

Macro-Economic Variables and Stock Prices in the Indian Power Sector

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ABSTRACT: *This research paper is an attempt to evaluate the Indian power sector by conducting a simple correlation analysis and multiple regression analysis over a period of eight years from 2011 to 2018. In this research paper we have chosen six of the best companies in the power sector which would have a greater scope of contributing to the economic growth of the country due to the large market share and good performance enjoyed by them to be measured against the macroeconomic variables which are gross domestic product per capita, foreign direct investment, nominal effective exchange rate and inflation measured in terms of the consumer price index in order to understand the relationship between the stock prices and variables and the degree of their influencing power. The companies chosen are as stated- National Thermal Power Corporation Limited (NTPC), Adani Power, Reliance Power, Power grid Corporation of India, Tata Power and JSW Energy.*

KEY WORDS: *Correlation, Multiple regressions, power sector, macroeconomic variables*

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I. INTRODUCTION

The power sector in India has always backed a very shaky avenue for investment in comparison to the other sectors in the country for various investors due to the issues related to the non-availability of resources and the need of the hour to switch to a more reliable and long lasting alternative which is the renewable sources of energy thus requiring a lot of time, effort and money. Power becoming one of the most important foundation industries in India with the growing population and a means of sustenance makes it a great point of analysis for being able to determine the direction of the economic growth of the country that has been on a rise with more rural households getting access to the power connections in the country. The macroeconomic variables can be a good indicator in determining the movement in stock prices of the power sector companies and the purpose would be to indicate the degree of their influencing power on the stock prices for the period of 8 years to ensure accurate and stable results. The macroeconomic variables that could be used to establish a relationship with the stock prices in the power sector would be gross domestic product per capita, foreign direct investment, nominal effective exchange rate and inflation measured in terms of the consumer price index.

II. REVIEW OF LITERATURE

- **The relationship between the stock prices and macroeconomic factors in the Nigerian Stock Market** In this journal article, the author has identified the macroeconomic variables by the implementation of the Structural Adjustment Program in Nigeria, particularly through the financial liberalisation segment, has brought about changes in the Nigerian Financial environment that may have implications for macroeconomic variables in the Nigerian economy. This paper looks at the dynamic equilibrium relationship between various macroeconomic variables and the Nigerian Stock Exchange index with the use of Johansen's (1991) vector error correction model. The macroeconomic factors researched incorporate the industrial production index, the consumer price index, money supply, oil costs and treasury bill rate. The estimation of the vector error correction model was done under two elective definitions of money supply: M1 and M2. The outcomes demonstrate that a co-integrating connection exists among macroeconomic factors. The co-integration relationship is steady with prior examinations, in contrast to the signs of some of the factors, which are conflicting with prior investigations.
- **Macroeconomic Factors Affecting Renewable in Pakistan** As per the author Pakistan is confronting one of its worst energy crisis, and with the growth in population, demand for electricity is increasing exponentially. As per the National Transmission and Distribution Company (NTDC), yearly electricity growth rate is estimated to float around 5-6% throughout the following ten years, which means peak electricity demand of 32,000 MW by 2020. The goal of the study was to look at the relation between macroeconomic variables (i.e., population growth; urbanization, industrialization, exchange rate, price

level, food production index and livestock production index) and renewable energy in Pakistan over a time of 1975-2012. Also, this study utilizes oil rent as an intervening variable to defeat the biasness of the single equation model. The outcomes demonstrate that macroeconomic factors positively added to renewable energy consumption in Pakistan. There is also bidirectional causality between exchange rate and livestock production in Pakistan. Variance decomposition analysis demonstrates that economic growth has a noteworthy contribution to increase renewable energy in Pakistan.

- **The impact of macroeconomic variables on stock market returns in Kenya** The author recognises the changes in macroeconomic variables have a varied impact across the economic spectrum, in spite of the fact that the ongoing developments in macroeconomic fundamentals are deficient in developing markets like Kenya. The aforementioned study explores the effect of the macroeconomic factors on stock returns in Kenya amid the period 2003-2013, with the use of Arbitrage Pricing Theory (APT) and Capital Asset Pricing Model (CAPM) framework for month to month data. The Ordinary Least Square (OLS) method is applied to test the legitimacy of the model and the overall significance of various factors which may affect the stock returns. The empirical analysis discovered two fascinating outcomes. To begin with, all factors are $I(0)$. Second, except for interest rates, there exists a critical relation between securities exchange returns and macroeconomic factors. As per the findings of the study, Money Supply, exchange rates and inflation influence stock markets returns in Kenya. Money supply and inflation are observed to be major determinants of the profits at NSE. Exchange rates is however, found to negatively affect stock returns, while interest rates isn't imperative in deciding long run returns in the NSE.
- **The Impact of Macroeconomic Variables on Stock Prices in Pakistan** The author seeks to emphasize that the macroeconomic factors are critical for any change in economy for a nation. Any sudden change among these factors has effect on the economy in different ways. If there should arise an occurrence of any change the regulatory authority takes steps and make alteration in their policies that would put the economy on advancement track. The goal of the study is to determine the influence of interest rate, exchange rate, and Gross domestic product and inflation rate on stock costs in Pakistan. System: Granger causality and co-integration tests are applied on the data to evaluate the conceivable effect of macroeconomic factors on stock prices. The findings of the study uncovered that there is no connection between dependent variable and explanatory variables in short run. Then again results demonstrate that there is solid relationship in long run. It is concluded that in long run there is significant relation between macroeconomic factors on stock prices.
- **Relationship between Macroeconomic Variables and Stock Market Indices: Co-integration Evidence from Stock Exchange of Singapore's All-S Sector Indices** As per the research paper the connection between macroeconomic factors and stock market returns is, at this point, well-documented in the literature. Nonetheless, a void in the literature is related to examining the co-integration between macroeconomic factors and stock market's sector indices as opposed to the composite index. Thus in this paper we look at the long-term equilibrium connection between selected macroeconomic factors and the Singapore stock market index (STI), and with different Singapore Exchange Sector indices—the finance index, the property index, and the hotel index. The investigation infers that the Singapore's stock market and the property index form a co-integrating relation with changes in the short and long term interest rates, industrial production, price levels, exchange rate and money supply.

III. RESEARCH DESIGN

- **Scope of the study:** We have chosen 6 of the companies from the power sector with NTPC being the leader in terms of production capacity and market standing among all, followed by several other power companies in India who are equally competent.

NTPC
ADANI POWER
RELIANCE POWER
POWER GRID CORPORATION OF INDIA
TATA POWER
JSW ENERGY

- **Statement of problem:** India's power sector is forecasted to attract investments worth \$11.56 trillion for the time period 2017-2022 in thermal, hydro, nuclear and renewables segment and would therefore be indicative of the higher prospects of contributing majorly to the economic growth of the country. The motive would be to evaluate the power sector by conducting a detailed analysis.

- **Objective of the study:**
 - To understand the power sector of India and the macroeconomic variables
 - To establish correlation between macroeconomic variables and stock prices
 - To establish the relationship via the degree of influencing power of macroeconomic variables on the stock prices of the companies in the power sector
- **Source of data:** Secondary data has been used for the purpose of our study. The data has been collected from the online government publications, company websites, online available statistical data, etc.
- **Hypothesis:**

H0: There lies no significant relationship between the stock prices of the power sector and macroeconomic variables

H1: There lies a significant relationship between the stock prices of the power sector and the macroeconomic variables
- **Limitations of the study:**
 - The research is conducted by taking an average measure rather than an absolute one hence it may not be accurate
 - The time period of 8 years has been considered for examining the relationship between macroeconomic variables and the stock prices
 - Only six companies have been chosen to analyze the entire power sector of the country
 - The variables are limited to four which are not completely representative of all the macroeconomic variables affecting the stock prices
- **Period of study:** The study was conducted using the data for companies between the time period of 4th January 2011 to 3th January 2019

- **Data analysis tools:**

In this research paper we have chosen correlation analysis and regression as a tool to conduct the data analysis.

Correlation analysis is a method of statistical assessment used to study the strength of a relationship between two variables. If correlation is found between two variables it implies that when there is a systematic change in one variable, there is likewise a systematic change in the other; the variables alter together over a specific time frame. If there is a correlation found can be either positive or negative. Positive correlation exists if one variable rises simultaneously with the other, which means the high numerical values of one variable relate to the high numerical values of the other. Negative correlation exists if one variable declines when other increases, which means the high numerical values of one variable relate to the low numerical values of the other.

Regression analysis is a set of statistical procedures for assessing the relations among variables. It includes numerous techniques for the analysis and modeling of several variables, when the attention is on the relationship between a dependent variable and at least one independent variable (or 'predictors'). More explicitly, regression analysis helps one see how the typical value of the dependent variable (or criterion variable) changes when any of the independent variable is differed, while the other independent variables are held fixed.

Multiple regression is an augmentation of simple linear regression. It is used when we need to foresee the value of a variable dependent on the value of at least two different variables. The variable we need to foresee is known as the dependent variable (or at times, the result, target or criterion variable). The variables we are using to foresee the value of the dependent variable are known as the independent variables (or sometimes, the predictor, explanatory or regressor variables).

IV. DATA ANALYSIS AND INTERPRETATIONS

The data used for analysis consisted of daily share prices of the 6 stocks of power sector. The daily average change of the 6 companies of the power sector was calculated to derive the average annual value of the stock prices of the power sector hence making it comparable to the data on macroeconomic variables

$$\text{Daily average returns} = \frac{P1 - P0}{P0}$$

Where,

P1= Opening stock price

P0= Closing stock prices on the previous day

This being a multivariate case, which is when there are more than one independent variables present requires an equation constituting all the variables. In general, as per the multiple regression model, the linear equation would take the following form:

$$\text{ANNUAL INDUSTRY STOCK PRICES} = a + b_1 * \text{GDP PER CAPITA} + b_2 * \text{FOREIGN DIRECT INVESTMENTS} + b_3 * \text{NEER} + b_4 * \text{INFLATION} + E$$

Where,

a = Y intercept at 0

X₁= Gross domestic product per capita

X₂= Foreign direct investments

X₃= Nominal Effective Exchange Rate

X₄= Inflation

b₁, b₂, b₃, b₄ = [regression coefficient](#) that measures a unit change in the dependent variable when X₁, X₂, X₃, X₄ changes

E= random errors in prediction

Correlation

Correlation	Gross Domestic Product	Foreign Investment	Direct	Nominal Exchange Rate	Effective	Inflation (Consumer Index)	Price
Average Annual Stock Prices	-0.293498929	-0.327140445		-0.202348064		-0.57999041	

In the correlational study conducted between the different macroeconomic variables and stock prices of the power sector, we found a negative correlation between the gross domestic product per capita and the annual average stock prices of the power sector however the existing literature as per the research paper, (Relationship between the GDP and share price movement at the Nairobi stocks exchange by Crispin ochieng ogutu) concluded that GDP would lead to increase in stock market performance which maybe contradicting.

Furthermore there is a negative correlation between the foreign direct investment and annual average stock prices of the power sector, however in comparison to the research paper (Foreign Direct Investment and Stock Market Development in Pakistan by [Ihtisham Abdul Malik](#) and [Shehla Amjad](#)) concluding the positive role of FDI in boosting the aggregate stock market, the results maybe deviating.

The negative association of the NEER and the average annual stock prices of the power sector supports the theoretical interpretation done by (Samveg Patel in The effect of Macroeconomic determinants on the performance of the Indian Stock Market) which provides clear emphasis on the very fact that the depreciation of the domestic currency against foreign currencies implies that the exchange rate should have a negative relationship.

In addition to the above, the study also indicated that a higher inflation rate will decrease the value of the firm and will result in lower share prices which have been proved in our study.

Multiple regression

Regression Statistics	
Multiple R	0.796060577
R Square	0.633712442
Adjusted R Square	-0.098862673
Standard Error	0.002206972
Observations	7

The model's R square indicates a value of 63% (0.63) which shows that the dependent variable (average annual stock prices of the power sector) is moderately affected by the chosen macroeconomic factors thus emphasizing on a considerable amount of dependency of the power sector stock prices on the macroeconomic factors because 63% is not a very high regression.

ANOVA					
	df	SS	MS	F	Significance F
Regression	4	1.68536E-05	4.21341E-06	0.865047732	0.598408541
Residual	2	9.74145E-06	4.87073E-06		
Total	6	2.65951E-05			

As the p-value is more than 0.05, we accept null hypothesis that implies that there is no significant relationship between the stock prices and the macroeconomic variables.

V. FINDINGS AND SUGGESTIONS

- There is a negative correlation between the GDP per capita and the power sector stock prices.
- There is a negative correlation between the FDI and the power sector stock prices.
- There is a negative correlation between the NEER and the power sector stock prices.
- There is a negative correlation between the Inflation and the power sector stock prices.
- The study is not conclusive for the two parameters- GDP per capita and FDI hence a more detailed study would be required.

VI. CONCLUSION

As per the study conducted, it is sensible to conclude that the macroeconomic variables chosen have a negative correlation to the power sector stock prices of India suggesting the inverse relation between them. Reason being all the companies chosen have a relatively good market standing thus making the impact of macroeconomic variables negligible.