A Comparative Study of the Adhesive Behavior Observed in Sales, Administrative and General Costs and the Cost of Sales Product among Firms Listed in Tehran Stock Exchange

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ABSTRACT

An increase in sales will relatively induce an increase in costs, but a decrease in sales does not reduce costs; this irregular behavior in costs is called adhesiveness of costs. Therefore the main objective of this research is to comparatively analyze the adhesive behavior of sales, administrative and general costs as well as the cost of sold goods as the major costs mentioned in financial statements. According to the results acquired through the current research based on the data from 185 firms listed in Iran stock exchange in a period of 10 years since the beginning of 2003 until the end of 2012, one percent increase in sales leads to a 62% increase in sales, administrative and general costs, while one percent decrease in sales leads to a 39% decrease in sales, administrative and general costs. Besides one percent increase in sales size leads to a 71% increase in sold goods, while one percent decrease in sales leads to a 45% decrease in the cost of sold goods. In addition this study examines how the intensity of cost adhesiveness changes during different periods and among different firms. The results indicate that cost adhesiveness is less intense in the periods following a decrease in revenues. Besides costs adhesiveness is more intense in firms with a greater ratio of total assets to sales.

KEYWORDS: Sales, Administrative and General Costs, The Cost of Sold Goods, Adhesive Behavior of Costs, Intensity of Costs Adhesiveness.

1. INTRODUCTION

Planning is one of the main responsibilities of management. It can play a significant role to contribute to error prevention or latent opportunity identification. Moreover decision making is the fundamental aspect of all managerial obligations as well as the base of planning as it cannot be claimed that there is a plan but no decision making. In other words, decision making is the core side of management, which is manifested in all managerial responsibilities. Management accounting is one of the most important tools for providing managers with the information needed for making decisions. Therefore preparing and offering comprehensible, credible, relevant and timely data can aid management in making timely and proper decisions. In other words, management accounting mainly emphasizes on presenting timely and useful data required for managers' planning and supervision. Yasukata and Kenjivara [1] believe that management accounting is capable of accomplishing its stewardship function by identifying and anticipating how costs behave in relation to the changes in the size of activities or revenues.

The idea of the existence of a relationship between costs and activities is proposed in some of the researchers' works, such as the studies of Solumon and Estabus, in late 1960s and early 1970s. Since then, numerous premises have been suggested on this issue, among which is Noreen and Soderstrom premise [2] which states that with respect to the size of activities, costs are divided into fixed and variable, and that the variable costs change relative to the change in the size of activities. But some of the researchers such as Anderson et al. [3] and Calleja et al. [4] found that the extent of change in case costs increase as a result of increased revenues is larger than the extent of change when costs decrease as a result of decreased revenues. In the scope of management accounting, this feature of costs is called adhesiveness of costs. For example if a 10% increase in sales revenue concurs with a 9% increase in costs, then in the case of a 10% decrease in sales revenue, a 9% decrease in costs cannot be expected. According to this premise, costs decrease less than 9%. So the prediction of costs behavior may be misleading without taking this feature into account. White, Sondhi, and Fried's position [5] in this regard is that estimating costs behavior without considering adhesiveness feature might mislead the users.

Profitability, growth, costs minimizing and products pricing are among the most important objectives of any commercial unit and organization, and the management activities, in the form of managers' main obligations such as decision making, planning and supervising, are directed toward meeting these objectives. Management needs information to fulfill its obligations; the more accurate the information, the more precise the future budgeting and planning and the smaller the number of deviations.

Being aware of the way costs behave in relation to the changes in the sizes of activities or sales is a significant piece of information required for managerial decision making with regard to planning, budgeting, pricing products, setting breakeven point and other managerial matters. In traditional models of costs behavior in

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management accounting, variable costs increase or decrease in relation to the changes in the size of activities. This means that the extent of changes in costs solely depends on the extent of changes in the size of activities and the trend of changes toward rising or falling size of the activities does not impact the extent of costs changes [6].

Knowledge of costs and their behavior is one of the most important pieces of information which is influential in planning and decision making. Based on the preliminary premises of management accounting, costs changes are related to the rising and falling size of activities, while recent studies pose the issue of costs adhesiveness which means that the extent of changes when costs increase as a response to the increased activities size is greater than the extent of changes in a case when costs decrease as a result of a decreased activities size, while the activities size has decreased or increased correspondingly.

To examine the adhesiveness of costs, we can conduct a meaningful analysis of, for example, the sales, administrative and general costs behaviors in relation to the changes in sales size, because the size of sales stimulates most of the sales, administrative and general costs [7].

Therefore with respect to the significance of sales, administrative and general costs and the cost of sold products in the firms' costs frames, this study attempts to analyze the way these costs behave with respect to the changes in sales size and to examine the adhesiveness of these costs. Besides this research studies how the intensity of adhesiveness in sales, administrative and general costs and the cost of sold products changes in different periods and among different firms. Undoubtedly knowledge of this study's findings has a significant role in a more accurate review of financial performances, estimation of firm's profitability and a more precise managerial decision making.

Ingram et al. [8] showed that costs behavior is not entirely variable or fixed. Recent empirical evidence presented by some researchers also show that costs increase more rapidly in response to the increased sales size compared with the time they decrease in response to the decreased sales size.

Anderson et al. findings [3] show that one percent increase in sales size leads to a 55% increase in sales, administrative and general costs, and one percent decrease in sales size reduces sales, administrative and general costs by 35%. Subramaniam and Weidenmier [9] also have examined and confirmed the existence of an adhesive behavior in the cost of sold products. Medeiros and Costa [10] have also investigated the adhesiveness of sales, administrative and general costs among 198 Brazilian firms. The results of his study also suggest that sales, administrative and general costs have an adhesive behavior.

Calleja et al. [4] examined the adhesiveness of operational costs using the data collected from the following 4 countries: America, England, France, and Germany. The results of his study show that one percent change in sales increases operational costs by 97% and one percent decrease in sales leads to a 91% decrease in operational costs, and that the costs adhesiveness is more intense in France and Germany compared to what has been observed in America and England.

Anderson and Lanen [11] also found some evidence proving that the intensity of costs adhesiveness differs among different industries and for some constituents of operational costs such as costs of marketing, investigation, development, salaries and wages. Balakrishnan and Gruca [12] studied the difference of the intensity of costs adhesiveness among different divisions of an organization and found that costs adhesiveness is more intense in central and main divisions of the firm. He et al. [13] studied the intensity of costs adhesiveness among Japanese firms between 1975 and 2000. They found that costs adhesiveness does not change with temporary changes of sales and they attributed this feature to managers' estimation and prediction of future economical conditions. Cannon [14] studied the determinants of costs adhesiveness in American air transport firms in another research. His findings show that costs adhesiveness raises if the managerial cost of increased capacity at the time of increased demand is more than the marginal profit of decreased capacity at the time of decreased demand. Nicola and Paolo [15] studied the costs behavior with regard to the size of the firms listed in Italy stock exchange between 1999 and 2008. The results showed that only costs of labor are adhesive and the researchers did not find a clue regarding the adhesiveness of sales, administrative and general costs and the cost of sold items. Kordestani and Mortazavi [16] conducted a research to study the impact of managers' judicious decisions on adhesiveness of costs in Tehran stock exchange. Their findings show that managers' expectation of raised sales leads to a reduced adhesiveness of sales costs and the more optimistic this expectation, the less adhesive the sales cost. But managers' optimism increases the adhesiveness of sales, administrative and general costs, and these costs adhesiveness is more in the case of managers' excessive optimism compared to the time when managers are less optimistic; this is considered as a robust proof for verifying the premise regarding judicious decisions about sales, administrative and general costs.

Therefore with regard to the increasing significance of predicting costs behavior, the present study investigates the intensity of sales, administrative and general costs adhesiveness in comparison with the cost of sold goods in the following contexts: intensity of costs adhesiveness, the extent of adhesiveness intensity during the period of decreased revenues and the large size of firm's assets in Tehran stock exchange. The findings of the present study are especially useful for financial analysts and managers because they devise regular and reliable plans and make careful decisions by identifying and predicting exactly how costs behave and respond to the fluctuating revenues. The following hypotheses are developed based on theoretical principles:

Hypothesis 1: when sales increase, the relative amount of increase in sales, administrative and general costs is more than the relative amount of decrease in sales, administrative and general costs when sales decrease.

Hypothesis 2: when sales increase, the relative amount of increase in the cost of sold goods is more than the relative amount of decrease in the cost sold goods when sales decrease.

Hypothesis 3: adhesiveness of sales, administrative and general costs is less intense during the periods following a period of decreased revenue.

Hypothesis 4: the intensity of costs adhesiveness is less during the periods following a period of decreased revenue.

Hypothesis 5: as the firm's assets raise, the adhesiveness of sales, administrative and general costs gets more intense.

Hypothesis 6: as the firm's assets raise, the adhesiveness of the cost of sold goods gets more intense.

Hypothesis 7: the intensity of costs adhesiveness is more than the adhesiveness intensity of sales, administrative and general costs.

2.   MATERIALS AND METHODS

This research is an applied research and belongs to the scope of accounting positive researches, which is conducted using multivariable regression method and econometric models. Its statistical population consists of firms admitted in Tehran stock exchange for ten years, since the beginning of 2003 to the end of 2012, which maintained their participation in the stock exchange during this period. Moreover the statistical population has been modified according to the following conditions:

1) Firms must be admitted in the stock exchange before 2003 and their shares must have been traded in the stock exchange since the beginning of 2003.

2) The end of firm's fiscal year must be at the end of March and it should not change during the research period.

3) The firms must not have a trading halt of more than one month in the stock exchange during the research period, in other words between 2003 and 2012.

After the application of these restraints, 185 firms met all the conditions for being in the statistical population. So 185 firs were selected as the statistical population and no other sampling method was applied. Also the final analysis of the data was conducted using an econometric software called Eviews 7.

Variables applied in this study consist of logarithms of sales, administrative and general costs and a logarithm of the cost of sold goods (dependent variables) and firm's net sales and assets as independent variables. This data was collected using Sahra and Tadbirpardazan software and the compact discs of the data issued by Tehran securities and exchange organization. The firms for which the data regarding any of the above variables was not available for a specified year as well as the firms for which sales, administrative and general costs of a specified year were not available have been omitted by a systematic elimination approach.

3.   RESULTS

This study benefits from the following model developed by Anderson et al. [3] and applied by other researchers [9, 4, 12] to analyze the costs behavior in relation to the changes in sales size during the periods of rising and falling revenues, separately.

Model (1)

$$LOG\left[\frac{SGA_{it}}{SGA_{it-1}}\right] = \beta_0 + \beta_1 * \log\left[\frac{REV_{it}}{REV_{it-1}}\right] + \beta_2 * D_{it} * \log\left[\frac{REV_{it}}{REV_{it-1}}\right] + \varepsilon_{it}$$

Model (2)

$$LOG\left[\frac{CGA_{IT}}{CGA_{it-1}}\right] = \beta_0 + \beta_1 * \log\left[\frac{REV_{it}}{REV_{it-1}}\right] + \beta_2 * D_{it} * \log\left[\frac{REV_{it}}{REV_{it-1}}\right] + \varepsilon_{it}$$

SGA_t: sales, administrative and general costs of the firm i during the year t,
SGA_{t-1}: sales, administrative and general costs of the firm i during the year t-1,
CGA_t: the cost of sold goods in the firm i during the year t,
rev_t: net sales of the firm i during the year t,
rev_{t-1}: net sales of the firm i during the year t-1,
D: dummy variable, in other words if sales (REV_T) during the year t has been raised relative to the amount of sales (REV_{T-1}) during the year t-1, then this variable equals 1, otherwise 0.

Since the population studied in this research consists of different firms and industries participating in stock exchange, using this model which is based on relative and logarithmic indices enhances the comparability of variables among firms and standardizes the interpretations of estimated coefficients. As the value of variable *D* is zero in the case of increased revenues, so the coefficient β1 shows the percentage of the increase in sales,

administrative and general costs following one percent increase in sales revenue. In addition, since the coefficient of variable D equals 1 in the case of decreased revenues, then the sum of coefficients β1+β2 represents the percentage of the decrease in sales, administrative and general costs following one percent decrease in sales revenue. If sales, administrative and general costs are adhesive, the percentage of the increase in costs during the periods of increased revenue should be more than the percentage of decrease in costs during the periods of decreased revenue, or B1>0 and β2<0.

Table 2 shows the results attained through the examination of the first and second hypotheses using models (1) and (2). These results suggest that the estimated coefficient β1 equals 62% and indicate that one percent increase in sales revenue raises sales, administrative and general costs by 62%. Also the coefficient β2 equals -23%. The negative value of the coefficient β2 suggests an adhesive behavior for sales, administrative and general costs, because β > 2β+1β1 and this means that one percent decrease in sales reduces the sales, administrative and general costs by 39% (62%-23%), so the first hypothesis is conceded.

Besides the results of the second hypothesis evaluation, which was conducted using model (2), indicate that the estimated coefficient β1 equals 71% and show that one percent increase in sales revenue raises the cost of sold goods by 71%. Also the coefficient β2 equals -29%. The negative value of the coefficient β2 (PV=0.000) suggests an adhesive behaviour in the cost of sold goods, because β > 2β+1β1, and it means that one percent decrease in sales revenue, reduces the cost of sold goods by 42% (71%-29%), so the second hypothesis is conceded. Besides according to the results achieved through these 2 hypotheses the intensity of costs adhesiveness (42%) is more than the adhesiveness intensity of sales, administrative and general costs (39%).

Table 1: Evaluation results of the first and second hypotheses of the study at the level of compositional data

Index	Sales, administrative and general costs			The cost of sold goods		
depiction	Coefficient	t statistic	p.v	Coefficient	t statistic	p.v
β_0	0.06	2.653	0.001	0.09	3.653	0.001
β_1	0.621	2.981	0.001	0.712	2.698	0.001
β_2	-0.230	2.450	0.001	-0.293	2.135	0.001
R^2	0.423			R^2	0.468	
F-static	16.36			F-static	19.325	
P-value	0.001			P-value	0.001	

Models (3) and (4) were used to analyze the third and fourth hypotheses, the procedure is described below:

Third hypothesis: adhesiveness of sales, administrative and general costs is less intense during the periods following a period of decreased revenue.

Fourth hypothesis: adhesiveness of costs is less intense during the periods following a period of decreased revenue.

Model (3)

$$LOG\left[\frac{SGA_{IT}}{SGA_{it-1}}\right]=\beta_0+\beta_1*Log\left[\frac{REV_{it}}{REV_{it-1}}\right]+\beta_2*D_{it}*Log\left[\frac{REV_{it}}{REV_{it-1}}\right]+\beta_3*D*Log\left[\frac{REV_{it}}{REV_{it-2}}\right]*SD+\varepsilon_{it}$$

Model (4)

$$LOG\left[\frac{CGA_{IT}}{CGA_{it-1}}\right]=\beta_0+\beta_1*Log\left[\frac{REV_{it}}{REV_{it-1}}\right]+\beta_2*D_{it}*Log\left[\frac{REV_{it}}{REV_{it-1}}\right]+\beta_3*D*Log\left[\frac{REV_{it}}{REV_{it-2}}\right]*SD+\varepsilon_{it}$$

SD: if the period preceding the periods of decreased revenue has faced a decrease in revenue, the value of this variable equals 1, otherwise 0.

The coefficient β1 represents the percentage of increase in sales, administrative and general costs in the first model and the percentage of increase in the costs of sold goods in the second model which follow one percent increase in sales revenue. β1+β2+β3 represent the percentage of decrease in sales, administrative and general costs and the costs of sold goods following one percent decrease in sales revenue. Negative value of coefficient β2 suggests that the costs are adhesive and the positive value of coefficient β3 (p-value=0.000) suggests that the adhesiveness intensity is reduced during the periods following a period of decreased revenue. Table 3 presents the evaluation results of the third and fourth hypotheses. The negative value of coefficient β2 indicates that the costs are adhesive. But the positive value of coefficient β3 shows that the variable SD has a reverse effect on intensity of costs adhesiveness and suggests a reduced adhesiveness intensity for the periods for which SD equals 1. In other words, the positive value of coefficient β3 indicates that the intensity of costs adhesiveness has reduced during the periods following a period of reduced revenue and is a proof for the third and fourth hypotheses. In addition according to the results of these two hypotheses, the intensity of costs adhesiveness (76%+276%-512%=52%) is more than the adhesiveness intensity of sales, administrative and general costs (743%+221%-462%=50%).

Table 2: evaluation results of the third and fourth hypotheses of the study at the level of compositional data

Index	Sales, administrative and general costs			The cost of sold goods		
depiction	Coefficient	t statistic	p.v.	Coefficient	t statistic	p.v.
β_0	0.02	2.136	0.001	0.04	1.92	0.031
β_1	0.743	3.643	0.001	0.76	2.135	0.001
β_2	-0.462	4.315	0.001	-0.512	2.98	0.001
β_3	0.221	2.954	0.001	0.276	4.61	0.001
R^2	0.5945			R^2	0.6135	
F-static	21.35			F-static	25.312	
P-value	0.001			P-value	0.001	

Model (5) and model (6) are used to assess the fifth and sixth hypotheses. The following model is developed by replacing the coefficient β2 in the model $\beta 2 = {}_{\log}\left[\frac{ASSETS_{it}}{REV_{it}}\right]\beta_0 + \beta_1$ and then substituting the coefficients. The model is used assess the influence of the size of the firm's assets on the intensity of costs adhesiveness.

Model (5)

$$LOG\left[\frac{CGA_{IT}}{CGA_{t-1}}\right] = \beta_0 + \beta_1 * \log\left[\frac{REV_{it}}{REV_{it-1}}\right] + \beta_2 * D_{it} * \log\left[\frac{REV_{it}}{REV_{it-1}}\right] + \beta_3 * D_{it} * \log\left[\frac{REV_{it}}{REV_{it-1}}\right] * \log\left[\frac{ASSETS_{it}}{REV_{it}}\right] + \varepsilon_{it}$$

Model (6)

$$LOG\left[\frac{SGA_{it}}{SGA_{it-1}}\right] = \beta_0 + \beta_1 * \log\left[\frac{REV_{it}}{REV_{it-1}}\right] + \beta_2 * D_{it} * \log\left[\frac{REV_{it}}{REV_{it-1}}\right] + \beta_3 * D_{it} * \log\left[\frac{REV_{it}}{REV_{it-1}}\right] * \log\left[\frac{ASSETS_{it}}{REV_{it}}\right] + \varepsilon_{it}$$

SGA_t : sales, administrative and general costs of the firm *i* during the year *t*,
SGA_{t-1} : sales, administrative and general costs of the firm *i* during the year *t-1*,
CGA_t : the cost of sold goods in the firm *i* during the year *t*,
rev_t : net sales of the firm *i* during the year *t*,
rev_{t-1} : net sales of the firm *i* during the year *t-1*.

Here too, the coefficient β1 represents the percentage of the increase in sales, administrative and general costs in the first model and the percentage of the increase in the costs of sold goods in the second model which are the result of one percent increase in sales revenue, and in both models β1+β2+β3 represents the percentage of decrease in sales, administrative and general costs and the costs of sold goods respectively, which follow one percent decrease in sales revenue. The negative value of coefficient β2 indicates that the costs are adhesive and the positive value of the coefficient β3 (p-value=0.001) indicates that the adhesiveness intensity increases in the firms for which the ratio of total assets to net sales is bigger. The results of the evaluation of the fifth and sixth hypotheses are presented in table (3) and show that the estimated coefficient β3 (p-value=0.00) has a negative value, the same as the coefficient β2, and it suggests that the variable ${}_{\log}\left[\frac{ASSETS_{it}}{REV_{it}}\right]$ has an incremental effect on the adhesiveness intensity of sales, administrative and general costs and the intensity of costs adhesiveness. In other words, the adhesiveness intensity is greater in the firms having a bigger ratio of total assets.

Table 3: Evaluation results of the fifth and sixth hypotheses of the study at the level of compositional data

Index	Sales, administrative and general costs			The cost of sold goods		
depiction	Coefficient	t statistic	p.v.	Coefficient	t statistic	p.v.
β_0	0.01	2.13	0.001	0.03	1.85	0.05
β_1	0.77	3.125	0.001	0.79	2.19	0.001
β_2	-0.22	4.315	0.001	-0.26	1.95	0.041
β_3	-0.18	2.98	0.001	-0.16	2.36	0.001
R^2	0.351			R^2	0.390	
F-static	21.326			F-static	29.35	
P-value	0.001			P-value	0.001	

4. DISCUSSION

The ultimate goal of any commercial unit is to maximize profits and subsequently raise shareholders' wages. Management of any private institute attempts to gain the maximum profit and efficiency by means of the minimum resources. But realization of this objective requires complete knowledge of the costs behavior and the influential factors in costs behavior. The issue of costs adhesiveness has to be considered in analyzing costs behavior. The general and dominant opinion is that decreased sales should change the costs relatively. For instance costs decreased by 5% if sales decrease by 5% but this is not what happens in reality. According to the premise of

judicious decisions, adhesiveness of costs is under the influence of management's decisions. In fact having the prospect of achieving long term profits, managers try to maintain their resources to avoid being divested of potential revenues in the future, and it makes them reduce the costs slightly when the firm faces decreased sales.

The empirical evidence of this study indicates that the sales, administrative and general costs and the costs of sold goods have adhesive behaviors in Tehran stock exchange. This finding is consistent with the researches conducted by Anderson et al. [3] and Medeiros and Costa [10]. Besides the adhesiveness intensity of the costs of sold goods was more evident than the adhesiveness intensity of sales, administrative and general costs. The results of this study involve significant information about the way costs behave. Users, particularly accountants, managers, financial analysts and auditors, can benefit from this information in their decisions and assessments.

The common method used for analyzing financial statements is to measure and compare the ratio of sales, administrative and general costs to net sales for the firms of an industry or for one firm during different periods. Financial analysts consider the haphazard increase of sales, administrative and general costs as a negative indication of management's financial function, because they believe this irregular increase in costs is probably due to management's improper control of costs or fruitless efforts in selling goods. Such an analysis might be misleading as its main assumption is based on changes of costs in relation to the size of sales, while according to the results of this study, such an assumption is not reliable for a set of data involving periods of rising and falling sales.

Moreover auditors confirm and use the premise regarding the changes of costs in relation to the changes in the size of activities in their analytical studies. A better understanding of how sales, administrative and general costs change relative to the changes of sales can help auditors conduct their analytical studies better.

According to the findings of this research, it is recommended that investors and shareholders become more familiar with the concept of costs adhesiveness and pay sufficient attention to it when making decisions. Because with regard to achieved results, firms with a high adhesiveness intensity face a smaller change in costs when their sales decrease compared to the time when their sales increase, while one of the most important factors in costs adhesiveness is tolerance of current costs to avoid more losses in future or gain greater benefits through future decisions and it depends on managerial decisions.

Besides, the findings of this study offer some suggestions to the managers. Managers are capable of identifying and controlling the adhesiveness of firm's costs. They can also reduce the intensity of costs adhesiveness and the necessary modifications required for reducing their operational assets during the periods of decreased sales and demands by signing proper contracts involving the lease of operational assets and the recruitment of employees (for example short term contracts).

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