Original Paper

Cost-Effective Portfolio Hedging: A Dividend-funded Derivative Approach

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Abstract

This paper examines the effectiveness of using dividend yield to fund hedging protection for an S&P500 equity portfolio. We construct a hedged portfolio that consists of the S&P500 index but uses the dividend yield to purchase put option protection for hedging risk. We then compare the risk and return of the hedged S&P500 portfolio to that of an unhedged S&P500 portfolio. The trade-off reduced returns compared to the overall risk reduction are also measured. Results indicate that this risk-management strategy could be appealing to a large contingency of investors seeking down-side protection at a modest cost that is self-funded from dividends.

Keywords

dividends, options, hedging, risk-return

1. Introduction

This paper considers the degree to which the dividends derived from a market portfolio can provide an ample basis for the implementation of an impactful insurance strategy using commonly available instruments. Recognizing the efficacy of Options-Based Portfolio Insurance (OBPI) that has been established in the literature, we consider the manner in which the premiums necessary to implement such a model are funded (Leland & Rubenstein, 1976; Merton et al., 1982). More specifically, we ask whether the dividend yield associated with the S&P 500Index can provide sufficient resources to execute an effective protective put strategy.

We explore this question by evaluating the performance of an entirely dividend-funded hedged strategy relative to an unhedged portfolio. The hedged portfolio is constructed by using the index's dividend

yield to buy put options that protect against adverse market movements. Through a comparative analysis of the hedged and unhedged portfolios, we are able to identify the presence of any significant differences in the risk and return characteristics that could be indicative of protection provided by the strategy.

Our analysis focuses on identifying: (i) whether a dividend-funded strategy insures against adverse changes in portfolio value during periods of declining market conditions, (ii) the cost of such insurance in terms of the level of foregone total return, and (iii) the degree to which the approach impacts the relationship between the risk and return profiles of each portfolio. We believe this line of study represents a unique aspect of options-based portfolio insurance that extends the prior research by incorporating the manner in which the requisite premiums are funded. By focusing our analysis on more ubiquitous instruments, the results of the study may offer a risk-management strategy to a broad swath of investors that lack access to more complex or costly hedging algorithms.

2. Literature Review

Portfolio insurance techniques provide investors with the ability to benefit from market strength while establishing a floor that limits the effects of adverse changes in valuation (Pézier & Scheller, 2013; Basak, 2002). The development of portfolio insurance mechanisms began with the introduction of OBPI, which asserted that a listed put option could be used to cover an invested portfolio (Leland & Rubenstein, 1976; Bertrand & Prigent, 2004; Bouyé, 2009).

The use of dividends in the application of various option-based strategies has been recognized in the literature (Zivney & Alderson, 1986). Adding to the work of Merton et al. (1982) and Figlewski et al. (1993) regarding the viability of options-based insurance strategies, Aggarwal and Gupta (2013) provided further support for the effectiveness of the protective put strategy as a means to hedge portfolio risk. Xu et al. (2020) extended the literature by affirming the benefits associated with an OBPI strategy within their examination of the performance of various portfolio insurance techniques.

Extant research has examined the role of dividends in the application of various options. Dichtl and Drobetz (2011) explained investor affinity for portfolio insurance strategies through the lens of cumulative prospect theory. Subsequent research advanced the literature by recognizing the relationship between investor risk aversion and the perceived suitability of various forms of portfolio insurance (Tawil, 2018). The prominence of risk aversion in the decision-making processes of retail investors documented by Vijaya (2014) seems consistent with the role of loss mitigation discussed in the prior research. Our focus on methods that utilize tools to which such individuals have ready access results from the recognition of the relevance of portfolio insurance techniques to non-institutional investors.

While the portfolio insurance literature has addressed certain techniques to manage the cost of protection, little attention has been allocated to the methods by which such strategies are funded (Clark & Arnott, 1987). This paper evaluates the relationship between investor "dividend yield choice" and options trading paradigms by exploring the use of dividends to fund the execution of an OBPI strategy

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(Grammatikos, 1989).

3. Data and Methodology

The S&P 500 index serves as the basis for this analysis. Annual and quarterly returns for the index were obtained using the end of period valuations for the SPDR S&P 500 Trust ETF (Ticker: SPY). The sample is comprised of all annual (n = 25) and quarterly (n = 107) observations during the period from 1994 through 2019. [See descriptive stats in Table 1 and Table 2 below.] Bloomberg was the source of both the pricing data and the periodic dividends considered in the analysis. The number of shares in the portfolio under evaluation in each period was determined by the net asset value per share (NAV) for the SPDR S&P 500 Trust ETF and a specified notional investment value of $1 million.

Based on the reported dividend yield for the S&P 500 index and the identified magnitude of the theoretical holdings, we determined the number of S&P500 put options that could be purchased as protection against downside risk given the quoted premium presented by Bloomberg. American options closest out-of-the-money with maturities that extended slightly beyond the period of analysis served as the basis for the insurance being considered within this study. Accordingly, the quarterly analysis incorporated options with four month maturities while the annual analysis considered options expiring in thirteen months. In further consideration of options market liquidity, the selected options reflected strike prices that were intended to closely align with, but not exceed, the NAV quoted for SPY at the time of measurement.

Having accumulated the relevant data, we evaluated the level of protection provided by the option strategy using an analysis of means between the hedged and unhedged portfolios. By identifying significant differences in the returns associated with the insured and uninsured holdings, we were able to determine whether utilizing the dividend yield of the market portfolio afforded sufficient resources to enact an effective options-based risk-management paradigm.

To fully evaluate the efficacy of this strategy, we compare the annual and quarterly mean returns for the hedged and unhedged portfolios under various market conditions. Beyond the overall returns for the full period under analysis, we considered the relative performance during periods marked byrising and declining equity market valuations (measured by S&P500 returns).There were 5 declining equity market years and 29 declining equity market quarters in our sample period. [See descriptive stats in Table 1 and Table 2 below.]We also measure the risk-return tradeoff by means of the coefficient of variation in which the standard deviation of returns is divided by the average of the returns.

This analysis provided us with the ability to assess: (i) the extent to which a protective strategy limits downside risk, (ii) the cost of implementing this form of portfolio insurance in terms of the forgone return during periods of robust market performance, and (iii) the degree to which dividend-funded hedging impacts the relationship between risk and return.

4. Results

Having established the viability of OBPI as a tool to mitigate the risk associated with the market index, we considered the adequacy of the portfolio dividend yield as the funding source for our theorized option strategy. We explore the noted research questions on the basis of the hypotheses that follow.

H1: The dividend-funded options-based strategy provides sufficient resources to limit the downside risk associated with adverse market environments.

To evaluate this hypothesis, we considered the difference in the hedged portfolio returns versus its unhedged counterpart during down markets. Comparing the mean returns of the hedged and unheeded portfolios during such periods provides data that supported the efficacy of the strategy.

As shown in Tables 1 the analysis of quarterly results indicates a significant mitigating effect on portfolio returns ($p < 0.001$) when market performance was negative. The magnitude of this effect is reflected in the 64 basis point excess mean quarterly return for the hedged portfolio during periods of declining market returns (-0.0705 versus -0.0769).

Table 1. Results Using Quarterly Data

Table 1	QUARTERLY	All Markets		Market Up		Market Down	
	Statistical	Unhedged	Hedged	Unhedged	Hedged	Unhedged	Hedged
T-Test for Paired Means	Mean	0.0243	0.0229	0.0624	0.0576	-0.0769	-0.0705
	Variance	0.0064	0.0056	0.0022	0.0021	0.0037	0.0031
	T-Stat	2.2921		0.6542		-4.0568	
	P-Value	0.0239		0.5140		0.0004	
	Mean	0.0243	0.0229	0.0624	0.0576	-0.0769	-0.0705
F-Test for Variances	Variance	0.0064	0.0056	0.0022	0.0021	0.0037	0.0031
	F-Value	1.1371		1.0182		1.2061	
	P-Value	0.2547		0.4686		0.3117	
	Observations	107		78		29	
Descriptive Stats	Minimum	-21.61%	-20.62%	-0.05%	-0.36%	-21.61%	-20.62%
	Maximum	21.54%	21.19%	21.54%	21.19%	-0.54%	-0.47%
	Beta	1.0000	0.9380	1.0000	0.9380	1.0000	0.9380
	Coef. of Variation	3.2799	3.2789	0.0172	0.0183	-0.0240	-0.0217

An identical analysis based on annual data in Table 2 did not yield a significant difference between either: (i) the mean portfolio performance ($p = 0.2371$) or (ii) overall volatility ($F = 2.2523$) during years in which market returns were negative. However, the limited number of observations within the annual dataset is likely reason for this result. Despite the lack of a discernable effect using annual data,

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the significant quarterly result indicates the dividend hedging strategy may be a modestly effective tool for investors. The annual data does show that during the worst of the down market periods, the hedged portfolio drops by nearly one-third less (-24.23% versus -36.38%) than the unhedged portfolio.

H2: The dividend-funded options-based strategy is implemented at a reasonable cost level.

We start our analysis of the second hypothesis by considering the cost associated with the dividend hedging strategy. Using the quarterly data in Table 1, we evaluate the returns provided by the hedged and unhedged portfolios across the full period under evaluation by comparing the mean returns related to each approach. The significant ($p = 0.0239$) return deficit of 14 basis points realized by the hedged portfolio indicates a seemingly reasonable cost that can be ascribed to the dividend hedging methodology. The annual return difference of 91 basis points between hedged and unhedged portfolios using annual data in Table 2 is not statistically significant.

Table 2. Results Using Annual Data

Table 2	ANNUAL	All Markets		Market Up		Market Down	
	Statistical	**Unhedged**	**Hedged**	**Unhedged**	**Hedged**	**Unhedged**	**Hedged**
T-Test for Paired Means	Mean	0.1167	0.1076	0.1969	0.1776	-0.1677	-0.1363
	Variance	0.0333	0.0259	0.0110	0.0106	0.0158	0.0070
	T-Stat	1.5436		19.4578		-1.3893	
	P-Value	0.1358		0.0000		0.2371	
F-Test for Variances	Mean	0.1167	0.1076	0.1969	0.1776	-0.1677	-0.1363
	Variance	0.0333	0.0259	0.0110	0.0106	0.0158	0.0070
	F-Value	1.2853		1.0438		2.2523	
	P-Value	0.2717		0.4643		0.2255	
	Observations	25		19		5	
Descriptive Stats	Minimum	-36.38%	-24.23%	-36.38%	-24.23%	-36.38%	-24.23%
	Maximum	37.70%	34.95%	37.70%	34.95%	-4.47%	-3.71%
	Beta	1.0000	0.8761	1.0000	0.8761	1.0000	0.8761
	Coef. of Variation	1.5632	1.4949	0.5337	0.5792	-0.7502	-0.6150

H3: The dividend-funded options-based strategy enhances the risk-return relationship as measured by comparative beta (β) and the coefficient of variation (CV).

Having established a modest cost for this insurance, we moved our attention to the analysis of the effects of the strategy on the relationship between risk and return. Once again focusing on the results in Table 1 and 2, we note the risk-mitigating effects of the hedging paradigm as expressed by the reduced beta ($\beta = 0.94$) of the hedged portfolio relative to that of its unhedged equivalent ($\beta = 1.00$) for

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quarterly data. A similar pronounced reduction in volatility is also found for the hedged portfolio beta ($\beta = 0.88$) in the annual data.

In light of the identified cost of the contemplated insurance and the demonstrated reduction in risk, we considered the effect of the dividend hedging strategy on the overall risk-return relationship. To evaluate the impact of this method, we looked to the coefficient of variation for each portfolio across the full period under evaluation. Lower CV values indicate a lower amount of volatility risk taken per unit of return gained. The lower CV values for the hedged portfolio relative to the unhedged counterpart for all markets using both the quarterly (3.2799 compared with 3.2789) and annual (1.5632 compared with 1.4949) data indicates a moderately more favorable relationship between risk and return for the hedged portfolio. The critical down market periods similarly indicate that the hedged portfolio is superior in the quarterly and annual periods.

4. Conclusion

This paper builds on the OBPI literature by considering the use of dividends to fund the implementation of a portfolio hedging strategy. The analysis focuses on the effectiveness and efficiency of a risk-management technique that employs broadly available tools to limit the adverse effects of declining markets on portfolio performance. Overall, the study provides support for the viability of a dividend-funded insurance strategy based on the use of protective put options.

This study demonstrated a moderately positive performance effect for an insured portfolio relative to an uninsured comparable portfolio, indicating the efficacy of the dividend hedging strategy. Having established the risk-mitigating effects of the dividend-based approach, we were able to determine the associated cost to investors in the form of the return forfeited in order to acquire the requisite options. Finally, we determined that the dividend hedging strategy reduced the volatility of returns and facilitated a more favorable risk-return balance. Based on the finding of a discernable benefit that favorably impacted the risk-return paradigm, this study builds on extant research by introducing the dividend-funded options-based hedging strategy as an effective downside risk-management tool.

This paper considered the sufficiency of portfolio dividends as the means to pursue an OBPI strategy. It is worth noting that over 100 of the S&P 500 Index constituent companies do not pay dividends, which could have diluted the protective effect of the dividend-funded insurance strategy as presented in this study. Future research focused exclusively on portfolios of dividend paying companies could provide a better view of the risk-mitigating effects of this insurance paradigm.

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