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# The information content of implied skewness and kurtosis changes prior to earnings announcements for stock and option returns

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## ABSTRACT

We use option prices to examine whether changes in stock return skewness and kurtosis preceding earnings announcements provide information about subsequent stock and option returns. We demonstrate that changes in jump risk premiums can lead to changes in implied skewness and kurtosis and are also associated with the mean and variability of the stock price response to the earnings announcement. We find that changes in both moments have strong predictive power for future stock returns, even after controlling for implied volatility. Additionally, changes in both moments predict call returns, while put return predictability is primarily linked to changes in skewness.

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## 1. Introduction

Understanding how information flows between option and stock markets is an important topic in accounting, economics, and finance. As stated by Black (1975), “An investor who wants the action on a stock has two ways of getting it. He can deal directly in the stock, or he can deal in the option.” Black suggests traders with private information prefer to transact in option markets due to lower short-selling costs and the ability to make leveraged bets. The likely result is that information is reflected in option prices before it is reflected in stock prices.<sup>1</sup> Evidence in Bali and Hovakimian (2009), Cremers and Weinbaum (2010), Diavatopoulos et al. (2008), Zhang et al. (2010), and Conrad et al. (2009) is consistent with Black’s conclusion.

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<sup>1</sup> Many studies address the general lead-lag relation between option and stock markets. For example, Manaster and Rendleman (1982) find closing prices of call options contain information about equilibrium underlying asset prices that is not contained in the closing prices of these underlying assets. Sheikh and Ronn (1994) find option returns contain systematic patterns even after adjusting for patterns in the means and variances of the underlying assets. This is consistent with the hypothesis that option markets contain information about the future value of the underlying assets due to informed trading in option markets.

On the other hand, there is a view that option prices do not participate in the price discovery process for the underlying stock and that option traders are simply speculators using existing public information. For example, DeLong et al. (1990) and Muravyev et al. (2011) suggest that options trading reduces pricing efficiency in the equity market because it introduces excess volatility. Stephan and Whaley (1990) provide evidence that stock prices lead option prices, Vijh (1990) and Chan et al. (1993) find that options trading has a negligible impact on stock prices, and Chan et al. (2002) find that new information in the options market comes in the form of quote revisions rather than trades. While the overall empirical literature is somewhat mixed in its conclusions regarding the information content of options markets,<sup>2</sup> the results of our study are consistent with the view that informed trading is active in options markets, and hence, option prices carry important implications for equity markets, in particular around earnings announcements.

Earnings announcements are often rich in information. Most earnings announcement analysis centers on event day(s) stock returns or returns in subsequent periods.<sup>3</sup> We add to the literature by closely examining time periods immediately preceding earnings

<sup>2</sup> See Ansi and Ouda (2009) for a recent literature review.

<sup>3</sup> See, for example, Beaver (1968), Ball and Brown (1968), Landsman and Mayhew (2002), and Battalio and Mendenhall (2005).

announcements, exploring if the distribution of option price changes can predict stock and option returns preceding, and at, these announcements. We specifically study whether changes in expected stock return skewness and kurtosis, as implied in option prices prior to earnings announcements, are related to future stock and option returns.

Stock price responses to earnings announcements pose significant risk to option traders, particularly those with short positions and especially if options are close to expiration. This risk is a function of the direction, uncertainty, and magnitude of stock price responses. These risks can be thought of as the risk premiums for mean jump size and jump size uncertainty. If option traders are informed, option prices will change to reflect changing premiums for jump risk and, as a result, reflect expectations regarding the realized direction of future stock price movements associated with earnings announcements. Under the assumption that option traders have information advantages, we provide a simulation analysis demonstrating that changing jump risk premiums will lead to changes in implied skewness and kurtosis. Establishing this theoretical link forms the basis for our empirical tests of whether implied skewness and kurtosis changes predict subsequent returns through earnings announcements.

Prior studies examine stock returns around earnings announcements after dividing firms into optionable or non-optionable stocks. Jennings and Starks (1986), Skinner (1990), Ho (1993), and Mendenhall and Fehrs (1999) find optionable firms have quicker average price responses and smaller average surprises than non-optionable firms. This suggests option listing improves informational efficiency for the underlying stock. Amin and Lee (1997) find option trading volume increases by more than 10% in the four days preceding quarterly earnings announcements, while stock volume increases by less than 5%. The greater option volume change suggests the information content of earnings announcements is, in part, entering securities markets via option trading. This supports the assertion that underlying asset markets are more efficient for stocks with listed options. Option traders also initiate a higher proportion of long (short) positions immediately before positive (negative) earnings announcements. This again implies that informed traders prefer to transact in option markets, consistent with Black's hypothesis.

Other studies investigate the relation between stock return volatility implied in option prices and future stock returns. Patell and Wolfson (1979, 1981) find implied volatility, as calculated from the Black and Scholes (1973) pricing model, increases before and decreases following earnings announcements. Zhang et al. (2010) examine the ability of implied stock return volatility skews to predict future stock returns.<sup>4</sup> They show that firms with the steepest implied volatility smirks experience the worst subsequent earnings surprises.<sup>5</sup> Using a measure of option implied skewness and kurtosis based on Bakshi et al. (2003), Conrad et al. (2009) find a negative (positive) relation between option implied skewness (kurtosis) and stock returns. Their results suggest that investors are willing to pay a premium to hold stocks with positive skewness. While we use the same methodology of deriving implied moments, our results complement and extend those documented by Conrad, Ditmar, and Ghysels. We focus on a particular corporate event; the announcement of earnings. Earnings announcements are rich in information and stock prices are inherently more volatile around these announcements (Beaver, 1968), which makes this period of interest to all investors. Examples include option traders concerned with

jump risk and portfolio managers interested in predicting the direction and change in a stock price prior to an earnings announcement. In addition, our analysis focuses on changes in implied moments, which is new to the analysis in Conrad, Ditmar, and Ghysels. This is an important distinction because implied parameters should change as the options market anticipates the size and direction of the approaching earnings announcement. Thus, in the context of our analysis, changes in implied moments are more informative than levels. In addition, we complement Conrad, Ditmar, and Ghysels by documenting a short-term skewness and kurtosis stock return relation that potentially stems from option traders information, as opposed to a long-term relation stemming from investor preferences for holding more concentrated positions in skewed securities.

The findings in Patell and Wolfson, Zhang, Zhao, and Xing, and Conrad, Ditmar, and Ghysels imply two specific relations between option and stock markets. First, option prices and implied stock return volatilities are driven up by traders prior to earnings announcements. Second, the shape of implied volatility skews may contain information regarding the direction of subsequent earnings announcements. With respect to future earnings, we find that implied skewness and kurtosis changes provide incremental information relative to implied volatility.

We extend prior research in two important ways. First, based on the assumption of informed option trading, we present simulation evidence linking changes in underlying asset (stock) risk premiums to changes in expected skewness and kurtosis as implied in option prices. Since these changes in implied moments reflect anticipated information, subsequent returns through the earnings announcement may be influenced. Second, we test this implication by empirically examining the effect of second, third, and fourth implied moment changes on subsequent stock and option returns prior to, and at, earnings announcements. While controlling for second moment changes, we demonstrate that changes in the third and fourth implied moments have predictive power for future returns. This result suggests that profitable trading strategies may be initiated prior to earnings announcements.

We provide empirical evidence that information contained in earnings announcements is incorporated in option prices before the actual announcement. We first separately sort stocks into quintiles based on implied skewness and kurtosis changes over three different periods preceding earnings announcements. In other words, six separate sorts are performed. In each case, mean buy-and-hold returns (BHRs) over the period beginning the day after the end of the sorting period and ending on the day after the announcement are significantly greater for the high moment change quintile than for the low moment change quintile. This supports the assertion that implied skewness and kurtosis changes have predictive power for future stock returns. These predictive abilities persist after controlling for implied volatility using a double sorting procedure.

Next, firm performance is examined after double sorting on changes in implied skewness and kurtosis. We find high skewness change quintile firms outperform low skewness change quintile firms after controlling for kurtosis changes, though this relation is stronger within higher kurtosis change quintiles. High kurtosis change quintile firms significantly outperform low kurtosis change quintile firms only within the two highest skewness change quintiles. These results indicate that changes in both implied skewness and kurtosis contribute to return predictability, with the strongest relation existing for high skewness and kurtosis change firms. Similar to stock BHRs, call and put option BHRs are examined following changes in implied skewness and kurtosis. As with stocks, we find strong evidence that implied skewness and kurtosis changes have power to predict option returns.

Finally, the portfolio results are corroborated by firm-level regressions with stock, call, and put BHRs as dependent variables.

<sup>4</sup> Volatility skew refers to the implied volatilities from options across strike prices, for a given maturity.

<sup>5</sup> A "smirk" is when one side of the volatility skew is higher than the other. For example, out-of-the-money puts may have higher implied volatility than in-the-money puts.

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