

“A Study On Arbitrage Trade Analysis of Stock Trading in Selected Stocks at National Stock Exchange (NSE) and Bombay Stock Exchange(BSE)”

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Introduction

The simultaneous purchase and sale of an asset in order to profit from a difference in the price. This usually takes place on different exchanges or market places also known as a “risk less profit”. A trader purchases the stock where it is undervalued and short sells the stock where it is overvalued, thus profiting from the difference. Arbitrage is recommended for experienced investors only. A central idea in modern finance is the law of one price. This states that in a competitive market, if two assets are equivalent from the point of view of risk and return, they should sell at the same price. If the price of the same asset is different in two markets, there will be operators who will buy in the market where the asset sells cheap and sell in the market where it is costly.

Arbitrage is a strategy involving a simultaneous purchase and sale of identical or equivalent instruments across two or more markets in order to benefit from a discrepancy in their price relationship. It is a risk-free transaction, as the long and short legs of the transaction offset each other exactly. Thus, arbitrage engages in a strategy in order to reduce risk of loss caused by price fluctuations of securities held in the portfolio. It involves buying and selling of equal quantities of a security in two different markets, with the expectations that a future change in price will offset by an opposite change in the other.

Definition- Arbitrage Pricing Theory (APT)

APT is an alternative asset pricing model to the Capital Asset Pricing Model-CAPM. Unlike the Capital Asset Pricing Model, which specifies returns as a linear function of only systematic risk, Arbitrage Pricing Theory may specify returns as a linear function of more than a single factor.

The Arbitrage Pricing Theory (APT) was developed primarily by Ross (1976a, 1976b). It is a one-period model in which every investor believes that the stochastic properties of returns of capital assets are consistent with a factor structure. Ross argues that if equilibrium prices offer no arbitrage opportunities over static portfolios of the assets, then the expected returns on the assets are approximately linearly related to the factor loadings. (The factor loadings, or betas, are proportional to the returns’ co variances with the factors.). Ross’ (1976a) heuristic argument for the theory is based on the preclusion of arbitrage. Ross’ formal proof shows that the Linear pricing relation is a necessary condition for equilibrium in a market where agents maximize certain types of utility. The subsequent work, which is surveyed below, derives either from the assumption of the preclusion of arbitrage or the equilibrium utility-maximization. A linear relation between the expected returns and the betas is tantamount to an identification of the stochastic discount factor (SDF).

Review of Literature

1. Arbitrage Opportunities in the Futures Market: A Study of NSE Nifty Futures By Dr. Dheeraj Misra; Dr. R Kannan & Dr. Sangeeta D Misra

Futures have constituted an important segment of the Indian derivatives market. In the Indian securities market, trading in index option commenced in June 2000. Even though it is less than six years since index futures trading was introduced in the Indian stock market, there has been spectacular growth in the turnover of index futures. The index futures turnover increased from Rs. 2365 crores during 2000-01 to Rs 1,165,355 crores during the first ten months of 2005-06.

There are three kinds of participants in the index futures market: speculator, hedger and arbitrageur. Hedgers use index futures to eliminate the price risk associated with an

underlying asset. Speculators use index futures to bet on future movement in the price of the underlying asset. Arbitrageurs use index futures to take advantage of mispricing. There exists a deterministic relationship between spot and futures prices. If the actual futures price differs from the theoretical futures price, there exists an arbitrage opportunity and an arbitrageur can set up a risk-less position and earn more than the risk-free rate of return.

2. Comparative Analysis of Indian Stock Market with International Markets by Debjiban Mukherjee T. A. Pai Management Institute, Manipal, India

Debjiban Mukherjee (2007) made a comparative Analysis of Indian stock market with International markets. His study covers New York Stock Exchange (NYSE), Hong Kong Stock exchange (HSE), Tokyo Stock exchange (TSE), Russian Stock exchange (RSE), Korean Stock exchange (KSE) from various socio- politico-economic backgrounds. Both the Bombay Stock exchange (BSE) and the National Stock Exchange of Indian Limited (NSE) have been used in the study as a part of Indian Stock Market. The main objective of this study is to capture the trends, similarities and patterns in the activities and movements of the Indian Stock Market in comparison to its international counterparts. The time period has been divided into various eras to test the correlation between the various exchanges to prove that the Indian markets have become more integrated with its global counterparts and its reaction are in tandem with that are seen globally. The various stock exchanges have been compared on the basis of Market Capitalization, number of listed securities, listing agreements, circuit filters, and settlement. It can safely be said that the markets do react to global cues and any happening in the global scenario be it macroeconomic or country specific (foreign trade channel) affect the various markets.

3. The Arbitrage Theory of Capital Asset Pricing By Stephen A. Ross

CAPM has only one factor and one beta. Conversely, the APT formula has multiple factors that include non-company factors, which requires the asset's beta in relation to each separate factor. However, the APT does not provide insight into what these factors could be, so users of the APT model must analytically determine relevant factors that might affect the asset's returns. On the other hand, the factor used in the CAPM is the difference between the expected market rate of return and the risk-free rate of return. Since the CAPM is a one-factor model and simpler to use, investors may want to use it to determine the expected theoretical appropriate rate of return rather than using APT, which requires users to quantify multiple factors.

Objective of the Study

➤ The objective of the study is to analyze the possibility of taking advantage of arbitrage mechanism of the some of the top companies of Indian economy, traded in BSE and NSE.

➤ **Assumptions/ Limitations:**

- The companies are studied for arbitration for a period of two months “SEP and OCT” for four years 2014,2015,2016 and 2017
- Closing prices of each share in the two exchanges (NSE & BSE) are taken for analysis.
- The difference in the prices is analyzed for any scope of arbitration

The companies selected are: Tata Consultancy Services, Reliance Industries, ONGC, ITC, HDFC, Coal India, Sun Pharma, Infosys, ICICI Bank, State Bank of India

Source: www.worldblaze.com

Data collection – Secondary data

Data Analysis tools – Arithmetic average or Mean, Percentage, Subtraction, MIN/MAX and Line Graph.

Methodology

Arithmetic average or mean:

The arithmetic average measures the central tendency. The purpose of computing an average value for a set of observations is to obtain a single value, which is representative of all the items. The main objective of averaging is to arrive at a single value which is a representative of the characteristics of the entire mass of data and arithmetic average or mean of a series (usually denoted by \bar{x}) is the value obtained by dividing the sum of the values of various items in a series ($\sum x$) divided by the number of items (N) constituting the series.

Thus, if X_1, X_2, \dots, X_n are the given N observations. Then

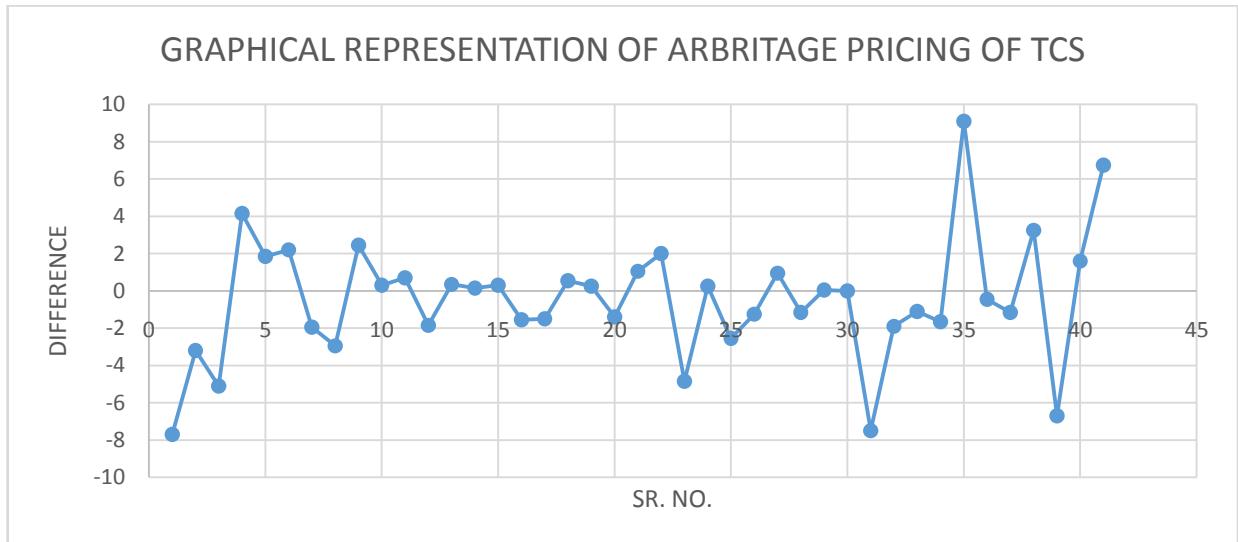
$$\bar{X} = \frac{X_1 + X_2 + \dots + X_n}{N}$$

Return

$$= \frac{\text{Current price} - \text{previous price}}{\text{Previous price}} * 100$$

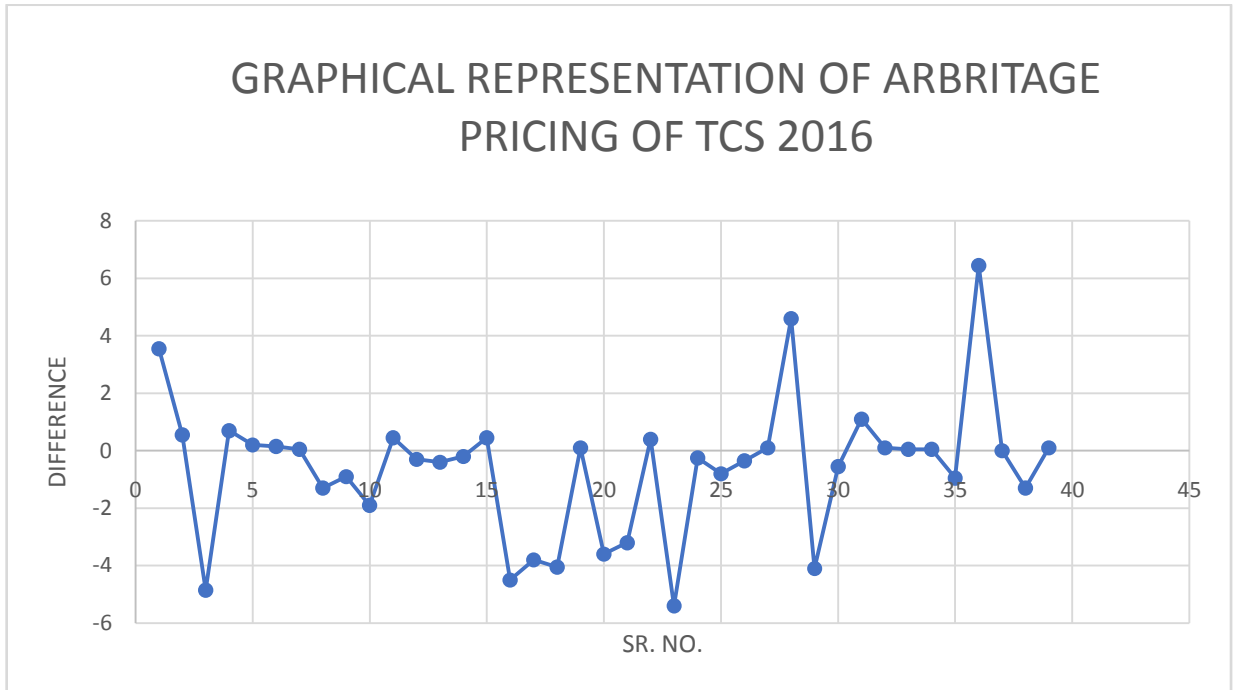
Statistics in Graphical form

TCS- 2017



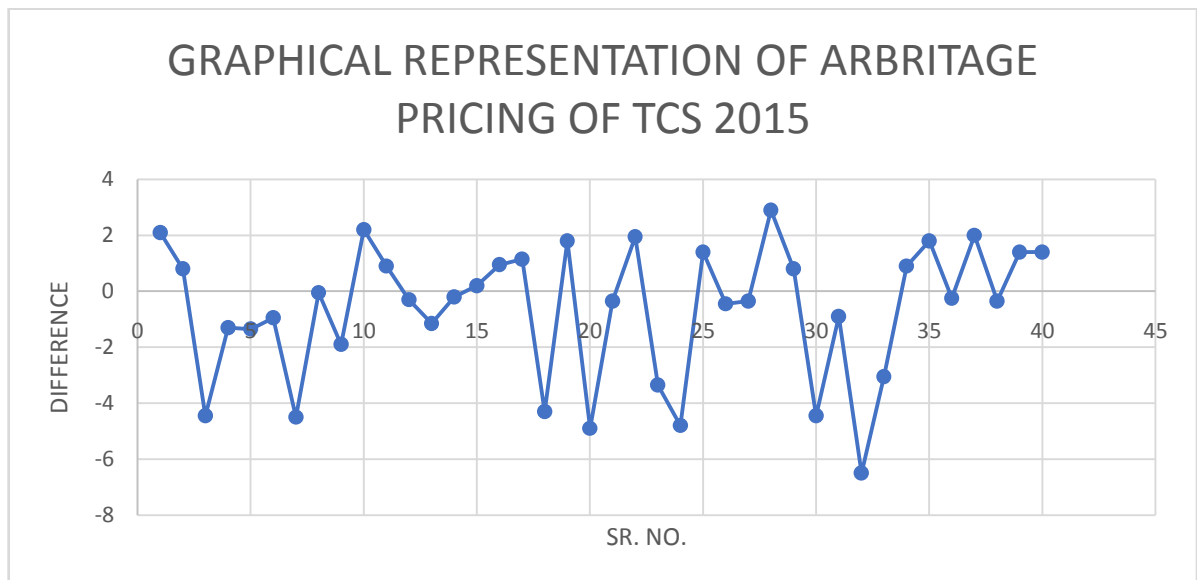
The above table and graph represents arbitrage pricing analysis of TCS stock trading in BSE and NSE. Here arbitrage price difference of TCS stock can be derived by subtracting NSE from BSE. In the months of SEP 2017 – OCT 2017 TCS stock consists minimum value is -7.7 and maximum value +9.1 and Mean is -0.47. The return is 7.41% show that there is scope for arbitrage as it is above seven percent (risk free rate).

TCS- 2016



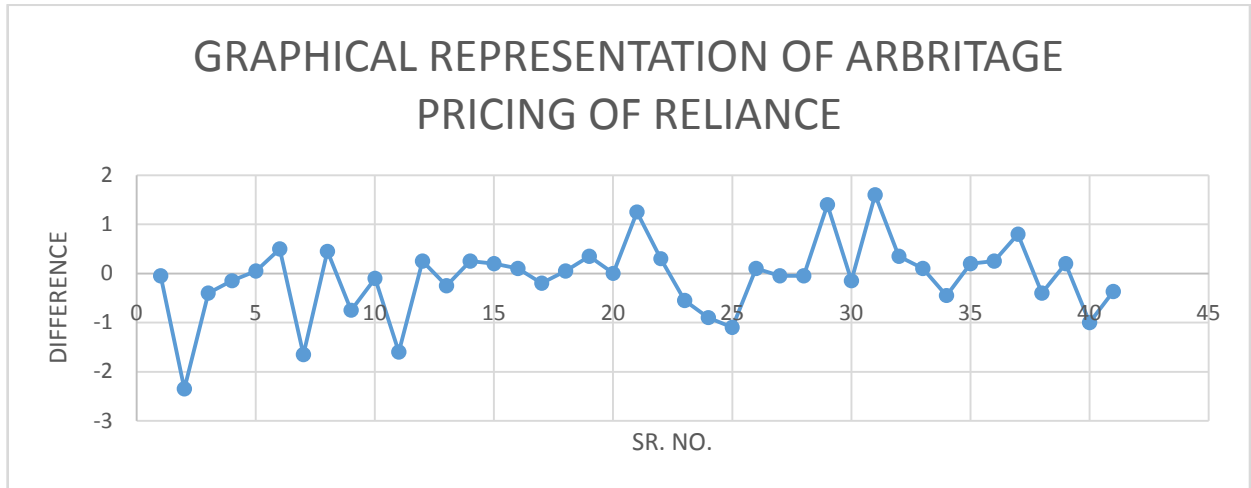
The above table and graph represents arbitrage pricing analysis of TCS stock trading in BSE and NSE. Here arbitrage price difference of TCS stock can be derived by subtracting NSE from BSE. In the months of SEP 2016 – OCT 2016 TCS stock consists minimum value is -5.4 and maximum value +6.4 and Mean is -0.6. The return is 8.34 show that there is scope for arbitrage as it is above seven percent (risk free rate).

TCS 2015



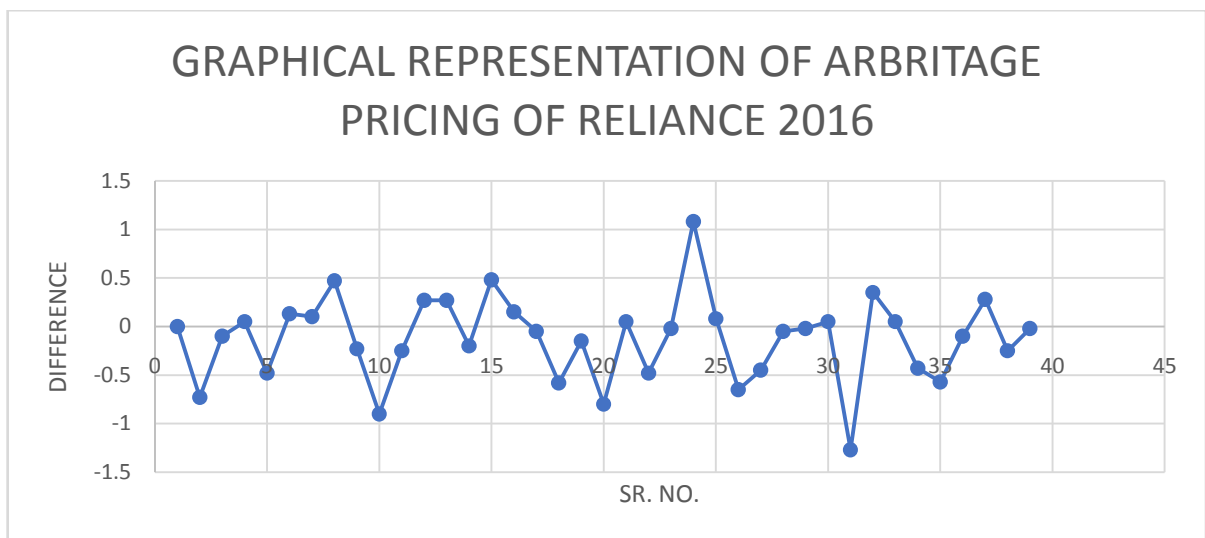
The above table and graph represents arbitrage pricing analysis of TCS stock trading in BSE and NSE. Here arbitrage price difference of TCS stock can be derived by subtracting NSE from BSE. In the months of SEP 2015 – OCT 2015 TCS stock consists minimum value is -6.5 and maximum value +2.9 and Mean is -0.63. The return is 9.95 show that there is scope for arbitrage as it is above seven percent (risk free rate).

2. RELIANCE 2017



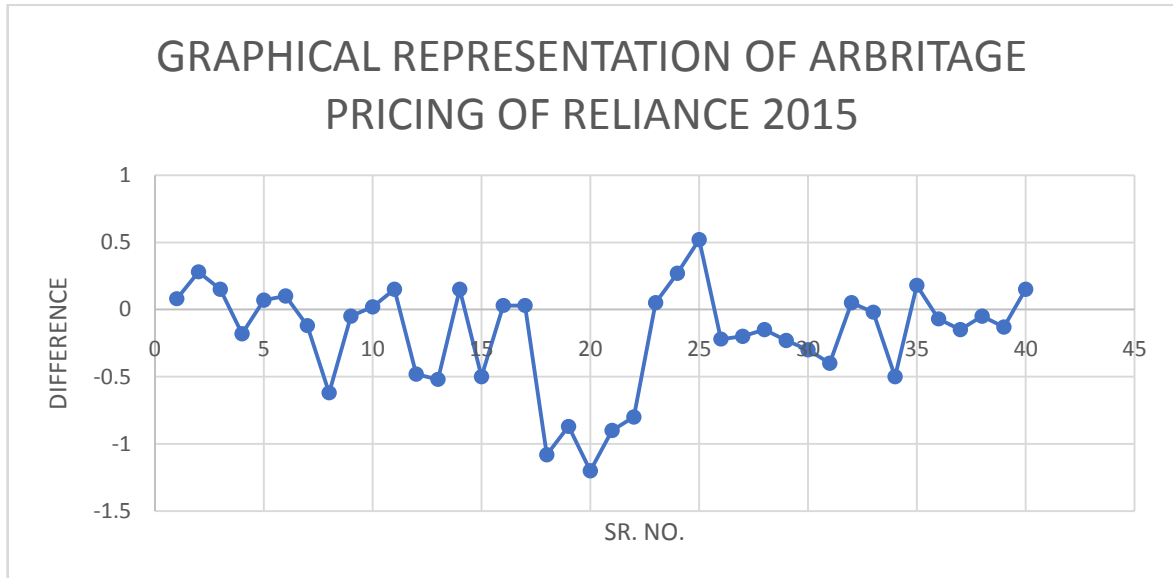
The above table and graph represents arbitrage pricing analysis of RELIANCE stock trading in BSE and NSE. Here arbitrage price difference of RELIANCE stock can be derived by subtracting NSE from BSE. In the months of SEP 2017 – OCT 2017 RELIANCE stock consists minimum value is -2.35 and maximum value +1.6 and Mean is -0.09195. The return is 17.5 show that there is scope for arbitrage as it is above seven percent (risk free rate).

RELIANCE- 2016



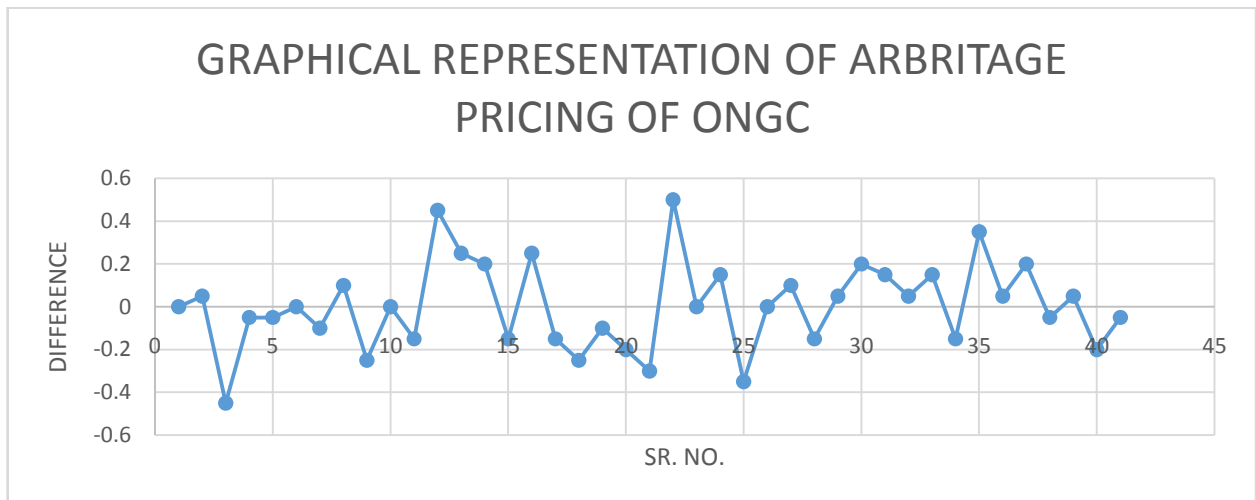
The above table and graph represents arbitrage pricing analysis of RELIANCE stock trading in BSE and NSE. Here arbitrage price difference of RELIANCE stock can be derived by subtracting NSE from BSE. In the months of SEP 2016 – OCT 2016 RELIANCE stock consists minimum value is -1.27 and maximum value +1.08 and Mean is -0.126. The return is 9.69 show that there is scope for arbitrage as it is above seven percent (risk free rate).

RELIANCE- 2015



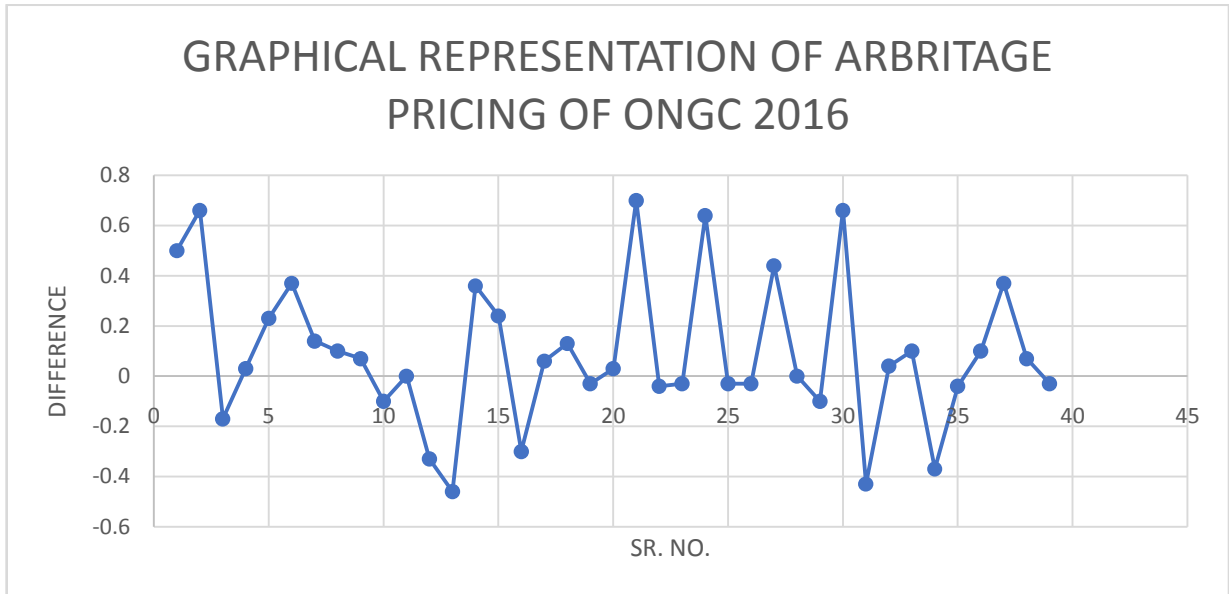
The above table and graph represents arbitrage pricing analysis of RELIANCE stock trading in BSE and NSE. Here arbitrage price difference of RELIANCE stock can be derived by subtracting NSE from BSE. In the months of SEP 2015 – OCT 2015 RELIANCE stock consists minimum value is -1.2 and maximum value +0.52 and Mean is -0.18. The return is 15.65 show that there is scope for arbitrage as it is above seven percent (risk free rate).

ONGC- 2017



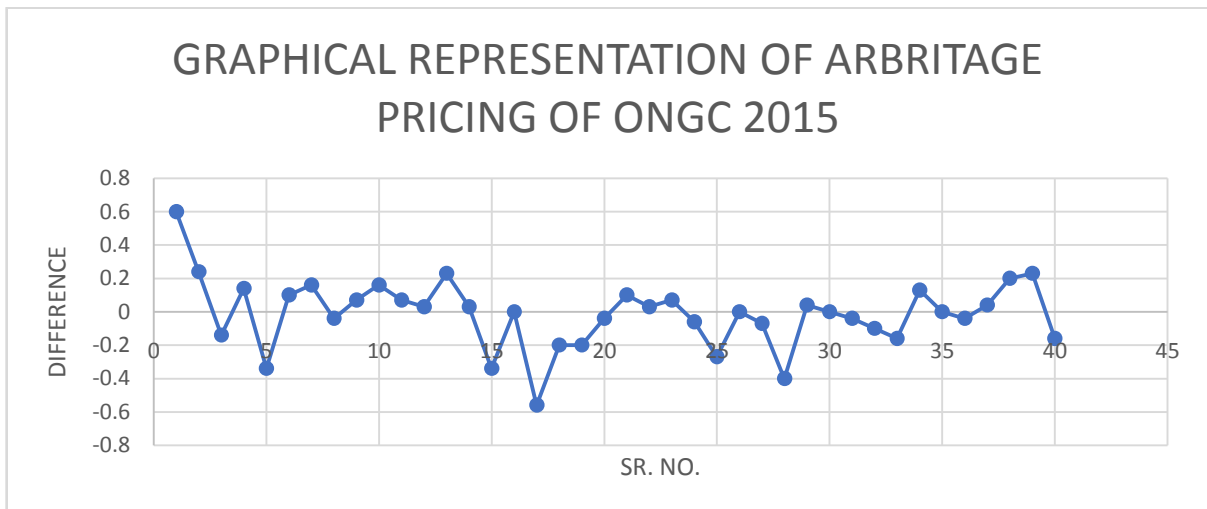
The above table and graph represents arbitrage pricing analysis of ONGC stock trading in BSE and NSE. Here arbitrage price difference of ONGC stock can be derived by subtracting NSE from BSE. In the months of SEP 2017 – OCT 2017 ONGC stock consists minimum value is -0.45 and maximum value +0.5 and Mean is 0.0003. The return is 16.6 show that there is scope for arbitrage as it is above seven percent (risk free rate).

ONGC-2016



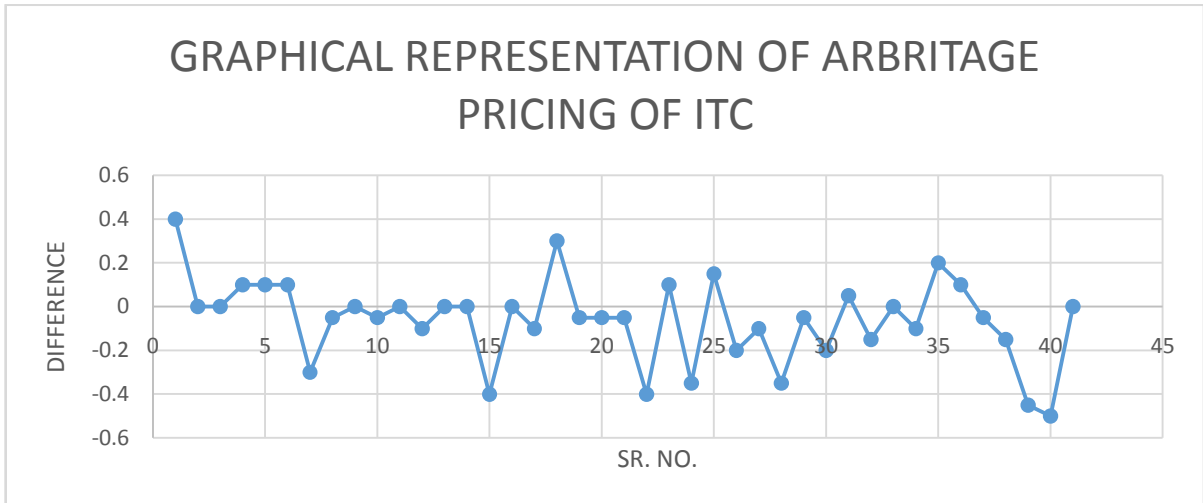
The above table and graph represents arbitrage pricing analysis of ONGC stock trading in BSE and NSE. Here arbitrage price difference of ONGC stock can be derived by subtracting NSE from BSE. In the months of SEP 2016 – OCT 2016 ONGC stock consists minimum value is - 0.46 and maximum value +0.47 and Mean is 0.09. The return is 23.8 show that there is scope for arbitrage as it is above seven percent (risk free rate).

ONGC- 2015



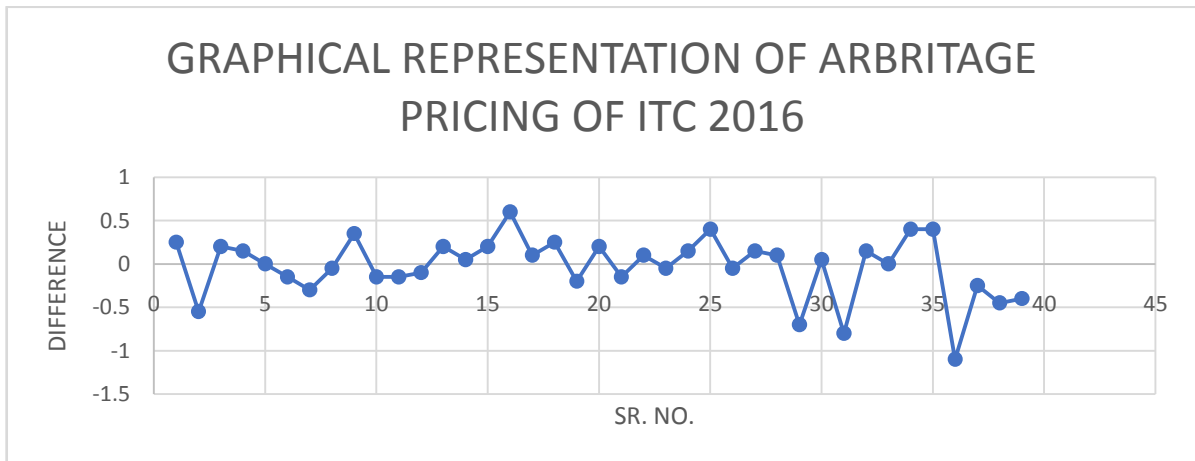
The above table and graph represents arbitrage pricing analysis of ONGC stock trading in BSE and NSE. Here arbitrage price difference of ONGC stock can be derived by subtracting NSE from BSE. In the months of SEP 2015 – OCT 2015 ONGC stock consists minimum value is - 0.56 and maximum value +0.6 and Mean is -0.012. The return is 17.4 show that there is scope for arbitrage as it is above seven percent (risk free rate).

ITC-2017



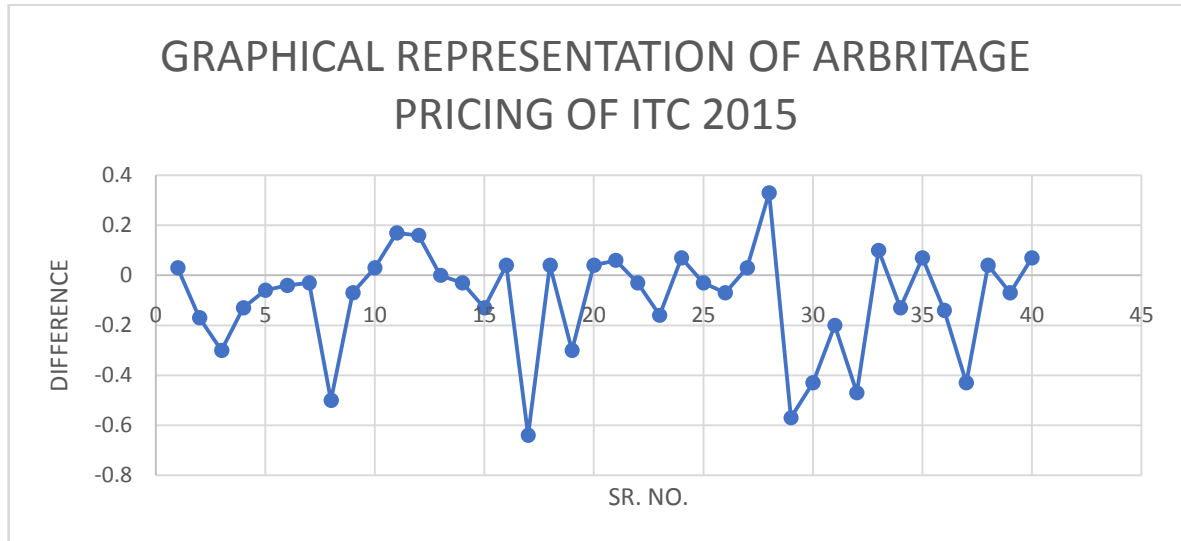
The above table and graph represents arbitrage pricing analysis of ITC stock trading in BSE and NSE. Here arbitrage price difference of ITC stock can be derived by subtracting NSE from BSE. In the months of SEP 2017 – OCT 2017 ITC stock consists minimum value is -0.5 and maximum value +0.4 and Mean is -0.063. The return is 8.93 show that there is scope for arbitrage as it is above seven percent (risk free rate).

ITC-2016



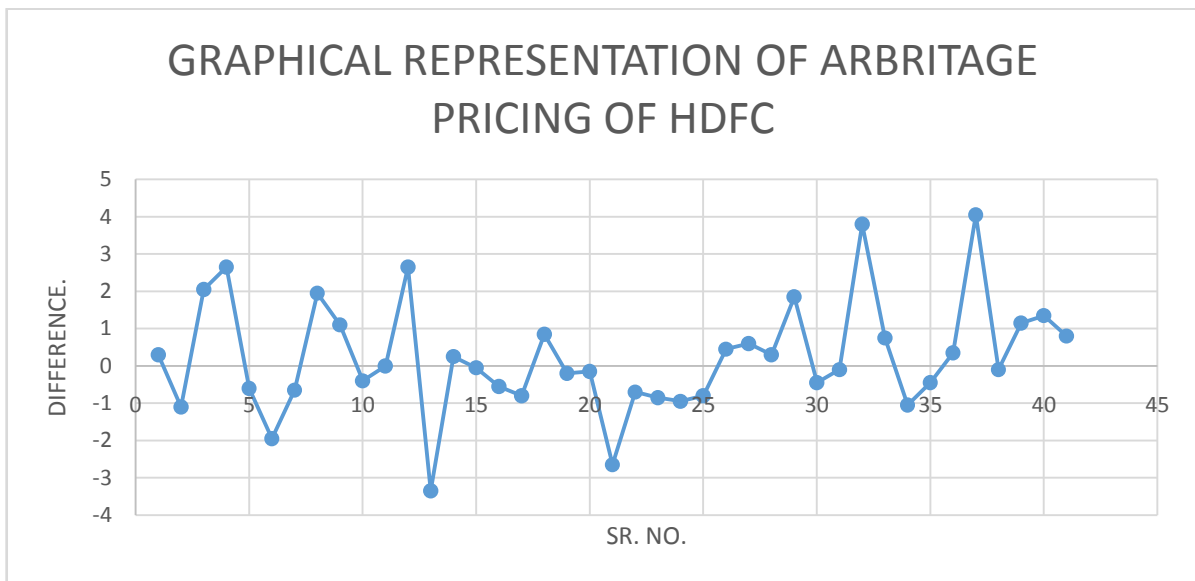
The above table and graph represents arbitrage pricing analysis of ITC stock trading in BSE and NSE. Here arbitrage price difference of ITC stock can be derived by subtracting NSE from BSE. In the months of SEP 2016 – OCT 2016 ITC stock consists minimum value is -1.1 and maximum value +0.6 and Mean is -0.029. The return is 11.75 show that there is scope for arbitrage as it is above seven percent (risk free rate).

ITC- 2015



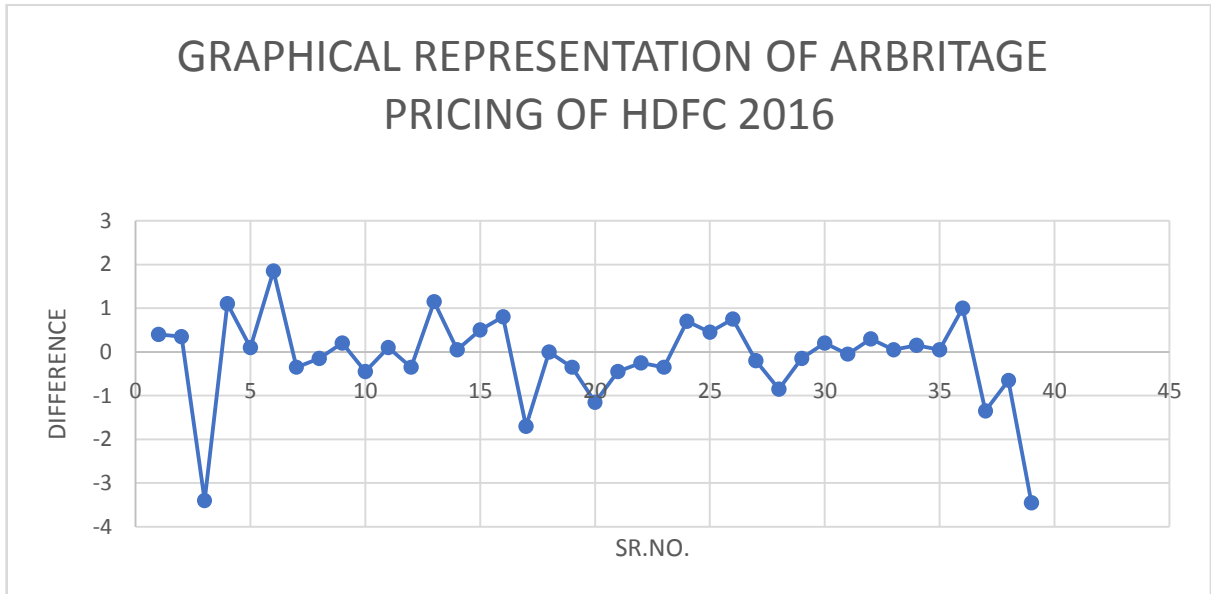
The above table and graph represents arbitrage pricing analysis of ITC stock trading in BSE and NSE. Here arbitrage price difference of ITC stock can be derived by subtracting NSE from BSE. In the months of SEP 2015 – OCT 2015 ITC stock consists minimum value is -0.64 and maximum value 0.33 and Mean is -0.09. The return is 14.8 show that there is scope for arbitrage as it is above seven percent (risk free rate).

HDFC Bank - 2017



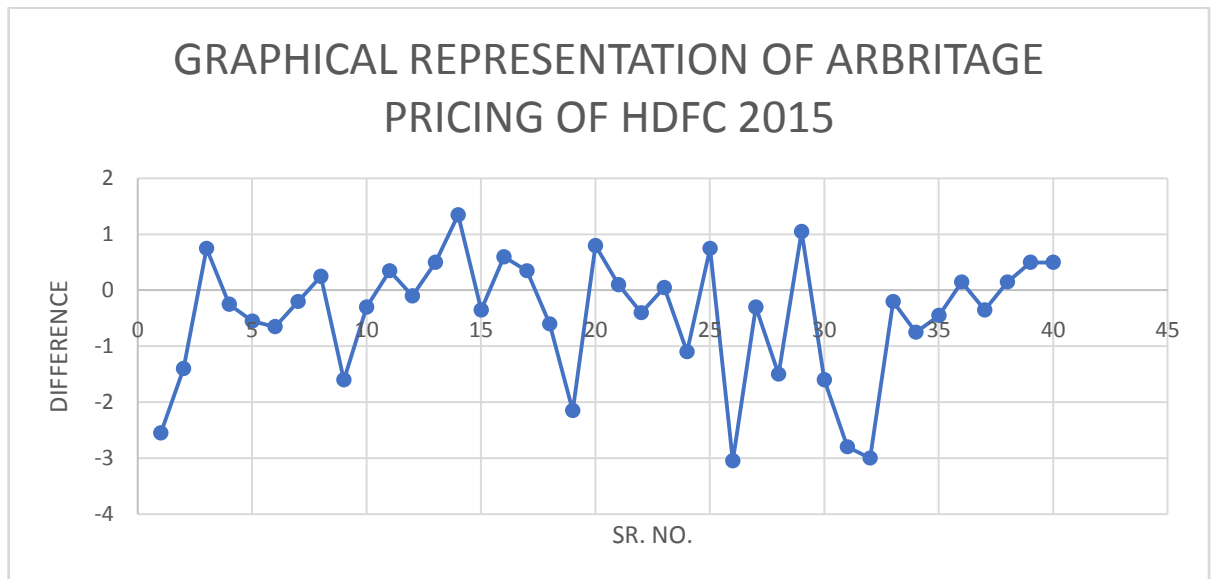
The above table and graph represents arbitrage pricing analysis of HDFC stock trading in BSE and NSE. Here arbitrage price difference of HDFC stock can be derived by subtracting NSE from BSE. In the months of SEP 2017 – OCT 2017 HDFC stock consists minimum value is - 3.3 and maximum value +4.0 and Mean is 0.228. The return is 6.35 show that there is no scope for arbitrage as it is below seven percent (risk free rate).

HDFC Bank-2016



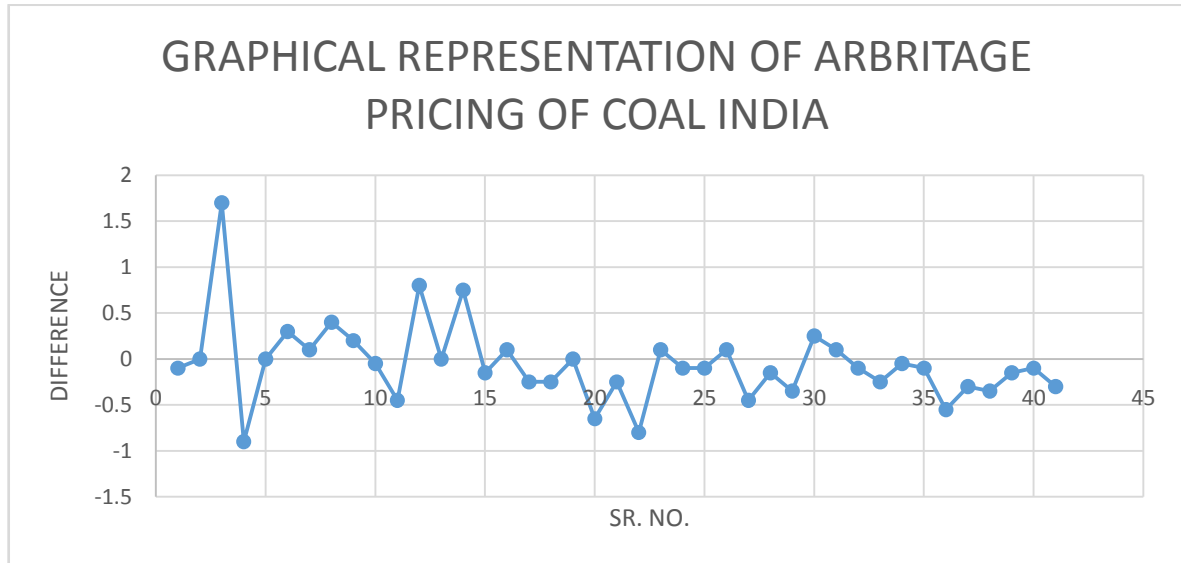
The above table and graph represents arbitrage pricing analysis of HDFC stock trading in BSE and NSE. Here arbitrage price difference of HDFC stock can be derived by subtracting NSE from BSE. In the months of SEP 2016 – OCT 2016 HDFC stock consists minimum value is - 3.45 and maximum value 1.85 and Mean is -0.1384. The return is 6.09 show that there is no scope for arbitrage as it is below seven percent (risk free rate).

HDFC Bank- 2015



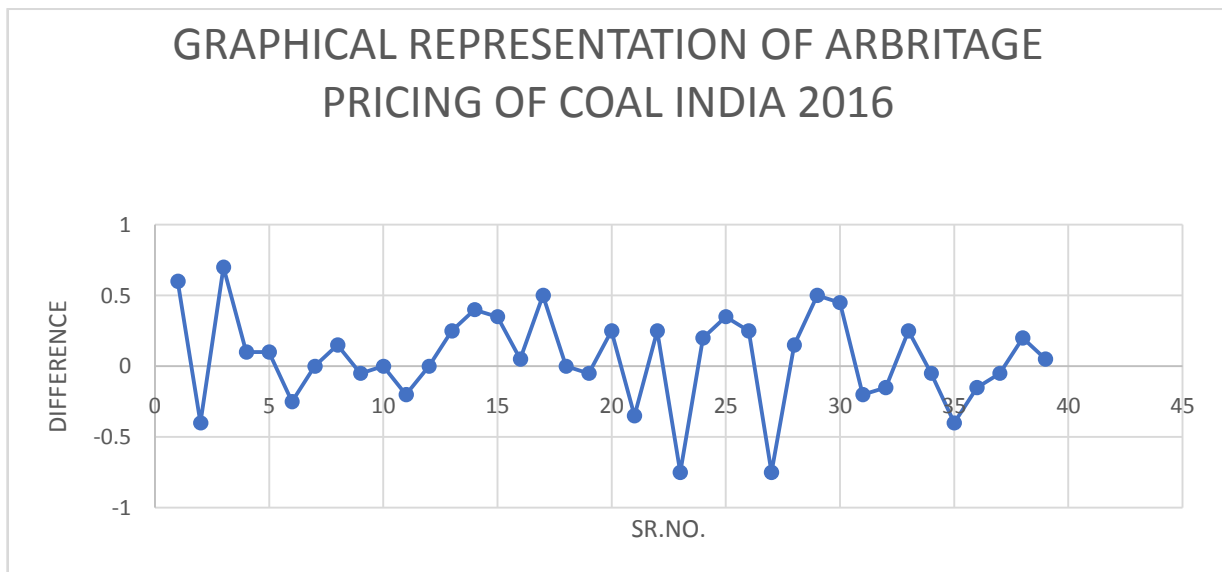
The above table and graph represents arbitrage pricing analysis of HDFC stock trading in BSE and NSE. Here arbitrage price difference of HDFC stock can be derived by subtracting NSE from BSE. In the months of SEP 2015 – OCT 2015 HDFC stock consists minimum value is - 3.05 and maximum value +1.35 and Mean is -0.45. The return is 12.98 show that there is scope for arbitrage as it is above seven percent (risk free rate).

COAL INDIA-2017



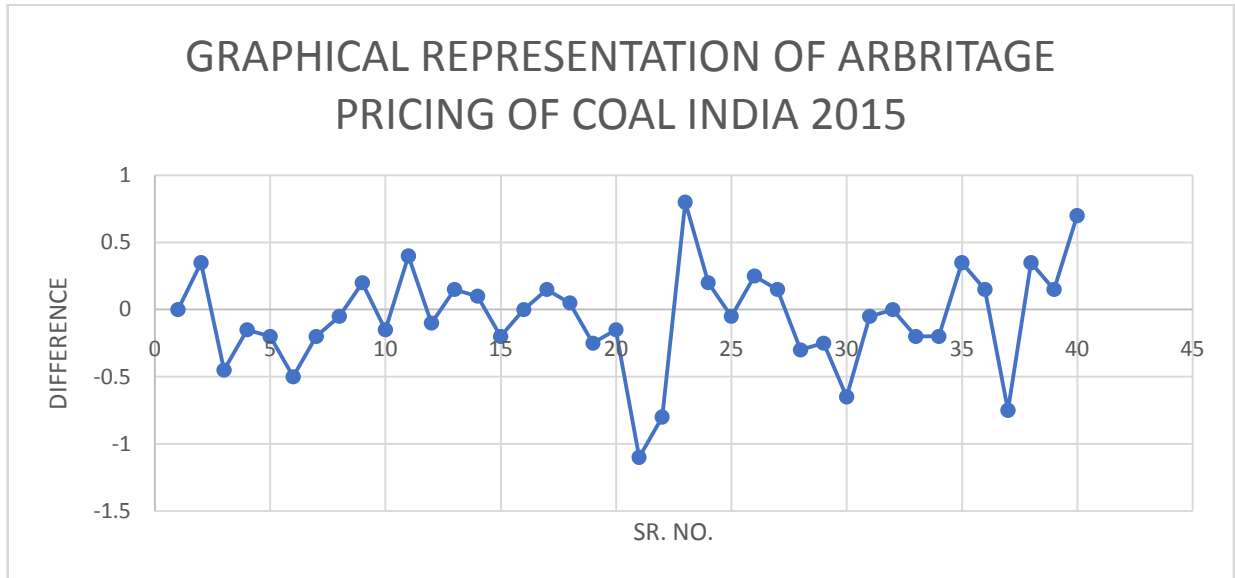
The above table and graph represents arbitrage pricing analysis of COAL INDIA stock trading in BSE and NSE. Here arbitrage price difference of COAL INDIA stock can be derived by subtracting NSE from BSE. In the months of SEP 2017 – OCT 2017 COAL INDIA stock consists minimum value is -0.9 and maximum value +1.7 and Mean is -0.057. The return is 18.74 show that there is scope for arbitrage as it is above seven percent (risk free rate).

COAL INDIA-2016



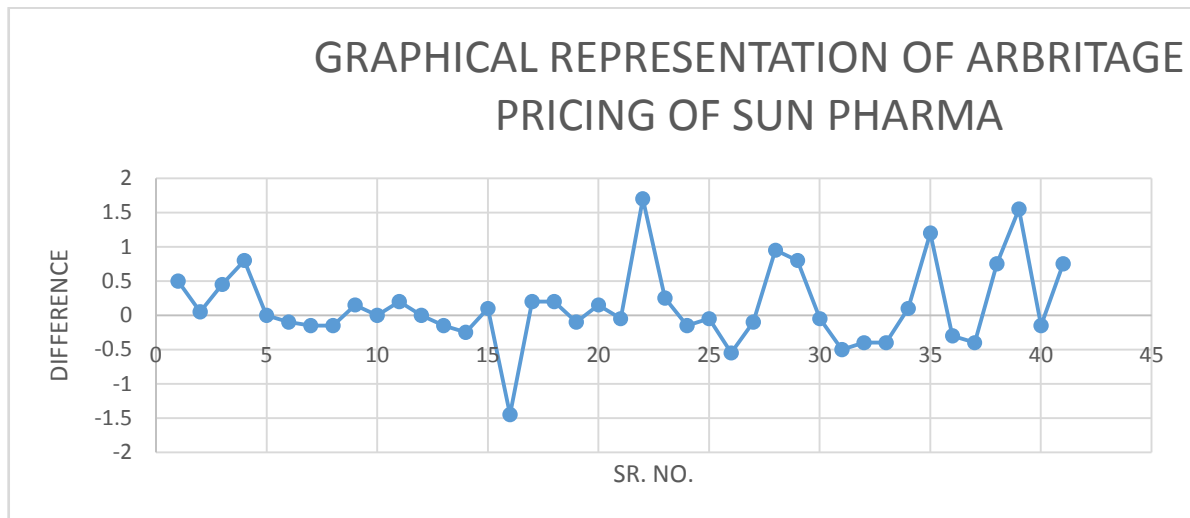
The above table and graph represents arbitrage pricing analysis of COAL INDIA stock trading in BSE and NSE. Here arbitrage price difference of COAL INDIA stock can be derived by subtracting NSE from BSE. In the months of SEP 2016 – OCT 2016 COAL INDIA stock consists minimum value is -0.75 and maximum value +0.7 and Mean is 0.0589. The return is 8.68 show that there is scope for arbitrage as it is above seven percent (risk free rate).

COAL INDIA- 2015



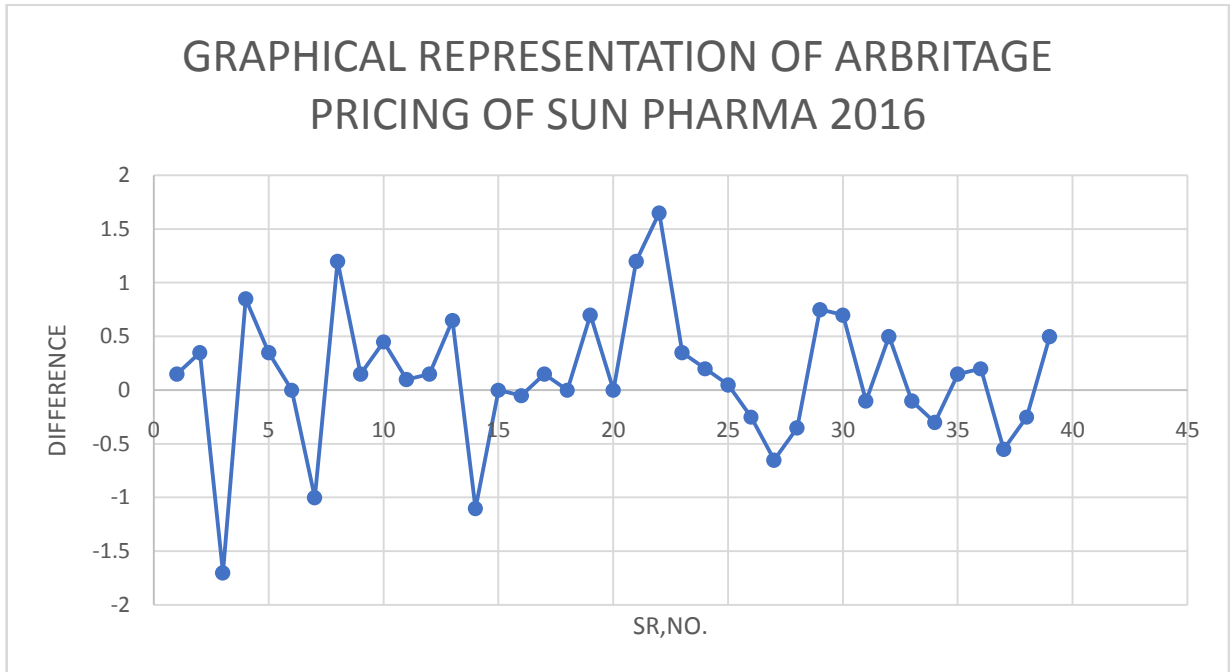
The above table and graph represents arbitrage pricing analysis of COAL INDIA stock trading in BSE and NSE. Here arbitrage price difference of COAL INDIA stock can be derived by subtracting NSE from BSE. In the months of SEP 2015 – OCT 2015 COAL INDIA stock consists minimum value is -1.1 and maximum value +0.8 and Mean is -0.056. The return is 15.07 show that there is scope for arbitrage as it is above seven percent (risk free rate).

SUN PHARMA-2017



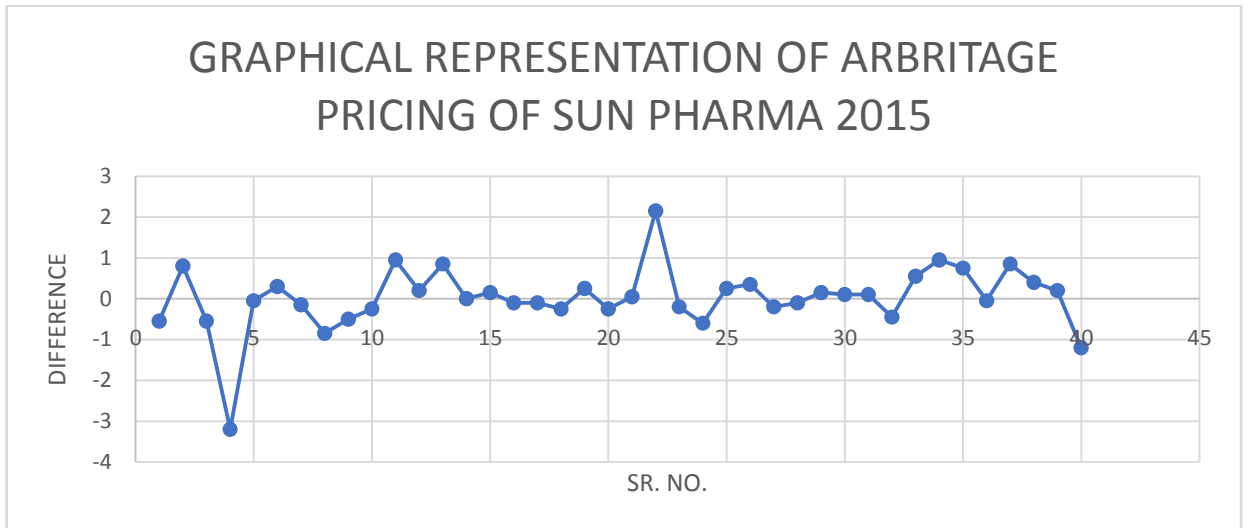
The above table and graph represents arbitrage pricing analysis of SUN PHARMA stock trading in BSE and NSE. Here arbitrage price difference of SUN PHARMA stock can be derived by subtracting NSE from BSE. In the months of SEP 2017 – OCT 2017 SUN PHARMA stock consists minimum value is -1.45 and maximum value +1.7 and Mean is 0.131. The return is 15.53 show that there is scope for arbitrage as it is above seven percent (risk free rate).

SUN PHARMA - 2016



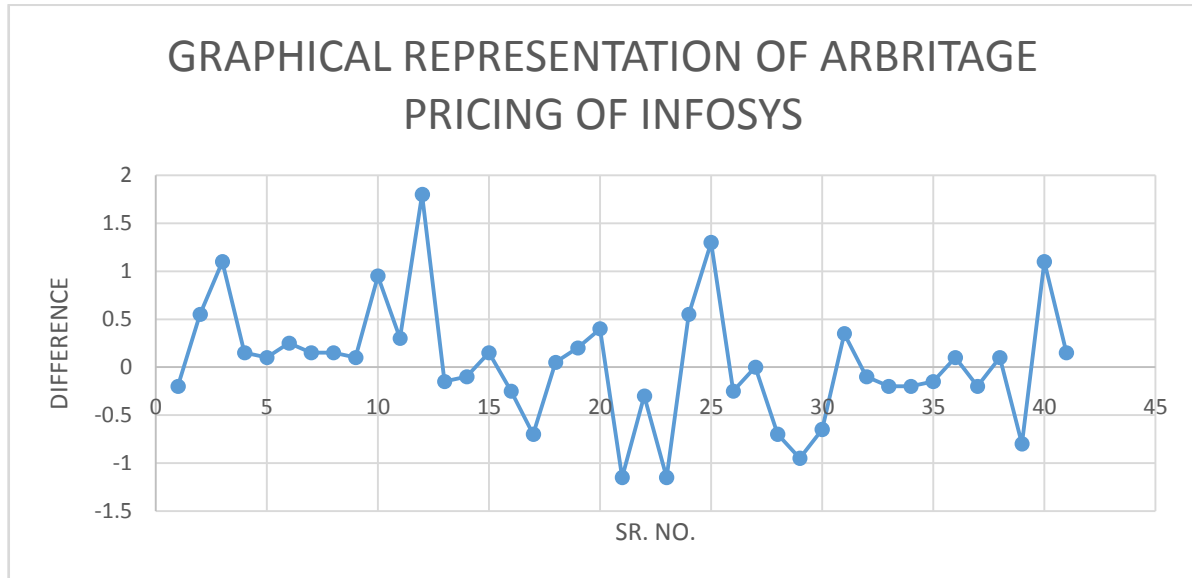
The above table and graph represents arbitrage pricing analysis of SUN PHARMA stock trading in BSE and NSE. Here arbitrage price difference of SUN PHARMA stock can be derived by subtracting NSE from BSE. In the months of SEP 2016 – OCT 2016 SUN PHARMA stock consists minimum value is -1.7 and maximum value +1.65 and Mean is 0.13. The return is 10.11 show that there is scope for arbitrage as it is above seven percent (risk free rate).

SUN PHARMA- 2015



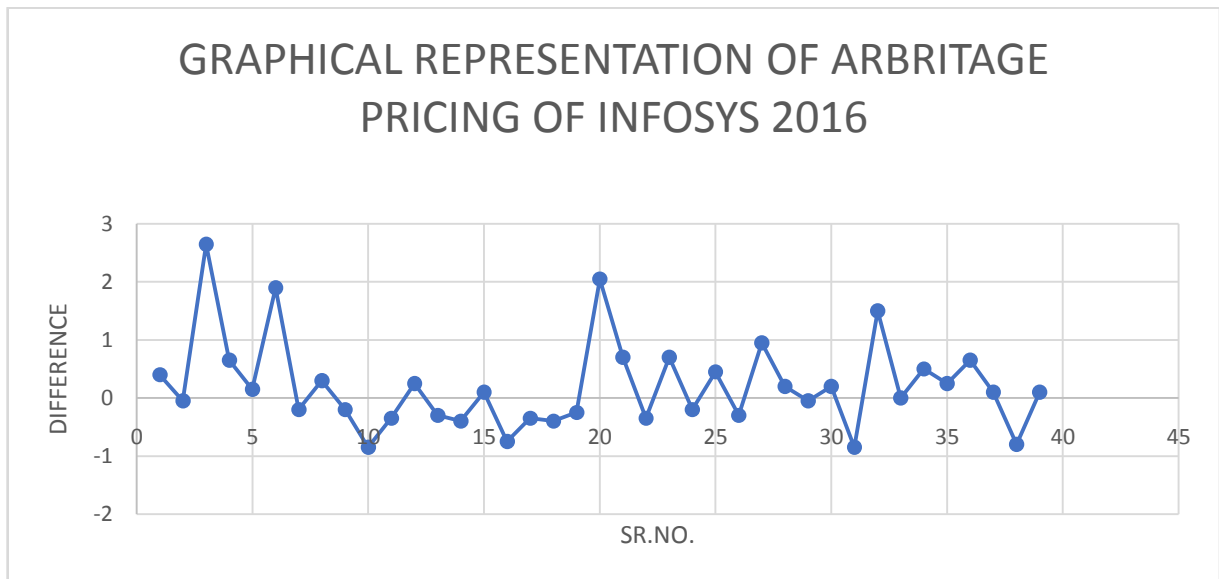
The above table and graph represents arbitrage pricing analysis of SUN PHARMA stock trading in BSE and NSE. Here arbitrage price difference of SUN PHARMA stock can be derived by subtracting NSE from BSE. In the months of SEP 2015 – OCT 2015 SUN PHARMA stock consists minimum value is -3.2 and maximum value +2.15 and Mean is 0.018. The return is 10.7 show that there is scope for arbitrage as it is above seven percent (risk free rate).

INFOSYS-2017



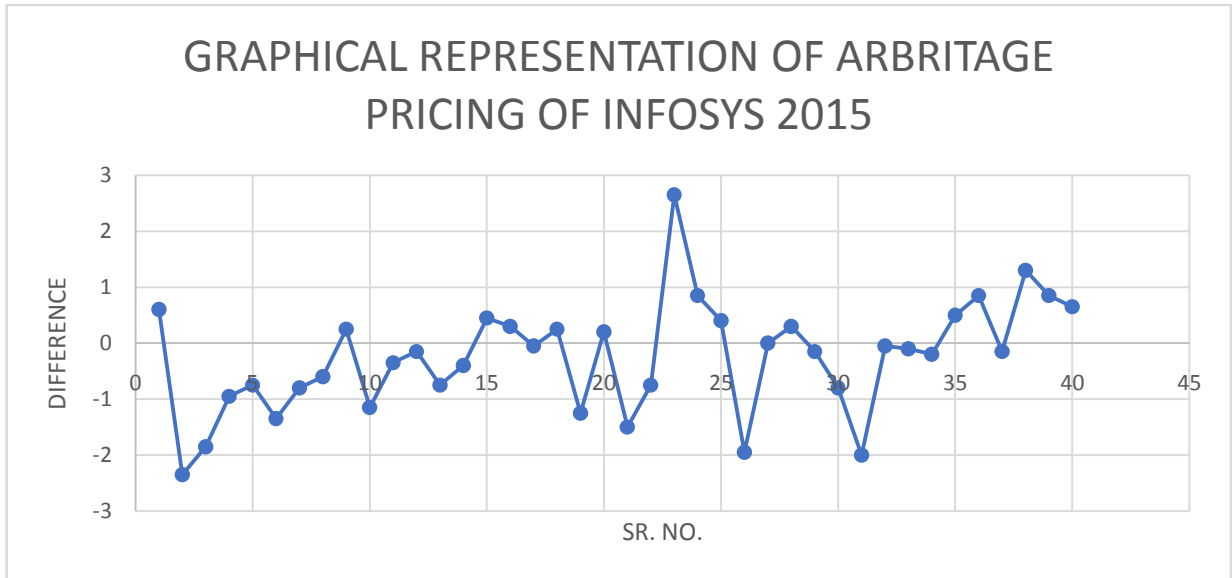
The above table and graph represents arbitrage pricing analysis of INFOSYS stock trading in BSE and NSE. Here arbitrage price difference of INFOSYS stock can be derived by subtracting NSE from BSE. In the months of SEP 2017 – OCT 2017 INFOSYS stock consists minimum value is -1.15 and maximum value +1.8 and Mean is 0.045. The return is 7.27 show that there is scope for arbitrage as it is above seven percent (risk free rate).

INFOSYS- 2016



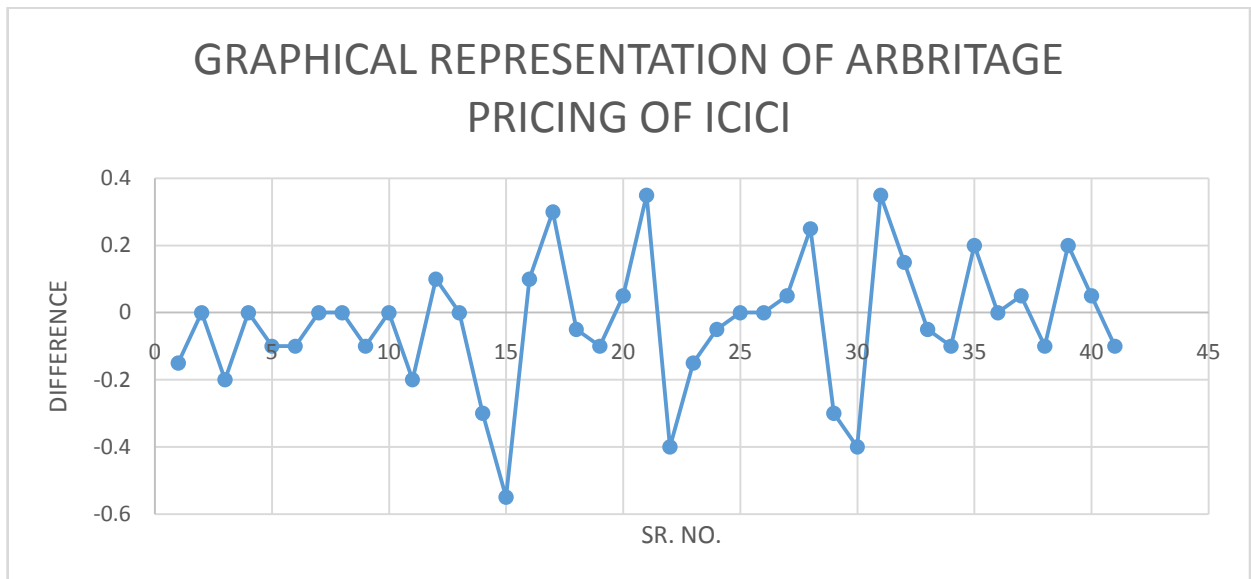
The above table and graph represents arbitrage pricing analysis of INFOSYS stock trading in BSE and NSE. Here arbitrage price difference of INFOSYS stock can be derived by subtracting NSE from BSE. In the months of SEP 2016 – OCT 2016 INFOSYS stock consists minimum value is -0.85 and maximum value +2.65 and Mean is 0.207. The return is 6.39 show that there is no scope for arbitrage as it is below seven percent (risk free rate).

INFOSYS- 2015



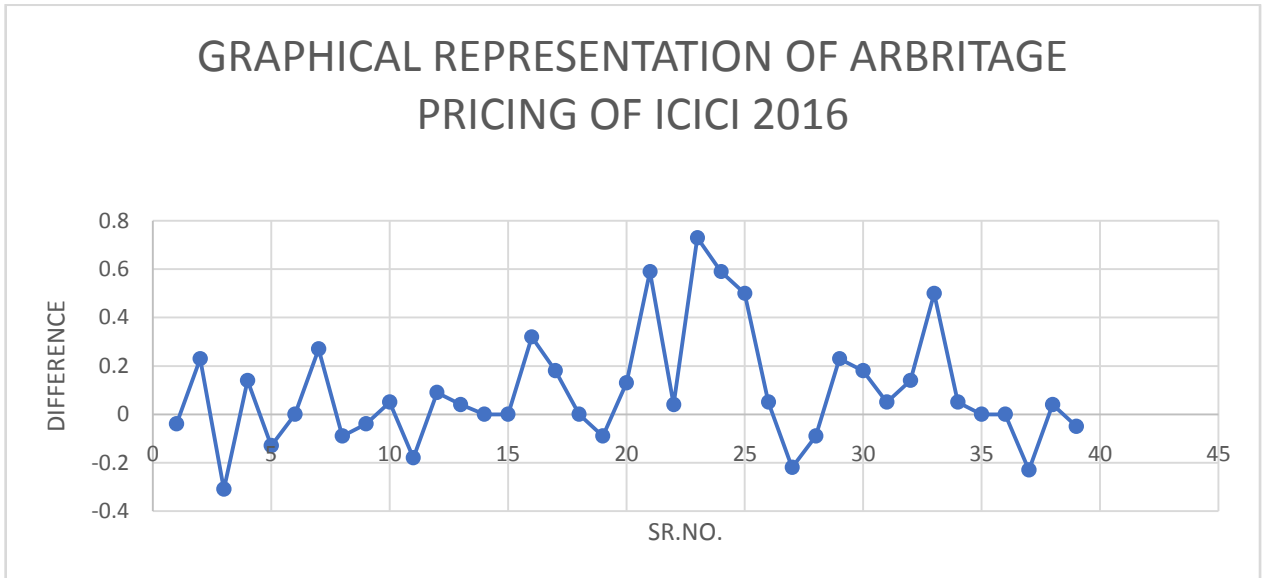
The above table and graph represents arbitrage pricing analysis of INFOSYS stock trading in BSE and NSE. Here arbitrage price difference of INFOSYS stock can be derived by subtracting NSE from BSE. In the months of SEP 2015 – OCT 2015 INFOSYS stock consists minimum value is -2.35 and maximum value +2.65 and Mean is -0.25. The return is 11.61 show that there is scope for arbitrage as it is above seven percent (risk free rate).

ICICI Bank- 2017



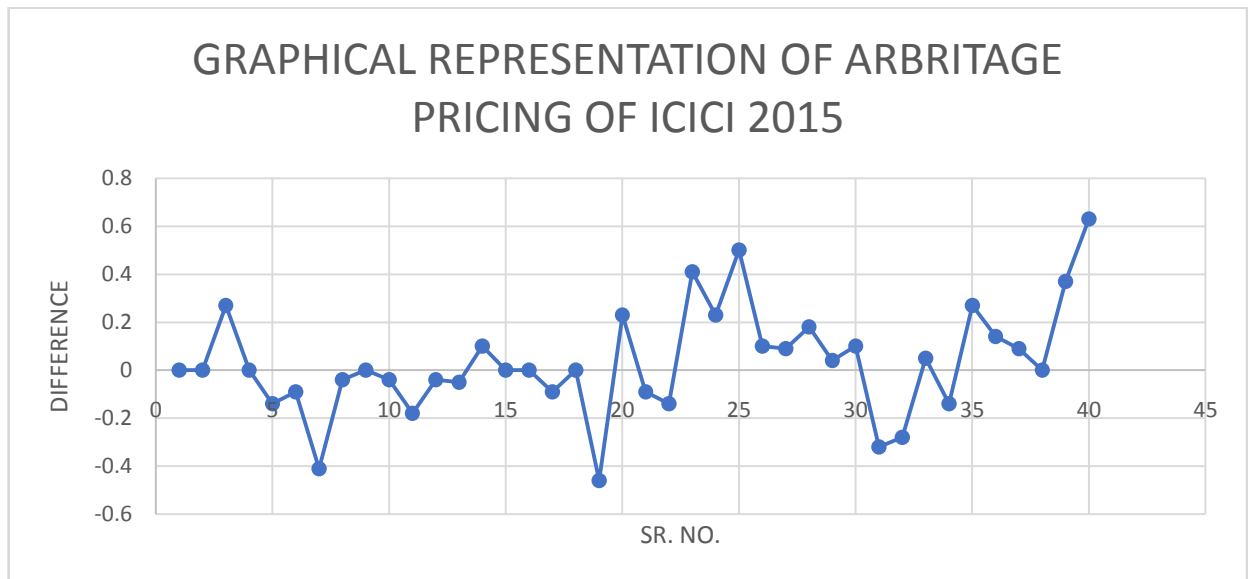
The above table and graph represents arbitrage pricing analysis of ICICI stock trading in BSE and NSE. Here arbitrage price difference of ICICI stock can be derived by subtracting NSE from BSE. In the months of SEP 2017 – OCT 2017 ICICI stock consists minimum value is -0.55 and maximum value +0.35 and Mean is -0.03171. The return is 15.65 show that there is scope for arbitrage as it is above seven percent (risk free rate).

ICICI Bank - 2016



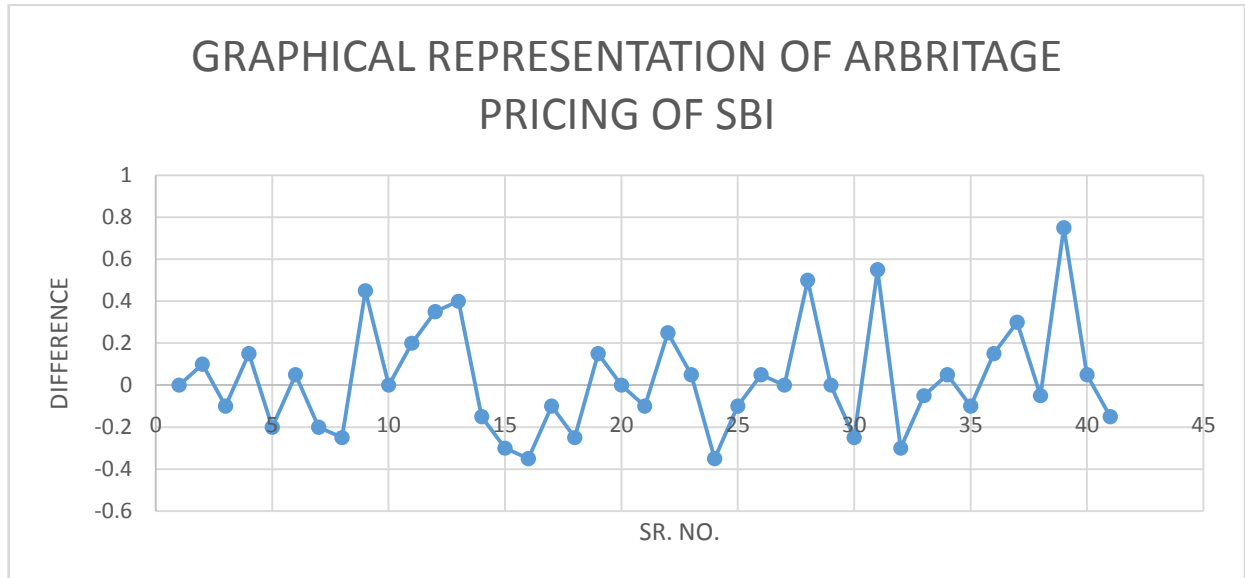
The above table and graph represents arbitrage pricing analysis of ICICI stock trading in BSE and NSE. Here arbitrage price difference of ICICI stock can be derived by subtracting NSE from BSE. In the months of SEP 2016 – OCT 2016 ICICI stock consists minimum value is - 0.31 and maximum value +0.73 and Mean is 0.094. The return is 19.9 show that there is scope for arbitrage as it is above seven percent (risk free rate).

ICICI Bank- 2015



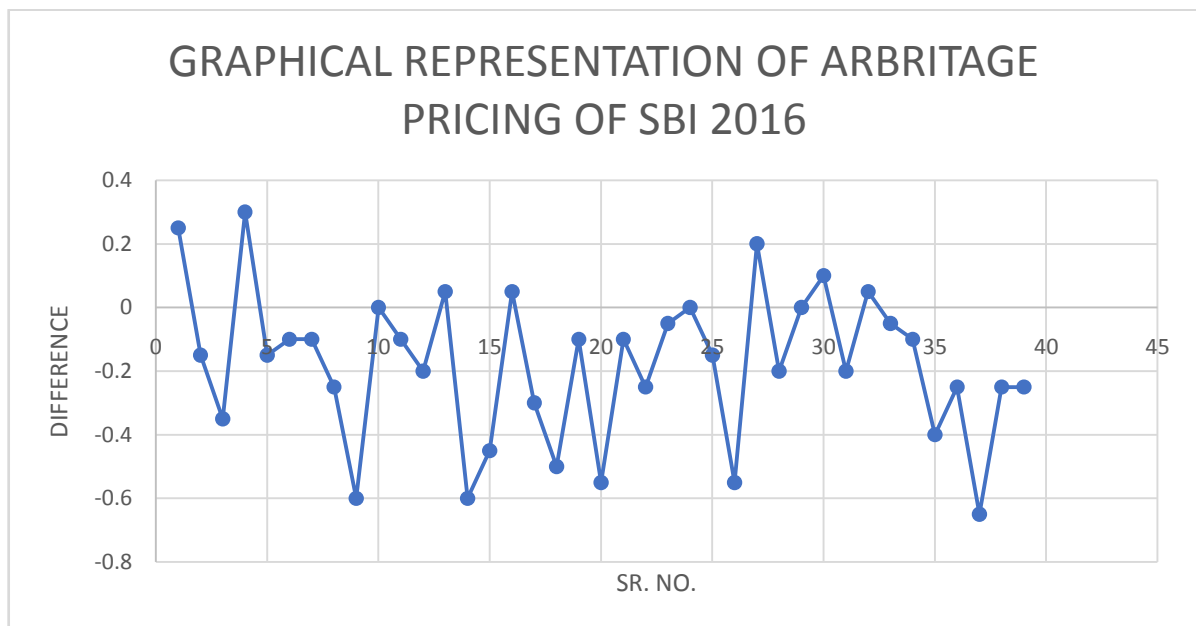
The above table and graph represents arbitrage pricing analysis of ICICI stock trading in BSE and NSE. Here arbitrage price difference of ICICI stock can be derived by subtracting NSE from BSE. In the months of SEP 2015 – OCT 2015 ICICI stock consists minimum value is - 0.46 and maximum value +0.63 and Mean is 0.03. The return is 16.4 show that there is scope for arbitrage as it is above seven percent (risk free rate).

SBI- 2017



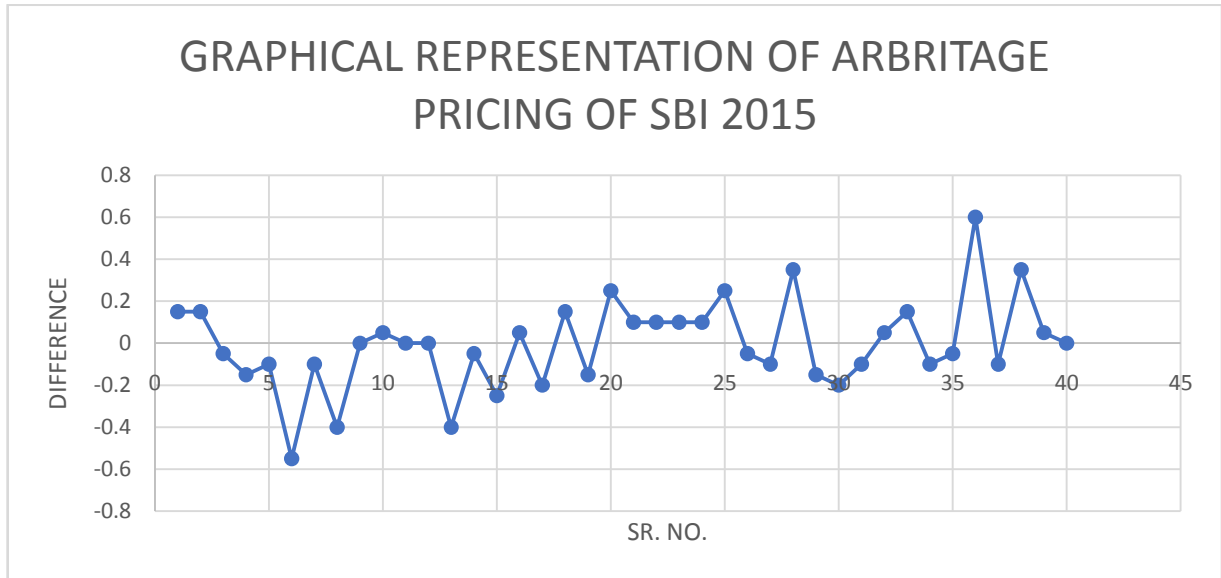
The above table and graph represents arbitrage pricing analysis of SBI stock trading in BSE and NSE. Here arbitrage price difference of SBI stock can be derived by subtracting NSE from BSE. In the months of SEP 2017 – OCT 2017 SBI stock consists minimum value is -0.35 and maximum value +0.75 and Mean is 0.029. The return is 25.36 show that there is scope for arbitrage as it is above seven percent (risk free rate).

SBI- 2016



The above table and graph represents arbitrage pricing analysis of SBI stock trading in BSE and NSE. Here arbitrage price difference of SBI stock can be derived by subtracting NSE from BSE. In the months of SEP 2016 – OCT 2016 SBI stock consists minimum value is -0.65 and maximum value +0.3 and Mean is -0.17. The return is 8.5 show that there is scope for arbitrage as it is above seven percent (risk free rate).

SBI- 2015



The above table and graph represents arbitrage pricing analysis of SBI stock trading in BSE and NSE. Here arbitrage price difference of SBI stock can be derived by subtracting NSE from BSE. In the months of SEP 2015 – OCT 2015 SBI stock consists minimum value is -0.55 and maximum value +0.6 and Mean is 0.006. The return is 15.28 show that there is scope for arbitrage as it is above seven percent (risk free rate).

Conclusions

The study reveals the following

TCS gives scope of arbitrage for a period of two months “SEP – OCT” for all the three years 2015, 2016 and 2017 as the return of the company is more than seven percent (risk free rate).

RELIANCE gives scope of arbitrage for a period of two months “SEP – OCT” for all the three years , 2015, 2016 and 2017 as the return of the company is more than seven percent (risk free rate).

ONGC gives scope of arbitrage for a period of two months “SEP – OCT” for all the three years , 2015, 2016 and 2017 as the return of the company is more than seven percent (risk free rate).

ITC gives scope of arbitrage for a period of two months “SEP – OCT” for all the three years , 2015, 2016 and 2017 as the return of the company is more than seven percent (risk free rate).

HDFC gives scope of arbitrage for a period of two months “SEP – OCT” for only one out of three r studied years 2015 as the return of the company is more than seven percent (risk free rate), whereas for the year 2016 and 2017 do not give any scope for arbitrage as the return of HDFC is less than seven percent (risk free rate).

COAL INDIA gives scope of arbitrage for a period of two months “SEP – OCT” for all the three years 2015, 2016 and 2017 as the return of the company is more than seven percent (risk free rate).

SUN PHARMA gives scope of arbitrage for a period of two months “SEP – OCT” for all the three years , 2015, 2016 and 2017 as the return of the company is more than seven percent (risk free rate).

INFOSYS gives scope of arbitrage for a period of two months “SEP – OCT” for the year, 2015 and 2017 as the return of the company is more than seven percent (risk free rate), whereas for the year 2016 do not give any scope for arbitrage as the return of INFOSYS is less than seven percent (risk free rate).

ICICI gives scope of arbitrage for a period of two months “SEP – OCT” for all the three years , 2015, 2016 and 2017 as the return of the company is more than seven percent (risk free rate).

SBI gives scope of arbitrage for a period of two months “SEP – OCT” for all the three years 2014, 2015, 2016 and 2017 as the return of the company is more than seven percent (risk free rate).

Thus out of the ten companies under study, 90 % of them have provided scope for arbitrage .

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