The relationship between total asset turnover and productivity indicators of companies listed in Tehran Stock Exchange

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ABSTRACT

This study is considering the relationship between total asset turnover and productivity indicators and is aimed to investigate the impact of employee productivity, capital productivity and total-factor productivity on total asset turnover. Productivity indicators ability in measurement of total assets turnover is also evaluated and some methods for productivity measurement and its improvement are introduced which help shareholders and creditors analyze financial statements in a proper way. In this study, the relationship between independent variables (employee productivity, capital productivity, and total-factor productivity) and dependent variables (total assets turnover) was examined using multiple regression analysis. The results show a significant relation between total assets turnover ratio and employee, capital and total-factor productivity indicators.

Key words: total assets turnover ratio, employee productivity indicators, capital productivity indicators, total-factor productivity indicators, value added.

Introduction

Measurement is an integrated part of scientific productivity evaluation and according to some interpretations is considered as the starting point. Productivity measurement provides information that allows assessment and judgment about how to move toward the goal (future status) from the point of start and previous conditions (present status). Productivity measurement helps the organization to establish a correct relationship between productivity and other strategic goals. For example, the primary tool to improve productivity may be an increase in organization's share in the market. Moreover, productivity may be measured in order to evaluate an organization's performance in financial or economic areas. As example is monetary value of a unit of production or service to monetary values of labor costs, materials or capital used in business processes.

In recent years, accounting scholars and professionals have focused on capital market, financing, allocation and control of resources. Moreover, one of the major tasks for financial managers is to control financial resources and ensure obtaining pre-determined results. Furthermore, the outcome of accounting is reporting financial conditions of an organization and its performance during a period. If these reports are not analyzed properly, they will not provide useful information and confuse users [7].

Therefore, various tools can be used to measure an organization's performance and evaluate its health including productivity measurement, and financial statements analysis using financial ratios.

Discussion:

Stating the problem and its significance:

Today, in addition to financial statements and calculation of profit and loss, other indicators and measurements are used to assess organization's performance. One of these tools is productivity measurement.

In today's world, productivity is one of organizations' important goals which insures the growth and survival of many leading organizations. It is also responsible in manufacturing concern and addresses many production and economic problems. As an index, it presents organizations' performance in a proper way and therefore is completely appropriate for performance comparison between an organization and similar institutes and evaluation of the results in a given period of time. But measurement of determinant factors which are called productivity indicators is the first requirement for productivity
evaluation and comparison.

Increased productivity can improve product and service quality and reduce production costs. As a result, profits and market share increase. More market share leads to sales growth which helps the organization to achieve different performance levels and activities. Increase in profit results in more funding and facilities to research and development which in turn helps to improve production systems and processes and encourage new productions and technologies.

Therefore, this research is aimed to investigate whether there is a relation between total assets turnover ratio and productivity indicators and how this relation is.

Review of Literature:

Similar studies have been done inside and out of country including:

Etemadi in a research titled "Influencing factors on productivity promotion in industrial sector" shows that all managerial factors affect productivity promotion and continuous justification, organizational support, providing continuous feedback, management's knowledge of external environment, and proper adaptation and contribution are respectively prior effective elements in managers' productivity promotion.

Sinai and et.al, in a study titled "The relationship between labor and capital productivity indicators with profitability indexes in public corporations" achieved these results: 1. There is a direct significant relation between labor productivity and profitability index (net profit margin, return on investment and return on shareholder's equity); 2. There is no significant relation between labor productivity and efficiency of fixed assets; 3. There is no significant relation between efficiency of fixed capital and net profit margin, return on investment and return on shareholder’s equity; 4. There is a direct significant relation between total capital productivity and net profit margin, return on total assets, return on investment and return on shareholder’s equity; 5. There is a direct significant relation between productivity of fixed capital and return on fixed assets.

Ghaemi and et.al, [5] in a study titles "The relationship between financial indicators and productivity indicators in manufacturing companies" show that: 1. There is a positive relation between return on total assets, labor and capital productivity. Regarding determination coefficient, the range of this relation is at most 28.3% for labor productivity and 65.2% for capital productivity which shows that return on total assets has the highest relation with capital productivity based on total assets and 65.2% change in capital productivity results from changes in total assets return; 2. There is a poor positive relation (determination coefficient less than 20%) between return on shareholder’s equity and labor productivity. There's also a poor positive relation between return on shareholder’s equity and capital productivity based on total assets, while there is no special relation between return on shareholder’s equity and capital productivity based fixed assets; 3. There is no special relation between financial leverage and productivity indicators.

Paloma, Anus, Caruso and et al., in a study titled "What factors encourage firms' productivity growth?" concluded that increased infrastructure quality, economic development, government, labor market flexibility, the ability of workers (as aspects of business environment) and market competitiveness increase total-factor productivity by 9.8, 7.8, 3.2, 3.4, 5.8, and 3 percent respectively. The results suggest that successful efforts in improving business environment have a positive impact on companies' productivity.

Mukesh Kumar and et al., [3] in a research titled "productivity growth as a factor for predicting increased shareholder value" offer some evidence on market value fluctuations due to technological changes and show that stock market recognizes innovative activities by companies. Companies provide positive changes in productivity by technological changes resulting from innovation and as a result increase value added of market and finally shareholders' value. Therefore, it can be said that there is a significant relation between components of productivity growth and companies' market value.

Theoretical Framework:

Scholars, national and international organizations have provided different definitions for productivity some of which are as follows:

Mandel: productivity means the ratio between return on production and consumed resources which is compared to a base period.

Fabricant[2]: a constant ratio between output and input Japan productivity center (1955): To maximize the use of resources, man power, facilities and so on in a scientific way, reduce production costs, expand markets, increase employment, try to increase real wages and improve living standards so that workers, managers and consumers benefit.

European productivity agency (1958): productivity is the degree of effective use of production factors. Productivity is primarily an intellectual perspective that always tries to improve what already exists. Productivity is based on the idea that a man can accomplish his tasks and responsibilities better than the day before. In addition, productivity requires continuous efforts to adapt economic activities to constantly changing business conditions and also apply new theories.
and methods.

National Iran productivity office (1995): productivity is a culture and a rational approach to life and work whose aim is to work more intelligently and achieve a better life.

In general, productivity is a concept to show the output ratio to the input of an individual, a unit or an organization which examines the relation between output and input as follows:

\[
\text{Productivity} = \frac{\text{output}}{\text{input}}
\]

Output includes produced goods and services provided by business units which can be defined in terms of total production, net production or both of them. Input includes factors such as labor, materials, energy, capital and other productivity-related resources that are used to create the output. Among these factors, labor and capital are more important and have a better position in productivity analysis [5].

As a result productivity indicators discussed in this research include: employee productivity, capital productivity, total-factor productivity (including both human and capital factors).

Employee productivity indicator (EP): It reflects the amount of wealth created (value added) for a company compared to employees' costs. This ratio not only shows employees' performance in obtaining output, but also includes other factors such as investment, management performance, labor-management relations, work attitudes, the impact of the price and demand on products and so on. The larger the ratio, more desirable is the effect of these factors on wealth creation.

Capital productivity indicator (CP): This index determines the operation of fixed assets and like labor productivity is distorted by inflation and market conditions. However, it should be mentioned that differences in asset valuation policies and also in property lease or ownership of fixed assets can affect this ration.

Index of total-factor productivity (TFP): Total-factor productivity is the ratio of net output to total labor and capital inputs. Net output means total output minus goods and services purchased (value added). In other words, the ratio of total output or value to total fixed assets and labor costs is called total-factor productivity.

Some advantages of this index include: 1. It's relatively easy to obtain input information 2. It is usually attractive from the perspective of institutional economists.

Activities related to the productivity of organizations and companies should be systematic; that is, they should be followed according to a particular program and clear concepts. All these activities should be carried out according to productivity improvement cycle.

In order to increase productivity in an organization, first productivity ratios need to be measured (productivity measurement). These ratios are analyzed based on organizational goals (productivity analysis). According to these assessments, partial goals are determined in long-term or short-term and planning is done to achieve them (productivity planning). Finally these plans are implemented to improve productivity.

This cycle begins again with productivity measurement and this process is continuous [6].

Productivity measurement includes preparation and development of information and making sure that resource productivity and growth in the production of goods and services has been improved in organizational level. In other words, productivity measurement aims to develop information efficiency in order to optimize utilization of production facilities in various economic aspects.

In fact, productivity measurement reflects productivity level and changes during a period of time. When a series of productivity indicators are calculated, they show whether productivity has increased from a year to another year or not. It means that regardless of a growing economy, whether a
Financial statement analysis is a tool for performance evaluation and future status prediction in an organization. This analysis can be done horizontally (to investigate organizations' financial position during years), vertically (comparing recorded items in statements of a financial period) and as ratio comparisons. Vertical and horizontal analysis compares financial information in one category, while financial data should be analyzed in various categories using financial ratios.

Financial ratios could be classified in five groups: liquidity, activity, leverage, profitability, and market value. In this paper the relation between total assets (one of ratios related to activity) and productivity indicators is examined.

Total assets turnover ratio (AT): It shows a company's ability to effectively utilize its assets in income generation. A low ratio may be related to several factors and it's important to determine these factors and reasons. For example, aren't invested assets too excessive compared to their productivity value (income earned)? In such a case, the company may decide to sell additional assets and invest in another place or area which has more profits.

Questions:

1. Is there a significant relation between total assets turnover ratio and employees' productivity indicator?
2. Is there a significant relation between total assets turnover ratio and capital productivity indicator?
3. Is there a significant relation between total assets turnover ratio and total-factor productivity indicator?

Assumptions:

1. There is a significant relation between total assets turnover ratio and employees' productivity indicator.
2. There is a significant relation between total assets turnover ratio and capital productivity indicator.
3. There is a significant relation between total assets turnover ratio and total-factor productivity indicator.

Research methodology:

This research was performed to find any relationships between total assets turnover ratio and employee, capital, and total-factor productivity indicators. In fact, the study aimed to seek if there is a linear model and relation between these variables and what percent of changes or distributions in dependent variable (total assets turnover) is determined by independent variables (productivity indicators). Therefore, we tried to study literature, background and title to get more familiar with research. In this respect, we identified Persian and English articles about the research questions which were published during recent years. This was done by reference to scientific websites.

Next, based on initial review and research literature, variables of the study were determined. Then a practical definition was provided for each variable and calculation methods, required data and references were mentioned.

After that we tried to visit the site of Tehran Stock Exchange, collect financial statements and then extract data. Data was entered into excel software after which dependent and independent variables were calculated and related to each other.

The relation between dependent and independent variables was investigated using multiple regression analysis. There were three independent variables.
employees productivity indicator, capital productivity indicator, and total-factor productivity indicator) and one dependent variable (total assets turnover ratio) in this multiple regression and the relation between variables was $y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3$ (for relationship between total assets turnover ratio and three indicators).

Multiple-regression aimed to estimate these parameters and examine significance of regression model and each coefficient. After estimating these parameters, multiple-regression model was obtained as:

$$\hat{y} = \hat{\beta}_0 + \hat{\beta}_1 x_1 + \hat{\beta}_2 x_2 + \hat{\beta}_3 x_3$$

$y =$ total assets turnover ratio, $\beta =$ model's constant amount, $X_1 =$ employees' productivity indicator, $X_2 =$ capital productivity indicator, $X_3 =$ total-factor productivity indicator

$\hat{y} =$ Estimated total assets turnover ratio, $\hat{\beta}_0 =$ estimated constant amount

$\hat{\beta}_1 =$ Estimated coefficients for employees' productivity indicator

$\hat{\beta}_2 =$ Estimated coefficients for capital productivity indicator

$\hat{\beta}_3 =$ Estimated coefficients for total-factor productivity indicator

Moreover, before regression analysis assumptions of dependent variables normality, constant variance of model residuals or absence of linear predictor variables were examined.

The results were analyzed and compared with similar studies and finally some suggestions were presented.

Data analysis and discussion of findings:

Prior to hypothesis testing, regression pre-assumptions were investigated and the following results were obtained:

1. Given that residuals of total-assets turnover ratio were not normal and inclined to the right, they were normalized through changing $y'$ so that $< 0$. In such a case, instead of dependent variable $y$, $y^{1/2}$ was used and regression model was changed to

$$y^{1/2} = \hat{\beta}_0 + \hat{\beta}_1 x_1 + \hat{\beta}_2 x_2 + \hat{\beta}_3 x_3$$

2. The assumption of constant variance in the residuals of e model is verified.

3. There is a linear relation between capital and total-factor indicators and other productivity indicators. As value added is involved in calculation of all three productivity indicators and total-factor indicator consists of both employee and capital productivity indicators, the presence of a linear relation between them is logical and there's no problem with the absence of independence assumption.

After examining pre-assumptions, the main part of this study which was hypothesis test was done by SPSS software and the following results were obtained.

The following tables show significance of regression model and its coefficients. Because $p$-value is very small (less than 0.05) the model is significant and all variables are significant too.

| Table 1: The results of model significance test. |
|----------------|----------------|----------------|----------------|----------------|
| Model         | R Correlation coefficient | R2 Correlation coefficient | Determination coefficient | Sig | Test result |
| Model1        | 0.206                | 0.042            | 0.002          |               | Model was verified |

| Table 2: Estimation of model coefficients and their significance. |
|----------------|----------------|----------------|----------------|----------------|
| Model          | Independent variables | Coefficient | Sig | Test result |
| Model1         | Model constant ($\rho$) | 0.9 | 0.000 | Model constant coefficient is significant |
|                | Employees' productivity indicator ($\rho_1$) | -0.014 | 0.005 | 1st assumption was verified. |
|                | Capital productivity indicator ($\rho_2$) | -0.013 | 0.001 | 2nd assumption was verified. |
|                | Total-factor productivity indicator ($\rho_3$) | 0.111 | 0.000 | 3rd assumption was verified. |

The model presented here is significant but due to determination coefficient 0.042 (about 0.4% of changes or distribution in total assets turnover ratio depends on employee, capital and total-factor productivity indicators) it could be concluded that it's not efficient and cannot explain distribution of total assets turnover properly. A non-linear model should be considered which is out of the scope of this study and can be included as a suggestion for further research.

Modell: $y^{1/2} = 0.9 - 0.0014 x_1 - 0.013 x_2 + 0.111 x_3$

Conclusion:

This study had some results presented briefly:

1. Hypothesis verification
There is a significant relation between total assets turnover ratio and employee, capital and total-factor productivity indicators. 

2. Obtaining the following model:

\[ y^{1/2} = 0.9 - 0.014 x_1 - 0.013 x_2 + 0.111 x_3 \]

Given the model coefficients in each productivity indicator, the following criteria may be considered:

a. Employees' productivity indicator is approximately -0.01 which means that assuming all other variables constant each unit increase in employees' productivity indicator leads to 0.01 decrease in total assets turnover ratio.

b. Capital productivity indicator is approximately -0.01 which means that assuming all other variables constant each unit increase in capital productivity indicator leads to 0.01 decrease in total assets turnover ratio.

c. Total-factor productivity indicator is approximately 0.11 which means that assuming all other variables constant each unit increase in total-factor productivity indicator leads to 0.11 decrease in total assets turnover ratio.

3. Increase in total assets turnover following increase in total-factor productivity. In fact, only improving employees' productivity or capital productivity cannot have significant positive impacts on revenue earned from assets. These improvements should be made along with each other and increase equally.

Suggestions:

Practical suggestions:

According to the results and the relationship between productivity and total assets turnover, managers could plan productivity improvement and achieve their goals to enhance the ability to use property in final activities (sales) of a company. In this regard some suggestions are provided.

1. Lack of focus on capital and employees' productivity improvement: When companies don't have proper economic conditions it is recommended not to focus on capital and employees' productivity improvement. According to the survey results, increased employee and capital productivity leads to a decrease in the company's ability to effectively use its assets and generate earnings.

2. Total-factor productivity improvement: As the companies (during 84-88) couldn't have a positive impact on the utilization of their assets in generating revenue through employee and capital productivity indicators, it is recommended that these improvements are applied together and increase equally, because according to our model and increase in total-factor productivity leads to an increase in total assets turnover.

3. Increase and improve product quality: Where the products are unrivaled, managers neglect quality improvement until they are faced with product obsolescence, aging and low quality. Product value and quality can be increased through better designing of product specifications. Expanding marketing research and promotion methods will be a key factor in productivity. These efforts will increase not only value added but also profitability.

References


