Panel data Fixed Effect Model for Profitability Determinants: Referencing to S&P BSE Sensex

K. Siva Nageswararao, Venkataramanaiah. M, Challa Madhavi Latha

Abstract— The present paper investigates the effect of profitability for the securities listed on S&P BSE Sensex index. The considered parameters for this analysis are size of the firm, return on assets, inventory turnover ratio, asset turnover ratio, liquidity and retained earnings. The time serioes data of 30 companies registred on the S&P BSE Sensex has been used for the period of 10 years starting from March 2007 to March 2017. The Hausman test and Wald test has been used to find the most suitable type of panel data model. Moreover, the fixed effect panel data model is also used for the purpose. Discriptive statistics like Karl Pearson's coefficient of correlation, Regression Analysis have been applied as statistical tools. The results have confirmed that the profitability has positive effect on liquidity and return on assets. The size, inventory turnover ratio, debt equity ratio, asset turnover ratio, retained earnings ratio and return on assets are found to be negative effect with dependent vaitable, i.e profitability.

Keywords: Fixed effects, Profitability, S&P BSE Sensex, Bombay Stock Exchange, Ratio analysis.

JEL Classification codes: C22, C23, C32, C33, G12

I. INTRODUCTION

Bombay Stock Exchange (BSE) is an Indian stock market and it is one of India's leading exchange groups and the oldest stock exchange in the South Asia region. In 1986, it added to the S&P BSE Sensex index, giving the BSE intend to gauge general execution of the trade. In 2000, the BSE utilized this index to open its derivatives business, trading Sensex futures contracts. The improvement of Sensex options alongside equity derivatives followed in 2001 and 2002, extending the BSE's exchanging platform.Profitability of any industry is usually evaluated by its performance and is determined by several micro and macro variables. Profitability is a financial result, which refers to when the revenues gained from a firm exceeds the expenses in a given period of time. At firms' level, profitability is measured by various profitability ratios at different cost levels; naming a few, operating ratio, net profit ratio, gross ratio, profit before tax ratio etc., and these ratios even include taxes paid, operating and non-operating expenses, cost of goods sold etc. Maximization of the shareholders wealth is the primary objective of any firm, however, from the existing literature it is evident that the prices of stocks in a stock exchange are more dynamic and volatile based on the several factors that are encountered in the daily trading. Earning announcement factor plays an essential role in influencing the prices of the stocks at a large scale. Several studies show that the relationship between stock prices and earnings are secure to be strong (Harkavy 1953; Mian*et al.*, 2010; Gordan 1959). Furthermore, profitability plays a vigorous role in terms of increasing the long-term returns, boost the income of employees, better quality of products, eco-friendly environment, generate more employment opportunities and tend to enhance the future investments.

Panel data is one of the most frequently used model, which is based on whether the individual effects are correlated with the explanatory variables or not. There are two classes are existed in the panel data. One is fixed effects panel model and the other one is random effects panel model. Fixed effects panel model explains that the individual effects are either random or not random but correlated with explanatory variables, and it represents a subject specific means. Whereas random effects panel model illustrates that the individual effects are random and uncorrelated with explanatory variables. In general, the most useful and robust model is fixed effects panel data model than random effects panel data model (Baltagi 2008). A fixed effects panel data model denotes to a regression process, which specifies that the fixed group. Each group mean is a group specific fixed quantity. Moreover in fixed effects regression process the fixed effects estimator has been used for the coefficients, which includes one time-invariant intercept for each group.

II. REVIEW OF LITERATURE

According to Sami and Mohamed (2016), there are several factors to increase Tunisian hotel profitability i.e., enhance hotel management efficiency, equity financing on moderate hotels in attractive destinations and skilled managers. A change in capital structure on profitability of BSE-FMCG sector has significant relationship between capital structure and profitability (Vinod, 2016). Gerritsen (2016) specifies that stock trading on the source of Technical Analysis (TA) recommendations does not contribute to atypical stock returns. TA trading rules are followed and the robustness check considered the

Revised Manuscript Received on May 07, 2019.

Dr. K. Siva Nageswararao, Assistant Professor, School of Management Studies, VFSTR(Deemed to be university), Guntur, Andhra Pradesh, India.

Dr. Venkataramanaiah. M, Assistant Professor of Commerce, Govt. Degree & PG College, Andhra Pradesh

Challa Madhavi Latha, Assistant Professor, Dept. of Information Technology, Faculty of Informatics, University of Gondar, Gondar, Ethiopia.

Published By:
Blue Eyes Intelligence Engineering
& Sciences Publication

recommendation revisions. Individual technical analysts repeated the same to check whether artistic recommendations exhibit different recommendations than trend following recommendations for the Dutch stock market (from 2003 to 2010).

Jacobs and Weber (2015), point to a link between limits to arbitrage, price divergence, and subsequent pairs trading profitability in the U.S. stock market as well as 34 international stock markets. Venkatachalam (2015), found that the significance level between liquidity (LIQ) and profitability of Bharath Heavy Electrical limited and relatively efficient financial position is also found in all cases as satisfactory. Al-Jafari&Samman (2015) examinethe determinants of profitability of industrial firms listed on Muscat securities market based on significance relationship between growth, size, fixed assets, working capital, financial leverage, profitability, average tax rate, etc. Dufrénot and Keddad (2014), improved Auto Regressive Stochastic Volatility model with Exogenous inputs (ARSVX) model in several manners such as return innovations, long-memory stochastic volatility, compared the case of India with other Asian markets, aggregation is uninteresting on BSE SENSEX index. Pratheepan (2014)) used static panel models to determine the factors of profitability in Sri Lankan manufacturing companies and firm performance using cross sectional analysis. In this analysis the relationship of size and profitability is positive in addition higher tangible assets present lower the profitability.

III. DATA DESCRIPTION

The study covers the secondary data for industrial firms listed on BSE-Sensex annual reports were gathered from the website of money control (www.moneyconrol.com). For the purpose of the present study, it is intended to cover all the companies listed on BSE-Sensex for the period of March 2007 to March 2017. For statistical analysis, the researcher used Eviews 9.5 software for regression and correlation.

Variables considered in this analysis

(i) Size: The size of the firm or industry is plays a major role to increase the profitability. Many researchers such as Chen & Tseng (2005), Barros & Mascarenhas (2005), Sami and LEFA (2016), are found that the positive relationship between the firm's size and profitability. However, some researchers such as Withiam (2000) and Pratheepan. (2014) are proved that the relationship between size and the profitability is negative with some specific reasons. To measure the size in this study is natural logarithm of book value. This study expected positive and significant relation.

(ii) Return On Assets (ROA):

The financial condition of the security could be measured by ROA.

This is supporting by many researchers, in which the results are provided the evidence of LIQ is explained by the profitability of pharmaceutical companies listed in Dhaka stock exchange.(Chowdhury and Amin, 2007)

(iii) Asset Turnover Ratio (ATR): It specifies the value of a company achieved revenue in relation to the value of the assets. Also used as an indicator for the performance of a company. It can be measured by Sales or revenues / Total Assets. The expected relationship was negative.

(iv) Liquidity (LIQ) : LIQ is more important for both companies and individuals. In the case of individuals, the person may rich in the form of total assets owned, even though that person may be in trouble when he or she unable to convert that assets in to cash. The working capital of the company or firm is very essential to meet day to day needs and short term profits. Less LIQ means fewer investments, so that the profitability also may effect. Khartik and Varghese (2011), Bhunia (2010), studied that the necessary reserves or working capital is essential to increase their profitability. The measurement of LIQ has been taken by the researcher is current ratio. The expected relatiship is negative with profitability.

(v) Inventory Turnover Ratio (ITR): This ratio is an important measure for evaluating a company efficiency administration in terms of turning its inventory into sales. Managing inventory levels is most important to business organizations. Furthermore, a higher ITR is preferable; it indicates that generating more sales within a certain amount of inventory. Alternatively, obsolescence or deficiencies, overstocking in the product line may point by low ITR. However, in certain situations a low price may be applicable, such as expected market shortages or rapidly rising prices. Increasing turnover ratio may reduce holding cost. Reducing holding cost increases net income and profitability. Madhusudhana&Prahlada(2009) said that the minimum level of inventory should be maintained throughout the supply chain for competitive advantage. The measurement of ITR is natural logarithm of inventory to sales has been taken. Positive relation was expected between ITR with profitability.

(vi) Retained Earnings (RE): RE refer to the cash reserves over the years that has not been reinvested in the business organization nor distributed to shareholders. The payment of dividend to investors may affects the issuing firm's RE depends on the form of dividend. The cash dividends straightly affect on RE, the stock dividends issuance is more complicated. More RE means more profitability (income that remains after accounting for the cost of doing business in a given year). On a per-share basis, the retention ratio can be expressed as 1 – (Dividends per share / EPS). Positive relation was expected between RE and profitability.

(vii) Debt Equity Ratio (DE ratio): It is indicating the relation between the debt and stakeholders' equity used to finance a firm's assets. Faruk and Habib (2010) observed that the debt coverage ratio is measured in three ways such as ratios of book value, time interest earned and debt. The ratio preference level is more than 1 if not their property is inadequate to gather their mortgage. The more DE ratio could affect the profitability. In other words low debts of the company will increase the profitability. Hutchinson and James (2010), explained DE ratio at company level and knows the company values to investors and owners. The formula for calculating DE ratio expressed as

DE Ratio = Total Liabilities / Shareholders' Equity (i)

Negatively related DE ratio with profitability was expected.

Model Specification

In the present study the result of profitability is reliant on independent variables. This analysis is based on securities under S&P BSE-Sensex. Therefore, the present study uses the following fixed effects model.

$$Y_{it} = m\left(X_{it}, \frac{t}{T}\right) + \alpha_i + e_{it}$$

Where

Y_{it} = dependent variable

X_{it}= independent or explanatory variable

Covariates $X_{it}= (X_{it}, 1 \ldots\ldots X_{it}, p)^{\tau}$, dimension p

α_i= unobserved individual effect, which is equal to zero and may be correlated with X_{it}

i= 1 …. N

t= 1…. T

e_{it}= random errors, which are independent and identically distributed

Profitability: Measured by net profit margin (NPM)

$SIZE_{i,t}$: Size of the firm

$ROA_{i,t}$: Return on Assets

$ATR_{i,t}$: Asset Turnover Ratio

$LIQ_{i,t}$: Liquidity Ratio (Current Ratio)

$ITR_{i,t}$: Inventory Turnover Ratio

$RER_{i,t}$: Retained Earnings Ratio

$DER_{i,t}$: Debt equity Ratio

Experimental Analysis

This section devoted to discuss the Hausman test, Wald test, descriptive statistics of the sample variables of the study and correlation among the sample variables. At last, researcher presents the results of regression using fixed effects least squares method.

The present analysis is done on the basis of panel data with the practical evidence on explanatory variables or factors of profitability. Furthermore, all the specified determinants are observed for each time period and each security. In this analysis the researcher used Hausman test and Wald test to find the most suitable type of panel data model.

The purpose of Hausman test is to check which one is relevant.

H0: Random effect panel data is pertinent

H1: Fixed effect panel data is pertinent

If the probability is less than 5 percent then reject null hypothesis other wise accept.

Table 1: Result of Hausman test to find the type of panel data model

Test Summary	Chi-Sq. Statistic	Chi-Sq.d.f.	Prob.
Period random	20.60816	7	0.0044

Source: Compiled by researcher

From the result of Table 1 the probability is 0.0044, which is less than 5 percent. Therefore, fixed effect model is suitable for the study.

The purpose of Wald test is to test all dummy variables, which are zero or not.

H0: Ordinary Least Squares (OLS) technique is appropriate, in which all the dummy variables are zero.

H1: Fixed effects model is appropriate, in which all dummy variables are nonzero.

Table 2 Result of Wald test to select type of regression method

Test Statistic	Value	df	Probability
F-statistic	48.53416	(8, 243)	0.000
Chi-square	388.2733	8	0.000

Source: Compiled by researcher

Table 2 reveals that the probability is less than 5 percent, which means that the dummy variables are nonzero. Hence fixed effect panel model is suitable for the study.

The descriptive statistics for the selected variables are shown in the following Table 3. Table 3 shows basic descriptive characteristics of profitability and the considered explanatory variables of the study. ITR is having high variations where standard deviation is 3441.552, which measure the efficiency of a security's operating cycle regarding stocks. Similarly, the significant variations has noticed in the Retains Earnings Ratio, ATR and ROA where the standard deviation values are 54.53, 57.63 and 11.06 respectively. This is the indication of that the securities under S&P BSE Sensex have taken more risk.

DATA INTERPRTETION & RESULTS

Table 3 Descriptive statistics of selected variables of the study

	Profitability	$ATR_{i,t}$	$SIZE_{i,t}$	$LIQ_{i,t}$	$DER_{i,t}$	$ITR_{i,t}$	$RER_{i,t}$	$ROA_{i,t}$
Mean	135.5854	75.10771	2.146921	1.726909	0.598618	603.8583	66.09905	13.05433
Median	16.68	70.74	2.174757	1.36	0.24	10.43	70.13	11.32
Maximum	9873.45	262.17	3.325639	14.22	10.3	45380.45	788.64	78.34
Minimum	-99.99	0	0.820201	0	0	0	-113.77	-20.44
Std. Dev.	784.8056	57.62726	0.459615	1.640945	1.16564	3441.552	54.52945	11.05888

Published By:
Blue Eyes Intelligence Engineering
& Sciences Publication

Skewness	9.094851	0.964961	-0.265716	3.27092	4.385626	9.545499	7.943564	1.98983
Kurtosis	98.49558	3.693032	2.611021	19.96015	27.06001	112.3465	114.5486	12.14378
Jarque-Bera	108284.4	48.18107	4.969758	3786.318	7514.592	141179.6	145469.1	1139.489
Probability	0.0000	0.0000	0.083336	0.0000	0.0000	0.0000	0.0000	0.0000
Sum	37285.98	20654.62	590.4033	474.9	164.62	166061	18177.24	3589.94
Sum Sq. Dev.	1.69E+08	909927	57.88133	737.7997	372.2885	3.25E+09	814728.4	33509.9
Obs	275	275	275	275	275	275	275	275

Table 3 illustrates the positive mean, which indicates that the down falls are less in this study period regarding specified variables. Mean is very high in ITR, which indicates that the high volume of inventory could be maintained. However, the high difference between maximum inventory turnover value of 45380.45 and the minimum value of 0.00 which indicates a latent problem in inventory or production budgeting that could affect the profitability. Lower values indicates that investment of that particular securities are not depends on their revenue and income. Whereas high values indicates that the low efficiency of the securities. Therefore, high variants are also consistent with high differences in NPM and ROA.

Table 4 Karl Pearson's Coefficient of Correlation among Sample Variables of the Study

	NPM	SIZE	LIQ	ITR	DER	ATR	RER	ROA
NPM	1							
SIZE	-0.20814*	1						
LIQ	0.126631**	0.196017*	1					
ITR	-0.02659	0.037885	-0.0462	1				
DER	-0.07229	0.010062	0.276766*	-0.06278	1			
ATR	-0.19922*	0.228793*	-0.0674	-0.01491	-0.3373*	1		
RER	-0.16727*	0.142233**	-0.01647	0.042786	-0.02829	-0.08329	1	
ROA	0.604228*	-0.24954*	0.209433*	0.010552	-0.35342*	0.231442*	-0.16728*	1

Source : Compiled by author

*. 1 percent significant level.

**. 5 percent significant level.

Note: NPM- Net Profit Margin, SIZE-Size of the firm, LIQ – liquidity, ITR – Inventory Turnover Ratio, DER- Debt Equity Ratio, ATR – Asset Turnover Ratio, RER – Retained Earnings Ratio, ROA- Return on Asset.

Table 4 shows that profitability is positive related with LIQ, and ROA. However this relationship is statistically significant. In contrast, variables such as size, ITR, DE ratio, ATR, RE ratio and ROA are found to be negatively related with profitability. Among these size, ATR, RE ratio and ROA are found to be significant relationship with profitability.

Regression Analysis:

Figure 1 illustrations the result of regression analysis. Findings from regression analyis indicate that the R referred the coefficient of the variables of the study is 0.83. R-squared which explains the measure of overall fitted model indicates that the model could explain .7983 per cent of the variability of sample variables.Therefore, it could be understood that this model explains only 79.83 percent of the symmetric variation in the dependent variable.Indirectly, nearly 20.17 percent of variation may be explained by other variables those are not fitted in the model. The same is judged by the adjusted R^2 (Adjusted R-squired).It is evident from the Table that there is significant relationship between profitability of the firms and the explanatory factors during the study period.

Overall, 79.83 percent of the variation in profitability is explained by the considered factors. Since the overall model is statistically significant (p value of F-test is 0.000), we can conclude that there is a statistically significant relationship between profitability of the securities listed under the S&P BSE-Sensex and the considered factors. This can be proven by the t-state value of 0.2258 and a P > |t| (0.8215).

Sample (adjusted): 3/01/2007 3/01/2017
Periods included: 11
Cross-sections included: 25
Total panel (balanced) observations: 275

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	49.37124	218.6276	0.225823	0.8215
SIZE	-293.3105	94.78833	-3.094373	0.0022
LIQ	-49.82324	21.11709	-2.359380	0.0191
ITR	0.009148	0.008080	1.132151	0.2587
DER	194.2924	66.25825	2.932350	0.0037
ATR	-2.067279	0.864381	-2.391630	0.0176
RER	0.083021	0.464616	0.178687	0.8583
ROA	63.57424	3.628861	17.51906	0.0000

Effects Specification

Cross-section fixed (dummy variables)
Period fixed (dummy variables)

R-squared	0.828476	Mean dependent var	135.5854
Adjusted R-squared	0.798294	S.D. dependent var	784.8056
S.E. of regression	352.4694	Akaike info criterion	14.70753
Sum squared resid	28946672	Schwarz criterion	15.25991
Log likelihood	-1980.285	Hannan-Quinn criter.	14.92921
F-statistic	27.44911	Durbin-Watson stat	2.382295
Prob(F-statistic)	0.000000		

Figure 1: Regression of fixed effects panel data.

In general, this result indicate that if the rest of all the variables are constant, an increase, say one percent, in indicator of the factor proxy by DER, may lead to increase, on an average, 194.29 per cent in the profitability of the sample security listed in BSE-Sensex.It means any increase in the DE ratio of the sample organization would cause to increase of profitability ratio. A positive and statistically significant relationship between profitability and DE as expected can be seen from Figure 1.Moreover, the positive coefficient is observed by ROA from the Figure 1, which is having the probability is 0.000. Therefore, the relation between ROA and profitability is statistically significant.

In contrast, negative and statistically significant relationship was observed in the case of size, LIQ and ATR. It means any decrease in the size, LIQ and ATR of the sample security would cause to increase of profitability ratio. i.e., on an average, the decreases of -293. 31percent of SIZE, -49.82 percent of LIQ and -2.067 per cent of ATR may increase the one percent of profitability of the security listed underS&P BSE-Sensex.

In addition to this, empirical findings of the regression on the relationship between LIQ and profitability of sample firms give a clue that there exists negetive relationship between these two variables as expected. Theoretically, more liquid assets enable the firm to get good profits comparatively those facing crunch of LIQ. But the model suggests an inverse relationship between LIQ of the security and its profitability. This strange phenomenon may account for over locking of funds in inventory.

CONCLUSION

The Hausman test and Wald test have been used to check whether the historical data is suitable for the study. It is found that the fixed effect panel data model has been fitted for the study. The relationship between profitability and prescribed determinants or factors are tested and found that the relation has been existed. In other words, the positive and significant effect has been found in the case of DE ratio(194.29) and ROA ratio (63.57). In addition to this size (-293.3105), LIQ (-49.82)and ATR (-2.06) are having the relation is inverse and significant. Furthermore, ITR (0.009) and return earnings ratio (0.08) are proved that insignificant relationship.

The present analysis concludes that the higher profitability depends on ROA ratio. In addition to this, the increase of the DE ratio requires high rate of returns and has positive impact on profitability. However no generalization can be made with respect to similar clusters in the absence of further research.

REFERENCES

1. Al-JafariMohamed Khaled & Hazem A Samman (2015), Determinants of Profitability: Evidence from Industrial Companies Listed on Muscat Securities Market, Review of European Studies, Vol. 7, No. 11, https://doi.org/10.5539/res.v7n11p303 .
2. Baltagi, B., (2008)., Econometric Analysis of Panel Data., John Wiley & Sons.
3. Barros, C. R., & Mascarenhas, M. J. (2005). Technical and allocative efficiency in a chain of small hotels, International Journal of Hospitality Management, Vol. 24(3), 415 to 436.
4. Bhunia, A. (2010)., A Study of Liquidity Trends on Private Sector Steel Companies in India, Asian Journal of Management Research, Vol. (6), pp. 1- 620.
5. Chen, H. M., & Tseng, C. H. (2005)., The performance of marketing alliances between the tourism industry and credit card issuing banks in Taiwan, Tourism Management, 26(1), 15e24.
6. Chowdhury, A., & Amin, (2007), Working capital management practiced in pharmaceutical companies listed in Dhaka stock exchange, BRAC University Journal, 4(2), 75-86.
7. Dufrénot Gilles, Benjamin Keddad(2014), Spillover effects of the 2008 global financial crisis on the volatility of the Indian equity markets: Coupling or uncoupling? A study on sector-based data, International Review of Financial Analysis, Vol 33 (C), pp.17-32, DOI: 10.1016/j.irfa.2013.07.004.
8. Faruk Hossan MdAhsan Habib (2010), Performance evaluation and ratio analysis of Pharmaceutical Company in Bangladesh, Master's thesis in international Business 15 ECTS, Department of Economic and Informatics University West ,Spring term 2010.
9. Gerritsen Dirk F. (2016), Are chartists artists? The determinants and profitability of recommendations based on technical analysis, International Review of Financial Analysi, Forthcoming Available at SSRN: http://sssrn.com/abstract=2801615.
10. Heiko Jacobs n, Martin Weber 1(2015), On the determinants of pairs trading profitability, Journal of Financial Markets, Vol 23(C), pp. 75-97.
11. Hutchinson, James (2010), Long Term Debt to Equity Ratio of a Business: Understand a Company's Value to its Investors and Owners, Journal of long term debt to equity ratio.
12. Khartik.S.K. and Varghese (2011), Profitability Analysis of Public Sector Undertaking: A Case Study of Hindustan Newsprint Limited (HNL), The Management Accountant, November 2011, Vol.46. No.11, pp.1067-1073.
13. Madhusudhana Rao.C and Prahlada Rao.K (2009), Inventory turnover ratio as a supply chain performance measure, Serbian Journal of Management 4 (1), pp. 41- 50.
14. Pratheepan, (2014), A Panel data Analysis of Profitability Determinants: Empirical results from Sri Lankan Manufacturing companies, International Journal of Economics, Commerce and Management, Vol 2(12), pp. 1-9.
15. Sami Ben Aissa and Mohamed Goaied LEFA (2016), Determinants of Tunisian hotel profitability: The role of managerial efficiency, IHEC Carthage, University of Carthage, Tunisia, Journal of Hospitality and Tourism Research, https://doi.org/10.1177/1096348014550870.
16. Venkatachalam (2015), Liquidity And Profitability Analysis Of Bharat Heavy Electrical Limited- A Case Study, Asia Pacific Journal Of Research Vol: 1. Issue Xxxi, September 2015.
17. Vinod K. Bhatnagar(2016), Effect of Change in Capital Structure on Profitability of FMCG Sector Companies, Published in Edited book, E-Governance : The Futuristic Growth of India Economy, Golden Valley Publication, Agra, pp.183-193.
18. Withiam, G. (2000), Size matters:Cornell Hotel and Restaurant Administration, Quarterly, 41(5), 15.

Published By:
Blue Eyes Intelligence Engineering
& Sciences Publication