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نماذج التنبؤ بالأرباح

**Asymmetric Cost Behavior and Its Impact on Improving
Earnings Prediction Models**

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Abstract:

The purpose of the study is to exhibit the terms and drivers of asymmetric cost behavior and to highlight the main factors that cause error in analysts' earnings forecasts. As well as, showing the impact of the asymmetric cost behavior on analysts' earnings forecasts in the Egyptian market. The study uses multiple regression analysis to examine the impact of the behavior of total costs (TC), selling, general, and administrative costs (SG&A) and costs of goods sold (COGS), each, on earnings forecast error for the Egyptian-listed firms. Using a sample of most effective firms in EGX100 index, the results indicated that the asymmetric cost behavior has a significant impact on analysts' earnings forecast in both total costs and costs of goods sold with lower significance of selling, general, and administrative costs. The study suggests analysts to adopt models that consider the asymmetric cost behavior.

- **Key words:** Sticky Costs, Cost Behavior, Earnings Forecasts, Analysts Coverage.

الملخص:

الغرض من هذه الدراسة هو عرض مصطلحات ومحركات سلوك التكلفة غير المتماثل وتسليط الضوء على العوامل الرئيسية التي تتسبب في وجود خطأ في توقعات أرباح المحللين. بالإضافة إلى بيان تأثير سلوك التكلفة غير المتماثل على توقعات أرباح المحللين في السوق المصري. تستخدم هذه الدراسة تحليل الانحدار المتعدد لبيان أثر سلوك التكاليف الإجمالية (TC) والتكاليف البيعية والعمومية والإدارية (SG&A) وتكلفة البضاعة المباعة (COGS) - كل على حدة - على خطأ توقع الأرباح في الشركات المدرجة بالبورصة المصرية. باستخدام عينة من أكثر الشركات المؤثرة في مؤشر EGX100 ، تشير النتائج إلى أن سلوك التكلفة غير المتماثل له تأثير كبير على توقعات أرباح المحللين من حيث إجمالي التكاليف وتكلفة البضاعة المباعة بتأثير أقل للتكاليف البيعية والعمومية والإدارية. تقترح الدراسة أن يتبنى المحللون نماذج تأخذ في الاعتبار سلوك التكلفة غير المتماثل.

- الكلمات المفتاحية: سلوك التكاليف ، التكاليف اللزجة ، توقعات الأرباح ، تغطية المحللين.

1. Introduction:



According to the definition, fixed costs are typically independent of the level of activity. By contrast, variable costs are usually symmetrically variable or even proportional to changes in activity. This means that magnitude of variable cost changes depends only on the magnitude of the simultaneous change in the level of activity, not on the direction of change. Based on this assumption, costs that - for example - increase by 0.7% per 1% increase in sales, fall by 0.7% per 1% decrease in sales.

However, the study of Anderson et al. (2003) introduced an alternative cost behavior model, in which costs are "sticky", meaning that they increase when the activity level increase more than they fall when activity falls by a similar amount. Using 6,229 firms over 20 years, their study found out that selling, general and administrative (SG&A) costs increase, on average, by 0.55% per 1% increase in sales. However, they only decrease by 0.35% per 1% decrease in sales. The analysis of Anderson's study compares the traditional cost behavior model, where costs move proportionately with activity changes, with an alternative model, where cost stickiness occurs because managers deliberately adjust resources of their firm.

Thus, there are two categories of variable costs: the traditional model that provides a symmetrical linear relation in costs associated with the activity in terms of increase and decrease, and the modern cost behavior model, which illustrates the variation of cost's response to the increase in activity from its decline. Thus, the determination of cost behavior depends on the direction of the change in activity and not just on its size.

When sales change, managers should decide whether to change the levels of sticky resources or not and how much to change, taking into consideration the associated adjustment costs. Managers' resource commitments are not only based on current sales, but also on prior period's resource level, which affect the adjustment costs incurred in the current period, future sales expectations, which affect future adjustment costs, and agency and behavioral factors, which place a barrier between the optimal choices of the firm and the actual managerial options. ABJ model argues that deliberate management decisions related to sticky resources create asymmetry in cost behavior.

2. Study Problem

Costs are termed "sticky" if they decrease less when sales fall than they rise with an equivalent sales increase. More sticky costs result in lower cost adjustments when activity level falls, and hence, lower cost savings. These lower savings lead to greater decrease in earnings when the level of activity falls which, in turn, increases the volatility of the earnings distribution, leading to less accurate earnings forecasts. Consequently, firms with greater cost stickiness show greater decline in earnings when the level of activity falls than firms with less cost stickiness. When forming their forecasts of future cost behavior, analysts do not usually consider cost increase.

On the other hand, understanding the asymmetric cost behavior and its negative impact on the accuracy of analysts' earnings forecasts makes investors depend less on analysts' information about future earnings because of their low predictive power.

Based on the above, the main problem of the study is to determine the accuracy of expectations of future earnings in firms with high cost stickiness.

The study problem can be summarized in the following questions:

- Do firms listed on the Egyptian Stock Exchange adopt asymmetric cost behavior?
- Does the asymmetric cost behavior affect analysts' prediction for firms listed on the Egyptian Stock Exchange?
- Do analysts fully understand the asymmetric cost behavior?

3. Study Importance

The importance of this study could be addressed through the following themes:

3.1: Scientific Importance:

The study derives its importance from the lack of research studies that combine the asymmetric cost behavior and earnings forecasts, especially with regard to the existence of uncertainties about the accuracy of forecasting in firms with more sticky cost behavior and its reflection on investors' perception of the value of these firms.

3.2: Practical Importance:



This study's practical importance is set for the role played by analysts in forming investors' views and the risk of not understanding asymmetric cost behavior, which negatively affects stakeholders. Also, deliberate resource adjustments by managers should be considered to meet targeted profits, which in turn may reduce or eliminate the phenomenon of asymmetric behavior.

4. Study Objectives

In view of the study problem and its importance, the main objective of the study is to exhibit how the asymmetric cost behavior can affect analysts' prediction accuracy. This objective can be summarized as follows:

- To determine theoretical considerations for the occurrence of asymmetric cost behavior and related concepts.
- To examine the relationship between the asymmetric cost behavior and prediction of future earnings.
- To state the impact of the asymmetric cost behavior on the accuracy of earnings forecasts.

5. Study Hypotheses

The key purpose of this study is to examine the impact of asymmetric cost behavior on the accuracy of analysts' earnings forecasts. This purpose is tested as follows:

The main hypothesis of the study states that:

"Cost stickiness affects the accuracy of earnings forecasts"

This hypothesis investigates the relationship between the asymmetric behavior of costs and earnings forecasts and examines how significant can this behavior be related to forecasts error. Hence, it is partitioned into three sub-hypotheses as follows:

H₁ : There is a statistically significant relationship between sticky total cost and the absolute value of forecast error.

H₂ : There is a statistically significant relationship between sticky costs of goods sold and the absolute value of forecast error.

H₃ : There is a statistically significant relationship between sticky selling, general & administrative costs and the absolute value of forecast error.

6. Study Limitation

The study is limited to represent the impact of asymmetric cost behavior on the accuracy of earnings forecasts and to examine the extent to which analysts understand this behavior. The study involves the related concepts of deliberate and unintentional decisions made by managers. The rest of the determinants such as (conservatism, budgets, sticky wages, etc.) are beyond the scope of this study.

7. Study Methodology

To achieve the objectives of the study, the researcher uses the integrated scientific approach, which combines the inductive and deductive approaches, as follows:

7.1: Inductive Method:

Through the examination of researches and periodicals and the evaluation of studies, statistics, reports, and published data for the sector in question.

7.2: Deductive Method:

By deducing the relationship between the behavior of asymmetric costs and the accuracy of earnings forecasts through an applied study to test the validity of study hypotheses using statistical methods in order to reach the desired results and recommendations of the study.

8. Literature Review

8.1: Ciftci et al. (2016)

The authors examined how much analysts incorporate cost variability and sticky costs in predicting earnings in the future. The study indicated that the error in earnings forecasts is the result of analysts' converging to average behavior while recognizing the behavior of cost stickiness and cost variability and whether analysts fully recognize cost behavior, then there would be no systematic relationship between cost behavior and errors in earnings forecasts.



To test the hypothesis empirically, Ciftci et al. (2016) used a sample of 105,577 firm-quarter observations in the period between 1998 and 2011. They found evidence of an asymmetric relationship between errors in sales forecasts and errors in earnings forecast. As the authors indicated, this effect is a result of analysts' failure to completely incorporate cost stickiness information in their earnings expectations.

8.2: Banker, R. D. et al. (2016)

The study examined the confounding impact of sticky costs on conditional conservatism. Because of the asymmetric behavior of costs, earnings behave asymmetrically. This operational asymmetry is likely to distort standard asymmetric timeliness measurements. To develop empirical hypotheses, Banker, R. D. et al. (2016) combined the theory of conservatism from financial accounting with sticky costs from cost accounting.

By using a sample of 55,448 firm-years during a period from 1987 to 2007, the authors provided evidence that the conditional conservatism estimates are overestimated by more than 25% since these models do not consider sticky costs. By controlling cost stickiness, estimates of asymmetric timeliness agree with the conservatism theory.

8.3: Ibrahim, A. and Ezat, A. (2017)

The study aimed to provide additional empirical evidence of asymmetric cost behavior in Egypt. The study used multiple regression analysis to examine the behavior of selling, general, and administrative costs, and costs of goods sold both separately and jointly by using total costs during the period 2004-2011 for listed firms in Egypt, besides comparing the behavior of cost three years before and after applying corporate governance code in 2007.

Results of this study indicated that the cost stickiness is a common behavior among Egyptian-listed firms as it was found that their selling, general, and administrative costs, costs of goods sold, and total costs had sticky behavior during the period of the study. Also, the study documented that applying corporate governance code have affected the nature of SG&A, as the behavior of these costs has changed from sticky to anti-sticky after applying the code. The authors have suggested that the code is likely to affect the extent of the stickiness of both COGS and TC.

9. Study Outline

Based on the objective, importance, limitation, and what the researcher seeks to achieve, the study will be structured as follows:

1. Theoretical Background of Asymmetric Cost Behavior
2. Occurrence of Cost Stickiness
3. Cost Stickiness and Earnings Forecast Errors
4. Hypotheses Testing
5. Discussion of Findings
6. Concluding Remarks
7. Future Research

1. Theoretical Background of Asymmetric Cost Behavior

Asymmetric cost behavior can be classified into two opposite forms:

When sales fall, optimistic managers usually retain slack resources in anticipation of a rebound in sales, resulting in an increase in costs to sales ratios, labeled as sticky cost behavior. It refers to costs that decrease less in response to a decrease in activity than they increase for an equivalent increase in activity. Conversely, pessimistic managers are likely to cut costs to a greater extent when costs fall. This is called anti-sticky cost behavior. It refers to costs that decrease more in response to an activity decrease than they increase for an equivalent activity increase.

Main differences between both symmetric and asymmetric cost behavior can be illustrated through Figure 2-1. Y refers to the activity level of a firm in a range from low (Y_L) to high (Y_H), where:

Regular cost curve represents the symmetric behavior where Cost behavior is said to be linear and moves upwards (from Y_0 to Y_H) and downwards (from Y_0 to Y_L) according to the proportion of activity.

Whereas Sticky cost curve tends to be less sensitive to the proportion of decrease than the proportion of increase. Thus, the cost function becomes flatter between Y_0 and Y_L than it is between Y_0 and Y_H . The area BAA* that spans across both slopes represent the magnitude of sticky costs. This suggests a higher cost-to-sales ratio as



comparably computed with application of the traditional cost models during revenue decreasing periods.

Anti-sticky cost curve represents an opposite relationship in which costs tend to be more sensitive to activity decrease than to the increase. Thus the cost function becomes flatter between Y_0 and Y_H than it is between Y_0 and Y_L .

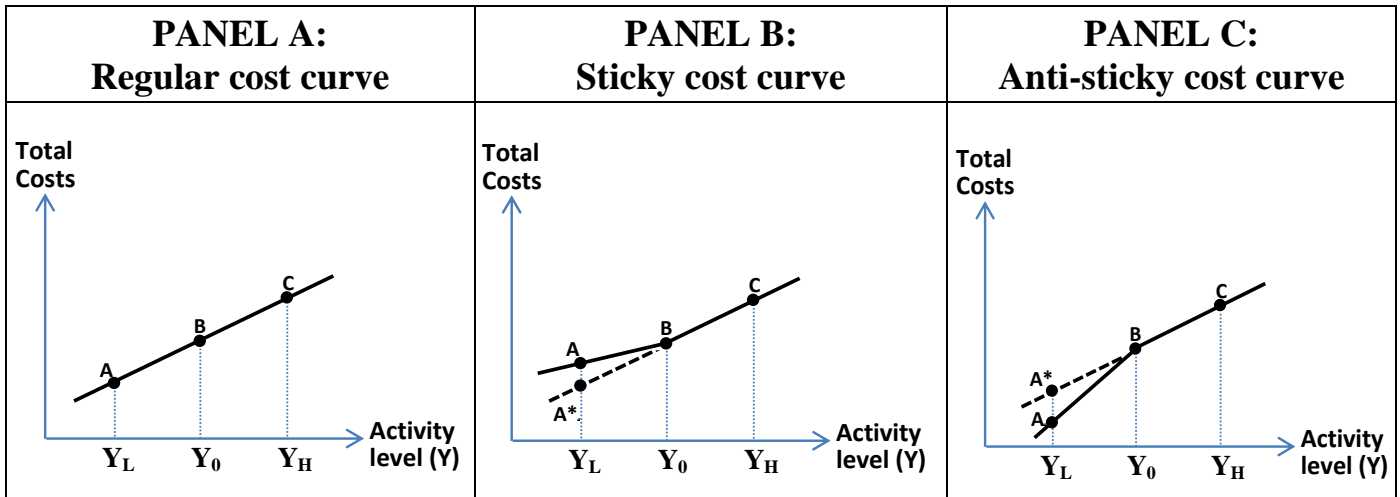


FIGURE 2-1: Different costs behaviors in relation to activity changes

2. Occurrence of Cost Stickiness

Cost stickiness phenomenon occurs due to several drivers including agency, economic, and behavior drivers. ABJ explained sticky costs through managerial behavior, i.e. managers who deliberately adjust resources responding to changes in the activity.

The key to understand cost stickiness is to identify in what circumstance managers become more or less willing to retain unutilized resources when there is a need to do so (i.e., activity declines).

The asymmetric cost behavior theory builds upon two main concepts about costs:

- Most costs increase because of managers' deliberate choice to commit resources.
- Though many resource commitments, in the short run, are able to be changed, managers usually incur resource adjustment costs such as disposal and installation costs for capital equipment.

The relationship between deliberate managerial decisions and resource adjustment costs creates complex dynamics in making decisions related to resource levels. Therefore, managers are ought to consider both current and prior activity levels since they affect adjustment costs incurred during the current period, besides future sales expectations, that have an effect on future adjustment costs. Moreover, decisions about resource commitments can be affected by managers' incentives and behavioral biases.

There are several drivers of cost stickiness to consider based on prior literature. In general, these drivers include economic, behavioral and agency sources. Cost stickiness typically occur due to intended managerial decisions. If these decisions are made in response to interests of the firm and works to achieve its main goals, then managerial decisions would be rational. In contrast, if the decisions are made in favor of managers, then intended decisions would be considered as irrational.

The most effective economic driver is adjustment cost. According to ABJ model, cost stickiness arises because of asymmetric frictions in adjusting resource which act as forces to restrain or slow the downward adjustment process more than the upward adjustment process. When managers perceive expected adjustment costs to be higher for a downward adjustment than for an upward adjustment, activity costs are likely to exhibit "sticky" behavior. Making the most appropriate decision mainly depends on management's awareness of the demand fluctuation and time horizon of the demand decline. Cost stickiness arises when the present value of the adjustment cost exceeds the present value of holding cost.

On the other hand, and unlike the intended deliberate managerial decisions, unintended decisions aren't affected by management's willing to retain or adjust unutilized resources when activity level decrease, but rather, they occur due to economic factors, market conditions, or legal affairs. it should be noted that not all reasons can be assigned directly to a particular category. Cost stickiness may occur due to internal reasons that aren't related to managerial intentions or economic conditions. For example, if accounting department is too slow to adjust resources at the optimal time period, lacks awareness, or inaccurate while determining cost stickiness immediately.



Although most of the factors affecting cost stickiness are associated with managers' willingness to achieve certain objectives either in their favor or to maximize the profitability of the firm, to achieve long-term benefit, or to overcome the temporary decline in demand, cost stickiness sometimes occurs by managers as a result of irrevocable terms such as contracts with fixed maturity, which cannot be adjusted according to fluctuations in demand. There may be a time lag between manager's decision to reduce committed resources and the actual adjustment because it takes time to unwind contractual commitments.

3. Cost Stickiness and Earnings Forecast Errors

Analysts do not usually consider cost increases while forming their expectations about future cost behavior. Their underlying cost forecasts (differences between expected sales and expected earnings) ignore sticky costs. Studies attribute this result to optimism in analysts' earnings forecasts.

Analysts' optimism is both externally, as they are optimistic about forecasted earnings more than the actual level, and internally when analysts forecast too high earnings with respect to forecasted sales. High forecasted earnings compared to forecasted sales means that costs incurred are highly underestimated when a firm reaches the forecasted sales level. Therefore, optimism in earnings forecast when sales are supposed to rise causes analysts to underestimate the associated increase in costs. Additionally, if underestimating increases in costs for high sales and overestimating decreases in costs for low sales is strong enough to overcompensate cost stickiness, forecasted costs that are actually sticky may appear as anti-sticky.

Analysts gives a more precise forecast for earnings and sales when they are given "better information". Naturally, managers are unlikely to provide information that would give the impression of being opportunistic or inefficient and due to the heavy reliance of analysts on information provided by managers, analysts may miscalculate the effect of this behavior. As a result, analysts, who are misinformed about the possibility of managers deliberately delaying resource cuts, are led to forecast earnings that are too high compared to the forecasted sales level.

The reason behind analysts' optimism (forecasted earnings exceeding actual earnings) depends on their intended purposes to perform the analysis. Analysts' forecasts can be rational and irrational as follows:

Rational forecasts include reporting and selection bias. *Reporting bias* (non-publication of undesirable results) for strategic reasons, such as the issuance of optimistic forecasts to yield revenue for the sake of their brokerage firms and getting better relationships with managers. *Selection bias* (selecting data subjectively rather than objectively), analysts may select data correctly but would prefer to publish their forecasts only when they are favorable. Selection bias can take the forecast to a totally different scenario, that is why it is considered the most worrying bias.

Irrational forecasts include cognitive and confirmation bias. *Cognitive bias* (systematic deviation from rationality in judgment) occurs if analysts commit systematic errors when processing public information (i.e. simplify information). *Confirmation bias* (favoring information which confirms existing beliefs) is a type of cognitive bias that occurs when there is an intended or unintended desire to prove an assumption or opinion. Analysts may have a tendency to interpret information in a way that confirms their beliefs about a firm's performance based on its preceding achievements, which is reflected in their optimistic forecasts

In general, it is worth noting that errors from optimistic forecasts are not totally independent because optimism may cause analysts to underreact to bad news and to overreact to good news. The thing that explains the excess future returns of previously losing firms. Furthermore, analysts tend to provide optimistic forecasts and recommendations to secure profitable investment relationships.

4. Hypotheses Testing

The main objective of this study was to prove that the models used by analysts to predict future earning may lead to inaccurate results since these models do not take the asymmetric cost behavior into consideration, and consequently results related to future earnings are likely to contain an undefined error.



Cost literature proposed a refined cost behavior model implying the asymmetric relationship between cost changes and sales changes in order to handle the phenomenon that costs increase when sales increase more than when sales decrease for an equivalent amount, termed as cost stickiness. If cost stickiness can accurately describe the relationship between costs and sales but analysts are unaware or disregard this behavior, it will probably contribute to more earnings surprises. Therefore, this study examines the effect of cost stickiness on earnings forecasts of analysts using their current models.

By examining how the asymmetric cost behavior affects analysts' earnings forecasts, results have shown that cost stickiness has a negative impact on earnings forecasts and that it is significantly related to the absolute forecast error. Meaning that, firms with stickier cost behavior have lower accurate earnings forecasts. The asymmetric cost behavior indeed plays a role in predicting earnings. Although researchers still have limited knowledge of how analysts form their forecasts and use cost behavior information, it seems that their expectations need more enhancement, in order to face fewer earnings surprises.

One of the suggestions is to use models that consider cost variability and cost stickiness when predicting earnings. These models can provide better insights about cost information and give a broader set of expectations to reduce earnings surprises.

5. Discussion of Findings

Given the above, the study measured the impact of the asymmetric cost behavior on forecasted earnings. The sample of this study involved 104 firms of the most effective ones listed in the Egyptian Stock Exchange, with data collected manually from the firms' financial statements, EGX website, and other specialized websites to test these two directions.

Using multiple regression analysis the researcher investigated the impact of the asymmetric cost behavior on accuracy of analysts' earnings forecasts. Stickiness of total costs, stickiness of cost of goods sold, and stickiness of selling, general and administrative costs are used in three different models as proxies of the asymmetric behavior of costs. Results showed that stickiness of both total costs, STICKY, and cost of goods sold, COGS-STICKY, are significantly related to the absolute value forecast error, ABS-FE, while the stickiness of selling, general and administrative costs, SG&A-STICKY, seem to have a lower effect on the

forecast error. Meaning that there is an evidence supporting the claim that the asymmetric cost behavior leads to lower forecast accuracy in the Egyptian market.

In addition, the researcher tested whether the sticky firms caused less accurate earnings forecasts compared to anti-sticky firms and showed that forecasts for anti-sticky firms are more accurate by slightly more than 30% than sticky firms in the Egyptian market.

Briefly, the asymmetric cost behavior negatively affects analysts' forecasts and leads to inaccurate forecasts due to the absence of the variables that address this issue from the followed models. It is likely that the main reason analysts disregard the asymmetric cost behavior is not to fully understand it. Their lack of awareness causes them to follow inaccurate models that do not take into account the asymmetric cost behavior, and thus, lead to more error. The problem is that by not understanding the cost behavior, they will not understand the cause of the error and will continue to do so. It is also possible that the error is due to the analysts' exaggerated confidence in the firm or the manager despite their possible understanding of this behavior, or because of analysts' optimism, which makes them believe that this error is just a temporary issue, especially if the targeted firm is accustomed to high demand and did not exhibit this behavior previously.

6. Concluding Remarks

- 1- The asymmetric cost behavior is a common behavior among Egyptian-listed firms since total costs, cost of goods sold and selling, general and administrative costs were found to be sticky in the study period.
- 2- Analysts often rely on managerial information and seem to particularly underestimate managers' hesitation to cut redundant resources. On the other hand, managers do not inform analysts about their tendency to retain these resources.
- 3- When demand falls, analysts expect managers to cut unutilized resources and, as a result, forecast higher earnings. The thing that negatively affects both analysts and investors.
- 4- The asymmetric cost behavior affects the accuracy of the forecasted earnings as cost stickiness reduces the precision of the accounting information, and so, it increases earnings surprises.



- 5- Forecast model that takes cost stickiness into consideration performs better than typically followed forecast models.
- 6- If analysts understand the asymmetric cost behavior, their coverage preferences should be addressed to less sticky or anti-sticky firms.

7. Future Research

- 1- A new fields for future research include studying the implications of the asymmetric cost behavior for other issues in both cost accounting and financial accounting.
- 2- Studying research area is how the asymmetric cost behavior can affect pricing decisions, and accordingly, integrating prices in the empirical tests.
- 3- Essentially, future research should target models considering cost stickiness in order to help analysts make less biased and more accurate forecasts.
- 4- Since they are the primary beneficiaries of more accurate forecasts, greater focus should be placed on investors, and so, further studies are needed to clarify market reaction to asymmetric cost behavior.
- 5- Research related to managers' long-term behavior since they may prefer to retain redundant resources for more than one quarter despite realizing that the demand will not recover in the near future.
- 6- Also, future research should consider managers' behavior regarding sticky costs under crisis periods in the Egyptian market.

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