Revisiting Covered Calls and Protective Puts: A Tale of Two Strategies

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Abstract

This paper examines the historical risk-adjusted returns of two hedging strategies designed to minimize downside market risk: Protective-puts and covered-calls. Using US market data from 1993 to 2020, we find that covered-call strategies outperform the buy-and-hold strategy on a raw and risk-adjusted basis over the entire sample and these excess returns appear to be consistent over time. After factoring in transaction/trading costs and income tax implications, the returns for the out-of-the-money call options maintain both significantly higher raw and risk-adjusted returns than the buy-and-hold strategy. We also find the opposite results hold for the protective put strategy: This strategy not only significantly underperforms the buy-and-hold strategy from a raw and risk-adjusted return standpoint, it actually significantly increases the probability of incurring losses each month. Finally, we evaluate the overall utility of various covered call strategies for loss averse investors, using the standard prospect theory utility function. Here, we find that out-of-the-money covered-call options yield the highest utilities for investors with less than average loss aversion, while in-the-money covered call options become more favorable as loss aversion increases.

Keywords: covered calls; trading strategies; protective puts; prospect theory

One major challenge that most financial planners encounter is their clients' exceedingly high expectations of receiving exceptional returns without taking any risks or incurring losses in their portfolio. Anybody that has managed other people's investments have likely experienced various levels of client "loss aversion". This "loss aversion" level, by which losses incurred in their portfolio are felt more strongly (i.e. they "loom larger") than similar gains in their portfolio (Kahneman & Tversky, 1979). This aversion plays a conflicting role in how financial planners allocate portfolio structures, balancing between their clients' happiness/satisfaction and the optimal expected returns of their portfolio. Thus, it seems sensible to study the performance of various trading strategies that employ an element of both a. participation in the stock market and b. protection (hedge) against stock market losses. Furthermore, we believe that it's beneficial to analyze not only the raw and risk-adjusted returns of these strategies, but also to view it from a risk/loss aversion standpoint. (Hastie and Dawes, 2001).

Two such trading strategies that have been previously analyzed in academic literature are covered-call (CC) and protective-put (PP) strategies. These two strategies, which employ call and put options accompanied by a long position in the market index, provide a protective element against losses if the overall stock index were to lose value over time while still maintaining a long position in the overall stock market index. More specifically, the covered-call strategy sells call options on the stock market index, which produces additional income for an investor (Tergesen, 2001), while providing at least partial protection from downside risk (Crawford, 2005). This income essentially "deadens the blow" on the overall portfolio performance if the stock market decreases in value at or before the expiration of the call option. The trade-off of this strategy is that it concedes any outstanding upside performance of the stock index above the call strike price (assuming that the strategy is 100% hedged), as any gains in the long position will be deducted by the value of the in-the-money call option. The second evaluated strategy, the protective put (PP) strategy, is more straight-forward: It buys put options to protect their long stock market portfolio from losses. Here, the investor pays a premium for this option, but is able to recoup the losses of their long position if the stock market index decreases in value.

Previous Literature

In previous literature, covered-call strategies (CC), also called “buy-write” strategies have historically posted promisingly strong performance, based on historical empirical analyses (Whaley, 2002; Feldman and Roy, 2005, and Hill et al., 2006), despite the theoretical frameworks which contradict such strong performance (Rendleman, 2001). Shefrin and Statman (1993) evaluated covered-calls from a prospect theory standpoint, and found that this strategy would be most beneficial for individuals that are highly risk (loss) averse. Recently, Brooks et al. (2019) found that the “superior performance” of the covered call strategy on the S&P500 are “spurious” as they ignore or dismiss skewness. In this paper, we report skewness and kurtosis in our results, but will refrain from conducting alternative measures of risk-adjusted performance, as we believe that skewness and kurtosis is an indication that the trading strategy has effectively minimized downside risk. Additionally, risk adverse investors generally prefer greater positive skewness and low kurtosis for the same reason.

Another strategy employed to protect against downside market risk is to buy put options on the stock index, which increase in value when the index decreases. Aggarwal and Gupta (2013) examined both covered-call and protective put strategies for India’s CNX Nifty index. They found that both strategies could outperform the benchmark on a risk-adjusted basis. They also found that the protective put strategy outperforms the covered-call strategy for both a risk-adjusted performance and hedging effectiveness standpoint. On the other hand, Israelov (2019) recently evaluated the benefits of protective puts, and deemed the results “pathetic” in protecting investors from losses.

This would not be the first report of a once beneficial and profitable trading strategy/anomaly posting diminished excess returns over time. Popular anomalies such as momentum investing (Jegadeesh & Titman, 1993), end-of-the-week/month/year/holiday effects (French, 1980; Gibbons and Hess, 1981; Keim, 1983; Ariel, 1987; Ariel, 1990) have either diminished or disappeared in recent years (Dolvin and Foltice, 2017; Robins and Smith, 2016; Robins and Smith, 2017; Robins and Smith, 2019). Thus, we believe that it’s worthwhile to revisit these strategies with more recent data in order to determine their efficacy over time.

This paper seeks to examine the historical risk-adjusted returns of two strategies designed to minimize downside market risk: Protective-puts and covered-calls, using US data from 1993 to 2020. We find that covered-call strategies outperform the buy-and-hold strategy on a raw and risk-adjusted basis over the entire sample and these excess returns appear to be consistent over time. We also find the opposite results for the protective put strategy: Not only is this strategy inefficient from a raw and risk-adjusted return standpoint, it actually significantly increases the probability of incurring losses each month. Finally, we evaluate the overall utility of various covered call strategies for loss averse investors, using the prospect theory utility function (Kahneman and Tversky, 1979). Here, we find that out-of-the-money call options yield the highest utilities for investors with less than average loss aversion, while in-the-money covered call options become optimal as loss aversion increases.

Methodology

For this analysis, we use monthly data from March 1993, when the "SPY" ETF commenced trading, to September 2020 (when the data for this manuscript was compiled). Total returns are computed by adding the capital gains (losses) by the quarterly dividend yield paid out each quarter.[1] We buy (sell) 1-month put (call) options at the beginning of each month and use the ITM payout at expiration at the end of the month.[2] According to Figelman (2008), it is better to implement short-dated calls for the covered-call strategy, about one month until expiration.

Option premiums are calculated using the Black-Scholes-Merton option pricing model, with dividends (Black and Scholes, 1973). In this analysis, we employ a spectrum of strike prices, according to the closing price of the SPY at the beginning of each month, ranging from out-of-the-money by 5% and increasing by 1% up to 5% in-the-money strike prices. We use the VIX as our proxy for volatility in our Black-Scholes option pricing each month.[3] Monthly "risk-free" rates were retrieved from French's Data Library (French, 2020). For the initial analysis, we assume that both option strategies are fully hedged (100 shares of SPY = 1 put or call contract per month).

Results

In Exhibit 1, we analyze the monthly returns of the covered call strategies against the buy-and-hold strategy of holding the SPY ETF on its own. Here, we find that the performance of the strategies of the 5% OTM up to the 2% ITM outperform the buy-and-hold strategy by up to 49 basis points on a raw monthly return basis. Furthermore, all CC strategies post lower portfolio

[1] We add dividends to the total returns only on the months that it is paid out.
[2] We acknowledge that, historically, options mainly expired on the third Friday of each month. However, SPY options now trade each month with numerous expiration dates, including the first and last trading days of each month.
[3] The VIX is the implied volatility of the S&P500 Index options.

return volatility than the buy-and-hold strategy. The buy-and-hold strategy has historically yielded a total monthly loss in 37% of the 331 months analyzed. As the covered-call strategy decreases in strike price (thereby, becoming more in-the-money), the frequency of negative monthly returns decrease from 31% down to 7% of the analyzed months. All covered-call strategies significantly decrease the probability of negative returns each month, based on a one-sided binomial probability test. Unsurprisingly, we see decreasing skewness and increasing kurtosis on the returns as the covered call option strategies are sold in-the-money.

When we examine the returns on a risk-adjusted basis, we find outperformance for all covered-call strategies using Sharpe ratios (Sharpe 1966, 1994). Further, we use the Capital Asset Pricing Model (Merton, 1973) to find each strategies average excess return, alpha, after factoring in systematic (beta) risk. Again, we find significant excess returns for all but two strategies, up to 0.59% per month.

Exhibit 1. Monthly Buy-and-Hold (B&H) returns compared to covered-call (CC) strategy returns: 3/1993 to 9/2020.

N=331	*B&H*	*CCOTM5*	*CCOTM4*	*CCOTM3*	*CCOTM2*	*CCOTM1*	*CCATM*	*CCITM1*	*CCITM2*	*CCITM3*	*CCITM4*	*CCITM5*
Mean	0.85%	1.30%***	1.33%***	1.34%***	1.31%***	1.23%***	1.12%*	0.98%	0.86%	0.73%	0.61%	0.52%
St. Dev.	0.042	0.039	0.037	0.034	0.031	0.028	0.025	0.022	0.019	0.017	0.014	0.012
Correl.	NA	0.983	0.975	0.963	0.943	0.916	0.881	0.840	0.790	0.741	0.696	0.640
Skewness	-0.573	-0.732	-0.903	-1.115	-1.355	-1.602	-1.862	-2.126	-2.401	-2.649	-2.889	-3.141
Kurtosis	1.167	0.797	1.028	1.501	2.249	3.331	4.824	6.697	9.011	11.717	14.987	18.995
Neg. Perf.	37%	31%*	31%**	29%**	27%***	24%***	21%***	17%***	14%***	11%***	9%***	7%***
Sharpe	0.152	0.282	0.307	0.329	0.350	0.361	0.361	0.351	0.340	0.316	0.284	0.260
Beta	1.000	0.894	0.843	0.777	0.698	0.611	0.522	0.436	0.356	0.289	0.232	0.182
Alpha	0.00%	0.49%*	0.55%**	0.59%**	0.59%***	0.56%***	0.48%***	0.39%**	0.30%**	0.20%*	0.11%	0.04%
% Exercised	NA	13.5%	18.1%	29.6%	33.1%	52.0%	61.6%	70.1%	77.6%	84.3%	88.5%	90.6%

Covered-call strategies above are listed from left to right, from 5% out-of-the-money options, increasing by 1% up to 5% in-the-money strike prices. Difference of means and "alphas" ("Buy and hold" as the benchmark) (paired two-sample T-test)
Difference of probability of negative performance ("Buy and hold" as the benchmark) (one-sided binomial probability test)
*significant at $p < 0.05$; ** significant at $p < 0.01$; ***significant at $p < 0.001$

In Exhibit 2, we analyze the returns of the protective put strategies against the same buy-and-hold strategy over the entire sample. Here, we find the opposite results in terms of performance against the buy-and-hold strategy: All protective put strategies significantly underperform the B&H strategy. Worse, they significantly increase the likelihood of negative returns each month, from 37% each month (buy and hold strategy) up to 75% of the time (3% in-the-money PP strategy). The risk-adjusted Sharpe ratios and CAPM "alphas" further support these ineffective results. The "pathetic" results on protective puts found in Israelov (2019) are hereby confirmed in this analysis: Protective puts do not protect against monthly losses, they appear to increase them. Thus, the forthcoming sections of analysis will only evaluate the covered-call strategies.

Exhibit 2. Monthly Buy-and-Hold (B&H) returns compared to protective-put (PP) strategy returns.

N=331	*B&H*	*PPOTM5*	*PPOTM4*	*PPOTM3*	*PPOTM2*	*PPOTM1*	*PPATM*	*PPITM1*	*PITM2*	*PPITM3*	*PPITM4*	*PPITM5*
Mean	0.85%	0.52%***	0.43%***	0.31%***	-0.12%***	0.06%***	-0.07%***	-0.18%***	-0.26%***	-0.28%***	-0.28%***	-0.24%***
St. Dev.	0.042	0.039	0.034	0.032	0.040	0.027	0.024	0.020	0.017	0.013	0.011	0.009
Correl.	NA	0.966	0.955	0.938	0.946	0.894	0.861	0.820	0.771	0.709	0.623	0.542
Neg. Perf.	37%	40%	41%	44%	40%	52%***	58%***	64%***	71%***	75%***	73%***	69%***
Sharpe	0.15	0.09***	0.07***	0.04***	-0.08***	-0.05***	-0.11***	-0.19***	-0.27***	-0.36***	-0.45***	-0.52***
Beta	1.000	0.819	0.768	0.712	0.884	0.564	0.478	0.389	0.303	0.224	0.157	0.106
Alpha	0.00%	-0.25%	-0.32%	-0.41%*	-0.91%***	-0.59%***	-0.68%***	-0.75%***	-0.79%***	-0.78%***	-0.74%***	-0.68%***
% Exercised	NA	9.4%	11.5%	15.7%	22.4%	29.9%	38.2%	48.0%	61.9%	70.4%	81.0%	86.7%

Difference of means, Sharpe rations and "alphas" ("Buy and hold" as the benchmark) (two-sample T-test)
*significant at p < 0.05; ** significant at p < 0.01; ***significant at p <0.001
Difference of probability of negative performance ("Buy and hold" as the benchmark) (one-sided binomial probability test)
*significant at p < 0.05; ** significant at p < 0.01; ***significant at p <0.001

Exhibits 3 and 4 split the data into halves, based on time, and we follow a similar process of analyzing returns in order to determine if the excess returns are primarily driven in either sub-group. Here, we find evidence that the excess returns have not diminished over time and remain consistently strong across both sub-periods. In addition to excess raw returns in both sub-periods, we find mostly significantly lower volatility in these strategies as well as significantly decreased likelihoods of negative monthly returns.

Exhibit 3. Monthly Buy-and-Hold (B&H) returns compared to covered-call (CC) strategy returns: March 1993 to Dec. 2006.

N=166	*B&H*	*CCOTM5*	*CCOTM4*	*CCOTM3*	*CCOTM2*	*CCOTM1*	*CCATM*	*CCITM1*	*CCITM2*	*CCITM3*	*CCITM4*	*CCITM5*
Mean	0.93%	1.38%***	1.42%***	1.42%***	1.39%**	1.33%**	1.22%*	1.11%	0.99%	0.87%	0.74%	0.64%
St. Dev.	0.042	0.037	0.035	0.033	0.030	0.027	0.023	0.020	0.017	0.015	0.013	0.011
Correl.	NA	0.985	0.976	0.963	0.940	0.908	0.869	0.818	0.761	0.706	0.663	0.605
Skewness	-0.555	-0.710	-0.886	-1.117	-1.384	-1.668	-1.992	-2.320	-2.676	-3.046	-3.433	-3.865
Kurtosis	0.857	0.783	1.047	1.610	2.484	3.768	5.629	8.035	11.172	15.134	20.064	26.035
Neg. Perf.	39%	31%*	30%*	29%**	27%***	22%***	19%***	17%***	13%***	11%***	7%***	5%***
Sharpe	0.150	0.283	0.309	0.332	0.356	0.374	0.380	0.381	0.375	0.355	0.319	0.292
Beta	1.000	0.911	0.856	0.782	0.696	0.602	0.506	0.414	0.331	0.261	0.207	0.159
Alpha	0.00%	0.49%	0.55%*	0.57%*	0.59%*	0.56%**	0.50%**	0.42%**	0.34%*	0.24%*	0.13%	0.06%

Difference of means and "alphas" ("Buy and hold" as the benchmark) (paired two-sample T-test)
Difference of probability of negative performance ("Buy and hold" as the benchmark) (one-sided binomial probability test)
*significant at p < 0.05; ** significant at p < 0.01; ***significant at p <0.001

Exhibit 4. Monthly Buy-and-Hold (B&H) returns compared to covered-call (CC) strategy returns: Jan. 2007 to Sept. 2020.

N=165	*B&H*	*CCOTM5*	*CCOTM4*	*CCOTM3*	*CCOTM2*	*CCOTM1*	*CCATM*	*CCITM1*	*CCITM2*	*CCITM3*	*CCITM4*	*CCITM5*
Mean	0.77%	1.21%***	1.25%***	1.26%***	1.22%**	1.13%*	1.01%	0.85%	0.73%	0.59%	0.48%	0.40%
St. Dev.	0.045	0.040	0.038	0.036	0.033	0.030	0.027	0.024	0.021	0.018	0.016	0.013
Correl.	NA	0.981	0.973	0.962	0.945	0.922	0.892	0.859	0.815	0.771	0.723	0.670
Skewness	-0.576	-0.745	-0.911	-1.107	-1.323	-1.539	-1.749	-1.965	-2.185	-2.359	-2.517	-2.675
Kurtosis	1.338	0.810	1.011	1.410	2.061	2.997	4.242	5.792	7.636	9.704	12.180	15.352
Neg. Perf.	35%	31%	31%	29%	28%*	26%**	23%***	18%***	14%***	12%***	10%***	9%***
Sharpe	0.154	0.281	0.304	0.326	0.344	0.349	0.344	0.327	0.312	0.284	0.258	0.236
Beta	1.000	0.880	0.832	0.772	0.699	0.618	0.534	0.453	0.376	0.310	0.251	0.200
Alpha	0.00%	0.50%	0.56%	0.60%*	0.60%*	0.55%*	0.47%*	0.36%	0.27%	0.17%	0.09%	0.03%

Difference of means and "alphas" ("Buy and hold" as the benchmark) (two-sample T-test)
Difference of probability of negative performance ("Buy and hold" as the benchmark) (one-sided binomial probability test)
*significant at p < 0.05; ** significant at p < 0.01; ***significant at p <0.001

In Exhibit 5, we include a 5-10% transaction cost to each of the options trading strategies. Today, most retail investors can trade options for only $.65 per contract (Bieber, 2022), but they also have to contend with the bid/ask spread. For robustness purposes, we use a higher percentage of costs than most SPY options are currently traded at. For options out-of-the-money by 3-5%, we employ a 10% transaction fee as bid/ask spreads are wider with out-of-the-money call options.[4] We also increased the transaction fees for out-of-the-money options to factor in a possible volatility smile (Yan, 2011).[5] In Exhibit 5, we find that the out-of-the-money returns hold their significantly higher monthly returns compared to the buy-and-hold strategy. Sharpe ratios and alphas also remain significantly higher after factoring transaction costs.

Exhibit 5. Monthly Buy-and-Hold (B&H) returns compared to covered-call (CC) strategy returns: With 5% (10% for options 3-5% OTM) transaction fees for option trading.

N=331	*B&H*	*CCOTM5*	*CCOTM4*	*CCOTM3*	*CCOTM2*	*CCOTM1*	*CCATM*	*CCITM1*	*CCITM2*	*CCITM3*	*CCITM4*	*CCITM5*
Mean	0.85%	1.22%***	1.24%***	1.22%***	1.23%***	1.14%**	1.00%	0.84%	0.69%	0.52%	0.36%*	0.24%**
St. Dev.	0.045	0.039	0.037	0.034	0.032	0.029	0.025	0.022	0.019	0.017	0.014	0.012
Correl.	NA	0.984	0.976	0.965	0.945	0.919	0.886	0.847	0.799	0.752	0.709	0.657
Skewness	-0.573	-0.774	-0.949	-1.168	-1.388	-1.645	-1.919	-2.202	-2.497	-2.771	-3.041	-3.327
Kurtosis	1.167	0.854	1.105	1.608	2.324	3.441	4.989	6.950	9.382	12.252	15.746	20.053
Sharpe	0.152	0.265	0.283	0.297	0.328	0.331	0.318	0.290	0.254	0.196	0.118	0.032
Beta	1.000	0.893	0.843	0.777	0.699	0.613	0.524	0.439	0.361	0.294	0.238	0.188
Alpha	0.00%	0.44%*	0.50%**	0.52%**	0.58%***	0.54%***	0.46%***	0.36%**	0.25%**	0.14%	0.01%	-0.08%

Covered-call strategies above are listed from left to right, from 5% out-of-the-money options, increasing by 1% up to 5% in-the-money strike prices. Difference of means, Sharpe ratio00s and "alphas" ("Buy and hold" as the benchmark) (two-sample T-test)
Difference of probability of negative performance ("Buy and hold" as the benchmark) (one-sided binomial probability test)
*significant at p < 0.05; ** significant at p < 0.01; ***significant at p <0.001

[4] For perspective, a recent 3% (5%) OTM one month call posted a 3% (6%) bid/ask spread during the trading day. An ATM one month call option traded with a 1.19% bid/ask spread.
[5] A volatility smile occurs when the implied volatility for an option increases as the strike price moves away from the current stock price.

In the final section, we add short-term capital taxes in addition to the transaction costs. For robustness purposes, we use the highest 2021 income bracket of 37% for short-term capital gains.[6] In Exhibit 6, we find that the out-of-the-money call option strategy maintains significantly higher returns (up to 39 basis points per month) over time, while continuing to post significantly positive risk-adjusted returns.

Exhibit 6. Monthly Buy-and-Hold (B&H) returns compared to covered-call (CC) strategy returns: With transaction fees and 37% taxes.

N=331	*B&H*	*CCOTM5*	*CCOTM4*	*CCOTM3*	*CCOTM2*	*CCOTM1*	*CCATM*	*CCITM1*	*CCITM2*	*CCITM3*	*CCITM4*	*CCITM5*
Mean	0.85%	1.08%***	1.10%***	1.08%***	1.09%***	1.03%**	0.94%	0.84%	0.75%	0.64%	0.54%*	0.46%**
St. Dev.	0.045	0.040	0.039	0.037	0.035	0.033	0.031	0.029	0.027	0.025	0.023	0.022
Skewness	-0.573	-0.717	-0.832	-0.969	-1.100	-1.242	-1.370	-1.473	-1.551	-1.575	-1.545	-1.487
Kurtosis	1.167	0.937	1.086	1.376	1.781	2.361	3.075	3.858	4.676	5.362	5.844	6.198
Sharpe	0.152	0.222	0.232	0.238	0.254	0.252	0.243	0.226	0.207	0.181	0.151	0.123
Beta	1.000	0.933	0.901	0.859	0.810	0.756	0.700	0.647	0.597	0.555	0.520	0.489
Alpha	0.00%	0.28%	0.31%	0.32%	0.37%*	0.34%*	0.29%*	0.23%	0.16%	0.09%	0.01%	-0.05%

Covered-call strategies above are listed from left to right, from 5% out-of-the-money options, increasing by 1% up to 5% in-the-money strike prices. Difference of means, Sharpe rations and "alphas" ("Buy and hold" as the benchmark) (two-sample T-test)
Difference of probability of negative performance ("Buy and hold" as the benchmark) (one-sided binomial probability test)
*significant at $p < 0.05$; ** significant at $p < 0.01$; ***significant at $p < 0.001$

Finally, we investigate the returns from a risk-aversion perspective: Using prospect theory to gauge overall utility for loss averse individuals. According to Tversky and Kahnemann (1992), an average investors feels losses 2.25 times more than they feel gains. This "2.25" is the loss aversion coefficient. Risk neutral investors have a loss aversion coefficient of 1.00. Secondly, we use Tversky and Kahnemann's (1992) diminishing value sensitivity factor of 0.88, as investors feel the initial gains and losses more sharply, but diminish as the gains and losses increase. The utility function of v(x) is stated below:

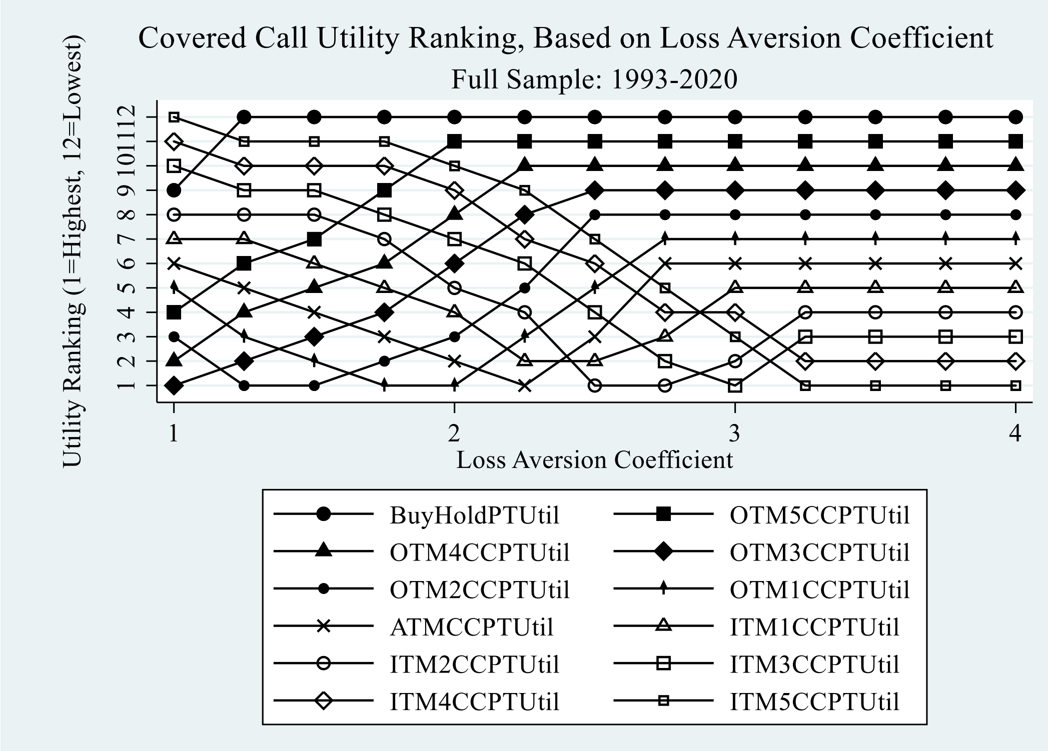
$$v(x) = \begin{cases} \mathrm{x}^{\alpha} \; if \;\; x \geq 0 \\ -\lambda(-\mathrm{x})^{\alpha} \text{ if } \mathrm{x} < 0 \end{cases} \tag{1}$$

where "α" equals the diminishing value sensitivity and "λ" equals the loss aversion coefficient. In Exhibit 5, we rank the average monthly utilities of the 12 analyzed strategies, from highest to lowest for all months and graph the rankings, from highest to lowest. Here, we find that the out-

[6] Capital losses are also incorporated for months that posted net options trading losses.

of-the-money covered call option strategies rank the best for investors with loss aversions from 1.0 to 2.0. For investors with loss aversions greater than average (>2.25), we see that the in-the-money options become the highest ranking utilities. Regardless, all covered call strategies provide a higher utility for investors than the traditional buy-and-hold strategy.

Exhibit 7. Prospect theory covered-call utility ranking, based on loss aversion coefficient: Full sample 1993-2020.



Discussion and Conclusion

This paper examines the historical risk-adjusted returns of two strategies designed to minimize downside market risk: Protective-puts and covered-calls, using US data from 1993 to 2020. We find that covered-call strategies outperform the buy-and-hold strategy on a raw and risk-adjusted basis over the entire sample and these excess returns appear to be consistent over time. After factoring in transaction/trading costs and tax implications, the returns for the out-of-the-money call options maintain both significantly higher raw and risk-adjusted returns.

We also find the opposite results for the protective put strategy: Not only is this strategy inefficient from a raw and risk-adjusted return standpoint, it actually significantly increases the probability of incurring losses each month.

Finally, we evaluate the overall utility of various covered call strategies for loss averse investors, using the prospect theory utility function (Kahneman and Tversky, 1979). Here, we find that out-of-the-money call options yield the highest utilities for investors with less than average loss aversion, while in-the-money covered call options become optimal as loss aversion increases.

Based on this analysis, it stands to reason that investors and practitioners alike could benefit from implementing a covered-call strategy and should refrain from utilizing protective puts in their overall portfolios. Not only has the covered-call strategy outperformed the buy-and-hold strategy based on raw returns, this strategy simultaneously reduces portfolio volatility and negative monthly returns. Unfortunately, past performance does not guarantee future results.

One very notable limitation of this study is the use of VIX over the "actual" implied volatility of these options in our Black-Scholes-Merton option pricing model. Historically, the implied volatility of the SPY options have not displayed the traditional volatility smile around the at-the-money strike price. Instead, the implied volatility is higher (lower) for in-the-money (out-of-the-money) call options compared to the ATM implied volatility. This reality would diminish the results found herein, possibly significantly so. On the other hand, the higher implied volatility would increase the returns of the ITM option strategies. Unfortunately, we were not able to access historical SPY option pricing or the implied volatility measures dating back to 1993, when the SPY began trading. When executing this strategy, it is important to understand the implications of lower implied volatility for OTM call options would yield less income for the seller and would reduce the returns. Before executing this strategy, investors and practitioners should review and compare whether or not the actual option pricing (based on the implied volatility) is consistent with the assumptions used in this analysis or understand how the difference of implied volatility from the VIX would impact their overall returns.

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