



Contents lists available at ScienceDirect

Journal of Financial Economics

journal homepage: www.elsevier.com/locate/jfecO/S: The relative trading activity in options and stock[☆]Richard Roll, Eduardo Schwartz, Avanidhar Subrahmanyam^{*}

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ARTICLE INFO

Article history:

Received 27 April 2009

Received in revised form

13 June 2009

Accepted 23 June 2009

Available online 12 November 2009

JEL classification:

G12

G13

G14

Keywords:

Options

Stock

Trading volume

Information

ABSTRACT

Relatively little is known about the trading volume in derivatives relative to the volume in underlying stocks. We study the time-series properties and the determinants of the options/stock trading volume ratio (O/S) using a comprehensive cross-section and time-series of data on equities and their listed options. O/S is related to many intuitive determinants such as delta and trading costs, and it also varies with institutional holdings, analyst following, and analyst forecast dispersion. O/S is higher around earnings announcements, suggesting increased trading in the options market. Further, post-announcement absolute returns are positively related to pre-announcement O/S, which suggests that at least part of the pre-announcement options trading is informed.

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1. Introduction

Where should one trade? The answer depends on liquidity and costs, of course, but also on the strength of a trader's convictions. A buyer believes, correctly or not, that the price is more likely to increase than decrease, and vice versa for a seller. The convinced trader would naturally attempt to execute where the profit potential is highest, in a leveraged market with ample liquidity. Hence, even though options are redundant in the

frictionless world of Black and Scholes (1973), trading options could be more attractive than trading stock for an informed agent with borrowing constraints, and it could also be more appealing for any agent with ill-founded but strong beliefs.

Although the theoretical literature about informed trading such as Kyle (1985) or Glosten and Milgrom (1985) emphasizes the distinction between informed and uninformed agents, trading itself is driven by agents with convictions, whether or not they possess valid information. Indeed, one of the great puzzles of finance is the sheer volume of trading, which seems far in excess of what could reasonably be anticipated based on the arrival of new private information. Presumably, some of this seemingly excessive trading is among agents who are not informed at all, but simply believe they are.

There is, nonetheless, recent evidence that at least some traders are truly informed. Easley, Hvidkjaer, and O'Hara (2002) find evidence that informed traders are active in equity markets and that information risk is priced in the cross-section of stock returns. Further, Pan and Poteshman (2006) find that put/call ratios in

[☆] We are grateful to the referee, Eugene Fama, for many helpful and constructive comments on previous drafts. Valuable comments were also received from Amber Anand, Tom Barkley, Steve Cauley, Bhagwan Chowdhry, Stuart Gabriel, Mark Garmaise, Bob Geske, Murali Jagannathan, Srinivasan Krishnamurthy, Hanno Lustig, Marc Martos-Vila, Milena Petrova, Pierre Yourougou, and participants in seminars at Syracuse University, UCLA, and at the annual meetings of the European Finance Association.

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transactions involving new positions are good predictors of future stock returns. This is consistent with informed traders exploiting the enhanced leverage of the options market to maximize profitability, thus indicating that options are not viewed as redundant securities by agents. Pan and Poteshman (2006) build on earlier theoretical work by Easley, O'Hara, and Srinivas (1998), which suggests that informed traders could use either options or stock and outlines conditions when options would be preferred, e.g., when implicit leverage in options is high and options are relatively liquid. Of course, the same conditions would entice non-informed true believers to trade in options. In addition, options could attract volume as vehicles that can be used to hedge positions in the underlying stock (or indeed, in other options).

Despite intimations in the past theoretical and empirical literature about the relative merits of trading in options and stock, there has been virtually no direct work on understanding variation in the actual relative trading volumes in derivatives and their underlying assets. In this paper, we hope to provide some evidence about this important issue by using an extensive cross-sectional and time-series sample of options and their underlying equities over a period spanning almost 3,000 trading days.

We first develop a simple empirical construct, the options/stock trading volume ratio (*O/S*). *O/S* is the ratio for a given calendar period, usually a day, between the total volume of trading on the listed options market and the corresponding volume of trading on the stock market in options and shares of a given firm. The components of *O/S* can be measured either in dollars or in shares, given that a typical option contract is for 100 shares of the underlying stock.

We study *O/S* for a comprehensive sample of equities over 12 years, 1996–2007 inclusive, when daily options trading volumes are readily available. For a given company, *O/S* swings dramatically from day to day, thereby indicating that on certain days, some traders are attempting to exploit what they believe is privileged information. We find too that *O/S* cross-sectionally depends on various determinants such as the costs of trading, the size of the firm, the available degree of leverage in options, institutional holdings, and, to some extent, proxies for the likely availability of private information and the diversity of opinions.

To illustrate how committed traders act around news events, we consider a broad sample of earnings announcements for stocks with listed options. We show that *O/S* increases significantly in the few days around an earnings announcement. Further, high *O/S* predicts high absolute cumulative abnormal returns (CARs) after the announcement. There is also evidence that some options traders are executing orders in the right direction for the upcoming earnings surprise. These findings are consistent with informed trading in the options market prior to earnings announcements.

To the best of our knowledge, this is the first look at the relative trading activity in options and stock. The empirical patterns are strongly significant, persistent, robust, and generally accord with intuition and received trading theory. Unlike returns generated by a random

walk process, there is every reason to think that trading volume could be strongly related to underlying determinants; we find convincing empirical support for such a supposition. Moreover, our work suggests a fertile research agenda that includes looking at *O/S* around other corporate announcements, as well as *O/S* for the overall market index.

The remainder of this paper is organized as follows. Section 2 provides a brief literature review to place our study in the context of existing research. Section 3 describes the data and provides some summary statistics. Section 4 presents the results of the basic regression analysis of *O/S* determinants. Section 5 presents time-series properties of some regression coefficients of interest. Sections 6 and 7 analyze, respectively, the behavior of *O/S* around earnings announcements and its relation to cumulative abnormal returns. Section 8 concludes.

2. Literature review

Black and Scholes (1973) treat options as securities that are redundant and can be replicated in continuous time by investments in stocks and bonds. In this paradigm, there is no role for options volume. However, options cannot be dynamically replicated with stocks and bonds when the process for the underlying stock involves features such as stochastic discontinuities (see, for example, Naik and Lee, 1990; Pan and Liu, 2003).¹ In general, when markets are incomplete, options cannot be replicated by simple securities such as stocks and bonds (see Ross, 1976; Hakansson, 1982; Detemple and Selden, 1991). Thus, the introduction of options may help complete markets and enhance welfare.²

In addition to completing markets, options may also alter the incentives to trade on private information about the underlying asset. For example, Cao (1999) argues that agents with information about future contingencies should be able to trade more effectively on their information in the presence of options, thus improving informational efficiency. In addition, informed traders may prefer to trade options rather than stock, because of increased opportunities for leverage (Back, 1992; Biais and Hillion, 1994).

Consistent with the preceding notions, Cao and Wei (2008) find evidence that information asymmetry is greater for options than for the underlying stock, implying that agents with information find the options market a more efficient venue for trading. This finding is supported by Easley, O'Hara, and Srinivas (1998), Chakravarty, Gulen, and Mayhew (2004), and Pan and Poteshman (2006), who find that options order flows contain information about the future direction of the underlying stock price. This accords with informed traders exploiting

¹ Figlewski and Webb (1993), Danielsen and Sorescu (2001), and Ofek, Richardson, and Whitelaw (2004) explore the role of options in alleviating short-selling constraints.

² Supporting the notion that options enhance expected utility and asset values, Conrad (1989) finds a positive effect on stock prices following an options listing.

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