International Journal of Economics, Commerce and Management
United Kingdom Vol. II, Issue 3, 2014
http://ijecm.co.uk/ ISSN 2348 0386

NON-LINEAR RELATIONSHIPS OF KEY DETERMINANTS IN INFLUENCING THE SHARE PRICE OF INDIA'S LARGEST PUBLIC SECTOR BANK

Rawlin, Rajveer
Acharya Bangalore Business School, Bangalore, India
samuelrr@yahoo.com

Shanmugam, Ramaswamy
Department of Management Studies, Bharathiar University, Coimbatore, India

Abstract

Banking sector reforms have influenced the functioning of the Indian banking industry in a significant manner. Indian banks have had to streamline their operations and eliminate inefficiencies to compete in the global banking domain by improving their profitability. Profitability eventually drives share price performance. Earlier work helped us identify key determinants of bank profitability and share price performance. The focus of this paper is to further study the interactions of these determinants in influencing the share price performance of a leading public sector bank in India. The key performance indicators namely deposits, advances, business-per-employee, profit-per-employee, % net non performing assets (NPA) and the capital adequacy ratio that influence bank share price performance were selected from our earlier study and subjected to curve estimation analysis. The analysis suggested a non-linear relationship between share price and these determinants. A step wise multiple regression was performed on non-linear combinations of these determinants. The natural logarithm of business-per-employee and the cube of profit-per-employee were found to be the key determinants of share price performance. This suggests that the productivity of the work force as measured by the above determinants is a key determinant of share price performance.

Keywords: Share Price, Key Performance Indicators, Indian Public Bank, Non Linear Relationships, Step Wise Multiple Regression

INTRODUCTION

Introduction of banking sector reforms have redefined the entire Indian banking landscape. A shift in marketing philosophy of banks is visible from the rising focus on customer service. However, banks are now facing a number of challenges such as technological change, stringent prudential norms, increasing competition, worrying level of nonperforming assets (NPA's), rising

customer expectations, increasing pressure on profitability, rising operating expenditure and shrinking levels of spreads. The reforms in banking sector have also brought margins under pressure. The Reserve Bank of India's (RBI) efforts to adopt international banking norms is forcing banks to adopt measures to control and maintain margins. Recent policy actions of the Reserve bank of India in defending the Rupee by raising short term interest rates has put a tremendous pressure on bank margins. Banks are now faced with declining profit and net interest margins due to rising borrowing costs. This has resulted in severe declines in the share prices of banks across the board as investors anticipate declining profits on account of rising nonperforming assets (NPA).

The share price performance of a bank is influenced by several key factors. These include but are not limited to changes in bank profitability (Chu and Lim, 1998), bank specific risks (Adenso-Diaz and Gascon, 1997), microeconomic factors such as net asset value per share, dividend percentage, and earnings per share (Uddin, 2009), changes in operating and cost efficiency (Beccalli et al., 2006) and earnings announcements (Seetharaman and Raj, 2011).

In the current research, we study the nature of the impact of some key internal factors on bank share price performance that we have identified in a recent study (Rajveer and Shanmugam, (2013)). These factors were narrowed down from a host of other factors that include deposits, advances, net NPAs, return on assets, the capital adequacy ratio, business-per-employee and profit-per-employee. The effect of these factors on bank share price performance was examined over a 10 year period spanning from 2004-2013 through curve fitting and multiple regression analysis

.

LITERATURE REVIEW

There are several factors that impact the profitability of banks (Sufian and Habibullah, (2010); Dietrich and Wanzenried, (2011)). These factors can be broadly classified as either internal determinants that originate within the firm such as bank size, capital, risk management, expenses management, and diversification (Molyneux and Thornton, (1992); Goddard et al., (2004); Bodla and Verma, (2006)) or external determinants that are outside the firm like market concentration, industry size and ownership, inflation, interest rates, money supply and Gross Domestic Product (GDP) (Athanasoglou et al., (2008); Chirwa, (2003)). Profitability in turn has been shown to be strongly influence the share price of banks (Seetharaman and Raj, 2011).

Adenso-Diaz and Gascon, 1997 tried to establish a relationship between stock performance and four different measures of partial efficiency namely production costs, branch network distribution, systematic risk and specific risk for Spanish banks using Data Envelopment Analysis (DEA). Their findings suggest that bank-specific risks are most influential in determining stock performance. Using DEA, Chu and Lim, 1998 evaluated the relative cost

and profit efficiency of six Singapore-listed banks from 1992 to 1996. They found that share price performance was influenced by changes in profits rather than cost efficiency.

Uddin, 2009 studied the impact of micro and macro economic factors on share price performance of bank leasing and insurance companies in the Dhaka stock exchange in Bangladesh through multiple regression analysis. He found linear relationship between market returns and some microeconomic factors such as net asset value per share, dividend percentage, and earnings per share. The relationship between market returns and macro economic factors was however not statistically significant.

Beccalli et al., 2006 studied the relationship between cost efficiency and share price performance of selected European Banks. They found that changes in operating efficiency resulted in changes in stock prices. They also found that share price performance of cost efficient banks was significantly better than their inefficient peers. Menaje, Jr, 2012 studied the impact of variables such as Earnings per Share, Cash Flows per Share, Cash Dividend per Share, Inflation Rate and the 3-month T-bill rate on the share price of 10 publicly listed banks in the Philippines with a multiple regression. He found that only the 3-month Treasury bill had a negative impact on share price. All other variables did not have any significant effect on bank share prices.

Seetharaman and Raj, 2011 studied the impact of Earnings per share (EPS) and earnings announcements on the share price performance of a Malaysian bank. They found a very strong positive correlation between the Bank's EPS and share price. They also found earnings announcements had a significant impact on the share price performance of the bank. Ali and Chowdhury, 2010 find no significant responses in the share prices of 25 listed Private Commercial Banks (PCBs) in Bangladesh to dividend announcements. Thus we attempt to add to the existing body of literature by studying a wider range of determinants of bank share prices over a larger time frame.

METHODOLOGY

This study used historical data to study the impact of the key variables namely, deposits, advances, business-per-employee (BPE), profit-per-employee (PPE), % Net NPA and the capital adequacy ratio that were identified as key determinants in an earlier study (Rajveer and Shanmugam, (2013) on the dependent variable namely, the share price of India's largest Indian public sector bank. The study was conducted with annual data for the past ten year period i.e. from the financial year 2004 to 2013. Historical data on all of the above were obtained from the *Capitaline* financial database (www.capitaline.com) and the Reserve Bank of India (www.rbidocs.rbi.org.in).

Q-Q plots were used to verify that the variables followed normal distributions. Curve estimation was used to determine the nature of the relationship between the variables. The relationship between non-linear combinations of the variables identified above and the dependent variable namely the share price was analyzed with the SPSS 18.0 package through a step wise multiple regression.

Correlation coefficients were determined to study the relationship between the respective variables. Significant F values from ANOVA were used to assess the statistical significance of the correlations observed at 95% confidence intervals. Relationships that were not statistically significant at 95% confidence intervals were excluded from further analysis and these variables were eliminated. Variables also exhibiting correlation coefficients less than 0.8 were excluded from further analysis. Further, The Variance Inflation Factor (VIF) was used to detect multi-collinearity.

ANALYSIS & FINDINGS

Table 1: Relationship between Share Price and Deposits: Curve Fitting Analysis

Dependent Variable (Share Price)	Independent Variable (Performance Indicators)	Model Fit	Correlation Coefficient (R)	Regression Coefficient (R^2)	F Value	Sig. F Value
Share Price	Deposits	Linear	0.875	0.766	26.20	0.001
Share Price	Deposits	Logarithmic	0.887	0.786	29.45	0.001
Share Price	Deposits	Inverse	-0.874	0.764	25.91	0.001
Share Price	Deposits	Quadratic	0.887	0.786	12.89	0.005
Share Price	Deposits	Cubic	0.888	0.788	7.42	0.019

Table 1 shows the results of curve fitting analysis. The bank's share price is considered as the dependent variable while the independent variable is deposits. Linear and non linear models were fitted to depict the relationship between the variables. Most of the relationships showed a positive correlation and were statistically significant at the 95% confidence level. Relationships were correlation coefficients exceeded 0.8 were considered for further analysis.

Table 2: Relationship between Share Price and Advances: Curve Fitting Analysis

Dependent Variable (Profitability)	Independent Variable (Performance Indicators)	Model Fit	Correlation Coefficient (R)	Regression Coefficient (R^2)	F Value	Sig. F Value
Share Price	Advances	Linear	0.871	0.759	25.14	0.001
Share Price	Advances	Logarithmic	0.859	0.739	22.60	0.001
Share Price	Advances	Inverse	-0.775	0.601	12.04	0.008
Share Price	Advances	Quadratic	0.880	0.775	12.03	0.005
Share Price	Advances	Cubic	0.887	0.787	7.40	0.019

Table 2 shows the results of curve fitting analysis. The bank's share price is considered as the dependent variable while the independent variable is advances. Linear and non linear models were fitted to depict the relationship between the variables. Most of the relationships exhibited a positive correlation and were statistically significant at the 95% confidence level. Relationships were correlation coefficients exceeded 0.8 were considered for further analysis.

Table 3: Relationship between Share Price and Business Per Employee (BPE): Curve Fitting Analysis

Dependent Variable (Profitability)	Independent Variable (Performance Indicators)	Model Fit	Correlation Coefficient (R)	Regression Coefficient (R^2)	F Value	Sig. F Value
Share Price	Business Per Employee	Linear	0.883	0.780	28.42	0.001
Share Price	Business Per Employee	Logarithmic	0.874	0.764	25.91	0.001
Share Price	Business Per Employee	Inverse	-0.820	0.672	16.42	0.004
Share Price	Business Per Employee	Quadratic	0.888	0.789	13.11	0.004
Share Price	Business Per Employee	Cubic	0.900	0.809	8.49	0.014

Table 3 shows the results of curve fitting analysis. The bank's share price is considered as the dependent variable while the independent variable is business per employee. Linear and non linear models were fitted to depict the relationship between the variables. Most of the relationships exhibited a positive correlation and were statistically significant at the 95% confidence level. Relationships were correlation coefficients exceeded 0.8 were considered for further analysis.

Table 4: Relationship between Share Price and Profit Per Employee (BPE): Curve Fitting Analysis

Dependent Variable (Profitability)	Independent Variable (Performance Indicators)	Model Fit	Correlation Coefficient (R)	Regression Coefficient (R^2)	F Value	Sig. F Value
Share Price	Profit Per Employee	Linear	0.863	0.744	23.29	0.001
Share Price	Profit Per Employee	Logarithmic	0.886	0.785	29.28	0.001
Share Price	Profit Per Employee	Inverse	0.895	0.802	32.31	0.000
Share Price	Profit Per Employee	Quadratic	0.889	0.791	13.22	0.004
Share Price	Profit Per Employee	Cubic	0.889	0.791	13.22	0.004

Table 4 shows the results of curve fitting analysis. The bank's share price is considered as the dependent variable while the independent variable is profit per employee. Linear and non linear models were fitted to depict the relationship between the variables. Most of the relationships exhibited a positive correlation and were statistically significant at the 95% confidence level. Relationships were correlation coefficients exceeded 0.8 were considered for further analysis.

The relationships between the share price and % NPA and share price and capital adequacy ratio were not statistically significant at the 95% confidence level and these variables were excluded from further analysis.

Table 5: Relationship between Profitability and Performance Indicators: Step Wise Multiple Regression Analysis

Dependent Variable	Independent Variable	Correlation Coefficient R	Regression Coefficient R^2	F Value	Sig. F Value	VIF
	Ln (Business Per Employee)					
Share Price	Profit Per Employee [3]	0.934	0.873	6.40	0.039	3.507

Table 5 shows the results of a step wise multiple regression performed taking the bank's share price as the dependent variable and non linear functions of deposits, advances business per employee and profit per employee as selected from tables 1, 2, 3 and 4 were chosen as independent variables. The step wise multiple regression eliminated most variables due to multi-collinearity issues and chose the natural logarithm of business per employee and the cube of profit per employee (VIF<5) as the most significant independent variables.

DISCUSSION

In the current study we focus exclusively on the impact of internal factors closely monitored by the RBI on the share price of India's largest public bank. These factors were selected from our earlier study (Rajveer and Shanmugam, 2013) and were further narrowed down to deposits, advances, business-per-employee and profit-per-employee in the current study. This study examined both linear and non linear relationships between profitability and the respective independent variables.

We find a strong positive correlation between linear and non linear combinations of deposits and the share price (Table 1). Deposits are often viewed as a measure of a bank's financial health and stability. In an earlier study Smirlock & Brown (1986), found a strong positive relationship between demand deposits and bank profitability. Ganesan (2001) also found a strong correlation between deposits and profitability for a group of public sector banks in

India. Profitability in turn has been shown to be strongly correlated with the share price of banks (Seetharaman and Raj, 2011).

We also find a strong positive correlation between linear and non linear combinations of advances and the share price (Table 2). Banks generate significant profits from their margins on advances. Ganesan, (2001) found a similar relationship between priority sector advances and profitability for a group of Indian public sector banks.

We find a strong positive correlation between business and profit generated-per-employee and the share price (Table 3, 4). Non linear combinations of business and profit per employee also exhibited significant correlations with profitability. These indicators help in assessing the productivity of the work force and the extent of their contribution to the operational efficiency of banks. Ben Naceur and Goaied, (2008) found that the best performing Tunisian banks are those that improve labor and capital productivity. Beccalli et al., 2006 found that changes in operating efficiency resulted in changes in stock prices.

The R^2 values observed were greater than 0.6 for all relationships studied (Table 1-4), with non linear relationships exhibiting higher R^2 values. Thus at least 60% of the total variation observed in the relationships is accounted for. The R^2 observed was highest when all the variables were taken together in a step wise multiple regression, accounting for well over 87% of the total variation. This points to a stronger dependence of the share price on the two variables business and profit per employee when compared to the other variables studied.

A step wise multiple regression analysis (Table 5) showing the combined effect of all the variables and their non-linear combinations on the share price was carried out in the study. The results showed that the natural logarithm of business-per-employee and the cube of profit-per-employee were the most important contributory variables (Table 5). With a similar multi-variate analysis Bodla and Verma, (2006) found that variables such as non-interest income, operating expenses, provisions, contingencies and spread have significant relationship with net profits. Thus indicators of the productivity of the work force such as business and profit per employee are key determinants of share price performance of India's largest public sector bank.

CONCLUSION

In this paper, we study the impact of some key internal determinants namely deposits, advances, business-per-employee and profit-per-employee on the share price of the largest Indian public bank. The effect of both linear and non linear combinations of the independent variables on profitability was assessed in the study. Linear and non linear combinations of deposits, advances, business-per-employee and profit-per-employee significantly influenced the share price. A step wise multiple regression analysis of the data indicated that the natural logarithm of business-per-employee and the cube of profit-per-employee emerged as the key

variables in influencing the share price. Thus we must consider non linear combinations of key determinants in addition to the determinants themselves while assessing their impact on the share price. The results indicate that the productivity of the work force as measured by business and profit per employee is a key determinant of share price performance for India's largest public sector bank.

REFERENCES

Adenso-Diaz, B. and F. Gascon (1997). Linking and Weighting Efficiency Estimates with Stock Performance in Banking Firms. Wharton School Working Paper, 97/21.

Ali, M.B.and T.A. Chowdhury. (2010). Effect of Dividend on Stock Price in Emerging Stock Market: A Study on the Listed Private Commercial Banks in DSE. International Journal of Economics & Finance. Vol. 2 Issue 4, p52-64.

Athanasoglou, P.P., S.N. Brissimis, and M.D. Delis. (2008)"Bank-Specific, Industry-Specific and Macroeconomic Determinants of Bank Profitability". Journal of International Financial Markets, Institutions & Money, Vol.18, Issue 2, p121-136.

Balance sheet and Profit & Loss Account of a major public bank in India, available from www.capitaline.com, accessed on 1/08/2013.

Beccalli, E., Casu, B. and C. Girardone. (2006), Efficiency and Stock Performance in European Banking. Journal of Business Finance & Accounting, 33: 245–262.

Ben Naceur, S. and M. Goaied. (2008). The Determinants of Commercial Bank Interest Margin and Profitability: Evidence from Tunisia. Frontiers in Finance and Economics 5, no. 1 106-30.

Bodla, B.S. and R. Verma. (2006). Determinants of profitability of Banks in India: A Multivariate Analysis. Journal of Services Research, Vol.6 Issue 2, p75-89.

Chirwa, E. W. (2003). Determinants of Commercial Banks Profitability in Malawi: A Co Integration Approach. Applied Financial Economics, vol.13 Issue 8, p565-571.

Chu, S.F. and G.H. Lim (1998). Share Performance and Profit Efficiency of Banks in an Oligopolistic Market: Evidence from Singapore. Journal of Multinational Financial Management, Vol. 8, pp. 155–68.

Dietrich, A. and G. Wanzenried. (2011). Determinants of Bank Profitability before and during the Crisis: Evidence from Switzerland. Journal of International Financial Markets, Institutions &Money,Vol.21 Issue 3,p307-327.

Ganesan, P. (2001). Determination of profits and Profitability of Public Section Banks in India: A Profit Function". Journal of Financial Management & Analysis & Analysis, Vol.14 Issue 1, p27-37.

Goddard, J., P. Molyneux, and J.O.S. Wilson. (2004). The Profitability of European Banks: A Cross-Sectional and Dynamic Panel Analysis, Manchester School, Vol. 72, No. 3, pp. 363-381.

Menaje, Jr. P.M. (2012). Impact of Selected Accounting and Economic Variables on Share Price of Publicly Listed Banks in the Philippines from 2002-2008. DLSU Business & Economics Review. 2012, Vol. 22 Issue 1, p35-62.

Molyneux, P. and J. Thornton. (1992). Determinants of European bank Profitability: A note. Journal of banking & Finance, Vol.16 Issue 6, p1173-1178.

performance, Applied Financial Economics, Vol.11:317-19.

Rawlin, R. and R. Shanmugam. (2013). Impact of Key Internal Determinants on Profitability and Share Price Performance of a Large Public Sector Bank in India. Journal of International Business and Economic Research, Vol.1, Issue 1, p 183-195.

Report on The Trend and Progress of Banking in India 2010-2011, available from http://rbidocs.rbi.org.in/rdocs/Publications/PDFs/0TPBI121111_FULL.pdf, accessed on 2/10/2013.

Seetharaman, A. and J.R. Raj. (2011). An Empirical Study on the Impact of Earnings per Share on Stock Prices of a Listed Bank in Malaysia. International Journal of Applied Economics & Finance. Vol. 5 Issue 2, p114-126.

Smirlock, M. and D. Brown. (1986). Collusion, Efficiency and Pricing Behavior: Evidence From the Banking Industry, Economic Inquiry, vol. XXIV, no. 1, pp.85-96.

Sufian, F and M.S. Habibullah. (2010). Accesing the Impact of Financial Crisis on Bank Performance: Empirical Evidence from Indonesia. ASEAN Economic Bulletin Vol. 27, No. 3, pp. 245-62.

Uddin, M.B. (2009). Determinants of market price of stock: A study on bank leasing and insurance companies of Bangladesh. Journal of Modern Accounting & Auditing. Jul2009, Vol. 5 Issue 7, p1-7