A Unique View of Hedge Fund Derivatives Usage:

Safeguard or Speculation?

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ABSTRACT

We investigate hedge fund holdings of common equities and equity options over the 1999-2006 period to assess the degree to which these investors actually hedge. We find that hedge funds' option positions are associated with significantly higher than normal subsequent realized volatility on the underlying security. Hedge funds are able to use this information profitably, for instance by greatly increasing their usage of protective puts amidst the unraveling of the Nasdaq technology bubble. We also find a strong positive (negative) relation between call (put) holdings and subsequent abnormal stock returns. These relations persist even after the holdings become publicly available. A real-time feasible tracking portfolio of stocks based on publicly observable hedge fund option holdings earns annualized abnormal returns of 14.8%. Compared to non-users, option users manage larger portfolios and portfolios with two post-fee performance features favorable for their constituent hedge fund investors: lower return volatility and higher Sharpe ratio. Overall the results highlight a previously undocumented speculative role of derivatives among professional investors.

Keywords: Keywords: hedge funds; investment advisors; informed trade; derivatives.
JEL Codes: G11, G12

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Abstract

We investigate hedge fund holdings of common equities and equity options over the 1999-2006 period to assess the degree to which these investors actually hedge. We find that hedge funds' option positions are associated with significantly higher than normal subsequent realized volatility on the underlying security. Hedge funds are able to use this information profitably, for instance by greatly increasing their usage of protective puts amidst the unraveling of the Nasdaq technology bubble. We also find a strong positive (negative) relation between call (put) holdings and subsequent abnormal stock returns. These relations persist even after the holdings become publicly available. A real-time feasible tracking portfolio of stocks based on publicly observable hedge fund option holdings earns annualized abnormal returns of 14.8%. Compared to non-users, option users manage larger portfolios and portfolios with two post-fee performance features favorable for their constituent hedge fund investors: lower return volatility and higher Sharpe ratio. Overall the results highlight a previously undocumented speculative role of derivatives among professional investors.

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I. Introduction

Despite the numerous potential uses of derivatives, their actual usage by professional investors is still largely unknown territory in the finance literature. Transparent institutions, such as mutual and pension funds, often face significant restrictions, limits, or outright prohibitions on usage of calls and puts. In contrast, hedge funds' exemption from regulation by the Investment Company Act of 1940 implies few restrictions on trading derivatives, and thus a natural laboratory in which to analyze investors' usage of equity options. In this study, we examine the common stock and equity option holdings of a large sample of hedge funds over the 1999–2006 period.

Existing theories give several reasons for investors to trade equity options. Options are an obvious potential vehicle for exploiting superior knowledge about stocks' volatility, but they also provide a hedge against unanticipated changes in volatility. This latter motive neither implies nor is implied by the possession of special information. In addition, options represent a high leverage channel through which an investor can profit from information about the direction of the underlying stock price.[1] To the extent that the best and brightest migrate to the hedge fund industry, our empirical approach is well suited to study the role of derivatives in utilizing superior information.

We report several new empirical findings. First, we examine the well publicized case of the Nasdaq technology bubble. Brunnermeier and Nagel (2004) report that hedge funds scale back their tech stock holdings as the bubble unravels. We find that while the stock holdings scale

[1] See, e.g., Black and Scholes (1973), Merton (1973), and Cox and Rubinstein (1985).

back, hedge fund put holdings on tech stocks are increasing. Thus, as volatility increases over the summer of calendar year 2000, these hedge funds are effectively in position to win doubly, from both price direction and volatility.

Second, we examine all disclosed option holdings and the volatility information they might contain. Whereas in general it is the case that Black-Scholes implied volatilities consistently overestimate subsequent realized volatilities, we document a clear pattern where hedge funds' non-directional option strategies (e.g., protective puts and straddles) are associated with an attenuation or outright reversal of this effect. In effect, realized volatilities following hedge funds' reported option holdings are higher than normal. A decomposition of the volatility differences suggests the effect is stock-specific rather than systematic.

Third, we examine the directional information content of advisors' option holdings by examining the abnormal returns in the underlying stocks. We find that a "call-minus-put" portfolio that buys (sells) stocks underlying call (put) holdings earns average abnormal returns of 1.40% per month over the three months following each quarter-end. We also analyze how quickly the information contained in option holdings is reflected in security prices. Positive abnormal stock returns associated with call holdings, 0.46% per month over the three months following each quarter-end, are concentrated in the second month following the quarter-end date, 0.69%. Negative abnormal stock returns associated with put holdings, -0.94% per month over the three months following each quarter-end, are strongest in the third month following the quarter-end date, -1.42%. Since holdings must be reported within 45 days of the quarter end, these put-related results suggest incomplete market incorporation of information publicly available.

To address the issue of private versus publicly available information about holdings, we also directly partition the sample using the specific filing date for each 13F. A portfolio that buys (sells) stocks underlying call (put) holdings the day after the filing date earns average abnormal return of 1.72% through the end of the quarter. This works out to an annualized return of 14.83% at the median realized reporting lag of 45 days. This portfolio is based upon publicly available disclosure information, so this evidence would potentially qualify as a rejection of the joint hypothesis of semi-strong form market efficiency and the benchmark employed. To further investigate the feasibility of these returns, and circumvent any short sales constraints on the common stocks underlying the put holdings, we also formulate option trading portfolios directly. A portfolio that buys (sells) 1-month expiry, near-the-money puts on securities underlying advisors' puts (calls) the day after the filing date earns average hold-to-maturity returns of 18.71% in excess of the expected returns implied by Black and Scholes (1973). The associated annualized figure would be astronomical, 683.15% at the maximum possible one month holding period.

Finally, we investigate whether the apparent informed character of hedge funds' option holdings contributes to the success of their constituent investors. To address the effectiveness of option usage, we analyze the after-fee portfolio returns and assets under management reported to the TASS hedge fund database. We find that funds reporting option holdings have significantly more assets under management than funds reporting no option holdings. Option usage is also associated with significantly lower after-fee return volatility and higher Sharpe ratio.

Our inferences are drawn from a unique data set of SEC-required quarterly disclosures of equity and equity option holdings of 250 hedge fund advisors. In contrast, most of the data used by existing studies of hedge funds must rely on coarse fund-level indicators of derivatives use, and not actual holdings. For example, Chen (2006) finds lower return volatility among hedge funds with a stated policy of allowing derivatives, as compared to funds with no such policy. Some patterns of derivatives usage have also been inferred from the nonlinear interactions between hedge fund portfolio returns and systematic factors. See, for example, Fung and Hsieh (2001) and Agarwal and Naik (2004). Our knowledge of individual equity option positions allows us to directly examine the role of derivatives in capitalizing on superior information about stock fundamentals.

Our results contribute to the existing evidence on how derivatives are used by professional investors. Koski and Pontiff (1999) find that mutual funds exhibit risk exposure and return performance that are independent of derivatives usage, but that derivatives allow mutual funds to efficiently manage changes in fund risk. Almazan et al. (2004) also find no difference in risk-adjusted returns across mutual funds that constrain derivatives use by managers. Moreover, Deli and Varma (2002) find evidence that derivatives improve the transactional efficiency of mutual fund portfolios and conclude (p.97), "[the] primary benefits associated with...derivatives are the potential to economize on trading costs, costs of liquidity-motivated trading, and the opportunity costs of holding cash." Our analysis of hedge fund option holdings highlights another important use of derivatives by investment managers—namely, to profit from private information about stock fundamentals.

Diamond and Verrecchia (1987) predict that short sale constraints reduce the speed of adjustment to news, especially bad news. Consistent with this prediction, we document negative abnormal returns in equities underlying put holdings even after the public disclosure date, while the positive information associated with call holdings is incorporated more quickly. The findings would also be consistent with the theory of Hong and Stein (1999), an alternative mechanism in which firm-specific information, especially negative information, diffuses only gradually across the investing public.

Our analysis also broadens the findings reached in prior studies of hedge funds' common equity holdings. Extending Griffin and Xu (2007) (306 advisors) and Brunnermeier and Nagel (2004) (53 advisors), our data are collected from original SEC filings rather than the processed commercially available Spectrum database that omits the mandatory call and put holdings disclosures. Griffin and Xu's (2007) analysis of stock holdings raises serious questions about the perceived superior skill of hedge fund managers. Complementing these results, the informed character of hedge fund option holdings that we document is consistent with the hypothesis that hedge funds' skill may be better showcased in alternative asset classes like equity options.

Our results also contribute to a growing body of evidence suggesting that option market aggregates are informative about the direction of future stock prices.[2] While most of the option volume data used in existing studies are market aggregates that include uninformed and informed trades, our sample design specifically highlights a group of investors that one might expect to be informed. We find, in addition to underlying stock price discovery, hedge funds' option holdings contain information about future stock return volatility. Our results therefore help bridge a gap between evidence of price discovery on one hand, and the potential uses of derivatives by investment managers on the other.

Finally, Pan and Poteshman (2006) present strong evidence that option market trading is

[2] See, e.g., Kumar, Sarin, and Shastri (1992), Chakravarty, Gulen, and Mayhew (2004), Easley, O'Hara, and Srinivas (1998), Cao, Chen, and Griffin (2005), Pan and Poteshman (2006), Mayhew, Sarin, and Shastri (1995), and Fleming, Ostdiek, and Whaley (1996). More recently, Ni, Pan, and Poteshman (2007) find evidence that option market volume can predict subsequent stock market volatility.

associated with future stock prices. However, they conclude that, "the economic source of [predictability] is valuable private information in the option volume rather than an inefficiency across the stock and option market (p. 873)." In contrast, our findings suggest that profitable trading strategies in both the stock and options markets can be identified using publicly-observable information contained in 13f filings.

The remainder of the paper is organized as follows. Section II describes the data. Section III discusses the methodology and empirical results on volatility. Section IV considers directional option positions and stock returns. Section V addresses hedge funds' portfolio performance. Section VI concludes.

II Data

II.A Holdings Disclosures

We begin with Bloomberg's list of all 13(f)-obligated hedge fund managers, those managers of over $100 million who are all required by Section 13(f) of the Exchange Act to make quarterly holdings disclosures to the SEC on Form 13F. We also use the Lipper/TASS database to identify the investment advisors of hedge funds. Each individual fund in TASS reports the name of its management firm. These names are then manually matched with SEC EDGAR in order to identify which advisor firms are subject to Section 13(f). The TASS database lists the investment advisors of both live and defunct hedge funds, thereby reducing the potential for survivorship bias.

The resulting list is merged with all quarterly 13F filings from the SEC Edgar website. The sample period begins in the first quarter of 1999–the earliest period for which 13F's are available in electronic format from EDGAR. Although downloading the individual 13F files is straightforward, the formatting is complex and laborious to decipher due to manager-specific idiosyncracies in reporting styles so a random sample of 250 advisors is used.

Options typically constitute 40 to 45 percent of the items on the Official List of 13(f) Securities.[3] Section 13(f) of the Exchange Act requires that any manager of over $100 million must make disclosures quarterly on Form 13F of any holding over $200,000 (or 10,000 shares for equity) of any security on the list.

Required disclosures for option holdings on Form 13F are CUSIP, fair value, and amount in terms of the securities underlying the options, not the options themselves. Managers are also required to report whether the options are calls or puts. Although Form 13F makes no explicit request for an option's maturity date or striking price, we can exactly identify these additional contract features for a subset of holdings.[4]

In contrast to the widely used institutional holdings databases compiled by Thomson Financial and/or CDA/Spectrum, the SEC's official list includes debt securities, preferred stock, and equity options and warrants. These securities are filtered out of the filings before the databases are sold. In this study we avoid abridgment by collecting complete 13F filings directly from the SEC. For an example of the striking disconnect between a complete 13F filing obtained directly from the SEC and the incomplete filings data available from Thomson, consider the Canyon Investment Advisors disclosure for March 2001. The 13F contains 42 equity positions picked up by Thomson, but also 53 option and debt positions omitted.[5]

Even unabridged, the raw required filings do not contain entire portfolios at the fund level.

[3] Source: http://www.sec.gov/divisions/investment/13flists.htm.
[4] Source: http://www.sec.gov/about/forms/form13f.pdf.
[5] A full enumeration of the positions appears in Aragon and Martin (2007).

In addition to securities not on the list or held in relatively small positions, short positions are generally omitted from the filings. Hedge fund advisors' short positions could theoretically constitute a significant portion of their total portfolio at times. Nevertheless, our main research questions concern whether observable positions contain information about stock fundamentals, and not about advisors' portfolio performance. Thus, any omission of short positions would have the effect of weakening our ability to reject the null hypothesis that the complete set of advisors' holdings contains no information about future stock returns and/or volatility.

II.B Public vs. Non-Public Information

Each Form 13F report must be filed with the SEC within 45 days after the end of each calendar year and each of the first three calendar quarters of each calendar year. Therefore, after each quarter there is potentially a significant period during which the contents of the 13F is non-public information. However, our research indicates that each 13F in our sample was publicly observable on the EDGAR website on and after the filing date reported in each filing. At the start of 1999, the SEC adopted rules to require electronic filing of Form 13F by institutional investment managers through the EDGAR system. According to the SEC, "...rapid dissemination of the institutional disclosure information to the public is a fundamental purpose of the bill."[6] Every submission transmitted to EDGAR is immediately validated based on criteria required by EDGAR standards for all electronic filings. If the submission meets all validation criteria, the submission is considered accepted, permanently stored in the EDGAR database, and immediately disseminated to the public.[7]

[6] Source: http://www.sec.gov/rules/final/34-40934.htm

[7] Submissions have a filing date of the next business when the transmission is started after 5:30pm, Eastern Time. Source: Edgar Filer Handbook: A Guide for Electronic Filing with the SEC By Charles H. Rider, Rider

In Table II we summarize the reporting lag for the 5,038 filings of Form 13F in our sample. The reporting lag is defined as the number of days between the quarter-end date and the actual filing date. The median reporting lag is exactly 44 days, indicating that most managers do not choose to exercise their option to report early. However, there is significant variation in the reporting lag as indicated by a standard deviation of 36 days. In addition, the reporting lag of several filings exceeds 45 days, while others are filed over a quarter late (> 90).

II.C Other Data

We use daily observations of implied volatilities, bid/offer quotes, and contract terms of S&P 500 Index and individual option implied volatilities provided by the Ivy OptionMetrics database. These data are used in tests to detect private information contained in option holdings about volatility and option returns. We also use CRSP daily and monthly files, with returns adjusted for stock delisting to avoid survivorship bias, following Shumway (1997).[8] We also use the quarterly sales (data2) data provided by Compustat, VIX data provide by the CBOE, and the daily risk-free rate provided by Kenneth French's website. Finally, we use the stock assignments and monthly returns corresponding to the characteristic-based benchmarks of Daniel, Grinblatt, Titman, and Wermers (1997).[9] We use these benchmarks in tests to detect the presence of private information in holdings about future stock returns.

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[8] In particular, the last return used is either the last return available on CRSP, or the delisting return, if available. While a last return for the stock of -100% is naturally included in the study, a return of -30% is assigned if the deletion reason is coded in CRSP as 500 (reason unavailable), 520 (went to OTC), 551-573 and 580 (various reasons), 574 (bankruptcy) and 584 (does not meet exchange financial guidelines). Shumway (1997) reports that -30% is the average delisting return, examining the OTC returns of delisted stocks. Amihud (2002) and Acharya and Pedersen (2005) employ an identical survivorship bias correction.

[9] The DGTW benchmarks are available at http://www.smith.umd.edu/faculty/rwermers/ftpsite/DGTW/coverpage.htm. See Daniel, et al. (1997) and Wermers (2004) for details on the construction of benchmark portfolios.

III Methodology and Results: Volatility and Hedging

III.A Tech Bubble Example

Brunnermeier and Nagel (2004, p. 2023) report that hedge fund holdings of Nasdaq technology stocks were growing as the bubble reached its March 2000 peak, and these holdings slowly diminished thereafter. These stock holdings alone, however, do not give a complete picture of the funds' overall strategies. Indeed, funds not specializing in short selling had returns with a much steadier net exposure to the $TECH$ factor over the year (p. 2029).[10] Following Brunnermeier and Nagel (2004), we define the bubble segment based on rankings on Price-to-Sales (P/S) ratios. At the end of each quarter, we sort all stocks into P/S terciles based on their P/S ratio using sales figures that are lagged at least six months and end-of-quarter market capitalization.

In Figure 1, we plot the time series of hedge fund holdings of put options on Nasdaq technology stocks from 1999 to 2001. Specifically, for each unique security held across all advisors at each quarter-end, we sort advisors depending on the type of strategy (if any) employed. We define the net demand for a particular strategy on a given security as the proportion of advisors choosing to implement that strategy. We then compute average net strategy demand across all securities corresponding to a P/S ratio group.

Put holdings of Nasdaq technology (High P/S) stocks increase steadily through the year 2000. This pattern holds for both protective puts (Panel B, representing simultaneous holding of shares and puts) and puts held without any underlying shareholding (Panel A). In contrast, put holdings of other Nasdaq stocks (low and mid P/S) exhibit a smaller net demand over the

[10] In comparison, the short selling specialist funds developed a large and growing negative exposure to the TECH factor.

sample period. The time series is consistent with hedge funds believing that an end to the bubble was at hand. We can contrast this case, where some informed belief about coming returns is plausible, with the unexpected (and unexpectable) volatility shock that occurred in September of 2001. Hedge fund put option positions overall were declining in the summer quarter of 2001.

Altogether this example suggests that a more detailed look at the potential information in hedge fund option positions is warranted. In addition to insurance motives for hedging, the funds may also be taking options positions to capitalize on superior knowledge.

III.B Volatility Benchmarks

Options may provide an opportunity to use special knowledge about stock return volatility to obtain a portfolio with positive risk-adjusted returns. In the absence of special information, options may still provide a means of hedging against unanticipated changes in volatility.[11] In the following we examine the relation between hedge funds' reported holdings and subsequent volatility. A natural test is to compare volatility in two cases: when positions do appear to involve hedging, and when they do not.

We classify a call option position as directional if the advisor does not simultaneously report a position in a put option on the same underlying security. Likewise, we classify a put option position as directional if the advisor does not simultaneously report a common stock or call option position in the underlying firm. This criterion thus classifies straddles and protective put strategies as non-directional options strategies.[12]

[11] For example, see Cox and Rubinstein (p.54).

[12] Ideally, we would measure directional magnitude of option strategies for a given stock through the net delta of an advisor's position in various securities for the same security issuer. However, the striking price and expiry date for many options positions are not reported by our sample advisors.

For each month k following quarter t, we compute a measure of unexpected volatility for security i as the difference between realized and implied volatility

$$UVOL_{i,t+k} = VOL_{i,t+k} - IVOL_{i,t+k-1}, \quad k = 1, 2, 3.$$

Following Merton (1980) and French, Schwert, and Stambaugh (1987), we use daily returns to compute the annualized realized monthly volatility of stock i:

$$VOL_{it+k} = \sqrt{\left(\sum_{d=1}^{D_{i,t+k}} r_{itd}^2 + 2 \sum_{d=1}^{D_{i,t+k}} r_{itd} r_{it,d-1} \right) \times \frac{365}{N_{i,t+k}}}$$

where $D_{i,t+k}$ and $N_{i,t+k}$ are the number of daily return observations and calendar days in month $t+k$, respectively. $IVOL_{i,t+k-1}$ corresponds to the annualized implied volatility at the end of month $t+k-1$ of the nearest-to-the-money call or put option on stock i that expires in month $t+k$. Specifically, at the end of each month, we identify all call and put option contracts for each underlying security i that expires in the following month. For each set of calls and puts, we select the contract with the minimum absolute moneyness-defined as the ratio of the contract's striking price and the current price of the underlying security. All contracts with absolute moneyness greater than 10% are dropped. For each underlying security, therefore, we have potentially two observations of implied volatility-one for each call and/or put. If both observations are available, we take the average implied volatility from the call and put contracts.

Our use of implied volatility as a benchmark for market expectations has the advantage that it is extracted from option prices and therefore forward-looking. According to the IVY DB manual (p. 27), "The implied volatilities and option sensitivities contained in Ivy DB are calculated in accordance with standard conventions used by participants in the equity and index option markets." For European-style options, implied volatility is obtained by inverting the Black Scholes model after setting the option price to the midpoint of the bid and ask quote. For American-style options, the implied volatility is obtained after inverting a proprietary pricing algorithm that is based on the Cox-Ross-Rubinstein binomial tree model. At the index level at least, the search for unbiased predictors remains the subject of much current research. See, for instance, Andersen and Bondarenko (2007), and Jiang and Tan (2005). However, our main qualitative results are unchanged when we use the "model-free" implied volatility now employed by the "new" VIX index.

The information in option holdings could be about systematic or idiosyncratic volatility. Following the above approach for total volatility, we construct a forward-looking benchmark for idiosyncratic volatility using option market prices. Specifically, for each underlying security i in the k'th month following quarter t, we first estimate a market model beta, $\beta_{i,t+k-1}$ using the previous sixty monthly return observations and the S&P 500 Index. We then decompose the implied volatility, $IVOL_{i,t+k-1}$, using the following relation:

$$IVOL^2_{i,t+k-1} = \beta^2_{i,t+k-1} IMVOL^2_{t+k-1} + IEVOL^2_{i,t+k-1}, \tag{1}$$

where $IMVOL_{t+k-1}$ is the average implied volatility at the end of month $k-1$ following quarter t of closest-to-the-money call and put options on the S&P 500 index with a one month expiry. Our measure of benchmark-adjusted idiosyncratic volatility ($UEVOL_{i,t+k}$) is obtained by subtracting the implied idiosyncratic volatility, $IEVOL_{i,t+k-1}$, from the realized idiosyncratic volatility (decomposed from the sum of squared daily residual stock returns) over the subsequent month,

$EVOL_{i,t+k}$.

III.C Volatility results by security

For each quarter-end, we identify the unique set of firms underlying the stock and option holdings across all advisors. We then fit the following cross sectional regression in each of the three months following each of the 28 sample quarters:

$$UVOL_{i,t+k} = \alpha_{t+k} + \gamma_{t+k} DIR_{i,t} + \delta_{t+k} NONDIR_{i,t} + \epsilon_{i,t+k}, \tag{2}$$

where $DIR_{i,t}$ is the proportion of advisors disclosing a directional option position on underlying security i at the end of quarter t, and $NONDIR_{i,t}$ is the proportion of advisors disclosing a nondirectional option position on underlying security i at the end of quarter t.

The results are in Table III. Reported average estimates are accompanied by Fama and MacBeth (1973) t-statistics. The intercept term shows the difference between realized and implied volatilities when no options positions are reported on otherwise optionable stocks. Table I shows that common stock positions constitute the majority of all holdings, and therefore exert a major influence on the unconditional average deviation from implied volatility. The estimated intercept, an annualized deviation of -4.09%, is significant. This result is consistent with existing evidence that Black-Scholes implied volatilities are on average biased predictors of realized volatility in the subsequent period.[13]

The positive coefficients on DIR and $NONDIR$ indicate greater positive deviations of realized volatility from implied volatility of stocks underlying option positions as compared to when

[13] See, for instance, Canina and Figlewski (1993), Day and Lewis (1992), Lamoureux and Lastrapes (1993), Jorion (1995), and Fleming (1998).

there are no options positions reported on stock. Both coefficients are statistically significant. We interpret this as saying that hedge funds' hedged positions are undertaken at times when volatility is higher than normal, and therefore when having done so turned out to be a good thing. In fact, contrary to the overall average behavior, realized volatility is significantly higher than the Black-Scholes implied volatility when all advisors hold either a directional or non-directional option position on the underlying security. However, the coefficient on $NONDIR$ is much larger as compared to DIR. Specifically, annualized monthly deviations of realized volatility from implied volatility is 11.75% when all advisors implement a nondirectional option strategy on the underlying security.

Next we consider a finer partition of hedge fund positions. We classify the directional positions as either bullish (containing one or more calls) or bearish (containing one or more puts). We classify the non-directional positions as either protective put (containing put and common) or straddle (containing both calls and puts). We then fit the following cross sectional regression in each of the three months following each of the 28 sample quarters:

$$\begin{aligned} UVOL_{i,t+k} = \alpha_{t+k} &+ \gamma_{1,t+k} BULL_{i,t} + \gamma_{2,t+k} BEAR_{i,t} \\ &+ \delta_{1,t+k} PPUT_{i,t} + \delta_{2,t+k} STRAD_{i,t} + \epsilon_{i,t+k}, \end{aligned} \tag{3}$$

where $BULL_{i,t}$ is the proportion of advisors disclosing a directional call option position on underlying security i at the end of quarter t, $BEAR_{i,t}$ is the proportion of advisors disclosing a directional put option position on underlying security i at the end of quarter t, $PPUT_{i,t}$ is the proportion of advisors disclosing a protective put position on underlying security i at the end of quarter t, and $STRAD_{i,t}$ is the proportion of advisors disclosing a straddle on underlying security i at the end of quarter t.

The results are in Table III. Reported average estimates are accompanied by Fama-MacBeth t-statistics. The intercept term again shows the difference between realized and implied volatilities when no options positions are reported on otherwise optionable stocks. It remains negative and significant. The $BULL$ and $STRAD$ coefficients are positive but insignificantly different from zero. In contrast, the coefficients on $BEAR$ and $PPUT$ are significant and positive. Hedge fund directional puts and protective puts tend to be undertaken at times when volatility is higher than the benchmark.

III.D Stock-Specific Information

To test whether the information is stock specific, we repeat our analysis with benchmark-adjusted idiosyncratic volatility as the dependent variable. We then fit the following cross sectional regression in each of the three months following each of the 28 sample quarters:

$$\begin{aligned} UEVOL_{i,t+k} = \alpha_{t+k} \quad &+ \quad \gamma_{1,t+k} BULL_{i,t} + \gamma_{2,t+k} BEAR_{i,t} \\ &+ \quad \delta_{1,t+k} PPUT_{i,t} + \delta_{2,t+k} STRAD_{i,t} + \epsilon_{i,t+k}, \end{aligned} \tag{4}$$

The results are in Table IV. Reported average estimates are accompanied by Fama-MacBeth t-statistics. The coefficients on all option variables are positive. In addition, the coefficients on $PPUT$ and $STRAD$ are significant and larger in magnitude than those reported in Table III. We interpret the evidence as saying that the volatility information contained in nondirectional holdings of individual equity options is mainly stock-specific.

III.E Aggregation By Advisor

The above evidence shows that option holdings, at the level of the individual security, are associated with higher deviations of realized volatility from implied volatility. In this subsection we examine the same relation at the level of an individual hedge fund advisor. Specifically, for each of the four position types (bullish, bearish, protective put, straddle) we compute within-advisor averages of $UVOL$ and $UEVOL$ for each of the three months following each reporting quarter t. As a benchmark, we also compute a within-advisor average for stocks held as common only but are otherwise optionable.

The results are in Table IV. In Panel A, the annual averages across advisors are reported for $VOL_{i,t} - IVOL_{i,t-1}$, which is a rough measure of unexpected total volatility. Bullish option strategies are associated with 0.16% greater deviations of volatility from implied volatility as compared to holdings of otherwise optionable common stock. However, the coefficient is not significant. The bearish positions deviate from the average behavior significantly, by 0.78%. The hedging strategies, protective puts and straddles, exhibit significant averages of 1.29% and 1.23% above the benchmark, respectively.

In Table V, the annual averages across advisors are reported for $EVOL_{i,t} - IEVOL_{i,t-1}$, which is our measure of unexpected stock-specific volatility. Both bullish and bearish strategies show significant positive differences from the common stock holdings benchmark, 0.66% and 0.74%, respectively. The protective puts and straddles exhibit large positive and significant averages, 1.06% and 1.77% above the benchmark, respectively. Overall, the results support the notion that option holdings allow managers to profit from private information about stock volatility.

III.F Performance of Holdings-Based Straddle Portfolios

In this section we present further evidence of volatility information, by comparing the realized returns of long/short portfolios of one-month-expiry, closest to the money straddles. Specifically, each individual straddle involves buying 1-month expiry, closest-to-the-money call and put options on the underlying security held by each advisor. Each straddle is held to maturity and the straddle return is calculated using the realized payoffs at expiration and market prices that prevailed at the time of investment. For each advisor and quarter-end, we sort each straddle return into groups depending on whether the security is part of an option strategy (bear, bull, pput, or straddle) or is held as common equity only. For each month in our sample we compute advisor/month/strategy observations of straddle returns as

$$STR^{s}_{a,t+k} = \frac{1}{N^{s}_{a,t+k}} \sum_{i=1}^{N^{s}_{a,t+k}} R_{i,t+k}, \quad , s = com, bull, bear, pput, strad$$

where $N^{s}_{a,t+k}$ is the number of unique underlying securities held by advisor a in strategy s at the end of quarter t, and $R_{i,t+k}$ is the hold-to-maturity return of a straddle on security i that was closest to the money at the end of month $t+k-1$ and that expires in month $t+k$.[14]

Broadie, Chernov, and Johannes (2007) highlight the pitfalls of using standard performance benchmarks (e.g., CAPM alphas, Sharpe Ratios) to benchmark option returns. They advocate comparing realized option returns with the expected returns implied by option pricing models.

[14] Specifically, the straddle return is given by

$$R_{i,t+k} = \frac{V^{c}_{i,t+k} + V^{p}_{i,t+k}}{P^{c}_{i,t+k} + P^{p}_{i,t+k}} - 1$$

where $V^{c}_{i,t+k}$ denotes the hold-to-maturity payoff of the call option on security i that was closest to the money at the end of month $t+k-1$ and that expires in month $t+k$, and $P^{c}_{i,t+k}$ denotes the time $t+k-1$ price of the call option on security i that is closest to the money and that expires in month $t+k$. $V^{p}_{i,t+k}$ and $P^{p}_{i,t+k}$ are defined similarly for puts.

In our analysis we compare option returns with the expected returns implied by Black and Scholes (1973).[15] Details of this procedure are provided in the Appendix.

In Table VII we present averages of the return spread $STR^{s}_{a,t+k} - STR^{com}_{a,t+k}$ for each option strategy. The return spread reflects the return from buying (selling) a straddle portfolio based on hedge fund advisor's holdings of a particular option strategy (common equity). We find that the average return spread for each option strategy is positive, thereby indicating that straddle returns are more likely to be profitable if they are constructed using hedge funds' option holdings (versus common holdings). For example, straddle portfolios constructed from holdings of directional and non-directional option strategies are associated with 2.27% and 3.49% higher excess monthly returns as compared to straddle portfolios constructed from common equity holdings, respectively. The differences are also significant. Among individual option strategies, straddle portfolios constructed from hedge funds' own straddle trades yield the highest return spread at 5.32% and significant.

Next we compute within-month averages

$$STR^{s}_{t+k} = \frac{1}{A^{s}_{t+k}} \sum_{a=1}^{A^{s}_{t+k}} STR^{s}_{a,t+k},$$

where A^{s}_{t+k} is the number of advisors that have at least one security in strategy s at the end of quarter t. An advantage of this approach is that the return spreads correspond to portfolios that places weight $\frac{1}{A^{s}_{t+k}}$ into each advisor-specific portfolio in each of the three months following every quarter-end, and therefore investable if the information contained in Form 13F is publicly

[15] Rubinstein (1984) derives an analytical expression for expected returns on European options under lognormality, continuous trading, and constant risk-free rate and volatility.

available at every quarter-end. The results are reported in Table VIII. As before, the average return spread for each option strategy is positive, and the straddle-based straddle portfolios yield the highest return spread. However, the coefficients on the nondirectional option strategies is not significant. On the other hand, the coefficient on the bear spread is significant, indicating the directional put strategies contain information about future volatility.

In Panel B we separately report statistics for the straddle portfolio return spreads according to each of the three months following the quarter-end. We find that positive spreads associated with directional put strategies are concentrated in the second month (at 5.89%) following the quarter-end date. However, it is unclear whether the holdings are public information in the second month because, as shown in Table II, the median filing date occurs in the middle of the second month. Therefore, we compute return spreads only using information after each filing date. Specifically, the post-fdate return spread corresponds to the returns from buying next-month-expiry straddles one day after the filing date and holding until maturity. We drop all filings with a reporting lag exceeding 90 days. The results show that the return spread obtained from buying (selling) straddle portfolios based upon publicly observable put (common equity) holdings is 5.86% and significant. Of course, this result might reflect directional information instead. We investigate this further in the next section.

IV Methodology and Results: Holdings and Returns

In the previous section, we show that hedge fund options positions, especially non-directional strategies like protective puts and straddles, are associated with greater positive deviations of realized volatility from implied volatility. We next turn to the question of whether their directional positions are informative about stock returns.

IV.A Abnormal Returns, Stock by Stock

For each stock i held each quarter-end t, we first compute the three subsequent monthly abnormal returns, $R_{i,t+k} - R_{ib,t+k}$, as the realized return in excess of the return on a size, book-to-market, and momentum characteristics-based benchmark portfolio over the kth month following the quarter-end, $k = 1, 2, 3$. The benchmarks are from Daniel, Grinblatt, Titman, and Wermers (1997). We then estimate the following model over the 1999–2006 period:

$$\begin{aligned} R_{i,t+k} - R_{ib,t+k} = \alpha_{t+k} \quad &+ \quad \gamma_{1,t+k} BULL_{i,t} + \gamma_{2,t+k} BEAR_{i,t} \\ &+ \quad \delta_{1,t+k} PPUT_{i,t} + \delta_{2,t+k} STRAD_{i,t} + \epsilon_{i,t+k}, \end{aligned} \tag{5}$$

for months $k = 1, 2, 3$.

The results are in Table IX. Monthly estimates are averaged by year. The final rows report the full sample average of the monthly estimates along with Fama-MacBeth t-statistics. The intercept, estimated at 0.01% and insignificant, is the expected monthly return on stocks held only as common by hedge funds, in excess of the return on a portfolio with the same size, book-to-market, and lagged return characteristics. The result is comparable to Griffin and Xu's (2007) finding that, "aggregate hedge fund trading and holdings are not beneficial in predicting the cross-section of future stock returns, indicating that on average hedge fund long-equity positions are not informed." In addition, the estimated coefficients are insignificant for both directional and non-directional option strategies. However, $DIROPT$ is a composite of calls and puts, and the finer decomposition in Model 2 reveals a significant negative relation between put holdings and future returns. Specifically, the benchmark-adjusted return on the underlying common stock averages a significant -7.02% for directional put holdings. The estimated coefficients are also negative and economically large for $PPUT$, but statistically insignificant. We interpret the result as saying that the put positions seem to involve negative directional information.

IV.B Detecting Directional Information: Tracking Portfolios

For a more intuitive approach to the question of directional information, we can use the disclosed positions to form portfolios and draw from the performance evaluation literature, where manager skill is inferred from portfolio returns. We check each advisor each quarter for bullish and bearish directional positions. In the bullish portfolio, a stock's portfolio weight equals the market value underlying the call positions on that stock divided by the aggregated market value underlying all reported call positions. In the bearish portfolio, a stock's portfolio weight equals the market value underlying the put positions on that stock divided by the aggregated market value underlying all reported put positions.

For each advisor and month, we calculate:

$$GT_{n,t} = \sum_{i=1}^{I} \left(w_{n,t-1,i} - w_{n,t-4,i}\right) \times r_{i,t}, \tag{6}$$

where $w_{n,t,i}$ is advisor n's portfolio weight in security i at the end of month t, $r_{i,t}$ is the month t return on stock i, and the summation is taken over all securities I. Portfolio weights are held constant across months within each quarter at the previous quarter-end weights. This measure comes from Grinblatt and Titman (1993), and it has the virtue of being model-free. We also compute:

$$CS_{n,t} = \sum_{i=1}^{I} w_{n,t-1,i} \times (r_{i,t} - r_{i,b,t}), \tag{7}$$

where $r_{i,b,t}$ is the month t return on stock i's characteristic-based benchmark portfolio. This is the measure from Daniel, Grinblatt, Titman, and Wermers (1997).

The portfolio change measure (GT) reflects the month t difference in returns between two portfolios: the actual portfolio held at the end of month $t-1$ and the lagged portfolio held at the end of month $t-4$. The characteristic-adjusted measure (CS) is the difference between the month t return of the portfolio held at the end of month $t-1$ and the month t return of the matching control portfolio.

$GT_{n,t}$ and $CS_{n,t}$ are averaged across advisors n, and then across the 96 sample months t. The null hypothesis is that the average is zero, for GT:

$$H_0 : \frac{1}{84} \sum_{t=1}^{84} \left[\frac{1}{N_t^s} \sum_{n=1}^{N_t^s} GT_{n,t}^s \right] = 0, \quad s \in \{\text{bull}, \text{bear}\} \tag{8}$$

and likewise for CS.

Table X reports the GT and CS performance measures for stock portfolios constructed from advisor holdings. The stock portfolio that tracks bull option holdings earns raw returns of 1.05% per month on average, versus -0.74% for the stock portfolio tracking bear option positions. Neither is significant, but the 1.79% difference is highly significant.

Under both the GT and CS measures, we can reject the null hypothesis that advisers do not have private information about the future return on their stock holdings. The average risk-adjusted return on bull portfolios, the stocks underlying hedge funds' disclosed call option holdings, equals 63 and 46 basis points per month, respectively. Depending on the returns benchmark, we can reject the null hypothesis that call options holdings do not contain information about future stock returns at the 5% level.

More dramatic results are shown in the bear portfolios, the stocks underlying hedge funds' disclosed put option holdings. The GT and CS returns are -69 and -94 basis points per month, respectively in risk-adjusted returns. Both estimates here are significant. The average return spread from buying (selling) stocks underlying calls (puts) are a significant 1.32% and 1.40% for the GT and CS benchmarks, respectively. Overall, our findings of significant risk-adjusted returns for bull and bear portfolios support the view that our sample of advisors are privately informed about the future direction of the underlying stock. However, as noted in Section III.F, the predictability that we document might correspond to either a gradual adjustment of market prices to the private information contained in the holdings (occurring within the first 45 days after quarter-end) and/or an immediate adjustment of prices to the public disclosures (occurring in the second month).

In Panel B we separately report statistics for the benchmark-adjusted returns according to each of the three months following the quarter-end. We find that positive abnormal returns associated with call holdings are concentrated in the second month following the quarter-end date. For call positions, therefore, we cannot reject semi-strong form market efficiency as described by Fama (1970). The results for put holdings are different. A stock portfolio tracking put holdings earns -1.42% abnormal returns in the third month following the quarter-end.

Next we divide the sample depending on whether the 13F filings are publicly or non-publicly observable, as proxied by the period before and after the filing date. The post-fdate returns correspond to a call-minus-put strategy that is implemented on the day after each filing date and held until the end of the quarter. We drop all filings with a reporting lag exceeding 90 days. The results show that the return spread obtained from buying (selling) stock portfolios based upon publicly observable call (put) holdings is 2.05% and 1.72% for the GT and CS returns benchmarks, respectively. Both estimates are significant. We interpret this evidence as potentially a rejection of the joint hypothesis of our returns benchmark and semi-strong form market efficiency.

We caution that the abnormal returns reported here do not reflect constraints on selling short the common stocks underlying the put holdings. Therefore, we also study the profitability of long/short portfolios in the options market using publicly observable information. Table XI summarizes the hold-to-maturity returns from buying next-month expiry, near-the-money puts on stocks underlying put and call holdings. Portfolios are rebalanced at each quarter-end and the end of the first two months following each quarter-end. The returns reflect equal-weighted averages of advisor-specific returns for each month in our sample. The second column of Panel A shows that the average return from a put portfolio based on hedge fund put holdings is 9.40% per month. In contrast, the average return for the put portfolio formed from call holdings is -4.02%. Thus, buying put options on stocks underlying hedge funds' holdings of call option earn negative average returns. The return spread, at 13.43%, is significant. The final three columns of Panel A report results for put portfolio returns in excess of the expected returns implied by the Black and Scholes (1973) model. For example, the excess return from the bear portfolio is almost 27% per month and significant. The return spread from buying (selling) puts based on put (call) holdings is 15.35% and significant. The results provide further support that hedge fund option holdings provide directional information.

In Panel B we divide the sample to examine how quickly the information contained in option holdings is reflected in option prices. The return spread in the put-minus-call put portfolio is positive in each of the three months following the quarter-end, the largest spread appears in the first month. For example, the excess return spread is almost 25% per month and significant in the first month following the quarter-end. We also use the filing date of each 13F to form put portfolios based on either public (post fdate) or non-public (pre fdate) information. Specifically, the post-fdate returns correspond to the same strategy starting the day after each filing date and holding until maturity. Panel B shows reveals a significant 18.71% return corresponding to the strategy using only public information on hedge fund holdings. Our findings suggest that publicly-observable information contained in 13f filings can be used to identify profitable trading strategies in both the stock and options markets.

V Portfolio Returns Reported to TASS

The above results emphatically point to the informed character of hedge fund positions, but they do not directly measure hedge funds' performance. To address whether option usage is directly related to portfolio performance, we use the subsample of 179 advisors that voluntarily report to the TASS hedge fund database. TASS provides portfolio returns and organizational characteristics for individual funds managed by a given advisor. To permit matching, we aggregate individual fund data at the advisor level.

Table VIII reports summary statistics for advisor-level characteristics and portfolio returns. Comparisons are made based upon whether or not advisors use options as determined by the portfolio disclosures reported in the SEC-required Form 13F. Panel A reports statistics for the equally weighted average of the characteristics of an advisor's individual funds. Redemption notice and lockup measure the ease with which fund investors can redeem their existing shares in the fund. The average redemption notice period is slightly longer for option-using funds (36 days versus 34 days). Nevertheless, non-users are more likely to impose a lockup provision as compared to users (0.37 versus 0.28). Overall, the differences are not statistically significant. The next two characteristics are parameters in the fund manager's compensation contract. The mean difference in performance fee (0.38%) between user and non-user funds is not significant. However, option-users are associated with 1.07% higher fixed management fee as compared to non-users.

We next compare the portfolio returns for option users and non-users. Panel B reports the mean, standard deviation, Sharpe ratio, and market-model alpha for portfolio returns (after fees) for advisors that use options and those that do not. Each advisor is required to have at least 12 monthly observations to be included in the test. Results are reported for both equal-weighted and asset-weighted averages of an advisor's individual fund returns, and also depending on whether backfilled observations are included in the return calculations. For the backfill-free sample of return observations, the average value-weighted portfolio return for option users is 0.63% per month, as compared to 0.54% for non-users. However, this difference is not significant. Meanwhile, the monthly return standard deviation of option users (3.05%) is significantly lower than that for non-users (4.01%). Taken together, option users achieve significantly higher Sharpe ratios (0.34 versus 0.23). Finally, although option users are associated with a higher market-model alpha (0.55% versus 0.51%), the difference is not significant. The results are qualitatively the same across all portfolio return calculation methodologies.

We interpret the higher Sharpe ratio for option users as overall support for the notion that options are worthwhile tools that allow managers to utilize information better. Although there are no significant differences in the market-model alpha, a caveat is in order. If option usage is indeed associated with greater manager skill, then it is unclear whether there should be any equilibrium relation between after-fee fund performance and option usage. Indeed, if fund capital is competitively supplied by investors to skilled managers, and if also managers face decreasing returns to scale in their ability to generate excess returns, then Berk and Green (2004) predict no cross-sectional differences in risk-adjusted performance. Instead, Berk (2004 p.3) predicts, "higher skilled managers will manage larger portfolios, which allows these managers to extract more economic rents by collecting fees on assets under management."[16] Panel A shows that option users manage significantly larger portfolios as compared to non-users. We interpret this as additional evidence that option use is associated with greater skill.

VI Conclusion

We decipher seven years of required disclosures by hedge fund managers to build the most complete portrait yet of how investment managers use derivatives. Many reported option holdings are involved in nondirectional hedging strategies. Straddle positions and protective put holdings seem to contain further information. They are followed by significantly higher than normal volatility for the underlying stock.

Option holdings classed as directional (simple calls and puts with no accompanying underly-

[16]Consistent with this notion, Aragon (2007) finds no significant market model alpha in hedge fund after-fee returns after controlling for share redemption restrictions.

ing stock holdings reported) contain information about returns as well. Buying stocks in which hedge funds take call option positions and holding for one quarter gives a portfolio exhibiting 5.7% per year alpha. Buying stocks in which hedge funds take put option positions and holding for one month gives a portfolio exhibiting -10.7% per year alpha. We do not claim these are achievable returns for other investors because of the 45-day reporting period following the end of each quarter.

Nonetheless, a stock portfolio tracking directional put holdings earns annualized benchmark-adjusted returns of -15.8%, on average, in the third month following the quarter-end. Explicitly changing the tracking portfolio to enter positions only after filing dates producing stark differences in call-based and put-based stock returns over the remainder of the quarter, 1.72% or 2.05%, depending upon the benchmark. Trading options themselves, rather than the underlying stocks, magnifies these differences immensely. Adjusted for the Black-Scholes benchmark, nearby month puts outperform nearby month calls by 18.71% held to maturity, which is never more than one month away.

The numbers here emphatically point out the informed character of hedge fund trades, but they do not directly measure hedge funds' performance. Our analysis of portfolio returns reveals that, compared to non-users, option users manage portfolio that are larger, have lower return standard deviation, and higher Sharpe ratios. Overall, the evidence highlights the option market as a useful tool for allowing managers to utilize information.

Appendix

In this appendix we describe our calculations of expected option returns implied by Black and Scholes (1973). For example, the expected hold-to-maturity return on a European call option is defined as

$$EOR^c = \frac{E[\max\{S_T - K, 0\}]}{P^c}$$

where P^c is the current price of the option implied by Black and Scholes (1973), S_T is the underlying stock price at expiration, and K is the striking price. Under Black and Scholes (1973) assumptions, S_T can be expressed as

$$S_T = S_0 \exp^{(\mu - \sigma^2/2)T + \sigma\sqrt{T}\epsilon}$$

where S_0 and S_T are the prices of the underlying today and at the expiration date, respectively, μ and σ are the annualized continuous expected rate of return and instantaneous volatility of the underlying stock, respectively, and ϵ is a standard normal random variable. Combining the last two expressions and expanding gives

$$E[\max\{S_T - K, 0\}] = S_0 \times \exp^{\mu T} \times N(d_3) - K \times N(d_3 - \sigma\sqrt{T}),$$

where

$$d_3 = \frac{ln(S_0/K) + (\mu + \sigma^2/2)T}{\sigma\sqrt{T}}$$

and N(.) is the standard normal cdf.

By put-call-parity, the expected payoff of the corresponding put option is

$$E[\max\{K - S_T, 0\}] = K \times \left(1 - N(d_3 - \sigma\sqrt{T})\right) - S_0 \times \exp^{\mu T} \times (1 - N(d_3))$$

We compute expected option returns EOR^c, EOR^p by combining the previous expressions with option prices (P^c, P^p) implied by the well-known Black and Scholes (1973) formulae. In addition, each straddle trade involves purchasing an equal number of call and put options on the underlying stock. Therefore, expected straddle returns are computed as

$$EOR^{str} = \left(\frac{\tilde{P}^c}{\tilde{P}^c + \tilde{P}^p}\right) \times EOR^c + \left(\frac{\tilde{P}^p}{\tilde{P}^c + \tilde{P}^p}\right) \times EOR^p,$$

where $\tilde{P}^c$ and $\tilde{P}^p$ denote the midpoint of the closing bid and ask quotes of the call and put options, respectively.

The key inputs to the calculations for expected option returns are the risk-free rate, and expected rate of return and volatility of the underlying stock. The risk-free rate appears in the pricing formulae used to calculate current option prices (P^c, P^p) implied by Black and Scholes (1973). We use the yield on the 30-day Treasury Bill for the risk-free rate. These data are provided by Ibbotson Associates. The volatility input appears both in our calculations of current option prices implied by Black and Scholes (1973) and also expected payoffs at maturity. We use the implied volatility from actual option market prices prevailing at the time the option positions are opened. These data are provided by OptionMetrics and discussed in Section III.B. Finally, the expected return on the underlying asset is an input to our calculations of expected option payoffs at maturity. We use the historical average return on the underlying asset using the prior 60 observations of monthly returns.

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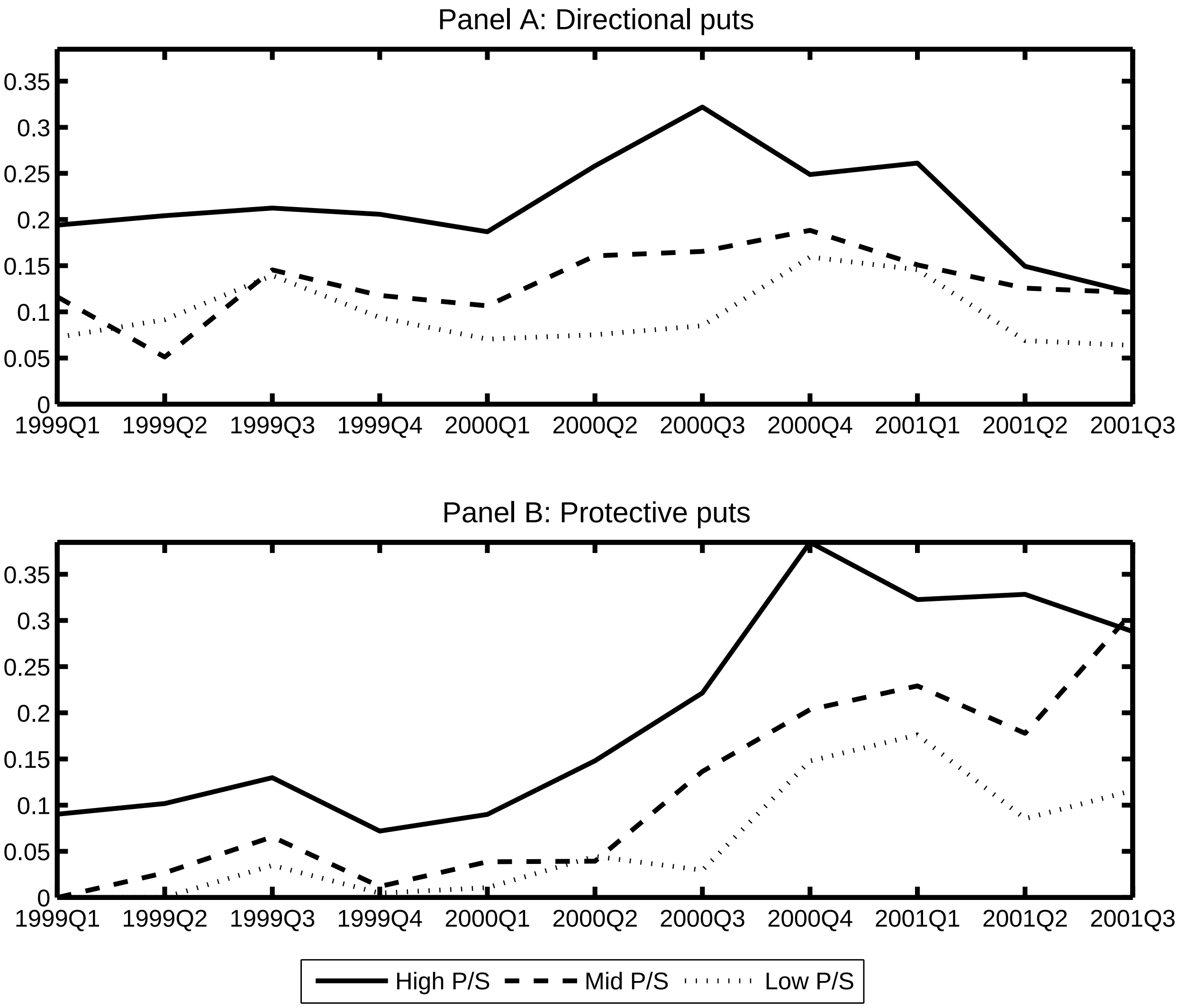

Figure 1. Hedge Fund Put Option Holdings on Nasdaq Technology Stocks. Dates indicate end of quarter reports of holdings. The bubble peak occurred during March 2000. The figure plots the mean of the net put option demand by hedge fund advisors across all Nasdaq stocks by P/S terciles. Net demand is the percentage of advisors employing a directional put (Panel A) and protective put (Panel B) strategy on a given security.

Table I

Hedge Fund Portfolio Composition

This table shows the portfolio holdings disclosed by 250 hedge fund advisors over the period 1999–2006. Positions are reported every quarter. Panel A shows the number of reported positions by security type. Panel B market value of reported positions by security type. Available market values for options and warrants are in terms of the securities underlying the options rather than the options themselves.

Position Type	N	Mean	Std Dev.
Panel A: Number of Positions			
common stock	1183506	238.39	822.97
debt	53534	10.77	28.46
call options			
hedging	64204	10.50	127.87
directional	14922	2.97	14.64
put options			
hedging	60753	10.21	110.03
directional	4461	0.91	2.69
warrants	2425	0.51	2.22
other	11315	2.98	11.43

Position Type	Total	Mean	Std Dev.
Panel B: Market Value ($ '000,000)			
common stock	17700000	3180.24	14707.77
debt	5773614	925.65	6713.73
call options			
hedging	3614992	583.52	9057.52
directional	1649857	273.12	3614.94
put options			
hedging	4467458	721.81	10999.14
directional	349234	58.38	660.20
warrants	203570	33.04	191.03
other	190787	42.30	304.49

Table II

Reporting Lag of Form 13F Over 1999–2006

This table summarizes the reporting lags of the 5,038 filings of Form 13F in our sample. The reporting lag is the number of days between the quarter-end day and the filing date. The filing date is the date the filing was approved by EDGAR. The first column corresponds to the reporting quarter of the filing (not the filing date). The second column gives the total number of filings. Columns three through seven list the number of filings for which the reporting lag is within the stated interval. The remaining columns summarize the reporting lag for all filings.

		Reporting lag (days)								
Year	N	0–29	30–44	45–50	51–89	90+	mean	med	sd	max
1999	412	47	210	124	24	7	43.3	43	16.1	208
2000	500	59	216	190	26	9	46.0	44	83.0	1866
2001	555	75	271	191	16	2	40.8	44	26.9	627
2002	583	74	318	170	12	9	43.6	43	37.3	537
2003	649	67	344	205	23	10	43.2	44	22.1	411
2004	748	82	410	238	16	2	41.1	43	10.0	133
2005	814	100	355	347	10	2	40.7	43	9.7	144
2006	777	93	310	362	11	1	40.2	44	9.3	122
1999–06	5038	597	2434	1827	138	42	42.1	44	32.5	1866

Table III

Stock Volatility Following Hedge Funds' Reported Holdings

This table reports the output from cross-sectional regressions of future excess volatility against aggregate hedge fund demand for holding options on a particular security. For each of the three months following each quarter-end we estimate the following two models:

$$\text{Model 1:} \quad VOL_i - IVOL_i = \alpha + \gamma DIR_i + \delta NONDIR_i + \epsilon_i$$
$$\text{Model 2:} \quad VOL_i - IVOL_i = \alpha + \gamma_1 BULL_i + \gamma_2 BEAR_i + \delta_1 PPUT_i + \delta_2 STRAD_i + \epsilon_i$$

For each quarter-end and underlying security i, DIR_i is the proportion of advisors disclosing a directional option position; $NONDIR_i$ is the proportion of advisors disclosing a nondirectional option position; $BULL_i$ is the proportion of advisors disclosing a directional call option position; $BEAR_i$ is the proportion of advisors disclosing a directional put option position; $PPUT_i$ is the proportion of advisors disclosing a protective put position; and $STRAD_i$ is the proportion of advisors disclosing a straddle. $IVOL_i$ denotes the annualized monthly lagged Black-Scholes implied volatility for security i, and VOL_i denotes the annualized realized volatility (sum of squared daily stock returns) of security i's stock return over the subsequent month. The table lists the annual averages of monthly estimates. The final rows report the full sample average of the monthly estimates along with Fama-MacBeth p-values corresponding to a two-sided test that the coefficient estimated equals zero. Raw data are winsorized at 99.5% and 0.5%.

	Model 1			Model 2				
Year	cons	dir	nondir	cons	bull	bear	pput	strad
1999	-2.87	6.15	40.06	-2.87	5.43	7.19	42.90	54.60
2000	-2.58	3.09	23.27	-2.60	-6.80	22.66	21.62	54.70
2001	-3.76	8.28	24.94	-3.77	7.04	13.68	27.11	-21.04
2002	-4.61	1.41	10.24	-4.63	-2.75	8.07	15.38	14.53
2003	-4.20	6.19	3.46	-4.18	5.59	5.85	7.67	-0.47
2004	-5.14	11.36	13.10	-5.16	11.09	10.28	4.23	20.91
2005	-5.08	-1.15	5.21	-5.12	-3.92	-0.07	-7.23	17.30
2006	-4.48	4.69	6.47	-4.49	2.73	8.11	-0.21	10.14
1999–06	-4.09	5.00	15.84	-4.10	2.30	9.47	13.93	18.84
p-val	0.00	0.01	0.00	0.00	0.33	0.00	0.00	0.10

Table IV

Idiosyncratic Stock Volatility Following Hedge Funds' Reported Holdings

This table reports the output from cross-sectional regressions of future excess volatility against aggregate hedge fund demand for holding options on a particular security. For each of the three months following each quarter-end we estimate the following two models:

$$\text{Model 1:} \quad EVOL_i - IEVOL_i = \alpha + \gamma DIR_i + \delta NONDIR_i + \epsilon_i$$
$$\text{Model 2:} \quad EVOL_i - IEVOL_i = \alpha + \gamma_1 BULL_i + \gamma_2 BEAR_i + \delta_1 PPUT_i + \delta_2 STRAD_i + \epsilon_i$$

For each quarter-end and underlying security i, DIR_i is the proportion of advisors disclosing a directional option position; $NONDIR_i$ is the proportion of advisors disclosing a nondirectional option position; $BULL_i$ is the proportion of advisors disclosing a directional call option position; $BEAR_i$ is the proportion of advisors disclosing a directional put option position; $PPUT_i$ is the proportion of advisors disclosing a protective put position; and $STRAD_i$ is the proportion of advisors disclosing a straddle. $IEVOL_i$ denotes the annualized monthly lagged Black-Scholes implied idiosyncratic volatility for security i, and $EVOL_i$ denotes the annualized realized idiosyncratic volatility (sum of squared daily stock returns) of security i's stock return over the subsequent month. The table lists the annual averages of monthly estimates. The final rows report the full sample average of the monthly estimates along with Fama-MacBeth p-values corresponding to a two-sided test that the coefficient estimated equals zero. Raw data are winsorized at 99.5% and 0.5%.

	Model 1			Model 2				
Year	cons	dir	nondir	cons	bull	bear	pput	strad
1999	1.61	1.01	56.84	1.60	5.97	-6.46	66.56	35.58
2000	-2.49	4.32	27.63	-2.48	-3.53	16.66	31.73	52.81
2001	-3.54	0.26	34.72	-3.54	-3.38	9.62	34.68	3.87
2002	-1.91	1.66	13.59	-1.95	-4.90	12.20	17.66	13.28
2003	-2.04	8.59	5.02	-2.05	9.65	3.46	1.42	6.72
2004	-3.50	13.43	16.10	-3.56	14.43	10.00	2.17	28.83
2005	-2.51	0.53	8.80	-2.52	0.18	-1.71	-0.91	15.14
2006	-3.41	3.93	9.97	-3.41	1.95	8.78	3.47	12.60
1999–06	-2.22	4.22	21.58	-2.24	2.55	6.57	19.60	21.10
p-val	0.00	0.04	0.00	0.00	0.34	0.06	0.00	0.04

Table V

Advisor Level Aggregation of Volatility Following Reported Hedge Fund Holdings

The table reports statistics for advisor-specific measures of future volatility corresponding to various option strategies. For each advisor and option strategy, we calculate the equal-weighted average future volatility across all securities held as part of that strategy. The future volatility corresponds to the 1, 2, and 3 months following each quarter-end and is equal to the difference $VOL_i - IVOL_i$, where $IVOL_i$ denotes the annualized lagged month-end Black-Scholes implied volatility for security i, and VOL_i denotes the annualized realized volatility (sum of squared daily stock returns) of security i's stock return over the subsequent month. The bull strategy is a directional call option position; bear is a directional put position; dir is the union of bull and bear; pput is a protective put strategy; strad is a straddle; nondir is the union of pput and strad; and com is a strategy in which the security is held exclusively as common stock. The table reports results for a test of the difference in future volatility between each option strategy and the common only (com) strategy. The table lists the annual averages of monthly estimates. The final rows report the full sample average of the monthly estimates along with Fama-MacBeth p-values corresponding to a two-sided test that the coefficient estimated equals zero. Raw data are winsorized at 99.5% and 0.5%.

	Directional positions			Non-directional positions		
Year	bull-com	bear-com	dir-com	pput-com	strad-com	nondir-com
1999	-1.03	1.49	-0.10	2.49	0.66	1.67
2000	-1.08	1.49	0.45	1.99	2.86	2.72
2001	1.65	1.19	2.36	-0.14	0.55	0.11
2002	0.40	0.35	0.94	0.19	1.74	0.76
2003	-0.56	0.22	0.04	-0.16	-0.72	-0.56
2004	0.31	2.52	1.37	2.29	-0.23	2.09
2005	0.15	-0.74	-0.27	1.77	2.07	1.74
2006	0.76	0.73	0.70	1.12	2.47	1.66
1999–06	0.16	0.78	0.60	1.29	1.23	1.40
p-val	0.51	0.02	0.01	0.00	0.01	0.00

Table VI

Advisor Level Aggregation of Idiosyncratic Volatility Following Reported Holdings

The table reports statistics for advisor-specific measures of future idiosyncratic volatility corresponding to various option strategies. For each advisor and option strategy, we calculate the equal-weighted average future idiosyncratic volatility across all securities held as part of that strategy. The future idiosyncratic volatility corresponds to the 1, 2, and 3 months following each quarter-end and is equal to the difference $EVOL_i - IEVOL_i$, where $IEVOL_i$ denotes the annualized lagged month-end Black-Scholes implied idiosyncratic volatility for security i, and $EVOL_i$ denotes the annualized realized idiosyncratic volatility (sum of squared daily stock returns) of security i's stock return over the subsequent month. Implied idiosyncratic volatility is inferred from the security's Black-Scholes implied volatility, an estimate of the security's S&P 500 beta, and the Black-Scholes implied volatility for the S&P 500. The bull strategy is a directional call option position; bear is a directional put position; dir is the union of bull and bear; pput is a protective put strategy; strad is a straddle; nondir is the union of pput and strad; and com is a strategy in which the security is held exclusively as common stock. The table reports results for a test of the difference in future volatility between each option strategy and the common only (com) strategy. The table lists the annual averages of monthly estimates. The final rows report the full sample average of the monthly estimates along with Fama-MacBeth p-values corresponding to a two-sided test that the coefficient estimated equals zero. Raw data are winsorized at 99.5% and 0.5%.

	Directional positions			Non-directional positions		
Year	bull-com	bear-com	dir-com	pput-com	strad-com	nondir-com
1999	-0.39	-3.34	-1.69	2.57	-1.31	1.43
2000	0.87	2.71	2.34	1.02	1.69	1.07
2001	2.74	2.05	3.35	0.73	1.67	0.81
2002	-1.40	-0.03	-0.87	0.83	3.46	1.13
2003	0.86	-0.01	0.64	0.60	0.61	0.59
2004	0.76	2.32	1.53	1.55	1.44	2.20
2005	0.93	-0.41	0.42	0.95	1.76	1.01
2006	0.41	1.57	0.90	0.81	3.05	1.62
1999–06	0.66	0.74	0.85	1.06	1.77	1.30
p-val	0.01	0.03	0.00	0.00	0.00	0.00

Table VII

Advisor Level Aggregation of BS-Adjusted Straddle Returns

The table reports average monthly hold-to-maturity returns for straddle portfolios formed based upon hedge fund advisors' holdings of 13(f) reportable securities. Each individual straddle involves buying a call and a put option on the underlying security held by each advisor. Both options expire in the following month and are closest-to-the-money. Individual straddle returns are averaged by advisor/month/strategy. The bull strategy is a directional call option position; bear is a directional put position; dir is the union of bull and bear; pput is a protective put strategy; strad is a straddle; nondir is the union of pput and strad; opt is the union of dir and nondir; and com is a strategy in which the security is held by the advisor exclusively as common stock. For each advisor and option strategy, we calculate the equal-weighted average straddle return. Each portfolio is rebalanced at the start of the three months following each quarter-end. The table reports results for a test of the difference in straddle returns between each option strategy and the common only (com) strategy. The BS-adjusted return is calculated as in Rubinstein (1984) and Broadie, Chernov, and Johannes (2007) as the difference between the realized option return and the expected return implied by the Black-Scholes model. Inputs to the model are the risk-free rate, the option implied volatility (from Black-Scholes), the value of the underlying, time to maturity, and the expected return on the underlying security. Expected returns on the underlying security are calculated as the average return over the prior 60-months. The table lists the annual averages of monthly estimates. The final rows report the full sample average of the monthly estimates along with Fama-MacBeth p-values corresponding to a two-sided test that the coefficient estimated equals zero. Raw data are winsorized at 99.5% and 0.5%.

year	bull-com	bear-com	dir-com	pput-com	strad-com	nondir-com	opt-com
1999	1.79	-5.36	-1.17	-1.63	17.80	2.22	-0.79
2000	-2.04	6.22	3.53	10.72	1.10	8.17	3.79
2001	6.83	7.42	8.20	-0.73	-4.31	0.74	5.85
2002	1.82	10.61	8.22	7.73	6.08	7.67	9.10
2003	-0.64	-6.34	-1.11	-3.13	-6.24	-3.63	-0.47
2004	-0.80	8.72	2.28	2.78	-2.07	1.36	1.43
2005	2.23	3.84	1.79	8.13	17.78	11.31	3.77
2006	-0.26	3.41	0.76	-4.64	7.69	-1.97	-0.31
1999–06	0.84	3.88	2.27	2.32	5.32	3.49	2.38
p-val	0.49	0.01	0.04	0.18	0.02	0.03	0.03

Table VIII

Straddle Portfolios Tracking Option Holdings by Pre/Post Filing Date

The table reports average monthly hold-to-maturity returns for straddle portfolios formed based upon hedge fund advisors' holdings of 13(f) reportable securities. Each individual straddle involves buying a call and a put option on the underlying security held by each advisor. Both options expire in the following month and are closest-to-the-money. Individual straddle returns are averaged by advisor/month/strategy. Advisor/month/strategy averages are then averaged by month/strategy. The bull strategy is a directional call option position; bear is a directional put position; dir is the union of bull and bear; pput is a protective put strategy; strad is a straddle; nondir is the union of pput and strad; opt is the union of dir and nondir; and com is a strategy in which the security is held by the advisor exclusively as common stock. For each advisor and option strategy, we calculate the equal-weighted average straddle return. Each portfolio is rebalanced at the start of the three months following each quarter-end. The table reports results for a test of the difference in straddle returns between each option strategy and the common only (com) strategy. The BS-adjusted return is calculated as in Rubinstein (1984) and Broadie, Chernov, and Johannes (2007) as the difference between the realized option return and the expected return implied by the Black-Scholes model. Panel A lists the annual averages of monthly estimates. The final rows report the full sample average of the monthly estimates along with Fama-MacBeth p-values corresponding to a two-sided test that the coefficient estimated equals zero. Panel B lists the average estimates for the 1,2, and 3 months following each quarter-end. Post-fdate returns correspond to hold-to-maturity returns of a strategy that buys straddles on the day after the 13F filing date. Raw data are winsorized at 99.5% and 0.5%.

year	bull-com	bear-com	dir-com	pput-com	strad-com	nondir-com	opt-com
Panel A: by calendar years							
1999	3.90	-1.15	0.55	-2.09	15.93	3.08	1.02
2000	-3.03	5.50	3.39	9.94	-1.99	7.08	3.59
2001	5.83	5.62	7.26	-2.77	-3.89	-1.59	4.97
2002	1.17	8.13	6.63	4.17	5.16	4.18	7.36
2003	0.26	-5.51	-0.92	-2.30	-4.71	-2.40	-0.11
2004	0.98	9.50	3.81	3.72	-3.64	1.48	2.80
2005	1.75	2.64	1.18	4.56	15.70	8.32	2.59
2006	1.15	4.35	2.16	-5.89	7.41	-3.08	0.92
1999–06	1.50	3.63	3.01	1.17	3.75	2.14	2.89
p-val	0.28	0.03	0.02	0.53	0.45	0.31	0.02
Panel B: by post-quarter month and filing date							
1	-4.15	0.07	-2.02	-2.52	12.42	2.86	-1.12
	0.12	0.98	0.38	0.42	0.37	0.55	0.64
2	3.21	5.89	5.36	-0.17	-0.47	-1.15	4.40
	0.08	0.05	0.01	0.96	0.91	0.69	0.02
3	5.45	4.94	5.68	6.19	-0.71	4.71	5.40
	0.03	0.07	0.01	0.06	0.87	0.12	0.01
post–fdate	2.26	5.86	4.13	0.62	-1.08	-0.20	3.22
	0.35	0.05	0.08	0.80	0.76	0.93	0.14

Table IX

Stock Returns Following Hedge Funds' Reported Holdings

This table reports the output from cross-sectional regressions of future abnormal stock returns against aggregate hedge fund demand for holding options on a particular security. For each of the three months following each quarter-end we estimate the following two models:

$$\text{Model 1:} \quad R_i - R_{ib} = \alpha + \gamma DIR_i + \delta NONDIR_i + \epsilon_i$$
$$\text{Model 2:} \quad R_i - R_{ib} = \alpha + \gamma_1 BULL_i + \gamma_2 BEAR_i + \delta_1 PPUT_i + \delta_2 STRAD_i + \epsilon_i$$

For each quarter-end and underlying security i, DIR_i is the proportion of advisors disclosing a directional option position; $NONDIR_i$ is the proportion of advisors disclosing a nondirectional option position; $BULL_i$ is the proportion of advisors disclosing a directional call option position; $BEAR_i$ is the proportion of advisors disclosing a directional put option position; $PPUT_i$ is the proportion of advisors disclosing a protective put position; and $STRAD_i$ is the proportion of advisors disclosing a straddle. $R_i - R_{ib}$ is the realized common stock return for security i in excess of the return on a size, book-to-market, and momentum characteristics-based benchmark portfolio over the 1, 2, and 3 months following the quarter-end. The table lists the annual averages of monthly estimates. The final rows report the full sample average of the monthly estimates along with Fama-MacBeth p-values corresponding to a two-sided test that the coefficient estimated equals zero. Raw data are winsorized at 99.5% and 0.5%.

	Model 1			Model 2				
Year	cons	dir	nondir	cons	bull	bear	pput	strad
1999	-0.63	6.15	7.17	-0.64	16.71	-4.98	15.56	-8.30
2000	-0.12	-1.18	-3.97	-0.11	0.16	-7.62	-10.53	-0.70
2001	0.30	-2.08	-9.10	0.30	2.97	-14.83	-9.56	-1.14
2002	-0.09	-7.27	-9.40	-0.10	-6.63	-8.88	-9.68	-2.51
2003	0.54	-4.46	2.29	0.53	-4.49	-5.99	-3.82	5.84
2004	0.04	-2.69	-0.26	0.04	-1.25	-5.87	1.66	-2.11
2005	-0.07	-1.93	2.20	-0.08	-0.15	-9.01	-0.34	5.08
2006	0.10	-2.65	-1.67	0.10	-3.94	1.07	-0.32	-2.22
1999–06	0.01	-2.01	-1.59	0.00	0.42	-7.02	-2.13	-0.76
p-val	0.97	0.22	0.58	0.98	0.83	0.00	0.51	0.92

Table X

Performance of Stock Portfolios Tracking Directional Option Holdings

The table reports average monthly returns for equally-weighted stock portfolios formed based upon hedge fund advisors' holdings of 13(f) reportable securities. Bull (bear) portfolios are long stocks underlying reported call (put) holdings. Quarterly reported notional amounts of options holdings are used to construct advisor-specific portfolios of the underlying common stock. Monthly raw returns and performance of these portfolios are generated over the following quarter assuming monthly rebalancing at the previous quarter's portfolio weights. The table reports the time series of the average raw return and performance across advisors. The GT measure is calculated by subtracting the time t return of the portfolio held at month $t-4$ from the time t return of the portfolio held at $t-1$. The CS measure is the difference between the time t return of the portfolio held at $t-1$ and the time t return of the time $t-1$ matching control portfolio. The return on a control portfolio is the value-weighted return on a group of stocks of similar market value, book-to-market ratio, and lagged one-year returns. Panel A reports average returns for all months by year and by the full sample period (1999–2006). Panel B reports average returns by the month following each quarter-end date. Post-fdate returns correspond to hold-to-maturity returns of a strategy that buys straddles on the day after the 13F filing date. p-values are reported below sample averages and correspond to a two-sided test of the hypothesis that the mean monthly return equals zero. Raw data are winsorized at 99.5% and 0.5%.

				Abnormal Returns					
	Raw Returns			GT Measure			CS Measure		
year	bull	bear	diff	bull	bear	diff	bull	bear	diff
Panel A: by calendar years									
1999	4.93	0.24	4.69	3.22	-0.62	3.84	2.14	-1.27	3.41
2000	-1.90	-5.69	3.79	0.51	-3.19	3.70	0.09	-2.14	2.24
2001	1.38	-1.55	2.93	1.09	-0.66	1.75	0.95	-1.25	2.20
2002	-3.58	-3.97	0.38	-1.87	-1.44	-0.44	-0.75	-1.44	0.68
2003	4.07	3.67	0.40	1.07	1.44	-0.37	0.83	0.17	0.66
2004	1.23	0.13	1.11	0.76	-0.51	1.27	0.55	-0.94	1.49
2005	1.02	0.51	0.51	-0.09	-0.75	0.67	-0.58	-0.79	0.21
2006	1.24	0.71	0.53	0.32	0.22	0.10	0.48	0.14	0.34
1999–06	1.05	-0.74	1.79	0.63	-0.69	1.32	0.46	-0.94	1.40
p-val	0.10	0.30	0.00	0.03	0.04	0.00	0.06	0.00	0.00
Panel B: by post-quarter month and filing date									
1	1.02	-0.55	1.57	0.43	-0.71	1.14	0.54	-0.63	1.17
	0.33	0.66	0.04	0.40	0.21	0.07	0.20	0.29	0.04
2	1.99	0.03	1.96	0.91	-0.47	1.39	0.69	-0.77	1.46
	0.08	0.98	0.00	0.04	0.47	0.05	0.14	0.03	0.01
3	0.14	-1.70	1.85	0.54	-0.89	1.43	0.15	-1.42	1.57
	0.90	0.15	0.01	0.30	0.11	0.03	0.70	0.00	0.00
post–fdate	1.23	-1.38	2.60	1.13	-0.92	2.05	0.11	-1.62	1.72
	0.35	0.37	0.00	0.05	0.27	0.01	0.80	0.00	0.01

Table XI

Performance of Put Option Portfolios Tracking Directional Option Holdings

The table reports average monthly hold-to-maturity returns for put portfolios formed based upon hedge fund advisors' holdings of 13(f) reportable securities. Individual puts expire in the following month and are closest-to-the-money. Individual put returns are averaged by advisor/month/strategy. Advisor/month/strategy averages are then averaged by month/strategy. The bull strategy is a directional call option position; bear is a directional put position; dir is the union of bull and bear; pput is a protective put strategy; strad is a straddle; nondir is the union of pput and strad; opt is the union of dir and nondir; and com is a strategy in which the security is held by the advisor exclusively as common stock. For each advisor and option strategy, we calculate the equal-weighted average straddle return. Each portfolio is rebalanced at the start of the three months following each quarter-end. The BS-adjusted return is calculated as in Rubinstein (1984) and Broadie, Chernov, and Johannes (2007) as the difference between the realized option return and the expected return implied by the Black-Scholes model. Inputs to the model are the risk-free rate, the option implied volatility (from Black-Scholes), the value of the underlying, time to maturity, and the expected return on the underlying security. Expected returns on the underlying security are calculated as the average return over the prior 60-months. Panel A lists the annual averages of monthly estimates. The final rows report the full sample average of the monthly estimates along with Fama-MacBeth p-values corresponding to a two-sided test that the coefficient estimated equals zero. Panel B lists the average estimates for the 1,2, and 3 months following each quarter-end. Post-fdate returns correspond to hold-to-maturity returns of a strategy that buys straddles on the day after the 13F filing date. Raw data are winsorized at 99.5% and 0.5%.

	Raw Returns			BS-Adjusted		
year	bear	bull	diff	bear	bull	diff
Panel A: by calendar years						
1999	-1.40	-14.52	13.12	13.25	3.16	10.09
2000	32.05	6.81	25.24	58.84	19.91	38.92
2001	42.51	4.56	37.94	62.07	22.78	39.28
2002	29.92	34.32	-4.40	45.04	40.22	4.82
2003	-35.78	-44.98	9.19	-17.51	-29.08	11.57
2004	15.07	-1.41	16.47	26.71	16.57	10.15
2005	-4.42	-6.16	1.74	14.28	10.58	3.70
2006	-2.71	-10.82	8.11	12.62	8.36	4.27
1999–06	9.40	-4.02	13.43	26.91	11.56	15.35
p-val	0.28	0.59	0.00	0.00	0.11	0.00
Panel B: by post-quarter month and filing date						
1	22.33	0.94	21.39	39.44	14.88	24.56
	0.14	0.94	0.01	0.01	0.24	0.01
2	-7.35	-18.31	10.96	10.58	0.59	9.99
	0.50	0.03	0.10	0.42	0.95	0.32
3	13.23	5.30	7.93	30.72	19.22	11.50
	0.48	0.75	0.35	0.13	0.23	0.18
post–fdate	12.07	-5.48	17.55	31.45	12.74	18.71
	0.42	0.71	0.01	0.05	0.38	0.00

Table XII

Characteristics and Portfolio Returns of Option Users vs. Non-users

The table summarizes the characteristics and portfolio returns for the sub-sample of 179 advisors that report to the TASS database. Comparisons are made depending on whether advisors use options in accordance with the SEC-required Form 13F portfolio disclosures. Characteristics and portfolio returns are voluntarily reported to the TASS database, and aggregated across individual funds managed by a given advisor. Each characteristic is computed as the sample mean characteristic of the individual funds managed by the same advisor. Characteristics include the redemption notice period (notice), an indicator for whether the fund imposes a lockup restriction (lockup?), and the percentage performance fee and fixed management fee. Ln(assets) is the natural logarithm of the sum of the assets under management across all advisor's individual funds, and is measured at the end of the sample period. Advisor-level portfolio returns are aggregated from underlying individual fund monthly returns either as equal-weighted (equal-weighted) or asset-weighted averages based upon reported assets at the end of the previous quarter. The table summarizes the sample mean, standard deviation, and Sharpe ratio of monthly portfolio returns across advisors. Alpha is computed as the intercept of a regression of advisor monthly portfolio returns on the value-weighted return on all NYSE, AMEX, and NASDAQ stocks minus the one-month Treasury bill rate (from Ken French). Advisors are required to have at least 12 monthly return observations to compute portfolio return statistics. Results are reported for the full sample of advisor returns and the sub-sample that excludes backfilled returns.

Variable	users	non-users	diff	p(diff)	users	non-users	diff	p(diff)
Panel A: Organization characteristics								
Notice (days)	36.42	33.64	2.78	0.415				
Lockup?	0.28	0.37	-0.09	0.142				
Performance fee (%)	18.35	17.96	0.38	0.614				
Management fee (%)	1.32	1.17	0.15	0.048				
ln($total assets)	18.79	17.72	1.07	0.001				
Panel B: Portfolio returns after fees								
	Full sample				Backfilled-free			
Equally-weighted								
Mean	1.07	0.93	0.14	0.259	0.61	0.56	0.05	0.735
Std. dev.	3.36	4.15	-0.80	0.019	3.08	3.95	-0.87	0.032
Sharpe ratio	0.42	0.26	0.16	0.000	0.34	0.23	0.12	0.016
Alpha	0.93	0.82	0.12	0.354	0.57	0.51	0.06	0.627
Asset-weighted								
Mean	0.90	0.90	-0.01	0.955	0.63	0.54	0.08	0.611
Std. dev.	3.33	4.34	-1.01	0.008	3.05	4.01	-0.96	0.031
Sharpe ratio	0.37	0.25	0.12	0.001	0.34	0.23	0.11	0.028
Alpha	0.74	0.78	-0.04	0.731	0.55	0.51	0.04	0.765