An Empirical Study on Equity based Options Market in India

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DISSERTATION ABSTRACT

This study examines three issues in the context of Indian options market that are evaluated under three phases; where phase-1 examines the drivers of option market liquidity and stock market variables. Option market volatility function and its determinants are examined in phase- 2, while phase- 3 covers option pricing efficiency. It is hypothesized that a). There is a relationship between stock market variables and option market liquidity, b). there is a relationship between option market implied volatility function and option market as well as stock market variables, and c). There is a pricing efficiency in options market using Black- Scholes option pricing model.

Study uses the daily data set of equity based option contracts as well as underlying assets market related information's and 91day T-bill rate for the calendar years 2004-05. The data source for option contracts (underlying assets) is futures and options (cash market) Segment of NSE website. T-bill rate is obtained from RBI website.

In the first phase, the Mayhew, Sarin and Shastri (1999) model has been used to test the relationship between stock market variables and option market liquidity. This model involves using of four stock market characteristics (stock price, stock return volatility, trading volume, market capitalization) that are expected to explain the option liquidity. A dummy variable has also been introduced in the estimation to capture the day of month effect. Two measures of options liquidity i.e. options contract volume in numbers and options contract volume in rupees are used as proxies of option liquidity. The study found that option liquidity is positively related with underlying stock price, trading volume as well as return volatility. Further, option liquidity is negatively related to the uncertainty in the information environment, which was measured by using company size as a surrogate. There also seems to be a day of the month effect for at least one of the years. The results are robust in general for different measures of option liquidity and different option types.

In phase-2, the two related propositions for the Indian equity option market are examined: 1). The relationship between implied volatility and option moneyness typically referred to as volatility smile and 2). The potential determinants of the volatility function. Three measures of options moneyness are employed to find out smile asymmetry profile, they are: (a) as the absolute value of the difference

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between Index value and strike price divided by Index value; (b). as the natural logarithm of the ratio of the strike price on the underlying Index value divided by the product of at the money implied volatility and the square root of the time to maturity; and (c). A delta measure provided by Black-Scholes (1973) option pricing model.

The study estimated linear and quadratic models and found that the implied volatility- moneyness relationship being explained by a linear model. However, there seems to be a positive asymmetry profile for both call and put options. The results on smile asymmetry are robust to alternative constructions of moneyness measure. The positive asymmetry is however stronger for put options compared to call options. The findings are in contrast with those for mature markets where the empirical evidence largely shows a negative asymmetry profile.

An attempt in finding out the potential determinants of the observable asymmetry profile finds that time to expiration and historical volatility linearly cause the asymmetry profile for call and put options, as was the case for mature markets. While, the former variable captures the impact of time on implied volatility, the latter may be responsible for the cross sectional differences in implied volatility for any given day.

As third phase of the study, the pricing efficiency of options market was evaluated. Where, the Black- Scholes model is operationalised using two alternative measures of volatility: 1. Historical volatility and 2. Weighted implied volatility. Employing the historical volatility measure, the study finds that both call and put options are fairly priced in India subject to the trading asymmetry condition in the spot market. However, weighted implied volatility measure grossly underestimates option values resulting in large and positive pricing errors. Thus, option pricing in India seems to be conditionally efficient and historical volatility does a good job as a measure of true volatility of the underlying asset.