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STOCK MANAGEMENT AS A CRITICAL SUCCESS FACTOR FOR POLISH CROP PRODCERS

PIOTR KORNETA

Faculty of Management, Warsaw University of Technology

The key objective of critical success factors is to filter out excessive information reaching organizations so that management can focus on several most critical areas. Both scholars and practitioners employ most frequently expert interviews as to identify critical success factors. The aim of this study is to show how quantitative methods can contribute to a more efficient critical success factors identification. This study uses a sample of observations relating to 300 Polish crop producers in a 5-years period between 2013 to 2017. The findings of this study show clearly that the lower the inventory levels the higher the profitability and the growth of sales revenues of Polish crop producers.

Keywords: critical success factors, performance measurement, performance management systems, inventory

1. Introduction

Last three decades have witnessed considerable development of performance management systems, among which balanced scorecard become the most well-recognized one. Currently performance management systems are defined as dynamic and balanced systems, which facilitate support of decision-making processes by gathering and evaluating relevant information. Although there is a huge number of published performance management systems, the vast majority of these frameworks rely highly on measurement and critical success factors [4, 13, 21]. The concept of critical success factors for companies was discussed by Ronald Daniels in

1961, who claimed that information systems must focus on a limited number of factors. These factors, if addressed properly, should both, ensure an organization's success and prevent the organization from receiving too much information [6, 17].

According to the literature, critical success factors can stem from: industry, environment, competitors, partnerships with clients or suppliers, information systems, strategic planning, products, process management, working capital management, knowledge management, environmental or country specific factors, financing, and other sources. The large number of critical success factors described in literature results from the fact that it is widely acknowledged that critical success factors should be tailor-made for each organization. Hence, one size fits all rule is not applicable for critical success factors [1, 19, 26].

With respect to above, it can be concluded, that critical success factors, constitute a fundamental role of performance management systems, and if are managed well, should directly improve the company's performance. The company's performance, in turn, can be measured with, inter alia, profitability or growth measures.

The aim of this paper is to study if the level of inventories at crop producers can be considered as critical success factor. Inventories in crop producers' industry are subject to several significant risks, including volatility of prices and various sources of impairment. As to achieve the aforementioned objective this study employs relevant statistical test.

The rest of this paper is organized as follows. In the next, second section a brief literature review is being provided, based on which relevant hypothesizes are developed. The following sections provides methodology for this study. In the fourth section the results are being presented and discussed. In the last section of the paper conclusions are being provided, practical implications, limitations of the study and the directions for further research.

2. Theoretical background, hypothesizes development

The literature on inventories is vast and continues to develop. Significant portion of papers relates to various aspects of stock management. The number of papers relating to stock levels optimization is also considerable. In general, the papers on stock levels optimization can be divided into those aiming to optimize stock levels within one organization and among a chain of cooperating companies, so called supply chains [3, 20, 24]. The number of papers measuring relationships between stock levels and profitability or growth of companies in various industries are considerable less numerous, while for some industries or countries insufficient, which justifies this study. According to Blinder and Maccini higher stock levels should improve the profitability of companies. This should be achieved through reduction of production interruptions in manufacturing cycle, which ought to protect abnormal costs of products, provide protection against price fluctuations and

prevent loss of business resulting from non-availability of raw materials. That sequence of cause and effects should finally lead to profitability improvements [5].

The majority of scholars however, postulate lower inventory levels are associated with higher profitability. The findings of these studies use either statistical test or regression analysis and are undertaken in various countries and various industries [9, 11, 15].

The selection of inventory levels for crop producers in this study, is primarily interesting because of the two more reasons. The first is the volatility of crop prices [16], which impose high risk on crop inventory holders, unless the inventory prices are properly hedged. Given, the awareness of Polish farms in this matter is not high, i.e. assuming Polish crop producers, especially smaller farms do not hedge crop prices than such companies incur considerable risk levels which might affect their profitability or even an overall performance. The second reason is that crop as inventory is subject to several physical risks such as, for example humidity, mold, or vermin, hence if crop is not stored properly than inventories can get impaired, loosing considerable value.

Based on argumentation provided above and in accordance with the majority of scholars the following hypothesis is developed:

H1: There is a negative and statistically significant relationship between profitability and the inventory levels at Polish crop producers.

Additionally, since the level of inventories should intuitively contribute to the growth of sales, the second hypothesis is formulated as follows:

H2: The higher the inventory the faster the growth of sales of Polish crop producers.

Verifications of relationships between inventory levels and both profitability and the growth of sales should allow to understand studied subject more thoroughly.

3. Methodology

The sample for this study comprise 300 Polish crop producers in a 5-years period between 2013 and 2017. The figures used in the study have been obtained from EMIS database (Emerging Markets Information Service) in October 2018. In particular, financial statements of 300 Polish crop producing companies in studied periods, between 2013 to 2017 have been obtained. Since EMIS database have not comprised financial statements of all studied companies for each of the studied periods only 1.017 observations have been obtained. Furthermore, due to the use of lagged variables, the number of observations used in this study reduced to 661 accordingly.

Table 1 provides the variables, with their descriptions, used in the study. This study uses 4 profitability variables, namely return on sales – in two versions, return on assets and return on equity. Stated 4 variables are widely acknowledged measures of profitability in the literature and so commonly used in various studies. Return on sales is used in two versions, the first version employs profit after tax, whereas the second one EBIT (earnings before interests and tax) and is considered as good proxy of profit margins. Therefore, this variable is of particular interest to both decision makers and scholars [2, 8, 14, 22, 25]. Growth of companies is measured in the literature in various ways [12, 23]. This study measures the growth of sales as a variance of sales revenues between two consecutive years. Finally, the study uses two variables relating to current and prior year inventories, both calculated as a percentage of sales.

Table 1. Variables used in the study

Variable	Acronym	Description
Return on sales	ROS	Ratio of profit after tax and sales
Return on sales 2	ROS2	Ratio of EBIT (Earnings before interests and tax) and sales
Return on assets	ROA	Ratio of profit after tax and total of assets
Return on equity	ROE	Ratio of profit after tax and equity
Growth of sales	GRS	((Sales t-year) – (sales t-1 year)) divided by (sales t-1 year)
Inventory	INVS	Inventory as a percentage of sales
Inventory prior year	INVSPY	Prior years' inventory as a percentage of sales

Pursuant to selection of variables for the study, a descriptive statistic of all variables have been reviewed. As significant portion of statistical test of significance requires normality assumption of both tested variables to be met or nearly met, for example Pearson correlation test [7], normality tests have been undertaken. In particular, Doornik-Hansen and Shapiro-Wilk tests of normality [10, 18] have been calculated. The null hypothesis for both of these tests is the same and states that the variables are normally distributed. Finally, relevant tests of significance have been selected and calculated as to obtain required results, which were next analyzed and discussed.

4. Results and discussion

Table 2 provides descriptive statistics of variables used in this study. On average, crop producers included in the study exhibit a high mean growth of sales revenues of 0.177 over the studied period from 2013 to 2017. Mean value of return on equity of 0,1038 is not especially high as compared to other, more profitable industries, but exceeds considerably the interests on bank deposits. As disclosed in Table 2, inventories of studied companies were high, accounting to around 0,37 of yearly sales levels.–

Table 2. Descriptive statistics of variables used in the study

Variable	Mean	SD	Median	Min	Max	Skewness	Kurtosis
ROS	0.0898	0.9141	0.0819	-22	6.2888	-20.9244	517.765
ROS2	0.1301	0.1787	0.0994	-0.9333	0.9432	0.9721	6.7531
ROA	0.057	0.2255	0.0446	-3.0251	2.9583	-1.7394	114.049
ROE	0.1038	0.7184	0.0753	-7.6075	9.1739	0.7045	83.2961
GRS	0.177	1.4352	-0.0118	-0.8009	27.6154	12.9204	215
INVS	0.3715	0.2675	0.3406	0	3.0083	2.3022	15.4869
INVSPY	0.3636	0.267	0.3228	0	2.0928	1.7474	6.7132

Source: own elaboration based on data provided in EMIS database

Results of Doornik-Hansen and Shapiro-Wilk tests of normality are being provided in Table 3. Since all p-values are significantly below the threshold of 5%, it is evident that none of the studied variables have a normal distribution. As a consequence, Pearson correlation, which requires normality assumption to be meet should not be used for any conclusions. Hence, Pearson coefficients are disclosed in further works only for indicative purposes.

Table 3. Results of normality tests with p-values (2 sides)

Variable	Doornik-Hansen	P (α=5%)	Shapiro-Wilk	P (α=5%)
ROS	125501	0	0.11785	9.58E-48
ROS2	228.874	2.00E-50	0.864917	2.04E-23
ROA	8626.9	0	0.367553	8.96E-04
ROE	6614.87	0	0.321961	8.63E-44
GRS	35654.6	0	0.203138	3.39E-46
INVS	236.489	4.44E-52	0.870876	6.09E-23
INVSPY	210.456	2.00E-46	0.889121	2.23E-21

Source: own elaboration based on data provided in EMIS database

As indicated above, since a normality distribution of studied variables cannot be assumed, this study uses Spearman's rank correlation coefficient and Kendall

rank correlation coefficient. Both of stated tests are non-parametric measures of rank correlation, which are resistant to the effects of outliers and nonnormality [7]. In this case, stated test are superior to Pearson correlation.

The results of selected statistical tests of dependence between profitability and growth of sales and inventory levels (INVS) in the end of studied periods are provided in Table 4.

Table 4. Results of statistical test of dependence between INVS and studied variables

Variable	PEARSON	p		Spearman	p		KENDALL tau-B	p	
ROS	0.0322	0.2045		-0.0091	0.4079		-0.0019	0.471	
ROS2	-0.0881	0.0117	*	0.0169	0.332		0.019	0.2329	
ROA	-0.0641	0.0499	*	-0.1541	0	*	-0.0973	0.0001	*
ROE	-0.0952	0.0072	*	-0.2368	0	*	-0.146	0	*
GRS	-0.0165	0.3362		-0.1634	0	*	-0.1037	0	*

Source: own elaboration based on data provided in EMIS database

The results of selected statistical tests of dependence between profitability and growth of sales variables and inventory levels (INVSPY) on the beginnings of studied periods are provided in Table 5.

Table 5. Results of statistical test of dependence between INVSPY and studied variables

Variable	PEARSON	p		Spearman	p		KENDALL tau-B	p	
ROS	-0.2331	0	*	-0.046	0.1189		-0.0239	0.1787	
ROS2	-0.2055	0	*	-0.0219	0.2866		-0.0058	0.4124	
ROA	-0.1786	0	*	-0.174	0	*	-0.1119	0	*
ROE	-0.0675	0.0414	*	-0.2513	0	*	-0.1605	0	*
GRS	-0.1643	0	*	-0.2657	0	*	-0.1736	0	*

Source: own elaboration based on data provided in EMIS database

Based on results of Spearman rho coefficients and KENDALL tau-B presented in Table 4 and Table 5 relating to return on assets (ROA) and return on equity (ROE) the first (H1) hypothesis stating that there is a negative and statistically significant relationship between profitability and the inventory levels at Polish crop producers must be accepted. The results of this study are therefore aligned to the majority of other researches.

Since the Spearman rho and KENDALL tau-B coefficients are negative and statistically significant (with p around zero) the second hypothesis stating that the higher the inventory the faster the growth of sales of Polish crop producers must be rejected.

Additionally, it should be noted that the coefficients for both sales profitability variables are statistically insignificant (Spearman rho and KENDALL tau-B), which shows that higher inventory levels do not increase sales profitability, i.e. crop producers to not enjoy higher margins despite possession of higher inventory levels.

5. Conclusion

The objective of this paper is to verify if the level of inventories at crop producers can be considered as a critical success factor. This objective is being achieved on inventory levels example at Polish crop producers in a 5-years period between 2013 to 2017.

Critical success factors for the purpose of this study are defined as the factors which, if improved increase profitability or growth of sales of studied companies. Based on results obtained in empirical part of the paper, which employs Spearman rho coefficient and Kendall tau-B a negative and statistically significant relationship between inventory levels and both the profitability and the growth of sales is identified. The dependence between inventory levels and growth of sales and profitability of Polish crop producers is being identified with the use of statistical methods, which confirms that the level of inventories at crop producers is the critical success factors.

The practical implication for decision makers of this study is that crop producers with lower inventory levels, in general, enjoy higher profitability and growth of sales revenues. This, in turn, promotes decisions aimed at stock reductions. Findings of this study seem to be aligned to business practice of crop producers, as inventory at stated industry is subject not only to typical inventory risks like obsoletes stock or shortages, but also high price volatility and additional industry specific physical risk factors such as mold or vermin. Hence, crop producers in the end of the business seasons are recommended to consider sales of stocks with reduced margins, which should improve their profitability.

This study has however, several limitations, which are primarily related to the sample of studied companies, which is limited to only one country and one industry. Additionally, longer time period could also be analyzed. Aforementioned limitations of the study are good indications for further research. Accordingly, further studies could focus on different countries or different industries or could study longer time frames.

REFERENCES

[1] Aquilani B., Silvestri C., Ruggieri A., Gatti C. (2017) *A systematic literature review on total quality management critical success factors and the identification of new avenues of research*, The TQM Journal, Vol. 29 Issue: 1, 184-213.

[2] Baah-Acquah P., Freeman E. and Ellis E.P. (2017) *Effects of capital structure choice on profitability of oil marketing companies in Ghana (OMCs): case studies of Ghana Oil Company limited and total petroleum Ghana limited*, International Journal of Multidisciplinary Research and Development, Vol. 4, No. 3, 117-122.

[3] Basu R. (2001) *New criteria of performance management: A transition from enterprise to collaborative supply chain*, Measuring Business Excellence, Vol. 5, Issue: 4, , 7-12.

[4] Bititci U.S., Turner T. and Begemann C. (2000), Dynamics of performance measurement systems, "International Journal of Operations & Production Management", Vol. 20.

[5] Blinder A.S. and Maccini L. (1991) *Taking stock: a critical assessment of recent research on inventories*, Journal of Economic Perspectives, Vol. 5 No. 1, pp. 73-96.

[6] Bond, T. (1999) *The role of performance measurement in continuous improvement*, International Journal of Operations & Production Management, Vol. 19 No. 12, 1318-1334.

[7] Bonett D.G., Wright T.A. (2000) *Sample size requirements for Pearson, Kendall, and Spearman correlations*, Psychometrika, No. 65, 23–28.

[8] Czerwińska-Kayzer D., Bieniasz A. (2012) *Pomiar i analiza przyczynowo-skutkowa rentowności kapitału własnego w małym przedsiębiorstwie*, Przegląd Organizacji, Nr 3, 25-28.

[9] Deloof M. (2003), *Does working capital management affects profitability of Belgian firms?*, Journal of Business Finance & Accounting, Vol. 30 Nos 3/4, 573-588.

[10] Doornik J.A., and Hansen H. (2008) *An omnibus test for univariate and multivariate normality*, Oxford Bulletin of Economics and Statistics, No. 70, 927–939.

[11] Falope O.I. and Ajilore O.T. (2009) *Working capital management and corporate profitability: evidence from panel data analysis of selected quoted companies in Nigeria*, Research Journal of Business Management, Vol. 3 No. 3, 73-84.

[12] Gruenwald R.K. (2015) *Measuring growth of the firm: Theoretical considerations*. In: Głodowska A., Wach K. (Eds.), *International business and global economy* („Przedsiębiorczość Międzynarodowa" vol. 1, no. 2. Kraków: Cracow University of Economics, 121-131.

[13] Kaplan R. and Norton D. (1996) *Using the Balanced Scorecard as a strategic management system*, Harvard Business Review, January-February.

[14] Lam T.Y., Lee S.K. (2012) *Family ownership, board committees and firm performance: evidence from Hong Kong*, Corporate Governance: The international journal of business in society, Vol. 12, Issue: 3, 353-366.

[15] Pais M.A., Gama P.M. (2015) *Working capital management and SMEs profitability: Portuguese evidence*, International Journal of Managerial Finance, Vol. 11 Issue: 3, 341-358.

[16] Płonka A., Musiał W. (2014) *Wahania cen głównych produktów rolnych na rynkach krajowych*, Roczniki Naukowe Stowarzyszenia Ekonomistów Rolnictwa i Agrobiznesu, Tom XVI, z.2, 223-228.

[17] Rockart, J.F. (1979) *Chief executives define their own data needs*, Harvard Business Review, Vol. 57 No. 2, 81-92.

[18] Royston P. (1992) *Approximating the Shapiro–Wilk W-test for non-normality*, Statistics and Computing, Vol 2 (3), 117–119.

[19] Sirus K.M. and Rahimi Moghaddam M. (2007) *Organization critical success factors and competencies*, Management Magazine, No. 120.

[20] Soosay C. A., Hyland P. (2015) *A decade of supply chain collaboration and directions for future research*, Supply Chain Management: An International Journal, Vol. 20, Issue: 6, 613-630.

[21] Taticchi P., Tonelli F., Cagnazzo L. (2010) *Performance measurement and management: a literature review and a research agenda*, Measuring Business Excellence, Vol. 14 Issue: 1.

[22] Tyagi S., Nauriyal D.K. (2017) *Firm level profitability determinants in Indian drugs and pharmaceutical industry*, International Journal of Pharmaceutical and Healthcare Marketing, Vol. 11, Issue: 3, 271-290.

[23] Wiklund J. and Shepherd D. (2003) *Aspiring for, and achieving growth: the moderating role of resources and opportunities*, Journal of Management Studies, Vol. 40, No. 8, 1919-1941.

[24] Williams B. D. and Tokar T. (2008) *A review of inventory management research in major logistics journals: Themes and future directions*, The International Journal of Logistics Management, Vol. 19, Issue: 2, 212-232.

[25] Yazdanfar D. (2013) *Profitability determinants among micro firms: evidence from Swedish data*, International Journal of Managerial Finance, Vol. 9, Issue: 2, 151-160.

[26] Usman A.M., Raouf A., Ahmad N Sparks, L. (2009) *Total quality management in developing countries: A case of pharmaceutical wholesale distribution in Pakistan*, International Journal of Pharmaceutical and Healthcare Marketing, Vol. 3 Issue: 4, 363-380.