
**A STUDY ON RELAVANCE OF THEORETICAL FUTURE PRICES
WITH FUTURE PRICES WITH REFERENCE TO NATIONAL STOCK EXCHANGE (NSE)**

Dr. M. Tulasinadh¹,

Assistant Professor

Dr. Rampilla Mahesh²,

Assistant Professor,

^{1,2}Department of Business Administration,

Amrita Sai Institute of Science & Technology,

Kanchikacherla, Krishna Dist, A.P, India.

ABSTRACT

In recent years, the increasing importance of futures market in the Indian financial market has received considerable attention from researchers, academicians and financial analyst. This paper aims at finding out whether there is relevance of futures prices with theoretical futures in the Indian market. This paper studies the relevance of futures market by using analysis of variance technique. At a practical level, a better understanding of futures market can improve arbitrage opportunities of the market agents. The findings have implications for policy makers, hedgers and arbitragers.

Keywords: futures market, theoretical future prices, arbitrage, volatility.

1. Introduction:

In futures contract, there are two parties involved – one of the parties to a futures contract assumes a long position and agrees to buy the underlying asset on a certain specified future date for a certain agreed price. The other party assumes a short position and agrees to sell the asset on the same date for the same price. The buyer of futures contract believes that the asset prices will increase in the future. The seller of futures contract believes that the asset prices will decline in the future. In the discussion in the present section, stock has been assumed as the underlying asset. The profits of the sellers (short futures) and buyers (long futures) in the futures market are as follows:

Profit from the long futures = $ST - F_0$

Profit from the short futures = $F_0 - ST$

Where: ST: the market price of the underlying asset on the maturity of the futures

F₀: current market price of the underlying asset in the futures market

There exists a theoretical relationship between spot price, futures price and other relevant variables such dividend yield, risk-free rate and time to maturity. If risk-free rate, dividend and time to maturity are given to us, for a given spot price, there will a unique theoretical futures price.

If actual futures price is different from theoretical futures price, there will exist a pure arbitrage opportunity and the investor will be able to earn the cash flow that will yield him more than the risk-free rate of return.

If theoretical futures price is more than actual futures price, one can earn arbitrage profits by buying futures, lending \$0 in risk-free market and acquiring a short position in the stock.

2. Review of Literature:

The volatility of stock futures market has been studied by a number of researches from different angles. Despite a disagreement of the researchers regarding the kind of influence that the market of derivatives has on the underlying market, most of them agree that it is beneficial even if the volatility is increased or decreased because the derivatives market act as a catalyst for the dissemination of information. Particularly, Danthine(1978) concluded that the derivatives market increases the depth of the market and consequently reduce its volatility.

The destabilization theory argues that the introduction of futures trading increases spot volatility. For example, Harris(1989) documents marginal increases in the variance of S&P 500 stocks after trading in S&P 500 index futures began. Lockwood and Linn (1990) report similar variance increases autocorrelations and increases the volatility of index stock returns. Lee and Ohk (1992) document that the volatility of stock returns in Australia, Hongkong, Japan, The U.K, and The U.S. rose significantly, following the introduction of index futures. On the other hand, Antoniou and Holmes the introduction of index futures, however this increase is attributed to an increase in the rate of flow of information to spot markets.

On the other side Edwards(1988 a,b) Gross man(1988), and Bechetti and Roberts(1990) find that S&P 500 index futures have an insignificant impact on cash market volatility. Schwert (1990) maintains that the growth and the stock index futures and options trading has not caused increases in volatility. similar conclusions are reached by Beckett and Roberts (1990), Kamara, Miller and Siegel(1992), Pericli and Koutmos(1997), Galloway and Miller(1997) and Darat, Rahaman and Zhong(2002) who document that introduction of stock index futures has either decreased or significantly increased the volatility in spot market, confirming the stabilization theory .

Min and Najand (1999) investigated lead and lag relationship in returns and volatilities between cash market and KOSPI200 futures interactions. This study depended on some ten minute's price data belonging to the periods of 3rd may 1996 and 16th October 1996 when futures transactions were introduced over KOSPI200. Granger causality analysis was used in the study. As per the analysis results; futures market leads the cash market by as long as 30 minutes. The trading volume has significant explanatory power for volatility changes in both spot and futures markets. Futures transactions have stronger influence than cash transactions and the future transactions have stronger influence over cash market volatility.

Gulen and Mayhew (2000) find that spot volatility is independent of changes in futures trading in 18 countries and that information less futures volume has a negative impact on spot volatility in Austria and U.K.

Thenmozhi(2002) showed that inception of futures trading has reduced the volatility of spot index returns due to increased information flow. According to Shenbagaraman(2003) the introduction of derivative products did not have any significant impact on market volatility in India. Raju and Karande(2003) also reported a decline in volatility of S&P CNX NIFTY after the introduction of

index futures.

Nath(2003) studied the behaviour of stock market volatility after derivatives and arrived at a conclusion that the volatility of the market as measured by benchmark indices like S&P CNX NIFTY and S&P CNX NIFTY Junior has fallen during the post derivatives period. The finding is in -line with the earlier findings of Thenmozhi (2002) and Raju and Karande (2003).

Bandivadekar and Ghosh (2003), and Sah and Omkarnath (2005) also investigated the behaviour of volatility in cash market in futures trading era. They also found that futures trading have led to reduction in volatility in the underlying asset market but they attributed the degree of declining volatility in the underlying market to the trading volume in futures market. They inferred that as the trade volume in the F&O segment of BSE is very low, the volatility in BSE has not significantly declined; whereas in the case of NSE(where the trade volume is at the peak),the volatility in NIFTY has reduced significantly.

Mallikarjunappa and Afsal (2007)studied the volatility implications of the introduction of derivatives on the stock market in India using S&PCNX IT Index and found that clustering and persistence of volatility in different degrees before and after derivatives and listing in the futures has increased the market volatility.

Kanas (2009),using a time -varying regime - switching vector error correction approach, finds that the NIKKEI stock index cash and futures price are jointly characterized by regime switching, which is time- varying and dependent upon the basis, the interest rate, the volatility of the cash index, and the US Future market.

Gannon (2010) develops simultaneous volatility models that allow for simultaneous and unidirectional volatility and volume of trade effects. Rajput, Kakkar, Batra and Gupta (2012) have examined the phenomenon of price discovery for a period ranging from January, 2003 to March, 2011.

3. SCOPE OF THE STUDY:

1. The study is focuses on price of the future and theoretical futures only.
2. The period of the study is one month contract.
3. The study uses a sample of top 10 weighted companies.

4. Objectives of the study:

1. To study the fluctuations in future prices and compare with theoretical future price
2. To find out the relevance of theoretical future price with future price

5. Hypothesis of the study:

H₀: There is no relevance between theoretical future prices with future prices.

H₁: There is relevance between theoretical future prices with future prices

6. Research Methodology:

The basic data for this study have been collected from www.nseindia.com, an official website of National Stock Exchange. The spot-futures have been verified using daily data on value of NSE Stock futures; time to maturity for different futures contracts available for trading.

To verify the relevance of futures and theoretical futures relationship, the sample carrying one contract time period from 1stApril 2017 to 31st April 2017 has been chosen.

Tools:

To study the relevance of futures prices and compare with theoretical future prices by using analysis of variance technique.

Calculation of Theoretical future price:

Below we can see the formula by which we can estimate the theoretical value of a future price

$$F_t = S_t * e^{(r_f - q) * (T-t)}$$

Where :

F_t : Theoretical price of contract

S_t : Spot price of underline asset

R_f : risk free rate

Q : dividend yield

$T-t$: time until marurity of the contract

7. Data Analysis and Interpretation:

Table: I DIFFERENCES BETWEEN FUTURE PRICE AND SPOT PRICE, DIFFERENCE BETWEEN THEORETICAL FUTURES AND SPOT PRICES

HDFC		HDFC BANK		ITC		RELIANCE		INFOSYS	
D=F-S	D=TF-S	D=F-S	D=TF-S	D=F-S	D=TF-S	D=F-S	D=TF-S	D=F-S	D=TF-S
2.5	8.067419178	-0.3	7.539024658	1.05	1.481030137	1.5	7.231035616	4.9	5.306564384
8.35	7.185380822	0.1	6.906673973	1.1	1.345073973	1.4	6.823013699	2.7	4.802389041
6.05	6.824021918	-3.95	6.621041096	1.1	1.261610959	-0.4	6.621041096	-0.35	4.60089863
4.65	6.508493151	-3.5	6.307287671	1.25	1.195178082	4.95	6.165917808	0.8	4.302684932
7.2	5.467945205	-0.45	5.343682192	1.4	1.019254795	7.3	5.146947945	4.55	3.552394521
7.55	5.179090411	-0.4	5.048109589	0.45	0.989106849	7.7	4.812624658	5.4	3.391649315
5.75	4.821863014	1.9	4.746410959	0.3	0.926794521	6.7	4.451506849	0.95	3.185260274
7.1	4.525720548	4.15	4.419550685	1.4	0.856569863	6.65	4.187879452	4.9	2.857994521
5.1	3.242849315	3.8	3.149150685	0.75	0.611726027	3.8	3.050630137	4.05	2.027178082
3.3	2.919550685	2.2	2.854947945	0.35	0.550454795	3.25	2.702860274	3.75	1.820021918
4	2.612953425	4.3	2.540712329	0.75	0.488679452	6.55	2.400087671	4.2	1.611747945
0.55	2.327605479	2.75	2.24329863	0.35	0.428821918	6.1	2.101227397	3.3	1.422706849
1.95	1.9824	-1.7	1.968131507	0.05	0.360789041	1.6	1.844383562	2.2	1.214728767
1.7	1.006487671	-9.4	1.008032877	0.15	0.181972603	0.15	0.931989041	3.1	0.609238356
-1.85	0.678750685	-10.75	0.673775342	-0.4	0.123309589	-0.65	0.628076712	0.85	0.407386301
-2.25	0.347616438	-4.95	0.339868493	-0.7	0.063758904	-1.4	0.310454795	2.6	0.200383562
2	0	-0.25	0	0.45	0	0.05	0	-1	0

Source: computed by the researcher on the basis of data collected from nseindia.com

Figures of the table 1 describe difference between the future price and spot price (D=F-S), difference between theoretical future price and spot price (D=TF-S) of top weighted companies prices.

Table: II DIFFERENCES BETWEEN FUTURE PRICE AND SPOT PRICE, DIFFERENCE BETWEEN THEORETICAL FUTURES AND SPOT PRICES

ICICI		L&TFH		TCS		KOTAK		SBI	
D=F-S	D=TF-S								
2.5	8.067419178	0.7	0.649643836	5.95	12.68620274	1	4.607736986	1.4	1.542049315
8.35	7.185380822	0.6	0.597435616	10.9	11.57863014	0.8	4.290783562	0.45	1.43379726
6.05	6.824021918	0.7	0.567057534	0.95	11.04680548	0.05	4.116460274	1.4	1.347912329
4.65	6.508493151	0.3	0.529534247	-1.25	10.64789041	4.1	3.827287671	0.85	1.268821918
7.2	5.467945205	0.35	0.455506849	-5.6	9.025369863	2.85	3.269030137	1.45	1.078126027
7.55	5.179090411	0.45	0.438706849	-0.55	8.484120548	1.5	3.089709589	1	1.032767123
5.75	4.821863014	0.1	0.408164384	0.05	7.868219178	0.5	2.891178082	1.45	0.953917808
7.1	4.525720548	0.6	0.372975342	-1.45	7.145446575	1.5	2.698739726	0.95	0.894619178
5.1	3.242849315	0.65	0.269917808	9.4	5.073643836	1	1.945424658	1.2	0.63539726
3.3	2.919550685	0.65	0.244306849	-1.55	4.554345205	0.35	1.739145205	0.85	0.572646575
4	2.612953425	0.6	0.220317808	2.45	4.031386301	3.7	1.53529863	1.4	0.498060274
0.55	2.327605479	0.55	0.195156164	-1.4	3.567890411	2.95	1.364175342	1.25	0.436953425
1.95	1.9824	0.25	0.166290411	-3.55	3.038860274	0.3	1.157786301	0.45	0.371112329
1.7	1.006487671	0.4	0.084328767	-2.25	1.530805479	-1.3	0.588986301	0.5	0.188087671
-1.85	0.678750685	0.15	0.056372603	0.1	1.013260274	-0.7	0.393643836	0.8	0.125391781
-2.25	0.347616438	-0.1	0.027934247	0.25	0.506378082	1.65	0.197336986	0.4	0.062783562
2	0	0.15	0	1.55	0	-0.3	0	-0.1	0

Source: computed by the researcher on the basis of data collected from nseindia.com

Table 2 reveals describe difference between the future price and spot price (D=F-S), difference between theoretical future price and spot price (D=TF-S) of top weighted companies prices.

Table 3**Calculation summary of variance**

Company Name	GROUPS	Count	Sum	Average	Variance
HDFC	Diff(F-S)	17	63.65	3.744117647	10.03621324
	Diff(TF-S)	17	63.69814795	3.746949879	6.51440247
HDFC BANK	Diff(F-S)	17	-16.45	-0.96765	19.37123162
	Diff(TF-S)	17	61.7097	3.629982	5.954239093
ITC	Diff(F-S)	17	9.8	0.5764706	0.3684743
	Diff(TF-S)	17	11.884132	0.6990666	0.2254574
RELIANCE	Diff(F-S)	17	55.25	3.25	10.067813
	Diff(TF-S)	17	59.409677	3.4946869	5.7271982
INFOSYS	Diff(F-S)	17	46.9	2.7588235	3.711011
	Diff(TF-S)	17	41.313227	2.4301898	2.9398978
ICICI	Diff(F-S)	17	7.25	0.4264706	0.2600368

BANK	Diff(TF-S)	17	12.009425	0.7064367	0.2361506
L&AMP, TFH	Diff(F-S)	17	7.1	0.4176471	0.0590441
	Diff(TF-S)	17	5.2836493	0.3108029	0.0438939
L&TFH	Diff(F-S)	17	7.1	0.4176471	0.0590441
	Diff(TF-S)	17	5.2836493	0.3108029	0.0438939
TCS	Diff(F-S)	17	14	0.8235294	18.611287
	Diff(TF-S)	17	101.79925	5.9881915	17.221959
KOTAK	Diff(F-S)	17	19.95	1.1735294	2.2819118
	Diff(TF-S)	17	37.712723	2.2183955	2.2723353
SBI	Diff(F-S)	17	15.7	0.9235294	0.2125368
	Diff(TF-S)	17	12.442444	0.7319085	0.253526

Above table 3 reveals the relationship between sum, average and variance of futures and theoretical future prices of top ten weighted companies.

Table 4

USING ANALYSIS OF VARIANCE (ANOVA) TECHNIQUE TO STUDY THE HYPOTHESIS

Company Name	Source of Variation	SS	df	MS	F	P-value	F crit	RESULTS
HDFC	Between Groups	6.81831E-05	1	6.81831E-05	8.23934	0.997727555	4.149097409	H ₀ : Rejected
	Within Groups	264.8098513	32	8.275307852				
	Total	264.8099195	33					
HDFC BANK	Between Groups	179.6747	1	179.6747	14.18924556	0.000671	4.149097	H ₀ : Rejected
	Within Groups	405.2075	32	12.66274				
	Total	584.8822	33					
ITC	Between Groups	0.1277531	1	0.1277531	0.4301944	0.5165821	4.1490974	H ₁ : Accepted
	Within Groups	9.5029074	32	0.2969659				
	Total	9.6306605	33					
RELIANCE	Between Groups	0.5089091	1	0.5089091	0.0644392	0.8012364	4.1490974	H ₁ : Accepted
	Within Groups	252.72017	32	7.8975054				

	Total	253.22908	33					
INFOSYS	Between Groups	0.9180008	1	0.9180008	0.2760527	0.6029221	4.1490974	H ₁ : Accepted
	Within Groups	106.41454	32	3.3254544				
	Total	107.33254	33					
ICICI	Between Groups	0.6662389	1	0.6662389	2.6854328	0.1110663	4.1490974	H ₁ : Accepted
	Within Groups	7.9389979	32	0.2480937				
	Total	8.6052368	33					
L& TFH	Between Groups	0.0970332	1	0.0970332	1.8852754	0.1792815	4.1490974	H ₁ : Accepted
	Within Groups	1.6470079	32	0.051469				
	Total	1.7440411	33					
TCS	Between Groups	226.72674	1	226.72674	12.654547	0.0011922	4.1490974	H ₀ : Rejected
	Within Groups	573.33193	32	17.916623				
	Total	800.05867	33					
KOTAK	Between Groups	9.2798335	1	9.2798335	4.0752437	0.0519615	4.1490974	H ₁ : Accepted
	Within Groups	72.867954	32	2.2771236				
	Total	82.147787	33					
SBI	Between Groups	0.312108	1	0.312108	1.3393389	0.2557165	4.1490974	H ₁ : Accepted
	Within Groups	7.4570043	32	0.2330314				
	Total	7.7691123	33					

FINDINGS & CONCLUSION:

Present project work has been undertaken to find out the relevance of theoretical future prices with future prices. It has been found out by calculating the future prices and theoretical future prices using the following tools.

Analysis of variance (ANOVA)

- **HDFC:** The calculated value is (8.23934) greater than the f crit value (4.14909), we reject the null hypothesis (H₀). i.e., no relevance between theoretical futures prices with future prices of HDFC.

- **HDFC BANK:** The calculated value is (14.18924556) greater than the f crit value (4.149097), we reject the null hypothesis (H0). i.e., no relevance between theoretical futures prices with future prices of HDFC BANK.
- **ITC:** The calculated value is (0.4301944) less than the f crit value (4.1490974); we accept the alternative hypothesis (H1). I.e. there is relevance between theoretical futures prices with future prices of ITC.
- **RELIANCE:** The calculated value is (0.0644392) less than the f crit value (4.1490974); we accept the alternative hypothesis (H1). I.e. there is relevance between theoretical futures prices with future prices of Reliance.
- **INFOSYS:** The calculated value is (0.2760527) less than the f crit value (4.1490974); we accept the alternative hypothesis (H1). I.e. there is relevance between theoretical futures prices with future prices of Infosys.
- **ICICI:** The calculated value is (2.6854328) less than the f crit value (4.1490974); we accept the alternative hypothesis (H1). I.e. there is relevance between theoretical futures prices with future prices of icici.
- **L&TFH:** The calculated value is (1.8852754) less than the f crit value (4.1490974); we accept the alternative hypothesis (H1). I.e. there is relevance between theoretical futures prices with future prices of L&TFH.
- **TCS:** The calculated value is (12.654547) greater than the f crit value (4.14909), we reject the null hypothesis (H0). i.e., no relevance between theoretical futures prices with future prices of TCS.
- **KOTAK:** The calculated value is (4.0752437) less than the f crit value (4.1490974); we accept the alternative hypothesis (H1). I.e. there is relevance between theoretical futures prices with future prices of Kotak.
- **SBI:** The calculated value is (1.3393389) less than the f crit value (4.1490974); we accept the alternative hypothesis (H1). I.e. there is relevance between theoretical futures prices with future prices of SBI.

9. Conclusions:

1. The overall analysis concluded that most of the companies there is relevance between theoretical future prices with future prices of some companies and there is no relevance of few companies.
2. From the study the investor can go for arbitrage opportunities by using the spot and futures markets.

3. In futures at the end contract the spot and future prices will be come to equal in the market.

10. References:

1. *AN EMPIRICAL ANALYSIS*, International Refereed Research Journal, Vol.- II, Issue -3, July 2011 *Journal of Futures Markets*, Vol.11, pp.153-163, *SEBI Bulletin*, Vol.1, No.3, pp.5-15
2. Brorsen, B.W., (1991). "Futures Trading, Transactions Costs, and stock market volatility".
3. Danthine, J. (1978): "Information, futures prices, and stabilizing speculation", *Journal of Economic Theory*, 17, 79-98
4. Darrat, A.F., Rahman, S., Zhong, M., (2002). "On the role of futures trading in cash market fluctuations: Perpetrator of volatility or victim of regret?" *Journal of Financial Research*, Vol.25, pp.431-444
5. Dr. Dheeraj Misra, *Arbitrage Opportunities in the Futures Market: A Study of NSE Nifty Futures*, 8th Global Conference of Actuaries, 2006.
6. Edwards, F.R., (1988a). "Does futures trading increase stock market volatility?", *Financial Analysts Journal*, pp.63-69.
7. Grossman, S.J. (1988). "An analysis of the implications for stock and futures price volatility of program trading and dynamic hedging strategies", *Journal of Business*, Vol. 61, No. 3, pp.275-298
8. Kamara, A., Miller, T., Siegel, A., (1992). "The effects of futures trading on the stability of the S&P 500 returns". *Journal of Futures Markets*. Vol.12, pp.645-658
9. Min, J. H, Najand, M. (1999): "A Further Investigation of the Lead-Lag Relationship between the Spot Market and Stock Index Futures: Early Evidence from Korea", *Journal of Futures Market*, 19(2): 217-232
10. Raju, M. T., & Karande, K. (2003). "Price discovery and volatility of NSE futures market".

Websites

www.nseindia.com.

www.positron-investments.com