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Stock Price Volatility of NSE Thematic Consumption Index: An Econometric Analysis

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Abstract

Had the Indian economy were a person, its income in 2020-21 and 2021-22 would be much less than what it was in 2019-20. This is what the recent World Bank predictions says. There is vast, perhaps unparalleled, economic pain ahead.

The World Bank released its Global Economic Prospects report in the second week of June, expecting India's gross domestic product (GDP) to contract by 3.2% in 2020-21. A moderate recovery growth is expected from 3.1% in 2021-22. India is not the only country which will face this quandary. As per the statistics, generally March and April each contributes to the sales turnover of 12% every year, but March 2020 has witnessed a downfall of 55% year on year amidst the corona- induced lockdown. Undoubtedly, the pandemic has a tremendous impact on these, but the industry certainly needs to cope us with the current situation and some key transitions should be made in their approach to sales, logistics, marketing to customer service. So, as an investor we need to know how the consumption market was just before the Covid-19 hit the Indian premise. The consumption industry is further segregates into durable, non-durable goods and services industry.

This paper compares the price volatility of the stock prices of three firms who are into consumer goods with its related NSE Nifty consumption index. Data has been taken from NSE website and the time period of the study is 2015-2019. The data has further been treated with time series analysis using multiple regression which tries to test whether there is any connect between the trends of the stock prices of firms vis-à-vis the Nifty index of the sector. The study also attempts to identify patterns between the regressor and the regressands.

Keywords: Volatility, Stock returns, Consumer goods, Consumption industry, Nifty returns.

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Introduction

According to the Webster dictionary, consumer goods are defined as "goods that directly satisfy human wants", giving us a hard time to identify the trade-off between scarcity and choice. The consumption industry is so huge that it contributes a lot to the GDP of India as well as to the GDP of the entire world. It is further segregated into convenience goods[1], shopping goods[2] and specialty goods[3].

The three sectors namely pharma(X1) and retail(X2) and healthcare (X3) that constitutes consumption industry has been classified on the basis of P/E ratio and market capitalization from NSE as on Nov 10, 2019.

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Healthcare has become one of the India's largest sectors both in terms of revenue and employment cohort. This entails various diverse categories such as hospitals, clinical trials, outsourcing, medical tourism, insurance, medical equipment's and medical devices. Deliberating on the pharma industry, it was valued at $36.7 billion in the year 2018 in the Indian market which is expected to

expand at a CAGR of 22.4% within the five years plan of 2015-20, expected to reach to a value of $55 billion. Going into the depth of retail industry in India this is one of the key pillars of the Indian economy and contributes to about 10% of the GDP. This market in the Indian economy is estimated to be $600 billion and is also standing strong as one of the top five retail markets in the entire globe by its economic value.

Going by the Investors 'perspective, NSE has several indexes based on different sectors tries to attain an understanding of whether the sectors that are falling inside a particular index showcases similar behavior as its Nifty index or not, i.e. whether there is an association between the pharma industry, the retail industry and the healthcare industry to the NSE consumption index. Thus this research will give us an idea as to how the relationship between the industries work.

Scope of the Study:

An investor with an intent to reap benefits invest their money into a basket of asset classes known as a portfolio. This study replicated that just before the pandemic what was the situation for consumption goods. The study refers to portfolio diversification and risk mitigation.

Review of Literature:

Bollerslev (August 1987) presented a time series model designed in order to capture the dependence of the price changes and stock returns on volatile and tranquil time periods. Extension of ARCH model (Autoregressive Conditional Heteroscedasticity) i.e. GARCH (Generalised Autoregressive Conditional Heteroscedasticity) has been used. A set of foreign exchange rates and the stock price indices has been taken to prove the validity of the model.

Reilly and Brown, (2003) have discussed that the economy and stock market have a robust and steady association. For several years various economists, statisticians and faculties involved in finance have been interested in developing and testing models pertaining to the changes in stock prices (Fama, 1965).

Forecasting of share price movement is a tedious task due to its uncertainty in the prevailing conditions of the market and wide-ranging expectations of the people dealing in the market, these in turn has a direct connection with the fluctuations in share prices. Market performances are not only determined by data; but they also showcases a trade-off between the demanders and the suppliers i.e. producer and consumer to be precise (Scott, 2006). Several influencing factors like rise in the investors' confidence, further simulated by increasing eading to major stock markets showing unprecedented growth (Kollmeyer, 2001). As per (Bouchaud and Cont, 1998), instabilities in stock markets reveals a lot of diverse statistical peculiarities which entails proper understandings.

Yong Fu et al. (2011) in his study of volatility transmission and asymmetry linkages added the application of the industry level stick data to a trivariate Baba, Engle, Kraft and Kronger generalised Autoregressive Conditional Heteroscedasticity (BEKK-GARCH) with U.S. industrial stock return as a controlled variable. The data period of 13 years from 1994-2007 brings up new shocks in the Japanese currency market accounting for volatility in eight of the ten firms considered for the study. Also, significant asymmetric effects were visible in some of the industries.

Rajan and Parimala (February 2013) discussed in their paper use of technical indicators such as historical price movements of securities, trading volumes and usage of charts in determining the trends of stock prices. Analysis has been done on three selective stocks of FMCG sector using Bollinger Bands and Simple moving average method on the share prices for a span of 12 months.

The hypothesis has been based upon the set of data and the literature review:

Hypothesis

H_{01}: presence of unit root in the time series.
H_{11}: Time series is stationary or trend stationary.
H_{02}: No Co-integration (long term relationship) exists between variables (X1, X2, X3 and Y).
H_{12}: Presence of long term association between the dependent and the independent variables (X1, X2, X3 and Y).

H_{03}: No presence of co-integration exists between the dependent and the independent variables (X1, X2, X3 and Y).

H_{13}: Co-integration exists between the dependent and the independent variables (X1, X2, X3 and Y).

Research Methodology:

Problem Statement :

This study attempts to identify the linkages between various sectors of pharma, healthcare and retail with its related NSE Index/Indices, in order to study and further check the volatility by appropriate diversification of the investors 'portfolio.

Research Objective:

The research paper has the following research objectives:

1. To identify whether Unit Root exists for all the variables under study ((X1, X2, X3 and Y).
2. To examine the long term relationship between all the variables under study (X1, X2, X3 and Y).
3. To observe the presence of co-integration among all the variables under study(X1, X2, X3 and Y).
4. To identify the long run and short run causality among all the variables under study (X1, X2, X3 and Y).

Source of Data & Period of Study:

All the data used for the research paper has been collected from National Stock Exchange (NSE) for the various share prices of each company as of November 10, 2019. The period of the study is from April 01, 2015-October 31, 2019. This also covers the period of demonetisation as well as implementation of GST which will cover the volatile period also for the area under study and will try to find out the common linkages in volatility measurement, if any.

Data Analysis

Unit root tests:

It is a stochastic trend in a time series, also refereed as "random walk". The presence or
absence of unit roots further helps to identify some of the features of the data shown in the series.

Test	Pharma	Retail	Healthcare	NSE Consumption Index
ADF Test Statistic	-34.29443	-32.58119	-25.61976	-31.12892
Probability	0.0000	0.0000	0.0000	0.0000
Test Critical Values 1%	-3.4359	-3.4359	-3.4359	-3.4359
Test Critical Values 5%	-2.8638	-2.8638	-2.8638	-2.8638
Adjusted R-squared	51.02%	48.45%	48.54%	46.18%
F-Statistic	1176.108	1061.534	532.5885	969.0100

During the Analysis, the results of Augmented Dickey Fuller test rejected the null hypothesis i.e. H01:

presence of unit root in the time series in favour of the alternate hypothesis. It is found that the time series data of all the 4 indices do not have a unit root and is stationary and thus we can perform the Johnson co-integration test on the series.

Co-integration tests:

Since all of them were stationary at the first difference, therefore the data was further checked for Cointegration using Johansen Co-integration test, in order to identify whether any stable long-run relationships exists between sets of variables. This test has been chosen as it can detect multiple co-integrating vectors.

Variables: Pharma, Retail, Healthcare, NSE Consumption Index			
	Trace Test		
	Trace Statistic	Critical Value	Probability
None*	57.90110	47.85613	0.0043
At Most 1	28.46209	29.79707	0.0707
	Maximum Eigen Value		
None*	29.43901	27.58434	0.0286
At Most 1	19.80124	21.13162	0.0759

The Johansen co-integration test is carried out between all variables to analyze the presence of co-integrating vectors between all the variables. From the above test results of the Trace test and the Max-Eigen Statistic that there exists 1 co-integration equation(s) between the variables at 5% level of significance.

There is an agreement in the Trace Statistics and the Max-Eigen Statistic that, we reject the null hypothesis Ho: No Co-integration (long term relationship) exists between variables in favor of the alternate hypothesis.

Since there exists a long term relationship between variables, we now proceed with Vector Error Correction Estimates (VECM) to remove the error.

Vector Error Correction Model:

A Suitable Lag length was checked with LLC (Lag Length Criteria) and using AIC and SIC the optimal lag length was found at 2, thus 2 lags were taken to determine VECM further.

Cointegrating Eq:	CointEq1
NSE(-1)	1.000000
HEALTHCARE(-1)	1.919398
	(0.63679)
	[3.01415]
PHARMA(-1)	3.594594
	(0.48010)
	[7.48711]
RETAIL(-1)	-2.448559
	(2.68271)
	[-0.91272]
C -	8494.555

Interpretation:

1. $\mathbf{ECT_{t-1}}$ = 1.00 NSE_{t-1} + 1.919 $Healthcare_{t-1}$ + 3.594 $Pharma_{t-1}$ - 2.448559 $Retail_{t-1}$ – 8494.555

Also,
NSE as the target variable, we get the final regression equation as:

2. $\mathbf{\Delta NSE_t}$ = -0.011550 ECM_{t-1} + 0.082320 ΔNSE_{t-1} - 0.010811 ΔNSE_{t-2} - 0.008395 $\Delta Healthcare_{t-1}$ + 0.032167 $\Delta Healthcare_{t-2}$ - 0.016302 $\Delta Pharma_{t-1}$ - 0.043808 $\Delta Pharma_{t-2}$ + 0.077423 $\Delta Retail_{t-1}$ + 0.541738 $\Delta Retail_{t-2}$ + 1.268352

The table depicting the R-Squared and the Adjusted R Square

R-squared	0.022687	Mean dependent var	1.461348
Adjusted R-squared	0.014820	S.D. dependent var	37.82631
S.E. of regression	37.54497	Akaike info criterion	10.09778
Sum squared resid	1575961.	Schwarz criterion	10.14236
Log likelihood	-5685.149	Hannan-Quinn criter.	10.11462
F-statistic	2.883658	Durbin-Watson stat	1.998630
Prob(F-statistic)	0.002256		

Further, Using Regression with Least Squares, we determine that out of these lags for all the regressors, we observe that the p-value of C(1), C(2), C(9) were less than 0.05 so we reject null hypothesis at 5% level of significance and conclude that these variables significantly contributes in the variance of NSE Consumption Index. Also, there are some insignificant variables in the system equation which are to be removed.

3. The final Regression equation is:

$$NSEt = C(1)^{*} NSE_{t-1} + 1.919^{*} Healthcare_{t-1} + 3.594^{*} Pharmat\text{-}1 - 2.448559^{*} Retail_{t-1} + C(2)^{*} NSE_{t-2} + C(9)^{*} Retail_{t-2}$$

		Coefficient	Std. Error	t-Statistic	Prob.
	C(1)	-0.011007	0.003037	-3.624638	0.0003
	C(2)	0.083984	0.029607	2.836569	0.0046
	C(9)	1.377860	1.117759	1.232699	0.2179
R-squared		0.017247	Mean dependent var		1.489548
Adjusted R-squared		0.015501	S.D. dependent var		37.82141
S.E. of regression		37.52712	Akaike info criterion		10.09066
Sum squared resid		1585729.	Schwarz criterion		10.10402
Log likelihood		-5693.177	Hannan-Quinn criter.		10.09571
F-statistic		9.880292	Durbin-Watson stat		2.003644
Prob(F-statistic)		0.000056			

for stationarity, then Johansen co-integration test was carried out and further the data was treated with Vector Error Correction Estimates (VECM) since there existed a long term association between variables, to remove the error. Further up to two differences of each of the variable has been taken in order to remove the error and the regression was run to see the association between the variables.

Thus a total of 10 variables has been taken to study the association. From the above results of the methods of least squares, we conclude that these two variables C1 and C2 significantly contributes in the variance of NSE consumption Index. 6.

[1] *Widely available and purchased frequently with minimal effort.*
[2] *Consumer goods usually purchased after customer has compared price, quality and style in at different stores.*
[3] *Product that certain consumers will actively seek to purchase due to its unique features or loyalty towards a brand.*

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