Arbitrage Of Single Stocks Versus Futures In India : A Case Study

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INTRODUCTION

In 2010, the National Stock Exchange of India (NSE) was ranked fourth among the global stock exchanges for the volume traded in stock index futures *(IOMA, 2011)*. With between 150 and 200 million NIFTY Index futures contracts traded annually, the NSE continues to rank in the top five global exchanges for trading in these type of futures. Unlike the situation in other global futures markets, however, arbitrage transactions between NIFTY stock baskets and NIFTY futures are notably absent. Given the extreme importance of stock index arbitrage to maintaining fairly valued prices, this situation is quite surprising. The stock versus futures arbitrage that does take place in India appears limited almost entirely to selected single stocks and their associated futures. Further, such single stock futures arbitrage appears limited almost entirely to intraday trading, rather than relying upon less volatile longer term transactions.

In this paper, the researchers first discuss the importance to regulators, exchanges, domestic and foreign investors of well developed forward and reverse futures arbitrage. Next, the types of stocks versus futures arbitrage possible in the Indian market are classified, and constraints confining arbitrage to single stock futures are identified. A list of the specific costs facing India arbitrageurs is carefully explored. Using these costs, the zero arbitrage bandwidth for single stock futures arbitrage is computed and compared with the same parameter observed in the China and US markets. The results of this study can suggest to regulators, exchanges and governing tax authorities, steps helpful to narrowing the zero arbitrage band and improving the ability of the stock market to attract and retain domestic and foreign investors.

THE IMPORTANCE OF STOCK VS. FUTURES ARBITRAGE

Financial professionals and scholars generally agree that arbitrage is the most important transaction type found in the global stock futures markets. The reasons are several. First, continuous arbitrage between stocks and futures establishes pricing pressure that causes futures and stock prices to revert to their relative economic fair values (Hasbrouck, J. 1995 and Calculating 2011). The fair value prices resulting from arbitrage confer an important degree of comfort to market participants, who then more willingly add to stock and futures trading volumes.

Second, adequate futures market liquidity, when coupled with fairly valued prices provide a necessary condition for the development and offering of product innovations that rely upon derivatives (Slivka, R., 2010). So-called *"arbitrage funds"* in India represent such an innovation. These funds are based upon exploiting arbitrage opportunities between single stocks and their associated futures contracts. Arbitrage funds operated in this way also offer tax advantaged income to shareholders.

Next, fairly valued futures allow foreign investors to economically hedge their holdings. Without a fairly priced futures market, institutional investors, both domestic and foreign, have few means to effectively hedge their stock portfolios when risks are perceived to be high. The only other alternative is for institutional investors to liquidate assets in times of risk, normally, a very expensive and undesirable action. Experience in global markets has made it clear - the absence of fairly priced futures limits foreign investments and can lead to significant outflows of capital in times of economic distress.

Finally, fair value pricing of futures that results from arbitrage is important to regulators and exchanges (Gupta, K.,

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2009) seeking to expand their domestic markets and wishing to attract foreign capital. Given the importance of arbitrage, it is surprising how very little is written about this activity. In particular, the purely practical elements of implementing arbitrage trades appear only occasionally in trade magazines and then only incompletely in general terms. This fact may be due in part to the preference of arbitrageurs to keep the knowledge of their craft private so as to maximize personal opportunities for profit. Nevertheless, such detailed practical knowledge is especially important for regulators and exchanges to understand, as they seek to promote efficient equity markets attractive to the widest variety of investors. Without a clear understanding of practical arbitrage requirements, it will be difficult for them to create and sustain trading rules, tax levels, margins and other conditions conducive to these essential transactions.

EQUITY ARBITRAGE IN INDIA

In countries with equity futures markets, the most common form of arbitrage is one in which either stocks are purchased, and futures sold (forward arbitrage) or stocks are sold short, and futures are purchased (reverse arbitrage). Regulatory, structural or business constraints in the local stock market may prohibit or inhibit one or both of these two arbitrage forms. For example, in China, where there is no developed securities lending business, the short selling of stocks is not feasible, and so prevents reverse arbitrage from occurring, while forward arbitrage is still possible. Furthermore, inhibiting the development of stock index arbitrage in China stems from the lack of a developed trading platform to support the swift electronic purchase of stock baskets. Lacking high speed execution of stock portfolios, stock index arbitrage of stock baskets versus index futures is simply not feasible. A similar situation is generally true for the Indian stock market, where regulators have only recently begun to allow short selling and have begun to encourage the development of securities lending activities (National, 2011).

Technically, there are at least six possible forms of equity arbitrage in the Indian market. These are :

❁ Index Futures and Stock Basket Arbitrage

1. Stock Baskets vs. Index Futures;
2. ETFs (Exchange Traded Funds) vs. Stock Baskets;
3. ETFs vs. Index Futures.

❁ Single Stock Arbitrage

4. ADR/GDRs vs. Single Stocks;
5. Single Stock Futures vs. Single Stock Futures;
6. Single Stocks vs. Single Stock Futures.

Table 1: US and India's Requirements For Equity Versus Futures Arbitrage

Arbitrage Requirement	S&P 500 Futures Arbitrage	NIFTY Futures Arbitrage	India Single Stock Arbitrage
Stock Basket Trading	Efficient	Developing	N/A
Short Sales	Permitted	Permitted	Selectively Permitted
Securities Lending	Efficient	Developing	224 Stocks
Stock Liquidity	High	Moderate to High	Moderate to High
Futures Liquidity	High	High	Moderate to High
ETFs	Yes	Yes	N/A

1) Stock Baskets vs. Index Futures : Two primary obstacles limit the growth of NIFTY stock index arbitrage in India. First is the less efficient status of electronic trading platforms to support the execution of baskets of stocks. Second are the regulatory limits by SEBI (Securities and Exchange Board of India) on the borrowing tenor for stocks and the number on which short sales are permitted. While the National Stock Exchange of India (NSE) accommodates electronic trading of stock baskets through its NEAT (National Exchange for Automated Trading) software, arbitrageurs have found that the time to complete the purchase of all NIFTY stocks is too long, putting arbitrage profits at risk. Reverse index arbitrage is even more difficult for arbitrageurs, as it requires the ability to borrow all 50 NIFTY stocks on a timely basis, and at a reasonable cost. Recognizing this need, the NSE has gradually expanded its Securities Lending and Borrowing Scheme (SLBS) to accommodate a growing number of stocks. Despite these positive efforts,

the securities lending business remains underdeveloped and presents a major obstacle to NIFTY arbitrage in India. When coupled with high transaction costs (discussed later in this paper), the constraints on short selling and basket trading have caused stocks vs. futures arbitrage in the Indian market to evolve a form and size different from the standard stock index futures arbitrage, most frequently found in other global markets. Combined, these factors explain why NIFTY stock baskets vs. index futures is not the most attractive form of arbitrage in the Indian market at this time.

2) ETFs vs. Stock Baskets : There is another form of arbitrage that requires no securities lending industry to supply stock baskets and also does not involve futures contracts. This arbitrage involves only the purchase or sale of stock baskets versus Exchange Traded Funds (ETFs). Because this arbitrage requires only a simple two-way exchange of stocks and ETF shares, it has no direct effect on maintaining futures at their fair value. However, this form of stock arbitrage has proven unattractive for yet other reasons.

There are presently only 13 NSE-listed equity Exchange Traded Funds, each based upon portfolios of Indian stocks and they all follow the creation and redemption process common to ETFs found elsewhere in the global markets. When ETF shares are priced below the value of the underlying securities, the ETF shares can be purchased by an arbitrageur and can be submitted to the ETF Trust holding the stocks for redemption in return for the underlying stock portfolio. The portfolio can then be sold in the secondary market to realize an arbitrage profit. When the ETF shares are priced above the value of the underlying securities, a portfolio of underlying stocks can be purchased and submitted to the ETF Trust, leading to the subsequent creation of ETF shares, which can then be sold in the secondary market to realize a profit.

While this in-kind creation and redemption mechanism for ETFs allows for an arbitrage that can often be pursued on a daily basis in the China market, such an arbitrage is severely limited in India due to low ETF liquidity and the limited number of listed ETFs. Data from the Association of Mutual Funds in India (Association, 2011) shows that ETFs comprise only 0.3% of the total industry assets vs. about 9% in the US market. Together, the limited amount of ETF assets available for stock basket arbitrage, coupled with the fact that such arbitrage is also subject to substantial minimum creation and redemption sizes, severely limits arbitrage opportunities. It is understandable that arbitrageurs operating under these conditions have largely turned their attention to other, more attractive forms of trading.

3) ETFs vs. Index Futures : As in the case of ETFs vs. Stock Baskets, the primary factor limiting ETF vs. Index Futures arbitrage in India is the small amount of assets invested in ETFs, and the associated low liquidity. Investors and analysts cite several reasons for this low level of ETF assets under management. First, brokerage for ETF sales are small compared to most other equity products, placing them low in the level of priorities for securities sales. Second, because the Indian equity market is less efficient than those in the developed countries, active managers often outperform passive ETFs on a regular basis. Understandably, investors seeking returns above the market choose to invest in stocks by means other than ETFs.

4) ADR/GDRs vs. Single Stocks : Depository receipts listed on world exchanges are of two types. American Depository Receipts (ADRs) appear on American Exchanges, including the New York and American Stock Exchanges, while Global Depository Receipts (GDRs) can be found on the London and Luxembourg Stock Exchanges. These receipts typically signify that on deposit with a custodian, the shares of a single stock are represented by the terms of the receipt. Because the supply and demand for depository receipts differ from those of the related stock, the ADR/GDR and stock prices can diverge, creating arbitrage opportunities. To capture the excess return from a depository receipt trading at a discount to the underlying shares, the receipt can be converted to discounted shares, which are immediately sold in the market to realize a profit. The reverse arbitrage can be executed when shares are trading at a discount to the depository receipt. In this case, market shares are converted into the depository receipt, which is immediately sold to realize a profit.

These in-kind conversions are similar to those applying to ETFs and serve the purpose of keeping ADR/GDR prices in close relationship. Complicating this form of arbitrage, however, is the listing of depository receipts on exchanges outside India and operating in different time zones. If, for example, Indian shares are trading at a discount to an ADR, the shares could be purchased locally, converted to an ADR, and sold in the US once the New York market opened for trading (Amary B. , 2011). The risk, of course, is that the markets in India and the US are not open simultaneously, making capture of a discount uncertain. Taken together with the limited number of ADRs traded outside the Indian market, this form of arbitrage has rarely been attractive.

5) Single Stock Futures vs. Single Stock Futures : The successful functioning of global stock futures markets depends not only upon the continuing arbitrage of stocks vs. futures, but also relies heavily upon the efficient execution of calendar spreads, in which pairs of futures having differing expiration dates offset each other's market exposure. Calendar transactions commonly dominate futures order flow in a dramatic fashion in the final weeks preceding a contract expiration. The arbitrage between these contracts is effective in keeping the fair values of each contract aligned with each other. In a healthy market, such arbitrage enhances liquidity and creates a stable environment for the pursuit of hedging and investing strategies by institutional participants. Despite their importance, there is little practical literature on these essential futures transactions. For example, until recently, there was no literature at all for China's CSI 300 futures contract (Slivka, R., 2011). In the Indian futures market calendar, spreads are a recognized transaction type, with their own margin levels set by SEBI (SEBI, 1998). While it is known that arbitrageurs in India pursue forward and reverse arbitrage between futures with differing expiration dates, there are no studies of this market appearing in the current literature.

6) Single Stocks vs. Single Stock Futures : While stock index futures arbitrage remains unattractive in the Indian market, forward arbitrage on single stocks has been found feasible and frequently quite profitable. The concentration in India of arbitrage in single stocks against their own futures contracts represents a creative adaption to the local regulatory and investment environment. Without question, the most frequently pursued form of equity arbitrage in India pairs single stocks against their single stock futures. Market participants include mutual funds, hedge funds, securities dealers, and proprietary traders. This arbitrage form, however, is not without its constraints. For example, both forward and reverse arbitrage are possible, but not by all market participants, and not with all stocks. SEBI permits short selling only on 224 securities, the same securities on which single stock futures are listed. Further, mutual funds have been prohibited from short selling, thereby removing them from the list of potential participants in reverse arbitrage. Indian arbitrage funds which specialize in exploiting inefficiencies in the futures markets are ,therefore, limited to forward arbitrage transactions only. Finally, the costs of this arbitrage are often quite high due to taxes and fees. As an example, certain states in India have sometimes introduced taxes that significantly reduce the profitability of single stock arbitrage, inhibiting the growth of this market. In the recent past, the state government of Maharashtra elected to double the stamp duty on equity transactions, causing arbitrageurs to seek relocation to another Indian state with a better tax environment.

Despite these obstacles, a meaningful amount of arbitrage continues to be transacted in India in single stock futures, and an examination of trading statistics suggests why. Today, over 90% of daily traded value on the NSE takes place in derivatives and with over 80% in stock futures and options. According to the World Federation of Exchanges, the NSE ranks first among global futures exchanges by notional value traded in single stock futures, and second by the number of contracts traded. In 2010, the notional value traded in single stock futures on the NSE was 23% higher than the second-ranked exchange, and 127% higher than the third-ranked exchange. Whether measured globally or by geographic region, the world's most active single stock futures market is in India. Understandably, this is also the most active market in which arbitrageurs pursue equity vs. futures arbitrage.

ARBITRAGE COSTS

Successful implementation of arbitrage trades requires a detailed knowledge of the explicit and implicit costs in setting up and unwinding these transactions. Without this understanding, profitable trade cannot be systematically pursued. To enumerate these costs, first consider a forward arbitrage, in which the two legs of the transaction are a single stock and a single stock futures contract on that stock. The primary direct and indirect costs for arbitrageurs typically include the following:

❁ **Bid / Ask Spreads:** The setup and subsequent unwind of an arbitrage trade will cause the arbitrageur to pay the difference between bid and offer prices for both stock and futures contract. The magnitude of the futures bid-offer spread is typically quite small and can be neglected, but the spread for stocks is typically meaningful and needs to be factored into the total costs for arbitrage. For example, the bid-offer spread on JSW Steel was found to be 0.35% of the market value. For the related single stock futures contract, the bid-offer spread was found to be negligible. An arbitrageur could reasonably be assumed to pay half the full bid-offer spread on setup and half on unwind for the transaction for a combined bid/ask cost of 0.35%. A provision for covering this total spread should be undertaken upon entering any arbitrage.

❁ **Brokerage Costs:** Brokerage costs for India's arbitrage transactions typically range from 0.10% to 0.50% of trade value for delivery trades, while the futures command a typical range from 0.015% to 0.035%. It is typical in the global markets that stock brokerage charges are far above those for futures, often by a ratio of 10 to 1 or more. For arbitrage trading in India, a brokerage on traded value of 0.10% for stock and 0.015% for futures represents highly favorable terms and were used in the researchers' calculations for arbitrage bands.

❁ **Government, Regulatory and Exchange Fees:** In most countries where stock and futures markets are found, there is an associated collection of fees imposed by governments, regulators and exchanges. All these must be carefully noted by the arbitrageur and factored into the cost of establishing and unwinding an arbitrage position. Because these fees are not always charged on both purchases and sales, the rules for cost calculations must be carefully understood in detail (see Table 2, Securities Transaction Tax on futures). Indian brokers are required to a collect a securities transaction tax (STT), Exchange Transaction charge, stamp duty and regulatory fee, all of which are included in the total customer charges. A typical set of these fees appears in the Table 2, along with assumed brokerage charges for delivery transactions.

Table 2: Common Costs For Forward And Reverse Arbitrage

Charges On Each Leg Of Delivery Transactions as % of Traded Value	%
Stock Charges	
Brokerage on Turnover (Traded Value)	0.50%
Service Tax on Brokerage	10.30%
Securities Transaction Tax (STT) For Delivery Trades	0.125%
Exchange Transaction Charges for NSE and BSE Trades	0.0035%
Stamp Duty	0.010%
SEBI Charges	0.0001%
Subtotal for Stock	0.6901%
Futures Charges	
Brokerage on Turnover (Traded Value)	0.035%
Service Tax on Brokerage	10.30%
Securities Transaction Tax (STT)*	0.0085%
Exchange Transaction Charges for NSE and BSE Trades	0.002%
Stamp Duty	0.002%
SEBI Charges	0.0001%
Subtotal for Futures	0.0512%
Round Turn for Stock + Futures Arbitrage	1.4826%
*Total of 0.0170% is charged on sales only; half-turn shown here	

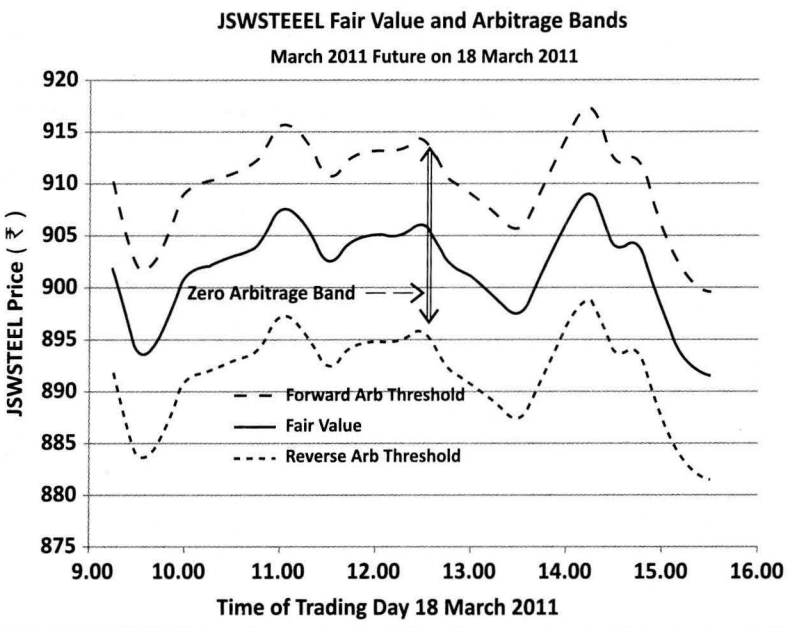
❁ **Short Sales:** When reverse arbitrage is executed, shares are sold short, and futures are purchased. Shares sold short must be borrowed from a lender who presents a significant obstacle, given the underdeveloped securities lending business in India. While SEBI has approved stock lending facilities, and the NSE has an automated stock lending system (SLBS), the volume of business is comparatively small and underdeveloped. Nevertheless, all stocks underlying single stock futures contracts are approved by SEBI and NSE for securities lending in the SLBS system. However, for India's mutual funds, known as arbitrage funds, SEBI has prohibited short sales. Such funds, therefore, are limited to forward arbitrage trades in their single stock arbitrage activities. For calculation purposes, the researchers have assumed that fully 85% of the interest on the short sale proceeds is retained by the lender of the securities. The balance of interest (the rebate) is made available to the arbitrageur.

ZERO ARBITRAGE BAND AND RETURN CALCULATIONS

The cumulative result of these direct and indirect costs is the establishment of forward and reverse arbitrage thresholds that must be exceeded if profitable arbitrage is to occur. These thresholds lie above and below the futures fair value and

form a zero arbitrage band, inside of which no forward or reverse profitable arbitrage takes place. We call the difference between fair value and the upper (lower) threshold the forward (reverse) arbitrage band. The width of the full zero arbitrage band is the sum of the widths of the forward and reverse arbitrage bands. Because the costs of forward and reverse arbitrage often differ, the sizes of those bands will differ as well. However, in all futures markets, a contract priced above the upper threshold presents a profitable opportunity for forward arbitrage, while a future priced below the lower threshold makes reverse arbitrage attractive. An illustration of the arbitrage bands during the 18 March 2011 trading day for the JSW Steel futures contract expiring March 2011 is displayed in the Figure 1.

Figure 1: Arbitrage Bands for JSW Steel March Futures Contract On 18 March 2011



With a clear knowledge of costs to be covered as arbitrage positions are set up and unwound, the upper and lower thresholds defining zero profit arbitrage can be calculated along with the resulting width of the forward, reverse and zero arbitrage bands. The wider these bands, the less favorable the market is for arbitrage transactions. It is, therefore, in the interests of regulators and exchanges to keep these bands as narrow as possible, to allow arbitrage to perform its primary price discovery function and so keeping prices at their economic fair value. The researchers found that in India, these bandwidths are sizeable relative to other global markets.

As a typical example on 18 March 2011 for the JSW Steel future expiring 28 April 2011, futures prices required to cover all costs for forward and reverse arbitrage were calculated. The widths of the upper and lower zero arbitrage bands were determined as a percentage of the futures fair value and appear in Table 3. The width of the zero arbitrage band is the sum of the widths for forward and reverse arbitrage bands. A forward arbitrage between stock and futures

Table 3: Arbitrage Bands For JSW Steel Futures Contract Expiring 28 April 2011

Brokerage On Turnover*	0.115%	0.000%
Width of Forward Arbitrage Band**	0.90%	0.67%
Width of Reverse Arbitrage Band	-1.57%	-1.34%
Total With of Zero Arbitrage Band	2.47%	2.01%

* Stock and Futures only; All taxes and fees excluded; See Table 2.
**As a percentage of Futures Fair Value.

closing prices would have produced an unattractive return net of all taxes, fees and brokerage costs in Table 2 of negative 5.32%. Reverse arbitrage was also notably unattractive at that time. However, for the purposes of zero arbitrage band calculations, this example is representative.

Table 4: Zero Arbitrage Bandwidths For India, China and US Markets

Country	Futures Contract	Zero Arbitrage Band Width*
India	Single Stock	2.47%
China	CSI 300	1.14%
US	S&P 500	1.00%

* As a percentage of Futures Fair Value

In mature futures markets with sizable arbitrage volumes, the approximate width of the forward and reverse bands is about plus or minus 0.50% of the fair value for a total width of about 1%. Examples include arbitrage in the S&P 500 and FTSE 100 contracts, each of which have a total zero arbitrage band width of about 1%. The width of the band for JSW Steel futures was found to be above this level due to higher brokerage and associated fees and taxes (Table 2). Calculations for multiple trade dates and for other single stock futures contracts with differing expiration dates were made to determine the typical total width of the zero arbitrage band. The band width findings here for JSW Steel were found to be representative and high relative to the China and US markets (see Table 4).

Taken together, Table 3 and Table 4 reveal an important feature of stock versus futures arbitrage trading in India. First, even assuming highly favorable brokerage, the zero arbitrage band in India (Table 3) is more than double than found in mature global markets, where frequent arbitrage plays a significant market role. Next, even assuming no brokerage at all (Table 3), the zero arbitrage bandwidth remains approximately double than that for mature markets, illustrating clearly, the role of taxes and fees in creating this result.

To narrow the zero arbitrage bandwidth, then, will require the cooperation of regulators, exchanges and taxing authorities. Without such cooperation, the absence of arbitrage will remain an unrecognized obstacle for both domestic and foreign investors. This essential activity will then be confined to its present limited intraday form, thereby providing minimal long term service for increasing market liquidity and price stability.

SUMMARY

Whether for hedging, investing or trading purposes, securities regulators and stock exchanges, along with domestic and foreign institutional investors, all have a common interest in having fairly priced futures contracts. Achieving and sustaining fairly valued equity futures depends heavily on the existence of active arbitrage, in which stocks and futures are paired off against one another by professional arbitrageurs seeking to exploit mispricing.

Current constraints on efficient arbitrage in India include the high costs of brokerage, government, exchange and regulatory fees, an underdeveloped security lending business to support short selling and, to a lesser extent, an electronic stock execution platform in need of speedier execution. The result of these costs and constraints is that stock versus futures arbitrage in India is presently confined almost entirely to intraday transactions between selected single stocks and their stock futures contracts.

Using recent single stock futures data, this article explored specific arbitrage details of single stocks vs. their futures in the Indian market. The zero arbitrage bandwidth for this type of arbitrage was found to be typically at least twice than that occurring in the mature global markets and in need of narrowing.

If India's regulators, exchanges and taxing authorities wish to encourage the growth of valuable arbitrage business, then steps will be needed to reduce the costs that widen this band. Knowledge of the requirements for successful arbitrage can be suggested to regulators and exchanges, and steps necessary for improving market liquidity and increasing participation in India's rapidly growing stock and futures markets can be taken.

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