Accounting and Management Information Systems
Vol. 10, No. 4, pp. 535–546, 2011

AN ECONOMETRIC ANALYSIS OF THE OPERATING PROFIT OF ROMANIAN COMPANIES

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ABSTRACT

This paper aims to contribute to the empirical literature by employing a panel data model for analysing the connection between operating profit of Romanian companies and the turnover, tangible assets, payrolls, stocks and cash. We find that the companies with a higher turnover recorded better economic results and an increased payroll is associated with a decline in economic performance. Likewise, companies that have the cash and / or tangible assets registered superior performance, while growth in stocks is accompanied by lower economic performance of the companies. Sectorial data confirm these results.

panel data model, operating profit, turnover, tangible assets, payrolls, stocks and cash

INTRODUCTION

In economy the benefit represents a controversial economic category. A series of theories have been formulated, the place of the benefit has been established differently according to several concepts. These analyses did not show a strong link between the turnover and the benefits. A company producing goods or providing services is not always able to make profit. Thus, the different methods to establish the profitability try to present the techniques to be used in order to be more efficient.

This paper aims to contribute to the empirical literature by using a direct and more adequate method for analysing the connection between operating profit of Romanian companies and the turnover, tangible assets, payrolls, stocks and cash. This analysis was done using an econometric model with panel data. The main advantage of such an

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analysis consists in that it allows more flexibility in modelling the differences recorded in individual behaviours.

When a sample of panel data is analyzed, the first test must focus on the homogeneity or heterogeneity of the random process generating the data. From the econometric point of view this means testing the equality of the coefficients from the studied model in individual dimensions. From economic point of view the specification test means verifying that the studied theoretical model is perfectly identical for all administrative units or, on the contrary, there are specific characteristics for every unit.

1. LITERATURE REVIEW

In the paper "The Relationship between Working Capital Management and Profitability: Evidence from the United States", Gill et al. (2010) realize a literature review concerning the correlation between company profitability and various inside factors. So, they mention that Deloof (2003: 573-588) used a sample of 1009 large Belgian non-financial firms for a period over 1992-1996 to investigate the relationship between working capital management and corporate profitability. In his analysis, trade credit policy and inventory policy are measured by number of days accounts receivable, accounts payable and inventories, and the cash conversion cycle is used as a comprehensive measure of working capital management. By using correlation and regression tests, the author found significant negative relationship between gross operating income and the number of days accounts receivable, inventories, and accounts payable of Belgian firms. Based on the study results, he suggests that :

(1) managers can increase corporate profitability by reducing the number of days accounts receivable and inventories, and

(2) less profitable firms wait longer to pay their bills.

More recently, Lazaridis and Tryfonidis (2006) investigate the relationship of corporate profitability and working capital management by using in a cross sectional study a sample of 131 companies listed on the Athens Stock Exchange (ASE) for the period over 2001-2004. They found statistically significant relationship between profitability, measured through gross operating profit, and the cash conversion cycle and its components (accounts receivables, accounts payable, and inventory). So, they observed that lower gross operating profit is associated with an increase in the number days of accounts payable. Based on the results of the analysis of annual data by using correlation and regression tests, they suggest that managers can create profit for their companies by handling correctly the cash conversion cycle and by keeping each different component of the conversion cycle (accounts receivable, accounts payable, and inventory) at an optimal level. Earlier, Shin and Soenen (1998) found a strong negative relationship between the cash conversion cycle and corporate profitability for listed American firms for the 1975 - 1994 period.

Garcia-Teruel and Martinez-Solano (2007) also provide (using the panel data methodology) empirical evidence about the effects of working capital management on the profitability of a sample of small and medium-sized Spanish companies. For this research they have used a sample of 8,872 small to medium-sized enterprises (SMEs) covering the period between 1996 - 2002. They tested the effects of working capital management on SME profitability using the panel data methodology. The results, which are robust to the presence of endogeneity, demonstrate that managers could create value by reducing their company's number of days accounts receivable and inventories, and the analysis cannot, however, confirm that the number of days accounts payable affects an SME's return on assets, as this relation loses significance when they control for possible endogeneity problems. Equally, shortening the cash conversion cycle also improves the company's profitability.

Mathuva (2009) studied the influence of working capital management components on corporate profitability by using a sample of 30 companies listed on the Nairobi Stock Exchange (NSE) for the period from 1993 to 2008. He used both the pooled OLS (ordinary least square OLS), and the fixed effects regression models. The key findings from the study were that: - there is a highly significant negative relationship between the time it takes for companies to collect cash from their customers (accounts collection period) and profitability; "this means that the more profitable companies take the shortest time to collect cash from their customers"(p.1, 8), there is a highly significant positive relationship between the period taken to convert inventories into sales (the inventory conversion period) and profitability; "this means that companies that maintain a sufficiently high inventory level reduce costs of possible interruption in the production process and loss of business due to scarcity of product. This reduces the company's supply cost and protects them against price fluctuations" (p.5, 8-9), and there is a highly significant positive relationship between the time it takes for the company to pay its creditors (average payment period) and profitability. "This implies that the longer a firm takes to pay its creditors, the more profitable it is" (p.5, 9), and good economic conditions (the growth in the Gross Domestic Product in nominal terms) tend to be reflected in a company's profitability (p.5, 11).

There are also recent studies showing that the management of current assets and current liabilities is very important in corporate finance because it directly affects the liquidity and profitability of the company (Appuhami, 2008; Christopher & Kamalavalli, 2009; Dash & Ravipati, 2009).

For Romania, Negulescu (2000) analysed the financial data of 6,203 enterprises, during the period from 1994 to 1997, in order to assess the extent of the changes in performance. The objective of this research is to identify the main directions of enterprise performance, measured in terms of profitability, capital utilization and capital structure, as well as changes in infrastructure, legal and regulatory framework and the enabling environment which might have led to restructuring.

2. METHODOLOGY OF THE ANALYSIS

We perform an analysis using data from the financial statements of companies from industry, agriculture, trade, transportation and services for the period over 1998-2007. The data refers to the profit and loss of the fiscal period, turnover, corporate assets, overheads, stocks, liquid assets. The studied matrix is of the following size: 300 (records) × 10 (years) and is filled out in more than 75% (2,258 data).

The study of *the data in the panel* refers to the common cross-section analysis of the observations (branches, economic sectors, companies, etc.), analysis carried out over different periods of time (Baltagi, 2005; Bourbonnais, 2009). The advantages of using various models from this category are mainly the following (Jula, 2010):

(1) The analysis of panel date may reveal individual particularities. Individuals, companies, economic sectors ... are heterogeneous. The econometric analysis of time series or of cross-sections cannot reveal such features, so there is a risk to get distorted estimators. In this type of analysis the atypical data are usually eliminated through introducing dummies. The analysis of panel data may reveal the invariant structures in an establishment (branch, etc.), or at a given point in time (e.g. the impact of an administrative decision, an institutional change). Thus the distortion induced by data aggregation may be reduced or eliminated.
(2) The analysis of panel data brings additional information, reveals the individual variability, reduces the phenomenon of multi-collinearity of the variables, increases the number of degrees of freedom, and, implicitly, the power of the tests and thus the degree of trust in their results, increases the efficiency and consistency of econometric estimates. The analysis of the panel data allows to construct and test more complex behaviour models than those based on the analysis of time series or cross-section structures.
(3) The panel data allow a better analysis of the dynamics of structural adjustments.

Starting from the above arguments we analyse the financial performance of the companies in the national economy (RE) based on turnover (CA), overheads (CP), liquid assests (D), tangible assets (IC) and total stocks (S).

The studied panel regression equation is:

$$RE_{it} = a_0 + (a_{1i}CA_{it} + a_{2i}CP_{it} + a_{3i}D_{it} + a_{4i}IC_{it} + a_{5i}S_{it}) + \alpha_i + \beta_t + e_{it},$$

where

RE_{it} – is the financial performance in the fiscal period of the companies in branch *i* (industry, agriculture, trade, transportation), in the year *t*;

CA_{it} – the turnover of the companies in branch *i* in the year *t*;
CP_{it} – overheads of the companies in branch *i* in the year *t*;
D_{it} – liquid assets of the companies in branch *i* in the year *t*;
IC_{it} – tangible assets of the companies in branch *i* in the year *t*;
S_{it} – stocks of the companies in branch *i* in the year *t*;
e_{it} – errors of the regression equation, supposedly independent and identically distributed (I.I.D.), normal and of zero mean.
a_1… – parameters of the model.
α_i – specific individual effects (fixed or random)
β_t – specific effects over time (fixed or random).

3. RESULTS

For the specification of the general model we used Hsiao's testing procedure (Hsiao, 1986). Thus, we tested the null hypothesis H_0 (the hypothesis of complete homogeneity, according to which the constants and the parameters of the exogenous variables are identical), H_0: $a_{1i} = a_1$, …, $a_{5i} = a_5$ and $\alpha_i = \alpha$, $\forall i$ and $\beta_t = \beta$, $\forall t$, as opposed to the alternative hypothesis H_1, according to which the constants and the parameters of the exogenous variables are different for at least two individuals or two time periods (Jula, 2003). For the studied problem, in terms of the national economy, we accept the assumption of total homogeneity of the panel data.

Statistics associated to the total homogeneity test H_0: $a_{1i} = a_1$, …, $a_{5i} = a_5$, $\alpha_i = \alpha$, $\forall i$ and $\beta_t = \beta$, $\forall t$, is written as:

$$F_{calc} = \frac{\frac{(SSR_r - SSR_1)}{(N-1)(k+1)}}{\frac{SSR_1}{NT - N(k+1)}}$$

followed by a Fischer-type distribution with (N-1)(k+1), that is NT-N(k+1) degrees of freedom, where N – is the number of units in the system, T – is the number of time periods and k – is the number of exogenous variables. SSR is the sum of squares of residues (Sum squared resid) from the initial model (SSR_1), namely from the restricted model under the assumption of total homogeneity (SSR_r). For N = 35 units, T = 10 time periods and k = 5, F_{calc} = 1.23 (Unweighted Statistics), inferior value to the theoretical threshold for the significance level 0.05, that is $F_{204,140;0.05}$ = 1.29. Consequently, we accept the hypothesis of complete homogeneity.

Consequently, the estimated model is of type:

$$RE_{it} = a_0 + (a_1CA_{it} + a_2CP_{it} + a_3D_{it} + a_4IC_{it} + a_5S_{it}) + e_{it}.$$

The results are as follows:

$$RE_{it} = 0.021388 \cdot CA_{it} - 0.114464 \cdot CP_{it} + 1.349364 \cdot D_{it} + \\ + 0.076854 \cdot IC_{it} - 0.863942 \cdot S_{it}.$$

This means that during the analysed period the companies with higher turnover had a better economic performance ($a_0 = 0.021388 > 0$), and the increased overheads are associated with a decline in economic performance ($a_2 = -0.114464 < 0$). Similarly, the companies that recorded liquid assets and / or bigger tangible assets had a better performance, while the growth of stocks is accompanied by a decline in economic performance of the companies in the national economy.

The results are significant from an econometric point of view (the risk associated to the null hypothesis, according to which the estimators are zero, is below 5%), and the above-mentioned factors explain more than 94% of the variation of the economic performance at the national level. The Durbin-Watson test (dw = 2.08) suggests a lack of autocorrelation of the errors. In details, the values of the estimators and the validation tests of the regression equation are presented in the following table:

Detailed model

Dependent Variable: RE?
Method: Pooled EGLS (Period SUR)
Sample: 1998 2007
Included observations: 10
Cross-sections included: 35
Total pool (unbalanced) observations: 186
Linear estimation after one-step weighting matrix
Period SUR (PCSE) standard errors & covariance (d.f. corrected)
Cross sections without valid observations dropped

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CA?	0.021388	0.011380	1.879470	0.0618
CP?	-0.114464	0.051644	-2.216408	0.0279
D?	1.349364	0.116597	11.57287	0.0000
IC?	0.076854	0.018248	4.211641	0.0000
S?	-0.863942	0.015276	-56.55472	0.0000
	Weighted Statistics			
R-squared	0.940046	Mean dependent var		-0.124657
Adjusted R-squared	0.938721	S.D. dependent var		3.278757
S.E. of regression	0.781050	Sum squared resid		110.4170
Durbin-Watson stat	2.085924			
	Unweighted Statistics			
R-squared	0.020027	Mean dependent var		-106266.4
Sum squared resid	2.38E+15	Durbin-Watson stat		3.018983

For the analysis of the stability of the results (*robustness model analysis*), the study was developed also in the cross-section structures, for each branch of the economy.

Thus, for the various branches of economy the following models have been developed:

– for agriculture:

$$(RE^{agr})_{it} = r_{1,agr}(CA^{agr})_{it} + r_{2,agr}(CP^{agr})_{it} + r_{3,agr}(D^{agr})_{it} + r_{4,agr}(IC^{agr})_{it} + + r_{5,agr}(S^{agr})_{it} + (e^{agr})_{it},$$

– for industry:

$$(RE^{ind})_{it} = r_{1,ind}(CA^{ind})_{it} + r_{2,ind}(CP^{ind})_{it} + r_{3,ind}(D^{ind})_{it} + r_{4,ind}(IC^{ind})_{it} + + r_{5,ind}(S^{ind})_{it} + (e^{ind})_{it},$$

– for trade:

$$(RE^{com})_{it} = r_{1,com}(CA^{com})_{it} + r_{2,com}(CP^{com})_{it} + r_{3,com}(D^{com})_{it} + + r_{4,com}(IC^{com})_{it} + r_{5,com}(S^{com})_{it} + (e^{com})_{it},$$

– for transportation:

$$(RE^{tr})_{it} = r_{1,tr}(CA^{tr})_{it} + r_{2,tr}(CP^{tr})_{it} + r_{3,tr}(D^{tr})_{it} + r_{4,tr}(IC^{tr})_{it} + + r_{5,tr}(S^{tr})_{it} + (e^{tr})_{it},$$

where:

- $(CA^{ram})_{it}$ – turnover of company *i* from branch *ram*, in the year *t*;
- $(CP^{ram})_{it}$ – overheads of company *i* from branch *ram*, in the year *t*;
- $(D^{ram})_{it}$ – liquid assets of company *i* from the studied branch *ram*, in the year *t*;
- $(IC^{ram})_{it}$ – tangible assets of company *i* from the studied branch *ram*, in the year *t*;
- $(S^{ram})_{it}$ – stocks of company *i* from the studied branch *ram*, in the year *t*;
- $(e^{ram})_{it}$ – errors of the regression equation developed for branch *ram*, presumed independent and identically distributed errors (I.I.D.), normal and of zero mean;
- $r_{1,ram}$ … – parameters of the model developed for branch *ram*;
- *ram* – agr = agriculture, ind = industry, com = trade, tr = transportation.

The results, shown in the following chart, are consistent and detail the result calculated for the economy as a whole:

	RESULTS OF THE EXERCISE FOR THE COMPANIES FROM:				
	Total economy	Agriculture	Industry	Trade	Transportation
CA	0.021388 (1.879)*	0.035639 (1.976)*	0.051079 (5.892)	0.030900 (1.770)*	0.058516 (114.826)
CP	-0.114464 (-2.216)	-3.073166 (-13.278)	0.095759 (3.602)	-0.496308 (-3.702)	-0.146461 (-9.161)
D	1.349364 (11.573)		1.054227 (2.202)	1.179072 (9.258)	
IC	0.076854 (4.212)	0.177910 (6.308)			0.046956 (1.935)*
S	-0.863942 (-56.555)	0.291648 (2.037)	-0.528415 (-6.144)	-0.381796* (-1.857)	
R^2	0.940046	0.720156	0.826351	0.562024	0.896400
DW	2.085924	2.149857	1.945718	1.453935	2.279835

In brackets, under the estimators, the values of the significance test t –statistics. For the values marked *, the significance of the estimators is at the threshold $\alpha = 0.10$. for the unmarked values the significance of the estimators is at least at the threshold $\alpha = 0.05$.

The blank cells in the chart mean that the respective parameters are not significant for the studied model, and have consequently been eliminated from the estimation process). For the branch *services* no conclusive results were achieved (the estimators are not significant from an econometric point of view and the model cannot be validated from the perspective of the accuracy of adjustment either, $R^2 = 0.0576$).

CONCLUSIONS

The turnover (CA) influences positively the performance of the year for all studied branches and, obviously the performance at national level. In what concerns the indicator overheads (CP), it influences negatively the performance of the fiscal period (the growth of the respective expenditures is associated with a decline in the performance of the year), except for the industry, where the growth of the size of the company is accompanied by the growth of the relative performance of the fiscal period.

The existence of certain liquid assets in the company has a positive impact over the performance of the company. The correlation is strong in industry and trade and relatively weak in agriculture and transportation (reason for which the respective indicators were eliminated from the regression equations). At aggregate level, there is a positive correlation.

On the other hand, tangible assets in agriculture and transportation are associated with a positive performance, unlike in industry and trade, where the impact is insignificant. Except for agriculture, stocks are negatively correlated with the performance of the fiscal period (a high value of the stock in the company is associated with poor performance of the year).

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APPENDIX

CALCULATION DETAILS

Dependent Variable: RE_AGR?
Method: Pooled EGLS (Cross-section weights)
Sample: 1998 2007
Included observations: 10
Cross-sections included: 9
Total pool (unbalanced) observations: 59
Linear estimation after one-step weighting matrix
Cross-section SUR (PCSE) standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CA_AGR?	0.035639	0.018039	1.975640	0.0532
IC_AGR?	0.177910	0.028205	6.307732	0.0000
S_AGR?	0.291648	0.143209	2.036512	0.0465
CP_AGR?	-3.073166	0.231449	-13.27793	0.0000
	Weighted Statistics			
R-squared	0.720156	Mean dependent var		-363860.5
Adjusted R-squared	0.704891	S.D. dependent var		1347212.
S.E. of regression	753680.8	Sum squared resid		3.12E+13
Durbin-Watson stat	2.149857			
	Unweighted Statistics			
R-squared	0.713128	Mean dependent var		-388922.1
Sum squared resid	3.72E+13	Durbin-Watson stat		3.215378

Dependent Variable: RE_IND?
Method: Pooled EGLS (Period weights)
Sample: 1998 2007
Included observations: 10
Cross-sections included: 9
Total pool (unbalanced) observations: 49
Linear estimation after one-step weighting matrix
Cross-section weights (PCSE) standard errors & covariance (d.f. corrected)
Cross sections without valid observations dropped

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CA_IND?	0.051079	0.008669	5.891878	0.0000
CP_IND?	0.095759	0.026588	3.601652	0.0008

S_IND?	-0.528415	0.086002	-6.144257	0.0000
D_IND?	1.054227	0.478775	2.201926	0.0328

Weighted Statistics			
R-squared	0.826351	Mean dependent var	28049.94
Adjusted R-squared	0.814775	S.D. dependent var	251198.2
S.E. of regression	103387.0	Sum squared resid	4.81E+11
Durbin-Watson stat	1.945718		

Unweighted Statistics			
R-squared	0.621299	Mean dependent var	3172.276
Sum squared resid	6.91E+11	Durbin-Watson stat	1.891453

Dependent Variable: RE_COM?
Method: Pooled EGLS (Cross-section SUR)
Sample: 1998 2007
Included observations: 10
Cross-sections included: 9
Total pool (unbalanced) observations: 42
Linear estimation after one-step weighting matrix
Cross-section SUR (PCSE) standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CA_COM?	0.030900	0.018426	1.676998	0.1018
CP_COM?	-0.496308	0.134070	-3.701846	0.0007
D_COM?	1.179072	0.127355	9.258154	0.0000
S_COM?	-0.381796	0.205622	-1.856787	0.0711

Weighted Statistics			
R-squared	0.562024	Mean dependent var	-0.062892
Adjusted R-squared	0.527447	S.D. dependent var	1.066591
S.E. of regression	0.734202	Sum squared resid	20.48403
Durbin-Watson stat	1.031773		

Unweighted Statistics			
R-squared	-0.026753	Mean dependent var	-108405.6
Sum squared resid	4.07E+12	Durbin-Watson stat	0.595052

Dependent Variable: RE_TR?
Method: Pooled EGLS (Cross-section weights)
Sample: 1998 2007
Included observations: 10
Cross-sections included: 9
Total pool (unbalanced) observations: 58
Linear estimation after one-step weighting matrix
Cross-section SUR (PCSE) standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
IC_TR?	0.046956	0.024265	1.935122	0.0581
CP_TR?	-0.146461	0.015987	-9.161150	0.0000
CA_TR?	0.058516	0.000510	114.8260	0.0000

Weighted Statistics			
R-squared	0.896400	Mean dependent var	7581050.
Adjusted R-squared	0.892633	S.D. dependent var	24085516
S.E. of regression	5695173.	Sum squared resid	1.78E+15
Durbin-Watson stat	2.279835		

Unweighted Statistics			
R-squared	-0.000403	Mean dependent var	85773.07
Sum squared resid	2.29E+15	Durbin-Watson stat	2.815881

Dependent Variable: RE_SERV?
Method: Pooled EGLS (Period weights)
Sample: 1998 2007
Included observations: 10
Cross-sections included: 7
Total pool (unbalanced) observations: 67
Linear estimation after one-step weighting matrix
Cross-section SUR (PCSE) standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CA_SERV?	0.008374	0.010686	0.783602	0.4363
CP_SERV?	-0.003728	0.018223	-0.204578	0.8386
D_SERV?	0.032304	0.113952	0.283486	0.7777
IC_SERV?	0.048492	0.056585	0.856987	0.3948
S_SERV?	-0.072750	0.060325	-1.205958	0.2324

Weighted Statistics			
R-squared	0.057586	Mean dependent var	16398.77
Adjusted R-squared	-0.003215	S.D. dependent var	54961.63
S.E. of regression	55020.15	Sum squared resid	1.88E+11
Durbin-Watson stat	1.849562		

Unweighted Statistics			
R-squared	0.078609	Mean dependent var	13474.14
Sum squared resid	1.90E+11	Durbin-Watson stat	1.565883