100	100	100	100	100	100	
Age	Pearson Correlation	-.356**	.004	.319**	.151	.160	.198*	
	Sig. (2-tailed)	<.001	.969	.001	.133	.111	.048	
	N	100	100	100	100	100	100	

Correlations

		Age
Sticky SGA	Pearson Correlation	-.356**
	Sig. (2-tailed)	<.001
	N	100
COGS	Pearson Correlation	.004
	Sig. (2-tailed)	.969
	N	100
ROA	Pearson Correlation	.319**
	Sig. (2-tailed)	.001
	N	100
ROE	Pearson Correlation	.151
	Sig. (2-tailed)	.133
	N	100
Debt Ratio	Pearson Correlation	.160
	Sig. (2-tailed)	.111
	N	100
Size	Pearson Correlation	.198*
	Sig. (2-tailed)	.048
	N	100
Age	Pearson Correlation	1
	Sig. (2-tailed)	
	N	100

** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).

Regression Analysis 1

Variables Entered/Removed^a

Model	Variables Entered	Variables Removed	Method
1	Sticky SGA ^b	.	Enter

a. Dependent Variable: ROA

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.456 ^a	.208	.200	.09074839324

a. Predictors: (Constant), Sticky SGA

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.212	1	.212	25.692	<.001 ^b
	Residual	.807	98	.008		
	Total	1.019	99			

a. Dependent Variable: ROA

b. Predictors: (Constant), Sticky SGA

Coefficients^a

Model		Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	.134	.016		8.302	<.001
	Sticky SGA	-.330	.065	-.456	-5.069	<.001

a. Dependent Variable: ROA

Regression Analysis 2

Regression

Variables Entered/Removed^a

Model	Variables Entered	Variables Removed	Method
1	COGS ^b	.	Enter

a. Dependent Variable: ROA

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.238 ^a	.057	.047	.09901667073

a. Predictors: (Constant), COGS

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.058	1	.058	5.897	.017 ^b
	Residual	.961	98	.010		
	Total	1.019	99			

a. Dependent Variable: ROA

b. Predictors: (Constant), COGS

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.126	.027		4.753	<.001
	COGS	-.134	.055	-.238	-2.428	.017

a. Dependent Variable: ROA

Regression Analysis 3

Correlations

		ROA	Debt Ratio	Size	Age	Sticky SGA	COGS
Pearson Correlation	ROA	1.000	-.232	.369	.319	-.456	-.238
	Debt Ratio	-.232	1.000	.020	.160	-.069	.438
	Size	.369	.020	1.000	.198	-.434	.149
	Age	.319	.160	.198	1.000	-.356	.004
	Sticky SGA	-.456	-.069	-.434	-.356	1.000	-.582
	COGS	-.238	.438	.149	.004	-.582	1.000
Sig. (1-tailed)	ROA	.	.010	<.001	<.001	<.001	.008
	Debt Ratio	.010	.	.420	.056	.247	.000
	Size	.000	.420	.	.024	.000	.070
	Age	.001	.056	.024	.	.000	.484
	Sticky SGA	.000	.247	.000	.000	.	.000
	COGS	.008	.000	.070	.484	.000	.
N	ROA	100	100	100	100	100	100
	Debt Ratio	100	100	100	100	100	100
	Size	100	100	100	100	100	100
	Age	100	100	100	100	100	100
	Sticky SGA	100	100	100	100	100	100
	COGS	100	100	100	100	100	100

Regression

Descriptive Statistics

	Mean	Std. Deviation	N
ROA	.06635832000	.10143593912	100
Debt Ratio	.64615415613	.33865556884	100
Size	4.5714998123	.58132282725	100
Age	1.4652130917	.22000607267	100
Sticky SGA	.20535400038	.14024381542	100
COGS	.44574243662	.18014980603	100

Variables Entered/Removed^a

Model	Variables Entered	Variables Removed	Method
1	Age, Debt Ratio, Size ^b	.	Enter
2	COGS, Sticky SGA ^b	.	Enter

a. Dependent Variable: ROA

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	df1
1	.529 ^a	.280	.257	.08743440293	.280	12.415	3
2	.777 ^b	.603	.582	.06556124596	.324	38.371	2

Model Summary

Model	Change Statistics	
	df2	Sig. F Change
1	96	<.001
2	94	<.001

a. Predictors: (Constant), Age, Debt Ratio, Size

b. Predictors: (Constant), Age, Debt Ratio, Size, COGS, Sticky SGA

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.285	3	.095	12.415	<.001 ^b
	Residual	.734	96	.008		
	Total	1.019	99			
2	Regression	.615	5	.123	28.597	<.001 ^c
	Residual	.404	94	.004		
	Total	1.019	99			

a. Dependent Variable: ROA

b. Predictors: (Constant), Age, Debt Ratio, Size

c. Predictors: (Constant), Age, Debt Ratio, Size, COGS, Sticky SGA

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations Zero-order
		B	Std. Error	Beta			
1	(Constant)	-.334	.084		-3.989	<.001	
	Debt Ratio	-.086	.026	-.287	-3.269	.001	-.232
	Size	.055	.015	.315	3.564	<.001	.369
	Age	.140	.041	.303	3.383	.001	.319
2	(Constant)	.299	.097		3.083	.003	
	Debt Ratio	.015	.024	.049	.613	.541	-.232
	Size	.020	.013	.113	1.543	.126	.369
	Age	-.006	.035	-.014	-.184	.854	.319
	Sticky SGA	-.623	.075	-.861	-8.300	<.001	-.456
	COGS	-.438	.057	-.777	-7.716	<.001	-.238

Coefficients^a

Model		Correlations		Collinearity Statistics	
		Partial	Part	Tolerance	VIF
1	(Constant)				
	Debt Ratio	-.316	-.283	.974	1.026
	Size	.342	.309	.961	1.041
	Age	.326	.293	.936	1.068
2	(Constant)				
	Debt Ratio	.063	.040	.671	1.489
	Size	.157	.100	.791	1.263
	Age	-.019	-.012	.723	1.383
	Sticky SGA	-.650	-.539	.392	2.549
	COGS	-.623	-.501	.416	2.405

a. Dependent Variable: ROA

Excluded Variables^a

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics	
						Tolerance	VIF
1	Sticky SGA	-.314 ^b	-3.263	.002	-.317	.736	1.360
	COGS	-.206 ^b	-2.139	.035	-.214	.780	1.283

Excluded Variables^a

Model		Collinearity ... Minimum Tolerance
1	Sticky SGA	.736
	COGS	.777

a. Dependent Variable: ROA

b. Predictors in the Model: (Constant), Age, Debt Ratio, Size