The Validity of Cost Structure Measures

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ABSTRACT

This paper aims to identify different measures for the cost structure and examines the validity of these measures. I presented three alternatives to measure cost structure used in prior accounting literature, then I tested the validity of these measures by using them to test a relation between uncertainty of demand and cost structure. Using a sample of 40 companies and 632 company-year observations from manufacturing companies listed in Egyptian Exchange. The results support the validity of these three alternatives as measures for firm's cost structure.

1. INTRODUCTION

A firm's cost structure is a very important factor that affects the firm performance. A more rigid cost structure, which implies a lower change in cost for a change in production volume, imposes risk on the firm in case of undesirable variability in an outcome such as revenues, costs, or margins. Relative to a firm with a more flexible cost structure, a decrease in sales and revenues will have more negative profit impact on a firm with more rigid cost structure because a smaller proportion of costs will decrease with a decrease in volume. Changes to a firm's cost structure usually require modifications to the firm's operations that are not easily reversible.

Accounting researchers, as well as practitioners, acknowledge the importance of a cost structure to firm performance. Hence, many researchers studied different aspects of cost structure and cost behavior, such as Anderson et al. (2003), Banker et al. (2008), Kama and Weiss (2010), and Weiss (2010) studied the cost stickiness behavior.[1] Datar et al. (1993), Anderson (1995), and Banker et al. (1995) studied non-volume cost drivers, such as area per part, number of engineering change orders, and number of purchasing and production planning personnel. Furthermore, Noreen and Soderstrom (1994, 1997) studied the extent to which overhead costs are fixed and variable.

[1] Cost stickiness refers to the degree of asymmetry in the response of costs to sales increase or decrease.

In addition, Kallapur and Eldenburg (2005), Banker et al (2014), and Holzhacker et al (2015) studied the relation between uncertainty and cost structure. But the problem is measuring the cost structure is very difficult and needs data that are internal to the firms. Thus, this paper provides three alternatives to measure firm's cost structure used in prior researches and test the validity of these measures.

2. COSTS CLASSIFICATIONS

Costs are resources sacrificed to achieve a particular purpose (Horngren et al 2015). There are various cost classifications, i.e. different costs for different purposes in decision-making (Garrison et al 2015). For example, for accounting for costs in manufacturing companies, costs may be classified into manufacturing and non-manufacturing costs. For cost assignment purposes, they are classified into direct costs and indirect costs. Also, it may be classified into product costs and period costs for preparing financial statements, while costs are classified into differential costs, sunk costs and opportunity costs for making decisions. Another classification to predict cost behavior in response to changes in activity levels is variable and fixed cost.

A variable cost changes, in total, in direct proportion to changes in the level of activity, while fixed cost remains constant, in total, regardless the level of activity within the relevant range (Garrison et al. 2015).

Manufacturing costs are neither purely fixed nor purely variable. Some costs are better described as step (semi-fixed) costs or mixed (semi-variable) costs (Abulezz, 2016). A step cost is the cost that remains fixed within a certain activity range then jumps to another level over a higher activity level and so on (Abulezz, 2016). A mixed cost is a cost that has both variable and fixed components (Horngren et al. 2015).

3. COST STRUCTURE MEASURES

As mentioned above and because of the difficulty in measuring firm's cost structure, researchers used alterative methods to measure firm's cost structure. Three different measures used in prior literature are described in this section.

3.1. Following Balakrishnan et al (1996):

Balakrishnan et al (1996) measured the cost structure by the ratio of depreciation to cost of goods sold as a measure of the extend of committed costs (rigidity). This method is too simple to apply, but the difficulty in this method is data availability. As to give better results, the depreciation portion in cost of goods sold should be used in the ratio rather than all depreciation expense, and firms rarely disclose the depreciation portion in cost of goods sold separately.

$$Fixed\ Cost\ Ratio = \frac{Depreciation\ Expense}{COGS}$$

3.2. Following Arellano (2008):

Arellano (2008) proposes two equations that allow estimation of cost structure using three ratios: *the profit margin*, *the growth rate in sales*, and *the growth rate in profits* as follow:

$$FC_1 = m_1 \left(\frac{r}{g} - 1\right)$$

$$VC_1 = 1 - \frac{m_1 r}{g}$$

$$FC_2 = \frac{m_2 (r - g)}{g (1 + r)}$$

$$VC_2 = 1 - \frac{m_2 r (1 + g)}{g (1 + r)}$$

Where:

FC_1, FC_2 refer to fixed cost percentage in period 1 and 2.

VC_1, VC_2 refer to variable cost percentage in period 1 and 2.

m_1, m_2 refer to profit margin in period 1 and 2.

g refers to percent change in sales from period 1 to period 2.

r refers to percent change in profits from period 1 to period 2.

3.3. Following Banker et al (2014):

Banker et al (2014) measured the cost structure in terms of variable cost and fixed cost by using regression analysis or with two variables on information

in income statements. The dependent variable is costs (cost of goods sold or selling, general and administrative expenses) and the independent variable is sales revenues. The regression is as following:

$$COST_{i,t} = \beta_0 + \beta_{i,t} SALES_{i,t} + \varepsilon_{i,t}$$

$\beta_{i,t}$ captures the percentage change in costs for a one percent change in sales revenue, and characterizes the degree of cost flexibility. Then, $\beta_{i,t}$ is used in a second regression as a substitute measure for cost structure.

4. VALIDITY TEST

To test the validity of the three alternative measures for cost structure, these measures are used to test a relationship between demand uncertainty and cost structure. If the three alternatives give the same results (relation), then the three cost structure measures are valid and testing the same item.

So that I examined the relation between demand uncertainty and cost structure by taking a sample of 40 manufacturing companies listed in Egyptian Exchange over an 18 years period (1999 to 2016) producing 632 company-year observations. After that, I estimate cost structure over three shorter periods, 1999–2005, 2006–2011, and 2012–2016. The results were significant and the same using the three alternative measures for cost structure.

5. CONCLUSION

Different cost structure measures following Balakrishnan et al (1996), Arellano (2008), and Banker et al (2014) are valid and can be used to measure firm's cost structure as all of them give the same results when measuring the relation between demand uncertainty and cost structure, but this result is driven from one study. To generalize and support this result, these alternative measures should be used in different studies.

6. REFERENCES

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صدق مقاييس هيكل التكلفة

ملخص:

نظرا لصعوبة قياس هيكل التكاليف لأنها معلومات داخلية غير منشورة، فيهدف هذا البحث دراسة مقاييس متعددة لهيكل التكاليف استخدمت سابقا في الأدبيات المحاسبية والتوصل لدرجة صدقها وصلاحيتها في القياس. فتبنى البحث ثلاث مقاييس بديلة لهيكل التكاليف من دراسة Balakrishnan et al. (1996) و Arellano (2008) و Banker et al. (2014).

وتم قياس صلاحية هذه المقاييس الثلاثة البديلة عن طريق استخدامهم لدراسة العلاقة بين عدم التأكد حول الطلب وهيكل التكاليف على عينة من 40 شركة ومشاهدات من سلسلة زمنية من 1999 إلى 2016 ليصل عدد المشاهدات 632 مشاهدة. وتم تقسيم السلسلة الزمنية لثلاث سلاسل أقصر من 1999-2005 و2006-2011 و2012-2016. وتوصلت المقاييس الثلاثة لنفس النتيجة مما يؤكد صلاحيتهم أي أن المقاييس الثلاثة تقيس نفس العنصر (هيكل التكاليف). ولكن يجب التعليق على هذه النتيجة بحرص لأنها قائمة على اختبار علاقة واحدة ويجب تكرارها على دراسات وعلاقات أخرى لتأكيد وتعميم النتائج.