

Investigation the relation between Costs and Revenues in Iranian Firms

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Abstract: Conventional cost accounting assumes that the relation between cost and volume is symmetric. Model has been tested where costs increase more when activity rises than they decrease when Activity falls by an equivalent amount. We find, for a sample of Iranian firms that costs increase 0.88 percent, per 1 percent increase in sales but decrease only 0.71 percent, per 1 percent decrease in sales, financial costs increase, on average, by around -0.1 percent per 1percent increase in revenue; means that financial costs in Iranian firms decreases when revenue increases. When revenue decreases by 1 percent, total financial costs decrease by around 1.22 percent. Confirms that changes in total financial costs are neither proportional nor symmetrical to changes in revenue, but it's not stickiness. We confirm cost stickiness for Iranian firms' costs.

[Masoumeh Nematollahi. **Investigation the relation between Costs and Revenues in Iranian Firms.** *N Y Sci J* 2013;6(11):52-57]. (ISSN: 1554-0200). <http://www.sciencepub.net/newyork>. 8

Keywords: costs, financial costs, sales, cost stickiness, regression

Introduction

Traditional cost behavior models in the accounting literature distinguish between fixed and variable costs with respect to changes in the level of activity. Fixed costs are assumed to be independent of the level of activity whereas variable costs are assumed to change linearly and proportionately to changes in the level of activity. Underlying the traditional cost behavior model are a number of assumptions which, apart from simplifying the real world, distance the model from the way costs behave in reality (K.calleja et al., 2005).

However, some authors have sustained costs rise more with increases in activity volume than they fall with decreases (Cooper and Kaplan, 1998, p. 247; Noreen and Sanderstrom, 1997). This kind of cost behavior is called by Anderson, Banker and Janakiraman (2003) "sticky costs".

Such sticky cost behavior arises if trimming off excess resources when demand declines are relatively more costly than scaling up resources to accommodate increased demand. Under such conditions, managers' rational resource adjustment decision entails less reduction of resources when sales decrease than addition of resources when sales increase (Anderson *et al.* 2003). Unlike the *static* traditional cost model that relates costs only to the contemporaneous level of sales volume independent of costs and volume in the prior period, cost stickiness exemplifies *dynamic* cost behavior that depends on costs and sales in the prior period and the direction of change in sales from the prior period. Resources that are not mechanically linked to overall activity levels are likely to exhibit sticky behavior. For example, the payroll costs of contract employees could be reasonably viewed as variable with total revenue. However, in a period of sales downturn

perceived to be temporary, managers may choose not to reduce the workforce proportionately in order to avoid having to incur additional costs of recruiting and retaining them when sales levels pick up in a subsequent period. Payroll costs for such employees retained in excess of the levels required for the reduced sales activity resemble "fixed costs" more than "variable costs" as traditionally defined. Then costs that may exhibit such "sticky" behavior include skilled labor payroll costs, advertising and sales promotion costs, and branch operating costs (R.banker, L.chen, 2004).

As put forward by Garrison and Noreen (2001, p. 131), attempts to take decisions without the thorough knowledge of costs involved and of how they change relative to the activity level might lead to disaster.

Review and Hypothesis

To understand cost behavior in response to changes in the level of production and Sales is critical for firms 'Management virtually in all sectors (Atkinson *et al.*, 2000; Horngren; Foster; Datar, 2000).

Garrison and Noreen (2001, p. 131) define that cost behavior means how will cost react or change when changes on the activity level occur. Managers who understand how costs behave have better conditions to predict what will be the trajectory of costs in several operating situations, allowing them to better plan their activities and, consequently, earnings. Suppose, for example, the following questions:

What is the effect of eliminating a product line on operating profits? Is it better to produce or purchase? Which prices must be raised? Which effect will an increase of 10percent on sales have on

operating profit? These and many other managerial decisions depend upon the knowledge of cost behavior.

The semi-variable cost is composed of a fixed part (the activity costs when the volume of services is equal to zero) and a variable part (which must vary according to the activity driver). The semi-variable or mixed costs (for example, wages of maintenance workers) remain constant within large activity ranges and increases or decreases in response to reasonably large changes on the activity level only. Small changes in the production level might not affect for example the number of employees required to adequately handle maintenance.

Fixed costs can be considered as committed or discretionary (Garrison and Noreen, 2001). Committed fixed costs are by nature long run and cannot be reduced to zero even for short periods. Depreciation of fixed assets, property tax, salaries of management and operating personnel are examples of committed fixed costs. Discretionary fixed costs are generally short-run costs and can be cut for short periods, with minimum damage for the organizations' long run targets. Examples of discretionary fixed costs are advertising, research, and public relations. Some managerial accounting experts argue that costs are neither genuinely variable nor fixed (Ingram, Albright and Hill, 1997) and that the relationship between variable and fixed costs and the activity level is valid within the so-called "relevant range" (Horngrén, Foster and Datar, 2000; Maher, 2001).

The relevant range is the activity range in which the cost behavior hypotheses assumed by the manager is valid. Despite the emphasis given by economists to the non-linearity of many variable costs, it is assumed that a non-linear cost can be approximated by a straight line, within the activity range (Garrison and Noreen, 2001).

Innes and Mitchell (1993, p. 86) consider that the accounting literature has a myopic view on how costs behave. Generally cost behavior is analyzed and measured by one driver only – production level. They add that classifying indirect costs as fixed (costs which do not change with changes in volume) might lead to wrong decisions insofar as in many organizations these costs have shown high growth rates without an increase in activity volume (Miller and Vollmann, 1985; Berliner and Brimson, 1992). The basis for this argument comes from the activity based costing (ABC) assumption that costs are primarily influenced by the volume of each activity flow, rather than by the volume of production (Innes and Mitchell, 1993). Hence, the efficacy of the cost-driver information is in providing a series of factors which might be used to explain fixed cost behavior (Innes and Mitchell,

1993). For the activity based costing a linear relationship between cost drivers and costs exists (Kaplan and Cooper, 1998).

Noreen (1991) demonstrates that cost allocation – even in ABC – is relevant for the decisions if, and only if, the following conditions are satisfied: 1) all costs can be divided in centers and each one is defined as a function of a measured activity; 2) the cost amount in each cost center changes in direct proportion to its activity; and 3) all activities can be attributed to products in the sense that if a product is cut, then the activities associated to this product will be eliminated. Noreen and Soderstrom (1994) tested the second condition: that the costs are strictly proportional to the activity. This hypothesis was rejected in the majority of indirect cost accounts in hospitals in the U.S.

Knowledge about cost behavior is important for accountants, researchers and other professionals related to the management field that assess the changes in costs with respect to changes in revenues. The managerial inference from the analysis is that cost stickiness can be recognized and controlled. Managers must assess their exposition to cost stickiness by considering the sensitivity of cost changes relative to volume reductions, increasing the firms' response capacity vis-à-vis reductions in the demand for products or services. This may contribute to improve the accountability process. By and large, this expression means the obligation of the agent or representative – either private or governmental – to give account to the principal or represented. By verifying cost stickiness, firm owners can analyze if managers are incurring in agency costs.

Understanding cost behavior is also relevant for external users (financial analysts, for example) who want to assess the firm's performance. The common procedure of financial analysts involves the comparison of costs components as a percentage of net sales revenues across firms or within the same firm through time. This analysis may be incorrect if cost behavior relative to decreases or increases in revenues is not observed and this can be improved when analysts understand how costs change with respect to revenues. Anderson *et al.* (2003) document that costs are sticky in that they decrease less with a sales decrease than they increase with a sales increase.

Although Noreen and Soderstrom (1997) find no evidence of stickiness, Anderson, Banker and Janakiraman (2003) find that selling, general and administrative costs are sticky and increase, on average, by 0.55percent per 1percent increase in revenues, but decrease only 0.35percent per 1percent decrease in revenues. Subramanian and Weidenmier (2003) confirm cost stickiness, finding that total costs

increase 0.93percent per 1percent increase in revenues but decrease by 0.85percent per 1percent decrease. Both Anderson *et al.* (2003) and Subramanian and Weidenmier (2003) also find that the level of stickiness is influenced by economic conditions and by firm characteristics. Medeiros and Costa (2005) find, for a sample of Brazilian firms that selling, general, and administrative costs increase 0.59percent per 1percent increase in sales but decrease only 0.32percent per 1percent decrease in sales.

The strongest evidence of sticky behavior is found in samples consisting of firms from multiple industries, while samples from one industry (Noreen and Soderstrom, 1994, 1997) exhibit limited sticky cost behavior. Prior research shows that each industry operates in a different production environment causing accounting variables to be industry specific, making the relationship of costs to activity changes industry-specific (Ely, 1991).

A number of conjectures based on managerial considerations have been advanced to explain this cost behavior (Cooper and Kaplan (1998a, 1998b). The basic premise is that cost stickiness arises because managers enter into contracts for resources that are costly to break. In the event of a subsequent decline in demand, managers might decide to retain under-utilized resources. Thus, while the firm might report a drop in revenues, costs will not fall in the same proportion as the fall in revenues. Stickiness might also be conditioned by existing capacity. Balakrishnan, Peterson and Soderstrom (2003) find, for example, that an organization working at full capacity and faced with a reduction in activity responds less than if it is facing an increase in activity. Slack in resources usually results from swings in demand. During periods of positive sales growth, companies expand with increasing manpower, capital expenditure and a general increase in the level of committed resources. Such increases might, for example, be particularly marked for those companies where managerial remuneration is tied to turnover or firm size. As indicated above, cost stickiness in responding to declines in levels of activity might be driven by external frictions in the form of potential costs-of adjustment which would be incurred in cutting back on previously committed resources.

However, apart from the issue of external frictions, three reasons can be advanced to account for management failure to cut back costs following a fall in the level of activity.

First, managers might be uncertain about the permanence of the decline and defer cutting back resources until they have more information.

Second, the firm may not wish to incur adjustment costs, such as dismissing employees, as a result of organizational policies or fear that such activities will taint the firm's public image or negatively affect the morale of remaining employees.

Third, managers may not wish to make such reductions to resources because of personal considerations. Managers, for example, may be unwilling to dismiss their colleagues, or reluctant to downsize their department since this may affect their status within the firm.

Hypotheses

In connection with the asymmetric cost behavior two hypotheses are tested in this study, as follows:

H1: the magnitude of costs increase as a function of an increase in net sales revenues is greater than the magnitude of costs reduction as a function of an equivalent reduction in net sales revenues.

H2: the magnitude of financial costs increase as a function of an increase in net sales revenues is greater than the magnitude of financial costs reduction as a function of an equivalent reduction in net sales revenues.

Hypothesis H1 and H2 considers how the managerial intervention affects the process of resource adjustment. Managers make discrete changes in committed resources because some corresponding costs cannot be added or reduced fast enough to combine changes in resources with small changes in demand.

Firms have to incur in adjustment costs to remove committed resources and to replenish these resources when demand is reestablished. Adjustment costs include, for example, expenses with dismissing employees and hiring new ones, as well as organizational costs deriving from reduction motivation of the remaining employees after the dismissing of many professionals.

When demand rises, managers raise committed resources in order to match the additional demand. When demand declines, however, some committed resources will not be totally utilized, unless managers take the deliberate decision to cut them. In order to do this, it is necessary that managers assess the probability that this demand decline is temporary, when the time is come to decide upon the reduction of committed resources. Sticky cost behavior will occur if the manager decides to keep unnecessary resources instead of incurring in adjustment costs when volume declines.

Managerial decisions of holding unnecessary resources can also be caused by personal interests, resulting in agency costs. Managers may keep idle resources in order to avoid personal

consequences of cost reductions, such as loss of status when a branch is restructured or the anguish of firing familiar employees, contributing to cost stickiness. Brealey, Myers and Marcus (1998) consider the understanding of the Agency Theory as one of the main foundations of financial management.

Observing cost stickiness in one time period only reflects the costs of maintaining unused resources in a period when a revenue decline occurred. When the observation window includes several time periods, more complete adjustment cycles are captured.

Sample Selections

The dataset comprises Iranian listed companies with at least eight consecutive years of accounting data during the period 1997 to 2004. We exclude financial companies due to the unavailability of standardized accounting data. Annual data for revenues and selling, general and administrative costs and costs and cost of goods sold for each of the companies are downloaded from Tadbir Pardaz software. Final sample comprises 77 companies with a total of 616 firm-years.

Research Methodologies

In this section we outline the models used to test the hypotheses outlined in Section 2. We test for cost stickiness of firms using the following model:

$$\log [\text{total costs}_{i,t} / \text{total costs}_{i,t-1}] = \alpha + \beta_1 * \log [\text{revenue}_{i,t} / \text{revenue}_{i,t-1}] + \beta_2 * \text{decrease}_{i,t} * \log [\text{revenue}_{i,t} / \text{revenue}_{i,t-1}] + \varepsilon_{i,t}$$

The variable *decrease* (*d*) is a dummy variable that takes the value of 1 when revenue decreases between two periods, and is otherwise 0.

The use of the log model is consistent with previous studies (Anderson *et al.* (2003), Subramaniam & Weidenmier (2003)). Since the value of the *decrease* variable (*d*) is 0 when revenue increases, β_1 measures the increase in percentage terms in costs with a 1percent increase in revenue. On the other hand, since the value of *decrease* is 1 when revenue decreases, the sum of β_1 and β_2 measures the decrease in percentage terms in costs following a 1percent decrease in revenue. If the traditional cost behavior model is valid, β_2 would be equal to 0 since upward and downward changes in costs will be equal, and β_1 would be equal to 1, reflecting proportionality. If companies exhibit sticky cost behavior, β_2 will be negative and statistically significant.

Empirical Procedures

The data used in our study are arranged as a pooled (across firms) regression model for each year, and then we took the average of annually regression coefficients, because to measure cost stickiness we need decrease and increase of revenue in our sample, but in pool of Iranian firms we have alone increase of revenue, and in each year maybe we have decrease of revenue too, in our sample firms each model are used for each year, and then we took an average from regression coefficients. The regressions are carried out using SPSS Version 14.

Empirical Findings

The empirical findings on each of the hypotheses are set out below.

Costs stickiness

Table 1 presents the results for the full sample of companies.

Table 1: Costs stickiness

$\log [\text{total costs}_{i,t} / \text{total costs}_{i,t-1}] = \alpha + \beta_1 * \log [\text{revenue}_{i,t} / \text{revenue}_{i,t-1}] + \beta_2 * \text{decrease}_{i,t} * \log [\text{revenue}_{i,t} / \text{revenue}_{i,t-1}] + \varepsilon_{i,t}$ The variable <i>decrease</i> (<i>d</i>) is a dummy variable that takes the value of 1 when revenue decreases, and is otherwise 0.						
Year	P value	α	β_1	β_2	R ²	Adj.R ²
1997	0	0.017 (2.67)	0.894 (20.916)	0.166 (1.82)	0.935	0.935
1998	0	0.026 (4.648)	0.8 (16.082)	-0.047 (0.598)	0.894	0.891
1999	0	0.027 (3.227)	0.714 (10.262)	0.414 (3.504)	0.865	0.861
2000	0	0.023 (4.426)	0.882 (29.217)	0.071 (1.734)	0.976	0.976
2001	0	0.005 (1.065)	0.945 (46.38)	-0.471 (-6.172)	0.972	0.971
2002	0	0.017 (4.814)	0.917 (72.165)	-1.67 (-1.036)	0.988	0.988
2003	0	0.015 (3.971)	0.904 (34.101)	0.086 (1.98)	0.978	0.997
2004	0	0.02 (3.329)	0.941 (22.045)	0.138 (1.761)	0.946	0.945

Regression results using 616 firm-years for Iranian companies. Separate regressions are run for each year and 77 companies. T-stats are shown in parentheses below the estimated regression coefficients.

The estimated values of β_1 range from 0.945 (for year 2001 listed companies) to 0.714 (for year 1999 listed companies), implying that total costs increase, on average, by around 0.88percent per 1percent increase in revenue (average of β_1 in each

year). Across all companies in the sample, β_2 averages -0.16; when revenue decreases by 1percent, total costs decrease by around 0.71percent (0.88-0.16). This confirms that changes in total costs are neither proportional nor symmetrical to changes in

revenue, and then total costs in Iranian firms are stickiness.

Financial costs stickiness

Table 2 presents the results for the full sample of companies.

Table 2: Financial cost stickiness

$$\log \left[\frac{\text{total costs}_{i,t}}{\text{total costs}_{i,t-1}} \right] = \alpha + \beta_1 * \log \left[\frac{\text{revenue}_{i,t}}{\text{revenue}_{i,t-1}} \right] + \beta_2 * \text{decrease}_{i,t} * \log \left[\frac{\text{revenue}_{i,t}}{\text{revenue}_{i,t-1}} \right] + \varepsilon_{i,t}$$

The variable *decrease* (*d*) is a dummy variable that takes the value of 1 when revenue decreases, and is otherwise 0.

Year	P value	α	β_1	β_2	R ²	Adj.R ²
1997	0.552				0.16	-0.11
1998	0.309				0.03	0
1999	0.353				0.03	0
2000	0.162				0.05	0.25
2001	0.108				0.06	0.03
2002	0	-0.09 (2.985)	0.046 (4.293)	0.56 (0.605)	0.23	0.21
2003	0	0.092 (2.990)	0.43 (2.055)	0.45 (1.32)	0.26	0.24
2004	0	0.123 (3.2)	-0.7 (-0.269)	2.95 (5.989)	0.5	0.49

Regression results using 616 firm-years for Iranian companies. Separate regressions are run for each year and 77 companies. T-stats are shown in parentheses below the estimated regression coefficients.

For financial costs however for five years we don't have meaningful regression, but for three years we have meaningful regression and in these three years The estimated values of β_1 range from .43 (for year 2003 listed companies) to -.7 (for year 2004 listed companies), implying that financial costs increase, on average, by around -0.1percent per 1percent increase in revenue (average of β_1 in each year) it means that financial costs in Iranian firms decreases when revenue increases. Across all companies in the sample, β_2 averages 1.32; when revenue decreases by 1percent, total financial costs decrease by around 1.22percent (-0.1+1.32). This confirms that changes in total financial costs are neither proportional nor symmetrical to changes in revenue, but it's not stickiness.

Conclusion:

Our findings suggest that total costs are sticky; averaged across all the firms in our sample, total costs increase by 0.88percent per 1percent increase in revenue, but decrease by only 0.71percent per 1percent decrease in revenue, and financial costs decrease by -.1percent per 1percent increase in revenue, but decrease by 01.22percent per 1percent decrease in revenue. This confirms that changes in total financial costs are neither proportional nor symmetrical to changes in revenue, but it's not stickiness.

Our results are consistent with an alternative cost behavior model that takes into account the asymmetric friction created by managers when adjusting committed resources following changes in the level of activity of the firm.

The results have implications for managers and corporate decision makers. Decisions based on the traditional cost behavior model will overestimate or underestimate the responsiveness of costs to changes in the level of activity. The traditional approach to cost behavior recommends methods such as regression analysis to estimate the average cost change associated to a unit change in the activity driver. Performing such estimations with no consideration to cost stickiness, leads to underestimation of cost responses when activity rises and to overestimation of cost responses when activity falls.

A managerial inference of the analysis is that cost stickiness can be verified and controlled. Managers can assess their exposition to sticky costs when observing the cost sensitivity to volume reductions. They can increase the costs sensitivity to volume fluctuations by taking contractual decisions which reduce the adjustment costs connected to change the levels of committed resources.

An understanding of sticky cost behavior will result in a better and more robust planning and control system. Careful planning can mitigate sticky cost behavior. To avoid or minimize the effects of sticky cost behavior, managers need to be able to identify and manage unused capacity and resources. This may not necessarily mean reducing the supply of resources, which may not be possible or feasible.

Alternative ways might include focusing on the marketing aspect to boost demand or shifting unutilized resources to alternative activities.

In terms of the control function, cost stickiness potentially distorts standard costing systems, variance analysis, and compensation schemes. Evaluating individual performance against a benchmark which, for perfectly rational reasons, does not flex as expected because of adjustment costs associated with prior commitments, is clearly inequitable.

Considering cost stickiness at the planning and control stages and making allowance for those factors that cause cost stickiness will yield better performance and results, and ultimately enhance shareholder wealth.

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11/5/2013