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Study on the behavior of finished cost elements of sold product and its effect on costs stickiness in companies listed in Tehran Stock Exchange

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Abstract: One of the complex problems for financial managers is the relationship between profit and efficiency of firm and reduction of costs. Identifying the cost behavior is one of the important discussions in finished cost accounting and management accounting. In traditional costs models in management accounting, variable costs increase or decrease regarding the volume of activity. This means that the largeness of changes is only depends on changes in activity volume and direction of changes in activity volume has no effect on the largeness of changes in costs. The main purpose of this research is studying the behavior of each finished cost elements of sold good and sale costs, general and administrative costs and their effect on the cost stickiness in the firms. In order to verify the hypotheses, multivariate regression method was used. Results of hypotheses testing show that elements of finished costs (including production factor costs i.e. direct material, direct wage and production overhead) has no stickiness relative to ale variations; but sale costs, general and administrative costs have stickiness relative to sale variation. Results indicate that for 1% increase in sale, cost of direct material reduces by 0.025%, cost of direct wage increases by 0.32% and overhead costs increases by 0.003%; but for 1% increase in sale, sale costs, general and administrative costs increase by 502% ad by 1% decrease in sale, sale, general and administrative costs reduces by 0.42%. This means that for 1% reduction in sale, sale, general and administrative costs has 0.042% stickiness.

Key words: Costs stickiness, Elements of finished cost, Administrative costs and sale

1. Introduction

The idea of the relationship between costs and activities has been expressed from late 1960s and early 1970s in works of some researchers like Solomon and Stabous. Since then, various theories are presented about this topic including Neron theory that based on it, costs in relation with activity level divide into fixed and variable costs and variable costs change with the change in the activity level. But findings of researchers like Anderson (2007) indicate that the amount of increase in costs when increasing income level, is higher that cost reduction at the time of reducing incomes. In management accounting, this characteristic of cost is called costs stickiness. For example, if by 10% increase in sale the costs simultaneously increase to 9%, in the case of 10% reduction in sale, we should not expect that costs reduce by 9%. Based on this theory, costs will reduce less than 9%. Therefore, predicting cost behavior without considering this characteristic is misleading. White et.al (1997) state that estimating cost behavior without considering stickiness leads to misleading of users.

Yasukata and Kajowara studied the relationship of reasonable decisions of managers with cost stickiness and showed that if managers expect to increase their sale in future, costs stickiness increases. Results of this study showed that amount of managers' optimism in predicting future sale has no significant relationship with finished cost stickiness but it has positive relationship with sale, general and official costs stickiness (Yasukata et.al, 2011).

Porporato and Werbin (2010) studied the cost stickiness among banks in Argentina, Brazil and Canada. Results showed that by 1percent increase in income, bank costs increased in Argentine, Brazil and Canada by 0.6, 082 and 0.92%, respectively. While with 1 percent decrease in the income of banks, 0.38, 0.48 and 0.92% reduction was observed, respectively. They found that banks with higher increase in costs at the time of sale improvement will have highest resection at the time of reducing sale.

Weiss (2010) in another research, studied the effect of asymmetric cost behavior on the earnings prediction and results showed that in firms with high sticky costs, accuracy of predicting earning by analysts is lower and investors consider cost stickiness in evaluating value of firm.

Banker et.al (2011) studied the relationship between management optimism and costs behavior and showed that by increasing (decreasing) sale, the higher optimism (pessimism) of management, and the higher costs and at increasing sale, the more prediction of analysts higher than future sale, cost increase balances increase.

Chen and Soughiannis (2012) tested the problem of agency cost, corporate governance and asymmetry

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for sale, general and official costs' behavior. Their result showed that the problem of agency cost can explain asymmetry of sale costs, especially for firms with weak corporate governance.

Dierynack et al (2012) studied the management stimulating factors and its effect on costs and measured the effect of management on the efficiency of human labor and effect of wage costs on earnings and concluded that there is some kind of asymmetry between activity level and relevant cost and company profitability.

2. Research methodology

This research is applied in terms of purpose. In this research, unit root test of variables reliability was used for studying the non-pseudo regression, Arch test for diagnosing the heterogeneity variance and Durbin-Watson test for autocorrelation of remained sentences and F-Limer test for diagnosing individual difference or heterogeneity in all sections.

2.1. Research hypotheses

Research hypotheses are as follows:

Since the first hypothesis is related to finished cost elements and these elements include production factors including direct material, direct wage and production overhead, therefore, we have three sub-hypothesis:

1. First subypothesis: direct material cost has stickiness toward sale changes.
2. Second subhypothsis: direct wage cost has stickiness toward sale changes.
3. Third subhypothesis: production overhead cost has stickiness toward sale changes.

2.2. Variables and research model

2.2.1. Dependent variables

In this research, cost growth rate log (direct material, direct wage, production overhead and sale, general and official costs) was studied as dependent variables.

Because sale level is the cost drive for most elements of official, general and sale costs (Cooper & Kaplan, 1998), in order to study the cost stickiness, we can test the behavior of official, general and sale costs relative to sale level, significantly; because this test has high importance. Mean ratio of official, general and sale costs to sale level for listed firms in Tehran Stock Exchange is 95% (Namazi, 1998).

Because the purpose is studying the behavior of each finished cost elements of sold goods and sale, general and official costs and its effects on cost stickiness, sale growth rate log is embedded in the model as explanatory variables.

2.2.2. Independent variable

In this research, cost stickiness variable is studied as Independent variable.

2.2.3. Virtual variable

In this research, sale reduction variable is considered as virtual variable.

In order to measure the costs variation in sale reduction periods, artificial variable sale reduction is used as virtual variable in models that if sale reduces, it is 1; otherwise, it is 0.

Because study sample includes all firms in different industries and different sizes, therefore, using a model based on ratio and logarithm indicators increases the comparability of variable amount firms; therefore, the model used in this research is Anderson et.al (2003) model which is as follows:

Model was presented based on first sub hypothesis:

$$log\left[\frac{Direct\ material_{i,t}}{Direct\ material_{i,t-1}}\right] = \beta_0 + \beta_1 log\left[\frac{sales_{i,t}}{sales_{i,t-1}}\right] + \beta_2 sales\_dummy_{i,t} * log\left[\frac{sales_{i,t}}{sales_{i,t-1}}\right] + \beta_3 Asset\ Turnover_{i,t} + \beta_4\ Inventory\ Turnover_{i,t} + \varepsilon_{i,t}$$

Second sub hypothesis model:

$$log\left[\frac{Direct\ labor_{i,t}}{Direct\ labor_{i,t-1}}\right] = \beta_0 + \beta_1 log\left[\frac{sales_{i,t}}{sales_{i,t-1}}\right] + \beta_2 sales\_dummy_{i,t} * log\left[\frac{sales_{i,t}}{sales_{i,t-1}}\right] + \beta_3 Asset\ Turnover_{i,t} + \beta_4\ Inventory\ Turnover_{i,t} + \varepsilon_{i,t}$$

Third sub hypothesis model:

$$log\left[\frac{Overhead_{i,t}}{Overhead_{i,t-1}}\right] = \beta_0 + \beta_1 log\left[\frac{sales_{i,t}}{sales_{i,t-1}}\right] + \beta_2 sales\_dummy_{i,t} * log\left[\frac{sales_{i,t}}{sales_{i,t-1}}\right] + \beta_3 Asset\ Turnover_{i,t} + \beta_4\ Inventory\ Turnover_{i,t} + \varepsilon_{i,t}$$

3. Research analysis and findings

When a bulk of information is gathered for research, organizing and summarizing them in a significant and comprehensible way is necessary.

3.1. Testing research hypotheses

First sub hypothesis

H_0: direct material cost has no stickiness relative to sale changes.

H_1: direct material cost has stickiness relative to sale changes.

In model (1), β_1 shows the cost changes per 1% increase in sale and β_1 and β_2 shows the cost changes per 1% sale reduction. Therefore, β_2 shows the difference between cost changes in sale increase and costs changes during sale, measures the costs stickiness.

Because $Dummy_{i,t}$ factor is 1 when the income decreases; therefore, sum of $\beta_1+\beta_2$ indicates the increase in costs in income increase periods. In fitness model, coefficient of β_1 and β_2 shows the cost changes for 1% increase and cost stickiness for 1% decrease. Positive estimation of each variable rescues cost stickiness and negative estimation increases cost stickiness (Table 1).

Table 1: Results of testing fist sub hypothesis

Variable	B	Standard error	t-statistic	Sig
Intersection	0.167	1.385	0.017	0.023
Sale growth rate	0.586	-0.546	0.046	-0.025
Mutual effect of sale reduction	0.695	0.393	0.016	0.006
Assets circulation	0.263	1.121	0.011	0.012
Good inventory	0.010	2.585	0.009	0.022
R	0.027	F	3.559	
Modified R	0.019	Durbin-Watson	20.89	

Results of testing first hypothesis about finished cost of sold good is shown in Table 1. Significance level of t-statistics (-0.564), sale growth rate (-0.025) is larger than 5% and insignificant which shows that by 1% increase in sale, cost of direct material decreases by -0.025%. T-statistics (0.393) of regression for sale reduction (0.006) in 5% level error is larger than 5% and insignificance which shows that by 1% sale reduction, cost stickiness increases by 0.006%. It can be concluded that material direct cost relative to sale changes has no stickiness, the first hypothesis is rejected.

Second sub hypothesis

H_0: direct material cost has no stickiness changes relative to sale changes.

H_1: direct wage cost has stickiness to sale changes (Table 2).

Table 2: results of second sub hypothesis

Variable	B	Standard error	t-statistic	Sig
Intersection	0.000	4.929	0.011	0.053
Sale growth rate	0.366	0.905	0.036	0.032
Mutual effect of sale reduction	0.126	-1.534	0.011	-0.017
Assets circulation	0.087	1.715	0.007	0.012
Good inventory	0.765	-0.299	0.005	-0.002
R	0/025	F	(0/016) 3/222	
Modified R	0/017	Durbin-Watson	2/039	

Results of testing first hypothesis about finished cost of sold good shows that significance level of t-statistics (-0.905), sale growth rate (-0.032) is larger than 5% and insignificant which shows that by 1% increase in sale, cost of direct material decreases by 0.032%. T-statistics (1.534) of regression for sale reduction (-0.017) in 5% level error is larger than 5% and insignificance which shows that by 1% sale reduction, cost stickiness increases by 0.006%. It can be concluded that wage direct cost relative to sale changes has no stickiness, the first hypothesis is rejected.

Third subhypothesis

H_0: cost of production overhead to sale change has no stickiness.

H_1: cost of production overhead has stickiness to sale changes (Table 3).

Table 3: result of testing third sub hypothesis

Variable	B	Standard error	t-statistic	Sig
Intersection	0.109	1.604	0.009	0.015
Sale growth rate	0.853	0.186	0.015	0.003
Mutual effect of sale reduction	0.199	-1.285	0.009	-0.011
Assets circulation	0.974	-0.033	0.006	0.000
Good inventory	0.000	5.354	0.005	0.026
R	0/076	F	(0/000) 10/609	
Modified R	0/068	Durbin-Watson	2/128	

Results of testing third hypothesis about finished cost of sold good shows that significance level of t-statistics (-0.905), sale growth rate (-0.032) is larger than 5% and insignificant which shows that by 1% increase in sale, cost of direct wage increases by 0.003%. T-statistics (-1.285) of regression for sale reduction (-0.011 in 5% level error is larger than 5% and insignificance which shows that by 1% sale reduction, cost stickiness increases by 0.006%. It can be concluded that production overhead cost relative to sale changes has stickiness, the third hypothesis is rejected.

4. Discussion and conclusion

In this research, we dealt with the behavior of finished cost of sold goods and sale, general, official costs and its effect on cost stickiness in firms.

Results of testing first hypothesis indicating non-stickiness of finished goods is consistent with results of Ghaemi and Nematollahi (2006), Kordestani and Mortazavi (2012) indicating sale reduction in sold good but it is inconsistent with results of Kordestani and Mortazavi (2012) that sale reduction in two consecutive periods leads to reduction in cost of sold good in second period.

Results of research showed that managers in the demand reduction periods compare the related costs of unused capacity with operating assets leave adjustment and reduction of capacity to take decisions. But evaluation of managers in comparison with related costs of unused capacity depends on the estimation of reduction and increase in market demand level. If evaluation of management shows the temporary reduction in market demand, costs of reducing production capacity will be higher than production capacity and if their evaluation indicates stability in residing market demand, costs of balancing capacity will be lower than production costs; because in this case only excess costs are available. Market demand level is relevant to production market and economic condition. If reduction trend continues, managers should decide with higher probability about temporary or permanent demand level; therefore, the probability of reducing market demand is higher. By this temporary decrease in market demand, managers act or reduce their production level and cost stickiness decreases.

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