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INDEX ARBITRAGE IN BSE WITH REFERENCE AT ANMOL SHARE BROKING PRIVATE LIMITED

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Abstract
This paper examines to predict the arbitrage opportunity from the selected optimum performing stocks in BSE against BSE SENSEX and estimate their forward price. This paper covers the arbitrage opportunities in BSE market and also tries to predict the price inefficiency and volatility of stock market. This paper confined to the technical aspect of selected stocks and would be useful to those investors who are looking forward for arbitrage opportunity from the selected stocks trading in BSE. The selected stocks of company trading in BSE will be compared with BSE SENSEX to spot arbitrage opportunity.

Keywords: Arbitrage, Hedging, Long position, short position.

1. Introduction

Anmol is a comprehensive Investment Management Group was founded in the year 2006 by Mr Mohit Bajaj and Suresh Bajaj who are also the current managing director of Anmol share broking firm. Anmol is dynamic and rapidly growing organization. The objective of starting the company was to offer investment services to all classes of investors. Anmol being a member of National Stock Exchange (NSE), Bombay Stock Exchange (BSE) and MCX provides platform for execution in Capital Market through Online as well as Offline mode. The aim of firm is to have an investment approach especially for clients and to expertise with the global research and investment capabilities to the customers. With the team of professional and youngsters they make up a cooperative team for Anmol.

BSE is known as Bombay stock exchange limited having prominence of 140 years with the current chairmanship of Mr. Sudhakar Rao. it is the oldest and first stock exchange in India. It is the only stock exchange in Asia growing at a rapid speed that is at the rate of 6 micro seconds. It is one of the leading and active stock exchange in India forming an efficient capital market to the corporate sector with approximation of more than 5500 companies makes it world's number one exchange in terms of listing. The index of BSE SENSEX which is average of 30 top companies is the major tracked indicator of Indian economy is also internationally traded on EUREX and even in leading exchange of BRCS nation.

Arbitrage is the simultaneous buying and selling of an asset to make a risk less profit from the variance of the price in two different markets. It is a trade where by arbitrager exploit the arbitrage opportunity and earns profit from it by trading similar assets on different forms or different markets, these opportunities happen only due to market efficiency.

Arbitrager: Arbitrager is a person or trader in market who takes the advantage of price difference of a particular asset in two different markets. This trader deals in lot of shares with borrowed money, an arbitrage to earn arbitrage profit should make a huge investment in difference as the difference is very minimum.

Index Arbitrage: it is the subset of statistical arbitrage (the price inefficiency between security is calculated through mathematical modeling techniques) where the main focus is on index components as index is made up of various components and the index value is determined by the weighted average of

the components. Here the arbitrager tries to make profit from actual and theoretical future prices. The stocks are compared to index and then the investor enters into long position in future contract and short hand in spot market. Index arbitrage includes buy and sell programs where an arbitrager will have long/short position in underlying stocks or long/short position in their future contracts.

Hedging: the arbitrager not only makes profit from the difference between the stock index and future contract but also, they hedge their risk by entering into future contact. Future contract is widely used derivative contract to hedge their risk to future dates. An investor enters into future contract with main objective to offset the risk and to defend themselves from variations in stock prices. Thus, to protect themselves they can enter into short or long position in future contract. Short position: in future contract the investor will either have short or long position. Short position means it is selling a future contract that means it owes the contract to the other party.

Long position: it means the investor will buy the future contract to hedge the risk and they will own the contract and the purchase of future contract will increase the value of the contract.

Beta value	Interpretation
Beta => 0.5	It indicates that stock is less volatile compared to market.
Beta => 1	It indicates stock moves in duo with market
Beta =>2	It indicates the stock returns are more volatile and risky than market volatility
Beta < 0(negative)	It indicates stock return moves in opposite direction to market return

Alpha

it is value which describes that stock return is independent of market return, in simple words the stock return cannot be predicted by market returns. Alpha also explains about the unsystematic risk involved to a particular share. An investor can use alpha for selection of stock as a positive alpha value yields a profitable return.

Correlation

The correlation measures the extent of relationship between the stock market index and stock return and it is mutual relation between variable variables which explains the relationship between the variables. In short it measures the extent of interdependence of variable included as a change in one variable to what extent will affect the other variable included in the study.

Covariance

covariance is a method where it can be used to determine the direction of relationship between two variables; it is similar to correlation the only difference is it is used when the data is not standardized. The covariance value explains in such a manner if both vary together then covariance is positive and if they vary in opposite direction then covariance is negative.

Standard deviation

calculates how value of variance deviates from mean. It simple words it is the positive square root of variance from their arithmetic mean. And it is denoted by Sigma.

Coefficient of variation: it is the relative measure of variation where a greater value indicates high level of variation and smaller value indicates low level of variation among the stocks with the index.

2. Objectives

1. To find out optimum return payment of selected stocks.
2. To find out the mechanism of Hedging for HNI's.
3. To measure the relation between change in stock prices with change in SENSEX values.
4. To estimate the stability of shares with BSE index stability.
5. To predict the future prices of selected stocks trading in BSE and spot arbitrage opportunity.

3. Research Methodology

This is an analytical study based on secondary data on the arbitrage opportunities in BSE and an analysis will be carried out and future opportunity will be forecasted thus secondary data is utilized for the study. Secondary data is collected through the Anmol Stock Broking Ltd. Data base and money control website. Past six months' data was collected averaged summarized before making such conclusions

Tools used for Analysis

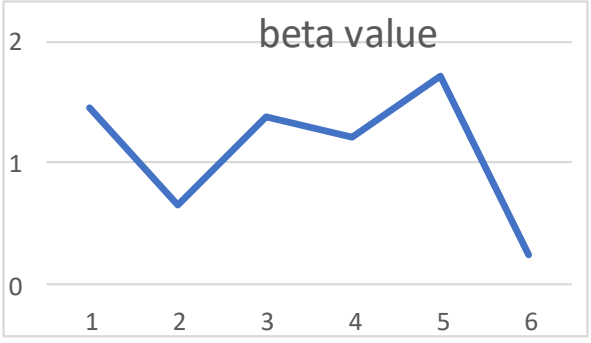
- Coefficient of S.D and Average is done to bring the consistency,
- Standard deviation is obtained to know about the deviations in terms of Sensex
- Beta is calculated based on which Rank correlation is drawn to know the best stock to invest
- Correlation
- Standard Deviation

4. Data Analysis and Interpretation

Table 4.1: MRF Beta values

Sl No.	Beta	Values
1	September	1.455069
2	October	0.663201
3	November	1.389386
4	December	1.210551
5	January	1.719992
6	February	0.249914
7	Average	1.114685

Graph 4.1: MRF Beta values for six months

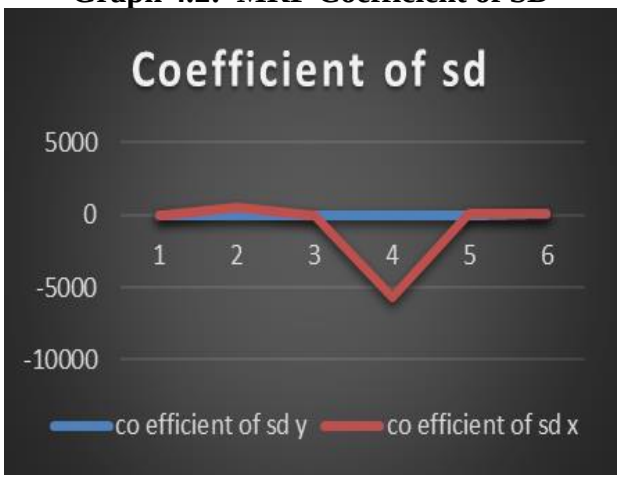


MRF : The Beta values of MRF for six months show an uneven movement of values. Which shows that the risk associated to MRF was increasing and decreasing due to some economic effect or changes. The highest beta value was in month of January with the value of 1.71 and lowest in month of February with the value of 0.24 which can be due to release of union budget. Most of the beta values are more than 1 which shows the risk associated with MRF is too high where the movement of share price of MRF is more than movement of index and it can be purchased by Arbitragers to earn good returns as they get affected by day to day market news. The average beta of MRF for 6 months is 1.11which shows that there is a high risk associated with MRF share prices and 1% change in BSE will change 1.11% in MRF share price.

Table 4.2: MRF Coefficient of SD

Sl No.	Months	Coefficient of SD	Coefficient of SD x
1	September	1.867873121	-90.5285431
2	October	-9.228470009	519.4611155
3	November	9.875998532	-44.76431585
4	December	-22.75808423	-5711.679204
5	January	9.102942089	56.43200077
6	February	58.19612438	57.61719259
7	Average	7.842730648	-868.9102924

Graph 4.2: MRF Coefficient of SD

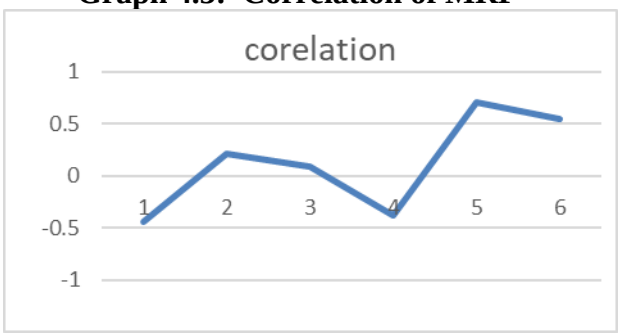


Coefficient of SD of MRF tells about the variation in share prices of MRF. Where the high level of variation was in month of February that is 58.19 and the second highest was in month of November, these two months had the highest variation. Thus, MRF share prices can provide arbitrage opportunity to earn profit and even hedge risk to future dates. And lowest variation was in month of -22.01 in the month of December which shows there was not much variation. The average variation of six months is 7.84 which shows MRF share prices do not have much variation. As coefficient of SD of index is -868.91 which shows very high level of variation.

Table 4.3: MRF Correlation of six Months

Sl No.	Months	Correlation
1	September	-0.44411
2	October	0.21042
3	November	0.091288
4	December	-0.38236
5	January	0.709363
6	February	0.546285
7	Average	0.121813

Graph 4.3: Correlation of MRF



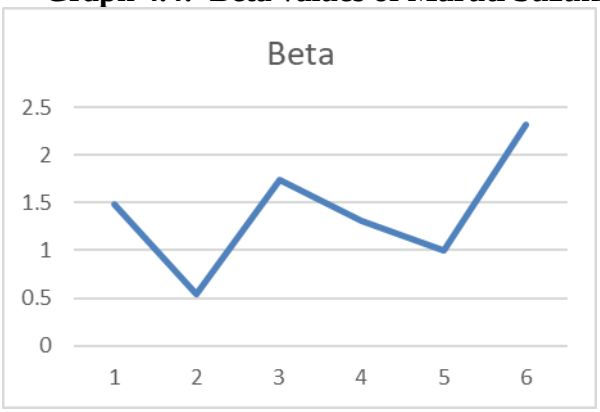
From the above table one can conclude that there is an insignificant relationship between the MRF share prices and index values. Thus, the relation between them is random and weak. A weak correlation shows that the index changes do not have much effect on a MRF share prices. The movement in share prices of MRF cannot be estimated with changes index changes. The highest value of correlation was in month of January that is 0.71 which shows moderate relation between changes in share price with change in index values. The lowest correlation value was in month of December that is -0.38 which shows there was an inverse and moderate relationship between MRF share price and index value which can be helpful for arbitragers to earn risk less profit by hedging it. The average correlation value is 0.12 which shows there exist an insignificant and weak relation between index value and MRF share prices. Thus, an investor cannot predict airtel share prices on basis change in index values.

Maruti Suzuki

Table 4.4: Beta values of Maruti Suzuki

Sl No.	Months	Beta
1	September	1.489308
2	October	0.536824
3	November	1.748202
4	December	1.314075
5	January	1.006139
6	February	2.320556
7	Average	1.402517

Graph 4.4: Beta values of Maruti Suzuki

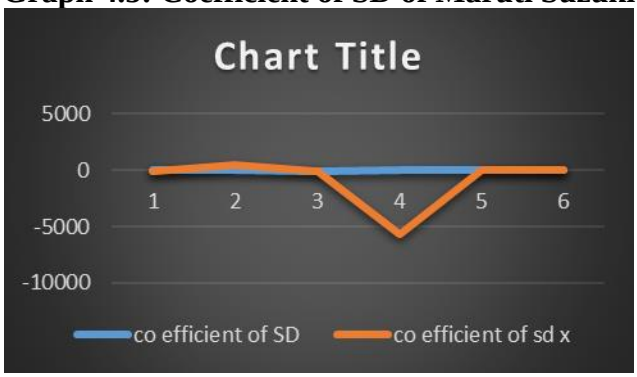


The Beta values of Maruti Suzuki for six months show an uneven movement of values. Which shows that the risk associated to Maruti Suzuki was increasing and decreasing due to some economic effect or changes. The highest beta value was in month of February with the value of 2.32 and lowest in month of October with the value of 0.53. Most of the beta values are more than 1 which shows the risk associated with Maruti Suzuki is too high where the movement of share price of Maruti Suzuki is more than movement of index and it fluctuates more than index changes. it can be purchased by Arbitragers to earn good returns as they get effected by day to day market news. The average beta of Maruti Suzuki for 6 months is 1.40which shows that there is a high risk associated with Maruti Suzuki share prices and 1% change in BSE will led to 1.40% change in Maruti Suzuki shares

Table 4.5: Maruti Suzuki Coefficient of SD

SL NO.	Months	Coefficient of SD	Coefficient of SD x
1	September	3.492067741	-90.5285431
2	October	2.64937247	519.4611155
3	November	-5.186741023	-44.76431585
4	December	29.71659844	-5711.679204
5	January	3.703516266	56.43200077
6	February	49.06486583	57.61719259
7	Average	13.90661329	-868.9102924

Graph 4.5: Coefficient of SD of Maruti Suzuki

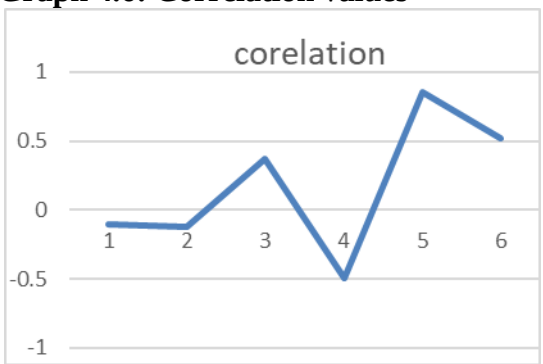


Coefficient of SD talks about the variation in share prices of Maruti Suzuki. Where the high level of variation was in month of February that is 49. 06 and the second highest was in month of December, these two months had the highest variation. Thus, Maruti Suzuki share prices can provide arbitrage opportunity to earn profit and even hedge risk to future dates. And lowest variation was in month of November -5.18. The average variation of six months is 13.90 which show Maruti Suzuki share prices have much variation. As coefficient of SD of index is -868.91 which shows very high level of variation.

Table 4.6: Maruti Suzuki Correlation values

Sl No.	Months	Correlation
1	September	-0.10113
2	October	-0.12121
3	November	0.372372
4	December	-0.49205
5	January	0.851504
6	February	0.518764
7	Average	0.171373

Graph 4.6: Correlation values



From the above table one can conclude that there is an insignificant relationship between the Maruti Suzuki share prices and index values. Thus, the relation between them is random and weak. A weak correlation shows that the index changes do not have much effect on share prices. The movement in share prices cannot be estimated with changes index changes. The highest value of correlation was in month of January that is 0.85 which shows strong relation between changes in share price with change in index values. The lowest correlation value was in month of September that is -0.10 which shows there

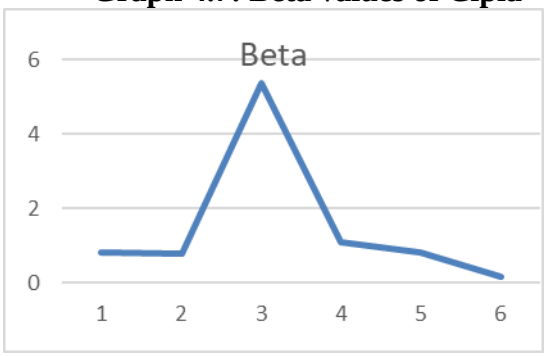
was an inverse relationship between Maruti share price and index value which can be helpful for arbitragers to earn risk less profit by hedging it. The average correlation value is 0.17 which shows there exist an insignificant and weak relation between index value and share prices. Thus, an investor cannot predict share prices on basis 0f only change in index values.

Cipla

Table 4.7: Beta values of Cipla

Sl No.	Months	Beta
1	September	0.80849
2	October	0.786132
3	November	5.348532
4	December	1.111386
5	January	0.833113
6	February	0.154535
7	Average	1.507032

Graph 4.7: Beta values of Cipla

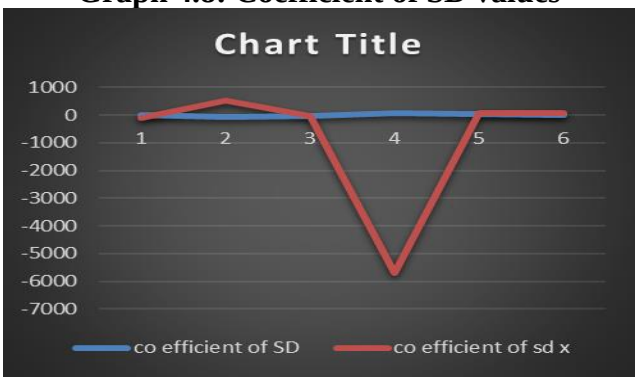


The Beta values of Cipla for six months show an uneven movement of values. Which shows that the risk associated to Cipla was increasing and decreasing due to some economic effect or changes. The highest beta value was in month of November with the value of 5.34 and lowest in month of February with the value of 0.15. Most of the beta values are less than 1 which shows the risk associated with Cipla is too moderate where the movement of share price is less than movement of index and it fluctuates less than index changes. It can be purchased by Arbitragers to earn good returns as they get effected by day to day market news. The average beta for 6 months is 1.51which shows that there is a high risk associated with Cipla share prices and 1% change in BSE will lead to 1.51% change in Cipla shares.

Table 4.8: Coefficient of SD of Cipla

Sl No.	Months	Coefficient of SD	Coefficient of SD x
1	September	20.02361646	-90.5285431
2	October	-76.60004819	519.4611155
3	November	-21.4906883	-44.76431585
4	December	60.23902291	-5711.679204
5	January	37.16435086	56.43200077
6	February	19.39438257	57.61719259
7	Average	6.455106052	-868.9102924

Graph 4.8: Coefficient of SD values

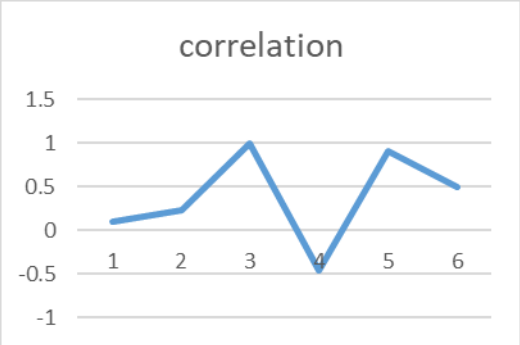


Co efficient of SD talks about the variation in share prices of Cipla. Where the high level of variation was in month of December that is 60.23 and the second highest was in month of January, these two months had the highest variation. Thus, Cipla share prices can provide arbitrage opportunity to earn profit and even hedge risk to future dates. And lowest variation was in month of October -76.18. The average variation of six months is 6.45 which shows Cipla share prices does not have much variation. As coefficient of SD of index is -868.91 which shows very high level of variation.

Table 4.9: Correlation values of Cipla

Sl No.	Months	Correlation
1	September	0.10399
2	October	0.234199
3	November	0.996094
4	December	-0.45654
5	January	0.915485
6	February	0.490315
7	Average	0.38059

Graph 4.9: Correlation values of Cipla



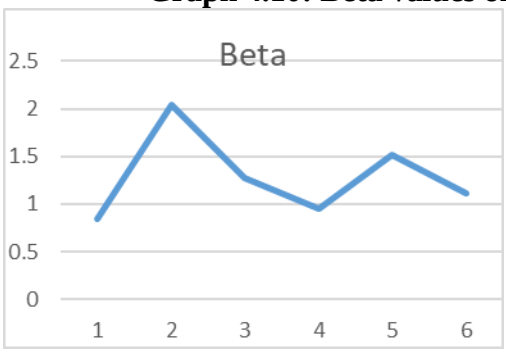
From the above table one can conclude that there is an insignificant relationship between the Cipla share prices and index values. Thus, the relation between them is random and weak. A weak correlation shows that the index changes do not have much effect on share prices. The movement in share prices cannot be estimated with changes index changes. The highest value of correlation was in month of November that is 0.99 which shows strong and perfect relation between changes in share price with change in index values. The lowest correlation value was in month of December that is -0.45 which shows there was an inverse relationship between Maruti share price and index value which can be helpful for arbitragers to earn risk less profit by hedging it. The average correlation value is 0.38 which shows there exist an insignificant and weak relation between index value and share prices. Thus, an investor cannot predict share prices on basis 0f only change in index values.

HDFC Bank

Table 4.10: Beta values of HDFC Bank

Sl No.	Months	Beta
1	September	0.843466
2	October	2.045642
3	November	1.274553
4	December	0.952022
5	January	1.520124
6	February	1.113764
7	Average	1.291595

Graph 4.10: Beta values of HDFC bank



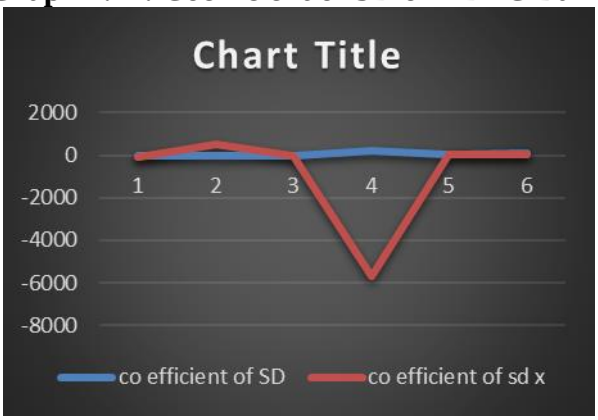
The beta values of HDFC for six months show an uneven movement of values. Which shows that the risk associated to HDFC was increasing and decreasing due to some economic effect or changes. The highest beta value was in month of October with the value of 2.04 and lowest in month of September with the value of 0.84. Most of the beta values are more than 1 which shows the risk associated with HDFC is too high where the movement of share price of HDFC is more than movement of index and it fluctuates more than index changes. it can be purchased by Arbitragers to earn good returns as they get

effected by day-to-day market news. The average beta of HDFC for 6 months is 1.29which shows that there is a high risk associated with HDFC share prices and 1% change in BSE will lead to 1.29% change in HDFC share price.

Table 4.11: Coefficient of SD of HDFC Bank

Sl No.	Months	Coefficient of SD	Coefficient of SD x
1	September	-29.43890095	-90.5285431
2	October	-39.41233506	519.4611155
3	November	-5.137378265	-44.76431585
4	December	232.8351443	-5711.679204
5	January	5.871636838	56.43200077
6	February	63.50552633	57.61719259
7	Average	38.03728221	-868.9102924

Graph 4.11: Coefficient of SD of HDFC Bank

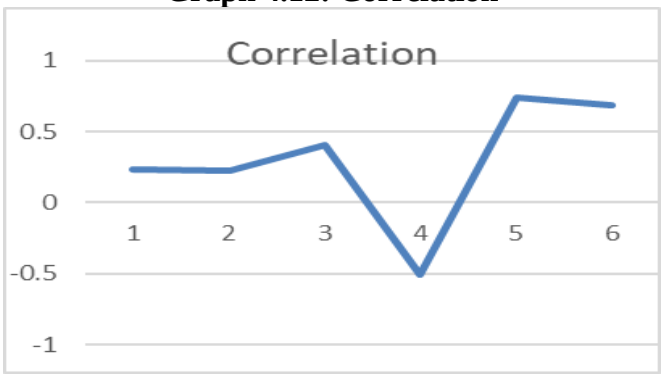


Coefficient of SD tells about the variation in share prices of HDFC. Where the high level of variation was in month of December that is 232.85and the second highest was in month of February these two months had the highest variation. Thus, HDFC share prices can provide arbitrage opportunity to earn profit and even hedge risk to future dates. And lowest variation was in month of November -5.13. The average variation of six months is 38.03 which show HDFC share prices have much variation. As coefficient of SD of index is -868.91 which shows very high level of variation.

Table 4.12: Correlation of HDFC Bank

Sl No.	Months	Correlation
1	September	0.23669
2	October	0.228868
3	November	0.405186
4	December	-0.50506
5	January	0.741084
6	February	0.682761
7	Average	0.298255

Graph 4.12: Correlation



From the above table one can conclude that there is an insignificant relationship between the HDFC share prices and index values. Thus, the relation between them is random and weak. A weak correlation shows that the index changes do not have much effect on share prices. The movement in share prices cannot be estimated with changes index changes. The highest value of correlation was in month of January that is 0.74 which shows strong relation between change in share price with change in index values. The lowest correlation value was in month of September that is -0.50 which shows there was an inverse relationship between share price and index value which can be helpful for arbitragers to earn risk less profit by hedging it. The average correlation value is 0.29 which shows there exist an insignificant and weak relation between index value and share prices. Thus, an investor cannot predict share prices on basis 0f only change in index values.

Table 4.13: Rank allocation on basis of Beta value

Sl No.	Companies	Beta	Correlation	Ranks
1	Cipla	1.5070315	0.38059	1st
2	Maruthi Suzuki	1.402517	0.1713733	2nd
3	HDFC	1.2915951	0.2982547	3rd
4	MRF	1.1146853	0.1218129	-

Table 4.14: Hedging strategy for top 3 shares

Details	Cipla	Maruti	HDFC
Date	Feb-22	Feb-22	Feb-22
Price	583.2	5922.85	1368.8
Open	574.8	5898	1364.9
High	621.9	6230.3	1435
Low	566.5	5845.5	1364.9
Change	1.56%	0.45%	0.18%
Forward price	601.257	6169.474	1427.724

Interpretation: In the month of September, the estimated forward price of top 3 shares for HNI will be as follows Cipla 601.25, Maruti Suzuki 6169.47 and at last HDFC 1427.72 irrespective of macro-economic factors. Thus, these shares can be preferred by HNI to seek arbitrage profit by entering into future contract of the underlying shares. An HNI if buys the top three shares in month of February then

to earn riskless arbitrage profit him must enter and hold the future contract for six months which will fetch him the profit as follows:
Cipla- rupees 18
Maruti Suzuki- 246.6
HDFC- 58.92

Findings on basis of Beta and Correlation:

- The average beta of MRF for 6 months is 1.11 which shows that there is a high risk associated with MRF share prices and 1% change in BSE will change 1.11% in MRF share price.
- The average beta of Maruti Suzuki for 6 months is 1.40 which shows that there is a high risk associated with Maruti Suzuki share prices and 1% change in BSE will led to 1.40% change in Maruti Suzuki shares
- The average beta for 6 months is 1.51 which shows that there is a high risk associated with Cipla share prices and 1% change in BSE will lead to 1.51% change in Cipla shares
- The average beta of HDFC for 6 months is 1.29 which shows that there is a high risk associated with HDFC share prices and 1% change in BSE will lead to 1.29% change in HDFC share price

Correlation

- The average correlation value of MRF is 0.12 which shows there exist an insignificant and weak relation between index value and MRF share prices. Thus, an investor cannot predict airtel share prices on basis change in index values.
- The average correlation value of Maruti Suzuki is 0.17 which shows there exist an insignificant and weak relation between index value and share prices. Thus, an investor cannot predict share prices on basis 0f only change in index values.
- The average correlation value of Cipla is 0.38 which shows there exist an insignificant and weak relation between index value and share prices. Thus, an investor cannot predict share prices on basis 0f only change in index values
- The average correlation value of HDFC is 0.29 which shows there exist an insignificant and weak relation between index value and share prices. Thus, an investor cannot predict share prices on basis 0f only change in index values.

Suggestions

Sl No.	Companies	Beta	Correlation	Ranks
1	Cipla	1.5070315	0.38059	1st
2	Maruthi	1.402517	0.1713733	2nd
3	HDFC	1.2915951	0.2982547	3rd

The HNI are suggested three plans of making a portfolio:
Suggestion 1- they can invest their entire amount in Cipla to bear high risk with high return and hedge the risk to future date.

Suggestion 2- they can invest equal amount in Cipla, Maruti Suzuki and HDFC to earn arbitrage profit
Suggestion 3- they can have their own portfolio but they are suggested to include Cipla in their portfolio.

Conclusion

Sl No.	Companies	Beta	Correlation
1	Cipla	1.5070315	0.38059
2	Maruti	1.402517	0.1713733
3	HDFC	1.2915951	0.2982547
4	MRF	1.1146853	0.1218129

- ❖ Cipla and Maruti Beta value is 1.50 and 1.40 respectively which includes high risk and it can be hedged to future dates by arbitragers to earn risk less profit
- ❖ HDFC and MRF are more than 1 and risky where good returns can be earned by hedging

References

1. Ilter, H. K., &Alguner, A. (2013). Lead lag relationship and price discovery in Turkish stock exchange and futures markets. African Journal of Business Management, 7(41),
2. Zhuo, W., Zhao, X., Zhou, Z., & Wang, S. (2012). Study on Stock Index Futures' Mean Reversion Effect and Arbitrage in China Based on High-Frequency Data. iBusiness, 4(01), 78.
3. Herbst, A. F., McCormack, J. P., & West, E. N. (1987). Investigation of a lead-lag relationship between spot stock indices and their futures contracts. Journal of FuturesMarkets, 7(4), 373-381.
4. Finnerty, J., & Park, H. (1987). Stock Index Futures: Does the Tail Wag the Dog? Financial Analysts Journal, 43(2), 57-61.
5. Chan, K., & Chung, Y. P. (1993). Intraday relationships among index arbitrage, spot and futures price volatility, and spot market volume: A transactions data test. Journal of banking & finance, 17(4), 663-687.
6. MacKinlay, A. C., &Ramaswamy, K. (1988). Index-futures arbitrage and the behaviour of stock index futures prices. Review of Financial Studies, 1(2), 137-158