Gunasekaran, Indhumathi
Other Persons: Ramkumar, Rajesh G.; Selvam, Murugesan

Working Paper

Analysis of Sectoral Market Efficiency- A Study on Banking Sector

Provided in Cooperation with:
Social Science Research Network (SSRN)

ANALYSIS OF SECTORAL MARKET EFFICIENCY- A STUDY ON BANKING SECTOR

R.Rajesh Ramkumar[1], Dr.M.Selvam[2] and Dr.G.Indhumathi[3]

Abstract

The sectoral analysis quantifies the key parameters of the economy. The analysis of different sectors of economy facilitates the Government to use it as the reference guide for the formulation of economic policy. The sectoral analysis is a summary that explains the economic growth report covering different industries. The sectoral analysis of our economy focuses on the key points of the latest reforms initiated by the Government of India. In addition, the study of this nature, analyses the efficiency of corporate sectors in the stock market. The banking industry is the core sector of the economy and therefore this paper tests the market efficiency across the companies under banking sector, listed at the BSE, by using the daily closing share prices from Jan 2006 to Dec 2009. The parametric and non-parametric tests were used for analysing the sectoral efficiency of sample banking companies and it is found that the banking sector was efficient during the study period.

Keywords: Market Efficiency, Autocorrelation, Runs Test and Sectoral Analysis

1. Introduction

The sectoral analysis is employed by investors who are to select better stocks to invest in. The investors identify most promising sectors and review the performance of companies within the sector to determine which individual stock would provide better returns and ultimately, be purchased. There are three aspects that would generally affect the performance of a company's stock in the stock market. The first aspect is the performance of the individual company. The second is the performance of the market as a whole. The third is the performances of the sector

---

[1] Ph.D Research Scholar, Dept of Commerce and Financial Studies, Bharathidasan University, Tiruchirappalli-620 024, Tamil Nadu, India, Email: grrajeshfmphd@gmail.com Contact No: +919789277094

[2] Associate Professor and Head, Dept of Commerce and Financial Studies, Bharathidasan University, Tiruchirappalli-620 024, Tamil Nadu, India, Email: drmselvam@yahoo.com, Contact No: +919443025112

[3] Assistant Professor, Dept of Commerce, Mother Teresa Women's University, Kodaikanal-624101, Email: indhu_nila@rediffmail.com, Contact No: +919884434722

to which the company belongs. It is a known fact that the sectors are groups of companies which perform similar functions in the economy. The sector analysis involves the process of dividing the total market into sectors and then studying the market performance of each sector individually, so that each sector can be compared to other sector or to the market as a whole.

The sectoral analysis covers the market efficiency of different sectors of the economy. It focuses on the key points of the latest reforms of economy as initiated by the Government of India. The banking industry is one of the core sectors of the economy. Therefore, this paper tests the market efficiency across the companies under banking sector, listed at the BSE, using daily closing share prices during the study period.

2. Review of Literature

The following are the few existing research studies available on the sector analysis and they are reviewed.

Mufeed Rawashdeh and Jay Squalli (2004), in their article entitled, "**A Sectoral Efficiency Analysis of the Amman Stock Exchange",** tested the market efficiency across the four sectors, namely, banking, industrial, insurances and services in the Amman Stock Exchange (ASE). This study used daily sectoral indexes between 1992 and 2004 using variance ratio and runs tests. It is found from the analysis that the random walk and weak form efficiency hypotheses were rejected for all sample sectors.

A study entitled, **"A Sectoral Efficiency Analysis of Malaysian Stock Exchange under Structural Bank**", by Chin Wen Cheog (2008), investigated the weak form market efficiency using daily returns of nine sectoral indices in Malaysian stock market between 1996 and 2006. The study found that the sectoral indices of Malaysian stock markets were inefficient weak-form (except the property index).

The study entitled, "**The Monetary Transmission Mechanism in Pakistan: A Sectoral Analysis",** by Tasneem Alam and Muhammad Waheed, investigated the monetary transmission mechanism in Pakistan at a sectoral level. Taking the structural transformation of the economy and the monetary and financial reforms during 1990s, the researchers assessed whether the reform process exercised notable impact on the monetary transmission mechanism. The study found evidence to support sector-specific variation in the real effects of monetary policy. The

study also suggested significant changes in the transmission of monetary shock to real sector of the economy during the post-reform period.

The above literature provides an overview of different models used to study the sectoral efficiency around the world. However, there was no comprehensive study carried out in Indian stock markets. Thus an attempt has been made in this study to evaluate market efficiency in the Indian context by taking the models used in the above studies.

3. Statement of the Problem

The Capital Market is a vital institution as it facilitates economic development. It is true that so many parties are interested in knowing the efficiency of the Capital Market. The retail investors can be motivated to save and invest their savings in the Capital Market only if their securities in the market are appropriately priced. The Random Walk Hypothesis of stock prices is concerned with the question of whether one can predict future price from past prices. Many studies tested the efficiency in global stock market and also tested the random walk hypotheses for various popular indices. But in India, few studies examined the returns of the stock market especially with reference to stock indices like S&P CNX Nifty, BSE 100 Index, Nifty Junior, etc. It is important to note that there were no comprehensive studies carried out to test the sectoral efficiency in the Indian context. The individual investors are not fully informed of the sectoral efficiency in the Indian stock market. Therefore, the present study aims to investigate the efficiency of Indian Stock Market for different sectors which were actively traded in the Bombay Stock Exchange (BSE). This study analyses the market efficiency among the sample companies to under banking sectors listed in the BSE.

4. Objectives of the Study

The present study was carried out to examine the market efficiency of the banking companies listed in the BSE- Bankex.

5. Hypotheses of the Study

The present study tested the following null hypotheses

NH1: There is no normal distribution in the returns of the shares of sample banks.

NH2: There is no significant difference in the share price behavior of sample stocks.

6. Methodology of the Study

6.1 Sample Selection

For the purpose of this study, stocks of all 18 banks stocks listed in BSE Bankex were taken as the total sample population. In the banking sector, there are totally 18 companies which were listed on 2nd January 2010 and these companies were taken for this study. The details of sample companies are given in **Table-1**.

6.2 Sources and Collection of Data

The present study was mainly based on secondary data (banking stock daily returns prices) which were collected from the Prowess Corporate Database. Further, the available secondary data were collected from the Annual Reports, published research reports by banking industry etc. In addition, other related information was collected from various books, periodicals and websites like www.bseindia.com and www.yahoofinance.com.

6.3 Period of the Study

The present study was mainly intended to examine the sectoral efficiency (market) of stocks of banking companies listed in BSE Bankex from 1st January 2006 to 31st December 2009.

6.4 Tools Used for Analysis

In order to evaluate the sectoral efficiency, tools like Runs Test and Autocorrelation were used.

(a) Runs Test

It is a non-parametric test used for measuring market performance. It does not require specification of the probability distribution. It depends only on the price. They are essentially concerned with direction of changes in price.

$$M = \frac{N(N+1) - \sum\limits_{i=1}^{3} n_i^2}{N}$$

Where,

M = Expected number of runs

n_i = Number of price changes of each sign (i=1,2,3)

N = Total number of price changes.

(b) Autocorrelation

It is the statistical tool used for measuring the company's successive terms in a given time series and dependence of the successive share price changes.

$$p_k = \frac{\sum_{t=1}^{n-k}(R_t - \overline{R})(R_{t+k} - \overline{R})}{\sum_{t=1}^{n}(R_t - \overline{R})^2}$$

Where,

K = Number of lags

Rt = Real rate of returns

n = Total number of observations

P_k = Sample autocorrelation function for the lag K

R = Mean returns

6.5 Limitations of the Study

The study suffers from the following limitations

1. The study was based on secondary data, and hence it is riddled with certain limitations which are bound to be connected with the use of secondary data.

2. This study focused only on the banking sector as it is one of the core sectors of the economy.

3. All the limitations, associated with Runs Test and Autocorrelation Tests, are applicable to this study also.

7. Analysis of Market Efficiency of Banking Sector's Stocks

The analysis of market efficiency of banking stocks is arranged as follows:

7.1 Market Efficiency - Runs Test

7.2 Market Efficiency- Autocorrelation

7.1 Market Efficiency- Runs Test

Table-2 shows the analysis of Runs Test by having mean value as the base for sample banking stocks. From the above Table, it is understood that out of 18 stocks, nine stocks in the banking sector, namely, stocks of Allahabad Bank, Bank of India, Canara Bank, Federal Bank, HDFC Bank, ICICI Bank, Kodak Mahindra Bank, Oriental Bank of Commerce and Yes Bank followed the normal distribution. The Z values of these nine banks were significant under normal distribution at 5% level. Therefore, the null hypothesis (**NH1),** "There is no normal distribution in the returns of the shares of sample companies", is not fully accepted. The remaining sample stocks (the stocks of AXIS Bank, BOB, IDBI, IOB, Indusind Bank, Karnataka Bank, PNB, SBI, and UBI) did not follow normal distributions as its mean values were not significant.

The results of Runs Test by having median value as the base for sample banking stocks are given in **Table-3.** It is clear that 11 stocks out of 18 stocks in the banking sector followed normal distribution. Those stocks belong to Allahabad Bank, Bank of Baroda, Bank of India, Canara Bank, Federal Bank, HDFC Bank, ICICI Bank, Indian Overseas Bank, Karnataka Bank, Kodak Mahindra, and Oriental Bank of Commerce. Besides, the Z values for these 11 banks were significant under normal distribution at 5% level. According to the analysis, it is to be noted that majority of sample banks followed normal distribution. Hence the null hypothesis (**NH1),** "There is no normal distribution in the returns of the shares of sample companies", is rejected under median base analysis. The stocks of other banks AXIS Bank, IDBI Bank, IOB, Indusind Bank, PNB, SBI, UBI and Yes Bank did not follow normal distribution as their values were not significant.

7.2 Market Efficiency – Autocorrelation

Table-4 reveals the results of autocorrelation of sample banking stocks during the study period. It is understood from the above Table that out of 18 sample banks taken for this study, only ten banks earned significant value in all the 10 lags. Those banks are BOB, Canara Bank, HDFC Bank, ICICI Bank, IDBI Bank, IOB, Karnataka Bank, Oriental Bank of Commerce, SBI and Yes Bank. Further, it is to be noted that the values of these ten banks are significant at 5%. The analysis of autocorrelation reveals the fact that there are three banks (namely AXIS Bank, PNB and UBI) that did not earn significant value at 5% level in all the 10 lags. The analysis of stocks of Allahabad Bank reveals that its value was significant in first 5 lags but not significant in the subsequent 5 lags. In the case of Federal Bank, its value was significant in the first 3 lags

but not significant in the last 7 lags. The value of BOI and Kodak Mahindra banks showed zigzag sign in its value. Finally, the remaining one stock (Indusind Bank) reached the significant level at 1st lag only, but not the remaining 9 lags. **Chart-1** explains the autocorrelation results for the banking sector. From the above chart, it is found that the banks residuals exhibit a distinct behaviour. Some of the banks were initially positive, then became negative and after that again turned positive. This shows that the returns were not randomly distributed.

8. Findings of the Study

The following are the important findings of the study.

1. The market efficiency of banking sector was tested by Runs Test which indicated that there was no randomness in the stock market, because the returns for all sample stocks were not normally distributed.

2. It is found that nine banks, namely, Allahabad Bank, BOI, Canara Bank, Federal Bank, HDFC Bank, ICICI Bank, Kodak Mahindra Bank, Oriental Bank of Commerce, and Yes Bank followed normal distribution based on their mean values in the Runs Test.

3. Based on the median values, only 11 banks (Allahabad Bank, BOB, BOI, Canara Bank, Federal Bank, HDFC Bank, ICICI Bank, IOB, Karnataka Bank, Kotak Mahindra Bank, Oriental Bank of commerce) followed the normal distribution.

4. The results of autocorrelation for few sample banks revealed significant returns at 5% level.

5. The returns of the sample banks were not distributed randomly under the Autocorrelation Test during the study period.

9. Conclusion

The study examined the returns of 18 sample companies for market efficiency by using Runs Test and Autocorrelation Function (ACF). The study reveals that the results of both tests (Runs and Autocorrelation) for Allahabad Bank, BOI, Canara Bank, Federal Bank, HDFC Bank, ICICI Bank, Kotak Mahindra Bank, Oriental Bank of commerce support normal distribution. This shows that the above eight banks were in a good position during the study period and investors of those banks earned maximum returns in the stock market operations. This depicts the growth of banking sector and their efficiency in the Indian Capital market.

10. Scope for Further Research

The followings are pointers towards further research.

➢ The study with similar objectives could be made with reference to other sectors.

➢ BSE Sector Indices, Midcap Indices and Small Cap Indices could be taken up for further study.

➢ There could be further study to examine the information content relating to economy, political, legal procedure etc.

➢ The study to determine the market factors which affect the share price movements of the companies could be taken up.

➢ The NSE market could be researched upon with different sectors.

References

1. Anand Pandey (2003), **"Efficiency of Indian Stock Market"**, Indian Economic Journal, Vol.36, No.4 (April – June), 68-121.

2. Civleek, M.A.(1991), **"Stock Market Efficiency Revisited: Evidence from the Amman Stock Exchange"**, The Amman Stock Exchange, The Middle East Business and Economic Review, 3,27-31.

3. Chin Wen Cheog (2008), **" A Sectoral Efficiency Analysis of Malaysian Stock Exchange under Structural Bank",** American Journal of Applied Science Vol.5, No.10, 1291-1295

4. Damodar Gujarati (1999), **"Essential of Econometrics"**, Mc-Graw Hill International Publication, New Delhi

5. David Edwarrd (2005), **"Finance Statistics an Introduction"**, Springer   Publication, Mumbai.

6. Gupta S.P. (2008), **"Statistical Methods"**, Sultan Chand and Sons Publications, New Delhi.

7. Kulkarni S.N. (1978) **"Share Price Behaviour in India: A Spectral Analysis of Random Walk Hypothesis"**, Sankhya Vol. 40, series D, II 135-162.

8. Mufeed Rawashdeh Jay Squalli (2005), **"A Sectoral Efficiency Analysis of the Amman Stock Exchange"**, Working Paper No. 05-04, December 2005.

9. Pandey I.M. (2005), "**Financial Management Theory and Practice"**,   Tata McGraw Hill Publication, New Delhi.

10. Peijie wang (2003), **"Financial Econometrics Methods and Models"**, Vikas Publishing House (Pvt) Ltd, New Delhi.

11. Peter Mulder and Henri L.F.de Groot **" International Comparisons of Sectoral Energy and Labour Productivity Performance",**

12. Sharma J.L and Robert E. Kennedy (1977) **"A Comparative Analysis of Stock Price Behaviour on the Bombay, London and New York Stock Exchanges"**, Journal of Financial and Quantitative Analysis Sep 1977.

13. Tasneem Alam and muhammed Waheed **"The Monetary Transmission Mechanism in Pakistan: A Sectoral Anaysis"** http://ssrn.com/abstract=971318.

Table 1- Details of Sample Banking Sector Companies listed on 02.01.2010

Sl. No	Name of the Bank	Sl. No	Name of the Bank
1	Allahabad Bank	10	Indusind Bank
2	AXIS Bank	11	Indian Overseas Bank
3	Bank of India	12	Karnataka Bank
4	Bank of Baroda	13	Kotak Mahindra Bank
5	Canara Bank	14	Oriental Bank of Commerce
6	Federal Bank	15	Punjab National Bank
7	HDFC Bank	16	State Bank of India
8	ICICI Bank	17	Union Bank of India
9	IDBI Bank	18	Yes Bank

Source: www.bseindia.com

Table 2 - Results of Runs Test with Mean Base for sample Banking Stocks

Bank Name	N	Significance level	Z
Allahabad Bank	442	.004	-2.881*
AXIS Bank	466	.171	-1.370
Bank of Baroda	464	.166	-1.385
Bank of India	453	.025	-2.240*
Canara Bank	439	.002	-3.055*
Federal Bank	452	.021	-2.302*
HDFC Bank	456	.048	-1.981*
ICICI Bank	444	.005	-2.813*
IDBI Bank	458	.054	-1.923
Indian Overseas Bank	465	.144	-1.460
Indusind Bank	480	.704	-.380
Karnataka Bank	459	.086	-1.716
Kotak Bank	446	.007	-2.693*
Oriental Bank of Commerce	447	.009	-2.626*
Punjab National Bank	496	.587	.543
State Bank of India	487	.950	-.063
Union Bank of India	459	.076	-1.775
YES Bank	439	.003	-2.987*

Source: Computed from Prowess

*Significance at 5% level

Table 3 – Results of Run Test with Median Base for sample banking stocks

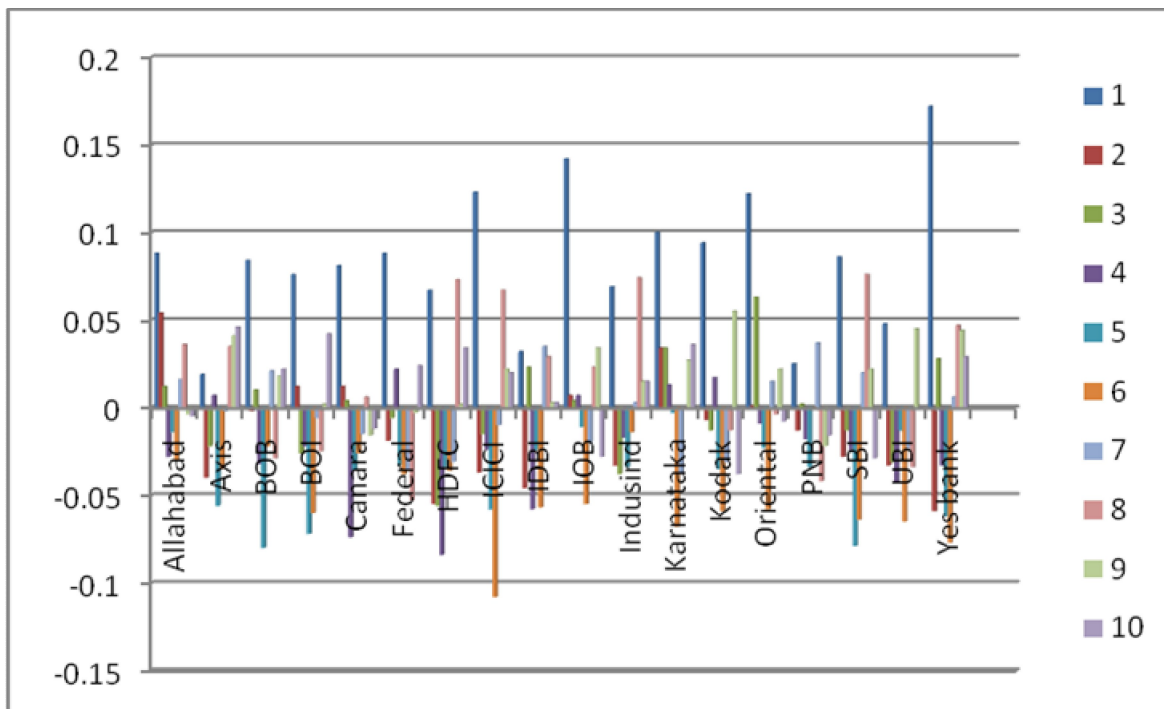| Bank Name	N	Significance level	Z
Allahabad Bank	434	.001	-3.460*
AXIS Bank	462	.096	-1.667
Bank of Baroda	456	.040	-2.052*
Bank of India	457	.047	-1.988*
Canara Bank	439	.002	-3.141*
Federal Bank	454	.029	-2.179*
HDFC Bank	456	.040	-2.052*
ICICI Bank	442	.003	-2.949*
IDBI Bank	458	.054	-1.923
Indian Overseas Bank	457	.047	-1.987
Indusind Bank	482	.701	-.385
Karnataka Bank	451	.018	-2.372*
Kotak Mahindra Bank	446	.007	-2.693*
Oriental Bank of Commerce	447	009	-2.629*
Punjab National Bank	486	.898	-.128
State Bank of India	487	.949	-.064
Union Bank of India	465	.140	-1.475
YES Bank	461	.083	-1.731

Source: Computed from Prowess

[*]**Significance at 5% level**

Table 4 - Results of Autocorrelation of Sample Banking Stocks during the Study Period

Name of the Bank	ACF& Probability	Lag 1	Lag 2	Lag 3	Lag 4	Lag 5	Lag 6	Lag 7	Lag 8	Lag 9	Lag 10
Allahabad	ACF	.088	.054	.012	-.028	-.014	-.030	.016	.036	-.004	-.005
	Probability	.006*	.006*	.015*	.023*	.043*	.054	.081	.080	.119	.168
Axis	ACF	.019	-.040	-.022	.007	-.056	-.035	-.002	.035	.041	.046
	Probability	.548	.381	.497	.657	.361	.351	.462	.446	.386	.312
BOB	ACF	.084	-.002	.010	-.032	-.080	-.022	.021	-.029	.018	.022
	Probability	.009*	.033*	.035*	.044*	.014*	.023*	.034*	.043*	.031*	.038*
BOI	ACF	.076	.012	-.026	-.022	-.072	-.060	-.006	-.025	.002	.042
	Probability	.014*	.046*	.079	.122	.030*	.014*	.025*	.035*	.055	.049*
Canara	ACF	.081	.012	.004	-.074	-.036	-.026	-.015	.006	-.016	-.012
	Probability	.011*	.037*	.045*	.018*	.021*	.031*	.049*	.028*	.016*	.022*
Federal	ACF	.088	-.019	-.006	.022	-.033	-.038	-.036	-.053	-.003	.024
	Probability	.006*	.019*	.046*	.090	.129	.142	.139	.088	.130	.158
HDFC	ACF	.067	-.055	-.056	-.084	-.034	-.036	-.031	.073	.002	.034
	Probability	.037*	.026*	.016*	.002*	.002*	.003*	.004*	.001*	.002*	.003*
ICICI	ACF	.123	-.037	-.015	-.024	-.058	-.108	-.010	.067	.022	.020
	Probability	.000*	.000*	.001*	.002*	.001*	.000*	.000*	.000*	.000*	.000*
IDBI	ACF	.032	-.046	.023	-.058	-.024	-.057	.035	.029	.003	.003
	Probability	.009*	.012*	.024*	.013*	.021*	.012*	.014*	.018*	.030*	.047*
IOB	ACF	.142	.007	.004	.007	-.011	-.055	-.020	.023	.034	-.028
	Probability	.000*	.000*	.000*	.001*	.001*	.001*	.001*	.002*	.003*	.004*
Indusind	ACF	.069	-.033	-.038	-.017	-.034	-.014	.003	.074	.015	.015
	Probability	.031*	.057	.069	.117	.130	.190	.272	.078	.110	.148
Karnataka	ACF	.100	.034	.034	.013	-.003	-.068	-.038	-.001	.027	.036
	Probability	.002*	.004*	.007*	.016*	.031*	.010*	.011*	.020*	.026*	.027*
Kodak	ACF	.094	-.007	-.013	.017	-.035	-.059	-.031	-.013	.055	-.038
	Probability	.003*	.014*	.033*	.060	.068	.034*	.0418	.064	.038*	.038*
Oriental	ACF	.122	.001	.063	-.009	-.023	-.058	.015	-.004	.022	-.008
	Probability	.000*	.001*	.000*	.001*	.002*	.001*	.002*	.004*	.006*	.010*
PNB	ACF	.025	-.013	.002	-.018	-.034	-.001	.037	-.042	-.022	-.016
	Probability	.435	.677	.854	.893	.818	.898	.828	.723	.761	.812
SBI	ACF	.086	-.028	-.013	-.024	-.079	-.064	.020	.076	.022	-.029
	Probability	.007*	.018*	.042*	.037*	.011*	.005*	.008*	.002*	.003*	.003*
UBI	ACF	.048	-.033	-.031	-.043	-.013	-.065	-.023	-.034	.045	.000
	Probability	.134	.189	.232	.194	.284	.111	.144	.151	.123	.173
Yes bank	ACF	.172	-.059	.028	-.033	-.062	-.077	.006	.047	.044	.029
	Probability	.000*	.000*	.000*	.000*	.000*	.000*	.000*	.000*	.000*	.000*

Source: www.bseindia.com, *Significance at 5% level

Chart 1 - The Chart showing the Result of Autocorrelation for Banking Sector

Source: Computed from Table-4