DOI : 10.21844/pajmes.v10i1.7799

Is NPA and Stock Return Related: An Empirical Study of Back Testing Model

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Abstract

This paper examines the relationship between NPA announcements by banks and the impulsive movement in stock price brought out by these announcements. Primary focus of this study is to determine whether we can create a swing trading model based on back testing the data for the banking stocks listed on the Indian bourses.To achieve this objective we created a databasespanning ten years (2006 to 2016) and collected the daily share prices of eight banks listed on Bombay Stock Exchange (BSE). The relationship between share price and changes in NPA is studied on the basis of correlation studies and panel-data analysis. Although correlation studies does not establish any significant relationship, but the result of panel-data analysis clearly shows a negative relationship between the two. The result is further utilized to develop swing trading model and get benefit out of it. The novelty of the present study is that it clearly guides the swing traders as to how to earn benefit because of fluctuations in share price due to announce of NPA result.

Keywords: *Banking, Share Performance, NPA, Correlation, Back Testing, Swing trading, Investor, Panel Data.*

Introduction

Considering the importance of the financial system in attaining the overall economic performance with changes in the regulatory environment and the globalization of financial markets, a great deal of effort has been made to investigate the relation between NPA movement and share price movement along with its application for short term trading opportunity. A large body of literature on banking efficiency spanning half a century has concentrated on the Indian Banking (Duca, 2007; Ioannidis et al., 2008; Inoguchi, 2008). Taking the structural changes in Indian banking industry into account, there is relatively more and a growing literature on Indian banking efficiency (Aftab et al., 2011;Vardar, 2013; Inyiama, 2015).

While more recent studies have expanded this analysis to several emerging countries (Leightner& Lovell, 1998; Hardy & Patti, 2001; Sufian&Habibullah, 2009; Thagunna&Poudel, 2013), a major part of the literature is dedicated in examining the banking efficiency using cross country sample (Berger & Humphrey, 1997).

Even though we have a very large volume of literature on banking efficacy, only a limited study have endeavoured to examine the association between bank efficiency and stock performance. Over the previous eras, studies have been conducted on the stock market with emphasis on the earnings information and its components as the helpful variables for identifying the movement in the banking stocks. However, since earnings can

only explain a small proportion of stock price movements, Athanasoglouet al.(2008) also point out that a profitable banking system is likely to absorb negative shocks, thus maintaining the stability of the financial system. In this respect, it is important to investigate the effectiveness of emerging banks. How banks are affected by increased competitive pressures, depends partly on how efficiently they are run. Banks can increase their profitability through either improvement of their cost efficiency or exerting their market power.Cooper et al., (2003) and Beccalli et al. (2006)points out that the literature on accounting information and stock returns typically excludes banking institutions due to their high leverage and other distinguishing characteristics of the industry. In an attempt to close this gap, studies from the banking literature have recently investigated the relationship between bank efficiency, and stock returns.

Huang (1999) by utilizing a translog cost function, examined the relationship between management quality and cost efficiency within Taiwan's banking industry. He discovered that asset quality and cost efficiency are related; the non-value-added activities of bad assets incur a negative consequence on the operating performance. In recent years, studies on bank efficiency have taken into account asset quality, specifically non-performing loans. The omission of such a variable might lead to an erroneous bank efficiency measure (Mester, 1996). This is particularly true since a large proportion of non-performing loans may signal that banks use fewer resources than usual in their credit evaluation and loans monitoring process. In addition, non-performing loans lead to inefficiency in the banking sector as founded by Altunbas et al. (2007), Fan & Shaffer (2004), and Girardone (2004). This is because efficient banks are better at managing their credit risk as highlighted by Berger & Young (1997).

In spite ofan enormousquantity of literature on the banks, theliterature still suffers from a paucity of studies on relating share price and bank efficiency effectively. Specifically, for using NPA and some other parameters as an investment direction for short term trading (Grigorian&Manole, 2002). However, the current literature continues to suffer from the lack of wide-ranging andsufficient empirical studies that contemplate on the correlation between efficiency and bank stockperformance in emerging countries.

The main objective of this study is two-fold. Firstly, it delves into investigating the relation between NPA movement and its impact on share price movement before and after 2 days of NPA declaration by the bank. Secondly, ittries to refine this knowledge in to an objectively defined trading plan for a short term trader.

Research Gap

Looking to the literature review, lot of research has been done to understand reasons of rising NPA in Indian banks, influence of microeconomic and macroeconomic factors on NPAs and impact of NPA on banks' business, its management and overall efficiency. Some work has also been done to analyse banks' stockperformance over the years. However, there appears to be not much research on estimating linkages between NPA and bank stock market returns. Therefore, this gap has been identified and is explored in the present study of "Impact of Non - Performing Assets on Stock Market Performance of listed bank stocks in India- An empirical assessment of how the two stocks – NPA and Share are related".

The study tries to answer following questions:

1. What is the relation between NPA movement and Movement of Share Price of banks within 2 days of NPA declaration?
2. Can Short term investor use NPA as catalyst for Short term trading specifically swing trading?

3. Can investor make good trade by using

NPA variable, if using correlation result correctly?

Data Collection

This study incorporates a sample of eight commercial banks out of the Bombay Stock Exchange (BSE) index as this index is the benchmark for the rest of the industry andone can make inferences about the banking industry of India through it. Data has been collected for a period of ten years (2006-16) from BombayStock Exchange database while financial statements information isgathered from the database of Moneycontrol.com and RBI data base.

Reason for choosing particular set of banks in this paper is based on old studies that have proven these banks as efficient and good performer in their respective sector (Madhvi&Srivastava, 2017)

Methodology, Analysis and Results

Two variables are considered in this study, namely NPA and Share Price, with the relationship between them being tested by the Correlation and panel regression model. The data used is tested for Swing trading model for short term trader and checking the validity of NPA to be used for short term trade. The paper explores whether NPA movement of banks immediately reflects on the Share Price and the directional momentum of this. Moreover, can this relation be used by the short term trader for swing trading opportunity in capital market.

Extensive Back testing of selected data is done and a strategy is devised and improvised by testing various filters for the selected tools. After all these testing and calibrations we can say with high probability that the model we developed can be used in the Indian banking stocks to generate a fair return for a swing trader. NPA data is being extracted from RBI and Money control database whereas share price datahas been taken from BSE and money control from 2006 to 2016. Model specification for this study is related to previous research efforts in the area of study and the analysis was guided by the following model (the base model).

A. Correlation:

Correlation study is used to measure the relation between Changes in NPA compared to preceding year and change in stock price from 2 days before to 2 days after NPA declared by banks. Study was found helpful for investor to know whether they can take NPA as catalyst for swing trading or not.

Variables Used:

Table 1: Variables Definition

Variable 1.	% Change In Share Price (Share Price before and after 2 days of declaring results)
Variable 2.	% Change In NPA (% change in NPA from last year)

(Source: Authors' Formation)

Table 2: Summary of % change in NPA to % change in Share Price

Years	SBI		PNB		BOB		Axis Bank		HDFC		ICICI		Kotak Mahindra		IDBI	
	% Δ in NPA	% Δ in Share Price	% Δ in NPA	% Δ in Share Price	% Δ in NPA	% Δ in Share Price	% Δ in NPA	% Δ in Share Price	% Δ in NPA	% Δ in Share Price	% Δ in NPA	% Δ in Share Price	% Δ in NPA	% Δ in Share Price	% Δ in NPA	% Δ in Share Price
2006-07	7	9	245	-9	-3	14	22	2	31	5	89	10	45	-2	28	2
2007-08	41	-2	4	-5	-2	-2	-7	4	47	4	75	-10	27	-3	50	4
2008-09	29	-5	-65	14	-9	10	32	3	110	2	30	3	44	-11	-12	3
2009-10	14	-5	272	3	34	3	28	11	-38	3	-16	4	-9	15	48	11
2010-11	14	-12.1	108	-4	31	-10	-2	5	-24	2	-37	1	-41	9	19	5
2011-12	28	6	118	-7	95	-13	15	-1	19	4	-23	5	12	3	73	-1
2012-13	39	-14.8	62	2	172	3	49	2	33	2	20	0.12	31	0.4	7	2
2013-14	-87	7	-86	4	-86	11	-85	-1	-83	1.072	-85	-2	-82	-2	-84	-1
2014-15	13	-5	55	-11	34	6	28	3	9	0.369	90	6	6	-2	22	3
2015-16	-29	-8	132	-2	140	-10	92	-2	47	1.532	107	-10	107	-1	144	-2

(Source: Authors' Calculation)

The above table shows the movement of Nonperforming assets and share prices of eight banks explaining the impact of change in NPA compared to preceding year on share price before two days of NPA declaring to after 2 days. We focus here in the subtle changes between the two variables, magnitude of these changes and how it culminates in to trading opportunities. In above table we can observe some important patterns, for e.g.

a) In case of SBI maximum increase in NPA of 41 % with the decrease in share price of 2% whereas in case of maximum decrease in NPA (87%) leads to only 7 % increase in share price. This points to the irrelevancy of magnitude of the movement between both variables but provides an insight on the negative correlation between YoY change in NPA and the corresponding stock price.

b) In case of Punjab National Bank Maximum increase in NPA (272%) leads to increase in share price with 3% whereas maximum decrease in NPA (86%) leads to 4 % increase in share price which again strengthen our observations in point(a) above. Similarly we can draw similar inference from other Banking stocks.

c) In case of Bank of Baroda maximum increase in NPA (172%) leads to 3% increase in share price whereas maximum decrease in NPA (86%) leads to 11% increase in share price but again no direct conclusion can be drawn about the magnitude of movement.

d) For Axis bank maximum increase in NPA (92%) leads to only 2 % decrease in share price whereas maximum decrease in NPA (85%) leads to 1 % decrease in Share Price

that was again a unexpected result for same.

e) In case of HDFC bank we found that maximum increase in NPA(110%) leads to 2 % increase in share price whereas maximum decrease in NPA (83%) leads to only 1% increase in share price that was quite surprising thing.

f) If we talk about ICICI, maximum increase in NPA (109%) leads to 10 % decrease in share price that is quite justifiable whereas 85 % decrease in NPA decrease in NPA leads to 2 % decrease in share price that shows NPA does not impact on share price movement.

g) In case of Kotak Mahindra Mahindra maximum increase in NPA(107%) leads to 1 % decrease in NPA whereas maximum decrease in NPA (82%) leads to 2 % fall in price that was again unexpected result.

h) At last for IDBI bank maximum increase in NPA (144%) leads to only 2 % decrease in share price whereas maximum decrease in NPA (84%) leads to 1 % decrease in share price that was again showing no impact of NPA on share price.

In above table it can be seen easily that movement of most of the bank's NPA does not lead to conclusion that whether changes in NPA influences the share price or not. This may be due to the influence of other factors which have not been considered in correlation studies. However, we may expect a negative relation between the changes in share price with respect change in NPA.

B. Panel Data Regression Analysis:

To get more robust result, we have performed a panel data regression, where % change in share price is taken as dependent variable and % change in NPA is taken as independent variable. Before going for panel data analysis, we have tested the data for pooled regression also. The equations used for all the three cases are as follows:

For Regression:

$$SP = \beta_0 + \beta_1 NPA + \varepsilon \quad \text{..... (Eq. 1)}$$

where SP represent % change in share price before and after two days of declaring NPA result, NPA represent % change in NPA from the last year's result, β_0, β_1 and ε represent constant, coefficient of % change in NPA and error term respectively.

For Fixed Effect Panel Regression:

$$SP_{it} = \beta_{1i} + \beta_2 NPA_{it} + \varepsilon_{it} \quad \text{..... (Eq.2)}$$

where, i represent different banks (here i = 1 to 8) and t represent different time period (here t = 1 to 10). The Eq. 2 refers to Fixed Effect because although the intercept differ across individuals (here 8 banks), each individual's intercept does not vary across time, i.e., time invariant.

For Random Effect Panel Regression:

Here,

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

Therefore, from Eq. 2 and 3, we can deduce the equation for random effect as,

$$SP_{it} = \beta_1 + \beta_2 NPA_{it} + \varepsilon_{it} + \delta \quad \text{..... (Eq.4)}$$

Hence,

$$SP_{it} = \beta_1 + \beta_2 NPA_{it} + \omega_{it} \quad \text{..... (Eq.5)}$$

where,

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

The result of pooled regression, fixed effect model and random effect model is shown below:

Table 3: Regression result between % Δ in Share Price Vs % Δ in NPA

Test						
	Value	Prob	Value	Prob	Value	Prob
Pooled OLS	1.5561**	0.0422	-0.0286***	0.0064	7.8525***	0.0064
Fixed Effect Model (FEM)	1.5988**	0.0388	-0.0300***	0.0070	1.9098*	0.0718
Random Effect Model (REM)	1.5626*	0.0590	-0.0288***	0.0064	7.9461***	0.0061

(Source: Authors' Calculations. ***, ** and * represent significant at 1%, 5% and 10% respectively)

As shown in Table 3, all the model – regression, FEM and REM, shows a negative relationship between % change in share price with % change in NPA, as expected. Here, as compared to pooled regression, our reliance is more on fixed-effect or random-effect model. According to the given condition, we expect that random-effect model should be more reliable because according to the economic theory, NPA should have negative impact on share price irrespective of the banks. Therefore, we are expecting that the error term and regressors (% change in NPA) are uncorrelated. But, as shown in Table 3, both fixed-effect and random-effect model are significant. However, F-statistics of REM is significant at 1%, therefore, we can rely more on REM. But we need to ascertain it which one is suitable in this case, hence, we'll run Hausman Test. The result of the test is given below:

Table 4: Result of Hausman Test

Test Summary	Chi-Sq statistics	Probability
Cross-Section Random	0.1341	0.7142

(Source: Author's Calculations)

As we know, the null hypothesis of Hausman Test is Random Effect Model is appropriate and in this case, the probability value is more than 10%, therefore, we fail to reject the null hypothesis. Hence, we can say that Random Effect Model is appropriate to study the relationship between % change in share price with the % change in NPA. Therefore, we can say that, beyond doubt, share price of different banks (taken here) is adversely affected by the level of NPA.

Now here the question arises that can investor make use of correlation and panel-data analysis results while doing swing trading in capital marketwhich lasts only for 3-4 days. Can there be any strategy that can prove NPA as one of the variable which can be used while trading. To get answer of all these question a correlation and trading model is setup to do back testing.

Table 5: Summary of Correlation and Win/Lose Traded

Years	SBI		PNB		BOB		Axis Bank		HDFC		ICICI		Kotak Mahindra		IDBI	
Correlation	-0.36		-0.44		-0.55		0.003		0.21		-0.13		-0.34		-0.08	
	Win Trade	Lose Trade	Win Trade	Lose Trade	Win Trade	Lose Trade	Win Trade	Lose Trade	Win Trade	Lose Trade	Win Trade	Lose Trade	Win Trade	Lose Trade	Win Trade	Lose Trade
No, of Trades	7	3	8	2	6	4	6	4	7	3	5	5	7	3	3	6
Return	50%	6%	56%	4%	67%	8%	22%	7%	18%	15%	30%	9%	43%	5%	6%	12%
Total Return	44%		52%		59%		15%		3%		21%		38%		-6%	

(Source: Author's calculation with reference to aboveTable No.2)

Above Table 5 explains the correlation between change in NPA and change in Share price. It was found in the study that all public sector banks except IDBI having negative bit insignificant relation and in case of Axis bank and HDFC were found positive but insignificant relationship.

It was further tested in model that if a swing trader makes trade on the basis of given correlation what return along with different trades he will get. To improve on this model we have also back-tested the more profound 2% stop loss scenario to improve upon the Risk-Reward profile for the trader. So in brief, the strategy we suggest for this wing trading model can be defined as follows:

1. Understand the correlation between NPA and 4-day stock movement for your banking stock.

2. On the basis of above correlation, +ve or –ve, trade this stock on the next result event.

3. Do not focus on the magnitude of the correlation only caveat being that it should not be close to zero.

4. After entering the trade, hold the stock for 4 days and exit on the close of this 4th day.

5. Do not set any profit target but it is advisable to put a loss target of 2%.

It was found in case of SBI that if trader on the basis of negative correlation, go with short trade if NPA increases and vice-versa, his winning trade will be more than losing trade with 44% return. In case of other banks as well except IDBI, all the banks were giving positive returns on basis of win lose trade.

It was found in the model that if correlation was very insignificant (close to 0) the return based on the above rules provide paltry returns whereas trades where we observe significant correlation (close to +/- 1) we can expect generating fair returns. That shows that if a swing trader on the basis of given correlation make a trade and take the position 2 days prior of NPA results to 2 days after he/she can generate positive returns on these stocks.

Conclusion

The Non - Performing Assets have always created a big problem for the banks in India. It is not justthe problem for the banks but for the economy as a whole. The money locked up in NPAs has a direct impact on shareholders' investment, profitability and market capitalization of the bank as Indian banks are highly dependent on income from interest on funds lent. This analysis has been emphasized for the period of 2006- 2016. In this period the NPA of SBI was on a rise and the stock prices were as usual in there waves. Similar observations could be made for other banking stocks as well.Through this study we can safely

conclude that NPA may not be a strong or the only criteria for judging the health of any particular bank and making an investment decision solely based on this but we can use NPA as a catalyst in generating positive returns as this can be used to identify and exploit the herd mentality of the crowd and the emotional impact, though short term, this crowd brings in to the stock market due to its actions prodding out more due to emotions than based on facts and data.

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