STUDY ON ARBITRAGE TRADE ANALYSIS OF STOCKS

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ABSTRACT
Arbitrage by definition is a financial transaction that makes an immediate profit without involving any risk. This usually takes place on different exchanges or market places. Also known as a “risk less profit”. Here’s an example of arbitrage: Say a domestic stock also trades on a foreign exchange in another country, where it hasn’t adjusted for the constantly changing exchange rate. 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. The buying cheap and selling expensive continues till prices in the two markets reach equilibrium. Hence, arbitrage helps to equalize prices and restore market efficiency.

Keywords: Risk less profit, law of one price

INTRODUCTION
An alternative asset pricing model to the Capital Asset Pricing Model, 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.

Fundamental Analysis
This investment strategy involves evaluating a stock by examining the company, especially its operations and its financial condition. Here we look at several valuation methods, factoring in price/earnings ratio, PEG, dividend yields, book value, price/sales ratio, and return on equity.

Stock Strategies
Learn about various strategies for investing in stocks, including the “buy and hold approach,” analyzing market timing, and estimating a company’s potential for growth.

Stocks and Your Portfolio
I like this company, but should I add it to my portfolio? This article talks about diversification and balancing risk with your stock selections.

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.) The result is stated in Section 1. Ross’ (1976a) heuristic
argument for the theory is based on the preclusion of arbitrage. This intuition is sketched out in Section 2. 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 futility-maximization. A linear relation between the expected returns and the betas is tantamount to an identification of the stochastic discount factor (SDF). Sections 3 and 4, respectively, review this literature.

OBJECTIVE

1. To measure the performance of the share prices of 10 stocks from 2010 to 2014.
2. To study the difference of 10 shares prices traded in NSE & BSE.
3. To identify the chance of arbitrage, thus measuring the volatility in returns.
4. To identify the best share that gives maximum returns through arbitrage.

HYPOTHESIS

H0: Positive Returns on share prices increases the scope for Arbitrage than Negative returns on share prices.

REVIEW OF LITERATURE

Zhi Da (2016) in his paper examines the relationship between arbitrage force and stock returns, with net arbitrage trading measured by the difference between abnormal hedge fund holdings and abnormal short interest. In the cross section, net arbitrage trading strongly predicts stock returns. This predictability is consistent with information advantage of arbitrageurs and copycat trading of other institutional investors. More importantly, across a broad set of stock anomalies, abnormal returns are realized only among anomaly stocks experiencing strong arbitrage trading, and such stocks are associated with high arbitrage cost on average. Finally, aggregate arbitrage trading predicts returns on mispriced stocks over time.

RESEARCH METHODOLOGY

Need and Importance of the study

The study is important from the point of view of the volatility of the stock market and the scope of ARBITRAGE in the changing market scenario. The study will also compare the ten selected stocks in BSE and NSE namely RELIANCE, INFOSYS, ICICI BANK, NTPC, TATA Steel, MARUTHI SUZUKI, CIPLA, ACC CEMENTS, SUN PHARMA, BHARATHI AIRTEL and compare them for arbitrage. The criteria for the selection of the above mentioned stock is that these are some of the stocks which are highly traded in BSE and NSE, and are giving good returns to the investors. From investors point of view, the study would be helpful for better investment decision making process. From the companies point of view the study would help to understand the business cycle and design appropriate strategies.

Secondary Data Analysis (Arbitration Trade Analysis)

To calculate the arbitrage of different industries Monthly closing data is calculated and the data is compared with BSE Sensex data. On the basis of this data Variance and Beta of each company is calculated and ranking was given to the companies on the basis of risk which is shown below:

1. Variance and Beta of Reliance Industries Ltd.

\[
\text{Covariance}(S,M) = \frac{\sum (M-\bar{M})(S-\bar{S})}{n-1} = 21.1
\]
Market Variance  \[ = \frac{\sum (M - EM)^2}{n-1} \]
\[ = 20.96 \]

Beta  \[ = \frac{\text{Covariance (SM)}}{\text{Market Variance}} = 1.00745 \]

It was found from the above analysis that the covariance of Reliance industries Ltd. With market index is 21.11 also Beta co-efficient of Reliance Industries Ltd. Is 1.00 which indicates that the stock moves exactly in step with the market.

2. Variance and Beta of Infosys Ltd..

Covariance(S,M)  \[ = \frac{\sum (M-EM) \cdot (S-ES)}{n-1} \]
\[ = 16.77 \]

Market Variance  \[ = \frac{\sum (M - EM)^2}{n-1} \]
\[ = 20.96 \]

Beta  \[ = \frac{\text{Covariance (SM)}}{\text{Market Variance}} = 0.80 \]

It was found from the above analysis that the covariance of Infosys Ltd. With market index is 16.77 also Beta co-efficient of Infosys Ltd. is 0.80 which indicates that the stock is 20% less volatile than market.

3. Variance and Beta of ICICI Bank Ltd.

Covariance(S,M)  \[ = \frac{\sum (M-EM) \cdot (S-ES)}{n-1} \]
\[ = 41.24 \]

Market Variance  \[ = \frac{\sum (M - EM)^2}{n-1} \]
\[ = 20.96 \]

Beta  \[ = \frac{\text{Covariance (SM)}}{\text{Market Variance}} = 1.97 \]

It was found from the above analysis that the covariance of ICICI Bank Ltd. with market index is 41.24 also Beta co-efficient of Infosys Ltd. is 1.97 which indicates that the stock is 97% more volatile than market.

4. Variance and Beta of NTPC Ltd.

Covariance(S,M)  \[ = \frac{\sum (M-EM) \cdot (S-ES)}{n-1} \]
\[ = 19.65 \]

Market Variance  \[ = \frac{\sum (M - EM)^2}{n-1} \]
\[ = 20.96 \]
Beta \( \beta \) = \frac{\text{Covariance}(S,M)}{\text{Market Variance}} = 0.94

It was found from the above analysis that the covariance of NTPC Ltd. with market index is 19.65 also Beta co-efficient of Infosys Ltd. is 0.94 which indicates that the stock is 6% less volatile than market.

5. Variance and Beta of Tata Steel Ltd.

\[
\text{Covariance}(S,M) = \frac{\sum (M-EM)(S-ES)}{n-1} = 32.75
\]

\[
\text{Market Variance} = \frac{\sum (M-EM)^2}{n-1} = 20.96
\]

\[
\text{Beta} = \frac{\text{Covariance}(S,M)}{\text{Market Variance}} = 1.56
\]

It was found from the above analysis that the covariance of Tata Steel Ltd. with market index is 32.75 also Beta co-efficient of Infosys Ltd. is 1.56 which indicates that the stock is 56% more volatile than market.

6. Variance and Beta of Maruti Suzuki India Ltd.

\[
\text{Covariance}(S,M) = \frac{\sum (M-EM)(S-ES)}{n-1} = 31.61
\]

\[
\text{Market Variance} = \frac{\sum (M-EM)^2}{n-1} = 20.96
\]

\[
\text{Beta} = \frac{\text{Covariance}(S,M)}{\text{Market Variance}} = 1.51
\]

It was found from the above analysis that the covariance of Maruti Suzuki India Ltd. with market index is 31.61 also Beta co-efficient of Infosys Ltd. is 1.51 which indicates that the stock is 51% more volatile than market.

7. Variance and Beta of Cipla Ltd.

\[
\text{Covariance}(S,M) = \frac{\sum (M-EM)(S-ES)}{n-1} = 11.65
\]

\[
\text{Market Variance} = \frac{\sum (M-EM)^2}{n-1} = 20.96
\]

\[
\text{Beta} = \frac{\text{Covariance}(S,M)}{\text{Market Variance}}
\]
It was found from the above analysis that the covariance of Cipla Ltd. with market index is 11.65 also Beta co-efficient of Infosys Ltd. is 0.56 which indicates that the stock is 44% less volatile than market.

8. Variance and Beta of ACC Ltd.
\[
\text{Covariance}(S,M) = \frac{\sum (M-EM)(S-ES)}{n-1} = 22.79
\]
\[
\text{Market Variance} = \frac{\sum (M-EM)^2}{n-1} = 20.96
\]
\[
\text{Beta} = \frac{\text{Covariance}(S,M)}{\text{Market Variance}} = 1.09
\]
It was found from the above analysis that the covariance of ACC Ltd. with market index is 22.79 also Beta co-efficient of Infosys Ltd. is 1.09 which indicates that the stock is 9% more volatile than market.

9. Variance and Beta of Sun Pharma Ltd.
\[
\text{Covariance}(S,M) = \frac{\sum (M-EM)(S-ES)}{n-1} = 20.54
\]
\[
\text{Market Variance} = \frac{\sum (M-EM)^2}{n-1} = 20.96
\]
\[
\text{Beta} = \frac{\text{Covariance}(S,M)}{\text{Market Variance}} = 0.98
\]
It was found from the above analysis that the covariance of Sun Pharma Ltd. with market index is 20.94 also Beta co-efficient of Infosys Ltd. is 0.98 which indicates that the stock is 2% less volatile than market.

10. Variance and Beta of Sun Pharma Ltd.
\[
\text{Covariance}(S,M) = \frac{\sum (M-EM)(S-ES)}{n-1} = 17.21
\]
\[
\text{Market Variance} = \frac{\sum (M-EM)^2}{n-1} = 20.96
\]
\[
\text{Beta} = \frac{\text{Covariance}(S,M)}{\text{Market Variance}} = 0.82
\]
It was found from the above analysis that the covariance of Bharti Airtel Ltd. with market index is 17.21 also Beta co-efficient of Infosys Ltd. is 0.82 which indicates that the stock is 18% less volatile than market.

**Comparative Arbitrage Analysis**

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Name of Organisation</th>
<th>Covariance</th>
<th>Beta</th>
<th>Risky Investment</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>Reliance Industries Ltd.</td>
<td>21.11</td>
<td>1.00</td>
<td>10</td>
</tr>
<tr>
<td>2</td>
<td>Infosys Ltd.</td>
<td>16.77</td>
<td>0.80</td>
<td>6</td>
</tr>
<tr>
<td>3</td>
<td>ICICI Bank Ltd.</td>
<td>41.24</td>
<td>1.97</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>NTPC Ltd.</td>
<td>19.65</td>
<td>0.94</td>
<td>8</td>
</tr>
<tr>
<td>5</td>
<td>Tata Steel Ltd.</td>
<td>32.75</td>
<td>1.56</td>
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</tr>
<tr>
<td>6</td>
<td>Maruti Suzuki India Ltd.</td>
<td>31.61</td>
<td>1.51</td>
<td>3</td>
</tr>
<tr>
<td>7</td>
<td>Cipla Ltd.</td>
<td>11.65</td>
<td>0.56</td>
<td>4</td>
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<tr>
<td>8</td>
<td>ACC Ltd.</td>
<td>22.79</td>
<td>1.09</td>
<td>7</td>
</tr>
<tr>
<td>9</td>
<td>Sun Pharma Ltd.</td>
<td>20.94</td>
<td>0.98</td>
<td>9</td>
</tr>
<tr>
<td>10</td>
<td>Bharti Airtel Ltd.</td>
<td>17.21</td>
<td>0.82</td>
<td>5</td>
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</table>

Thus from the above analysis it was found that ICICI Bank with highest beta is most risky and volatile stock followed by Tata Steel Ltd. with Beta of 1.56 and Maruti Suzuki India Ltd. at 3rd position in terms of risk with beta of 1.51. At 4th position in terms of risk is Cipla Ltd. with Beta of 0.56 and Bharti Airtel Ltd. at 5th position with Beta of 0.82. Infosys Ltd. ranks 6th in terms of risk with Beta of 0.80. ACC Ltd. ranks 8th with Beta of 1.09, NTPC Ltd. at 8th Position with Beta of 0.94 and Sun Pharma Ltd. at 9th position in terms of risk with Beta of 0.98. The least risky company in terms of Beta is Reliance Industries Ltd. having Beta of 1.00.
HYPOTHESIS TESTING

To test the hypothesis “Positive Returns on share prices increases the scope for Arbitrage than Negative returns on share prices” one-way ANOVA test is applied taking whether Positive return on stock prices increases the scope for Arbitrage as independent variable and Arbitrage is not an Intraday Trade, Last Traded Price is not the Price for Arbitrage, Arbitrage Trades should never be Manual, Retail investors cannot trade in arbitrage and you can only do arbitrage for stocks that you have in your DP as dependent variable.

### Descriptive

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<thead>
<tr>
<th></th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Std. Error</th>
<th>95% Confidence Interval for Mean</th>
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<th>Maximum</th>
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<td>.00000</td>
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<td>4.0000</td>
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### Retail investors cannot trade in arbitrage

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<th>Total</th>
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<th>Disagree</th>
<th>Neither agree nor disagree</th>
<th>Agree</th>
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<th>Total</th>
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### ANOVA

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<th>F</th>
<th>Sig.</th>
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<tr>
<td>Arbitrage is not an Intraday Trade</td>
<td></td>
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<tr>
<td>Between Groups</td>
<td>4.963</td>
<td>4</td>
<td>1.241</td>
<td>.626</td>
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<tr>
<td>Within Groups</td>
<td>188.197</td>
<td>95</td>
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<td>Total</td>
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<td>2.877</td>
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Retail investors cannot trade in arbitrage

<table>
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<th></th>
<th>Between Groups</th>
<th>Within Groups</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Within Groups</td>
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<tr>
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<tr>
<td>Within Groups</td>
<td>9.635</td>
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<td>1.938</td>
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<tr>
<td>Total</td>
<td>6.799</td>
<td>.000</td>
<td>.110</td>
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The above table shows the following

1. One-way ANOVA test is applied to study whether Positive return on stock prices increases the scope for Arbitrage taking Arbitrage is not intraday trade as dependent variable, where significance value obtained at F value of 0.626 is 0.645 which is more than alpha value of 0.05. This proves that Positive return on stock prices increases the scope for Arbitrage in case of intraday trade.

2. To test the above hypothesis, the variable Last Traded Price is not the Price for Arbitrage is taken as dependent variable where significance value obtained at F value of 1.746 is 0.146 which is more than alpha value of 0.05. This proves that Positive return on stock prices increases the scope for Arbitrage in case if Last traded price is not considered the price for arbitrage.

3. The hypothesis is also tested taking the variable Arbitrage trades should never be manual as dependent variable where significance value obtained at F value of 2.122 is 0.084 which is more than alpha value of 0.05. This proves that Positive return on stock prices increases the scope for Arbitrage in case where arbitrage trades are not manual.

4. To study the relationship between the scope of arbitrage and Arbitrage trade by retail investors one way ANOVA test is applied, where significance value obtained at F value of 6.799 is 0.00 which is less than alpha value of 0.05. This rejects that Positive return on stock prices increases the scope for Arbitrage in case of arbitrage trade by retail investors.

5. To study the relationship between the scope of arbitrage and Arbitrage of stocks in DP one way ANOVA test is applied, where significance value obtained at F value of 1.938 is 0.110 which is more than alpha value of 0.05. This proves that Positive return on stock prices increases the scope for Arbitrage in case of stock that are with DP only.

Thus from the above analysis it is found that in majority of the cases the hypothesis is proved and hence it is concluded that the hypothesis “Positive Returns on share prices increases the scope for Arbitrage than Negative returns on share prices” is accepted.

FINDINGS AND CONCLUSIONS:

1. Data was collected from Stock brokers, sub brokers and financial consultants and it was found that majority of the respondents were male and very few were female. Out of the total respondents, majority of the respondents were found dealing in securities on behalf of their clients.

2. It was found observed during the research that majority of the respondents always give recommendations to their clients regarding shares to buy and most of the time these recommendations were found to be fully rewarding. Only 38% of the clients said their recommendations were found partially rewarding and only 14% of the respondents found their recommendations not at all rewarding.
3. When asked whether clients act on the recommendations given by respondents, 54% said their clients always reach to the same, 30% said clients sometimes act on the recommendation and 16% said clients not at all act on the recommendations.

4. Market research is one of the key factors used in maintaining competitiveness over competitors. Market research provides important information to identify and analyse the market need, market size and competition. Market-research techniques encompass both qualitative techniques such as focus groups, in-depth interviews, and ethnography, as well as quantitative techniques such as customer surveys, and analysis of secondary data. It was found in the study that majority of the respondents conduct market research before giving recommendations to the clients.

5. Conducting market research before carrying out any business activity proves to be beneficial to the business and in this research this is being agreed by majority of the respondents.

6. Conducting industry analysis and budgetary analysis as a part of fundamental and technical analysis is very important to give better recommendations to the clients and majority of the respondents agree that they undertake such industry and budgetary analysis prior to recommending any stock to their clients.

7. Technical analysis is a method of evaluating securities by analyzing the statistics generated by market activity, such as past prices and volume. Technical analysts do not attempt to measure a security's intrinsic value, but instead use charts and other tools to identify patterns that can suggest future activity. Most important part of technical analysis is arbitrage analysis and majority of the respondents agree that they perform arbitrage analysis before analysing any stock and giving recommendations to the clients.

8. Majority i.e. 74% of the respondents agree to the fact that Positive return on stock prices increases the scope for arbitrage. 12% of the respondents neither agree nor disagree to this, whereas, 14% of the respondents disagree to this.

9. Investors are not allowed to buy and sell the same stock in different exchanges on the same day. This means if you buy stock ABC today in NSE, then you are not allowed to sell stock ABC in BSE the same day. If you do that, you may have penalty of short selling in the exchange you sold. This has also been approved by majority of the respondents who agree that Arbitrage is not an intraday trade.

10. If a price difference of few Rupees is seen in both the exchanges does not always mean there is an arbitrage. The big price number that is seen by us is last traded price which means those price in both the exchange is the traded price and not the price at which you will be able to trade. Arbitrage exists only if you have higher bid price and lower offer price in either of the exchanges. Majority of the respondents also agree to the same.

11. Sometimes retail investors spot some arbitrage opportunities in the market but if they try to key in those trades manually, they may lose the opportunity because by that time many big traders who have automated software running for spotting such arbitrages would have executed those trades. This statement is supported by majority of the respondents during the research.

12. Due to inability to make fast manual calculations and lack of availability of automated software with the retail investors it is difficult to calculate arbitrages opportunities in the market and hence miss the chance of earning profits. Due to this reason majority of the investors said retail investors cannot trade in arbitrage.
Arbitrage Analysis

1. It was found during the research that ICICI Bank with highest beta is most risky and volatile stock followed by Tata Steel Ltd. with Beta of 1.56 and Maruti Suzuki India Ltd. at 3rd position in terms of risk with beta of 1.51. At 4th position in terms of risk is Cipla Ltd. with Beta of 0.56 and Bharti Airtel Ltd. at 5th position with Beta of 0.82. Infosys Ltd. ranks 6th in terms of risk with Beta of 0.80, ACC Ltd. ranks 8th with Beta of 1.09, NTPC Ltd. at 8th Position with Beta of 0.94 and Sun Pharma Ltd. at 9th position in terms of risk with Beta of 0.98. The least risky company in terms of Beta is Reliance Industries Ltd. having Beta of 1.00.

2. Thus from the above it is said that Reliance Industries Ltd. is the safest stock for investment followed by Sun pharma and NTPC Ltd. However, ICICI Banks’s stock is found to be most risky investment

RECOMMENDATIONS

1. Investing in arbitrage funds during uncertain times, can prove to be one of the good choices by investors, other than putting the money in fixed deposits. The Fund House is claiming a return of around 9 - 9.9%, which is much better than that of many other savings instruments.

2. Pair trade execution becomes difficult in low volume stocks therefore, spotting arbitrage in them should be avoided.

3. It is also recommended that one should understand the business model of any company before investing in. The "Oracle of Omaha", Warren Buffett, rarely invests in tech stocks because most of the time he doesn't understand them. This is not to say the technology sector is bad, but it's not Buffett's area of expertise; he doesn't feel comfortable investing in this area. Similarly, unless you understand a company's business model, you don't know what the drivers are for future growth, and you leave yourself vulnerable to being blindsided like shareholders of Boston Chicken were.

4. If you want to maximize your profit from arbitrage you need to make sure that the asset you trade in are electronically traded across different markets. Only then you can effectively make the transactions at the real time and maximize your profit from the whole process.

5. Arbitrage when done in an informative way and with proper stock market analysis can effectively increase your profit limit. To ensure that you get maximum return from the arbitrage consult your stock broker or financial advisor for the proper asset and best time.

REFERENCES


