Enterprise Performance Regression Model Analysis Based On Management Accounting

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Management accounting has great application value in enterprise performance analysis. In this study, enterprise performance was analyzed based on management accounting and the indicators of economic, social and environmental benefits. Twelve indicators were selected for significance analysis, and non-significant indicators were eliminated. A regression model was then established for regression analysis to determine the factors with the greatest impact on enterprise performance. This study aims to show that enterprise performance analysis based on management accounting can provide a scientific and reasonable analysis of enterprises and provide support for decision makers.

Keywords: enterprise performance, management accounting, analysis indicator, regression model

1. INTRODUCTION

The survival and development of an enterprise relies on its performance (Bao et al., 2017). Measuring performance can help enterprises understand the situation of enterprise operations over a certain period of time and provide guidance for subsequent adjustments. The traditional performance analysis method is to maximize the interests of enterprises without considering non-financial factors; this however does not meet the requirements for sustainable development (Zhang & Xiong, 2014). Many non-financial factors also have a great impact on the performance of an enterprise. Through hierarchical regression analysis, Tiantian et al. (2014) found that the dynamic capabilities of an enterprise had a significant role in improving its performance, which provides theoretical guidance for the construction of the dynamic capabilities of enterprises. Mamun et al. (2016) studied 407 micro-enterprises and found that the ability to identify and utilize entrepreneurial opportunities had a significant positive impact on enterprise performance. They proposed that entrepreneurs should be trained to improve their ability to identify and utilize entrepreneurial opportunities. Due to the influence of non-financial data on enterprise performance it is crucial to use this data when conducting enterprise performance analysis. Management accounting plays a very effective role in this aspect. Rasid et al. (2014) analyzed enterprise performance by combining management accounting with enterprise risk management and found that management accounting played an important role in performance analysis. Fullerton et al. (2014) proposed that financial control via management accounting could effectively improve enterprise performance. In this study, enterprise performance was analyzed using the aspects of economic, social and environmental benefits based on management accounting. The role of management accounting in performance analysis was determined based on the selection of indicators and the establishment of a regression model.

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Table 1 The analysis indicators of enterprise performance.

Indicators	Symbol	Specific indicators
Performance	Y	Multiple of enterprise value
Economical benefits	X_1	Net profit margin on sales
	X_2	Return on total assets
	X_3	Rate of return on investment
	X_4	Total assets growth rate
	X_5	Growth rate of regional per capita GDP
Social benefits	X_6	Growth rate of public funds
	X_7	Growth rate of number of employees
Environmental benefits	X_8	Growth rate of environmental protection funds
	X_9	Proportion of green products
	X_{10}	Disposal rate of industrial wastes
	X_{11}	Utilization rate of solid wastes
	X_{12}	Energy consumption per 10000 yuan of GDP

2. ENTERPRISE PERFORMANCE AND MANAGEMENT ACCOUNTING

Performance is the reflection of the operating efficiency of an enterprise. With the intensification of competition among enterprises, it is necessary to make a scientific and effective analysis of enterprise performance to improve the management ability of enterprises and ensure that enterprises can withstand fierce market competition. Performance analysis can provide information support for decision-makers through objective evaluation of business activities, in order to provide a theoretical basis for business operators and decision-makers in the formulation of the future development strategy of the enterprise and promote the rapid, stable and high-quality development of the enterprise. Traditional performance analysis evaluates the operation of an enterprise based on the financial data of the enterprise and reflects the development of the enterprise using indicators such as income, profits, and liabilities. However, this method has many shortcomings. When only the financial data is taken as the indicator of an enterprise's operation status, some operational conditions which cannot be reflected by the financial data are neglected. The emphasis on enterprise economic benefits becomes one-sided. The social and environmental benefits and considerations for other stakeholders and the environment are ignored when profit is taken as the sole basis of enterprise development. Therefore, such performance analysis cannot reflect the social responsibility and environmental responsibility of an enterprise. Moreover, the financial data is historic, which cannot be used for predicting future opportunities and challenges and cannot provide reliable information for the future development of enterprises.

Management accounting is a subject that combines management and accounting. It appeared in the West in the 19th century and gradually matured (Lowry, 2014). It plays a very important role in enterprise performance analysis. It has a good application in enterprise management, resource allocation and talent allocation and can provide appropriate decision-making information for enterprises (Adler et al., 2014; Tappura et al., 2015). Management accounting is not promoted well in China, as it has had a late and slow development (Hopper & Bui, 2016). The analysis of enterprise performance based on management accounting can improve the efficiency and quality of enterprise performance analysis. Analysis of enterprise performance based on financial and non-financial data can realize scientific decision making.

3. SELECTION OF INDICATORS FOR ENTERPRISE PERFORMANCE ANALYSIS BASED ON MANAGEMENT ACCOUNTING

3.1 Principles of Indicator Selection

Under the guidance of management accounting, the selection of analytical indicators should take full account of the economy, society and the environment. They must be authentic enough to be able to reliably reflect the business conditions of enterprises, sensitive enough to be able to quickly and timely show the changes in business conditions of enterprises, and integral enough to comprehensively reflect the situation of enterprises.

Economic benefit analysis indicators should be able to reflect the ability of enterprises to make profits, repay debts, operate and grow the contribution of the enterprise in the economic field and the situation of economic wealth created by the enterprise. Social benefit analysis indicators should be able to reflect the realization degree of social responsibilities and duties of the enterprise. Environmental benefit analysis indicators should be able to reflect the degree of implementation of the principles of sustainable development and highlight the contribution of the enterprise to environmental protection.

3.2 Selection of analysis indicators

The performance analysis indicators selected, based on the economical, social and environmental benefits of enterprises are shown in Table 1.

The multiple of the enterprise value was taken as the overall enterprise performance indicator. It was found in this

Table 2 Results of significance test on the indicators.

Indicator	Content	T value	Significance sig.
X_1	Net profit margin on sales	1.832	0.000
X_2	Return on total assets	1.039	0.001
X_3	Rate of return on investment	0.742	0.052*
X_4	Total assets growth rate	1.003	0.087*
X_5	Growth rate of regional per capita GDP	0.015	0.000
X_6	Growth rate of public funds	0.508	0.007
X_7	Growth rate of number of employees	0.326	0.078*
X_8	Growth rate of environmental protection funds	1.001	0.029
X_9	Proportion of green products	1.015	0.051*
X_{10}	Disposal rate of industrial wastes	1.603	0.001
X_{11}	Utilization rate of solid wastes	1.062	0.015
X_{12}	Energy consumption per 10,000 yuan of GDP	1.006	0.058*

*: $P > 0.05$

study that the profitability of the enterprise had the greatest correlation with economic benefits. Generally speaking, the profitability of enterprises is always directly related to the economic benefit. Therefore, indicators related to the profitability of enterprises were selected, in which the growth rate of regional per capita GDP was used for representing the economic contribution of enterprises to a region. A higher growth rate of regional per capita GDP indicated a greater contribution to the regional economy and higher economic benefits.

Two social benefit indicators were selected. The growth rate of public funds refers to the growth rate of investment funds of enterprises in public welfare undertakings. The sense of social responsibility of enterprises is also directly related to the contribution of these enterprises to society. The growth rate of number of employees refers to the contribution of enterprises to regional employment and can also represent the social benefit of enterprises.

Environmental benefits mainly refer to the contribution made by enterprises to protect the environment and to achieve sustainable development. Environmental aspects include investment in environmental protection funds, research and development of green products, the treatment of pollutants and the consumption of energy. Larger investments in environmental protection, environmental friendly, energy-saving and green products, a better ability to process pollutants and lower energy consumption indicate a larger contribution to the environment and higher environmental benefits.

3.3 Establishment of a Regression Model

The performance of enterprises was predicted using the regression model data analysis tool from management accounting. The impact of economic, social and environmental benefits on the overall performance of enterprises were also analyzed. The linear regression model is established as follows:

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \cdots + \beta_n X_n + \varepsilon \quad (1)$$

where Y stands for enterprise performance, α stands for constant term, β stands for regression coefficient, and ε stands for residual term.

4. INSTANCE ANALYSIS

4.1 Indicator Analysis

The four-year performance data (2016–2019) of the top 100 companies which appeared in the list for the most times in the last year (June 30, 2019 – June 30, 2020) were selected from the special list of Dragon & Tiger displayed on East Money Net as the sampling data. The sample data was obtained by collecting information such as financial statements and social responsibility reports, and the regression analysis was then performed. Firstly, the indicators were processed. Significance test was then performed on the indicators in Table 1, and the results shown in Table 2.

Table 2 shows that net sales interest rate, return on total assets, growth rate of regional per capita GDP and the disposal rate of industrial waste had the highest significance, which indicated that they had the most impact on enterprise performance. The impacts of the rate of return on investment, the growth rate of total assets, the growth rate of the number of employees, the proportion of green products and the energy consumption per 10,000 yuan of GDP on enterprise performance were insignificant; therefore they were eliminated. The new performance analysis indicators are as shown in Table 3.

The obtained regression model is:

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \varepsilon \quad (2)$$

Regression analysis was performed on the economical, social and environmental benefits that affect enterprise performance, and the results are shown in Table 4.

Table 4 shows that the economic benefits of enterprises had the greatest impact on the overall performance of enterprises, economical benefits could explain 76.8% of the changes in the overall performance of enterprises, and its regression coefficient was 0.842. Social benefits could explain 27.6% of the changes in enterprise performance and environmental benefits could explain 48.6% of the changes in enterprise performance. The impact of economical benefits on enterprise performance was the highest, followed by environmental benefits and social benefits.

Table 3 The enterprise performance analysis indicators.

Indicator	Content
X_1	Net profit margin on sales
X_2	Return on total assets
X_3	Growth rate of regional per capita GDP
X_4	Growth rate of public funds
X_5	Growth rate of environmental protection funds
X_6	Disposal rate of industrial wastes
X_7	Utilization rate of solid wastes

Table 4 Variable regression analysis.

Indicator	R^2	Standardized regression coefficient	F	Sig.
Economical benefits	0.768	0.842	110.87	0.000
Social benefits	0.276	0.563	79.32	0.000
Environmental benefits	0.486	0.762	86.24	0.000

Table 5 The regression results of the indicators.

Indicator	Content	Unstandardized coefficient		Standard coefficient	t	Sig.
		B	Standard error	Trial		
Constant		6.328	1.462			
X_1	Net profit margin on sales	0.289	1.325	0.562	1.832	0.000
X_2	Return on total assets	0.268	1.245	0.184	1.039	0.001
X_3	Growth rate of regional per capita GDP	0.291	1.256	0.521	0.015	0.000
X_4	Growth rate of public funds	0.246	1.548	0.162	0.508	0.007
X_5	Growth rate of environmental protection funds	0.208	1.268	0.152	1.001	0.029
X_6	Disposal rate of industrial wastes	0.267	1.272	0.154	1.603	0.001
X_7	Utilization rate of solid wastes	0.258	1.321	0.268	1.062	0.015

4.2 Regression Analysis

A regression test was performed on equation (2) to evaluate its reasonability in enterprise performance analysis, with $R^2 = 0.862$. It indicated that the regression model could explain 86.2% of changes in enterprise performance and that the model was reasonable.

Regression analysis was performed on the indicators shown in Table 3, and the obtained results are shown in Table 5.

The following regression model was obtained:

$$Y = 6.328 + 0.289X_1 + 0.268X_2 + 0.291X_3 + 0.246X_4$$
$$+ 0.208X_5 + 0.267X_6 + 0.258X_7. \tag{3}$$

It was found from Table 5 that economic benefits were mainly reflected by net profit margin on sales and the growth rate of regional per capita GDP, social benefits were mainly reflected by the growth rate of public funds, and environmental benefits were mainly reflected by the disposal rate of industrial waste.

Generally speaking, the regression coefficients of net profit margin on sales and the growth rate of regional per capita GDP were relatively high; their impact on enterprise performance was significant, and the regression coefficient of the growth rate of environmental protection funds was relatively low, with a lower overall impact on enterprise performance.

5. DISCUSSION

Enterprise performance analysis is of great significance to the development of enterprises. Combining performance analysis with management accounting has become the generally adopted approach. The traditional method of performance analysis which relies on financial indicators is one-sided and unreasonable. Only under the guidance of management accounting can the performance of enterprises be analyzed scientifically and effectively (Abrahman et al.,

2016; Ma, 2017). Management accounting, that takes both financial indicators and non-financial indicators into account, can provide a further and detailed analysis of enterprise performance (Maas et al., 2016).

In the present study, social and environmental benefits were also considered in enterprise performance analysis alongside economical benefits. The most representative indicators were selected from the three aspects, a regression model was established, and enterprise performance analysis was performed. It was found that the regression model proposed in this study could explain 86.2% of the changes in enterprise performance. The regression analysis of various indicators suggested that the economic benefit indicators had the greatest impact on enterprise performance and the social benefit had the least impact on enterprise performance. Moreover, several indicators which had relatively significant impact on enterprise performance were also found, including net profit margin on sales and the growth rate of regional per capita GDP.

However, this method has some shortcomings. For example, in terms of the social benefit indicators of enterprises, the accuracy and credibility of the enterprise social responsibility report was brought into question because a third-party audit was not performed; there are no professional and strict evaluation criteria for environmental benefits. The evaluation criteria are not comprehensive enough to explain the environmental benefits of enterprises adequately and reliably.

In order to make better use of management accounting methods in the analysis of enterprise performance, the following suggestions are put forward.

(1) The importance of non-financial indicators needs to be increased. The collection of non-financial indicators is difficult as enterprises do not place enough value on these indicators. Management accounting can help enterprises to collect non-financial indicators, for example, after-sales service and customer surveys. This data and the following analysis can demonstrate the importance of non-financial indicators to stakeholders and decision-makers within the enterprise.

(2) Enterprise performance analysis results should be considered completely. The results of enterprise performance analysis obtained based on management accounting can show the performance of an enterprise comprehensively. Based on these performance analysis results, the performance analysis plan and control functions can be introduced fully. The operating conditions of an enterprise can be comprehensively understood according to the performance analysis results and adjusted to realize the maximization of economical, social and environmental benefits.

6.   CONCLUSION

Enterprise performance analysis is better based on management accounting. In this study, enterprise performance was analyzed from three aspects, economic, social and environmental benefits. A regression model was established

after the selection of indicators. The regression analysis found that economic benefits could explain 76.8% of the changes in enterprise performance and environmental benefits could explain 48.6% of the changes in enterprise performance, this demonstrated that the traditional performance analysis, based solely on financial indicators, was not reasonable. The study of the indicators suggested that the changes of indicators such as the growth rate of regional per capita GDP and industrial waste disposal rate had significant impacts on enterprise performance; this indicated that enterprise performance analysis based on management accounting was highly feasible.

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