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Covered Call Investing in a Loss Aversion Framework

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In a mean–variance framework, the covered call investment strategy has been seen as an inefficient method of allocating wealth. Covered calls reduce the riskiness of the portfolio and therefore lead to lower portfolio returns. Recent debate has focused on the shortcomings of mean–variance efficiency as an accurate depiction of investor utility. Using alternative utility functions, we find mixed support for the use of the covered call investing strategy. Using loss aversion, however, we reexamine the covered call investment decision and find it significantly enhances investor utility relative to an index portfolio investment strategy. We conclude that loss aversion's more accurate depiction of investor preferences and behavior helps to explain the popularity of the covered call investment strategy.

Financial managers frequently recommend a covered call portfolio investment strategy as a means of increasing portfolio returns while reducing overall investment risk. A covered call strategy requires investors to write a call option on stocks that are purchased; a fully covered call strategy results when investors write one call for each share of stock purchased.

The advantage of the covered call strategy lies in the upfront fee earned on writing the call. If the call expires without being exercised, the portfolio receives an initial cash inflow and has no further financial burden. If the call is in the money and is exercised, however, the positive returns of owning the stock are offset by the costs of the call, thus reducing the portfolio return. The covered call investor, in essence, trades off the upside potential of the stock investment with an upfront fee and limited exposure to downside risk.

Research using the Black–Scholes [1972] model to price options typically finds the covered call strategy results in lower overall portfolio returns and therefore is ill-conceived as an investing strategy. Several studies discount these results, however, noting that Black–Scholes underestimates volatility, and would, therefore, tend to underprice options. Using observed option prices, some studies find the covered call strategy is preferred to investing in a stock-only portfolio.

Board, Sutcliffe, and Patrinos [2000] (hereafter referred to as BSP) question the use of mean–variance efficiency as a measure of optimal portfolio selection since the returns for a covered call portfolio are truncated and are not, therefore, normally distributed. Using alternative utility functions and taking into consideration transactions costs, the authors find the covered call strategy is preferred for out-of-the-money options. These authors do not consider prospect theory's loss aversion utility function.

Evidence exists that a covered call investing strategy may be preferred for investors who tend to be highly risk averse. Prospect theory provides an alternative utility function that does not require investors to be strictly risk averse across all returns and allows investors to frame their investing decisions relative to a reference point.

We use the S&P 500 index to create a covered call investment strategy. We presume the investor buys the S&P 500 and sells options; we compare the returns for this portfolio to the returns earned by strictly holding the S&P 500. We evaluate the returns using prospect theory's loss aversion utility function as well as Markowitz's [1952] mean–variance efficient utility, or the BSP [2000] alternative utility functions.

Results for returns in a mean–variance framework are mixed. Two alternative utility functions support the covered call strategy, but the results are generally not economically significant. When considering the loss aversion utility function, however, the covered call strategy is the superior investment strategy for all investing time frames and is statistically superior for short investing horizons. We conclude that the use of a more representative investor utility function justifies the existence of a covered call strategy.

The paper is structured as follows. The second section reviews the existing literature and provides the theoretical framework for our model; the third section describes the data and methodology; the fourth section contains the results and analysis; and the final section details the conclusions.

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Review of Literature

Many investment advisory services claim that creating a portfolio using a covered call strategy will result in increased returns with reduced risk, as compared to holding a portfolio of the stock alone (Rendleman, 2000). Early empirical work in this area using simulated option prices finds that the covered call strategy does not enhance the performance of the portfolio (Merton, Scholes, and Gladstein, 1978; Clarke, 1987; Brooks, Levy, and Yoder, 1987; and Lhabitant, 1999). These results are consistent with the Black–Scholes option pricing model [1972], which derives a risk-free rate of return for a continuously rebalanced portfolio of stocks and options.

The CAPM-based option derivation shows that an option's instantaneous expected return should be the same as that implied by the CAPM (Black and Scholes, 1973). For risk-averse investors wishing to maximize utility, the optimal portfolio will maximize expected return for a given level of risk. The covered call strategy purportedly increases returns while simultaneously reducing risk. Rendleman [1981, 1999] shows that there is theoretically no such thing as a free lunch: Investors cannot reduce risk and increase returns in an efficient market. Therefore, writing calls should only be done if the calls are consistently overpriced (Benninga and Blume, 1985).

But what if calls are mispriced? Green and Figlewski [1999] note that call writing is only profitable if the call is significantly overpriced. Therefore it is only viable for investors who can recognize and take advantage of mispriced options. This may be feasible for institutions that continually monitor option prices and can rebalance a portfolio at lower transaction costs; for individual investors, however, it is unlikely to be profitable.

The authors note that call writers are exposed to risk from many sources, including misspecified volatility estimates. Evidence exists that over-the-counter call option writers first obtain the best forecast for volatility, then increase the volatility figure used in pricing the option or, alternatively, increase the option price by a predetermined amount (Green and Figlewski, 1999). This action serves to decrease the option writer's risk exposure. Either case (increasing the volatility estimate or increasing the option price) leads to overpricing of options in the over-the-counter market.

Others find similar evidence of option overpricing in the exchange-traded market (Coval and Shumway, 2000; Isakov and Morard, 2000; and Yan, 2000). Evidence indicates that additional factors, such as systematic stochastic volatility, may be priced in option returns (Heston, 1993). After correcting for discretization biases associated with option returns, Yan [2000] finds they are still 6% lower than returns suggested by CAPM forecasts. Yan also finds evidence of systematic volatility, but not enough to explain a 6% mispricing. He notes that the overpricing of options reflects both the volatility risk premium and the cost of writing options. Is this overpricing sufficient to make a covered call portfolio investing strategy beneficial?

Isakov and Morard [2000] analyze stocks traded simultaneously on the Zurich Stock Exchange and the Swiss Options and Financial Futures Exchange. The chosen options are the most out of the money with transaction activity. The authors find the covered call portfolio outperforms the stock-only portfolio, and results in increased returns while decreasing the risk of the portfolio. However, the deep-out-of-the-money options used in this study are the least likely to be exercised. Therefore the call writer benefits from receipt of the call premium up front with a low likelihood of exerise. Deep-out-of-the-money options do not offer much upfront return to compensate investors for stock price decreases, however, as their call option premiums are very small compared to those for nearby options. Very few studies to date have examined the covered call investment strategy using nearby options.

The question remains as to whether mean-variance dominance is the appropriate measure of performance for portfolios that include options (Leland, 1999 and Lhabitant, 1999). Introducing options to a portfolio changes its distribution. The variability of the portfolio decreases and the portfolio is negatively skewed, thus making the distribution of returns asymmetric (Bookstaber and Clarke, 1985, 1984, 1981). Investor utility functions based on the mean and variance of portfolio returns may not be appropriate (Markowitz, 1952).

Board, Sutcliffe, and Patrinos [2000] examine the covered call strategy using four utility functions that represent alternative combinations of absolute and relative risk aversion. Using U.K. data and out-of-the-money options, the authors find the covered call portfolio outperforms the stock portfolio. This study does not, however, include prospect theory's loss aversion utility function.

Kahneman and Tversky's [1979] prospect theory notes that investors evaluate choices relative to a reference point. While standard investors are presumed to always be risk averse, prospect investors have S-shaped utility curves, displaying risk-averse behavior over gains and risk-seeking behavior over losses. This behavior is consistent with a covered call investment strategy. For prospect theory, investors also seek to minimize the regret associated with an ex post bad investment outcome. A strategy of committing to a program (i.e., selling calls on a regular basis) serves to remove the investor from a pattern of frequent decision-making and thus reduces investor regret (Kahneman and Tversky, 1979).

Using the S&P 500 index and options on the S&P 500, we create a fully covered call investing strategy using either nearby or deep-out-of-the-money options to determine if the utility preference observed by BSP

[2000] with U.K. data and alternative utility functions holds for U.S. data and the loss aversion utility. We begin by evaluating the mean-variance efficiency of the covered call strategy using the BSP utility functions. We then use loss aversion utility to alter the life of the derivative and the status of the instrument (just in the money or just out of the money) to determine the impact on investor utility.

Data And Methodology

Data

This study uses the Berkeley Options Database of Chicago Board Options Exchange bid–ask quotes.[1] The S&P 500 options data cover the nine-year period of February 1987 to December 1995.[2] These options are European-style, thus eliminating the possibility of early exercise.

The covered call strategy presumes the investor purchases the S&P 500 index and sells a call option at the bid price of the first transaction on the Tuesday one month before the Friday that the option contract expires.[3] We consider different types of options, including deep-out-of-the-money calls, six-month just-in-the-money or just-out-of-the-money calls, and one-month just-in-the-money or just-out-of-the-money calls.[4] For one-month calls, the investor essentially sells a contract with thirty-two to thirty-five days until expiration and holds the position until maturity. We calculate holding-period returns for two portfolios: one comprised solely of the index, and the covered call portfolio.

Anecdotal evidence from portfolio managers indicates an investor's recommended strategy is to sell one-month out-of-the-money calls or six-month deep-out-of-the-money calls. Investors benefit from the upfront fee received from writing the call, and so they hope the call is not exercised. However, selling just-in-the-money calls results in frequent exercise of the option because the call is in the money to begin and stocks typically experience positive drift over time. Just-out-of-the-money one-month calls may or may not finish in the money; therefore, the likelihood that the investor will keep the call premium and the option will expire without being exercised is enhanced.

For six-month calls, at-the-money options have a high likelihood of finishing in the money given the additional time to maturity. An investor wishing to sell six-month calls will be advised to sell deep-out-of-the-money options. These options have a lesser likeliood of expiring in the money than near-term contracts. However, they also offer a lower upfront premium and less risk protection for the investor. While we report the results for all five call writing strategies, the contracts of most interest are the one-month just-out-of-the-money and the six-month deep-out-of-the-money.

Methodology

For the covered call portfolio, this study assumes an investor sells a call and holds the index until the call expires. He then calculates his return for this holding period. The investor then creates the same portfolio structure for the next holding period.

For example, an investor sells a one-month call and purchases the index on June 14. He holds the position until the call expires on July 12. He then calculates his holding-period return for this month. The investor next sells a one-month call that expires on August 16 and continues to hold the index.

The investor continues to sell a one-month call each month after the previous position is closed. The investor will consistently sell either one-month just-in-the-money or one-month just-out-of-the-money calls (we calculate holding-period returns for both investing strategies). We also study investing strategies of selling six-month deep-out-of-the-money calls while holding the index portfolio and holding this portfolio position until expiration.

The alternative investment strategy is for an investor to strictly hold the index portfolio during the same time period as the covered call portfolio is held, and at the conclusion to then calculate the holding-period return. The holding-period percentage returns for the stock portfolio and the covered call portfolio are computed as follows:

$$R_S = (d + I_N - I_B)/I_B$$

$$R_C = (d + I_N + C_P - I_B - C_V)/(I_B - C_P)$$

where

R_S = percentage return on the stock portfolio.

d = dividend yield on the stocks that comprise the S&P 500.

I_N = spot price of the S&P 500 index at expiration.

I_B = spot price of the index at the initiation of the option contract.

R_C = percentage return on the covered call portfolio.

C_P = call premium received at initiation of the option contract.

C_V = terminal value of the call contract.

We compute holding-period returns for each investment strategy during the sample period as well as the moments of the sample.

Results and Analysis

We compute the holding-period returns for the portfolio of the S&P 500 index and for the covered call portfolio. The mean one-month return for the index portfolio is 0.9521% (12.1% annualized); the mean monthly return for the covered call portfolio is 1.0868% (13.93% annualized) for just-in-the-money one-month options. For one-month just-out-of-the-money options, the index portfolio return is 0.9055% (11.48% annualized), and the covered call portfolio return is 1.1966% (15.44% annualized).[5] Although the covered call portfolio yields a higher return, the difference is not statistically significant. And, when considering transaction costs, the difference will also not be economically significant.

The annualized return for the covered call portfolio for the deep-out-of-the-money option strategy is higher for the covered call strategy, but, again, the difference in mean returns is not significant. For the investing strategy of selling near-the-money contracts (just in the money or just out of the money), we find that the index portfolio returns for contracts with six months until expiration exceed the returns for the covered call portfolio. For near-term contracts, the return results from a mean–variance perspective appear to favor the covered call strategy when investors sell calls with a short life span (one month until expiration), or when the call is longer term but deep out of the money. Yet the stock-only portfolio is preferred for a six-month investing horizon for near-the-money contracts.

The covered call portfolio is believed to be a risk reduction strategy, and, indeed, we note that it has a lower standard deviation than the index portfolio in all investing scenarios. For example, the standard deviation for the covered call strategy is 4.64%, as compared to 9.24% for the index portfolio and just-in-the-money six-month option contracts (Table 1).

As expected, the covered call portfolio is more negatively skewed. This skewness calls into question the relevance of the return data based on a normal distribution. An alternative means of comparing the portfolio returns is by using investor utility functions, including prospect theory's loss aversion.

Alternative Utility Functions

Board, Sutcliffe, and Patrinos [2000] use alternative utility functions to test for dominance of portfolio returns. We consider two of these alternative utility functions: the negative exponential function, and a utility function proposed by Gordon, Paradis, and Rorke [1972].[6] The utility functions have various levels of absolute and relative risk aversion, as suggested by Pratt

Table 1. *Summary Statistics for Return Distributions for the S&P 500 Index and for a Covered Call Portfolio.*

	Index Portfolio	Covered Call Portfolio	p-value
A. *Just in the Money One Month Options*			
Mean Return (%)	0.9521	1.0868	0.5821
Median Return (%)	1.4207	1.4321	
Standard Deviation (%)	3.9300	2.4469	
Skewness	–1.1984	–5.9504	
Kurtosis	13.2640	47.8787	
B. *Just in the Money Six Month Options*			
Mean Return (%)	5.2493	4.2639	0.3583
Median Return (%)	4.8768	5.0968	
Standard Deviation (%)	9.2371	4.6397	
Skewness	–0.5956	–2.7169	
Kurtosis	0.7375	8.1570	
C. *Just out of the Money One Month Options*			
Mean Return (%)	0.9055	1.1966	0.1741
Median Return (%)	1.3454	1.7697	
Standard Deviation (%)	4.0162	2.8231	
Skewness	–1.1340	–4.6286	
Kurtosis	12.5040	32.0495	
D. *Just out of the Money Six Month Options*			
Mean Return (%)	5.2772	4.3049	0.3443
Median Return (%)	4.8170	5.3715	
Standard Deviation (%)	9.1176	5.1281	
Skewness	–0.6572	–2.3215	
Kurtosis	0.9022	6.2952	
E. *Deep out of the Money Six Month Options*			
Mean Return (%)	5.9584	5.9919	0.9722
Median Return (%)	4.5619	6.2066	
Standard Deviation (%)	10.8126	8.7973	
Skewness	0.0935	–0.6513	
Kurtosis	1.5487	0.8439	

Note: The P-Values Reported Are A Result Of The Mean Comparisons For The Index Portfolio And The Covered Call Portfolio.

[1964], who classified them according to the investor's reaction to risk. If the dollars invested in the risky asset increase (decrease) with wealth, the investor has decreasing (increasing) absolute risk aversion. If the percentage of wealth invested in the risky asset increases (decreases) with wealth, the investor has decreasing (increasing) relative risk aversion.

The negative exponential utility function assumes investors prefer more wealth to less, but the preference for increasing wealth decreases as wealth increases (increasing relative risk aversion). Additionally, the investor has constant absolute risk aversion. The exponential utility function is:

$$\text{Utility} = -e^{-\beta(\text{Wealth})}$$

where β is the measure of absolute risk aversion and wealth measures the period return.

As Table 2 shows, the covered call portfolio and the index-only portfolio yield nearly identical utilities for all β scenarios for typical values of the risk aversion coefficient (β = 0.0001, 0.01, or 0.1)[7] Although investors prefer the covered call investment portfolio, the results are not statistically significant for in-the-money calls, but are significant for out-of-the-money calls.

For extreme measures of absolute risk aversion β = 10 or 20), the covered call portfolio again is preferred, but the results are not statistically significant for either type of at-the-money call portfolio. Although investor utility is improved with covered calls, the results are not economically significant. The improvement in utility for the one-month out-of-the-money covered call portfolio is so slight as to be eliminated if transaction costs are considered.

The results from the negative exponential utility function show a slight and statistically insignificant preference for the covered call strategy at expected levels of risk aversion. Investor utility improves at extreme levels of risk aversion, although research does not support investor risk aversion coefficients on the magnitude of 10 or 20. Our conclusion from the negative exponential model is that investors do show a slight improvement in utility with the covered call portfolio, but that improvement is not economically significant.

For the Gordon, Paradis, and Rorke [1972] model, the utility function is

$$\text{Utility} = (\text{Wealth} + \kappa)^{\delta}$$

where Wealth represents the return for the period and κ is a constant.[7,8] Using this utility function results in improved investor utility for the covered call strategy, although the difference is neither statistically nor economically significant. These results are inconsistent with BSP's [2000] results, however, and indicate that investors are statistically indifferent between the covered call investing strategy and the index portfolio investing strategy when they have decreasing absolute risk aversion and increasing relative risk aversion. We now turn to the loss aversion utility function, which has not been considered by BSP.

Prospect Theory

Prospect theory is an alternative to the expected utility of wealth hypothesis and is used to explain decision-making when outcomes are uncertain. Expected utility theory is based on three tenets: 1) the overall

Table 2. *Utility Functions for the S&P 500 Index and the Covered Call Portfolio.*

Utility Functions	β = 0.0001	β = 0.01	β = 0.1	β = 10	β = 20
A. *Negative Exponential*					
Just in the Money One Month Calls					
Index Portfolio	–0.9999	–0.99989	–0.9987	–2.7623	–343.10
Covered Call Portfolio	–0.9998	–0.99982	–0.9983	–1.8340	–106.10
	(0.1979)	*(0.1968)*	*(0.1869)*	*(0.2500)*	*(0.3185)*
Just out of the Money One Month Calls					
Index Portfolio	–0.9998	–0.9998	–0.9988	–2.84	–356.66
Covered Call Portfolio	–0.9997	–0.9997	–0.9981	–2.05	–151.16
	*(0.0169)***	*(0.0167)***	*(0.0154)***	*(0.2324)*	*(0.3185)*
B. *Gordon Utility*	δ = 0.1	δ = 0.4	δ = 0.6	δ = 0.8	
Just in the Money One Month Calls					
Index Portfolio	1.1748	1.905	2.629	3.629	
Covered Call Portfolio	1.1749	1.906	2.630	3.630	
	(0.5564)	*(0.5649)*	*(0.5706)*	*(0.5764)*	
Just out of the Money One Month Calls					
Index Portfolio	1.1748	1.905	2.629	3.629	
Covered Call Portfolio	1.1749	1.906	2.630	3.631	
	(0.1601)	*(0.1646)*	*(0.1677)*	*(0.1709)*	

*, **, *** indicate significance at the 0.10, 0.05, or 0.01 level of significance, respectively.

Note: P-values (in parenthesis) compare the utility functions for the index portfolio and the covered call portfolio.

utility of a choice is equal to the sum of the expected utilities of all possible outcomes; 2) a choice is acceptable if it adds value to the existing asset portfolio; and 3) investors are risk averse (Markowitz, 1952).

Tversky and Kahneman [1986] note a deviation in actual investor behavior that is not explained by this normative model. While expected utility theory posits that investors evaluate decisions based on the impact on their total wealth, prospect theory says that investors evaluate choices in terms of potential gains and losses relative to a reference point (Statman, 1995). Prospect theory breaks the investor choice process into two phases: framing and valuation. In the framing phase, investors analyze the choices and frame the effective acts, contingencies, and outcomes (Tversky and Kahneman, 1992). The framing phase is impacted by the manner in which the problem is presented as well as by the norms, habits, and expectancies of the investor. In the valuation phase, investors determine the value of each alternative and choose the preferred opportunity.

Expected utility theory says investors are risk averse with a concave value (utility) function. With prospect theory, outcomes are expressed as deviations (both positive and negative) from a reference point; the value function is S-shaped, with the curve concave for gains and convex for losses.

A final important property of the prospect theory value function relates to investor loss aversion. Investor response to a loss is more extreme than to a gain. In addition to an S-shaped value function, therefore, the slope of the utility function under prospect theory is steeper for losses than for gains.

Investor Utility Function

While Markowitz [1952] assumes constant relative risk aversion, Tversky and Kahneman [1992] propose the following two-part value function:

$$v(x) = x^a \text{ if } x \geq 0$$

$$-\lambda(-x)^a \text{ if } x < 0$$

where x is the outcome premium, α measures the sensitivity to increasingly large gains or losses, and λ is the loss aversion coefficient.

The loss aversion hypothesis of prospect theory is based on clinical studies of investor actions (Shumway, 1997). Tversky and Kahneman [1992] observe that investors find an outcome acceptable if the probability of a gain is nearly twice that of a loss. Using a non-linear regression procedure, they find the parameter estimates to be 2.25 for λ(loss aversion), and 0.88 for α (risk aversion).

Application

Investors who choose the covered call investment strategy are believed to be risk averse. By selling a call option on the index that the investor purchases, the investor is in essence trading some of the upside potential of the index for an upfront call premium. The call premium provides guaranteed, immediate cash flow and can be used to mitigate a decrease in price of the stock index, should it decline.

The investor's reference point for distinguishing between gains and losses is an important component of the prospect theory model. We presume the reference point is zero.[10]

Table 3 presents the results for the loss aversion utility function. Regardless of the duration of the call, the covered call portfolio always yields the higher investor utility. With just-in-the-money one-month options, investor utility for the index alone is –0.001534, while the covered call utility is 0.011465. This difference in investor utility is highly significant.

For the just-in-the-money six-month contracts, the investor utility is positive for both portfolio investment strategies, but utility is maximized with the covered call portfolio strategy; this result holds despite the lower mean return for the covered call strategy observed in Table 1. For the just-out-of-the-money one-month call portfolio investment strategy, we again find negative investor utility for the index portfolio and positive investor utility for the covered call portfolio. This difference in utility is also highly significant. The results appear to justify the existence of the covered call portfolio strategy when investors are loss averse.

Table 3. *Prospect Theory Loss Aversion Utility Results for the S&P 500 Index Portfolio and the Covered Call Portfolio.*

Portfolios	Utility	p-value
A. Just in the Money One Month Calls		
Index Portfolio	–0.001534	0.0037***
Covered Call Portfolio	0.011465	
B. Just in the Money Six Month Calls		
Index Portfolio	0.043635	0.7581
Covered Call Portfolio	0.047967	
C. Just out of the Money One Month Calls		
Index Portfolio	–0.002903	0.0003***
Covered Call Portfolio	0.010896	
D. Just out of the Money Six Month Calls		
Index Portfolio	0.045391	0.8757
Covered Call Portfolio	0.047017	
E. Deep out of the Money Six Month Calls		
Index Portfolio	0.050365	0.4304
Covered Call Portfolio	0.057126	

*, **, *** indicate significance at the 0.10, 0.05, or 0.01 level of significance, respectively.

Note: The p-values reported are a result of the utility function comparisons for the index portfolio and the covered call portfolio.

Ex Ante Test

To confirm the results using an alternative sampling period, we conduct the following ex ante study. Using the existing data set for one-month options, we select the first eighty data points and calculate the mean returns and loss aversion utility for both one-month nearby options.[10] We use the results to compute a mean return and standard deviation for the sample, and then compute a theoretical call option price using Black–Scholes [1973].[12] We compute the portfolio moments and utility using the theoretical call price applied to the remaining observations in the original sample, and compare the covered call portfolio based on a theoretically priced call applied to the remaining observations to an index portfolio strategy for the remaining observations. Table 4 reports the results for the first four moments for each sample.

The covered call portfolio continues to earn a higher mean return for the first subsample. The results are significant for the just-out-of-the-money one-month call portfolio, with a mean return of 0.758% for the index portfolio and 1.25% for the covered call portfolio (p-value = 0.0529). As with the full sample, the covered call portfolio also has a lower standard deviation than the index portfolio and is more highly negatively skewed for both the one-month just-in-the-money and one-month just-out-of-the-money investing strategies.

For the remaining data points, the risk (as measured by the standard deviation) is lower for the covered call portfolio. However, the mean return is greater for the index portfolio for both the just-in-the-money and just-out-of-the-money investing strategies (the results are not statistically significant). This result may reflect evidence found by Yan [2000], who notes there are premiums priced in options that do not reflect the theoretical price obtained by using Black–Scholes.

Despite the mean returns for the theoretically priced options, the loss aversion utility of the covered call portfolio remains superior to the utility of the index portfolio (Table 5). The loss aversion utility is statistically significant for both portfolios when evaluating the first subsample for both nearby contracts (p-value of 0.0025 for the just-in-the-money portfolio, and 0.0001 for the just-out-of-the-money portfolio).

For the theoretically priced covered call portfolios, for the just-in-the-money portfolio, the loss aversion utility for the theoretically priced options is 0.0174; utility is 0.0103 for the index portfolio. While the utility is superior for the covered call portfolio, it is not sta-

Table 4. *Summary Statistics for the Return Distributions Using a Split Sample for the S&P 500 Index and for a Covered Call Portfolio*

	Index Portfolio	Covered Call Portfolio	p-value
Just in the Money One Month Options			
First 80 Observations			
Mean Return (%)	0.836	1.132	0.3238
Median Return (%)	1.380	1.580	
Standard Deviation (%)	4.280	2.740	
Skewness	–1.140	–5.590	
Kurtosis	12.190	40.340	
Remaining Observations			
Mean Return (%)	1.32	1.29	0.9271
Median Return (%)	1.56	1.67	
Standard Deviation (%)	2.51	1.04	
Skewness	–4.86	–2.49	
Kurtosis	–0.35	4.96	
Just Out of the Money One Month Options			
First 80 Observations			
Mean Return (%)	0.758	1.25	0.0529*
Median Return (%)	1.170	1.73	
Standard Deviation (%)	4.290	3.07	
Skewness	–1.070	–4.53	
Kurtosis	12.050	29.23	
Remaining Observations			
Mean Return (%)	1.47	1.39	0.8302
Median Return (%)	1.90	2.06	
Standard Deviation (%)	2.76	1.59	
Skewness	–0.76	–2.17	
Kurtosis	–0.03	3.63	

*, **, *** indicate significance at the 0.10, 0.05, or 0.01 level of significance, respectively.

Note: Returns are calculated using the first 80 observations and then calculated using the remaining observations. The covered call for the remaining observations is the theoretically priced covered call based on parameters obtained from the first 80 observations and applied to the Black-Scholes model to arrive at a call price. The p-values reported are a result of the mean comparisons for the index portfolio and the covered call portfolio.

Table 5. *Loss Aversion Utility Function Values for the Ex Ante Sample Using a Split Sample for the S&P 500 Index and for a Covered Call Portfolio*

Portfolios	Utility	p-value
A. Just in the Money One Month Calls		
First 80 Observations		
Index Portfolio	–0.0052	0.0025***
Covered Call Portfolio	0.0114	
Remaining Observations		
Index Portfolio	0.0103	0.3214
Covered Call Portfolio	0.0174	
B. Just out of the Money One Month Calls		
First 80 Observations		
Index Portfolio	–0.0066	0.0001***
Covered Call Portfolio	0.0103	
Remaining Observations		
Index Portfolio	0.0113	0.464
Covered Call Portfolio	0.0159	

*, **, *** indicate significance at the 0.10, 0.05, or 0.01 level of significance, respectively.

Note: The covered call for the remaining observations is the theoretically priced covered call based on parameters obtained from the first 80 observations and applied to the Black-Scholes model to arrive at a call price. The utility is calculated using prospect theory's loss aversion. Reported p-values compare the utility functions for the index portfolio and the covered call portfolio.

tistically significant. This is probably a result of the lower premiums associated with theoretically priced calls, which reduce investor utility when selling calls.

The results are consistent for the first subsample and the full sample. Investor utility from a loss aversion perspective is enhanced with a covered call investing strategy, even when the covered call portfolio is created with a portfolio of theoretically priced options (albeit the result is not statistically significant). We also perform a similar analysis using the last eighty data points as the first subsample. We derived the same conclusions, and, moreover, the better performance of the covered call portfolio was statistically significant.

Conclusion

Financial advisers must create portfolios to meet their clients' needs. An investment strategy that increases returns at lower levels of risk would certainly be a valuable addition to an advisor's offerings. Mean–variance efficiency discounts the possibility of the existence of such an investment strategy. This belief is supported by research that considers portfolios consisting of calls priced theoretically according to the Black–Scholes option pricing models. Because call writers overprice options to cover the uncertainty associated with estimating volatility for assets, there does appear to be evidence that a covered call portfolio's returns are superior to the returns earned by strictly holding the stock index.

Since the distribution of returns for a covered call portfolio does not conform to a normal distribution, it is appropriate to consider alternative investor utility functions. For highly risk-averse investors as represented by the Gordon utility function (decreasing absolute and increasing relative risk aversion), the covered call portfolio is preferred, although the results are not statistically significant. For the negative exponential utility function and just-out-of-the-money one-month calls, the improvement in investor utility using the covered call strategy is statistically significant at reasonable levels of risk aversion. Although we test portfolio preference at extreme levels of risk aversion $\beta = 10$ or 20), estimates suggest the risk aversion coefficient is closer to 1 (Mehra and Prescott, 1985).

The literature on the equity premium puzzle offers two explanations for the excess premium associated with risky investments: excessive levels of investor risk aversion, or a combination of moderate investor risk aversion with moderate levels of investor loss aversion (Benartzi and Thaler, 1995). Since the likelihood of extreme investor risk aversion seems implausible, we turn to loss aversion as an explanation of investor behavior.

With a one-month investing horizon, investor utility is significantly enhanced with a covered call portfolio strategy. The covered call offers the investor an upfront payment in exchange for some of the upside potential of the index. Since the call writer also purchases the index, one potential loss to be sustained is an opportunity: If the index increases in value, the call writer will be forced to surrender the index at the exercise price instead of selling it at the open market price. However, if the index decreases in value, the call will not be exercised and the call premium payment can be used to offset the loss associated with the decline in index value. Thus investor loss is mitigated.

For six-month calls, investor utility is also improved, although not significantly. Research indicates loss-averse investors are more likely to accept risky investments if they evaluate them less frequently (Samuelson, 1963). For example, if an investor evaluates portfolio returns on a semiannual basis, the additional risk of the index portfolio would not take on the same level of disutility as if the returns were assessed monthly. The smoothing of variability of portfolio returns over the extended portfolio evaluation period makes the variability of the index returns more palatable to the investor, thus decreasing the utility of the covered call portfolio.

These results appear to justify the existence of a covered call portfolio strategy and are of interest to portfolio managers. For a typical investor, the covered call portfolio appears to be the preferred strategy. Because portfolio managers work with a range of investors whose attitudes toward risk vary, the covered call portfolio may be the most appropriate strategy for many of them.

NOTES

1. The authors are grateful to Tyler Shumway for sharing his data. The one-month and six-month covered call investment strategies presume the investor sells one option at the bid price reported on the first transaction on the option contract on the Tuesday either one month or six months prior to contract expiration; the position is evaluated with the first transaction on the Tuesday prior to the contract's expiration.
2. The data exclude several months due to insufficient trading activity on the nearby contract. Our sample size is 105 monthly holding periods for just-in-the-money contracts, and 101 monthly holding periods for just-out-of-the-money contracts. For six-month contracts, the sample sizes are 34 and 32, respectively.
3. There are two types of at-the-money contracts: just in the money or just out of the money. We examine each type in turn. We then evaluate deep-out-of-the-money contracts with six months to expiration.
4. A deep-out-of-the-money call is the contract with the largest spot price/exercise price that is still trading. Just-in-the-money contracts have a call price/exercise price less than or equal to \$5.00; just-out-of-the-money contracts have an exercise price/call price of less than or equal to \$5.00.
5. The variation in index portfolio returns is a function of the number of monthly holding periods in the samples: 105 months for just-in-the-money contracts, and 101 months for just-out-of-the-money contracts.
6. For a complete explanation of the alternative utility functions and the assumptions associated with each, see Board, Sutcliffe and Patrinos [2000].
7. Table 3 reported results for one-month call writing contracts. None of the results for six-month contracts are statistically significant and are therefore not reported here.
8. We varied the values of κ to range from 0.1 to 5, and found the results consistent for all values of k tested. Table 4 reports the results for $\kappa = 3$.
9. The Gordon, Paradis, and Rorke [1972] model is a power utility function that assumes investors have decreasing absolute risk aversion but increasing relative risk aversion.
10. Alternative reasonable reference points would be the risk-free rate or the unhedged portfolio's return. We do not consider these because both vary over time. We do expect the results to be consistent using these alternative reference points.
11. Note that we chose to sample eighty data points in order to guarantee enough remaining observations (twenty-five for just-in-the-money one-month calls, and twenty-one for just-out-of-the-money one-month calls) to presume the normality of returns assumption holds. We also tested using alternative splits of the data and found the results to be consistent. We only study one-month sample period observations since the sample size for six-month options is too small for the data to be segmented.
12. Note that the Black–Scholes model assumes prices are log-normal. This implies that the representative investor has power utility. Under these assumptions, an investor who values extreme gains less highly than the representative investor will benefit from the covered call strategy—assuming fair pricing and no transactions costs.

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