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An empirical study of Co-integration and Casual relationship between Indian Capital Market and Banking Sector

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Abstract

Global markets always plays key role on banking and financial sectors, this we have seen in global financial crises 2008. Predicting the banking sector stocks along with Nifty index is possibly one of the very toughest exercises in Indian Capital Markets. The present study focuses on Short & Long term dynamics of the Banking industry in Indian capital market. The Banking sector along with Nifty Index Regular closing monitory value is a sample to the analysis between January 2015 and December 2021. In the paper, ADF test is embarked to examine immovability of data and is evident that it is un-movable at initial difference level. The Johansen co-integration test of Johansen is applied to assess long-term balance of Nifty Index analysis with the Banking sector and to define the co-integration of the variables. Granger causality test is used to regulate causal & short-term relationship of the variables with the corresponding bidirectional of the causality among the variables.

Keywords: Banking sector, Nifty 50 index, ADF test, Engle granger causality test, Johansen co integration, Global markets

Introduction:

At Present situation banking sector is backbone for the economy. When you see back to 2019 banks are played very crucial role and this impact very badly on NPA. After privatization and globalization, Indian Capital markets have become more integrated worldwide (Amalendu Bhunia and Devrim Yaman 2017). Due to independent movement of capital in financial markets, international capital markets and economies became progressively more integrated in the mid-1990s of globalization. Indian stock exchanges are popular not only in Asia, But also in global markets (Rajesh et al 2019). This stock-market reform process continued with successful FDI trend control in many sectors and capital market integration. Integrated capital markets can associate price fluctuations with other markets and mcro-Influenced financial markets, such as crude oil prices, gold prices, exchange rates (al bitah et al 2020). Capital market plays a pivotal role in Indian economy development and achieving the economic goals of various industries

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(Srihari 2017). Stock market is a place for selling long term debt or shares. It has two section forms; one is primary and later is secondary.

In primary market helps companies collect funds by selling shares, and tributary market is the succeeding security sales and purchases (Liddle, B. 2013).. The Countries foremost stock exchanges are Bombay stock exchange and the NSE (Mahaub basha et al 2017). The dawn of technology to markets primarily led to investor's trading and settlement processes (Nymoen, R. 2019).

Private and public sector banks are most influence factor for countrys Gdp. India's banking sector is sufficiently capitalized and well-regulated. The financial and economic conditions in the country are far superior to any other country in the world. Credit, market and liquidity risk studies suggest that Indian banks are generally resilient and have withstood the global downturn well. Indian banking industry has recently witnessed the roll out of innovative banking models like payments and small finance banks. RBI's new measures may go a long way in helping the restructuring of the domestic banking industry. The digital payments system in India has evolved the most among 25 countries with India's Immediate Payment Service (IMPS) being the only system at level five in the Faster Payments Innovation Index (IBEF Report 2020)

Literature Reviews:

Ravi Kumar (2015) study aimed to examine the dynamic relationships between crude oil price, domestic gold price and nifty and the cointegration relationship as well. Increasing crude oil prices will increase the production costs which will affect cash flow and decrease stock prices. Investors are showing fewer concerns in the stock markets and investing in yellow metals due to increasing trend in gold prices on account of no fear and no future loss. The study based on secondary data and sources including NSE database, West Texas Intermediate (WTI) crude oil spot price quoted in US dollar (USD) and World Gold Council database for the period from April 1, 2004 to March 31, 2014. In the process of analysis, ADF unit root test, Johansen cointegration analysis and Granger causality test had been used. The study concluded that the empirical results are that the selected time series exhibit nonstationary and hence provide indication of no long-term cointegration relationship. Multivariate cointegration test results indicate that long-term cointegration is not stable relationship. Granger causality test result showed that there is no causality among the variables except Nifty and Oil Price.

Amanjot Singh and Manjit Singh (2016) in their study attempted to capture long run and short run inter-linkages and causal relationships between the US and BRIC equity markets during different time frames, i.e., pre-crisis, crisis and post-crisis periods. The study employs Johansen cointegration, VAR, VECM, Toda-Yamamoto's Granger causality, generalized impulse responses, and variance decomposition models to account for the said linkages. For the full sample period analysis, Gregory–Hansen cointegration and Diebold and Yilmaz's (2011)

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spillover index approaches are also employed. The results relating to the short run dynamics report that there is only uni-directional causality running from one market to another during pre-crisis, crisis and post-crisis periods. However, for the full sample period, bi-directional causality elements are also observed between the US-Brazilian and US-Russian markets. The market responses are largely transitory in nature, decaying after a few days during the crisis and full sample periods in the context of non-cointegrated variables. During the pre-crisis and post-crisis periods, the stimulated impulse responses generally highlight a substantial shift in the long run equilibrium relationship in the event of any market shock. Expectedly, there is uni-directional causality running from the US to BRIC equity markets during the crisis period. However, the Chinese equity market is found to be independent, driven by its own market shocks. These findings are critically important for the portfolio managers in their attempt of analyzing predictive power of one market in explaining movements in another. Overall, the results report changing market dynamics and partial integration across the years 2004–2014. So, there are short run portfolio diversification benefits available to the international investors. The impact of the US market on other BRIC equity markets is quite obvious during the crisis period, however, ever since the financial crisis, both the US and Brazilian markets are exerting stronger dynamic influence on other BRIC equity markets. These linkages further highlight the role of domestic investors and fiscal policies against adverse cross market dynamics. So, an understanding of long run as well as short run causal relationships is of paramount interest.

A Anjali et al (2015) analyzed the long-term liaison amongst the federal bank capital market and banking. Secondary data was used from 1 January 2005 to 31 December 2014. Study analyzed ADF test, Granger test and analysis of co-integration. Co-integration study by Johansen revealed unidirectional movement between nifty and federal banks. Researchers came to conclusion that, the NSE effects contribute to banking sector movement.

Jiya tom (2020) studied Nifty 50 stock price macro variables from 2006 to 2017. FII has unit root after Initial variance finds patterns in Nifty 50, IIP, call currency, WPI and interchange rates. The co-integration test by Johansen showed that there is co-integration among the variables suggesting continuing equilibrium affiliation amongst macro variable and Nifty 50 index. Researcher concluded that granger causality test indicates exchange rates can affect nifty, but nifty does not affect exchange rates.

Amalendu Bhunia and Devrim Yaman (2017) examined whether there is a causal relationship between selected stock markets in Asia and the US. The study found a positive association between the latter and most of the Asian stock markets in our sample. An exception is the Vietnamese stock market, which has a negative correlation with the US financial market, indicating opportunities for diversification by investors. The time series stock index values are not stationary at level but stationary at first difference. The Johansen cointegration test results indicate that all the stock markets have a long-run association of the same order. The VECM test

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results confirm that there is significant long-run as well as short-run causality in both directions between the US financial market and the rest of the sample. These findings reflect the degree of integration between the US and Asian stock markets, but also point to valuable opportunities for international investors to diversify their portfolios across these markets.

Eddie Simiyu et al (2020) investigated Kenya's stock market shocks. Consuming Johansen's co-integration, Vector fault rectification model and its effects resulted in bidirectional granger connection amongst the manufacturing and associated banking segments. There is no causality between investment and manufacturing industries. However, the study found that impulse retort investigation showed that shocks from other sectors to manufacturing and related sectors were less important. Shocks in banking sector were most powerful in their ability to respond from other market indices. This study concluded that the banking sector has the greatest propensity to affect volatility in other sector shocks.

Nsisong P et al (2016) explored the complex relationship amongst crude oil values and stock market pointers and Nigerian economic progress using VAR model and Johansen co-integration study. Study found the long-term sustainable relationship between variables using Johansen co-integration tests. Extended affiliation with a vector-autoregressive order model VAR (3). They concluded that crude oil values, movement of stock markets and economic growth have an extended affiliation.

D Bhuvaneshwari et al (2017) evaluated co-integration and causality amongst Nifty 50 shock values and altercation rates since January 2006 to December 2015. Researcher evaluated Johansen lack of extended affiliation amongst nifty and exchange rates. Variables do not co-integrate long-term relationships, but short-term causality relationships were strong between shock values and nifty-fifty. Study settled that there is a short-term association amongst shock values and exchange rates. Many analysts performed various sectoral capital market studies in India and other global markets. Many studies testing Johansen's co-integration and Granger's causality test among different sectors. This study explores the possible Banking sector relation with Nifty 50 index.

Mazhar M. Islam(2019) investigated the dynamic linkages among the equity markets of the US (proxied by S&P 500), Germany(proxied by DAX30 , France (proxied by CAC30), UK (proxied by FTSE100) and other 14 other major Eurozone markets (proxied by STOXX 600) using daily stock series from March 3, 2010 through April 17, 2018. Data are collected from the Bloomberg Database and the econometric models are estimated applying the most recent version of Econometric software (EViews 11). Jarque-Bera statistic shows non-normal distribution of the series. Augmented Dicky Fuller test indicates nonstationarity in level series and stationary in first Differenced series. Applying Johansen Cointegration technique the study finds that stock price indices of these countries have long-run (equilibium) relationship. Applying the Granger-causality test, strong unidirectional causality has been detected from the US to 16 European

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markets except for the UK. No causality has been found from the European markets to the US market, indicating that the US market is the leader and the Euro markets are the followers. This is not surprising given the robust US economic growth during the period of our study A strong unidirectional Granger causality has been detected from Germany to the France market with 1 through 5 days lag. A weak unidirectional Granger causality is found from the UK to other Eurozone markets, and from the French to the UK market. In the case of Europe, Frankfurt stock market strongly affects the Paris bourse as well as other Eurozone markets. This result is also not surprising given the high economic growth rates of Germany and French during the sample period and the unfavorable impact of Britain exit from the European Union (BREXIT).

Objectives

1. To study the co-integration relationship between Banking sector and Nifty Index
2. To study the casual relationship between Banking sector and Nifty Index

Hypothesis

The below mentioned hypothesis are set to empirically verified to study the aforesaid objectives

$H_{1:}$ There is non-stationary exists between the banking sector and Nifty Index

$H_{2:}$ There is no long-term equilibrium relationship amongst the variables

$H_{3:}$ There is no causality prevailing amongst the variables

Data and Research Methodology

Present paper targets at scrutinizing the co-integration and causal affiliation amongst Banking sector index and Nifty 50 index for the period of January 2015 and December 2021.The daily closing prices of both Banking sector and Nifty collected from NSE

The key statistical tools used in the study are ADF unit root test, Johansen cointegration and Granger causality tests.

Testing for Unit root test

The ADF unit root test is applied to check the immobile of the present study along with it to find the direction of integration between the variables.

The Augmented Dickey – Fuller unit root test is grounded on the Null hypothesis *(H_0):* Unit root is existent in yt this point outs that yt is not *I(0),* i.e., is not integrated of order at level *(0),* which implies yt is un-stationary. If the premeditated Augmented Dickey – Fuller unit root test statistics is fewer than null hypothesis is prohibited, or else null hypothesis is acknowledged. If the facts is identified non-stationary at a level, the Augmented Dickey – Fuller unit root test is to be testing a unit root. In the above situation, stationary data to be co-integrated at first level *I(1).*

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Johansen's Cointegration Test

Johansen cointegration test is an econometric variables test that predicts the long-term affiliation amongst 2 or more variables based on ADF test. The co-integration of Johansen defines the number of co-integrated vectors for whichever number of non-stationary variables of parallel level order and most cases at *I(1)*. This implies that two or more variables are co-integrated if either of time series variables is immobile

The key point here is that if the variables are in long-term affiliation amongst Yt and Xt, the variables will grow in due moment and there will be a general tendency to link them. What we need is a linear blend of Yt and Xt that is a stationary variable *(I(0)* for a balance or long-run relationship to occur.

Johansen advises 2 trials statistics that is, λmax statistics and λtrace statistics to regulate the co-integrating rank (number of co-integrating associations). The trials statistcs institutes the rank of the π matrix built on its Eigen standards (and henceforth the number of co-integrating associations)

$(r)=-T\ (1-\lambda\ i)\ ki=r+1$ (1) $\lambda\max\ (r,+1)=-T\ ln(1-\lambda\ r+1)$ (2)

A resolution concerning the presence of a long-term affiliation is built on the price of the trial statistic gained from model.

Granger Causality test

The Granger causality test is statistical hypotheses it calculates 1 variable have sufficient to predict other variable in a given period of time. Its capability to forecast the forthcoming values of the variables by using time series data of additional time series (Granter 1988). The current learning trails the Granger causality model in VAR framework.

$Yt = \alpha iYt-i + \beta iXt-i + \varepsilon 1t$

$Xt = \lambda iXt-i + \delta iYt-i + \varepsilon 2t$

Data Analysis and Interpretation

Descriptive statistics

Table 1 show the descriptive statistics results. Study demonstrates that, a major gap is evident amongst minimum and maximum Nifty 50 and Banking segment variables. The skewness is negative (-0.0425) for Nifty 50 suggesting that the distribution's long left tail is thicker than the upper tail and Banking sector's skewness is positive (0.35895), indicating that the long right distribution tail is thicker than the lower tail.

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Nifty 50 and Banking sectors' Kurtosis coefficient values are positive and found to be less than 3, suggesting platykurtic distribution. The Jarque-Bera test statistics indicate that every variable is abnormally disseminated. ***Hypothesis 1,*** thus, discharged and concluded that Nifty 50 and Banking sectors are not usually distributed. Results are considered to be consistent with (D. Bhuvanshwari et al 2017).

Table 1: Descriptive statistics of NSE and Banking sector

PARTICULARS	NSE	BANKING
Mean	9169.89	10851.71
Median	9878.55	9928
Maximum	12362.3	13470
Minimum	6970.6	6432.3
Std. Dev.	1438.83	1475.948
Skewness	-0.0425	0.35895
Kurtosis	1.72277	2.319068
Jarque-Bera	77.181	67.29878
Probability	0.0000	0.0000
Observations	1052	1052

Testing the data for Staionarity

The results for the ADF unit root test for checking stationarity of the facts obtained in Table 2.

Table 2: Results of Augmented Dickey-Fuller Test at level

	Intercept but no trend			Intercept and trend		
Variables	Test statistics	Critical value (5%)	Prob.	Test statistics	Critical Value (5%)	Prob.
NSE	-0.85	-2.86	0.1521	-2.09	-3.41	0.3123
Banking Sector	-1.71	-2.86	0.4320	-3.92	-3.41	0.0009

Results of Augmented Dickey-Fuller Test at 1st difference

	Intercept but no trend			Intercept and trend		
Variables	Test statistics	Critical value (5%)	Prob.	Test statistics	Critical Value (5%)	Prob.
NSE	-8.01	-2.86	0.0000	-11.02	-3.41	0.0000

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Banking Sector	-23.30	-2.86	0.0000	-23.39	-3.41	0.0000

From the above table 2, it's identified that Nifty 50 and Banking sector to be non-stationary at level form but found that to be stationary at first difference I(1). Hence both variable are integrated at first difference I(1). Therefore, ***Hypothesis 2*** rejected and it's understood that the variables (Nifty 50 and Banking Sector) taken for this study are stationary. Co-integration test can be applied on Nifty 50 and Banking sector variables, as supported in (Hina Shahzadi 2012).

Testing for being of Long-term equilibrium association

Johansen's co-integration test is smeared to discover the linear relationship or long-term cointegration amid the variables, to be exact, whether there is any long-term affiliation amongst Nifty 50 and Banking Sector. 2 trials are applied, the Trace and Maximum Eigen value test to regulate the sum of vectors. A lag of 1 to 4 (in 1st differences) is applied to every series, centered on the AIC (Akaike Information Criterion).

Table 3: Results of Johansen's Cointegration Test

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.025491	10.91669	12.49470	0.0067
At most 1	0.001789	3.970813	2.841461	0.2187

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**

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None *	0.025491	17.14679	14.96461	0.0067
At most 1	0.001789	3.970813	2.841461	0.2187

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Outcomes show trace test and maximum value test is more than 5 percent precarious. Consequently, both test standards are noteworthy. The study implies that there is long relationship/association between Nifty and Banking sector. It found that the model has one co-integration vector, which means that the variable moves together for a long-term relationship. It can infer that a stationary, long-term affiliation exists between variables as supported in (Saha and Bhunia 2011) and (Amalendu Bhunia 2013). Figure shows the Co-integrating relationship between variabls.1.

Testing for Granger Causality

Granger causality investigates to show if one data series variable is having adequate to forecast other data series variable in a specific age of time and also helps in defining the short run affiliation among the variables.

Table 3: Results of Granger causality test

Null Hypothesis:	Obs	F-Statistic	Prob.
BANKING does not Granger Cause NSE	1052	101.1299	1.E-78
NSE does not Granger Cause BANKING		9.934612	0.0000

The outcomes point out that there is causality amongst the Nifty index and Banking sector. The direction of causality found to be bi-directional (From Banking Nifty Index and also Nifty Index Banking Sector) and noteworthy at 5%. Consequently, ***Hypothesis 3*** overruled. The

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outcome of the above investigation is discovered equivalent to the studies by (Kutty 2010) and (D. Bhuvaneshwari et al 2017).

Conclusion

The present study analyzed Nifty Index and the Banking sector daily closing prices form January 2015 - December 2021. The research variables data series was I (0) level non-stationary and became stationary series at initial variance (Parthasarathy, S. 2019). All research variables are combined at order level I(1). Johansen's co-integration test showed no long-term affiliation amongst stock values and exchange amount (Kaushal, S., & Ghosh, A. 2017).. This implies long-run partnership co-movement amongst the Nifty Index and Banking Market. Granger causality test is used to detect if there is causal and short-term Nifty 50 index and Banking Sector relationship. Granger causality test fallouts in bidirectional causality and having same both directional in both sectors.

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