Financial Risk and Cost Stickiness: Evidence From Egypt

Mohamed Mandour

Accounting Department, Faculty of Commerce, Alexandria University, Egypt

E-mail: mohamed.mandour@alexu.edu.eg

Abstract

This study seeks to investigate whether the cost of goods sold (COGS) behaves asymmetric to change in sales, and examines the effect of financial risk on asymmetric cost behavior of COGS in the Egyptian manufacturing firms. The financial data of this study were collected from the published annual reports for a sample of 65 Egyptian listed manufacturing firms during the period (2006-2015) with total observations 530 firm-year. The analysis of this paper is based on Anderson et al.'s (2003) cost stickiness model. The findings indicate that the COGS is sticky to change in sales, it rises more when sales increase than when it falls for equivalent sales decrease and the degree of cost stickiness increases with a firm's financial risk. This study is the first attempt to examine the direct effect of financial risk on the COGS behavior using Altman Z-score model as a proxy for financial risk, which may affect the accuracy of the results. By focusing on this proxy, the study identifies a significant relationship, which was not adequately addressed in previous studies. Therefore, this study extends the cost behavior literature by examining the impact of financial risk on managers' decisions to amend the resources.

Keywords: Egypt, Financial risk, Asymmetric cost behavior, Cost stickiness, Cost of goods sold

1. Introduction

Globalization increases challenges facing companies. Nowadays, business environment is characterized by strongly competitive pressures and dealing with clients with multiple needs. Decision makers at all levels are in need of appropriate and accurate information to be provided at the right time; cost is one of the most important information that managers need in response to increasing and intensive competition. Managerial accountants use multiple methods that depend on identifying cost behavior, such as: estimating the cost and the analysis of the relationship among cost, volume and profit. The analysis of cost behavior models is normally based on a traditional cost assumption, which is based on the classification of costs according

to their relationship with activity levels, into fixed cost and variable cost. It is assumed that the total fixed costs do not change with the change in activity levels within a certain range called the relevant range. While variable cost behavior is a linearly symmetrical behavior; meaning that the total variable cost varies proportionally with changes in activity levels, regardless of the direction of this change - increase or decrease - compared to the prior period. Thus, the proportion of cost increase with the increase in the activity by a specific amount is the same as the proportion of cost decrease if there was an equivalent decrease in the activity (Noreen, 1991).

Recently, the assumption of a linear cost behavior has been questioned in many studies. It was found that cost does not respond symmetrically to changes in activity levels up and down. A study of Anderson et al. (2003) present a model to measure the asymmetric cost behavior, and it concluded that the selling, general, and administrative(SG&A) costs behavior is not symmetric, as it increased by 0.55% with an increase in sales by 1%, and decreased by 0.35% with a decrease in sales by 1%. So cost increases with the increase in activity level with a percentage bigger than its decrease with an equivalent decrease in activity level. Thus, cost behavior does not depend only on the degree of change in activity but it is also influenced by the direction of this change as well. Anderson et al. (2003) named this phenomenon as sticky cost. Other studies (e.g.Balakrishnan et al., 2004; Wiess, 2010; Banker and Byzalov, 2014; Banker et al., 2014; Cannon, 2014; Chen et al., 2019) find that, in some circumstances, cost decreases when activity level decreases more than its increases in the case of an equivalent increase in activity as a result of managers taking the decision to remove idle capacity when activity level decreased, and not to increase the capacity with the increase in activity, which is called anti-sticky cost.

The traditional view of symmetric cost behavior neglects management's interference in the allocation of resources (Anderson et al., 2003; Yukcu and Ozkaya, 2011; Guenther et al., 2014; Kitching et al., 2016). According to the model of Anderson et al. (2003), the costs behavior is determined by separate decisions taken by managers, and does not change immediately with the change in activity levels. The authors considered that sticky cost arises as a result of the asymmetry of the managers' behavior when they make the decision to amend the resources in the case of changes in the activity up and down, as management hesitate or delay taking the decision to cut the resources when there is a decrease in activity level. The management deliberately kept idle resources to make sure of the continuity of decrease in activity, while the acceleration of management to take the decision to increase resources when expecting an increase in activity to absorb the expected increase in the activity.

Contemporary empirical research on cost behavior acknowledges that managers' decisions to adjust the resources are subject to several restrictions and motives. For instance, Anderson et al. (2003) suggest the resource adjustment costs hypothesis as one of the main reasons for asymmetric cost behavior. According to Venieris et al. (2015, p.55), resource adjustment costs refer to "economic sacrifices, social, contracting or psychological costs which emerge during the resource-adjustment process". It includes, end-of-service benefits to dismissed workers when sales decrease, loss of morale and trust among workers especially when their colleagues are terminated, as well as the costs associated with the search for, recruitment and training of

new workers in the future when sales rebound (Anderson et al., 2003: Bu et al., 2015; Venieris et al., 2015). The high cost of resource adjustment per unit of reduction or expansion of resources compared to the cost of maintaining slack resources leads managers to be hesitated to make a decision to reduce the resources with the drop in sales until they are sure that this drop is permanent leading to cost stickiness. The characteristics of the firm in terms of fixed asset intensity, labor intensity, labor protection legislation and labor market characteristics affect the adjustment costs (Anderson et al.,2003; Calleja et al., 2006; Banker et al., 2013; Nassirzadeh et al., 2013; Armanto et al., 2015; Bu et al.,2015; Zanella et al., 2015).

Additionally, several studies argue that cost stickiness and economic growth are related. For instance, Anderson et al. (2003) explain that over powerful economic growth durations, managers believe that the increase in sales is permanent and the decrease in sales is temporary. In this case, managers would prefer to speed up the decision to expand the resources if the demand increases and delay the decision to dispose the unused resources if the demand decreases, which leads to cost stickiness. Dierynck et al.(2012) argue that managers tend to postpone acquiring new recourses when demand rises during weak economic growth periods and scurry to reduce unused resources severely when demand falls, which leads to cost anti-stickiness. Moreover, Ibrahim (2015) states that cost stickiness occurred during strong economic periods, while anti-stickiness cost appeared during economic recession periods.

From the behavioral point of view, managerial incentives can be an essential driver of cost asymmetry. Chen et al. (2012) examine the effect of managerial empire-building incentives on cost pattern. The study finds that cost behaves sticky when the empire building incentives exist, as managers will hurry to add additional resources when demand increases, but will delay the decision to dispose the unused resources when demand decreases only to avoid personal consequences such as losing their position or status in the firm. On the same stream, Kama and Weiss (2013) test the effect of managerial incentives to achieve earnings targets on cost behavior. They find that when managers were under pressure to achieve earnings targets, a lower degree of cost stickiness was noted. Dierynck et al. (2012) report that when managers face pressure to meet or beat the target profits, they become more willing to reduce labor costs substantially when demand decreases and increase labor costs to a smaller extent when demand increases, leading to anti-sticky cost behavior. On the other hand, Ciftic and Salama (2018) suggest that managers do not completely consider the negative effects of cost stickiness into their earnings forecasts, as they find that stickiness cost has a positive effect on management earnings forecast errors.

Accordingly, there are two types of managerial motives that result in asymmetric cost behavior both driven by the agency problem. The first motive is to build a managerial empire, which leads costs to behave as sticky. The second motive is to achieve the target profits, which leads costs to behave as anti-sticky. Therefore, some studies aimed to examine the effect of corporate governance mechanisms on cost behavior, the studies suggest that corporate governance mechanisms decrease the degree of cost stickiness (Ezat, 2014; Xue and Hong, 2016; Ibrahim and Ezat, 2017;Ibrahim, 2018).

By reviewing previous studies in the asymmetric cost behavior literature, the researcher can conclude that despite the numerous attempts to identify the determinants of this behavior, there is a scarcity in studies dealing with the impact of financial risk on cost behavior despite the importance of this issue from the perspective of risk management. Firms with high level of financial risk do not have the ability to afford additional risks due to the inflexibility of their cost structure to interact with the changes in the activity level, which may lead these firms to be bankrupted (Holzhacker et al., 2015). According to Kitada et al.(2016), financial risk may affect cost behavior by influencing the degree of managerial choices in resource adjustment decisions in two ways. First, increase in financial risk will lead to increase the firm's cost of capital. Thus, the cost of maintaining unexploited resources will increase. This leads to a decrease in the acceptable amount of unutilized resources and increases the cost of adding new resources. Therefore, the cost will increase slowly if demand increases and it will decrease heavily if demand decreases leading to asymmetric cost behavior. Second, debt-repayment commitments restrict the firm's financial flexibility, making it difficult to invest in profitable projects. Therefore, firms with a higher financial risk, lower financial flexibility, will have difficulty in maintaining a high level of unexploited resources even if retaining these resources is important to increase the value of firms in the future. Accordingly, the acceptable amount of unexploited resources is likely to decrease in firms with low financial flexibility, limiting managers' freedom of resource adjustment decisions. Cheng et al. (2018) consider financing costs as a major part of adjustment costs that affect cost behavior. Firms with a high level of financial risk have difficulty in obtaining external financing and usually have to pay a high cost of capital. The increase in the cost of capital not only limits capacity expansion when activity increases due to the increase in adjustment costs but also pushes managers to cut unused capacity when activity decreases to avoid the higher opportunity cost of retaining slack resources, which would decrease the degree of cost stickiness(Holzhacker et al., 2015; Cheng et al., 2018).

This study is the first attempt to examine the direct effect of financial risk on the COGS behavior using Altman Z-score model as a proxy for financial risk, which may affect the accuracy of the results. By focusing on this proxy, the study identifies a significant relationship, which was not adequately addressed in previous studies. Moreover, most of the attempts to identify the pattern of cost behavior have focused on SG&A costs and the examining of COGS behavior did not get the same attention despite its weight within the cost structure. COGS is the largest single expense on any manufacturing firm's income statement. In the current study, COGS contributes an average of 77 percent of the sample's net sales.

Conducting a study in the Egyptian manufacturing industry is important for the following reasons. First, the manufacturing industry is a main pillar of the Egyptian economy since it contributes 21% of GDP (State Information Service, 2018). Consequently, understanding the cost behavior in this sector will enable a wide range of stakeholders to understand the management's behavior when making decisions related to the changing of resources due to changes in sales. Understanding management's behavior will help investors and creditors to make rational decisions. Second, most of the available evidence about the cost behavior is based on Anglo/ American contexts and little is known about cost behavior in emerging

economies like Egypt (Cheng et al., 2018; Stimolo and Porporato, 2020). The current study aims to cover this gap in the literature through identifying the pattern of cost behavior in the Egyptian manufacturing firms since the results may vary in emerging economies compared to developed economies. Third, it is becoming increasingly important to study the influence of financial risk on cost behavior in the Egyptian environment due to the increase in financial distress of the Egyptian firms because of political and economic instability experienced by Egypt and the Arab spring countries in recent years. Fourth, the study of the effect of financial risk on cost stickiness behavior adds to research in the field of risk management and cost management in the Egyptian context.

The above illustration represents a research gap in which the current research empirically addresses in the Egyptian environment.

Accordingly, the following research questions are proposed and addressed empirically:

Q1. What is the behavior of the COGS in Egyptian manufacturing firms?

Q2. Does the financial risk affect the behavior of the COGS?

This study seeks to achieve two objectives. The first is to extend the cost stickiness literature by empirically testing the cost stickiness behavior in one of the emerging economies, which is Egypt, depending on a sample of listed manufacturing firms at the Egyptian Exchange over the period 2006-2015. The second is to investigate the potential effect of financial risk on the pattern and degree of asymmetry behavior of COGS.

The remaining part of this research is organized as follows. Literature review and hypotheses are developed in Section 2, the empirical study is described in Section 3, and the empirical results are discussed in Section 4. Finally, section 5 offers the research's conclusions, recommendations and limitations.

2. Literature Review and Hypotheses

2.1 Asymmetric Cost Behavior

Cost behavior describes the variation of costs with respect to changes in activity driver. Because costs are caused by resource consumption, understanding costs behavior depends on understanding how resource levels change due to the changes in activity level (Cooper and Kaplan, 1992). Referring to the traditional model of cost behavior, costs are classified as "Fixed" and "Variable" costs. Cooper and Kaplan (1992) have noticed that these classes are realized by two different types of resources- they differ in the cost of short term adjustment-which are fixed resources committed by the firm in advance before determining the actual activity volume; such as building, machines and equipment, which are costly to be modified in the short-term. However, it results in fixed costs related to the actual activity level, in addition to the variable resources consumed as needed according to the actual activity level; such as the costs of direct and indirect materials, which are flexible to be adjusted in the short-term, and result in variable costs. According to the traditional model of cost behavior, the total fixed costs are predetermined, and not related to the actual activity level within relevant range, while the

variable cost reflects the consumption of variable resources according to the actual activity level; and then it changes proportionately with change in activity.

Recently, the imposition of cost linearity has been questioned by many studies (Malcom, 1991; Make and Rousch, 1994; Noreen and Soderstrom, 1994, 1997; Anderson et al. 2003; Cohen et al.,2017; Ibrahim and Ezat, 2017; Fourati et al.,2020), which have found that cost does not respond symmetrically to changes in activity up and down. When cost increases more with an increase in activity level, than it declines with an equivalent decrease of activity level, that is, "Sticky" cost (Anderson et al., 2003). However, depending on some specific circumstances, cost may fall with decreases in activity driver more than its increases with an equivalent drop in the activity driver, that is, "Anti-sticky" cost (Balakrishnan et al., 2004; Wiess, 2010; Banker and Byzalov, 2014; Banker et al., 2014; Cannon, 2014; Chen et al., 2019). Thus, cost behavior does not depend only on the degree of change in activity but it is also influenced by the direction of this change even "upward" or "downward".

Malcom (1991) is one of the first studies that discuss the concept of asymmetry of cost behavior, it points out that indirect labor costs are not fully commensurate with changes in activity. Noreen and Soderstrom (1994; 1997) conducted two studies to examine the behavior of overhead costs, using data from hospitals in Washington State. The authors find that overhead costs do not behave symmetric to change in activity.

Anderson et al. (2003) test the SG&A costs behavior for a sample of 7,629 United States industrial firms during the period 1979-1998. They find that SG&A costs increased by 0.55% with an increase in sales revenue by 1% and decreased by 0.35% with a decrease in sales revenue by 1%.

By examining a sample of United States, United Kingdom, French and German firms, Calleja et al. (2006) find that operating costs are sticky in response to change in revenues in all the four countries. In addition, the degree of cost stickiness for French and German firms is more than those for United States and United Kingdom firms.

Dierynck et al. (2012) investigate the behavior of labor cost using a sample of Belgian firms. The study finds that labor costs behave stickily, where they increase by 0.60% following a 1% rise in sales but decrease by 0.34% following a 1% fall in sales.

Additionally, Cannon (2014) examines whether managers do retain unused capacity when demand decrease using a sample of United States Air Transportation industry. The result indicates that costs of United States Air Transportation industry are sticky; costs averagely increased by 0.485% for a 1% increase in net revenue but decreased only 0.288% for a 1% decrease in net revenue.

Ezat (2014) finds that COGS increased by 1.1% and decreased by 0.95% with a 1% change in sales up and down, respectively, which affirms cost stickiness for a sample of Egyptian listed firms over the period 2009-2013.

Based on a sample of Australian listed firms, Bugeja et al. (2015) suggest that cost behavior is sticky on average. Costs increase by 0.885%, but decrease by only 0.797% in response to 1% increase and decrease in sales revenue.

Furthermore, Ibrahim (2015) investigates whether any of SG&A costs, COGS and operating cost behaves asymmetrically to change in demand using a sample of non-financial firms listed on Egyptian Exchange over the period 2004-2011.The findings confirmed cost stickiness for SG&A costs and COGS and cost anti-stickiness for operating costs.

Zanella et al. (2015) did not find an evidence for asymmetric cost behavior for SG&A costs using data from 49 firms listed on the United Arab Emirates during the period 2002-2012. The main reason is that most of labor force in the United Arab Emirates is temporary employment and the labor law does not provide them with more benefits, so the adjustment cost during decreasing demand is low due to the low cost of layoffs.

To sum up, the literature review of previous studies on cost stickiness finds powerful evidence on asymmetric behavior of different sorts of costs. Cost stickiness may occur for economic reasons or behavioral reasons. These reasons are not limited to a specific country or industry. Therefore, to examine Egyptian evidence of COGS stickiness, the research's first hypothesis can be derived as follows:

H1: The COGS behaves asymmetrically to an equivalent changes in sales revenue up and down.

2.2 Financial Risk and Cost Stickiness

The financial risk is defined as "The potential future inability of the firm to cover required financial obligations" (Holzhacker et al., 2015, p.2306). Financial risk has negative direct and indirect ramifications for the firm. Direct ramifications include increase cost of capital and legal costs, while indirect ramifications include opportunity costs of lost sales due to the lack of preference for customers to deal with a firm on the verge of bankruptcy. In addition, key suppliers will be resistant to extend trade credit, which means losing key suppliers and losing more efficient employees (Piotroski , 2000). The firm's circumstances affect the degree to which managers are free to make decisions to modify resources that affect dependency on cost behavior (Banker et al., 2014). The financial risk may affect the firm's cost structure. Managers of firms with a high level of financial risk are most probably to take decisions that make cost structure more flexible in responding to changes in demand. Examples of these decisions are extending the outsourcing, leasing of equipment instead of buying and increasing the proportion of contract labor against full-time employees. These decisions will make cost structure more flexible which will lessen the further risk on one hand and influence cost behavior on the other hand (Holzhacker et al., 2015).

Kitada et al. (2016) suggest that financial risk may affect cost behavior by influencing the degree of managerial choices in resource adjustment decisions in two ways. First, increase in financial risk will lead to increase the firm's cost of capital. Thus, the cost of maintaining unexploited resources will increase. This leads to a decrease in the acceptable amount of unutilized resources and increases the cost of adding new resources. Therefore, the cost will

increase slowly if demand increases and it will decrease heavily if demand decreases leading to asymmetric cost behavior. Second, debt-repayment commitments restrict the firm's financial flexibility, making it difficult to invest in profitable projects. Therefore, firms with a higher financial risk, lower financial flexibility, will have difficulty in maintaining a high level of unexploited resources even if retaining these resources is important to increase the value of firms in the future. Accordingly, the acceptable amount of unexploited resources is likely to decrease in firms with low financial flexibility, limiting managers' freedom of resource adjustment decisions.

Additionally, Cheng et al. (2018) consider financing costs as a major part of adjustment costs that affect cost behavior. The increase in the cost of capital, due to increase in financial risk, not only limits capacity expansion when activity increases due to the increase in adjustment costs, but also pushes managers to cut unused capacity when activity decreases to avoid the higher opportunity cost of retaining slack resources, which would decrease the degree of cost stickiness (Holzhacker et al., 2015; Cheng et al., 2018).

Furthermore, Calleja et al. (2006) find that firms with higher levels of debt exhibit symmetric cost behavior, possibly because they may be subject to greater scrutiny and pressure by creditors to meet debt and interest, prompting managers of these firms to adopt a more flexible cost structure that responds quickly to changes in demand.

Abu-Serdaneh (2014) reports that firm's debt intensity has negative effect on cost stickiness for a sample of 62 manufacturing firms listed on the Amman Exchange from 2008 to 2012. Via and Perego (2014) investigate the effect of debts intensity on cost behavior for a sample of Italian manufacturing and trading firms during the period 1999–2008.They conclude that firms with higher levels of debts tend to cut costs when demand decreases, leading to decrease in the degree of cost stickiness or increase in the degree of cost anti-stickiness.

Holzhacker et al. (2015) test the direct and indirect effect of the financial risk on cost behavior using a sample of 2,202 hospital-year observations of California hospitals during the period 2002-2012. The results show a positive direct effect of financial risk on the flexibility of the cost structure, which means that the greater the financial risk, the more flexible the cost structure; which in turn decreases the degree of asymmetric cost behavior. The findings also suggest that firms increment their cost flexibility due to financial risk by extending the outsourcing, leasing of equipment instead of buying and increasing the proportion of contract labor against full-time employees. Moreover, Homburg et al. (2015) find a negative relationship between financial distress and the degree of cost stickiness because managers have a strong motive to cut costs when the firm's survival is at stake.

As settled in the cost stickiness literature, adjustment costs and deliberate managerial decisions are the main drivers of asymmetric cost behavior (Anderson et al., 2003; Banker and Byzalov, 2014; Banker et al., 2014; Cannon, 2014; Chen et al., 2019). In this study, the researcher suggest that financial risk will affect cost behavior by influencing the degree of managerial choices in resource adjustment decisions through its impact on financial flexibility and the cost of capital. Increase in financial risk will restrict the firm's financial flexibility and increase the firm's cost of capital. Consequently, the increase in financial risk will limit managers' ability to

maintain idle resources when demand decreases and restrict managers' ability to add more resources when demand increases. Accordingly, this will decrease the degree of cost stickiness or increase the degree of cost anti-stickiness. Therefore, to examine the impact of financial risk on COGS behavior in the Egyptian context, the second hypothesis can be derived as follows:

H2: Firm's financial risk has a negative effect on the degree of COGS stickiness.

3. Study Methodology

3.1 Study Population and Sample Selection

The study's population includes all listed manufacturing firms on the Egyptian Exchange for 10 years (2006-2015). The study focuses on manufacturing firms only and excludes other economic sectors because cost structure varies from one economic sector to another, which may affect the study's results. Moreover, the population is limited to firms with fiscal year ends on December 31. The initial sample consists of 65 firms operating in seven industrial fields, as follows; food and beverage (15 firms), construction and materials (17 firms), industrial goods and services and automobiles (13 firms), basic resources (5 firms), healthcare and pharmaceuticals (6 firms) chemicals (5 firms), and personal and household products (4 firms). Therefore, the initial sample is 650 firm-year observations (65 firms X 10 years).

Following the previous studies in cost stickiness field (e.g. Anderson et al., 2003; Ezat, 2014; Armanto et al., 2015; Ibrahim, 2015; Chen et al., 2019) firm-year observations that include missing data were dismissed and firm-year observations with COGS more than net sales revenue were eliminated. Additionally, to limit the effect of extreme observations, firm-year observations with standardized residuals greater than an absolute value of four were discarded. After applying the previous criteria, the final valid sample size includes 530 firm-years as shown in Table 1.

Table 1. The study's sample

	Firm-Year Obs.
Initial sample size (65*10)	650
Less: observations with missing data	(54)
Less: observations with COGS more than net sales	(13)
Less: Extreme observations	(53)
Final sample	530

3.2 Variables Measurement and Study Models

To test the cost behavior of COGS and the effect of financial risk on it, three models are used. The study uses the basic model in Anderson et al. (2003), which is widely used in the cost stickiness research (Banker and Byzalov, 2014; Cannon, 2014; Via and Perego, 2014; Subramaniam and Watson, 2016). Model (1) is used for examining the stickiness of COGS. In order to test the impact of financial risk on the sticky cost phenomenon, Model (1) is expanded to include the variable financial risk as interaction term, as shown in model (2).To measure the effect of some control variables on the asymmetric behavior of COGS, model (2) is expanded by adding four control variables, as shown in model (3).

Basic Model (1):

$\Delta \ln COGS_{i,t} = \beta_0 + \beta_1 \Delta \ln Sales_{i,t} + \beta_2 DEC_{i,t} * \Delta \ln Sales_{i,t} + \varepsilon_{i,t}$

Model (2):

$\Delta \ln COGS_{i,t} = \beta_0 + \beta_1 \Delta \ln Sales_{i,t} + \beta_2 DEC_{i,t} * \Delta \ln Sales_{i,t}$

$\qquad + \beta_3 DEC_{i,t} * \Delta \ln Sales_{i,t} * FR_{i,t} + \varepsilon_{it}$

Model (3): (With control variables):

$\Delta \ln COGS_{i,t} = \beta_0 + \beta_1 \Delta \ln Sales_{i,t} + \beta_2 DEC_{i,t} * \Delta \ln Sales_{i,t}$

$\qquad + \beta_3 DEC_{i,t} * \Delta \ln Sales_{i,t} * FR_{i,t}$

$\qquad + \beta_4 DEC_{i,t} * \Delta \ln Sales_{i,t} * AINT_{i,t}$

$\qquad + \beta_5 DEC_{i,t} * \Delta \ln Sales_{i,t} * GDP_t$

$\qquad + \beta_6 DEC_{i,t} * \Delta \ln Sales_{i,t} * Loss_{i,t-1}$

$\qquad + \beta_7 DEC_{i,t} * \Delta \ln Sales_{i,t} * Successive\text{-} Dec_{i,t} + \varepsilon_{i,t}$

Table 2 shows the models' variables, definitions, and measurements.

Table 2. Models' variables, definitions, and measurements

Variable	Definition and Measurement
$\Delta \ln COGS_{i,t}$	The logarithm of the change in the COGS for the firm i between year t and year t-1.
$\Delta \ln Sales_{i,t}$	The logarithm of the change in net sales for the firm i between year t and year t-1.
$DEC_{i,t}$	A dummy variable that is equal to one when the net sales for firm i decreases from year t-1 to year t, and zero otherwise.
$FR_{i,t}$	Financial risk for the firm i in year t. The modified Altman Z-score model (Altman, 1983) is used as a proxy of the financial risk. The Z-score can be determined as follows: **Z-Score= 0.717 X_1 + 0.847 X_2 + 3.107 X_3 + 0.42 X_4 + 0.998 X_5** Where X_1 measured by dividing working capital by total assets. X_2 measured by dividing retained earnings by total assets. X_3 calculated by dividing earnings before interest and taxes by total assets. To measure X_4, book value of equity scaled by book value of total debt. Finally, X_5 calculated by dividing net sales by total assets. Following Altman (1983) and Shahwan (2015), a firm with a Z-score value more than 2.9 is considered to be healthy, where as a firm with a Z-score less than 2.90 is considered to be distressed. $FR_{i,t}$ is a dummy variable equal to one in case of high financial risk (Z<2.9), and zero otherwise (Holzhacker et al.,2015; Shahwan ,2015).
$AINT_{i,t}$	Refers to asset intensity and measured by Log [$Asset_{i,t}$ / $Sales_{i,t}$]
GDP_t	Refers to the economic growth rate during year t
$Loss_{i,t-1}$	A dummy variable equal to one if the firm reported a loss in the previous year and zero otherwise (Dierynck et al., 2012).
Successive-$Dec_{i,t}$	A dummy variable equal to one when net sales$_{t-2}$ > net sales$_{t-1}$ > net sales$_t$ and zero otherwise (Dierynck et al., 2012).
$\varepsilon_{i,t}$	Error term

Coefficient β_1 estimates the relation between COGS change and net sales change when net sales increases by 1%. Coefficient β_2 estimates the difference in the relation between COGS change and net sales change when net sales increases and decreases by 1%. Therefore, it is called the sticky cost parameter (Cannon, 2014).The combined coefficients,$(\beta_1 + \beta_2)$ measures the percentage fall in COGS with a 1% fall in net sales.

A significantly negative β_2 coefficient indicates the presence of cost stickiness, as $(\beta_1 - \beta_2) < \beta_1$ which means that the degree of increase in cost due to an increase in net sales by 1% is bigger than the degree of decrease in cost due to a 1% decline in net sales. In addition, a significantly positive β_2 coefficient indicates the presence of cost anti-stickiness, as $(\beta_1 + \beta_2) > \beta_1$, which demonstrates that the degree of cost decline is bigger than the degree of cost increment for a 1% change in net sales (Weiss, 2010). Finally, if β_2 equals to zero, this infers the cost decreases and increases by the same percent with a 1% change in net sales, which refers to symmetric cost behavior (Anderson., 2003; Uy, 2014).

The modified Altman Z-score model (Altman, 1983) is used as a proxy for the financial risk because it is more applicable to manufacturing firms (Shahwan, 2015). To eliminate the impact of inflation on the research results, the financial data for all variables were converted to equivalent 2006 dollars using GDP deflator (Anderson et al., 2003; Banker and Byzalov, 2014; Bu et al., 2015).

The data of the study were collected from the published annual reports from the official website of the Egyptian Exchange (www.egx.com.eg), firms' websites on the internet, and World Bank website on the internet (www.worldbank.org/en/country/egypt). Data were collected during the period of 2006-2015 as well as the period of 2004-2005, because some variables in the study model include the beginning balances and the changes from the prior years.

4. Empirical Results

4.1 Descriptive Statistics

Table 3 provides descriptive statistics for all variables used in the study. The sample firms reports mean value of net sales per year about LE 590,7 million(median= LE 185.1 million), which is incomparable to the mean value of $1277.09 million in Anderson et al.(2003) taking into account the exchange rates. The mean value of annual COGS is LE 463,9 million(median= LE 142,3 million), which is lower than the mean value of $ 1,059.66 million reported by Subramaniam and Watson (2016) taking into account the exchange rates. The average value of COGS as a percentage of net sales is 77% (median=80%), which is higher than the ratios of 63.77 and 67 reported by Subramaniam and Watson (2016) and Ibrahim and Ezat (2017), respectively. Moreover, the average percentage of financial risk is about 67.8% (median =1), which reflects high level of financial risk as compared to 28.9% reported by Holzhacker et al. (2015). The collected data reported that the mean value of assets intensity was around 183% (median=145%). The GDP growth rate variable showed mean value about 4.08% (median=4.2%). The period of study witnessed several economic events that may affect the decisions of the management concerned with the adjustment of resources, and thus

affect the cost behavior starting with economic growth during the years 2006-2008. The GDP growth rate increases from 6.3% on 2006 to 7.2% on 2008. This was followed by the global financial crisis, which was accompanied by the decline in the economic growth on 2009 to 4.7% and improved to 5.1% on 2010. Then the GDP growth declined starting in 2011, following the events of the January revolution and the subsequent political and economic instability, to reach 2.2% on 2014 and improved to 4.2% in 2015. In addition, about 7.5% of observations achieved losses during the prior year. The collected data reported that the average percentage of successive decreases in net sales is about 18.3%.

Table 3. Descriptive analysis

	Mean	Median	Std. Devia
Net sales	590,7	185,1	1,390
[In millions of Egyptian Pounds (LE)]			
Cost of goods sold	463,9	142,3	1,171
[In millions of Egyptian Pounds (LE)]			
COGS as a percentage of net sales	77%	80%	14.7%
FR	67.8%	1	47%
Assets intensity	1.8261	1.4517	1.4922
GDP%	4.08%	4.2%	2.03%
Prior year loss ($Loss_{i,t-1}$)	0.0758	0.0	0.2648
Successive- Decreases in sales$_{i,t}$	0.1830	0.0	0.38705

4.2 Regression Results

4.2.1 COGS Behavior (Model 1)

To test COGS behavior (H1), the study uses the basic model (Model 1). Table 4 column (I) shows the results of estimating the basic model using ordinary least squares (OLS) regression analysis. First, the results show that the model is highly significant (F-value=525.235, p < 0.001). In addition, the adjusted R^2 value equals 66.5%, which means that approximately 66.5% of the variance in COGS was accounted for the independent variables in the model and remaining percentage, 33.5%, is explained by other factors. This is similar to the adjusted R^2 value of 67% reported by Via and Perego (2014). Second, the model coefficients show that COGS behaves sticky, as the coefficient estimate on β_1 is 1.064 and significant at level 1%, while that of β_2 is -0.363 and significant at level 1%. These results indicate that when sales increase by 1%, the COGS increases by 1.064%, while when sales decrease by 1%, the COGS decreases by (1.064% - 0.363%) 0.701%. The difference between these, β_2, refers to the degree of cost stickiness.

Hence, on average, the firms in the sample exhibit COGS stickiness in the period 2006-2015 (COGS increases by 1.064% for 1% rise in sales and decreases by 0.701% for 1% fall in sales). This means that COGS responds asymmetrically to equivalent change in sales. Thus, H1 is supported.

This result aligns with previous research results (Ezat, 2014; Ibrahim, 2015; Subramanian and Watson, 2016; Ibrahim and Ezat, 2017). According to Ibrahim and Ezat (2017), there are two

reasons behind the stickiness of COGS, the first one is related to raw material cost and the other one is related to labor cost as the main components of COGS. First, raw material costs are likely to behave sticky, as suppliers motivate managers to purchase a large quantity of raw material to obtain purchase discount, which has two effects on COGS behavior as follows; purchase large quantities of raw material and receives discount will reduce the unit cost of raw material more than what was estimated by the traditional cost behavior model. Moreover, ordering large quantities of raw material will increase the inventory intensity, which in turn leads to an increase in the degree of COGS stickiness. Second, labor costs are likely to behave sticky as when sales decrease, managers may decide to keep the high-skilled labor, which leads to asymmetric cost behavior. Furthermore, the labor cost per unit may decrease due to learning curve.

4.2.2 Financial Risk and COGS Behavior (Model 2)

To test the influence of financial risk on COGS behavior (H2), the study uses the extended model 2. Table 4 (column II) shows the results of estimating model 2 using OLS regression analysis. First, the results show that the model is highly significant, (F-value = 357.27, p <0.001). In addition, the adjusted R^2 value equals 67%, which means that approximately 67% of the variance in COGS was accounted for the independent variables in the model and the remaining percentage, 33%, is explained by other factors. Which is comparable to the adjusted R^2 value of 70% reported by Via and Perego (2014). Second, the model coefficients show that COGS behaves sticky, as the coefficient estimate on β_1 is 1.063 and significant at level 1%, while that of β_2 is -.188 and significant at level 10%. These results confirm the basic model's finding that COGS is sticky. On the other hand, the coefficient of the financial risk interaction term (β_3) is negative (β_3= -0.256) and significant at level 1% indicating that the magnitude of COGS stickiness is higher in firm-year observations with higher financial risk (Anderson et al., 2003). The results, as shown in Table 3, indicate that the degree of cost stickiness is increased from 0.363 in model 1 to 0.444 (0.188+0.256) in model 2, which means that the financial risk has a positive effect on the degree of cost stickiness. Thus, H2 is rejected.

This result is in line with that obtained by Reimer (2018, p.127), who found a positive relationship between financial risk and cost stickiness. There are several possible explanations for this result. This result may reflect that managers with higher financial risk are more likely to be overconfidence about the future of their firms (Malmendier et al., 2011; Adam et al., 2015) which would be reflected in their decision to adjust resources with changes in demand. Increasing the degree of overconfidence increases the optimistic managerial expectations about the future sales (Libby and Rennekamp 2012). When managers are optimistic about the future sales, they are more willing to add capacity for current sales increase and retain unused capacity for current sales decrease, which in turn makes the cost behavior sticky (Banker and Byzalov, 2013; Chen et al., 2013).

Another possible explanation for this result might be that managers of firms in financial distress would be willing to invest in risky projects; if the project is successful, the firm avoids entry into bankruptcy phase, and if the project does not succeed, the creditors carry the

cost (López-Gutiérrez et al., 2015). Keeping unused resources when current sales fall and future sales are uncertain can be seen as an investment in a risky project (Reimer, 2018, p.68). Accordingly, the increase in financial risk would push managers to invest in risky projects by increasing the resources when activity levels increase to avoid entry into bankruptcy phase and retain unused resources when activity levels decrease, which in turn makes the cost behavior sticky.

4.2.3 Robustness Checks

To check the robustness of the results, this study added control variables, splitted the sample according to the level of financial risk and added the financial risk as a standalone Independent variable. First, regarding the control variables, a number of studies on cost stickiness suggest that asset intensity, economic growth rate, incentive to avoid losses and the direction of the change in prior period sales are likely to affect cost behavior (e.g. Anderson et al., 2003; Dierynck et al., 2012; Banker et al., 2014; Bu et al., 2015; Ibrahim, 2015; Venieris et al., 2015, Banker et al., 2018). To measure the sensitivity of the study's results to additional control variables that are likely to affect cost behavior, model (3) is applied. Table 4 (column III) shows the results of estimating model 3 using OLS regression analysis. Results remain essentially unchanged after adding control variables, as the model coefficients show that COGS behaves sticky, as the coefficient estimate of β_1 is 1.065 and significant at level 1%, while that of β_2 is -0.279 and significant at level 5%. These findings confirm the basic model's result that COGS is sticky and supported H1. On the other hand, the coefficient of the financial risk interaction term (β_3) is negative (-0.308) and significant at level 1% meaning that the magnitude of COGS stickiness is higher in firm-year observations with higher financial risk. Therefore, the firm's financial risk increase the degree of COGS stickiness, which means H2 is not supported.

Concentrating on other control variables of model 3, the results suggest that, the relationship between asset intensity and the degree of COGS stickiness is not significant. This finding is in agreement with the results of previous studies (e.g. Dierynck et al., 2012). For coefficient β_5, which captures the COGS stickiness in periods of macroeconomic growth, the findings reveal that the coefficient is insignificant. Although this result is unexpected but it is consistent with previous literature (e.g. He et al., 2010; Dierynck et al., 2012; Bu et al., 2015; Venieris et al., 2015; Zanella et al., 2015). This might be due to the long-dated visions of managers who are not ready to modify their COGS dependent on temporary economic changes (He et al., 2010). For coefficient β_6, which measures the effect of incentive to avoid losses on cost stickiness, the findings show that the coefficient is positive (0.309) and significant at level 10%, as expected. This result indicates that the incentive to avoid loss encourages managers to cut cost with decrease in demand and not to increase cost with increase in demand, thus, COGS behaves as anti-sticky. Coefficient β_7, which measures the effect of decrease in sales in two consecutive years on cost stickiness, is positive as expected and significant at level 1%. This result suggests that, the decrease in sales in two consecutive years encourages managers to reduce cost with decrease in demand and not to increase cost with increase in demand, thus, COGS behaves as anti-sticky. This result is in agreement with the results of previous studies (e.g. Anderson et al., 2003; Banker et al., 2014).

Second, to further test the effect of financial risk on COGS behavior, the study sample was splitted into two sub-samples according to the level of financial risk. The first sub-sample contains observations with a low financial risk (Z-Score greater than or equal to 2.9) with a total of 172 firm- year observations, while the second sub-sample contains observations with a high financial risk (Z-Score less than 2.9) with a total of 358 firm- year observations. The basic model (Model 1) was estimated for each sub-sample separately.

Table 5 shows the findings from estimating model (1) in sub-samples of observations with a low level of financial risk and with a high level of financial risk. Given the low level of financial risk, the estimate of β_2 is −0.21, which is insignificant (see column I). Whereas, COGS shows asymmetric behavior in case of a low level of financial risk. However, given the high level of financial risk, the estimate of β_2 is -0.43, significant at the 1% level (see column II). That is, COGS is sticky in case of a high level of financial risk. This indicates that firms with a low level of financial risk exhibit a more symmetric cost behavior, while firms with a high level of financial risk exhibit cost stickiness. Therefore, financial risk has a positive impact on the degree of COGS stickiness, which confirms the rejection of H2.

Table 4. Results of estimating the study's three models using Ordinary Least Squares (OLS)

	Predicted Sign	I Basic Model (1)	II Extended Model with Financial Risk (2)	III Extended Model with both Financial Risk and Control Variables (3)
β_0: Constant		-0.016** (-2.053)	-0.036** (-2.042)	-0.037** (-2.104)
β_1: $\Delta InSales_{i,t}$	+	1.064*** (22.13)	1.063*** (22.25)	1.065*** (22.480)
Two-Way Interaction Terms				
β_2 : $DEC_{i,t} * \Delta InSales_{i,t}$	_	-0.363*** (-4.059)	-0.188* (-1.727)	-0.279** (-2.433)
Three-Way Interaction Terms				
β_3: $DEC_{i,t} * \Delta InSales_{i,t} * FR_{i,t}$	+		-0.256*** (-2.792)	-0.308*** (-3.061)
β_4: $DEC_{i,t} * \Delta InSales_{i,t} * AINT_{i,t}$	_			0.009 (0.122)
β_5: $DEC_{i,t} * \Delta InSales_{i,t} * GDP\%$	_			0.023 (1.070)
β_6: $DEC_{i,t} * \Delta InSales_{i,t} * Loss_{i,t-1}$	+			0.309* (1.894)
β_7: $DEC_{i,t} * \Delta InSales_{i,t} * Successive\text{-}Dec_{i,t}$	+			0.231*** (2.593)
F-Value		525.235	357.27	184.372
(Sig.)		(0.000)	(0.000)	(0.000)
Adjusted R Square		66.5%	67%	67.5%

*, **, *** indicate significance at 10%, 5%, and 1% respectively
The maximum VIF value for all independent variables are less than 10, indicating the absence of multicollinearity (Landau and Everitt, 2004,p.116)

Table 5. Results of estimating the basic Model (1) for the sub-samples using Ordinary Least Squares (OLS)

	I Basic Model (1) with low level of financial risk sub-sample	II Basic Model (1) with high level of financial risk sub-sample
β_0: Constant	-0.01	-0.01
	(-0.90)	(-0.03)
β_1: $\Delta InSales_{i,t}$	1.078***	1.057***
	(8.882)	(24.2)
β_2: $DEC_{i,t} * \Delta InSales_{i,t}$	-0.21	-0.43***
	(-0.93)	(-5.35)
F-Value	105.8	569
(Sig.)	(0.000)	(0.000)
Adjusted R Square	59.2%	79%

*, **, *** indicate significance at 10%, 5%, and 1% respectively

The maximum VIF value for all independent variables are less than 10, indicating the absence of multicollinearity (Landau and Everitt, 2004,p.116)

5. Conclusion, Recommendations and Limitations

This study aims to determine the nature of COGS behavior for a sample of manufacturing firms listed on the Egyptian Exchange over the period 2006-2015. In addition, the study aims to test the impact of financial risk on the asymmetry behavior of the COGS. Based on Anderson et al.'s cost stickiness model (2003), results indicate that the COGS is sticky with change in sales; it rises more when sales increase than it falls for equivalent sales decrease. Further, the results show that financial risk increases the degree of stickiness of COGS.

This study makes several contributions to the literature. First, the study provides empirical evidence on the extent of asymmetry behavior of COGS in the Egyptian manufacturing firms given the scarcity of research on this topic in the Egyptian environment. Second, this study is the first attempt to study the impact of financial risk on the COGS behavior in Egypt, and from the few studies that have covered this impact generally, so the study contributes to understanding the nature of the relationship between financial risk and management decisions to amend the resources. Third, many of the managerial decisions taken are stem from understanding cost behavior in relation to activity. Therefore, the results of this study can help management to understand the cost behavior, increasing their ability to have better prediction of the behavior of cost with the changes in activity. This is considered an important element for the purposes of planning, controlling, and decision-making. Fourth, the results of the study are expected to help investors and financial analysts to understand the management's behavior when making decisions related to the changing of resources as a result of changes in activity. Which is an important information when making investment

decisions that are not disclosed in financial reports. Finally, asymmetric cost behavior leads to asymmetric profit behavior, because the cost is an essential component of profit, thus understanding cost behavior can improve the accuracy of research results in the field of financial accounting that relies on understanding the behavior of profits or predicting them.

This study is subject to several limitations. First, the study aims to understand the COGS behavior, on average, excluding the behavior of manufacturing cost elements; which are components of COGS like, direct material cost, direct labor cost and overhead cost. This is due to the unavailability of detailed data about these components. Second, the sample of this study is limited only to listed manufacturing firms in the Egyptian Exchange without considering other economic sectors, thus, the study's findings cannot be generalized to other sectors. Third, the small sample size represents another limitation.

Future research may investigate the effect of financial risk on asymmetric cost behavior in non-manufacturing sectors. Furthermore, it may be beneficial to test the influence of asymmetric cost behavior on the accuracy of management accounting information system output.

References

Abu-Serdaneh, J. (2014). The asymmetrical behavior of cost: Evidence from Jordan. *International Business Research*, *7*(8), 113-122.

Adam, T. R., Fernando, C. S., & Golubeva, E. (2015). Managerial overconfidence and corporate risk management. *Journal of Banking & Finance, 60*, 195-208.

Altman, E. (1983). *Corporate financial distress: A complete guide to predicting, avoiding and dealing with bankruptcy*. Wiley, New York, NY.

Anderson, M. C., Banker, R. D., & Janakiraman, S. N. (2003). Are selling, general, and administrative costs "sticky"?. *Journal of Accounting Research, 41*(1), 47-63.

Armanto, B., Tiono, K. M., & Suthiono, H. (2015). The stickiness of selling, general, and administrative costs in the Indonesian companies. *International Research Journal of Business Studies, 7*(1), 39-53.

Balakrishnan, R., Petersen, M. J., & Soderstrom, N. S. (2004). Does capacity utilization affect the "stickiness" of cost?. *Journal of Accounting, Auditing & Finance, 19*(3), 283-300.

Banker, R. D., & Byzalov, D. (2014). Asymmetric cost behavior. *Journal of Management Accounting Research, 26*(2), 43-79.

Banker, R. D., Byzalov, D., & Chen, L. T. (2013). Employment protection legislation, adjustment costs and cross-country differences in cost behavior. *Journal of Accounting and Economics, 55*(1), 111-127.

Banker, R. D., Byzalov, D., Ciftci, M., & Mashruwala, R. (2014). The moderating effect of prior sales changes on asymmetric cost behavior. *Journal of Management Accounting Research, 26*(2), 221-242.

Banker, R. D., Byzalov, D., Fang, S., & Liang, Y. (2018). Cost Management Research. *Journal of Management Accounting Research, 30*(3), 187-209.

Bu, D., Wen, C., & Banker, R. D. (2015). Implications of asymmetric cost behaviour for

analysing financial reports of companies in China. *China Journal of Accounting Studies, 3*(3), 181-208.

Bugeja, M., Lu, M., & Shan, Y. (2015). Cost stickiness in Australia: Characteristics and determinants. *Australian Accounting Review, 25*(3), 248-261.

Calleja, K., Steliaros, M., & Thomas, D. C. (2006). A note on cost stickiness: Some international comparisons. *Management Accounting Research, 17*(2), 127-140.

Cannon, J. N. (2014). Determinants of "sticky costs": An analysis of cost behavior using United States air transportation industry data. *The Accounting Review, 89*(5), 1645-1672.

Chen, C. X., Gores, T., & Nasev, J. (2013). Managerial overconfidence and cost stickiness. Retrieved July 2, 2019, from https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2208622

Chen, C. X., Lu, H., & Sougiannis, T. (2012).The agency problem, corporate governance, and the asymmetrical behavior of selling, general, and administrative costs. *Contemporary Accounting Research, 29*(1), 252-282.

Chen, J. V., Kama, I., & Lehavy, R. (2019). A contextual analysis of the impact of managerial expectations on asymmetric cost behavior. *Review of Accounting Studies, 24*(2), 665-693.

Cheng, S., Jiang, W., & Zeng, Y. (2018). Does access to capital affect cost stickiness? Evidence from China. *Asia-Pacific Journal of Accounting and Economics, 25*(1-2), 177-198.

Ciftci, M., & Salama, F. M. (2018). Stickiness in Costs and Voluntary Disclosures: Evidence from Management Earnings Forecasts. *Journal of Management Accounting Research, 30*(3), 211-234.

Cohen, S., Karatzimas, S., & Naoum, V. C. (2017). The sticky cost phenomenon at the local government level: empirical evidence from Greece. *Journal of Applied Accounting Research, 18*(4), 445-463.

Cooper, R., & Kaplan, R. S. (1992). Activity-based systems: Measuring the costs of resource usage. *Accounting Horizons, 6*(3), 1-13.

Dierynck, B., Landsman, W. R., & Renders, A. (2012). Do managerial incentives drive cost behavior? Evidence about the role of the zero earnings benchmark for labor cost behavior in private Belgian firms. *The Accounting Review, 87*(4), 1219-1246.

Ezat, A. N. (2014). Corporate Governance, Ownership Structure, and Cost Stickiness: Evidence from Egypt. Working paper, Mansoura University. Retrieved May 11, 2019, from https://www.researchgate.net/publication/283854985

Fourati, Y. M., Ghorbel, R. C., & Jarboui, A. (2020). Sticky cost behavior and its implication on accounting conservatism: a cross-country study. *Journal of Financial Reporting and* Accounting, *18*(1), 169-197

Guenther, T. W., Riehl, A., & Robler, R. (2014). Cost stickiness: State of the art of research and implications. *Journal of Management Control, 24*(4), 301-318.

He, D., Teruya, J., & Shimizu, T. (2010). Sticky selling, general and administrative cost behavior and its changes in Japan. *Global Journal of Business Research, 4*(4), 1-10.

Holzhacker, M., Krishnan, R., & Mahlendorf, M. D. (2015). Unraveling the black box of cost behavior: an empirical investigation of risk drivers, managerial resource procurement, and cost elasticity. *The Accounting Review, 90*(6), 2305-2335.

Homburg, C., Nasev, J., & Richter, C. (2015). Corporate Financial Distress and Slack Resources. *Working paper,* University of Cologne.

Ibrahim, A. E. A. (2015). Economic growth and cost stickiness: evidence from Egypt. *Journal of Financial Reporting and Accounting, 13*(1), 119-140.

Ibrahim, A. E. A. (2018). Board characteristics and asymmetric cost behavior: evidence from Egypt. *Accounting Research Journal, 31*(2), 301-322.

Ibrahim, A. E. A., & Ezat, A. N. (2017). Sticky cost behavior: evidence from Egypt. *Journal of Accounting in Emerging Economies, 7*(1), 16-34.

Kama, I., & Weiss, D. (2013). Do earnings targets and managerial incentives affect sticky costs?. *Journal of Accounting Research, 51*(1), 201-224.

Kitada, T., Koyama, M., & Kajiwara, T. (2016). The moderating effect of the main bank system in Japan on the association between financial risk and cost behavior. Retrieved May 25, 2018, from https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2823246

Kitching, K., Mashruwala, R., & Pevzner, M. (2016). Culture and cost stickiness: A cross-country study. *The International Journal of Accounting, 51*(3), 402-417.

Landau, S., & Everitt, B. (2004). *A handbook of statistical analyses using SPSS* (1st ed.). Boca Raton, FL: Chapman and Hall/CRC.

Libby, R., & Rennekamp, K. (2012). Self-Serving Attribution Bias, Overconfidence, and the Issuance of Management Forecasts. *Journal of Accounting Research, 50*(1), 197-231.

López-Gutiérrez, C., Sanfilippo-Azofra, S., & Torre-Olmo, B. (2015). Investment decisions of companies in financial distress. *BRQ Business Research Quarterly, 18*(3), 174-187.

Mak, Y. T., & Roush, M. L. (1994). Flexible budgeting and variance analysis in an activity-based costing environment. *Accounting Horizons, 8*(2), 93-103.

Malcom, R. E. (1991). Overhead control implications of activity costing. *Accounting Horizons, 5*(4), 69-78.

Malmendier, U., Tate, G., & Yan, J. (2011). Overconfidence and early-life experiences: the effect of managerial traits on corporate financial policies. *The Journal of finance, 66*(5), 1687-1733.

Nassirzadeh, F., Saei, M. J., Salehi, M., & Bayegi, S. A. H. (2013). A Study of the stickiness of cost of goods sold and operating costs to changes in sales level in Iran. *Studies in Business and Economics, 8*(2), 79-89.

Noreen, E. (1991). Conditions under which activity-based cost systems provide relevant costs. *Journal of Management Accounting Research, 3*(4), 159-168.

Noreen, E., & Soderstrom, N. (1994). Are overhead cost strictly proportional to activity?. *Journal of Accounting and Economics, 17*(1/2), 255-278.

Noreen, E., & Soderstrom, N. (1997). The accuracy of proportional cost models: evidence from hospital service departments. *Review of Accounting Studies, 2*(1),89-114.

Piotroski, J. D. (2000). Value investing: The use of historical financial statement information to separate winners from losers. *Journal of Accounting Research, 38,* 1-52.

Reimer, K. (2018). *Asymmetric Cost Behavior: Implications for the Credit and Financial Risk of a Firm*. Springer.

Shahwan, T. M. (2015). The effects of corporate governance on financial performance and financial distress: evidence from Egypt. *Corporate Governance, 15*(5), 641-662.

State Information Service. (2018). The Egyptian economy sectors. Retrieved September 18, 2020, from https://www.sis.gov.eg/Story/1241/%D8%A7%D9%84%D8%B5%D9%86%D8%A7%D8%B9%D8%A9-?lang=ar

Stimolo, M. I., & Porporato, M. (2019). How different cost behaviour is in emerging economies? Evidence from Argentina. *Journal of Accounting in Emerging Economies, 10*(1), 21-47.

Subramaniam, C., & Watson, M. W. (2016). Additional evidence on the sticky behavior of costs. *Advances in Management Accounting, 26,* 275-305.

Uy, A. O. O. (2014). The dynamics of firm competitiveness: Evidence from cost behavior of Filipino firms. *Academy of Accounting and Financial Studies Journal, 18*(4), 84-94.

Venieris, G., Naoum, V. C., & Vlismas, O. (2015). Organisation capital and sticky behaviour of selling, general and administrative expenses. *Management Accounting Research, 26,* 54-82.

Via, N. D., & Perego, P. (2014). Sticky cost behaviour: Evidence from small and medium sized companies. *Accounting & Finance, 54*(3), 753-778.

Weiss, D. (2010). Cost behavior and analysts' earnings forecasts. *The Accounting Review, 85*(4), 1441-1471.

Xue, S., & Hong, Y. (2016). Earnings management, corporate governance and expense stickiness. *China Journal of Accounting Research, 9*(1), 41-58

Yukcu, S., & Ozkaya, H. (2011). Cost behavior in Turkish firms: Are selling, general and administrative costs and total operating costs "sticky"?. *World of Accounting Science, 13*(3), 1-27.

Zanella, F., Oyelere, P., & Hossain, S. (2015). Are costs really sticky? Evidence from publicly listed companies in the UAE. *Applied Economics, 47*(60), 6519-6528.

Copyright Disclaimer