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The informative role of trading volume in an expanding spot and futures market

S. Bhaumik[a], M. Karanasos[b], A. Kartsaklas[b,*]

[a] Sheffield University, Sheffield, UK
[b] Brunel University London, London, UK

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ABSTRACT

This paper investigates the information content of trading volume and its relationship with range-based volatility in the Indian stock market for the period 1995–2007. We examine the dynamics of the two variables and their respective uncertainties using a bivariate dual long-memory model. We distinguish between volume traded before and after the introduction of futures and options trading. We find that in all three periods the impact of both the number of trades and the value of shares traded on volatility is negative. This result is consistent with the argument that the activity of informed traders is inversely related to volatility when the marketplace has increased liquidity, an increasing number of active investors and high consensus among investors when new information is released. We also find that (i) the introduction of futures trading leads to a decrease in spot volatility, (ii) volume decreases after the introduction of option contracts and (iii) there are significant expiration day effects on both the value of shares traded and volatility series.

1. Introduction

The rapid growth in the market for financial derivatives has resulted in continual exploration of the impact of these financial instruments on the volatility of the spot equity (or cash) market. The ability to trade a 'derivative' security is very likely to affect the underlying security's liquidity and information flow and therefore its volume (Stein, 1987; Subrahmanyam, 1991). Trading on a new market, such as the index futures and options market, is initially very small but as more traders become aware of the market's possibilities, its trading volume is likely to increase and more information to be impounded into futures prices. The question of interest that we try to address here is how does trading in index futures/options affects the trading in individual securities. Specifically, we examine the informative role of spot volume in terms of predicting cash volatility and how this role changes after the introduction of index futures and options. Market microstructure models predict volatility–volume relationships (simultaneous and feedback) which are sensitive to the type and quality of information, the expectations formed based on this information and the trading motives of investors.[1]

* Corresponding author at: Department of Economis and Finance, Brunel University London Kingston Lane, Uxbridge, Middlesex UB8 3PH, UK.
E-mail address: aris.kartsaklas@brunel.ac.uk (A. Kartsaklas).

[1] A positive volatility–volume relationship is predicted by most information induced trading models while a negative one is also existent due to liquidity induced trading (Li and Wu, 2006), the extent to which new information affects the knowledge of and agreement between agents (Holthausen and Verrecchia, 1990), and the number of active traders in the market (Tauchen and Pitts, 1983). Daigler and Wiley (1999) find that the activity of informed

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This study also contributes to the literature about the impact of derivatives trading on the volatility of cash markets in emerging market economies. The effect of derivatives trading on cash market volatility is theoretically ambiguous and depends on the specific assumptions of the model (Stein, 1987; Subrahmanyam, 1991; Mayhew, 2000). The empirical evidence is also mixed. While some researchers have found that the introduction of futures and options trading has not had any impact on stock volatility, others have found evidence of a positive effect in a number of countries including, Japan, the UK and the USA. The balance of evidence suggests that introduction of derivatives trading may have increased volatility in the cash market in Japan and the USA, but it had no impact on the other markets (Gulen and Mayhew, 2000).[2]

The volatility–volume relationship and the effect of derivatives trading on the cash market are analyzed together in this paper by estimating a bivariate ccc ARFI-FIGARCH model with lagged values of one variable included in the mean equation of the other one. The fractional integration applies to the mean and the variance specification and allows to capture the long memory characteristics of our data. Apart from using absolute values of the returns, their squares and conditional variances from a GARCH-type model as our measure of volatility, we also employ the range-based volatility estimator of Garman and Klass (1980) (hereafter GK). The GK estimator is more efficient than the traditional close-to-close estimator and exhibits very little bias, whereas the realized volatility constructed from high frequency data can possess inherent biases impounded by market microstructure factors (Alizadeh et al., 2002). Finally, we use two measures of volume, the number of trades and the value of shares traded, in order to capture differences in their information content over time and changes to it with the introduction of derivatives trading. Jones et al. (1994) find that on average the size of trades has no significant incremental information content and that any information in the trading behaviour of agents is almost entirely contained in the frequency of trades during a particular interval.

The sample period from November 3, 1995 to January 25, 2007 includes the introduction of (index) futures and (index) options trading on the National Stock Exchange (NSE) of India, at two different points in time. We, therefore, have three distinct sub-periods in our data, one in which financial derivatives were not traded, another during which only futures contracts were traded, and finally one in which both futures and options contracts were traded. The results suggest that the impact of the value of shares traded – one of our measures of volume – on volatility is sensitive to the introduction of derivatives trading. In all three periods, the impact is negative. However, the strength of this negative relationship was weakened after the introduction of options trading, perhaps because of a reduction in the flow of information in the cash market. Similarly, the impact of the number of trades – our second measure of volume – on volatility is negative in all three periods. Overall, increases in unexpected volume (proxy for information arrival) are related with lower range-based volatility over time. This supports the hypothesis that the activity of informed traders is inversely related to volatility when the marketplace has increased liquidity, an increasing number of active investors and high consensus among investors when new information is released. In sharp contrast, both measures of volume are not affected by past changes in volatility.

Our specification allows us to examine the direct impact of introduction of futures and options trading on volume and volatility in the cash market as well. We find that (i) the introduction of futures trading leads to a decrease in spot volatility as predicted by Stein (1987) and Hong (2000) and, (ii) volume decreases after the introduction of option contracts, offering support to the view that the migration of some speculators to options markets on the listing of options is accompanied by a decrease in trading volume in the underlying security. We also control for expiration day effects in our bivariate ccc ARFI-FIGARCH model. The results indicate that expiration of equity based derivatives has a significant positive impact on the value of shares traded on expiration days and a significant negative impact on the range-based volatility. The increased trading on expiration days can easily be explained by way of settlement of futures contracts (and exercise of options contracts) that necessitate purchase and sale of shares in the cash market.

The remainder of this article is organized as follows. In Section 2, we trace the post-reforms evolution of the secondary market for equities in India. Section 3 discusses the theory concerning the link between volume and volatility and the impact of futures/options trading on the latter. Section 4 outlines the data which are used in the empirical tests of this paper and we describe the time series model for the two variables. In Section 5 we report the empirical results and we discuss them within the context of the Indian market. Section 6 contains summary remarks and conclusions.

2. The Indian equity market

The choice of the National Stock Exchange (NSE hereafter) of India as the basis for our analysis can easily be justified. The market capitalisation in March 2007, the last month of the 2006-07 financial year, was Indian rupees (INR) 33,673.5 billion, more than 10 times the market capitalisation in March 1995 (INR 2926.4 billion), the last month of NSE's first (financial) year of operation. The number of trades executed at NSE's cash market during the corresponding months was 71 million and 0.1 million, respectively. The growth in the derivatives segment of the exchange has kept pace with the growth in the cash market. Of the 1098 listed securities, 123 act as underlying assets for futures and options contracts. In addition, three

traders is often inversely related to volatility. Moreover, Avramov et al. (2006) show that informed (or contrarian) trades lead to a reduction in volatility while non-informational (or herding) trades lead to an increase in volatility.

[2] It is only recently that the development and financial literature have started exploring the impact of phenomena like market participation by foreign portfolio investors and expiration of derivatives contracts in emerging economies (see, for example, Pok and Poshakwale, 2004; Vipul, 2006; Wang, 2007; Bhaumik and Bose, 2009).