World Applied Sciences Journal 28 (3): 421-424, 2013
ISSN 1818-4952

DOI: 10.5829/idosi.wasj.2013.28.03.1996

Some Problems of Optimization of Fixed Assets and Working Capital Structure of Industrial Enterprises

Babenko Inna Viktorovna

South-West State University, Russia, 305040, Kursk, Studencheskaya Str. 20, App. 12.

Abstract: The relationship between the ratio between the growth rate of fixed assets and current assets and their productivity affecting the efficiency of the use of production assets have been found. The dynamics of the GRP and production assets in the industry have been studied. To assess the rationality of the structure of production assets an index showing the amount of current assets per a ruble of fixed assets and measuring the degree of provision of the production process with material resources has been proposed. An economic-mathematical model for the optimization of the relation between current and fixed assets permitting to maximize the capital productivity of production assets in case of a constant amount of fixed assets and a given level of current assets turnover has been proposed. Some ways of the rationalization of production assets have been proposed.

Key words: Working capital · Production capital assets · Rational structure of production assets

INTRODUCTION

High rates of economic growth are usually inextricably connected with a corresponding increase in production assets. The dynamics of current assets as a component of production assets of the economy is determined by two oppositely acting factors; on the one hand the amount of current assets increases with the GRP growth and thus with the growth of consumed material resources, but on the other hand decreases due to the acceleration of their turnover. Consequently, production volume can be increased at a lower growth rate, constancy, or reduction of current assets.

MATERIALS AND METHODS

So, when accelerating current assets turnover, BPA growth rate should exceed the figures of current assets. Thus, in case of faster BPA growth current assets turnover doesn't accelerate and we can conclude that material resources are used irrationally and there is some deterioration of the provision of BPA with material resources [1].

The study of the dynamics of GRP and production assets in the industry shows that the growth rate of productive assets outstrips the growth rate of gross output, indicating a decrease in the efficiency of their use. Reduction of the rate of turnover in 2010 - 2011 had a significant impact on the efficiency of productive assets use. Under these circumstances, the outstripping growth of current assets compared to fixed assets shows that in this period material resources were not rationally used; there were some excessive production inventories, which had an impact on the economic efficiency of production assets. [2] In 2005 - 2009, the capital productivity of production assets increased, but in 2011 there was a decrease to 0.3%.

The decrease in capital productivity of production assets was caused by the 12.3% decrease of current assets productivity of productive assets; at the same time the return on fixed assets increased by 25.6%.

This fact indicates the existence of a close relationship between the ratio of the growth rate of fixed and current assets and return on them [3]. The relationship of growth rates is primarily reflected in the structure of production assets. Smooth functioning of the

Corresponding Author: Babenko Inna Viktorovna, South-West State University, Russia, 305040, Kursk, Studencheskaya Str. 20, App. 12.

Table 1: Data of the dynamics of the gross output, fixed assets and working capital of the industrial sector of the Kursk region, %

	2005	2006	2007	2008	2009	2010	2011
GRP	100	113,4	135,5	194	268,8	285,8	339,8
Current PA	100	150,9	181,1	246	242,9	277,5	374,3
BPA	100	100,3	106	109	114,2	127,1	135,7
PA	100	154	129,6	255,5	372,8	316,2	376,7
Current PA turmover	176	234	236	224	159	171	194

Table 2: Dynamics of production assets efficiency of the industrial sector of the Kursk region,%

	2005	2006	2007	2008	2009	2010	2011
Growth rates of CPA	100	75,18	74,8	78,7	110,6	103	90,7
Growth rates of CA	100	113	127,7	177,6	235,4	224,7	250,3
Growth rates of PA	100	73,6	67,8	75,9	77,1	90,4	90,1

process of production and making a profit depend directly on the rational relationship between the fixed and current assets. A rational structure of production assets is a structure where minimal current assets at a specified rate of return ensure full utilization of production capacity [4]. The criterion of the optimal rational structure of productive assets can be as full as possible return or maximum profit [5].

To assess the rationality of the structure of production assets it is possible to use an index showing the amount of current assets per one ruble of fixed assets and measuring the process of production endowment with material resources:

$$X = \frac{ObC}{OC}, \quad (1)$$

where,

X – An index of a production assets structure,
ObC – An average annual current assets balance,
OC – An average annual fixed assets balance.

When deciding on the optimal balance between the fixed and current assets it is necessary to start from the assumption that at every moment the value of fixed assets is a known quantity, as it is defined in the production output program, so the emphasis should be placed on the amount of current assets. The index of full productive assets productivity is determined by the indices of the return on fixed and current assets, depending on their relationship [6]. To study the effect of the production assets structure at the first stage it is necessary to determine the impact of the structure on the return on fixed assets.

If a company has a fixed amount of fixed assets and starts to launch material resources into production, it is obvious that the increase in material resources increases the output and capital productivity [7]. However, this process is limited by production capacity and as soon as the production process becomes saturated with material resources, the capital productivity growth gradually slows down and becomes stable. This dependence can be represented as a symmetrical logistic function:

$$f_{opf} = \frac{k}{1 + ae^{-bx}}, \quad (2)$$

fo – Index of the return on fixed assets;
x – Index of the relation between fixed and current assets;
k – Saturation point;
a,b – Fixed coefficients;
e – Natural logarithm basis.

In the course of the economic activity in the analyzed period the ratio between fixed assets and current assets changes from 0.21 rubles to 0.59 rubles, the least of which corresponds to the index of return on assets of 0.44 rubles and the greatest corresponds to 1.1 rubles. The analysis shows that in the years when there was an increase of current assets for one ruble of the fixed assets, there was a trend of increase of the return on fixed production assets. Indices of the structure of production assets and capital productivity in industry are presented in Table 3.

To prove this dependence we use software program Neural Analyzer. To train the network we used indices of gross output dynamics, fixed assets and current assets in industry, indices of the efficiency of production assets use, indices of the structure of production assets; we set a BPA capital productivity index as a target. The calculations done by means of Neural Analyzer show that maximum possible return on the fixed assets is when one ruble of fixed assets has 0.21 rubles of current assets. Thus, some changes in the structure of production assets due to the changes in current production assets lead to some changes in BPA capital productivity. After calculating the parameters of the logistic function, it takes the following form:

Table 3: Data of the structure and capital productivity in industry in the Kursk region

	2005	2006	2007	2008	2009	2010	2011
Working capital per ruble of BPA	0,21	0,32	0,37	0,49	0,46	0,47	0,59
CPA return	2,03	1,53	1,52	1,6	2,25	2,09	1,84
CA return	0,44	0,5	0,56	0,78	1,04	0,99	1,1
PA return	0,91	0,67	0,62	0,69	0,66	0,82	0,82

Table 4: Indices of current assets productivity in the industry in the Kursk region,%

GRP per a ruble of CPA	2,63	3,01	3,07	2,93	2,69	2,40	2,09	1,80	1,53	1,28	1,07	0,88
GRP per a ruble of BPA	0,22	0,61	1,12	1,44	1,57	1,6	1,61	1,61	1,61	1,61	1,61	1,61
GRP per a ruble of PA	1,00	1,05	1,06	1,04	1,01	0,96	0,91	0,85	0,78	0,71	0,64	0,57
OПA per a ruble of BPA	0,1	0,15	0,2	0,25	0,3	0,35	0,4	0,45	0,5	0,55	0,6	0,65

$$f_{opf} = \frac{1,62}{1+177,12?^{-21,3?}}, \quad (3)$$

Mean root square error of this equation is 0.031; the correlation coefficient is 0.75, the coefficient of determination of 0.42.

For a fixed amount of fixed assets a gradual increase in the current assets causes some increase in their return. [8] This level of increase is determined by production capacity, as well as the equipment capability to process a certain amount of material resources in unit time [9]. After the saturation of the process of production with material resources increase of current assets does not affect the volume of production, which leads to a decrease in the current assets return [10]. This dependence can be expressed by the right-symmetric function of growth:

$$f_{opa} = axe^{-bx}, \quad (4)$$

where, f_{opa} – working capital productivity

The current assets productivity index has a maximum value when x = -1 / b; in this case the maximum level of return on assets is determined by the formula:

$$\max f_{opa} = -\frac{a}{b}e^{-1}, \quad (5)$$

The indices of current assets productivity in the industry in the Kursk region are given in Table 4.

The smallest ratio of fixed assets and current assets corresponds to the index of current assets productivity of 2.63 rub. and the largest to 0.88 rubles. Therefore, due to the saturation of the fixed assets with material resources the process of reducing of current assets productivity begins.

After determining the parameters of the function, equation (4) becomes:

$$f_{opa} = 84,11xe^{-4,38x}, \quad (6)$$

The correlation coefficient is 0.92, the coefficient of determination of 0.7, the root mean square error of the equation is - 0.15 rubles.

The index of full production assets productivity is estimated according to fixed and current assets returns, but is not their total sum; and the index of total capital-output ratio of productive assets is the sum of capital-output ratio of fixed and current assets, hence the total return on assets index, expressed in terms of the capital-output ratio is equal to:

$$f_{pf} = \frac{f_{opf} * f_{opa}}{f_{opf} + f_{opa}}, \quad (7)$$

An economic-mathematical model of optimization of working capital and fixed assets, permitting to maximize the full productivity of productive assets at a constant value of fixed assets and a given level of turnover of current assets is as follows:

$$f_{pf} = \frac{f_{opf} * f_{opa}}{f_{opf} + f_{opa}}, \quad (8)$$

If we use the indices of capital productivity in the expression we get an economic - mathematical model of a complete productive assets productivity:

$$f_{pf} = \frac{147,56xe^{-4,23x}}{1,62 + 91,09x^{-4,23x}x^{e-25,5}}, \quad (9)$$

The root mean square error of this equation is 0.031, the correlation coefficient is 0.75, the coefficient of determination of 0.42.

RESULTS AND DISCUSSION

This fact indicates the existence of a close relationship between the ratio of the growth rate of fixed assets and current assets and their capital productivity. The relationship between the growth rates is primarily reflected in the structure of production assets. A smooth

functioning of the process of production and making a profit depends directly on a rational relationship between the fixed and current assets.

CONCLUSION

Thus, the analysis revealed a significant correlation between the ratio of the growth rate of fixed assets and current assets and their productivity, which is primarily reflected in the structure of production assets of the regional production sector. In the process of management the only optimal ratio of cost of fixed and current assets should be ensured; it permits to reveal an industrial potential, to ensure the utilization of production capacity, to reduce production costs, to provide necessary for the production process raw and other materials.

REFERENCES

1. Kuryanov, A.V., 1975. Current assets of industrial enterprises and the efficiency of their use. [Text] / A. Kuryanov. Kiev. Naukova Dumka, pp: 149.
2. Bunic, P.G., *et al*., 1973. Economic- mathematical methods of working capital management. [Text]/ P.G. Bunich, V.L. Perlamutrov. Moscow: Finance, pp: 276.
3. Sisvadze, A.O., 1984. Production inventory management methods [Text] / AO Sisvadze. Tbilisi Metsniereba, pp: 109.
4. Teals, S.V., 2011. Sources of and economic performance of working capital [Text] / S. Teal / / Vector Science TSU. Series "Economics and Management", 2(5): 44-47.
5. Darling, V.I., 2012. The use of logistic approach in the formation of the working capital of business entities [Text] / Darling VI, SV Riabtsev / / The Baltic Economic Journal, 1: 117-123.
6. Mehmet, S.E.N., 2009. Relationship between Efficiency Level of Working Capital Management and Return on Total Assets in Ise / Mehmet SEN, Eda ORUÇ // International Journal of Business and Management, 4(10): 109-114.
7. Mian Sajid Nazir and Talat Afza, 2009. Impact of Aggressive Working Capital Management Policy on Firms' Profitability // The IUP Journal of Applied Finance, 15(8): 19-30.
8. Ebrahim Lotfinia Zahra Mousavi Azam Jari, 2012. The Relationship betweenWorking Capital Management and Firm Characteristics: Evidence From Tehran Stock Exchange(TSE) // International Journal of Business and Social Sci., 3(14): 296-301
9. Bhavesh, Chadamiya and Vijay Pithadia, 2012. Working Capital Management in it Companies IJSR - // International Journal Of Scientific Research, 1(6): 128-129.
10. Rajesh, M. Reddy, 2011. "Impact of working capital management on firms profitability". // Global Journal of Finance and Management, 3(1): 151-158.