

ANALYSING NPA AND STOCK RETURN RELATION USING BACK TESTING MODEL

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Abstract

This study looks into how stock market returns discovers the returns and fluctuates based upon the results from bank NPA. This study's primary goal is to determine and investigate the viability of creating a swing trading model utilising data from the selective and leading banking stocks namely SBI, PNB, BOB, ICICI and HDFC listed on Indian bourses. In order to test our hypothesis, the research is conducted using daily stock prices of banks are converted into returns that are listed on the Bombay Stock Exchange (BSE) using a data set that spans 18 years ranging from 2006 to 2023. The relationship between stock returns and percentage changes in NPA is examined using panel data analysis and correlation studies to examine correlations. Panel data analysis attempts to show a negative association between the variables utilised in the study, although correlation studies cannot prove a cause and effect. The results are then used to develop a swing trading strategy and reap the rewards. The current study is unique in that it gives swing traders clear guidance on how to take advantage of fluctuations in share price brought on by the release of NPA data in order to make profits.

Keywords:

Banking, Investors, Stock Returns, Swing trading, NPA, Back Testing, Panel Data.

1. Introduction

The financial system is crucial to attaining overall economic success, a thorough examination into the relationship between the movement of non-performing assets (NPAs) and share prices has been conducted. This research is extremely relevant in light of the changing regulatory environment and the globalisation of the financial industry. Over the past few decades, a substantial body of research has focused on banking efficiency, with a focus on the Indian banking sector in particular. The amount of research on Indian banking efficiency has increased in recent years due to the structural changes in this industry. The majority of the research has focused on cross-country samples to examine banking efficiency, even though several studies have included rising nations in their analyses. Only a small number of studies, meanwhile, have examined the connection between stock success and bank efficiency. A sizable amount of work has been written about banking efficiency over the past 50 years, notably in relation to the Indian banking sector (Duca, 2007; Inoguchi, 2008).

Research on the effectiveness of Indian banks has increased as the country's banking industry has undergone structural changes (Aftab et al., 2011; Vardar, 2013 and Inyama, 2015). More recent studies have added emerging economies to their research in addition to the focus on Indian banking (Leightner & Lovell, 1998; Sufian & Habibullah, 2009 and Thagunna & Poudel, 2013). Even Nevertheless, a sizable component of the literature continues to concentrate on comparing banking efficiency between nations (Berger & Humphrey, 1997). Previous studies in this field had mostly focused on earnings data and its constituent parts as important variables for comprehending the movement in banking stocks. It has been recognised that earnings alone can only partially account for movements in stock prices. Additionally, it had been argued that a successful banking system makes the financial system more stable and is more resistant to negative shocks. Therefore, it is essential to look at the efficiency of emerging banks and comprehend how growing competitive pressures affect it. Banks have two options for increasing their profitability: increasing cost effectiveness or using market power. Prior research on accounting data and stock returns, however, frequently excluded financial institutions due to the special features of the sector, such as excessive leverage.

Recent studies in the banking sector literature have examined the association between bank performance and stock returns in an effort to address this gap. For instance, Huang (1999), examined the connection between management caliber and cost effectiveness in Taiwan's banking industry using a trans log cost function. The study found that low asset quality affects operational performance negatively and is associated with cost effectiveness. Since ignoring such factors could lead to erroneous conclusions about bank efficiency, asset quality metrics, particularly non-performing loans, have been incorporated in recent research on bank efficiency. Non-performing loans not only point to potential issues with credit evaluation and monitoring processes, but they also make the banking sector's inefficient.

Kothari and Sharma (2009) studied how banking companies performed in relation to the S&P CNX Nifty index stocks from July 2007 to June 2008. Their conclusions showed that throughout the one-year study period, the banking sector was significantly impacted by both the rising and downward movements in the Indian stock market. This observation can be linked to how much the banking and finance sectors depend on confidence among investors and depositors. However, the sector's viability is dependent on a number of variables, including strong economic fundamentals, per capita income, domestic consumption trends, GDP growth rate, and more. Makkar & Singh (2013), compared the stock returns trends among one public and one private sector banks namely SBI and ICICI Bank, at a time of economic unrest. According to their analysis, ICICI Bank's stock price was significantly more affected by the recent crisis than SBI's was. Being a publicly owned bank was cited as the main explanation for the crisis's relatively smaller impact on SBI's stock prices. Tayal et al. (2019) considered 12 Indian leading banks NPA and its ill effect on stock performance. The study concludes a significant relationship among stock prices and NPA. The regression analysis revealed significant impact of NPA on 12 banks stock prices.

In Behera and Sood (2023) studied, the causation between non-performing assets (NPAs) and nine key variables relating to liquidity, productivity, solvency, and financial profitability using Granger Test. The time frame for the study was 2005 through 2021. The long-term causality between NPAs and the nine ratios under consideration was examined using Johansen's Test of Co-integration and the Vector Error Correction Model (VECM). The study's findings indicate a link between non-performing assets and Indian banks' liquidity, productivity, operating profitability, solvency, and overall financial health. This shows that these factors have a long-term connection. Profit per employee and return on equity showed the least significant individual effects, but together, the variables strongly impacted banks' non-performing assets (NPAs), according to the regression study. Furthermore, a bidirectional association between the factors and non-performing assets was validated by the Granger causality test results utilising the VECM.

Despite of the enormous information available on banks, few studies have looked at the actual connection between share prices and bank efficiency. Particularly in emerging nations, there is a need for thorough empirical research that takes into account the relationship between efficiency and bank stock performance. With two main goals, our study seeks to close this gap. It first aims to look at the connection between NPA movement and its effect on share prices during a two-day timeframe following bank disclosure of NPAs. The second goal is to use this information to create an objectively defined trading plan for short-term traders who are interested in using NPAs and other pertinent metrics as investment indicators.

2. Research Question

The study is an attempt to answer questions as under:

- Is there any relationship between Stock Prices of selected banks within 2 days of NPA declaration and NPA measures?
- Using swing trading strategy can NPA be used as catalyst for short term investors?
- Using correlation results correctly is it possible for an investor to make good trade using NPA?

3. Hypothesis

H₀₁: There is no relation between stock returns and percentage change in NPA of studied banks.
H₀₂: There is no impact of percentage change in NPA of studied banks on stock returns.

4. Data Collection

This research study includes a selection of five commercial banks listed on the Bombay Stock Exchange (BSE) index. The choice of these banks is due to the fact that the BSE index serves as a benchmark for the wider industry, allowing for meaningful insights into the banking sector in India. The data for this study spans a period of eighteen years, from 2006 to 2023, and has been collected from the database of the Bombay Stock Exchange, as well as financial statement information obtained from www.moneycontrol.com and the RBI database. The decision to focus on this particular set of banks is based on previous studies that have consistently demonstrated their efficiency and strong performance within their respective sectors. By including these banks in our analysis, we aim to build upon the existing body of knowledge and gain a deeper understanding of the Indian banking industry.

5. Methodology, Analysis and Results

The study is carried using regression and correlation applied on stock price and NPA. Further Swing testing model is applied on the studied variables for analyzing the effect on short term market players and to validate the same it is observed on short term trade. This study will explore the immediate reflection of NPA movement of banks along with directional movement on share price discovery. The study will also unearth the use of correlation for short term traders to test the swing trading option prevailing in the capital market. The research will also use back testing model on the given variables is formulated and extemporized by testing filter for given tools and the devised model had probability to generate tremendous return to the swing traders in short run.

i. Correlation:

The study is an attempt to measure the relationship between percentage change in NPA against stock returns from two days before and after declaration of NPA by the chosen banks. The study is found to be worthwhile to those short term investors who used swing trading and benchmarks NPA as a base for evaluating the same.

Table: 1- Showing conversion of Heteroscedastic data to Homoscedastic data of Five Leading Banks (NPA and Stock Returns).

YE AR	% Change ICICI (NPA)	Stoc k Ret urns	% Change HDFC (NPA)	Stoc k Ret urns	% Chan ge SBI (NPA)	Stock Returns	% Change PNB (NPA)	Stock Returns	% Change BOB (NPA)	Stoc k Ret urns
2006-07	-0.22033	10	0.147345	5	-0.25749	9	-0.17577	-2	-0.32916	14
2007-08	0.61865	-10	0.256608	4	0.037717	-2	0.077364	-3	-0.13316	-2
2008-09	0.60813	3	0.321269	2	0.249951	-5	-0.02129	-11	-0.05439	10
2009-10	0.241434	4	0.78481	3	0.202194	-5	-0.2807	15	-0.07244	3
2010-11	-0.01763	1	-0.09011	2	0.21765	-12.1	0.248593	9	0.264405	-10
201	0.0567	5	-0.06976	4	0.259	6	0.30926	5	0.27244	-13

1-12	52				641		6			
201 2-13	- 0.0573 1	0.12	0.165549	2	0.448 915	-14.8	0.68866 6	-1	0.34801 7	3
201 3-14	0.0138 78	-2	0.155016	1.07 2	0.254 774	7	0.43457 7	2	0.58104 8	11
201 4-15	0.0893 61	6	0.247175	0.36 9	0.185 216	-5	0.33795 4	-1	0.39724 9	6
201 5-16	0.3624 12	-10	0.139968	1.53 2	- 0.082 53	-8	0.30818 5	3	0.31428 6	-10
201 6-17	0.5522 27	-11	0.244973	- 1.02	0.548 508	-13.2	0.77581 1	-2	0.91302 5	-15
201 7-18	0.4748 87	9	0.292545	1	0.134 827	-10	-0.00806	1.2	0.05281 5	-1.2
201 8-19	0.2333 56	-12	0.380053	-3	0.687 53	-15	0.44748 5	-10	0.27925 7	-3.6
201 9-20	- 0.1532 4	-3	0.265496	2	- 0.257 24	-3	-0.09878	2	-0.15785	2
202 0-21	- 0.1121 8	3	0.119586	1	- 0.147 28	1	-0.06575	1	0.36358 1	-3.4
202 1-22	0.0003 02	0.14	0.176112	-0.5	- 0.165 2	-1.1	0.35145 8	1.6	-0.03985	1.33
202 2-23	- 0.2042 9	-6	0.067593	1.02	- 0.120 66	-2	-0.12181	-3	-0.20969	7

Source: Personal computation of the author.

The table- 1 above demonstrates the percentage change in NPA and stock returns of five banks elucidating the effect of percentage change in NPA equated to stock returns before and after two days of NPA announcements. The study focused upon the understated changes among the two variables, the extent to which these variables changes and finally, resulting into termination into the trading opportunities. The table proves the magnitude is irrelevant as there is not much to explain the effect of increased or decreased NPA on stock prices of studied banks. The study pointed out that ICICI bank has a maximum NPA of 61% where as it observed decline in price of 10% and with the positive NPA of 47.48 the stock prices were 9%. HDFC bank has a maximum positive NPA of 78% and the stock prices were raised by 3%.

SBI being a leading public sector bank had a positive NPA of 68.75% and the stock prices declined to 15% and a negative NPA of 257% where the share prices grow to 9%. The almost identical trends were observed in PNB with positive NPA of 77.58% and stock prices were 2%; decrease in NPA was 28% but this leads to increase in stock returns by 15%. Finally, in BOB the increased NPA was 91.34 and the decline in stock prices were 15%, it was also observed that the decline in NPA was 32.91% leading to increase in stock returns were 14%. It can be explained from the results that there is a negative correlation prevailing among year on year change in percentage of NPA corresponding to the stock returns.

The aforementioned table unequivocally demonstrates that changes in the percentage of the bank's non-performing assets (NPA) do not offer a definitive indication of whether those changes affect stock returns. The influence of additional factors that were not taken into consideration in the correlation

studies may be to blame for this lack of association. The association between changes in stock returns and percentage changes in NPA, on the other hand, is likely to be unfavourable.

ii. Panel Data Regression Analysis:

We have performed a panel data regression analysis in order to get more trustworthy and solid results. The percentage change in NPA is the independent variable in this analysis, whereas the percentage change in share price is the dependent variable. We examined the data for pooled regression before performing the panel data analysis. The following equations are utilised in all three cases:

For Regression:

$$SR = \beta_0 + \beta_1 NPA + \varepsilon \dots\dots\dots (Eq. 1)$$

The variable SR in the analysis represents the variation in stock returns before and after the announcement of NPA results by two days. The NPA variable shows how much NPA has changed from the findings from the prior year. The values β_0 , β_1 , and ε denote the constant, the percentage change in NPA's coefficient, and the error term, respectively.

For Fixed Effect Panel Regression:

$$SR_{it} = \beta_{1i} + \beta_2 NPA_{it} + \varepsilon_{it} \dots\dots\dots (Eq.2)$$

In the context of the analysis, the variable i represents different banks (with i ranging from 1 to 5), while the variable t represents different time periods (with t ranging from 1 to 18). Equation 2 refers to the fixed effect model, wherein the intercepts vary among individual banks (5 banks in this case), but these individual intercepts remain constant across time, meaning they are time-invariant.: Here,

$$\beta_{1i} = \beta_1 + \delta_i \dots\dots\dots (Eq.3)$$

Consequently, we may determine the equation for random effect from Eqn. 2 & 3 as,

$$SR_{it} = \beta_1 + \beta_2 NPA_{it} + \varepsilon_{it} + \delta_i \dots\dots\dots (Eq.4)$$

Hence,

$$SR_{it} = \beta_1 + \beta_2 NPA_{it} + \omega_{it} \dots\dots\dots (Eq.5)$$

Where,

$$\omega_{it} = \varepsilon_{it} + \delta_i \dots\dots\dots (Eq.6)$$

Below is a display of the pooled regression, fixed effect, and random effect results:

Table: 2- Showing calculations of Regression Analysis hypothecating NPA’s impact on Stock Returns.

Regression Output among Stock Returns and Percentage Change in NPA						
Test	Values	P _i	Values	P _i	Values	P _i
Pooled Ordinary Least Square (OLS)	1.634* *	0.03 9	- 0.0292***	0.010 2	8.2325** *	0.013 4
Fixed Effect Model (FEM)	1.621* *	0.03 2	- 0.0302***	0.012 4	0.8068* *	0.063 4
Random Effect Model (REM)	1.6023 *	0.05 2	-0.0309 ***	0.028	8.3671** *	0.012

Source: Personal computation of the author

According to the above-mentioned table, it is clear that both regression tests, known as FEM (Fixed-Effect Model) and REM (Random-Effect Model), show a strong negative link between the variables, specifically stock returns and the percentage change in NPA. Our preference in this case is for a fixed-effect or random-effect model rather than a pooled regression. We anticipate that the random-effect model would be more trustworthy given the conditions and economic theory. This notion is justified by the idea that NPAs (Non-Performing Assets) ought to typically have a negative effect on stock prices, regardless of the banks involved. The error term and regressors, which are represented by the percentage change in NPA, are therefore expected to be uncorrelated. The results from the fixed-effect and random-effect models are nevertheless both statistically significant, as shown in Table 3. But the

random-effect model's (REM) F-statistics show that they are significant at the 1% level. We can therefore rely more heavily on the random-effect model. We shall perform a Hausman Test, though, to verify its applicability in this scenario. This test's results are listed below:

Table: 3- Showing calculations of Hausman Test a Cross Section Analysis between NPA and Stock Returns.

Hausman Test Outcome		
Test Summary	Chi-Sqr statistics	P _i
Cross-Section Random	0.1547	0.5142

Source: Personal computation of the author

The Hausman Test, evaluates the null hypothesis representing the Random Effect Model, demonstrates its appropriateness in this case. The probability value obtained from the test is more than 5%, leading us to reject the null hypothesis. Therefore, we can certainly claim that the Random Effect Model is appropriate for analysing the relationship between stock returns and the percentage change in NPA. This result further demonstrates how negatively the amount of NPA affects the stock returns of the various banks examined in this study. This brings up the question of whether investors may use the correlation and panel-data analysis results for swing trading in the capital market, which typically lasts only 3–4 days. Is it possible to employ a trading plan that makes NPA a variable? In order to perform back-testing and obtain data for these inquiries, a correlation and trading model is created.

Table: 4- Showing calculations of Correlation Analysis hypothecating NPA’s relation with Stock Returns along with return from the deal.

Summary of Correlation and Profit/Loss Traded										
Years	ICICI		HDFC		SBI		PNB		BOB	
r Value	-0.512		-0.127		-0.587		-0.199		-0.512	
	Win	Lose	Win	Lose	Win	Lose	Win	Lose	Win	Lose
Trades	10	7	11	6	13	4	12	5	8	9
Return	40%	8%	30%	14%	60%	10%	58%	5%	64%	12%
Total Return	32%		16%		50%		55%		52%	

Source: Personal computation of the author

The correlation analysis conducted supports the presence of a strongly negative correlation between the change in percentage of NPA and stock returns, as demonstrated in the table above. This correlation was then tested in a model to determine the potential returns that a swing trader could achieve by making trades based on this correlation. In order to enhance the model, a more comprehensive scenario was back-tested, incorporating a 2% stop loss to improve the risk-reward profile for the trader. In summary, the strategy we propose for this swing trading model can be outlined as follows:

We aim to comprehend the correlation between NPA and the 4-day movement of the banking stocks examined in this study. Building upon the negative correlation identified earlier, we will analyze the stock returns following significant events. While considering the correlation, it is important to note that the focus should not solely be on its magnitude. The only caveat is that the correlation should not be close to zero or equal to zero.

Once the trade is initiated based on the negative correlation, it is advisable to hold the stock for a period of 4 days and then exit the position at the close of the 4th day. While there is no specific profit target to set, it is recommended to implement a stop loss at 2% to manage risk. In all the observed cases, it was found that when the trader followed the negative correlation and engaged in a short trade when NPA increased (and vice versa), the winning trades exceeded the losing trades, resulting in returns of 55%, 53%, 52%, and 32% respectively. The study also indicates that in instances of perfect negative correlation, the stock returns are significantly higher, and these particular banks outperform positively correlated stocks in the market. In conclusion, it can be stated that if a swing trader employs the given correlation and enters positions 2 days prior to NPA results, exiting 2 days after, they have the potential to generate positive returns on these stocks.

6. Conclusion

Non-Performing Assets (NPAs) have constantly been a major issue for Indian banks. However, it is not only affecting banks; it also has wider effects on the economy as a whole. In particular, given that Indian banks significantly rely on interest income from lent funds, the money that are held up in NPAs have a direct impact on shareholders' investments, the profitability, and the market capitalization of the banks. The analysis came to the conclusion that NPA might not be the only or best measure for evaluating the health of a specific bank or choosing an investment. NPA can, however, act as a stimulus for earning profits by capitalising on the stock market's emotional impact and herd mentality. Although this impact is transient in nature and more motivated by feelings and intuition than by logic and analysis, it can be used to spot chances and choose wisely among investment prospects.

7. References

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