Ref No.: NSE/DEAP/59 (Revised) March 1, 2002

FUTURES TRADING AND SPOT PRICE VOLATILITY OF NIFTY INDEX FUTURES

Introduction:

The introduction of stock index futures has profoundly changed the nature of trading on stock exchanges. Edwards (1988), Harris (1989), Herbst & Maberly (1992), Jegadeesh and Subrahmanyam (1993) and Antoniou & Holmes (1995) have found that the introduction of stock index futures have caused an increase in spot market volatility in the short run while there is no significant change in volatility in the long-run. The apparent increase in volatility has been attributed to increased information flow in the market through the channel of futures trading. However, several studies {Schwert (1990), Bessembinder and Seguin (1992), Kamara *et al.* (1992) and Darrat & Rahman (1995)} categorically deny any increase in spot market volatility resulting from the introduction of futures trading.

The concern over how trading in futures contracts affects the spot market and the lead-lag relation between price movements of stock index futures and the underlying cash market would indicate the pattern of relationship among futures trading, information and spot price volatility. Kawaller et. al. (1987), Finnerty and Park (1987), Gordon *et al.* (1987), Stoll and Whaley (1990 and Chan *et al.* (1991) have found that futures lead the spot market while there is very little evidence of spot index leading the futures market. Abhyankar (1995) finds support for the hypotheses that lower transactions and entry costs in the stock index futures market is one of the reasons why futures market leads the spot index. In India, Index futures being a recent phenomenon, not much work has been done in the aforementioned lines to assess its impact on the volatility of the underlying index and its role as a price discovery vehicle for the spot market. Hence, this study attempts to examine the relationship among information, spot price volatility and futures trading in the Indian context.

Objectives

The objective of the study is to examine if index futures predicts the spot index. The volatility of index returns before and after introduction of index futures will also be examined.

Data and Sample:

In order to estimate the impact of futures trading on the volatility of Nifty, daily closing price returns of NSE-50 Index will be considered for the period 10th June 1999 to 31 March 2002. Nifty junior returns will also be considered for the same period to capture the market wide volatility.

The lead-lag relation between Nifty and Nifty Futures will be analysed using the daily closing price returns of Nifty Index and Nifty Index futures from 12th June 2000 to March 31, 2002. Daily closing prices have to be used due to non-availability of intra-day data. If intra-day data is available, then it will be used instead of daily data. The returns for the futures contract and the spot index are defined as $R_{F,t} = \{Ln(F_t/F_{t-1}) + 5\}$ and $R_{S,t} = \{Ln(S_t/S_{t-1}) + 5\}$, respectively.

Method of Analysis:

The impact on the volatility of the spot Nifty is assessed by comparing the Nifty volatilities before and after the introduction of futures trading. Volatility has been measured using standard deviation (Hodgson 1991, Herbst, 1992) of the daily returns.

In order to examine if the "market wide" information affects the Nifty index, the following regression model will be used. The Nifty Junior returns will be used as a proxy to capture market wide influences on price volatility.

$$\mathbf{R}^{N}_{t} = a_0 + a_1 \mathbf{R}_t^{NJ} + e_t$$

$\mathbf{R}^{N}_{t}$: NSE-50 index returns (log of daily closing prices)

$\mathbf{R}_t^{NJ}$: Nifty junior returns

a_0 : Constant

a_1 : Coefficient of Nifty Junior returns

α_1 (information coefficient) relates to the impact of market specific information that affects the prices (i.e. returns) of Nifty. If α_1 is statistically significant, it implies that "market-wide" information has been captured.

The extent of impact of futures trading on the spot market volatility is measured by identifying the volatility due to futures trading and other market related factors using multiple regression technique (Antoniou and Holmes, 1995, Kamara et al., 1992, Gregory et al., 1996, Darren Butterworth). For the purpose of this study, the spot market volatility will be regressed with the Nifty Junior Index returns (which essentially captures the market wide volatility) and a dummy variable using the ordinary least squares multiple regression model given below:

$$\mathbf{SD^N_t = b_0 + b_1 SD^{NJ}_t + b_2 D_t + E_t}$$

SD^N_t is the standard deviation of Nifty return series

SD^{NJ}_t is the standard deviation of Nifty Junior return series

D_t is the dummy variable (0 for pre-futures and 1 for post-futures)

β_1, β_2 are regression coefficients.

In order to examine the lead/lag relationships between index futures prices and spot index, initially autocorrelation test is used (Stoll and Whaley, (1990), Chan, (1992), Abhyankar, A.H (1995), Abhyankar (1998)) to reveal the extent to which serial correlation problems persist in the spot index and futures return series. The spurious lead/lag relation between the index and futures returns as caused by the infrequent trading of component stocks and bid-ask price affects will be examined by fitting the return series with ARMA model(Stoll and Whaley (1990)) using Cochrane-Orcutt Iterative Least Squares (COILS) method (Stephen A.D). The length of the lead/lag coefficients will be determined by the cross-correlation estimates of the daily index and futures returns (Stoll and Whaley (1990), Chan (1992), Abhyankar, A.H (1995), Abhyankar (1998)). The lead/lag relationship can be examined using simultaneous equation model solved by ordinary least squares (Chan (1992), Abhyankar, A.H (1995), Abhyankar (1998)) regression and three stage least squares regression (Koch and Koch (1987)) as well. In this study, the lead/lag relation is examined using simultaneous equation model solved by two stage least squares regression. The

lead/lag coefficients are determined by regressing the spot market returns with the current and lagged futures returns and vice versa. The model that will be used for this purpose is

$$R_{F,t} = a + \sum_{k=-n}^{k=n} b_k R_{S,t-k} + e_t$$

$$R_{S,t} = a + \sum_{k=-n}^{k=n} b_k R_{F,t-k} + e_t$$

$R_{S,t}$ and $R_{F,t}$ are the daily spot and futures returns at time t, n denotes the number of leads/lags used and ε_t denotes the error term.

The analysis, if necessary, can be done separately for different time periods – before and after ban of short sales, before and after September 11,etc.

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