International Journal of Economics, Commerce and Management
United Kingdom Vol. II, Issue 12, Dec 2014
http://ijecm.co.uk/ ISSN 2348 0386

A PANEL DATA ANALYSIS OF PROFITABILITY DETERMINANTS

EMPIRICAL RESULTS FROM SRI LANKAN MANUFACTURING COMPANIES

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Abstract

The study of factors determining the profitability of companies has warranted special attention over time by different fields of scientific knowledge. In this study, a balanced panel data set of Sri Lankan listed manufacturing companies was used for examining the determinants of profitability of manufacturing companies using the static panel models. For this purpose, 550 observations of 55 listed manufacturing companies over the period of 2003 – 2012 were included. Return on assets considered as a measure for profitability is a dependent variable whereas size, leverage, liquidity and tangibility are considered as independent variables. According to the findings, size is statistically significant of positive relationship with profitability whereas tangibility shows statistically significant of inverse relationship with profitability for selected listed manufacturing companies in Sri Lanka. Leverage and liquidity indicate insignificant impacts on profitability. Further research on impact on financial companies' profitability with Management Quality, Corporate Governance, and Risk Management will not only add value in explaining profitability of companies and but also add value to the academic literature.

Keywords: Profitability, Panel data, Determinants, Manufacturing Companies

INTRODUCTION

Firms' profitability and ways of improving it are hotly debated issues among managers and scholars. Identification of the sources of variation in firm level profitability is an important research theme in economics, strategic management and accounting and finance (Goddard, Tavakoli & Wilson, 2005). In the literature researchers have made a number of efforts to explore theoretical models which could be used to improve firms' profitability.

Understanding the determinants of heterogeneity in firm profitability is arguably one of the most fertile fields of analysis both for industrial economists and strategic management researchers (Kattuman, Rodriguez, Sharapov & Velazquez, 2011).

It is common knowledge that the profitability determinants of manufacturing companies is crucially important - as a main strategy for economic development – to any country adopting an export – oriented industrialization policy within an open economic environment. Several Asian countries have been very successful in adopting such a policy. Since Sri Lanka has also made significant progress in its industrialization strategies through such a policy during the past three decades, it is important to examine what the profitability determinants are in manufacturing companies when compared with their counterparts in a country that has achieved greater development in the manufacturing sector.

There has been a huge volume of literature to date that has sought to identify the determinants of firm profitability, and less number of researchers in the area has relied on panel data analysis to establish an empirical relationship in Sri Lanka. The panel nature of the data permits the estimation of dynamic profitability models over the business cycle at the level of the individual firm, to test both the persistence and cyclicality of firm profitability (McDonald, 1999).

Therefore, the purpose of this paper is to examine the determinants of profitability for a sample of Sri Lankan manufacturing firms listed in the Colombo stock exchange for the period of 2003 to 2012.

Research Question

What are the important determinants of profitability of manufacturing companies in Sri Lanka?

Objectives of the Study

In relation to the companies from business sectors engaged in manufacturing and listed on the Colombo Stock Exchange, the study:

1. identifies the determinants of profitability of the manufacturing companies in the Sri Lankan context;
2. determines the extent and nature of relationships (if any) between profitability's determinants and profitability of companies;
3. assesses the level of intensity of these factors in the profit determination of companies.

LITERATURE REVIEW

The determinants of profitability of manufacturing firms are well-established in the literature. This section will show that a number of studies have researched the determinants of profitability. According to those research, size of the firm, sales growth, market power, investment and efficiency have the strongest impact on profitability. Asimakopoulos, Samitas & Papadogonas, 2009) have attempted to identify the determinants of profitability using a sample of Greek non-financial firms in the Athens Stock Exchange. They found that Firm profitability was positively affected by the different determinants such as size of the firms, sales growth and investment, in the mean time it was negatively affected by leverage and current assets.

In studying the determinants of profitability, size of the firm and sales income are conceptualized as major determinants (Asimakopoulos et al., 2009; Sakakibara & Yamawaki, 2000; Steinerowska-Streb, 2012; Ito & Fukao, 2010); macroeconomic conditions (Sakakibara & Yamawaki, 2000) as well as a market behavioral comprising variables such as local supplier networks (Sakakibara & Yamawaki, 2000), market power and efficiency (Bennenbroek & Harris, 1995) have been taken as the determinants in past.

Determinants of profitability have also been conceptualized by using the Financial Statement Analysis. Variables for the analyses such as: Inventory turn over ratio, Debtor's turn over ratio, Creditor's velocity, Total assets turn over ratio, and Gross profit margin. Profitability as a dependent variable is represented by the Gross profit margin while other ratios are independent variables (Innocent, Mary & Matthew, 2013).

Further, the finding of some studies identifies the importance of the firm effect and business group effect in relation to the firm profitability; business group effects are the second largest influence on firm profitability after the firm effect and differences across countries appear to have little relevance in explaining heterogeneity in firm profitability (Kattuman et al., 2011).

In addition to the size of the firms, and investment, some of the other determinants have also affected profitability, such as Lagged profitability is a significant determinant of current profit margins, and that industry concentration is positively related to firm profits margins. Further, profit margins are found to be procyclical in concentrated industries but counter cyclical in less concentrated industries (McDonald, 1999).

In summary, studies researching the determinants of profitability have identified several factors in many countries. However, they do not clearly indicate which factors are the most significant in relation to the firm profitability, although different factors have been identified as determinants of profitability in different countries by using the different methods of study. This is an area this research intends to explore. Further, while current studies do indicate that panel data analysis is more suitable than other methods of study in determining the profitability of

manufacturing companies. Therefore this study also hopes to explore the relative importance of determinant of profitability by using the panel data analysis.

RESEARCH METHODOLOGY

Variables in the Study

Summary of the variables and corresponding measurements is presented in Table 1. The dependent variable is profitability as measured by the return on assets. As independent variables consider (1) Sales, given by the sales of logarithm; (2) Leverage, given by the ratio of debt to total assets; (3) Liquidity, given by the ratio of current assets to short term liabilities, (4) Asset Structure, given by the ratio of fixed assets to total assets.

Table 1: Measurement of Variables

Variables	Measurement
Dependent variable	
Profitability (PROF)	Ratio between profit and total assets (ROA)
Independent Variables	
Size (SIZE)	Logarithm of sales
Leverage (LEV)	Ratio between debt and total assets
Liquidity (LIQ)	Ratio between current assets and long term liability
Tangibility (TANG)	Ratio between fixed assets and total assets

Data Source

The data used in this present study refer to a sample of manufacturing companies listed on the Colombo Stock Exchange for the period from 2003 to 2012. Banks, insurance, finance and service related sector companies were excluded due to their line of business. With the purpose of obtaining the balanced panel, researcher considers all the companies that are present for the entire period of analysis. This resulted in a final sample of 55 companies. All secondary financial data were extracted from the published financial statements of the companies under examination.

Model Specification and Mode of Analysis

The data for this analysis use the cross sectional and time series data (balanced panel data). Panel data allows controlling for variables which we cannot observe or measure or for variable that change over time and not across entities, and therefore, this approach has advantages

compared to the cross sectional approach often used in financial research. In addition, by using panel data, it is possible to include time effects as well as to control for individual heterogeneity, which is captured by firm specific fixed or random effects components, that leads to biased results when neglected in cross section or time series estimations (Baltagi, 1995).

To estimate the results of the relationship between the profitability of Sri Lankan manufacturing companies and its determinants, the researcher used the static panel model as follows:

$$PROF_{i,t} = \beta_0 + \beta_1 SIZE_{i,t} + \beta_2 LEV_{i,t} + \beta_3 LIQ_{i,t} + \beta_4 TANG_{i,t} + \varepsilon_{i,t}$$

In which i represents the each of the companies; t represents the period of time; β_0 stands for model constant; β_i stands for the coefficiency of independent variables: $PROF_{i,t}$ is the profitability; $SIZE_{i,t}$ is the size; $LEV_{i,t}$ is the leverage; $LIQ_{i,t}$ is the liquidity; $TANG_{i,t}$ is the tangibility and $\varepsilon_{i,t}$ the error which is assumed to have a normal distribution.

EMPIRICAL ANALYSIS

Descriptive Statistics

Descriptive statistics for the variables are given in Table 2. The descriptive statistics is based on 55 manufacturing companies' 10 years data set which includes 550 observations. From observation of the descriptive statistics, it can be concluded that the profitability of manufacturing companies is noticeably unstable, since the standard deviation is above the average. In the case of explanatory variables such as Size, Leverage and Tangibility, it can be concluded that the volatility is not particularly high, since standard deviations are below the respective averages while Liquidity has high volatility due to standard deviation which is above the average.

Table 2: Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
PROFIT	550	0.1135179	0.1283976	-0.5171878	0.9118637
SIZE	550	9.1084	0.9584551	0	10.91788
LEV	550	0.5249182	0.4289879	0.0013256	5.076673
LIQ	550	2.799277	13.83048	0.1033345	316.3353
TANGIBLE	550	0.4801623	0.2149468	0.0269522	0.9956021

Multicollinearity

The variance inflation factor (VIF) for the test of multicollinearity measures the relationship of all explanatory variables concurrently. It explains how much the variance of a coefficient is inflated due to linear dependence with other explanatory variables. When the VIF is lesser, multicollinearity between explanatory variables is less and the usual rule of thumb is that any variables with a VIF greater than 10 is probably of concern. The researcher checked for VIF of the variables and all variables are within the rule of thumb 10 (Table 3). It can be concluded that there is no multicollinearity problem in this regression model.

Table 3: Variance Inflation Factor (VIF)

Variable	VIF	1/VIF
SIZE	1.07	0.936728
TANGIBLE	1.06	0.940889
LIQ	1.04	0.959739
LEV	1.04	0.965062
Mean VIF	1.05	

Static panel models

The results of panel Ordinary Least Square (OLS), Random effects and Fixed affects are reported in Table 4. Concerning statistical significance and estimated parameters, the researcher does not find significant differences among the results of applying the OLS, fixed and random effects panel models.

Based on the results obtained from the application of the static panel models, the OLS regression has high R-squared and appears to be able to explain variations in profitability. Furthermore, the F-statistics confirms the significance of all the OLS, fixed and random effects models. Considerably, the estimated coefficient of the size variables turns out to be positive and statistically significant in all cases implying that size is a significant determinant of firm profitability. It indicates that large firms enjoy higher profits compared to the small size of firms. This finding suggests that larger firms take advantage of their position in negotiating the purchasing prices for their materials inputs and this leads to reduce their average cost for improving profitability.

As expected, leverage comes out with a negative sign, indicating high debt levels with lower firm profitability, but it is not statistically significant in all static panel models.

There is a negative and statistically significant relationship between asset tangibility and profitability. The result obtained implies that Sri Lankan manufacturing companies with higher level of tangible assets, more inclined to innovation and projects for improving human capital and with greater possibilities to take advantage of long term investment opportunities are more profitable. (Nunes, Serrasqueiro & Sequeira, 2009).

The results obtained do not let me conclude that liquidity has an influence on profitability. Its shows that managers of Sri Lankan manufacturing companies with higher levels of liquidity do not make any special use of the informational advantage they have over owners to invest in projects that could affect profitability.

Table 4: Static panel models

Dependent Variable: PROF			
Independent Variables	OLS	Random Effects	Fixed Effects
SIZE	0.0407113*** (0.0051956)	0.0090173** (0.0058712)	0.0001121* (0.0064318)
LEV	-0.0066681 (0.0114365)	-0.0115022 (0.0111664)	-0.0116678 (0.0115667)
LIQ	-0.0001913 (0.0003557)	-0.0000954 (0.0002676)	-0.0000104 (0.0002683)
TANGIBLE	-0.1914005*** (0.0231162)	-0.1642435*** (0.0337692)	-0.1519508*** (0.0411134)
_Cons	-0.1613583 (0.0514867)	0.1165533 (0.0619025)	0.1916115 (0.0688593)
Observations	550	550	550
R^2	0.2321	0.1879	0.1394

*Notes: OLS, Ordinary Least Squares. *Significant at 10% level; **significant at 5% level; ***significant at 1% level.*

CONCLUSION

What are the important determinants of profitability of manufacturing companies in Sri Lanka? What is the level of intensity of these profitability determinants factors? This study initiated based on the above two questions. In Sri Lanka, manufacturing sector holds a larger portion compared with other sectors. Profitability of this sector is very much important not only in the view of the objective of shareholders, but also in the prospective of financial system stability of the economy. The sector as a whole is systematically important and due to the unsystematic risk nature of the sector, stability of every manufacturing company in the industry is essential and profitability is one way to strengthen the stability.

In this present study, the researcher used the static panel models to determine the factors that affected Sri Lankan manufacturing firms' profitability using financial data from the firms listed in Colombo Stock Exchange continuously during the 2003 – 2012 period. The

researcher applied a panel data analysis in contrast to previous studies which had been done in Sri Lanka that had analyzed the firm performance using cross sectional analysis.

The results obtained by applying different panel models are quite similar. Contrary to the empirical evidence from Sivathaasan et al., (2013), the positive relationship between size and profitability allows me to conclude that larger firms have the opportunity to negotiate with their material suppliers to reduce the cost as well as increase the profitability. This finding is consistent with the findings of Asimakopoulos et al., (2009) and Nunes, Serrasqueiro & Sequeira, (2009).

In addition, the results indicates that Sri Lankan manufacturing companies with higher level of tangible assets are the ones that present lower levels of profitability. This result is particularly relevant as it shows that companies more inclined to invest in research and development activities, and consequently innovate, are the ones with greater profitability. This is in the line with the findings of Nunes, Serrasqueiro & Sequeira, (2009).

To answer the question of the level of intensity of factors, coefficient of these factors can be considered and accordingly, tangibility records the high negative coefficient of -0.19. In the mean time, size shows a positive coefficient of 0.04. In this regards tangibility shows high intensity. However, since this study is limited to the sample of selected manufacturing companies quoted on the Colombo stock exchange, the findings of this research could be generalized to the companies similar to these categories.

Further research on impact of companies profitability with Management Quality, Corporate Governance, and Risk Management will not only add value on explaining profitability of companies and but also add value to the academic literature.

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