

Investigation of Stock Index as a barometer of leading Asian Economies

Ms. Namrata H. Deshmukh*

Asst. Professor - MET Institute of Management,
BKC, Nashik
E-mail id: namrata.pradhan22@gmail.com

Dr. Prasad V. Joshi**

Asst. Professor - MET Institute of Management,
BKC, Nashik
E-mail id: prof.prasadjoshi@gmail.com

ABSTRACT

Fundamental Analysts view stock market as a leading indicator of Economy whereas theories like Efficient Market Hypothesis talks about stock prices to be Random and thus market is efficient. Thus, the paper here attempts to investigate the relationship between the macro-economic indicators of Top 3 Asian countries like GDP, WPI/CPI and IIP with the Stock Index of the respective country. There is multitude of factors causing impact on the stock index movement apart from economic indicators. The statement “Stock index as a barometer of economy” is thus questionable. The paper thus tries to find out the relationship amongst the variables using Correlation, Multiple Regression model & Granger Causality Test.

Keywords: Barometer, Leading indicator, Granger causality test, Regression, correlation, China, Japan, India

Introduction:

Most of the Research Analyst works on a combination of Economic, Industry and Company Analysis to obtain a stock's Intrinsic Value and predict the future value. Economic Analysis studies the general economic factors that evaluate the security's value. Stock market is considered to be a vital part of the economy. When the level of economic activity in the country is low, stock prices are low and when the level of economic activity is high, it reflects a booming outlook for the sales and profits of firms. There are lot of macro-economic factors affecting economy like GDP, Savings & investment, Inflation, Interest Rates, Budget & Fiscal deficit, FIIs, FDIs, Balance of payments, infrastructure, etc.

Any economic variable that predicts the future of financial or economic trends is called an economic indicator. The purpose of indicator is to make an early diagnosis of the turning points of business cycle. Basically, economic indicators are classified into 3 parts : Leading, Lagging and Co-incidental indicator.

What is going to happen in the economy is indicated by the Leading indicators. Along with fiscal policy, monetary policy, productivity, rainfall, etc. Stock market is also considered to be a leading indicator which means that rise of market index shows that economy is heading towards recovery.

The state of economy is indicated by the coincidental indicators. They are GNP, interest rates industrial production, and reserve funds. Lagging indicators reflect the changes occurring in the leading & coincidental indicators. Generally the lagging indicators are Consumer Price Index, unemployment rate and flow of foreign funds.

There are many theoretical bases for considering stock market as a leading indicator of economy. One of the valuation models is Gordon's Constant growth Model which recognizes the value of share of common stock as present value of expected future dividends. Thus, if stock prices depend upon expected dividends and dividends depend upon profitability of firms, then stock prices should symbolize the expectations held by investors. However this is a forward looking case whereby the reliability of investors' forecast is questionable.

Another theory is the Dow Theory was developed by Charles H. Dow, refined by William Hamilton and was articulated by Robert Rhea. The Dow Theory addresses not only technical analysis and price action, but also market philosophy. Charles Dow is credited with developing the Dow Theory, however it was S.A. Nelson and William Hamilton who later refined the theory into what it is today. Nelson wrote “The ABC of Stock Speculation” and was the first to actually use the term “Dow theory.” Hamilton further refined the theory through a series of articles in The Wall Street Journal from 1902 to 1929. Hamilton also wrote an article on The Stock Market Barometer in 1922, which explains the theory in detail. The theory assumes that the market discounts everything.

In light of all these theories which support the statement of Stock market as a barometer of economy, the paper tries to investigate whether there is any correlation between the economic indicators and stock index.

Objectives of the study:

- To find out the correlation between economic indicators & Stock index.
- To find out the relationship between GDP, Inflation and IIP as Economic indicators and Stock Index.
- To investigate the causal relationship between Economy & Stock Index.

Hypothesis:**China**

1. Ho: SSE does not Granger Cause China GDP
H1: SSE Granger Causes China GDP
2. Ho: China GDP does not Granger Cause SSE
H1: China GDP Granger Causes SSE
3. Ho: SSE does not Granger Cause China CPI
H1: SSE Granger Causes China CPI
4. Ho: China CPI does not Granger Cause SSE
H1: China CPI Granger Causes SSE
5. Ho: SSE does not Granger Cause China IIP
H1: SSE Granger Causes China IIP
6. Ho: China IIP does not Granger Cause SSE
H1: China IIP Granger Causes SSE

Japan

7. Ho: NIKKEI does not Granger Cause Japanese GDP
H1: NIKKEI Granger Causes Japanese GDP
8. Ho: Japanese GDP does not Granger Cause NIKKEI
H1: Japanese GDP Granger Causes NIKKEI
9. Ho: NIKKEI does not Granger Cause Japanese CPI
H1: NIKKEI Granger Causes Japanese CPI
10. Ho: Japanese CPI does not Granger Cause NIKKEI
H1: Japanese CPI Granger Causes NIKKEI
11. Ho: NIKKEI does not Granger Cause Japanese IIP
H1: NIKKEI Granger Causes Japanese IIP
12. Ho: Japanese IIP does not Granger Cause NIKKEI
H1: Japanese IIP Granger Causes NIKKEI

India

13. Ho: SENSEX does not Granger Cause Indian GDP
H1: SENSEX Granger Causes Indian GDP
14. Ho: Indian GDP does not Granger Cause SENSEX
H1: Indian GDP Granger Causes SENSEX
15. Ho: SENSEX does not Granger Cause Indian WPI
H1: SENSEX Granger Causes Indian WPI
16. Ho: WPI does not Granger Cause SENSEX
H1: WPI Granger Causes SENSEX
17. Ho: SENSEX does not Granger Cause Indian IIP
H1: SENSEX Granger Causes Indian IIP
18. Ho: IIP does not Granger Cause SENSEX
H1: IIP Granger Causes SENSEX

Literature review:

Gevit Duca in the paper “**The relationship between the stock market and the economy: Experience from International Financial Markets**” published in Bank of Valletta Review, No. 36, Autumn 2007 talks about the causal inspection of stock market prices and GDP in developed market economies reveals that they tend to move together over time. The study uses the data of top ten stock markets of the world. The author concludes that there is a unidirectional causality between stock prices and GDP which implies that the level of economic activity in a country can potentially depend upon the stock market amongst other variables.

Mr. Sauabh Singh, Dr. L.K. Tripathi and Kirti Lalwani in their paper on “**An Empirical study of impact of exchange rate & inflation rate on performance of BSE Sensex**” published in SAJMR Spectrum: A journal of Multidisciplinary Research Vol. No. 1 Issue 3, June 2012, ISSN 2278-0637 tries to examine the primary factors responsible for affecting BSE in India. The results suggest that Inflation Rate & exchange rate significantly affect the performance of BSE Sensex.

Research Methodology:

The research design here is descriptive and causal both since it used the historical data in order to find out the cause effect relationship amongst the variable. For the purpose of this study 4 variables are used each from top 3 Asian countries based on GDP viz. China, Japan and India. 3 of them are the economic indicators i.e. GDP, Inflation and IIP whereas fourth variable is the Stock Index of the respective country like Shanghai Stock Exchange (SSE) of China, NIKKEI of Japan and SENSEX of India. The stock index is selected based on the market capitalization. The research has been conducted on 15 years quarterly data for all the 4 variables i.e. the period starting from the year 2000 to 2015. Correlation coefficient was calculated amongst all the variables with special focus on correlation of economic indicator with the respective stock index.

Multiple Regression model was used in order to derive the relationship between Stock index as a dependant variable and the economic indicators viz. GDP, Inflation and IIP as the Independent variables. The equation is as shown below:

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3$$

Where,

Y = Return of Stock Index

α = Intercept

β_1 =Slope of GDP

β_2 =Slope of Inflation

β_3 =Slope of IIP

X_1 =GDP

X_2 =WPI/CPI

X_3 =IIP

Granger causality test was applied in order to check if there is any causal relationship amongst the different economic indicators & Stock Index using lag 4. The Granger causality test is a statistical hypothesis test for determining whether one time series is useful in forecasting another, The test was first proposed in 1969. Ordinarily, regressions reflect "mere" correlations, but Clive Granger argued that causality in economics could be tested by measuring the ability to predict the future values of a time series using prior values of another time series.

Data Analysis:**Correlation between the economic variables & Stock Index**

Table 1.1 shown below indicates the correlation between the economic variables of China like GDP, CPI, IIP & SSE being the largest stock index based on Market capitalization.

Table No. 1.1

Correlation coefficient	China GDP	China CPI	China IIP	SSE
China GDP	1	0.094	0.104	0.064
China CPI	0.094	1	-0.126	0.028
China IIP	0.104	-0.126	1	0.061
SSE	0.064	0.028	0.061	1

Table 1.2 shown below indicates the correlation between the economic variables of Japan like GDP, CPI, IIP & NIKKEI being the largest stock index based on Market capitalization.

Table No. 1.2

Correlation coefficient	Japan GDP	Japan CPI	Japan IIP	NIKKEI
Japan GDP	1	0.121	-0.231	0.309
Japan CPI	0.121	1	-0.176	0.118
Japan IIP	-0.231	-0.176	1	-0.300
NIKKEI	0.309	0.118	-0.300	1

Table 1.3 shown below indicates the correlation between the economic variables of India like GDP, WPI, IIP & SENSEX being the largest stock index based on Market capitalization.

Table No. 1.3

Correlation coefficient	India GDP	India WPI	India IIP	SENSEX
India GDP	1	0.106	-0.066	0.037
India WPI	0.106	1	-0.048	-0.076

India IIP	-0.066	-0.048	1	0.284
SENSEX	0.037	-0.076	0.284	1

The correlation coefficient value in almost all the cases shown above in Table 1.1, 1.2 & 1.3 is below 0.3 which indicates a very minimal relationship between the 3 economic variables & Stock Index of all 3 countries.

Multiple Regression Model:

Table 2.1

<i>Regression Statistics for China</i>								
Multiple R	0.1169							
R Square	0.0137							
Adjusted R Square	-0.0401							
Standard Error	0.1674							
Observations	59.0000							
<i>ANOVA</i>								
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>			
Regression	3	0.0213	0.0071	0.2539	0.8583			
Residual	55	1.5415	0.0280					
Total	58	1.5628						
	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
Intercept	0.0182	0.0235	0.7742	0.4421	-0.0290	0.0654	-0.0290	0.0654
China GDP	0.1147	0.2024	0.5666	0.5733	-0.2910	0.5203	-0.2910	0.5203
China CPI	0.0037	0.0165	0.2262	0.8219	-0.0293	0.0368	-0.0290	0.0368
China IIP	1.2030	2.0927	0.5748	0.5677	-2.9909	5.3969	-2.9909	5.3969

In an attempt to check if at all economic variables have any effect on Stock Index, the Multiple Regression was used. The results of the Multiple regression for China shown in Table 2.1 indicate that the value of Multiple R & R Square are very less. R square is only 13.7% which indicates that only 13.7% of variation is shown by GDP, CPI & IIP in dependant variable i.e. Shanghai Stock Exchange. Secondly, the P values of China's GDP, CPI & IIP are 0.5733, 0.8219 & 0.5677 which is far above the 0.05 level which indicates that the group of independent variables does not show a statistically significant relationship with the dependent variable, or that the group of independent variables does not reliably predict the dependent variable.

Table 2.2

<i>Regression Statistics of Japan</i>								
Multiple R	0.3911							
R Square	0.1530							
Adjusted R Square	0.1092							
Standard Error	0.1026							
Observations	59							
<i>ANOVA</i>								
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>			
Regression	3	0.1104	0.0368	3.4920	0.0212			
Residual	58	0.6110	0.0105					
Total	61	0.7214						
	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>

Intercept	-0.0016	0.0134	-	0.1184	0.9061	-0.0284	0.0252	0.0284	0.0252
Japan GDP	2.6031	1.3009	2.0010	0.0501	-0.0009	5.2070	0.0009	5.2070	
Japan CPI	0.9839	2.5990	0.3786	0.7064	-4.2186	6.1864	4.2186	6.1864	
Japan IIP	-0.0138	0.0074	1.8658	0.0671	-0.0285	0.0010	0.0285	0.0010	

Interpretation:

The results of the Multiple regression for Japan shown in 2.2 indicate that the value of Multiple R & R Square are very less. Multiple R & R square are 39.11% & 15.30% respectively which indicates that only 15.30% of variation is shown by GDP, CPI & IIP in dependant variable i.e. NIKKEI. Secondly, the P values of Japan's GDP, CPI & IIP are 0.0501, 0.7064 & 0.0671 which is far above the 0.05 level which indicates that the group of independent variables does not show a statistically significant relationship with the dependent variable, or that the group of independent variables does not reliably predict the dependent variable.

Table 2.3

<i>Regression</i>	<i>Statistics of</i>
Multiple R	0.2965
R Square	0.0879
Adjusted R Square	0.0399
Standard Error	0.0808
Observations	59

ANOVA					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	3	0.0359	0.0120	1.8312	0.1518
Residual	57	0.3726	0.0065		
Total	60	0.4085			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
Intercept	0.0288	0.0111	2.5973	0.0119	0.0066	0.0509	0.0066	0.0509
India GDP	0.0569	0.1149	0.4950	0.6225	-0.1732	0.2870	-0.173	0.2870
India WPI	-0.0946	0.1700	0.5566	0.5800	-0.4351	0.2459	-0.435	0.2459
India IIP	0.4008	0.1795	2.2327	0.0295	0.0413	0.7602	0.0413	0.7602

Interpretation:

The results of the Multiple regression for India shown in Table 2.3 indicate that the value of Multiple R & R Square are very less i.e. 29.65% & 8.75% R square indicates that only 8.75% of variation is shown by GDP, CPI & IIP in dependant variable i.e. Shanghai Stock Exchange. Secondly, the P values of India's GDP, WPI & IIP are 0.6225, 0.5800 & 0.0295 which is far above the 0.05 level which indicates that the group of independent variables does not show a statistically significant relationship with the dependent variable, or that the group of independent variables does not reliably predict the dependent variable.

Granger Causality Test:**Table 3.1 Granger Causality Test Result for SSE & GDP**

Pairwise Granger Causality Tests			
Date: 01/15/16 Time: 17:51			
Sample: 2000Q1 to 2015Q4			
Lags : 4			
Null Hypothesis:	Obs	F-Statistics	Prob.
SSE does not Granger Cause China GDP	60	1.9175	0.1220

China GDP does not Granger Cause SSE		0.9431	0.4469
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Table 3.2 Granger Causality Test Result for SSE & CPI

Pairwise Granger Causality Tests Date: 01/15/16 Time: 17:53 Sample: 2000Q1 to 2015Q4 Lags : 4			
Null Hypothesis:	Obs	F-Statistics	Prob.
SSE does not Granger Cause China CPI	60	5.1294	0.0016
China CPI does not Granger Cause SSE		0.7902	0.5374

Table 3.3 Granger Causality Test Result for SSE & IIP

Pairwise Granger Causality Tests Date: 01/15/16 Time: 17:55 Sample: 2000Q1 to 2015Q4 Lags : 4			
Null Hypothesis:	Obs	F-Statistics	Prob.
SSE does not Granger Cause China IIP	60	3.4966	0.0137
China IIP does not Granger Cause SSE		1.9197	0.1220

Interpretation:

Granger Causality Test Result in Table 3.1, 3.2 & 3.3 shows the P-value for China in almost all cases is greater than 0.05 except for the Null Hypothesis of SSE does not cause CPI & IIP which gets rejected. Rest all Null Hypothesis are accepted indicating no causal relationship amongst the economic indicators and SSE.

Table 4.1 Granger Causality Test Result for NIKKEI & GDP

Pairwise Granger Causality Tests Date: 01/15/16 Time: 17:58 Sample: 2000Q1 to 2015Q4 Lags : 4			
Null Hypothesis:	Obs	F-Statistics	Prob.
NIKKEI does not Granger Cause Japanese GDP	60	1.4514	0.2311
Japanese GDP does not Granger Cause NIKKEI		0.4250	0.7899

Table 4.2 Granger Causality Test Result for NIKKEI & CPI

Pairwise Granger Causality Tests Date: 01/15/16 Time: 17:58 Sample: 2000Q1 to 2015Q4 Lags : 4			
Null Hypothesis:	Obs	F-Statistics	Prob.
NIKKEI does not Granger Cause Japanese CPI	60	2.4894	0.0550
Japanese CPI does not Granger Cause NIKKEI		1.8575	0.1326

Table 4.3 Granger Causality Test Result for NIKKEI & IIP

Pairwise Granger Causality Tests Date: 01/15/16 Time: 18:01 Sample: 2000Q1 to 2015Q4 Lags : 4			
Null Hypothesis:	Obs	F-Statistics	Prob.
NIKKEI does not Granger Cause Japanese IIP	60	2.0584	0.1003
Japanese IIP does not Granger Cause NIKKEI		0.6439	0.6337

Interpretation:

Granger Causality Test Result in Table 4.1, 4.2 & 4.3 shows the P-value for Japan in all the cases is greater than 0.05 indicating no causal relationship amongst any of the economic indicators and NIKKEI.

Table 5.1 Granger Causality Test Result for SENSEX & GDP

Pairwise Granger Causality Tests Date: 01/13/16 Time: 18:08 Sample: 2000Q1 to 2015Q4 Lags : 4			
Null Hypothesis:	Obs	F-Statistics	Prob.
SENSEX does not Granger Cause Indian GDP	60	1.6297	0.1814

Indian GDP does not Granger Cause SENSEX		1.9382	0.1186
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Table 5.2 Granger Causality Test Result for SENSEX & WPI

Pairwise Granger Causality Tests Date: 01/13/16 Time: 18:15 Sample: 2000Q1 to 2015Q4 Lags : 4			
Null Hypothesis:	Obs	F-Statistics	Prob.
SENSEX does not Granger Cause Indian WPI	60	0.1635	0.9558
Indian WPI does not Granger Cause SENSEX		0.4340	0.7834

Table 5.3 Granger Causality Test Result for SENSEX & IIP

Pairwise Granger Causality Tests Date: 01/13/16 Time: 18:28 Sample: 2000Q1 to 2015Q4 Lags : 4			
Null Hypothesis:	Obs	F-Statistics	Prob.
SENSEX does not Granger Cause Indian IIP	60	3.0834	0.0240
Indian IIP does not Granger Cause SENSEX		0.6061	0.6601

Interpretation:

Granger Causality Test Result in Table 5.1, 5.2 & 5.3 shows the P-value for India in almost all cases is greater than 0.05 except for the Null Hypothesis of SENSEX does not cause IIP which gets rejected. Rest all Null Hypothesis are accepted indicating no causal relationship amongst the economic indicators and SENSEX. The Null Hypothesis in Granger Causality Test in almost all the case gets accepted. Only in 3 cases it gets rejected which raises a question on the reliability of the fact that stock index is the barometer of economy. Even this test proves that the reverse too is not true. Since its tests the causes both way like whether GDP causes Index or Index causes GDP.

Table No. 6

Null Hypothesis statements	P Value	Hypothesis Testing
Ho: SSE does not Granger Cause China GDP	0.122	Ho Accepted
Ho: China GDP does not Granger Cause SSE	0.4469	Ho Accepted
Ho: SSE does not Granger Cause China CPI	0.0016*	Ho Rejected
Ho: China CPI does not Granger Cause SSE	0.5374	Ho Accepted
Ho: SSE does not Granger Cause China IIP	0.0137*	Ho Rejected
Ho: China IIP does not Granger Cause SSE	0.122	Ho Accepted
Ho: NIKKEI does not Granger Cause Japanese GDP	0.2311	Ho Accepted
Ho: Japanese GDP does not Granger Cause NIKKEI	0.7899	Ho Accepted
Ho: NIKKEI does not Granger Cause Japanese CPI	0.055	Ho Accepted
Ho: Japanese CPI does not Granger Cause NIKKEI	0.1326	Ho Accepted
Ho: NIKKEI does not Granger Cause Japanese IIP	0.1003	Ho Accepted
Ho: Japanese IIP does not Granger Cause NIKKEI	0.6337	Ho Accepted
Ho: SENSEX does not Granger Cause Indian GDP	0.1814	Ho Accepted
Ho: Indian GDP does not Granger Cause SENSEX	0.1186	Ho Accepted
Ho: SENSEX does not Granger Cause Indian WPI	0.9558	Ho Accepted
Ho: WPI does not Granger Cause SENSEX	0.7834	Ho Accepted
Ho: SENSEX does not Granger Cause Indian IIP	0.024*	Ho Rejected
Ho: IIP does not Granger Cause SENSEX	0.6601	Ho Accepted

***indicate that the Null Hypothesis is Rejected**

Table 6 is the summary of the Null Hypothesis Acceptance & Rejection Status. The table above clearly indicates only 3 Null Hypothesis is rejected & rest 15 Null Hypothesis are accepted showing no cause effect relationship amongst the variables.

Conclusion:

The goal of this paper was to investigate if at all the Stock Index acts as a barometer of economy. With this objective of finding relationship between the Stock Index & Economic variables of China, Japan & India we have tried to find out the correlation which indicated very minimal relationship. The study further tried to use regression in order to check the effect of independent variable i.e. GDP, Inflation & IIP on dependant variable which is the Stock index of the respective country. However the R square values were below 50% which shows very less reliability & P values more than 0.05 indicating no significant difference amongst the variables.

In light of these results one more test was used to get some causal relationship amongst economic indicators & Stock Index. Out of 18 Hypothesis framed hardly 3 Null Hypothesis got rejected thus showing a causal relationship in only 3 cases. Rest all showed no causal relationship. Thus, the results of this research do not support the statement that Stock Markets are the barometer of the economy. Stock Index may be the indicators of Economy and not the barometer.

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