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Does realized skewness predict the cross-section of equity returns?☆

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ABSTRACT

We use intraday data to compute weekly realized moments for equity returns and study their time-series and cross-sectional properties. Buying stocks in the lowest realized skewness decile and selling stocks in the highest realized skewness decile generates an average return of 19 basis points the following week with a *t*-statistic of 3.70. This result is robust across a wide variety of implementations and is not captured by the Fama-French and Carhart factors. The relation between realized kurtosis and next week's stock returns is positive but not always significant. We do not find a strong relation between realized volatility and next week's stock returns.

1. Introduction

We examine the properties of higher moments computed from intraday returns. Merton (1980) first noted that volatility can be measured arbitrarily precisely as the sampling frequency increases. This insight was later applied to the measurement of time-varying volatility in the realized volatility literature, which constructs daily measures of realized volatility computed from intraday squared returns. Extending the now well-established concept of realized volatility, we compute realized skewness and kurtosis from intraday cubed and quartic returns. We show that under realistic assumptions, based on a continuous-time specification of equity price dynamics that includes stochastic volatility and jumps, the realized moments converge to well-defined limits. The limits

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of the higher realized moments are determined by the jump parameters of the continuous-time price process. Using Monte Carlo techniques, we verify that the measurement of the realized higher moments is reliable in finite samples, and that it is robust to the presence of market microstructure noise as well as to quote discontinuities in existence prior to decimalization.

Our empirical strategy uses an extensive sample of weekly data. We aggregate daily realized moments to obtain weekly realized volatility, skewness, and kurtosis measures for over three million firm-week observations. We find considerable time-variation in the cross-sectional percentiles. While the cross-sectional dispersion in realized volatility has decreased during our sample period, the cross-sectional dispersion in realized skewness and kurtosis has increased. The median cross-sectional kurtosis has also increased significantly.

Next we examine the relation between higher moments computed from intraday returns and future stock returns. We sort stocks into deciles based on the current-week realized moment and compute the subsequent one-week return of the trading strategy that buys the portfolio of stocks with a high realized moment (volatility, skewness, or kurtosis) and sells the portfolio of stocks with a low realized moment.

When sorting on realized volatility, the resulting portfolio return differences are not statistically significant. However, when sorting by realized skewness, the long-short value-weighted portfolio produces an average weekly return of -19 basis points with a t-statistic of -3.70. The resulting four-factor Carhart risk-adjusted alpha for the long-short skewness portfolio is also close to -19 basis points per week. We find a positive relation between realized kurtosis and subsequent stock returns, but the economic magnitude is smaller and the results are less significant.

We confirm the negative relation between realized skewness and future returns using Fama-MacBeth regressions. We also investigate the robustness of these findings when controlling for a number of well-documented determinants of returns: firm size and book-to-market ratio as in Fama and French (1993), market beta, lagged return as in Jegadeesh (1990), Lehmann (1990), and Gutierrez and Kelley (2008), historical skewness, idiosyncratic volatility as in Ang, Hodrick, Xing, and Zhang (2006), coskewness as in Harvey and Siddique (2000), realized volatility and kurtosis, maximum return as in Bali, Cakici, and Whitelaw (2009), the number of analysts that follow the firm as in Arbel and Strebel (1982), illiquidity as in Amihud (2002), and the number of intraday transactions. Realized skewness continues to be highly significant in explaining the cross-section of returns after controlling for these factors. Finally, results for realized skewness are robust to the January effect and are significant when considering only NYSE stocks. We also show that the cross-sectional results obtain for alternative holding periods.

The positive relation between realized kurtosis and future returns is also confirmed using Fama-MacBeth regressions. However, robustness exercises indicate that the results for realized kurtosis are not as economically and statistically significant as the results for realized skewness.

To verify that our measures of higher moments are not contaminated by microstructure noise, and to make sure that we are effectively measuring asymmetry and fat tails, we investigate four additional measures of skewness and kurtosis using high-frequency data. In the first measure, the return drift is removed from the realized moments. A second measure uses jump-robust estimates of realized volatility to compute higher moments. The third measure is an enhanced version of the realized moment that uses the subsampling methodology suggested by Zhang, Mykland, and Ait-Sahalia (2005) to compute realized volatility. This subsampling methodology ensures that useful data are not ignored and provides a more robust estimator of the realized moment. The fourth approach uses percentiles of the high-frequency return distribution as alternative measures to capture skewness and kurtosis.

We find that the relation between realized kurtosis and stock returns is not always robust to different implementations. However, the negative relation between realized skewness and future stock returns is robust. We show that our realized skewness measure captures jumps in returns, and therefore has a different information content than historical skewness measures based on daily returns, which also capture the diffusive part of returns.

Finally, we further investigate the relation between realized skewness and other documented determinants of returns. Two-way sorts on realized skewness and firm characteristics also confirm that the relation between realized skewness and returns is significant. We pay particular attention to the relation between realized skewness computed from intraday returns during the week and the total stock return for the week. The short-term return reversal effect is well-documented in the literature,[1] and while we find that realized skewness and weekly return are related, their effects on the subsequent week's return are different. Furthermore, when we compute realized skewness adjusting for the weekly return drift, the subsequent week's cross-sectional pattern in returns is preserved. When constructing a portfolio that combines the reversal strategy and the realized skewness strategy, the Sharpe ratio is generally larger than for the two individual strategies and the tail risk for the combined portfolio is much lower than for the reversal strategy alone.

Ang, Hodrick, Xing, and Zhang (2006) find that stocks with high idiosyncratic volatility earn low returns. Motivated by their findings, we also explore the relation between realized skewness, idiosyncratic volatility, and subsequent stock returns. We find that when idiosyncratic volatility increases, low-skewness stocks are compensated with higher returns while high-skewness stocks are compensated with lower returns. This pattern is stronger for small stocks. Therefore, skewness provides a partial explanation of the idiosyncratic volatility puzzle. Similar findings obtain when using realized volatility instead of idiosyncratic volatility.

[1] Return reversals at the daily, weekly, and monthly frequencies have been studied by Lehmann (1990), Jegadeesh (1990), Cox and Peterson (1994), Avramov, Chordia, and Goyal (2006), and Gutierrez and Kelley (2008), among others.