A New Methodology for Identifying the Sources of Cost Stickiness and Investigating their Effects on Earnings Forecast Accuracy

Ali Shirzad

Ph.D. Student in Accounting, School of Economics and Administrative Sciences, Ferdowsi University of Mashhad, Mashhad, Iran.
Email: alishirzad@mail.um.ac.ir

Mohammad Javad Saei[*]

Assistant Professor of Accounting, School of Economics and Administrative Sciences, Ferdowsi University of Mashhad, Mashhad, Iran.
Corresponding Author: Mohammad Javad Saei
Email: mj-saei@um.ac.ir

Farzaneh Nassir Zadeh

Associate Professor of Accounting, School of Economics and Administrative Sciences, Ferdowsi University of Mashhad, Mashhad, Iran.
Email: nasirzadeh@um.ac.ir

Hassan yazdifar
Professor of Accounting and Head of Accounting, Finance and Economics Department, Bournemouth university, England

[1]Corresponding Author: Mohammad Javad Saei, School of Economics and Administrative Sciences, Ferdowsi University of Mashhad, Mashhad, Iran. Phone: +989153114339, Email: mj-saei@um.ac.ir

A New Methodology for Identifying the Sources of Cost Stickiness and Investigating their Effects on Earnings Forecast Accuracy

Abstract

The main aim of this study is to present a new methodology for separating the sources of cost stickiness. In previous research, various factors have been shown to affect cost stickiness. These factors are rooted in the industry and firm-specific characteristics or specific events, which may occur each year at national or international scales. Overall, they could be classified into three groups: 1. Year-specific events and features, 2. Industry-specific and 3. Firm-specific characteristics. In this study, in the first step, a new methodology is presented to separate the sources of cost stickiness, including a novel method for calculating cost stickiness for each firm-year. In the second step, we investigated the effect of each firm-year stickiness and each source of stickiness on the management earnings forecast accuracy (MEFA). To investigate the validity, the results compared with Anderson et al. (2007). The statistical population of the study consisted of all companies listed on the Tehran Stock Exchange, from which 1080 observations in 2014-2018 period were selected and reviewed. Our results indicated that MEFA has a negative and significant relationship with total stickiness, stickiness of each year and each company, but no significant relationship was found with stickiness of each industry. In addition, the results of using the proposed method are consistent with Anderson et al.'s (2007) model and even more significant to that. The findings suggest that the events of each year and the intra-organizational events of each company have a greater impact on cost behavior. Hence, it is necessary for managers and financial analysts to take into account each source of cost stickiness, especially year-specific events and firm-specific characteristics, and consider their effects in earnings forecast to improve their MEFA.

Keywords: Cost stickiness, Management Earnings Forecast, Political factors, Industrial factors, Intra organizational factors.

JEL Classification: M41, G17

1. Introduction

Understanding cost behavior is crucial for all participants of the capital market. Cost management is one of the ongoing concerns of managers. It is because costs determine earnings, which are a measure widely used to evaluate the performance of firms and managers along with the pricing of shares. In particular, in competitive markets where managers are inevitably required to accept market prices, they can increase earnings by focusing on costs. For more accuracy in earnings prediction, in addition to managers, analysts, creditors and investors make great efforts to analyze and forecast cost behavior. The outsiders also assess the performance of firms in a variety of ways, including the management ability to efficiently control costs.

The traditional view classifies cost behavior into fixed and variable costs based on changes in the activity level of a company. Fixed costs are considered independent of the activity level, while variable costs are assumed proportional to the change in the activity level. However, contrary to the traditional belief that indicates a linear and fitting cost behavior, various empirical studies have shown that cost behavior is asymmetric. This new approach began with the interpretation of the asymmetric behavior of costs in the accounting literature by Anderson et al. (2003), who demonstrated that the relationship between cost and activity level depends on the direction of changes in activity. That is, the change of costs is not equal, in the same fall and rise of activity level, and in the declining situation costs decreasing is less and so is sticky.

Over the past two decades, a growing body of accounting research has looked into the asymmetric response of costs to changes in activity levels. The results of these studies suggest that costs fall (rise) when the level of activities fall (rise), but the rate of costs reduction is less than the reduction in activities. In contrast, the rate of increase in costs is almost proportional to the improvement in the level of activities. This type of cost behavior is called cost stickiness.

Anderson et al. (2003) were the first to focus on asymmetric selling, general, and administrative costs (SG&A) to illustrate that cost stickiness has a negative effect on the firm's current earnings. It is because sales shrinkage is not offset by a reduction in costs. In their view, senior managers have authority over SG&A costs. By reviewing and criticizing traditional models of cost behavior, they presented a new model in which costs do not change relative to changes in the level of activities. Rather, changes are based on decisions made by managers. They declare that two main causes of cost stickiness are "the theory of manager's personal considerations" that serve personal interest and "the theory of adjusted costs ". According to the former theory, managers do not always make decisions that provide the best outcomes for shareholders. Managers tend to maximize their own interests and may therefore be reluctant to cut back on resources in order to prevent a power reduction. One of the consequences of opportunistic contracts is managerial empire, meaning that management tends to overgrow the company and maintain untapped resources in order to preserve and increase personal interests, including prestige, position, power, reward, and credibility.

According to "the theory of adjusted costs" or "cost adjustments", when demand for an organization's products and services falls, managers can eliminate redundant resources and adjust the associated costs. If decreased activity level is temporary, the cost adjustment and the subsequent increase (due to the raised activity level) will likely exceed the cost of retaining redundant resources that have been temporarily conserved. The resource adjustment costs may include severance payments to dismissed employees, assets disposal costs, and penalties for terminating contracts. In addition, if the demand for products keeps rising after the cost adjustment, the firm will incur costs such as acquiring new assets based on conditions set by the company, recruiting and training new employees and negotiating costs for signing new contracts. Therefore,

costs are not only proportionate to the current level of sales, but also may be reliant on managers' expectations for future sales.

However, sometimes there are reasons other than the company level that complicates the adjustment of resources despite managers' pessimism about the company's future. In this study, these factors are divided into macro to micro levels. At the first level, there are macroeconomic factors stemming from global and national developments, which contribute to cost stickiness. For example, events such as war, tariff warfare, sanctions, or global political crises at the international arena and changes in domestic policies (including amendments of laws or changes in political drivers that are expected to alter corporate support) affect management behavior in handling cost and therefore stickiness at the macro level. Given that these factors may vary at different times, the time factor (year) has been used to differentiate their effects. At the second level of stickiness, we look into industry-level factors. The industry-specific characteristics such as operational and production environment, intensity of competition and cost structure in different industries are other variables that influence the degree of cost stickiness. At the third level, there are the factors related to the company, including the ability of managers to forecast future conditions and varying levels of risk aversion.

Identifying the source of these factors enables managers to make appropriate decisions regarding resource adjustment. By identifying and measuring the sources of cost stickiness, managers can clarify and evaluate their reasons for cost stickiness and non-adjustment of costs, improving the company's flexibility in the face of diminishing demand for its goods or services. This helps improve the company's accountability process. By knowing the cost behavior, company owners can also determine whether management is imposing unnecessary costs on the firm. It is also useful to ascertain the cost behavior of external users (such as analysts) who intend to evaluate the

company's performance. Therefore, identifying the origin, can be effective in measuring and controlling the degree of cost stickiness and its consequences.

As noted in a few numbers of previous research, one of the major consequences of cost stickiness is its effect on the MEFA. Most financial managers and analysts project earnings irrespective of the effects of cost stickiness on future expenses, which underlines the MEFA. However, they can forecast earnings more accurately by assessing the cost stickiness and the impact of its sources on future earnings. Therefore, as the second goal of this study, we consider the importance of accurate earnings forecast and its impact on users' decisions, and seek to investigate the effect of the degree of cost stickiness on MEFA and measure the relative share of each stickiness source on MEFA.

Therefore, the main contribution of this research to the literature on cost stickiness are:

1) Developing a new methodology for identifying, separating and measuring stickiness sources,

2) Examining the separate consequences and impacts of each cost stickiness source on MEFA.

In the following, first, the theoretical foundations and research background are discussed and the hypotheses are proposed. Then the data are described and descriptive statistics and correlations between research variables are presented. In the next section, following the separation of cost stickiness sources, the impact of each source on the MEFA is evaluated. Finally, the study results concluded and suggestions presented.

2. Prior Literature and Hypothesis Development

2.1. Sources of Cost Stickiness

Cost stickiness is induced by a variety of reasons, each of which is of a distinct nature. According to Anderson et al. (2003), the bulk of the research on asymmetric cost behavior has focused on economic incentives and reasons, as well as the agency of cost stickiness, with some dealing with behavioral causes as well.

According to previous research, multiple factors influence cost stickiness. Each of these factors are related to specific characteristics of each year [Lee et al. (2015), Awad and Awad (2015)], country [(Banker, Byzalov, and Chen (2006b), Banker , Byzalov & Chen (2013), Banker & Byzalov (2014), Kama & Weiss (2013), Calleja et al. (2006)], industry [Banker, Flasher & Zhang (2014), Subramaniam & Weidenmier (2003)] and firm [Banker et al. (2014), Subramaniam et al. and Weidenmier (2003), Dierynck & Renders (2009), Kama and Weiss (2013), Hay et al. (2010), Banker et al. (2011) and Chen et al. (2011)]. For example, setting varying tariffs by the United States on European and Chinese goods in 2018 is one of the events that can affect the economies of the parties, the level of production and even the degree of cost stickiness in continental Europe, China and the United States. Moreover, the imposition of various economic sanctions against Iran affects GDP, sales and the degree of cost stickiness based on managers' optimism or pessimism about the country's economic future. Besides, a number of factors such as technology level, which is rooted in the development of a country, and industry membership, can affect the degree of cost stickiness. In addition, laws and regulations of each country, corporate governance, and a host of other factors can influence the degree of cost stickiness. Each of these sources can trigger cost stickiness, but as noted by researchers [(Calleja et al. (2006), Banker , Byzalov & Chen (2013), Banker & Byzalov (2014), Lee et al. (2015), Awad and Awad (2015)] identifying some of these factors could be ambiguous and increase the probability of errors in decisions. As mentioned earlier, in this study, the sources of stickiness are divided into three levels: year, industry and firm. Each of these three levels is discussed in detail below.

2.1.1. Year-Specific Characteristics of Cost Stickiness

Certain global and local events alter the degree of cost stickiness. These factors can be provoked by special political or economies events such as sanctions, war, tariff warfare, elections and political instability. According to Anderson et al. (2003), management not only takes into account

the specific characteristics of a company in declining demand, but also analyzes the economic development in the product market and economic conditions at the global scale. Managers tend to see demand reduction as temporary whenever they expect significant economic growth. War and sanctions can make managers pessimistic about the future and influence their decisions about resource adjustment. Lee et al. (2015) suggested that even by controlling company-level and country-level factors, the cost behavior asymmetry (cost stickiness) in election years will be greater than in non-election years. Economic sanctions are also one of the major tools for achieving political goals, which prompt economic and political instability, especially in sanctioned years. In recent years, multiple sanctions imposed on Iran have engendered serious economic problems, so that the production and sale of almost all industries have been adversely affected. Sanctions have always been a major hurdle to Iran's progress and development, which while hampering the introduction of modern technologies to Iran and reducing oil and non-oil exports, have rendered investors pessimistic about the country's economic future and managers disappointed with corporate futures. Economic sanctions, as economic and political destabilizers, will modify the asymmetric behavior of costs, and the asymmetric cost behavior and managers' pessimism about the company's future will exert a negative effect on the degree of cost stickiness.

According to Awad & Awad (2015), if a company's activity level falls, general, administrative and sales expenses will demonstrate sticky and anti-sticky behaviors during economic booms and recession, respectively. In addition, the full price in both periods (i.e. boom and recession) displays a sticky behavior, but its stickiness is lower during recession. Their results on operating costs were significant neither in economic boom not in recession. Anderson et al. (2003) concluded that managers tend to perceive sales reduction as temporary when there is economic growth and hence refuses to adjust resources, which in turn heightens the degree of cost stickiness. They also point out that there is a positive relationship between GDP growth and cost stickiness. In addition,

Calleja et al. (2006) stated that the highest level of cost stickiness is achieved during the peak of economic growth. Hay et al. (2010) also believe that during recession, managers are under pressure to reduce the level of surplus production and adopt the outsourcing approach by employing part-time labor, which can lessen cost stickiness.

2.1.2. Industry-Specific Characteristics of Cost Stickiness

The industry-specific characteristics affect costs adjustment when the scale of the company's activity is modified. These features can be split into two groups. The first group consists the intensity of assets and employees. The second group embraces other industry-specific characteristics such as operating and production environment, competition intensity, fixed and variable cost ratios, and supply chain.

That the asset and employee Anderson et al. (2003) contend intensity as two main specific characteristics of the company that affect the adjustment of costs. It is assumed that the intensity of assets alters the adjustment of resources, because a decrease in assets is not commensurate with the decline in the company's activities. In firms with higher asset intensity, the costs associated with their resources, such as depreciation, repairs and maintenance costs will be higher, and failure to reduce costs relative to the level of activity will lead to cost stickiness. Therefore, assets have a huge bearing on cost stickiness because small companies usually hold less fixed assets. This indicates low costs associated with assets and when the level of activity shrinks, the stickiness in these companies will be lower. Employee intensity affects cost adjustment for three reasons. First, the layoffs of redundant workforce will impose additional costs on the firm, and managers will be worry about losing skilled, experienced, and loyal employees. Second, if demand for products rises, the firm will be forced to hire new employees, which will incur recruitment and training costs. Third, layoffs will dampen the morale of other employees and diminish productivity. A mixture of these factors leads to the non-dismissal of employees, and consequently the lack

resources and costs adjustment. Therefore, with a higher number of employees, the costs of deescalating the level of activity stickiness will be higher. In their research, they looked into the effect of these two factors on cost stickiness, concluding that these factors have a positive effect on the level of adjusted costs at the firm level.

Anderson et al. (2004) evaluated the effect of staff turnover, declining sales, and economic growth on the cost stickiness of different cost groups in service companies. However, this study did not confirm the effect of assets on the stickiness of service costs, Anderson et al. (2004) stated that cost stickiness soars when growth is expected to be high. The main reason for this conclusion is that if demand is expected to rise in the short term, managers do not adjust costs, which escalates the degree of cost stickiness. They also reported a greater degree of cost stickiness for service companies in more concentrated industries with lower competitive conditions. These industries constitute an environment that is not sufficiently motivated to adapt to shifting circumstances. Anderson et al. (2004) provide empirical evidence that the costs stickiness of service companies undergoing higher sales fluctuations in the past is greater, which is probably due to temporary changes in the firms' sales. Consistent with these findings, Anderson et al. (2007) posit that with rising competition, the severity of labor cost stickiness falls.

Cost structure varies significantly in diverse industries. For example, according to Elie (1991), the ratio of cost to sales is 5% in the coal industry and 66% in pharmaceutical product industry. Subramaniam & Weidenmier (2003) concluded that the highest rate of cost stickiness belonged to manufacturing companies followed by service and commercial companies. In contrast, they did not observe any sign of asymmetric cost behavior in financial companies. Anderson et al. (2004) investigated cost behavior in service companies, reporting the absence of any sticky costs in the retail sector, while the entertainment sector had the highest cost stickiness. According to their research, not only the degree of cost stickiness varies in different industries, but also the factors

that provoke cost sticky behavior may exert divergent effects in each industry. They reported that, assets, staff and the prospect of improved sales had no effect on the degree of cost stickiness in the entertainment sector; while these factors had an undeniable impact on the degree of service costs in the hotel and restaurant industry.

2.1.3. Firm-Specific Characteristics of Cost Stickiness

Firm characteristics that could affect cost stickiness are, asset intensity, employee intensity, redundant operational capacity, and optimistic of management. The intensity of asset and employee, as discussed above, not only affected by industry type but also the firm-specific features have a significant effect on them.

Banker et al. (2006a) verified the relationship between utilized capacity and sticky cost behavior, attempting to expand this concept. According to Anderson et al. (2003), managers' expectations of the company's future performance play a pivotal role in adjustment/ non- adjustment of the company's resources.

In another study, Banker et al. (2011d) used indices of managerial optimism and pessimism to offer more empirical evidence for their argument, contending that managers' expectations are a determinant of cost behavior. Banker et al. (2011d) found that if these indicators transmit clear and continuous positive signals about the future of the company, the degree of cost stickiness will increase, but if conflicting or negative signals are sent, cost stickiness will plunge. In another study, Banker et al. (2011c) tested the model of Banker et al. (2011d) on an international sample, and their findings ratifying the above outcomes for most of countries.

Overall, the existing literature and theoretical foundations present strong evidence for stickiness in diverse types of costs in different years, industries, and companies. The research literature offers various reasons for cost stickiness, including managers' optimism and pessimism about sales prospects, earnings management, the nature of costs (in terms of controllability and

uncontrollability), government regulations, technology level, employment protection laws and systems of, which can affect the degree of cost stickiness.

2.2. Hypothesis Development

According to agency theory, there is a conflict of interest and information asymmetry between the management and shareholders of the company. The issue of earnings forecast is a tool to lessen information asymmetry between company management and investors. Paragraph 47 of Statement of Financial Accounting Concepts No. 1 states that investors, creditors, and interested parties use the projected earnings to estimate earning power and the ability of dividend distribution, and assess the risk of investing in or lending to an enterprise. In Iran, the first earnings forecast dates back to early 1993, before that companies mainly sufficed to submitting production and sales budget. Since 1993, enterprises have been obliged to prepare their quarterly and annual earnings forecasts, and submit it to the supervisory body of stock exchange organizations for a maximum of 20 days after the end of the quarterly period. However, since December 2016, the Tehran Stock Exchange Organization has banned the listed companies from the publication of earnings forecasts, replacing it with the management interpretive reports.

Among all types of forecasts and disclosures of information by enterprises, accurate earnings forecast is of great importance, as it lays the basis for decision making and judgments by users. The MEFA is crucial for investors because investors arrive at decisions regarding purchase, sale or holding of stocks based on this information. If such a prediction is erroneous, it will mislead the users and lead to wrong decisions. In addition, the evidence exhibits that earnings per share and earnings forecast have a bearing on the common share market price, which manifests the importance of accurate earnings forecast. Roland (1978) proposed three alternatives for measuring earnings forecast in research; first: Management forecast, second: Analysts forecast, and third: Forecast using time series models (random walk). In this study, managers' forecast is used.

A variety of factors can influence the MEFA. According to previous research [Weiss (2010), Cifitci and Salama (2018)] asymmetric cost behavior is one of the main factors affecting the MEFA. Weiss (2010) contends that there is a negative relationship between cost stickiness and MEFA, so that the average earnings forecast error (MEFE) of analysts is 0.0080 for sticky companies and 0.0060 for anti-stick companies. He states that sticky companies tend to forecast low future earnings, which explain the higher errors in projection of future earnings. Besides that, Weiss (2010) investigated the effect of cost sticky behavior on analysts' forecasts, arguing that if analysts ascertain the relationship between asymmetric cost behavior and the MEFA, they would consider cost stickiness as a top priority (factor) in their forecasts. Banker and Chen (2006b) also indicated that the inclusion of cost stickiness in earnings forecast models reduces the MEFE.

Cifitci et al. (2016) argue that if analysts can fully understand cost behavior, no systematic relationship will be observed between cost behavior and MEFE. They state that if analysts forecast fixed costs, costs will respond proportionally and equitably to reduced sales, and the ratio of MEFE to sale forecast error will be identical under different scenarios. On the other hand, if analysts fail to take cost stickiness into account in their forecasts, the degree of MEFE will be significantly different at the time of declining and rising demand. Cifitci and Salama (2018) revealed a positive relationship between cost stickiness and MEFE, because managers and analysts do not consider adverse consequences of cost stickiness in earnings forecast. If financial analysts are accurate in estimating variable costs or cost stickiness, the MEFE should be symmetrical with the abnormal sales (desirable or undesirable). They stated that accurate cost forecast has a significant impact on the MEFA. Therefore, according to the above, it can be stated that the degree of cost stickiness is one of the major factors that can influence the MEFA and if financial analysts and managers fail to account for the degree of cost stickiness in their forecasts, they may have more mistake in earnings prediction. Therefore, the first research hypothesis is developed as follows:

H1: *Cost stickiness has a negative relationship with MEFA.*

However, since the sources of cost stickiness are different and triggered by year, industry and firm-specific events and circumstances, we expect that the impact of each of these sources on the MEFA be different. Forecasting and controlling events of each year, and identifying the firm-specific features is more complicates than other stickiness sources.

Therefore, the greater the impact of each sources on cost stickiness, the lower the MEFA. Hence, the second hypothesis is expressed as follows:

H2: *Each source of cost stickiness has a different effect on MEFA.*

3. Research Design

3.1. Separation of cost stickiness sources

The degree of cost stickiness will be measured using the model of Anderson et al. (2003) according to model (1).

Model (1):

$$\text{Log}\left(\frac{\text{Cost}_{f,t}}{\text{Cost}_{f,t-1}}\right) = B_0 + B_1 . \text{Log}\left(\frac{\text{Sales}_{f,t}}{\text{Sales}_{f,t-1}}\right) + B_2 . DD . \text{Log}\left(\frac{\text{Sales}_{f,t}}{\text{Sales}_{f,t-1}}\right) + e_{f,t}$$

As noted by Anderson et al. (2003), "If sales revenue rises, the dummy variable of sales decrease (*DD*) will be zero. Thus, coefficient B_1 shows an increase in costs as a result of a 1% rise in sales revenue. Moreover, since the coefficient of the dummy variable of sales is equal to 1 when revenue decrease, the sum of coefficients $B_1 + B_2$ denotes the percentage reduction in costs as a result of 1% reduction in sales revenue.

In sticky cases, the percentage of increase in costs during revenue growth period will be greater than the percentage of decrease in costs during revenue decrement. In other words, we will have $B_1 > 0$, $B_2 < 0$ $(B_1 + B_2 < B_1)$. If costs are anti-sticky, $B_1 > 0$ and $B_2 > 0$, in which case $B_1 + B_2 > B_1$. It indicates that for 1% change in sales, the costs reduction will be greater than the rising costs.

We use three steps to separate the stickiness sources as follow.

Step 1: Separating the year origin

In this step, model (1) is run by all observations and overall stickiness is calculated by B_2 coefficient. The calculated coefficient (B_2) is affected by year, industry and firm. Then to control the effects of year, model (1) is tested for each year and the coefficient B_2 is calculated for each year ($B_{2,y}$) that influenced by the effects of industry and company. Therefore, by comparing $B_{2,y}$ and B_2 the degree of relative stickiness of each year (CS_y) can be calculated as follow:

Model (2):

$$CS_y = \frac{B_{2,y}}{B_2}$$

Step 2: Measuring the industry effects

In this step we use the previous calculated $B_{2,y}$, and then, to control the effects of industry, model (1) will be run for each industry in each year. When name the coefficient $B_{2,y,i}$ which is influenced by the effects of the company. Therefore, by comparing $B_{2,y,i}$ and $B_{2,y}$, the degree of relative stickiness of each industry in each year ($CS_{y,i}$) is obtained as follow:

Model (3):

$$CS_{y,i} = \frac{B_{2,y,i}}{B_{2,y}}$$

Step 3: Segregating the firm-specific impacts

Since the number of observations is limited to one to determine the relative stickiness of each firm; hence, it is impossible to test regression for a single data. However, for the homogeneity of calculations with previous steps, the degree of relative stickiness of each company can be obtained as follow. Diagram 1 is used to simplify the description. Each point in this diagram represents a

hypothetical relationship between the change in sales (X-Axis) and change in costs (Y-Axis) for a specific company in a given industry and year.

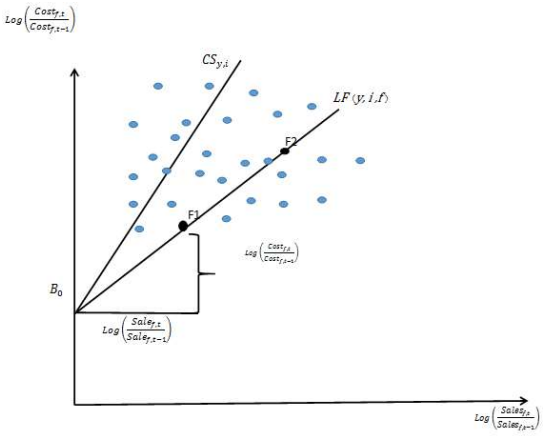

Diagram 1. Degree of relative stickiness of each industry - year and each company

Supposed line $CS_{y,i}$ indicates the regression relationship of these points according to the model 1 that ran in industry-year level (as discussed in step 2) with the slope of $B_{2,y,i}$. We assume that the intercept illustrates factors, which are the same in all observations of that industry-year and the difference of each observation is related to the specific cost stickiness of that point. The slope of each point (such as F1) with a line ($LF_{(y,i,f)}$) that originating from the intercept shows the total stickiness of that observation ($B_{y,i,f}$), and model 4 illustrates its mathematically.

Model (4):

$$B_{y,i,f} = \frac{Log\left(\frac{Cost_{f,t}}{Cost_{f,t-1}}\right) - B_0}{Log\left(\frac{Sales_{f,t}}{Sales_{f,t-1}}\right)}$$

By this definition, all points on a definite line (such as F1 vs. F2 on $LF_{(y,i,f)}$) will have equal stickiness. In a similar way to other sources of cost stickiness, the relative cost stickiness of each firm-year is divided by the total cost stickiness of each observation ($B_{y,i,f}$) to $B_{2,y,i}$ calculated as described in model 5.

Model (5):

$$CS_{y,i,f} = \frac{B_{y,i,f}}{B_{۲,y,i}}$$

A summary of the points discussed in this section and the conceptual model of separation of cost stickiness sources are presented in Figure 1.

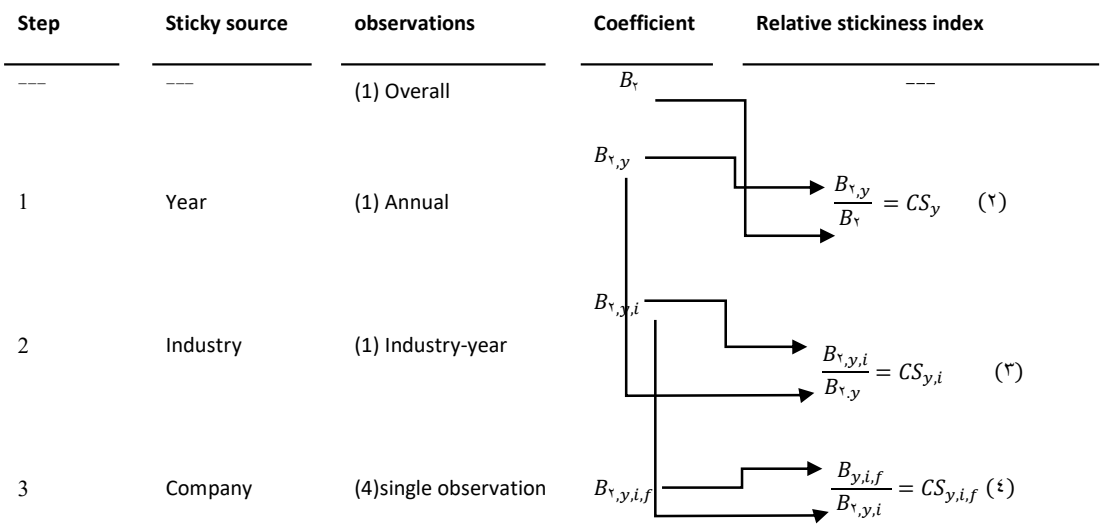

Figure 1 - Conceptual model of separating cost stickiness sources

3.2. Measuring the MEFA

The financial analysts' forecasts are not officially and publicly released in Iran. Instead, the management earnings forecast is used. The MEFE was measured using Cheng and Firth's (2000) model as follows. It should be noted that the smaller $FE_{f,t}$, the greater the MEFA.

Model (6):

$$FE_{f,t} = \left| \frac{(AP_{f,t} - FP_{f,t})}{FP_{f,t}} \right|$$

3.3. Testing Research Hypotheses

According to previous research, multiple factors influence the MEFA. To test the research hypotheses and explain how cost stickiness and its sources can reduce MEFA, it is necessary to

control other variables affecting MEFA.

One of the factors related to is the size of information available to the public and analysts, which as noted in previous research, the degree of access to information of a company is directly correlated with the company size (Atiase, 1985; Collins et al., 1987; Bhushan, 1989). That is, the larger a company, the greater the expectation for information to be publicly available and the lower the MEFE.

Brown (2001) stated that the degree of profit and loss forecast error is different. He observed that the relationship between losses and forecast error is stronger than profit. Considering the effect of loss forecast on forecast error, as noted by Matsumoto (2002), a dummy variable will be used to control the effect of forecasted losses.

Sales change also can alter MEFA. According to Weiss (2010), variations in the company's sales compared to the previous period, which are attributable to a variety of factors and can influence the MEFA. Another one is the standard deviation of forecasted earnings for the company, which will be employed to measure various aspects of environmental uncertainty (Barron et al., 1998). Brown et al. (1987) and Wiedman (1996) stated that MEFE rises when the standard deviation of forecasts increases. As we noted above, in this study, given that the forecasts of financial analysts are not published officially in Iran, managers' forecast is used. Therefore, calculating the standard deviation of forecasted earnings, from a single observation, is impossible.

Adar et al. (1997) revealed that there is a positive relationship between earnings margin and MEFE under uncertain conditions in the C.V.P analysis. Earning margins in different companies and industries rely on the characteristics of the company's business environment like macroeconomic conditions (e.g. boom and recession). According to the previous research, we expect that in companies with a higher earning margin, the MEFE be greater.

Unexpected shocks in different years are also one of the factors that increase the MEFE. According to Matsumoto (2002), this variable controls the association between sales changes and MEFE, which is expected to be positive.

Therefore, based on the above, to test the research hypotheses, we used the models proposed by Weiss (2010), Cifitci and Salama (2018) and Anderson et al. (2007). In this research, we used model 7 to test the first hypothesis (total cost stickiness); and model 8 for second hypothesis (cost stickiness sources).

Model (7):

$$FE_{f,t} = \beta_0 + \beta_1 TCS_{f,t} + \beta_2 MV_{f,t} + \beta_3 LOSS_{f,t} + \beta_4 VSALE_{f,t} + \beta_5 OPLEV_{f,t} + \beta_6 \Delta NINCOME_{f,t} + \varepsilon_{f,t}$$

Model (8):

$$FE_{f,t} = \beta_0 + \beta_1 CS_y + \beta_2 CS_{y,i} + \beta_3 CS_{y,i,f} + \beta_4 MV_{f,t} + \beta_5 LOSS_{f,t} + \beta_6 VSALE_{f,t} + \beta_7 OPLEV_{f,t} + \beta_8 \Delta NINCOME_{f,t} + \varepsilon_{f,t}$$

To verify the validity of the results, we calculated the cost stickiness by Anderson et al.'s model (2007) and confirming our first hypothesis results with them. The main reason for choosing this model is the ability of that to measure cost stickiness for each firm-year. Anderson et al (2007) used the model 9 for their purposes (effect of cost behavior on the change of EPS;$CHEPS_{i,t}$)

Model (9):

$$CHEPS_{i,t} = \alpha + \beta_1 Signal\ TC^-_{f,t} + \beta_2\ Signal\ TC^+_{f,t} + \delta CHGEPS_{f,t} + \sum_{j=1}^{10} \gamma_{it}\ Other\ Signals_{f,j} + \varepsilon_{f,t}$$

We used their cost behavior proxies ($Signal\ TC^-_{f,t}$; $Signal\ TC^+_{f,t}$) and substituted them in model 7 with our proxy ($TCS_{f,t}$) and obtained the model 10. The results of this model are comparable with model 7 for verifying our proposed measurement.

Model (10):

$$FE_{f,t} = \beta_0 + \beta_1 TotalCost\ Signal^{-}_{f,t} + \beta_2 TotalCost\ Signal^{+}_{f,t} + \beta_3 MV_{f,t} + \beta_4 LOSS_{f,t} + \beta_5 VSALE_{f,t}$$

$$+ \beta_6 OPLEV_{f,t} + \beta_7 \Delta NINCOME_{f,t} + \varepsilon_{f,t}$$

Table 1 provides descriptions of all variables.

Table 1
Descriptions of variables (alphabetic)

Variable	Description
AP	*Actual earnings per share (EPS)*
COST	*Total selling, general, and administrative (SG&A) costs and the cost of goods sold (COGS)*
CS_y	*Relative cost stickiness for each year when sales decrease and 0 otherwise, similar to Anderson et al (2007).*
$CS_{y,i}$	*Relative industry-year cost stickiness when sales decrease and 0 otherwise, similar to Anderson et al (2007).*
$CS_{y,i,t}$	*Relative firm-industry-year cost stickiness when sales decrease and 0 otherwise, similar to Anderson et al (2007).*
Decrease _Dummy	*The dummy variable takes the value of 1 when sales revenue decreases between period t −1 and t, and 0 otherwise.*
FP	*Management earnings per share (EPS) forecasts*
FE	*The absolute forecast errors.*
LOSS	*Dummy variable that equals 1 if the reported earnings are negative and 0 otherwise.*
MV	*Logarithm of market value of equity*
ΔNINCOME	*Indicator variable that equals 1 if the change in earnings from the prior year is positive, and 0 otherwise*
OPLEV	*Ratio of gross income (sales, minus COGS) and sales*
Sale	*Total revenue*
TCS	*The total cost stickiness of each firm-year (model 4) when sales decrease and 0 otherwise.*
$TotalCost\ Signal^{-}$	*The total cost signal⁻ (cost stickiness) of each firm-year when sales decrease and 0 otherwise. The negative cost signal based on Anderson et al.'s model (2007) is calculated as follows:* $TotalCost\ Signal^{-} = \frac{COST_{i,t}}{SALES_{i,t}} - \frac{COST_{i,t-1}}{SALES_{i,t-1}}$
$TotalCost\ Signal^{+}$	*The total cost signal⁺ of each firm-year when sales increase and 0 otherwise. The positive cost signal based on Anderson et al.'s model (2007) is calculated as follows::* $TotalCost\ Signal^{+} = \frac{COST_{i,t}}{SALES_{i,t}} - \frac{COST_{i,t-1}}{SALES_{i,t-1}}$
VSALE	*The percentage change of sales to previous year.*

This table defines the main variables.

۳،۵. *Sample, Data, and Descriptive Statistics*

Our sample includes all industrial firms from 2013 to 2018. Table 2 describes industry information. The sample was chosen according to the first two-digit SIC-Code[۲] industry, which displays the code of identifying the major industry group. Since regression model must be fitted in each industry-year to compute the cost stickiness in each industry-year. We also exclude firm-year observations in the financial services industry due to the disparity of financial report interpretations between these industries and other industries (Subramanyam, 1996).

Table 2
Industry Information

	Observation
Motor Vehicles	152
Mineral Mining	143
Chemical	193
Food	138
Base Metals	148
Building	160
Pharmaceuticals	146
Total	1080

Table 3 describes our sample selection procedure. Our sample consists of all companies listed on the Tehran Stock Exchange (TSE)[۳] from 2013-2018. We trimmed the data to eliminate extreme observations by removing observations where the value of any variable was in the top or bottom 0.5 percent of its distribution (Chen & Dixon, 1972). The final sample contains 1080 firm-year observations from 2014 to 2018.

[۲] Standard Industrial Classification

[۳] The TSE is Iran's largest capital market. For detailed information about the TSE, refer to http://www.TSE.ir/.

Table 3
Sample selection procedures

	Observation
All companies listed on the TSE from 2013 to 2018	2219
Financial industry companies	966
Firms with insufficient information	173
Final sample	1080

Table (4) demonstrates descriptive statistics in three columns (low MEFE, High MEFE, and all sample data). The low and high MEFE distinguished by the median static. By comparing the average total cost stickiness and its resources in the two groups, it can be stated that total cost stickiness (*TCS*), year origin of stickiness (CS_y) and industry source ($CS_{y,i}$) are higher in high MEFE conditions. The results are adverse for firm level of stickiness.

Table 4
Descriptive statistics of the full sample

Variables	low MEFE		High MEFE		All Sample Data	
	N	Mean	N	Mean	N	Mean
FE	540	0.356	540	2.005	1080	0.873
TCS	540	0.010	540	0.233	1080	0.110
CSy	540	0.061	540	0.185	1080	0.093
CSy,i	540	0.447	540	0.493	1080	0.459
CSy,i,f	540	0.045	540	0.390	1080	0.121
$\boldsymbol{TotalCost\ Signal^{-}}$	540	0.013	540	0.022	1080	0.013
$\boldsymbol{TotalCost\ Signal^{+}}$	540	-0.002	540	-0.023	1080	-0.002
MV	540	6.044	540	5.819	1080	5.935
VSALE	540	0.084	540	0.082	1080	0.081

OPLEV	540	0.284	540	0.221	1080	0.253
Δ*NINCOME*	540	-0.132	540	-0.441	1080	-0.257

According to Table (5), it can be seen that there is a strong correlation between dependent and independent variables. Total cost stickiness is significantly correlated with MEFE (13.2%) and the relative stickiness of each year and each company have a significant correlation and more than 12% with MEFE, while the correlation between relative stickiness of each industry and MEFE is weaker. This illustrates that each source of cost stickiness can have a distinct effect on MEFE.

Table 5
Correlation coefficients

Variables	FE	*TCS*	*CSy*	*CSy,i*	*CSy,i,f*	*Total Cost Signal*$^{-}$	*TotalCost Signal*$^{+}$	*MV*	*VSALE*	*OPLEV*	*ΔNINCOME*	*loss*
FE	1											
TCS	**0.132****	1										
CSy	**0.147****	**0.426****	1									
CSy,i	**0.011***	**0.478****	**0.295****	1								
CSy,i,f	**0.125****	**0.231***	**0.428****	0.049	1							
TotalCost Signal^{-}	**0.112****	**0.512****	**0.248****	**0.354****	**0.281***	1						
TotalCost Signal^{+}	**-0.085***	0.354	0.124	**0.258***	**0.154***	0.521	1					
MV	**0.093*****	-0.030	-0.102	-0.042	-0.117	-0.078	-0.125*	1				
VSALE	**0.070***	**0.249****	**0.077****	0.040	0.051	**-0.207****	-0.001	-0.122	1			
OPLEV	**0.162*****	-0.009	**-0.124****	**-0.030****	**-0.061****	**-0.215****	-0.175	**0.310***	-0.003	1		
ΔNINCOME	**-0.084***	0.005	**0.067****	0.013	-0.023	**-0.247***	-0.132	0.040	-0.006	**-0.100****	1	
loss	**0.323***	**0.087****	**0.249****	**0.150****	**0.141****	**0.295****	0.091	-0.236	**0.199****	-0.309	-0.089	1

*Significant level: *** 1%, ** 5% ,.* 10%*

4. Results

4.1. Cost stickiness sources

Step 1: Year origin

In this step, we apply model (1) twice, first with all observations that results showed on table 6, and second for each year (table 7), and then calculated relative stickiness of years (table 8).

Table 6
Results of Regressing Changes in Costs on Changes in Sales Revenue for the 5-Year Period 2014–2018

$$\textit{Model (1):}\ Log\left(\frac{Cost_{f,t}}{Cost_{f,t-1}}\right) = B_0 + B_1.Log\left(\frac{Sales_{f,t}}{Sales_{f,t-1}}\right) + B_2.DD.Log\left(\frac{Sales_{f,t}}{Sales_{f,t-1}}\right) + e_{f,t}$$

Independent variable	Exp. sign	Coef	p-value
$Log\left(\frac{Sales_{f,t}}{Sales_{f,t-1}}\right)$	+	0.810 (28.34)	**0.000**
$DD.Log\left(\frac{Sales_{f,t}}{Sales_{f,t-1}}\right)$	-	-0.180 (-2.82)	0.005
Constant		0.025 (3.60)	**0.000**
Adjusted R Square	77.18%		
Observation	1080		

The coefficient β_2 is a negative estimate that indicates the degree of stickiness in all observations, which is equal to -0.180 and is significant.

In table 7, $B_{2,y}$ showed the stickiness of each year, and could be influenced by the effects of industry and company.

Table 7
Results of Regressing Changes in Costs on Changes in Sales Revenue for each year over 2014–2018

$$\textit{Model (1):}\ Log\left(\frac{Cost_{f,t}}{Cost_{f,t-1}}\right) = B_0 + B_1.Log\left(\frac{Sales_{f,t}}{Sales_{f,t-1}}\right) + B_{2,y}.DD.Log\left(\frac{Sales_{f,t}}{Sales_{f,t-1}}\right) + e_{f,t}$$

Year	$B_{2,y}$
2014	-0.166 (-2.28)
2015	-0.400 (-3.15)
2016	-0.055 (3.42)
2017	-0.123 (-2.43)
2018	-0.223 (-2.26)

The results of Table 7 demonstrate that cost behavior has been sticky in all years. Then, by comparing B_2 and $B_{2,y}$, the degree of relative stickiness related to each year (CS_y) was calculated, the results of which are presented in Table 8.

Table 8
Relative cost stickiness for each year

$$\textit{Model (2):}\ CS_y = \frac{B_{2,y}}{B_2}$$

Year	Total Cost Stickiness B_2	Annual cost stickiness $B_{2,y}$	Relative cost stickiness for each year (CS_y)
2014	-0.180	-0.166	0.992
2015		-0.400	2.222
2016		-0.055	0.306
2017		-0.123	0.638
2018		-0.223	1.239

As depicted in Table (8), the relative stickiness was the highest in 2015 and 2018, which indicates the strong effects of the events in 2015 and 2018 on the degree of stickiness. The most important event of 2018 was the withdrawal of the United States from JCPOA[٤] and the imposition of new sanctions against Iran, which was a major hurdle to the production and export of many industries in Iran and cut its production capacity, so that companies faced significant unutilized resources.

Step 2: Industry effects

Table 9 represents the results of executing cost stickiness regression at the industry-year level. By comparing the cost stickiness coefficient of this model with the results of Table 7, the relative effects of industry on cost stickiness can be determined (table 10).

Table 9
Results of Regressing Changes in Costs on Changes in Sales Revenue for each industry-year over 2014–2018

$$\textit{Model (1):}\ Log\left(\frac{Cost_{f,t}}{Cost_{f,t-1}}\right) = B_0 + B_1.Log\left(\frac{Sales_{f,t}}{Sales_{f,t-1}}\right) + B_{2,y,i}.DD.Log\left(\frac{Sales_{f,t}}{Sales_{f,t-1}}\right) + e_{f,t}$$

Year	Building	Food	Mineral Mining	Base Metals	Chemical	Pharmaceuticals	Motor Vehicles
2014	-0.530	0.049	0.061	-0.508	0.235	0.755	0.262
2015	-0.503	-0.239	-1.145	-0.103	0.002	0.670	-0.027
2016	0.585	-0.259	-0.044	-0.248	-0.252	0.280	-0.416
2017	-1.291	-0.326	-0.269	0.254	-0.147	0.218	0.289
2018	-0.167	-0.663	-0.392	0.065	0.809	-0.631	-0.354

[٤] *Joint Comprehensive Plan of Action*

Table (90) shows that cost behavior has not been sticky in some industries in certain years. In the years that this coefficient was negative, stickiness can be inferred. The estimated $B_{۲,y,i}$ is influenced by the effects of the company. Therefore, by comparing $B_{۲,y,i}$ and $B_{۲,y}$ the relative stickiness intensity of each industry in each year $CS_{y,i}$ can be obtained, as depicted in Table (10).

Table 10
Relative cost stickiness for each industry-year over 2014–2018

Model (3): $CS_{y,i,f} = \frac{B_{2,y,i}}{B_{2,y}}$

Year	Annual cost stickiness $B_{2,y}$	Building	Food	Mineral Mining	Base Metals	Chemical	Manufacture of Pharmaceuticals	Manufacture of Motor Vehicles
2014	-0.166	3.192	0.295	-0.367	3.060	-1.415	-4.548	-1.578
2015	-0.400	1.257	0.597	2.862	0.257	-0.005	-1.675	0.067
2016	-0.055	10.636	4.709	0.800	4.509	4.581	5.090	7.563
2017	-0.123	10.495	2.650	2.186	-2.065	1.195	1.772	-2.349
2018	-0.223	0.748	2.973	1.757	-0.291	-3.627	2.829	1.587

The results of Table (10) suggest that in the construction, food and beverage industries, there has been cost stickiness in all years, so that in 2017, the construction group had the highest relative cost stickiness (10.636) among all year-industry levels. In addition, cost behavior in the food and construction industries has been sticky over the years. On the other hand, cost behavior in the chemical industry was sticky only in 2017 and 2018.

Step 3: Firm-specific impacts

Table (11) presents the average cost stickiness calculated for each company (*TCS*) using model (4). According to the results, the average degree of company stickiness in the construction industry was higher than other industries.

Table 11
Cost Stickiness Mean for Each Firm-Year

$$\textit{Model (4):}\ B_{2,y,i,f} = \frac{Log\left(\frac{Cost_{f,t}}{Cost_{f,t-1}}\right) - B_0}{Log\left(\frac{Sales_{f,t}}{Sales_{f,t-1}}\right)}$$

Year	Building	Food	Mineral Mining	Base Metals	Chemical	Pharmaceuticals	Motor Vehicles
2014	-8.744	0.033	1.057	0.333	1.696	4.297	0.692
2015	-0.601	-0.007	0.015	0.614	0.633	1.956	0.605
2016	-1.140	0.006	0.490	0.443	1.038	1.116	-1.083
2017	0.341	0.027	0.176	0.600	0.705	0.944	0.503
2018	1.465	-0.024	-2.372	-0.292	0.942	-1.841	0.802

The relative cost stickiness of each firm calculated by using model 5. If we calculate the average of relative cost stickiness of each firm-year, we get exactly the results of the model 3 that are presented in table 10.

4.2. Testing Hypothesis

4.2.1. Cost stickiness and MEFA (H1)

The test results of first hypothesis are presented in table (12). The hypothesis test results are reported in two columns of this table; The first column is based on our model (model 7) and the second column is based on Anderson et al (2007) model (model 10). As shown by the results, the cost stickiness of each company is positively and significantly correlated with the MEFE and the hypothesis is confirmed with both models.

Table 12
Regression Coefficient of Management Forecast Error on Total Cost Stickiness.

Regression Model (7):

$$FE_{f,t} = \beta_0 + \beta_1 TCS_{f,t} + \beta_2 MV_{f,t} + \beta_3 LOSS_{f,t} + \beta_4 VSALE_{f,t} + \beta_5 OPLEV_{f,t} + \beta_6 \Delta NINCOME_{f,t} + \varepsilon_{f,t}$$

Regression Model (10):

$$FE_{f,t} = \beta_0 + \beta_1 TotalCost\ Signal^{-}_{f,t} + \beta_2 TotalCost\ Signal^{+}_{f,t} + \beta_3 MV_{f,t} + \beta_4 LOSS_{f,t} + + \beta_5 VSALE_{f,t} + \beta_6 OPLEV_{f,t} + \beta_7 \Delta NINCOME_{f,t} + \varepsilon_{f,t}$$

	Coefficient Estimates (*t*-statistics)	
Independent variable	**Model (7)**	**Model (10)**
TCS	0.281*** (4.59)	
$TotalCost\ Signal^{-}$		0.278** (2.53)
$TotalCost\ Signal^{+}$		0.721** (2.18)
MV	-0.338* (-1.75)	-0.002 (-0.03)
LOSS	-0.129 (-0.26)	1.244** (-2.40)
VSALE	0.119*** (3.63)	-0.045 (-0.92)
OPLEV	-2.424*** (-3.41)	-0.096 (-0.94)
ΔNINCOME	0.269*** (9.09)	-0.103** (-2.099)
Constant	4.288 (3.72)	0.009 (0.705)
Adjusted R-Square	12.37%	10.86%
Number of observations	1080	1080

*Significant level: *** 1%, ** 5% , * 10%*

The results calculated by our model illustrates a stronger relationship between cost stickiness and MEFE. The cost stickiness coefficient estimated by our model was significantly positive (β_1 = 0.281, t-statistics= 4.59), which shows that the stickiness of total costs is directly and significantly related to MEFE, so that with one-unit increase in the total cost stickiness, the MEFE rises by 0.281. The coefficient of total costs estimated by Anderson et al (2007) model was positive (β_1 = 0.278) and significant (t-statistic = 2.5344), suggesting that the stickiness of total costs is directly and significantly related to the MEFE.

4.2.2. Cost stickiness sources and MEFA (H2)

The test results of the second hypothesis are presented in Table (13). The results illustrate that the relative stickiness of each year and each company is significantly related with the MEFE, while there is no significant relationship between the stickiness of each industry and MEFE.

The estimated coefficient of relative stickiness in each year was positive (β_1 = 0.675) and significant (t-statistic = 1.96), indicating that the relative stickiness in each year is directly and significantly correlated with MEFE. That is, with a one-unit increase in the relative stickiness of each year, the MEFE rises by 0.675 units. The estimated coefficient of relative stickiness in each industry and year is negative (β_2 = -0.073) and not significant (t-statistic = -0.82), demonstrating that the average relative stickiness of each industry did not induce a significant forecast error. In the company level, the estimated coefficient of relative stickiness was positive (β_3 = 0.226) and significant (t-statistic = 3.35), suggesting that the relative stickiness of each company has a direct and significant relationship with MEFE.

Table 13

***Regression Coefficient of Management Forecast Error on* the Sources of Cost Stickiness.**

Regression Model (8):

$$FE_{f,t} = \beta_0 + \beta_1 CS_y + \beta_2 CS_{y,i} + \beta_3 CS_{y,i,f} + \beta_4 MV_{f,t} + \beta_5 LOSS_{f,t} + \beta_6 VSALE_{f,t} + \beta_7 OPLEV_{f,t} + \beta_8 \Delta NINCOME_{f,t} \varepsilon_{f,t}$$

	Coefficient Estimates (*t*-statistics)
Independent variables	**Model (8)**
CS_y	0.675* (1.96)
$CS_{y,i}$	-0.073 (-0.82)
$CS_{y,i,f}$	0.226*** (3.35)
MV	-0.339* (-1.76)
LOSS	0.259*** (-0.50)
VSALE	0.117*** (3.57)
OPLEV	-2.358*** (-3.31)
Δ*NINCOME*	0.291*** (3.65)
Constant	4.209*** (3.65)
Adjusted R-Square	١٢,٥٤٪
Observation	١٠٨٠
*Significant level: *** 1%, ** 5% , * 10%*	

5. Summary and Conclusion

According to previous research, one of the major consequences of cost stickiness is its adverse impact on the MEFA. In the present study, we further investigated this subject by examining the relationship between the stickiness of each source of cost stickiness and the MEFA. In this study, we presented a method that not only separated the sources of cost stickiness, but also calculated cost stickiness for each year-company. Then, the effect of cost stickiness and all of its sources on the MEFA was investigated. The results showed that the degree of cost stickiness has a negative and significant relationship with the MEFA so that a higher degree of stickiness decreased the MEFA.

Accordingly, investors, analysts, managers, and other users need to consider the consequences of total cost stickiness in forecasting future earnings and assessing the value of company so that they can estimate the future performance of the company with the least error.

In addition, to further investigate the proposed method, each year-company stickiness was tested with the model of Anderson et al. (2007) and its effect on the MEFA was explored. The results were aligned with those obtained from our proposed method. Findings also suggest that among the sources of cost stickiness, stickiness of each year and each company have a negative and significant effect on the MEFA. It indicates that each year events and intra-organizational events have a greater effect on MEFA compared to other sources of cost stickiness.

Therefore, it can be contended that by separating the sources of cost stickiness and including them in earnings forecast models, a more accurate estimate of future earnings can be made. It is worth to note that the findings of this study are consistent with those reported by Weiss (2010), Cifitci et al. (2016), Cifitci and Salama (2018) and Banker and Chen (2006).

References

1. Adar, Z., Barnea, A., & Lev, B. (1977), "A Comprehensive Cost-Volume-Profit Analysis under Uncertainty", *The Accounting Review*, Vol. 52 No. 1, pp. 137-149.

2. Anderson, M. C., R. D. Banker, and S. N. Janakiraman. (2003), "Are Selling, General, and Administrative Costs "Sticky" "? *Journal of Accounting Research,* Vol. 41 No. 1, pp.47–63. https://doi.org/10.1111/1475-679X.00095

3. Anderson, M. C., R. D. Banker, L. Chen, and S. N. Janakiraman. (2004), "Sticky Costs at Service Firms", *Working paper, University of Texas at Dallas.*

4. Anderson, M., Banker, R., Huang, R., & Janakiraman, S. (2007), "Cost Behavior and Fundamental Analysis of SG&A Costs", *Journal of Accounting, Auditing & Finance*, Vol. 22 No. 1, pp. 1-28. https://doi.org/10.1177/0148558X0702200103

5. Armstrong,J. S.,& Collopy,F.(1992), "Error Measures for Generalizing About Forecasting Methods: Empirical Comparisons", *Retrieved from https://repository.upenn.edu/marketing_papers/69*

6. Atiase, R. (1985), "Predisclosure Information, Firm Capitalization, and Security Price Behavior Around Earnings Announcements", *Journal of Accounting Research,* Vol. 23 No. 1, pp. 21-36.https://doi.org/10.2307/2490905

۷. □□□□, □. □ □□□□, □. (۲۰۱۵), "□□□□□□□□□ □□□□□□ □□□ □□□□ □□□□□□□□□□□: □□□□□□□□ □□□□ □□□□□", *□□□□□□□ □□ □□□□□□□□□*

Reporting and Accounting, Vol. 13 No. 1, pp.119-140. https://doi.org/10.1108/JFRA-06-2014-0052

8. Ibrahim, A. (2015), "Economic growth and cost stickiness: evidence from Egypt", *Journal of Financial Reporting and Accounting*, Vol. 13 No. 1, pp.119-140. https://doi.org/10.1108/JFRA-06-2014-0052

9. Banker, Rajiv D. and Chen, Tony Lei, (2006) "Labor Market Characteristics and Cross-Country Differences in Cost Stickiness", *AAA 2007 Management Accounting Section (MAS) Meeting, Available at SSRN: https://ssrn.com/abstract=921419 or http://dx.doi.org/10.2139/ssrn.921419*

10. Banker, R. D., and L. Chen. (2006b), "Predicting Earnings Using a Model Based on Cost Variability and Cost Stickiness", *The Accounting Review,* Vol. 81 No. 2, pp. 285–307. https://doi.org/10.2308/accr.2006.81.2.285

11. Banker, R. D., D. Byzalov, and J. M. Plehn-Dujowich. (2011), "*Sticky Cost Behavior: Theory and Evidence"*, *Working Paper, Temple University*.

12. Banker, R. D., D. Byzalov, and L. T. Chen. (2011a)*,* "Impact of Labor Laws on Cost Behavior"*, Working paper, Temple University and Peking University.*

13. Banker, R. D., D. Byzalov, and L. Chen. (2013), "Employment protection legislation, adjustment costs and cross-country differences in cost behavior", *Journal of Accounting and Economics,* Vol. 55 No. 1, pp.111-127. https://doi.org/ 10.1016/j.jacceco.2012.08.003.

14. Banker, R. D., and L. Chen. (2006b), "Predicting Earnings Using a Model Based on Cost Variability and Cost Stickiness", *The Accounting Review,* Vol. 81 No. 2, pp. 285–307. https://doi.org/10.2308/accr.2006.81.2.285

15. Banker, R. D., R. Flasher, and D. Zhang. (2014), "Strategic positioning and asymmetric cost behavior". *Working paper, Temple University.*

16. Banker, R. D., D. Byzalov, M. Ciftci, and R. Mashruwala.(2014), "The Moderating Effect of Prior Sales Changes on Asymmetric Cost Behavior"*, Journal of Management Accounting Research*, Vol. 26 No. 2, pp.221-242. https://doi.org/10.2308/jmar-50726

17. Barron, O., Kim, O., Lim, S., & Stevens, D. (1998), "Using Analysts' Forecasts to Measure Properties of Analysts' Information Environment", *The Accounting Review,* Vol. 73 No. 4, pp. 421-433.

18. Belsley, D., E. Kuh, and R. Welsch. Regression Diagnostics: Identifying Influential Data and Collinearity. New York: Wiley, 1980.

19. Bhushan, R., (1989), "Firm characteristics and analyst following", *Journal of Accounting and Economics*, Vol. 11. pp. 255-274. https://doi.org/10.1016/0165-4101(89)90008-6

20. Brown, L., (2001)."A temporal analysis of earnings surprises: Profits versus losses", *Journal of Accounting Research,* Vol. 39, pp.221-241. https://doi.org/10.1111/1475-679X.00010

21. Brown, L., Richardson, G., & Schwager, S. (1987), "An Information Interpretation of Financial Analyst Superiority in Forecasting Earnings", *Journal of Accounting Research,* Vol. 25 No. 1, pp.49-67. https://doi.org/10.2307/2491258

22. Calleja, K., M. Steliaros, and D. C. Thomas. (2006), "A Note on Cost Stickiness: Some International Comparisons", *Management Accounting Research,* Vol. 17 No. 2, pp.127-140. https://doi.org/10.1016/j.mar.2006.02.001

23. Cannon, J. N. (2014), "Determinants of "Sticky Costs": An Analysis of Cost Behavior using United States Air Transportation Industry Data", *The Accounting Review*, Vol. 89 No. 5, pp.1645-1672. https://doi.org/10.2308/accr-50806

24. Chen, C.X., Lu, H. and Sougiannis, T. (2012), "The Agency Problem, Corporate Governance, and the Asymmetrical Behavior of Selling, General, and Administrative Costs", *Contemporary Accounting Research*, Vol. 29, pp. 252-282. □□□□□://□□□.□□□/10.1111/j.1911-3846.2011.01094.x

25. Cheng, T. and Firth, M. (2000), An Empirical Analysis of the Bias and Rationality of Profit Forecasts Published in New Issue Prospectuses. *Journal of Business Finance & Accounting*, Vol.27, pp.423-446. https://doi.org/10.1111/1468-5957.00319

26. Ciftci, M., R, Mashruwala,., D,Weiss.(2016). "Implications of Cost Behavior for Analysts' Earnings Forecasts". *Journal of Management Accounting Research*, Vol. 28 No. 1, pp.57-80. https://doi.org/10.2308/jmar-51073

27. Ciftci, M & M. Salama. (2018). "Stickiness in Costs and Voluntary Disclosures: Evidence from Management Earnings Forecasts", *Journal of Management Accounting Research*, Vol. 30 No. 3, pp. 211-234. https://doi.org/10.2308/jmar-51966

28. Collins, D.W., Kothari, S.P., Rayburn, J.D. (1987), "Firm size and the information content of prices with respect to earnings", *Journal of Accounting and Economics*, Vol. 9 No. 2, pp.111-138. https://doi.org/10.1016/0165-4101(87)90002-4

29. Dierynck, Bart and Renders, Annelies, (2009), "Earnings Management Incentives and the Asymmetric Behavior of Labor Costs: Evidence from a Non-US Setting". *AAA 2010 Management Accounting Section (MAS) Meeting Paper*, Available at SSRN: https://ssrn.com/abstract=1441250 or http://dx.doi.org/10.2139/ssrn.1441250

30. Edwin H. Chen & W. J. Dixon. (1972), "Estimates of Parameters of a Censored Regression Sample", *Journal of the American Statistical Association*, Vol. 67 No. 339, pp. 664-671, https://doi.org/10.1080/01621459.1972.10481273

31. Ely, K. (1991), "Interindustry Differences in the Relation between Compensation and Firm Performance Variables", *Journal of Accounting Research*, Vol. 29 No. 1, pp.37-58. https://doi.org/10.2307/2491027

32. He, D. S., J. Teruya, and T. Shimizu.(2010), "Sticky Selling, General, and Administrative Cost Behavior and its Changes in Japan", *Global Journal of Business Research,* Vol. 4 No. 4, pp.1-10.

33. Kana, I. and weiss, D. (2013), "Do Earnings Targets and Managerial Incentives Affect Sticky Costs?", *Journal of Accounting Research*, Vol. 51, pp. 201-224. https://doi.org/10.1111/j.1475-679X.2012.00471.x

34. Lee, W. J. & Pittman, J. & Saffar, W. (2020), "Political Uncertainty and Cost Stickiness: Evidence from National Elections around the World", *Contemporary Accounting Research*, *Vol*. 17 No. 2, pp. 1107-1139. https://doi.org/10.1111/1911-3846.12547

35. Matsumoto, D. (2002), "Management's Incentives to Avoid Negative Earnings Surprises", *The Accounting Review,* Vol. 77 No. 3, pp. 483-514.

36. Ruland, W. (1978), "The Accuracy of Forecasts by Management and by Financial Analysts", *The Accounting Review,* Vol. 53 No. 2, pp. 439-447.

37. Subramanyam, K. (1996), "The Pricing of Discretionary Accruals", *Journal of Accounting and Economics,* Vol. 22 No. 1-3, pp.249–281. https://doi.org/10.1016/S0165-4101(96)00434-X

38. Weidenmier, M.Lynne and C.Subramaniam, (2010), "Additional Evidence on the Sticky Behavior of Costs". *TCU Working Paper*, Available at: SSRN: https://ssrn.com/abstract=369941 or http://dx.doi.org/10.2139/ssrn.369941.

39. Subramaniam, C. and Watson, M.W. (2016), "Additional Evidence on the Sticky Behavior of Costs", Advances in Management Accounting (Advances in Management Accounting, Vol. 26, Emerald Group Publishing Limited, pp. 275-305. https://doi.org/10.1108/S1474-787120150000026006.

٤٠. Weiss, D. (٢٠١٠), "Cost Behavior and Analysts' Earnings Forecasts", *The Accounting Review,* Vol. 85 No. 4, pp. 1441–1471. https://doi.org/10.2308/accr.2010.85.4.1441

41. Wiedman, C., (1996), "The relevance of characteristics of the information environment in the selection of a proxy for the market's expectations for earnings: An extension of Brown, Richardson, and Schwager", *Journal of Accounting Research,* Vol. 34, pp.313- 324.