Journal of Banking & Finance 35 (2011) 430–442

Contents lists available at ScienceDirect

Journal of Banking & Finance

journal homepage: www.elsevier.com/locate/jbf

Options, short-sale constraints and market efficiency: A new perspective

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ARTICLE INFO

Article history:
Received 10 November 2009
Accepted 21 August 2010
Available online 27 August 2010

JEL classification:
G12
G14

Keywords:
Short-sale constraints
Option listing
Market efficiency

ABSTRACT

This paper undertakes a new investigation of the potential for options to mitigate short-sale constraints. I find that option introduction alleviates 79% of the price adjustment efficiency disparity between short-sale constrained and unconstrained stocks in relation to negative news. No significant improvement in adjustment efficiency is found in response to positive information. These results are robust to controls for endogeneity biases associated with the option introduction selection process. Further, I find evidence that post-option improvement in efficiency is similar in relation to private and public information. This suggests that short-sale constraint effects stem, at least in part, from an irrational, optimism bias or another behavioral source as suggested theoretically by Miller (1977). Collectively, these results suggest that options act as an effective substitute to short-sales, significantly contributing to the informational efficiency of the market.

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1. Introduction

> "*Short sellers occupy a position in the stock market like that of predators in nature: necessary but unloved*" (Sauer, 2006).

Through history short-sellers have been both reviled and lauded by investors. Short-selling "bear raids" were widely perceived by many investors as a cause of the 1929 stock market crash (US SEC, 1999). More recently, on September 19, 2008 the US Securities and Exchange Commission (SEC) banned short-sale transactions for financial sector stocks in an effort to stabilize the market amidst the 2008–2009 global financial crisis. The effect of short-sale constraints on stock prices and market efficiency has been studied extensively. Most empirical studies conclude that short-sale constraints are associated with overpricing and are related to a reduction in market quality and the efficiency which negative information incorporates into prices.[1]

The finance literature is less clear and divided on the potential for options to mitigate short-sale constraints. Several authors have found evidence in support of a reduction in short-sale constraints following option introduction.[2] These results have been criticized by Mayhew and Mihov (2005) for failing to control for option introduction endogeneity, suggesting that relations between stock characteristics and options previously regarded as evidence of a reduction of short-sale constraints may be spurious. Further, Bris et al. (2007) examine 46 equity markets around the world and find the effect of put options to be insignificant in the presence of short-selling restrictions. In this paper I contribute to this ongoing debate by conducting an event study which examines the change in market efficiency following 1732 option introduction events between 1981 and 1997.[3]

Prior research has examined average abnormal returns (Sorescu, 2000), changes in short interest (Figlewski and Webb, 1993) and put option trading volumes (Mayhew and Mihov, 2005) at the time of option introduction. I extend the approach of these papers in several ways. First, as opposed to examining aggregate effects, I examine cross-sectional variation in option introduction effects conditioning on pre-option short-sale constraint levels. Specifically, I utilize institutional ownership to proxy for short-sale constraints as institutional investors in long positions provide the majority of shares for short-sale loans (D'Avolio, 2002). Asquith et al. (2005) argue that short-sale constraints likely only bind for

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[1] For example, D'Avolio (2002) and Nagel (2005) both conclude that short-sale constraints contribute to the exclusion of negative value opinions from the market leading to overpricing. Charoenrook and Daouk (2005) analyze markets in 111 countries and find that when short-selling is allowed expected returns are lower and that stock prices exhibit less volatility and greater liquidity. Chen and Rhee (2010) document that short-sales increase the speed of price adjustment to both firm specific and market-wide information.

[2] For example, Figlewski and Webb (1993) find that short interest increases and Sorescu (2000) finds negative abnormal returns for stocks following option introduction. Both findings are reflective of greater access to synthetic short transactions and the correction of overpricing by options. Nilsson (2008) documents that short-sale constraint effects are less pronounced in the presence of options. This literature is discussed in greater detail in Section 2.

[3] The option introduction dataset is as used by Mayhew and Mihov (2004).

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doi:10.1016/j.jbankfin.2010.08.022

a small segment of stocks. Drawing on these observations, I hypothesize that option introduction effects will be isolated to (or more pronounced for) stocks with low institutional ownership holdings for which short-sale constraints most likely bind. To my knowledge, this is the first paper to utilize this approach.[4]

These tests are further segmented by positive and negative information taking advantage of the differential effect of short-sale constraints on different types of news. As short-sale constraints only impede negative information from stock prices, I hypothesize that option introduction effects will be jointly isolated to low ownership stocks when responding to negative information. This approach allows me to more confidently attribute any noted effects to the reduction of short-sale constraints as opposed to other potential endogenous factors.

To measure the post-option reduction in short-sale constraints I utilize an extension of the speed of stock price adjustment measures defined in Hou and Moskowitz (2005).[5] The Hou and Moskowitz model assesses the power of lagged market returns for predicting contemporaneous stock returns. The greater the number of lagged market returns that are significant for predicting contemporaneous stock returns, the greater the delay in adjustment to new information.[6] I focus on market efficiency, as opposed to other factors, as this variable captures the tangible, end-result of short-sale constraints, the speed with which negative information is impounded into stock prices. While the variables examined in prior studies may be interpreted as indicative of an effect of options on short-sale constraints, I am able to both identify and quantify the extent to which any relaxation of constraints has impacted the market.[7]

The effect of option introduction on market efficiency has been previously examined. For example, Jennings and Starks (1986) and Skinner (1990) examine the rate of stock price adjustment following earnings announcements and find prices for optioned stocks adjust more rapidly. Conversely, Mazouz (2004) and others finds that option introduction has no significant impact on either price volatility or the speed of stock price adjustment of the underlying stock. Thus, the broad option literature is inconclusive in regard to the effect of options on market efficiency. This paper is the first to examine the effect of options on market efficiency, while conditioning on short-sale constraint proxies and the differential response to positive and negative information.

To further verify that the effects I document are related to options and not endogenous factors common to stocks at the time of option introduction, I implement the control methodology suggested by Danielsen et al. (2007). Also to my knowledge, this is the first paper to examine the change in market efficiency resulting from option mitigation of short-sale constraints which controls for option introduction endogeneity.

Finally, there are two prevalent hypotheses in relation to the source of short-sale constraint effects. Miller (1977) argues that short-sale constraints exclude pessimistic investors from the market, thus when short-sale constraints bind, stock prices are set by the subset of investors with the most optimistic value opinion. In slight contrast, Diamond and Verrecchia (1987) argue that once option trading is introduced, investors may take a synthetic short position allowing more rapid incorporation of negative, private information into stock prices. As an extension of the market efficiency tests, I examine the differential improvement in market efficiency in relation to private and public news. These additional tests allow inferences regarding the source of the short-sale constraint effect, contrasting the behavioral source suggested by Miller (1977) to the rational movement of markets from semi-strong to strong form efficiency suggested by Diamond and Verrecchia (1987).

Similar to Danielsen et al. (2007), Asquith et al. (2005) and others, I find that, on average, prior to option introduction short-sale constraints do not bind. But unlike prior studies, I document significant cross-sectional variation in post-option efficiency improvements. Only stocks with low institutional ownership (with low short-sale loan supply) realize a significant post-option improvement in the speed of price adjustment.

Consistent with the hypothesis that the post-option improvement in market efficiency is related to the relaxation of short-sale constraints, I find that improvement is limited to negative news. No significant post-option improvement in adjustment efficiency is noted in response to positive news. Prior to option introduction, short-sale constrained stocks adjust to negative news 19% more slowly than unconstrained stocks. Following option introduction that difference is reduced to 4%, indicating that options eliminate up to 79% of the price efficiency disparity between short-sale constrained and unconstrained stocks. These results are robust to the endogeneity control methodology suggested by the results of Danielsen et al. (2007).

As an extension of these tests I replicate the extended Hou and Moskowitz models utilizing lagged excess stock returns in the place of lagged market returns. As market returns reflect predominantly public information and excess stock returns reflect both private and public firm specific information, the Diamond and Verrecchia (1987) and Miller (1977) hypotheses generate contrasting predictions. Following Diamond and Verrecchia, efficiency gains should be limited to the negative, private information component of firm specific returns. In contrast, Miller's hypothesis predicts similar efficiency gains in relation to the public information component of both market and excess stock returns. I find that improvements in efficiency are similar between the market and excess stock return models, suggesting short-sale constraint effects stem from an optimism bias or other behavioral source as argued by Miller (1977). Delayed incorporation of negative, private information into stock prices likely also plays a role in short-sale constraint effects, but does not appear to be the exclusive source as suggested by Diamond and Verrecchia (1987).

Considered collectively, the results of this paper can be summarized as follows. For the majority of the market adequate short-sale loan supply is available to meet demand, such that short-sale constraints do not bind, even in the absence of options. For a subset of the market with low institutional investor holdings, who typically provide the majority of short-sale liquidity, options act as a substitute for short-sales contributing significantly to market completeness.

The remainder of the paper is organized as follows: Section 2 reviews the related literature in more detail. Section 3 describes the sample and Section 4 describes the stock price efficiency measures utilized in the paper. Section 5 presents an analysis of the determinants of stock price delay. Section 6 examines the effect of option

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[4] One exception is Mayhew and Mihov (2005) who examine variation in put trading volume segmented by firm size, float, short interest, market model residual variance and abnormal returns to proxy for short-sale constraints.

[5] The Hou and Moskowitz (2005) model is similarly used to quantify the extent of short-sale constraints by Saffi and Sigurdsson (2007) and is similar to the model utilized by Bris et al. (2007).

[6] As discussed in more detail in Section 4, I augment the original Hou and Moskowitz (2005) model with excess stock returns and negative news interaction dummies to allow a greater range of market efficiency tests.

[7] It is possible to approach the question of the effect of options on short-sale constraints by examining other variables than market efficiency. For example, one could also examine the change in short interest or trading volume conditioning on the magnitude of negative information revealed in the market. While variation in these variables is interesting in their own right, ultimately what this paper seeks to explore is not only evidence of an effect of options on short-sale constraints but the magnitude of the end result in the market. The extent to which options complete the market via the relaxation of short-sale constraints is better captured by examining market efficiency.

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