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Niblock, Scott J; Sinnewe, Elisabeth
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Are covered calls the right option for Australian investors?

Dr. Scott J. Niblock[*]
Lecturer of Finance
School of Business and Tourism
Southern Cross University
Ph: +61 7 55893098
Email: scott.niblock@scu.edu.au

Dr. Elisabeth Sinnewe
Lecturer of Accounting
School of Accountancy
Queensland University of Technology
Ph: +61 7 31380208
Email: elisabeth.sinnewe@qut.edu.au

ABSTRACT

Purpose – This paper examines whether superior risk-adjusted returns can be generated using monthly covered call option strategies in large capitalized Australian equity portfolios and across varying market volatility conditions.

Design/methodology/approach – We construct monthly in-the-money (ITM) and out-of-the-money (OTM) S&P/ASX 20 covered call portfolios from 2010 to 2015 and employ standard and alternative performance measures. An assessment of variable levels of market volatility on risk-adjusted return performance is also carried out using the spread between implied and realized volatility indexes.

Findings – Our results show that covered call writing produces similar nominal returns at lower risk when compared against the standalone buy-and-hold portfolio. Both standard and alternative performance measures (with the exception of the upside potential ratio) demonstrate that covered call portfolios produce superior risk-adjusted returns, particularly when written deeper OTM. 36-month rolling regressions also reveal that deeper OTM portfolios deliver greater risk-adjusted returns in the majority of the sub-periods investigated. We also establish that volatility spread variation may be a driver of performance for covered call writing in Australia.

Originality/value – We suggest that deeper OTM covered call strategies based on large capitalized portfolios create value for investors/fund managers in the Australian stock market and can be executed in volatile market conditions. Such strategies are particularly useful for those seeking market neutral asset allocation and less risk exposure in volatile market environments.

Keywords Australia, Covered Call, Options, Performance, Portfolio, Volatility

Paper type Research paper

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1. Introduction

Increased market volatility and risk constraints are changing the way modern investment portfolios are managed. This is particularly the case for investors and money managers wishing to preserve capital, generate income, and/or reduce the impact of market volatility on their investment portfolios (Allen, 2015; Groothaert and Thomas, 2003). Moreover, there is growing demand for financial derivative instruments (e.g. options) which hedge downside price risk (CME Group, 2015) [1]. For instance, Cici and Palacios (2015) and Natter et al. (2016) suggest that funds are pursuing options-based strategies due to increasing demand for portfolio hedging in the retail investment environment.

Covered call writing (also known as 'buy-write') is an example of a popular options-based strategy (Allen, 2015; Board et al., 2000). The investment strategy is considered by investment practitioners and sophisticated retail investors to be fairly simple, flexible and low-risk, accounting for the majority of call options written (Hoffmann and Fischer, 2012; Lakonishok et al., 2007; McIntyre and Jackson, 2007). The covered call (see Figure 1) is essentially utilized as a 'buy-and-hold' strategy, whereby a stock is purchased (long position) and a short-dated, slightly out-of-the money (OTM) call option on the underlying stock is simultaneously written (short position) to generate income (or premium), capture limited upside price appreciation and lower overall volatility (El-Hassan et al., 2004; Figelman, 2008; Groothaert and Thomas, 2003) [2].

[Insert Figure 1]

Although the premium from call writing provides partial protection against small declines in the underlying stock price, it also creates an opportunity cost (Thomsett, 2010). For instance, call writing caps upside profits due to the writer's obligation to sell at the agreed strike price and maturity date (Hoffmann and Fischer, 2012; Kapadia and Szado, 2007). More simply, writers of covered calls receive compensation (via the premium) and liquidity for selling the upside potential of their long stock positions (Groothaert and Thomas, 2003; Israelov and Nielsen, 2014, 2015). Hence, if a call is in-the-money (ITM) and is exercised at expiry date, the positive returns of owning the stock are offset by the costs of writing the call (Groothaert and Thomas, 2003; Leggio and Lien, 2002) [3]. The merit of the strategy is therefore compromised when markets rise rapidly or are 'bullish', as the investor is not able to fully participate in strong upward movements of the stock price; consequently, resulting in underperformance versus the buy-and-hold portfolio (Figelman, 2008; Hill et al., 2006; McIntyre and Jackson, 2007) [4].

So does the covered call strategy add value for investors? And when and under what circumstances should the strategy be employed? The empirical evidence is well established in the US and generally appears to be supportive of covered call writing over the last 15 years (Han and Dadlani, 2006; Hill et al., 2006; Kapadia and Szado, 2007; Leggio and Lien, 2002; Whaley, 2002). For instance, covered call writing on US portfolios and indexes has been shown to produce similar returns to the underlying stock with considerably lower standard deviation of returns (Hill et al., 2006; Whaley, 2002). While numerous studies have examined the risk-adjusted return performance of covered calls in the United States (US), only a handful of studies have been carried out in an Australian market setting (see El-Hassan et al., 2004; Frino and Wearin, 2004; Jarnecic, 2004; Mugwagwa et al., 2012; O'Connell and O'Grady, 2014) [5].

On the basis of limited evidence, it is unclear whether covered call writing delivers superior risk-adjusted return performance above standalone buy-and-hold portfolios from an Australian market perspective. Given the perceived benefits and costs of covered call strategies, further investigation is warranted. Therefore, the aim of this paper is to investigate the risk-adjusted return performance of monthly covered call option strategies for value-weighted portfolios of S&P/ASX 20 listed companies from 2010 to 2015. For comparative purposes, we employ standard performance measures, along with alternative performance measures across a variety of market environments. An assessment of variable levels of market volatility on risk-adjusted return performance is also carried out using the monthly spread between S&P/ASX 200 implied (A-VIX) and realized volatility indexes. Hence, the research question is:

'Do covered call option strategies demonstrate risk-adjusted return outperformance in large capitalized Australian equity portfolios?'

To our knowledge, this is the first study that examines the risk-adjusted return performance of large capitalized Australian covered call portfolios using volatility indexes as a gauge of market sentiment. An in-depth analysis of covered call strategies across varied moneyness and market conditions will provide a better understanding of the role of call writing in Australian equity portfolios. The findings of this study will establish whether the strategy is a value-add for funds managers and investors pursuing less risk exposure in the Australian stock market and also be of interest to those seeking alternative investments as a result of the limited availability of Australian retail financial products (Australian Treasury, 2014). The remainder of the paper is organized as follows. Section 2 highlights key literature and introduces the research propositions. Section 3 describes the data and methods adopted. Section 4 presents the results. Section 5 discusses implications of the results and offers suggestions for future research.

2. Literature Review and Propositions

Portfolio allocation and performance are prominent topics in modern finance. Besides the theoretical implications of the empirical research associated with these topics, there are also practical implications for the development and implementation of investment strategies such as covered call option writing (O'Connell and O'Grady, 2014). There remains a considerable amount of academic scrutiny and subsequent controversy over whether covered call writing can actually deliver superior risk-adjusted return performance versus the standalone buy-and-hold market portfolio (Mugwagwa et al., 2012). For instance, both researchers and practitioners have made claims that covered call strategies demonstrate the potential to produce large returns at substantially lower risk; thereby, improving investor utility (Rendleman, 2001). Using prospect theory (Kahneman and Tversky, 1979) and hedonic framing (Thaler, 1985), Shefrin and Statman (1993) show that risk averse investors prefer various covered call positions over a stock only position, despite equal net cash flows. This behavioural perspective infers that most investors do not base their decisions purely only on risk-return payoffs but are also influenced by heuristics and frames, which often result in market inefficiencies (Shefrin, 2002).

On the other hand, there is empirical evidence to suggest that the strategy may weigh on portfolio returns and is an inefficient method of allocating wealth (Bookstaber and Clarke, 1984; Booth et al., 1985; Lhabitant, 1999; Merton et al., 1978; Mugwagwa et al., 2012). While the arguments for covered call writing are generally appealing, investors cannot simultaneously increase returns and reduce risk in a mean-variance efficient market (Leggio and Lien, 2002). Theoretically, covered call writing should reduce both risk and expected return. If this notion holds, risk averse investors that seek to exploit utility in an optimal portfolio sense will only maximize their expected return for a given level of risk. As such, Rendleman (1981, 1999) purports that there is no such thing as a 'free lunch' with covered call writing in an efficient market. The risk-adjusted return of a covered call strategy should not be different to the risk-adjusted return of the underlying stock/portfolio in the classic utility sense (Fama, 1998). Hoffmann and Fischer (2012) further assert that the strategy can only be profitable in a mean-variance framework if the writer can predict that the stock price will remain stagnant during the holding period (El-Hassan et al., 2004; Reilly and Brown, 1997) and/or if the call option is significantly overpriced due to uncertainty associated with estimating volatility (Benninga and Blume, 1985; Black, 1975; Figlewski and Green, 1999; Hill et al., 2006; Leggio and Lien, 2002; Rendleman, 2001), which would imply market inefficiencies (Black and Scholes, 1972; Fama, 1998).

The controversy surrounding Markowitz's (1952) mean-variance framework as an accurate representation of investor utility in covered call writing has been a matter of ongoing academic debate (Board et al., 2000; Leggio and Lien, 2002). Because the covered call strategy has been found to demonstrate an asymmetric (or non-normal) return distribution, a mean-variance analysis of its performance is not appropriate (Bookstaber and Clarke, 1984; Booth et al., 1985; Lhabitant, 1999; Merton et al., 1978). Claims of outperformance based on the assumption that covered call writers have quadratic utility functions and returns produced from such strategies are normally distributed can be misleading. This is particularly the case when variance is deemed to be a reliable/adequate measure of risk in an asymmetric return distribution environment (Board et al., 2000; Leggio and Lien, 2002).

Figure 2 shows that covered call writing truncates the positive tail of the distribution resulting in negative skewness and reduces the desired part of the variance; that is, upside risk (Bookstaber and Clarke, 1984). Moreover, variance treats upside risk (i.e. risk of outperformance) and downside risk (i.e. risk of underperformance) symmetrically. As investors generally prefer investments with high returns and dislike investments with low returns, using traditional mean-variance based measures (such as the Sharpe and Treynor ratios) may lead to biased conclusions when evaluating the non-linear performance/payoffs of covered call strategies (Bernardo and Ledoit, 2000; Board et al., 2000; Groothaert and Thomas, 2003; Hübner, 2016; Mahdavi, 2004; O'Connell and O'Grady, 2014). For example, standard performance measures do not account for the third and fourth moments of the return distribution (i.e. skewness and kurtosis) and may overstate performance (Lhabitant, 2000; O'Connell and O'Grady, 2014).

[Insert Figure 2]

Despite these issues, the historical return performance of covered call writing continues to challenge the concept of efficient markets (Siddiqi, 2015), with empirical studies showing that portfolio performance may be improved by pursuing covered call strategies (see El-Hassan et al., 2004; Frino and Wearin, 2004; Hill et al., 2006; Jarnecic, 2004; O'Connell and O'Grady, 2014; Whaley, 2002). Therefore, we identify two research propositions:

P_1: Superior risk-adjusted returns can be generated using covered call option strategies in S&P/ASX 20 portfolios.

P_2: Superior risk-adjusted returns can be produced using covered call option strategies in S&P/ASX 20 portfolios across varying market volatility conditions.

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3. Data and Methods

We source closing prices, strikes and expiry dates for monthly call option series of S&P/ASX 20 companies from the Thomson Reuters Tick History (TRTH) database. Price and/or dividend (including franking credit) data relating to the underlying companies and S&P/ASX 200 implied volatility (A-VIX) and realized volatility indexes are also sourced from the TRTH database. We restrict our observations to S&P/ASX 20 companies due to their size [6] and high positive correlation with the Australian stock market [7]. Further, S&P/ASX 20 constituents are heavily traded and liquid stocks, thus making them strong candidates for covered call writing. Also, the TRTH database reveals that option availability of companies outside the S&P/ASX 20 is either limited or non-existent. Mugwagwa et al. (2012) and O'Connell and O'Grady (2014) also assert that the majority of the Australian options market is illiquid, with many options series outside the S&P/ASX 20 found to be thinly traded or not traded at all on a daily basis. To ensure that our sample is not plagued by survivorship bias we determine the constituents of the S&P/ASX 20 monthly [8]. Since we base our covered call strategies on companies in the value-weighted S&P/ASX 20 index, market capitalization weights for the companies are required. These weights are estimated based on market capitalization values for the S&P/ASX 20 constituents retrieved from Morningstar DatAnalysis.

We test our covered call option strategies over a 60-month time period from September 2010 to August 2015, with the sample period determined by the availability of S&P/ASX 200 A-VIX index data (ASX, 2016a). We assume that an investor holds the underlying stock portfolio consisting of S&P/ASX 20 constituents throughout the sample period. In addition, the investor writes short-dated call options at month-end expiration date over S&P/ASX 20 companies with an expiry date in the following month to generate regular monthly income. No early exercise is assumed and positions are kept open until expiration. Trading costs relating to the strategies are also ignored. To avoid any zero premiums on the call options series under investigation the end-of-expiry month option price is in some cases substituted by the settlement price. Where settlement prices are not available for the respective series we employ the average end-of-expiry month option price over the sample period.

To estimate returns of the covered call option strategies, S&P/ASX 20 constituents and their market weights are established at month t. Relevant call option pricing data (i.e. strike price and option prices) is identified by filtering the stocks at t with an expiry date in the following month t_{+1} [9]. For stocks with multiple tradeable series in month t_{+1}, it is assumed that call options with strike prices equivalent to the stock price at month t are simultaneously written one (1) strike ITM and up to five (5) strikes OTM (Diaz and Kwon, 2016; Hill et al.

2006). Note: each strike represents the relevant price increment for individual equity options series (American Style) set by the ASX (ASX, 2016b). This equates to six (6) value-weighted S&P/ASX 20 covered call portfolios [10].

Monthly returns are established at t and are based on whether the call option is OTM or ITM at monthly expiry $t+1$. If the call option is OTM or ATM at expiry, it is assumed that it expires worthless and the writer keeps the underlying stock, option premium and dividend and franking credit (if applicable); thus, the return for month t is calculated as:

$$R_{p,t} = (P_{t+1} / P_t * \prod_{t+1}^{t} dilution_t) \tag{1}$$

where $\prod_{t+1}^{t} dilution_t$ is the product sum of any dividend (*D*), franking credit (FC) and the end-of-month call option premium *(OP)* received at *t*, while P_{t+1} and P_t are the prices of the stock at $t+1$ and *t*. Note: the dilution factor is estimated as $P_{t+1}/(P_{t+1}+D+FC+OP)$.

If the call option is ITM at expiry, exercise is assumed, the writer sells the stock to the option holder (or buyer) at the strike price and keeps the option premium, dividend, franking credit (if applicable) and any price appreciation up to the strike price; thus, the return for month t under this scenario is calculated as:

$$R_{p,t} = (S_{t+1} / P_t * \prod_{t+1}^{t} dilution_t) \tag{2}$$

here S_{t+1} is defined as the strike at expiry month $t+1$ and the dilution factor is estimated as $S_{t+1}/(S_{t+1}+D+FC+OP)$.

It should be recognized that portfolios including covered call writing generally produce non-normal return distributions due to their asymmetric nature. Mugwagwa et al. (2012) and O'Connell and O'Grady (2014) claim that traditional evaluations of covered call risk-adjusted return performance are questionable due to asymmetrical distributions and require adequate measures of risk. Such asymmetry undermines the use of traditional risk measures, as variance treats upside and downside risk symmetrically, which is deemed inappropriate when examining covered call performance (O'Connell and O'Grady, 2014). Moreover, standard performance comparisons based solely on the mean-variance framework could lead to erroneous conclusions for non-normal return distributions. Thus, any evaluation of covered call portfolio performance should not only consider first and second moments (i.e. mean and variance) but also take into account third and fourth moments (i.e. skewness and kurtosis) (Isakov and Morard, 2001) [11].

To ensure that we account for asymmetric return distributions associated with covered call portfolios, we utilize alternative 'non-linear' performance measures such as the Sortino ratio ('downside risk') (Sortino and van der Meer, 1991) and upside potential ratio ('upside risk') (Sortino et al., 2003). For comparative purposes, we employ standard 'linear' performance

measures such as the Sharpe (1966) ratio, Modigliani and Modigliani (1997) 'M^2' ratio, Treynor (1965) ratio and Goodwin (1998) information ratio. We also use a modified Jensen (1968) alpha model in ordinary least squares regression (OLS) form. With this model, alpha (α_p) is designed to capture the risk-adjusted return of the respective covered call portfolio in relation to the standalone 'benchmark' S&P/ASX 20 buy-and-hold (BH) portfolio:

$$R_{p,t} - rf_t = \alpha_p + \beta_p (R_{i,t} - rf_t) + \varepsilon_{p,t} \tag{3}$$

where $R_{p,t}$ is the monthly weighted S&P/ASX 20 covered call portfolio return; $R_{i,t}$ is the standalone monthly weighted S&P/ASX 20 BH portfolio return; and rf_t is the 30-day Australian BAB return [12]. Note: p-values from the Newey-West t-statistics are adjusted for autocorrelation up to 3 lags using the automatic observation-based lag selection approach.

For **P$_1$**, we evaluate the suite of standard performance measures specified above and establish which covered call portfolios deliver the best risk-adjusted returns versus their peer group and the standalone BH portfolio. To gain a better understanding of the risk-adjusted return performance of our covered call portfolios, we also employ the Costa et al. (2014) rolling OLS regression approach. Specifically, we break the 60-month sample period into rolling sub-periods to observe how α_p and β_p change over time. To remain consistent with Costa et al. (2014) we construct 36-month sub-periods for all portfolios under investigation. We achieve this by rolling both the beginning and ending months forward by one month to October 2010 and September 2013, respectively. We continue to roll forward in one month increments to create subsequent sub-samples until reaching the ending month of July 2015. With this approach 24 thirty-six month sub-periods from the total sample period are created. We then run the modified Jensen alpha model (as per Equation (3) above) for each sub-period of the covered call portfolio returns to validate the performance measure findings and re-visit **P$_1$**.

For **P$_2$**, we further expand the modified Jensen alpha model by observing Hill et al.'s (2006) strike price approach [13]. In our study, we test whether varying levels of implied and realized market volatility influence the risk-adjusted return performance of monthly covered call portfolios over different strike prices. Market volatility levels are determined by the monthly volatility spread between S&P/ASX 200 implied (A-VIX) and realized volatility indexes over the total sample period:

$$VS_t = IV_t - RV_t \tag{4}$$

where VS_t is the volatility spread, IV_t is annualized implied market volatility, and RV_t is annualized realized market volatility (see Figure 3). Note: we calculate RV_t by observing the

standard deviation of S&P/ASX 200 index prices over the 30-day period prior to t and then annualize.

<div align="center">**[Insert Figure 3]**</div>

To compare the risk-adjusted return performance of our covered call portfolios across varying market volatility levels, we introduce three dummy variables in Equation (5) below, which are coded 1 if *VS* observations fall within moderate volatility ($\alpha_p VSQ2$), high volatility ($\alpha_p VSQ3$) and extreme volatility ($\alpha_p VSQ4$) periods, respectively. The periods are determined by sorting *VS* observations into quartiles from smallest (*Q1*) to largest (*Q4*). We do not introduce additional dummy variables for the *VSQ1* observations to avoid the dummy variable trap. In this setting, the original intercept (α_p) represents the low volatility period ($\alpha_p VSQ1$):

$$R_{p,t} - rf_t = \alpha_p + \alpha_p VSQ2 + \alpha_p VSQ3 + \alpha_p VSQ4 + \beta_p(R_{i,t} - rf_t) + \varepsilon_{p,t} \qquad (5)$$

4. Results

4.1 Summary statistics

In Table 1 we provide summary statistics for our S&P/ASX 20 covered call portfolios, standalone S&P/ASX 20 BH portfolio and 30-day BAB. We find that all portfolios under investigation produce higher annualized total returns than the 30-day BAB (3.43%). The annualized total return of the 4-OTM and 5-OTM portfolios (9.65% and 10.10, respectively) are higher than the BH portfolio (9.59%), while the remaining covered call portfolios produce marginally lower total returns. This shows that covered call portfolios from 1-ITM up to 3-OTM nominally underperform the BH portfolio approach on a total return basis. This could be due to deeper OTM call options (such as 4-OTM and 5-OTM) having a lower probability of ending up ITM at maturity.

<div align="center">**[Insert Table 1]**</div>

In Figure 4 we illustrate that the 1-ITM and 1-OTM portfolios (-31.87% and -19.73%, respectively) generate the lowest annualized capital growth, while the 4-OTM, 5-OTM and BH portfolios (-1.72%, 0.46% and 2.92%, respectively) deliver the highest. Conversely, the 1-ITM and 1-OTM portfolios (39.89% and 27.63%, respectively) demonstrate the highest annualized income yields (i.e. gross dividend plus call premium). This is notable when compared against the income yield of the BH portfolio (6.66%). Also, all covered call portfolios demonstrate lower total and downside risk than the BH portfolio. For example, the 1-ITM portfolio produces an annualized standard deviation of 5.84% and an annualized semi-standard deviation of 4.79%, which are substantially lower than the standard deviation and semi-standard deviation of the

BH portfolio (12.03% and 8.71%, respectively). These results reveal that our covered call portfolios generate up to 50% less total risk and up to 45% less downside risk than the standard BH portfolio approach.

[Insert Figure 4]

We also find that the covered call portfolio returns are more fat-tailed (with the exception of the 5-OTM portfolio) and negatively skewed than the BH portfolio returns. Non-normal return distributions are particularly evident in the 1-ITM, 1-OTM and 2-OTM portfolios (21.66, 13.87 and 7.57, respectively), with the reported Jarque-Bera test statistics being significant at the 5% level or better. The covered call portfolios also produce a lower range of returns than the BH portfolio. For example, the 1-ITM portfolio's range of monthly returns is 8.2%, whereas the BH portfolio's range of monthly returns is 16.13%. This difference can perhaps be explained by the capping of upside return potential associated with covered call writing, along with the offsetting effect of call premiums on downside return. Further, 1-ITM and 1-OTM portfolios are exercised on average 53.43% and 39.79% of the time, respectively, during the sample period. This is significantly higher than the average exercise percentage of the 4-OTM and 5-OTM portfolios (10.61% and 6.56%, respectively). Thus, frequent exercise and associated costs may influence the performance of ITM and slightly OTM covered call strategies (Hill et al., 2006; Kapadia and Szado, 2007).

4.2 Performance measures

In Table 2 we present annualized performance measures for our S&P/ASX 20 covered call portfolios and S&P/ASX 20 BH portfolio. The Sharpe, Sortino and M^2 ratios show that covered call portfolios are less exposed to total and downside risk and generate higher risk-adjusted returns than the standalone BH portfolio. For instance, all covered call portfolios outperform the BH portfolio (0.512) using the Sharpe ratio. Of the covered call portfolios, the 1-ITM portfolio (0.787) has the highest Sharpe ratio, while the 4-OTM portfolio (0.584) has the lowest. To explain this finding in percentage terms, the M^2 (σ) ratio indicates that on a risk-adjusted return basis the 1-ITM portfolio outperforms the BH portfolio by 3.30% annually. However, the Sharpe and M^2 (σ) ratios can be problematic when considering the risk-adjusted return performance of covered call portfolios. This is due to the asymmetric nature of the strategy (i.e. negative skewness) and the use of standard deviation as the risk measure, but can be alleviated by the use of downside risk performance measures such as the Sortino and M^2 (σ_{DR}) ratios (El-Hassan et al., 2004). Again, all covered call portfolios outperform the BH

portfolio (0.707) when the Sortino ratio is applied. The 1-ITM portfolio (0.961) has the highest Sortino ratio, while the 2-OTM portfolio (0.745) has the lowest. The M^2 (σ_{DR}) ratio shows that when downside risk is considered, the 1-ITM portfolio outperforms the S&P/ASX 20 portfolio by 5.40% annually.

[Insert Table 2]

The Treynor ratios indicate that covered call portfolios are less exposed to systematic risk than the standalone BH portfolio and produce higher risk-adjusted returns. For example, all covered call portfolios outperform the BH portfolio (0.062) when the Treynor ratio is employed. Of the covered call portfolios, the 1-ITM portfolio (0.106) has the highest Treynor ratio, while the 5-OTM portfolio (0.071) has the lowest. The information ratios show that covered call portfolios have lower nominal returns and greater excess volatility compared to the standalone BH portfolio (with the exception of the deeper OTM portfolios). For instance, the information ratios are positive for the 4-OTM and 5-OTM portfolios (0.031 and 0.396, respectively) but negative for the remaining covered call portfolios, with the 1-OTM portfolio (-0.294) producing the lowest information ratio. The upside potential ratios reveal that covered call portfolios have restricted upside return potential when compared to the standalone BH portfolio (0.538). Again, this can be explained by the capped upside of the strategy. The closer to the money the call option is written, the lower the upside potential. For example, the upside potential ratios for the covered call portfolios range from 0.449 (1-ITM) to 0.534 (5-OTM).

The modified Jensen OLS regressions demonstrate that covered call portfolios (with the exception of the 5-OTM portfolio) do not generate higher risk-adjusted returns than the standalone BH portfolio. After adjusting for systematic risk, all covered call portfolios produce positive alphas. The 1-ITM portfolio (1.93%) has the highest alpha, while the 2-OTM portfolio (0.82%) has the lowest; however, only the 5-OTM portfolio alpha (0.92%) is statistically significant at the 5% level. Also, beta coefficients increase from 0.433 (1-ITM) to 0.934 (5-OTM) across the covered call portfolios and are statistically significant at the 1% level. In fact, all six regressions used to determine the beta coefficients demonstrate significant explanatory power, with adjusted R^2 ranging from 0.793 (1-ITM) to 0.992 (5-OTM). This is to be expected as the covered call portfolios are basically an extension of the BH portfolio; whereby, the lower/higher the effect of the premium, the higher/lower the association between the covered call portfolio returns and the BH portfolio return.

Overall, covered call portfolios produce superior risk-adjusted returns when they are written 5-OTM and offer reasonable risk-adjusted returns when written at 1-ITM, 3-OTM and

4-OTM. On the other hand, the 1-OTM and 2-OTM covered call portfolios do not appear to perform as well. Also, writing covered calls beyond 5-OTM does not add value on top of a naïve BH portfolio approach (as evidenced by the comparable upside potential ratios of the 5-OTM and BH portfolios). This could be explained by the relatively smaller premiums and lack of liquidity in the majority of Australian call option series beyond 5-OTM. These findings challenge previous research (Jarnecic, 2004; Leggio and Lien, 2002; Mugwagwa et al., 2012; O'Connell and O'Grady, 2014) which claim that writing calls slightly OTM is preferable to deeper OTM calls. However, such performance may be attributable to the market conditions encountered over the holding period. Based on the performance measure evidence presented, P_1 is accepted.

4.3 36-month rolling regressions

In Table 3 we provide a summary of annualized 36-month rolling regressions for our S&P/ASX 20 covered call portfolios. All of the covered call portfolios have at least ten statistically significant positive alphas at the 10% level or better over the 24 sub-periods. For instance, the 1-ITM and 1-OTM, 2-OTM, 3-OTM, 4-OTM and 5-OTM portfolios demonstrate ten, twelve, sixteen, twenty and twenty-three 36-month periods, respectively, where alpha is positive and statistically significant. As an illustrative example, Figures 5 and 6 display the 1-ITM and 5-OTM findings, respectively, for the 36-month rolling regressions. The plots clearly show how alpha varies over time. The covered call portfolio alphas all display a similar trend. That is, they steadily decline over the sub-periods. This could be explained by the falling volatility spread over the total sample period (e.g. as implied volatility falls so does the value and statistical significance of the portfolio alphas – see Figure 3). The range of alphas also progressively decline across the covered call portfolios.

[Insert Table 3]
[Insert Figure 5]
[Insert Figure 6]

For instance, the 1-ITM portfolio has a 2.14% alpha range (with a minimum of 1.03% and maximum of 3.17%), while the 5-OTM portfolio has a 0.89% range (with a minimum of 0.68% and maximum of 1.57%). This is notable as the total sample period alphas for 1-ITM and 5-OTM portfolios are 1.93% and 0.92%, respectively. Table 3 also presents beta coefficient risk factor loadings for the covered call portfolios. The beta coefficients are all positive, statistically significant at the 1% level and vary in magnitude over time. For example, the 1-ITM portfolio

beta coefficient ranges from 0.377 to 0.479 and the 5-OTM portfolio ranges from 0.919 and 0.976, as compared to the full sample beta coefficients of 0.433 and 0.934, respectively.

On the whole, the rolling regression findings suggest that statistically significant positive alphas are observed for covered call portfolios after controlling for rolling 36-month sub-period risk. The deeper OTM covered call portfolios generate superior risk-adjusted returns in the majority of the sub-periods, particularly the 3-OTM, 4-OTM and 5-OTM portfolios. It is also evident that beta coefficients change in magnitude over time. Moreover, caution must be taken when interpreting the risk-adjusted return performance of covered call portfolios over the total sample period, as rolling sub-period regressions reveal numerous (and varied) statistically significant alphas and beta coefficients. Arguably, these sub-period alphas and betas are similar to those experienced by investors throughout the total sample period and may be a more reliable indicator of risk-adjusted return performance over time. Therefore, the previous performance measure findings are validated and $\mathbf{P}_1$ is accepted once again.

4.4 Volatility spread regressions

In Table 4 we present annualized volatility spread regressions for our S&P/ASX 20 covered call portfolios. The OLS regressions show that the 4-OTM and 5-OTM portfolios generate higher risk-adjusted returns across varying market volatility conditions. A statistically significant positive alpha at the 10% level demonstrates that the 4-OTM portfolio outperforms the low market volatility period by 3.62% in the high market volatility period. The 5-OTM portfolio also generates statistically significant positive alphas at the 10% level, outperforming the low market volatility period by 2.56% in the moderate market volatility period, 2.79% in the high market volatility period, and 2.81% in the extreme market volatility period.

[Insert Table 4]

None of the portfolio alphas during the low market volatility period are statistically significant at the 10% level or better. In fact, all covered call portfolios generate negative alphas during this period (with the exception of the 1-ITM portfolio (0.39%)). Nevertheless, the 1-ITM underperforms the low market volatility period by -0.12% in the following moderate market volatility period, but is also statistically insignificant. The remaining covered call portfolios produce positive alphas (with varying magnitudes) across the moderate, high and extreme market volatility periods; however, they are *not* statistically significant at the 10% level or better. When we consider the positive alphas across these periods it is clear that covered call portfolios perform better during some periods than others. For instance, the average alpha for covered call portfolios during the low market volatility period is -1.11%, while the average

outperformance of the low market volatility period during extreme, high and moderate market volatility periods is 3.54%, 3.33% and 1.87%, respectively. The high and extreme market volatility periods also experience a greater magnitude of positive alphas. For example, the 2-OTM and 3-OTM portfolios outperform the low market volatility period by 3.96% and 4.02% (respectively) in the high market volatility period, while the 1-ITM and 3-OTM portfolios outperform by 3.99% and 3.80% (respectively) in the extreme market volatility period [14].

Overall, we show that variation in the volatility spread may be a driver of performance for covered call writing strategies. For example, writing covered calls during periods of moderate, high and extreme market volatility appears to be advantageous for 4-OTM and 5-OTM portfolios. Outperformance of the naïve BH portfolio approach could be explained by the wide volatility spreads (or large premiums) encountered and potential overpricing of call options during periods of moderate, high and extreme market volatility (Figelman, 2008; Kapadia and Szado, 2007; McIntyre and Jackson, 2007; O'Connell and O'Grady, 2014; Simon, 2011, 2013). However, we note that none of the covered call portfolios outperform the BH portfolio in the low market volatility period. It appears covered call writing is best avoided during periods of low market volatility, with investors better off taking long only positions in underlying stocks within the BH portfolio. A potential reason for underperformance compared to the naïve BH portfolio approach during periods of low market volatility could be explained by positive/bullish market sentiment and smaller option time premia encountered. We also demonstrate that deeper OTM portfolios perform well during periods of heightened market volatility. This finding is in opposition to Hill et al. (2006) who maintain that deeper OTM covered call strategies may be better suited to low volatility and/or positive market conditions. Based on these findings, we accept P_2.

5. Conclusions

This paper examines whether superior risk-adjusted returns can be generated using monthly covered call option strategies in large capitalized Australian equity portfolios and across varying market volatility conditions from 2010 to 2015. With the exception of Mugwagwa et al. (2012), our results are consistent with the Australian covered call/buy-write performance studies conducted to-date (see El-Hassan et al., 2004; Frino and Wearin, 2004; Jarnecic, 2004; O'Connell and O'Grady, 2014). The empirical evidence presented suggests that passive covered call strategies are a relatively low-risk strategy, create value for investors/fund managers and can be executed in most market conditions. This is particularly useful for those seeking market neutral asset allocation and less risk exposure in volatile market environments.

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Notably, the merit of covered call writing does *not* appear to be compromised when markets rise moderately, fall or trade sideways; thus, presenting as a valid investment strategy when compared to equivalent asset classes (i.e. fixed-income, value-orientated equities, etc.). Investors are still able to participate in limited upward movements of the stock price when writing covered calls, and at lower risk versus the standard buy-and-hold portfolio. Moreover, converting uncertain future capital gains into immediate cash flows appears to be advantageous, particularly with regard to deeper OTM strikes.

The value of our study is that it is the first to comprehensively examine the risk-adjusted return performance of large capitalized Australian covered call portfolios across varying market volatility conditions. It extends the work of El-Hassan et al. (2004) who show that covered call writing on S&P/ASX 20 constituents can reduce risk and offer comparable returns to the traditional buy-and-hold portfolio approach. Further, the study adds to our understanding of the performance of covered call portfolios by challenging findings in the extant literature (see Mugwagwa et al., 2012). The study also contributes to asset pricing theory. For example, we show that deeper OTM covered call writing has the potential to generate superior risk-adjusted returns over the naïve BH portfolio approach, which could be attributable to the overpricing of call options in Australia. In addition, we reveal that sub-period analyses and varying market volatility can impact the risk-adjusted return performance of covered call portfolios in Australia.

Ultimately, the benefits associated with covered call writing appear to be reliant upon: 1) implied volatility being greater than the corresponding realized volatility (Hill et al., 2006); 2) the investor's ability to consistently write overpriced call options (O'Connell and O'Grady, 2014); and 3) market conditions encountered during the holding period of the strategy (El-Hassan et al., 2004). It should be borne in mind, however, that while our results are useful for evaluating the risk-adjusted return performance of covered call writing in Australia, we must acknowledge alternative explanations for the performance documented. Firstly, our results only capture market settings specific to the holding period under investigation; and thus, do not capture all potential risks pertaining to covered call option writing (El-Hassan et al., 2004). The impact of different market settings (i.e. market location and direction, volatility, liquidity, regulations and tax treatment, intra-daily data, etc.) on the strategy may need to be taken into consideration when evaluating future holding periods (Hill et al., 2006). A further limitation of the study is that transaction costs are not considered when examining the performance of our portfolios (Hill et al., 2006; Kapadia and Szado, 2007).

It is also possible that the standard performance measures chosen may be weakened due to the effect of higher moments (i.e. skewness and kurtosis). Model misspecifications and/or

asset pricing errors/anomalies associated with the Jensen alpha/multifactor model and its failure to account for non-linearities in covered call returns may have influenced our results (Broadie et al., 2009; Buchner and Wagner, 2016; Coval and Shumway, 2001; Dittmar, 2002; Frezzini and Pedersen, 2014; Glosten and Jagannathan, 1994; Goetzmann et al., 2007; Grinblatt and Titman, 1989; Harvey and Siddique, 2000; Hübner, 2016; Leland, 1999). As such, care must be taken when interpreting the alphas generated from such models. However, despite the Jarque-Bera findings rejecting the assumption of normality of the nearer the money covered call portfolios, the negative skewness and kurtosis of the deeper OTM portfolios did not appear to be as severe when compared to both the BH portfolio and that of the normal distribution. This is reassuring in the sense that standard performance measures work well for symmetric distributions but *not* asymmetric ones (Whaley, 2002). Given that the Sortino ratio produced similar results to the Sharpe ratio across the strikes, it is evident that the non-normality of the return distributions did not detract from the overall efficacy of the strategy (Figelman, 2009).

It is important to recognize that a generally accepted alternative performance measure for covered call portfolios remains allusive. For instance, Hoffmann and Fischer (2012, p. 68) state that: "[a]lternative performance measures lead to varying conclusions, depending on the construction of the measure and what it exactly measures". While it is acknowledged that linear performance measures are not ideal for dealing with the asymmetrical return distributions associated with covered call strategies, it is unclear which non-linear performance measures should be used in their place, particularly when such measures are found to be contradictory (Groothaert and Thomas, 2003; Hoffman and Fischer, 2012). For example, we use non-linear performance measures such as the upside potential ratio and Sortino ratio. We find that the upside potential ratio prefers the standalone portfolio over the covered call portfolios, which can be attributable to the limited upside risk of the covered call strategy and accompanying opportunity costs. This is particularly the case for the nearer the money portfolios. Conversely, the Sortino ratio favours the covered call portfolios over the standalone portfolios, which can be explained by the lower downside risk of the strategy. These findings suggest that investors with an appetite for risk best avoid covered call writing, while those with above average risk aversion may be better suited to the strategy (Hoffmann and Fischer, 2012; Stotz, 2011). They are also consistent with Figelman's (2009) notion that different investment strategies and performance measures will be preferred under different circumstances.

Finally, there is still uncertainty as to why money managers do not go beyond the traditional mean-variance framework when evaluating the performance of covered call strategies. Is it because of traditional reasons? Are they uninformed when it comes to higher

moment preferences? Or are they deliberately ignoring higher moment preferences in an attempt to deliver alpha? The latter could be considered a play on kurtosis (i.e. reducing the probability of large losses and gains). Future research could explore these issues by replicating our approach within different Australian markets/sectors, time periods, data intervals and samples. We also encourage researchers to consider option market liquidity and transaction costs (Hill et al., 2006), along with alternative frameworks/approaches such as stochastic dominance (Brooks et al., 1987; Morard and Naciri, 1990), expected and alternative utility (Board et al., 2000; Figelman, 2009; Leggio and Lien, 2002; O'Connell and O'Grady, 2014) and conditional strike prices (Stotz, 2011). It is anticipated that such research will expand the literature on this interesting topic by providing a better understanding of the relationship between market volatility and return performance of covered call writing in Australia. The further development of strategies that attempt to mitigate the effects of persistent market volatility on modern portfolios are also desirable.

References

Allen, G.C. (2015), "Covered Call Writing: Is it an Appropriate Strategy for Investors?", *Journal of Financial Service Professionals*, Vol. 69, No. 1, pp. 87-92.

ASX. (2016a), "ASX A-VIX Report", available at:
http://www.asx.com.au/products/201311-asx-monthly-a-vix-report.htm (accessed 15 January 2016).

—— (2016b), "Equity and Index Options Listing Guidelines – for ASX Equity Markets", available at:
http://www.asx.com.au/documents/products/OptionsListingGuidelinesJan16.pdf
(accessed 13 September 2016).

Australian Treasury. (2014), "Financial System Inquiry: Final Report", December, Commonwealth of Australia, Canberra.

Benninga, S., and M. Blume. (1985), "On the Optimality of Portfolio Insurance", *Journal of Finance*, Vol. 40, No. 5, pp. 1341-1352.

Bernardo A.E., and O. Ledoit. (2000), "Gain, Loss, and Asset Pricing", *Journal of Political Economy*, Vol. 8, No. 1, pp. 144-172.

Black, F. (1975), "Fact and Fantasy in the Use of Options", *Financial Analysts Journal*, Vol. 31, No. 4, pp. 36-41 and 61-72.

Black, F., and M. Scholes. (1972), "The Valuation of Option Contracts and a Test of Market Efficiency", *Journal of Finance*, Vol. 27, No. 2, pp. 399–417.

Board, J., C. Sutcliffe, and E. Patrinos. (2000), "The Performance of Covered Calls", *The European Journal of Finance*, Vol. 6. No. 1, pp. 1-17.

Bookstaber, R., and R.G. Clarke. (1984), "Option Portfolio Strategies: Measurement and Evaluation", *Journal of Business*, Vol. 57, No. 4, pp. 469-492.

Booth, J. R., A. Tehranian, and G. L. Trennepohl. (1985), "Efficiency Analysis and Option Portfolio Selection", *Journal of Financial and Quantitative Analysis*, Vol. 20, No. 4, pp. 435-450.

Broadie, M., M. Chernov, and M. Johannes. (2009), "Understanding Index Option Returns", *Review of Financial Studies*, Vol. 22, No. 11, pp. 4493-4529.

Brooks, R., H. Levy, and J. Yoder. (1987), "Using Stochastic Dominance to Evaluate the Performance of Portfolios with Options", *Financial Analysts Journal*, Vol. 43, No. 2, pp. 79-92.

Buchner, A., and N. Wagner. (2016), "The Betting Against Beta Anomaly: Fact or Fiction?", *Finance Research Letters*, Vol. 16, pp. 283-289.

Cici, G., and L-F. Palacios. (2015), "On the Use of Options by Mutual Funds: Do They Know What They Are Doing?", *Journal of Banking and Finance*, Vol. 50, pp. 157-168.

CME Group. (2015), "The Remarkable Growth of Options on Futures", available at: http://openmarkets.cmegroup.com/9704/infographic-the-remarkable-growth-of-options-on-futures (accessed 15 January 2016).

Costa, B., K. Jakob, S.J. Niblock, and E. Sinnewe. (2014), "Australian Indexes and the Four-Factor Model", *Applied Finance Letters*, Vol 3, No. 1, pp. 10-21.

Coval, J.D., and T. Shumway. (2001), "Expected Option Returns", *The Journal of Finance*, Vol. 56, No. 3, pp. 983-1009.

Diaz, M., and R.H. Kwon. (2016), "Optimization of Covered Call Strategies", *Optimization Letters*, doi:10.1007/s11590-016-1083-8.

Dittmar, R.F. (2002), "Nonlinear Pricing Kernels, Kurtosis Preference, and Evidence from the Cross Section of Equity Returns", *Journal of Finance*, Vol. 57, No. 1, pp. 369-403.

El-Hassan, N., T. Hall, and J. Kobarg. (2004), "Risk and Return of Covered Call Strategies for Balanced Funds: Australian Evidence", available at: http://www.asx.com.au/documents/products/covered_calls_report_final.pdf (accessed 15 January 2016).

Fama. E. (1998), "Market Efficiency, Long-Term Returns, and Behavioral Finance", *Journal of Financial Economics*, Vol. 49, No. 3, pp. 283-306.

Figelman, I. (2008), "Expected Return and Risk of Covered Call Strategies", *Journal of Portfolio Management*, Vol. 34, No. 4, pp. 81-95.

―― (2009), "Effect of Non-Normality Dynamics on the Expected Return of Options", *Journal of Portfolio Management*, Vol. 35, No. 2, pp. 110-117.

Figlewski. S., and T. Green. (1999), "Market Risk and Model Risk for a Financial Institution Writing Options", *Journal of Finance*, Vol. 54, No. 4, pp. 1465-1499.

Financial Times. (2015), "Global Fund Industry Manages Record $74tn", available at: http://www.ft.com/intl/cms/s/0/5a395bb4-24a6-11e5-9c4e-a775d2b173ca.html#axzz3xC1q6I6p (accessed 15 January 2016).

Frezzini, A., and L.H. Pedersen. (2014). "Betting Against Beta", *Journal of Financial Economics*, Vol. 111, No. 1, pp. 1-25.

Frino, A., and G. Wearin. (2004), "The Performance of Buy-Write Strategies: Investment Strategies", *JASSA*, No. 4 (Summer), pp. 26-29.

Glosten, L., and R. Jagannathan. (1994), "A Contingent Claim Approach to Performance Evaluation", *Journal of Empirical Finance*, Vol. 1, No. 2, pp. 133-160.

Goetzmann, W., J. Ingersoll, M. Spiegel, and I. Welch. (2007), "Portfolio Performance Manipulation and Manipulation-Proof Performance Measures", *Review of Financial Studies*, Vol. 20, No. 5, pp. 1503-1546.

Goodwin, T.H. (1998), "The Information Ratio", *Financial Analysts Journal*, Vol. 54, No. 4, pp. 34-43.

Grinblatt, M., and S. Titman. (1989), "Portfolio Performance Evaluation: Old Issues and New Insights", *Review of Financial Studies*, Vol. 2, No. 3, pp. 393-421.

Groothaert, T., and S. Thomas. (2003), "Creation of a Eurex Buy-Write Monthly Index on SMI", available at: http://bellmontsecurities.com.au/wp-content/uploads/2014/03/Creation-of-a-Eurex-Buy-Write-Monthly-Index-on-SMI.pdf (accessed 15 January 2016).

Han, K.C., and K. Dadlani. (2006), "Covered Call Writing as a Strategy for Small Investors", *Journal of Personal Finance*, Vol. 5, No. 2, pp. 87-100.

Harvey, C.R., and A. Siddique. (2000), "Conditional Skewness in Asset Pricing Tests", *Journal of Finance*, Vol. 55, No. 3, pp. 1263-1295.

Hill, J., V. Balasubramanian, K. Gregory, and I. Tierens. (2006), "Finding Alpha via Covered Call Writing", *Financial Analysts Journal,* Vol. 62, No. 5, pp. 279-346.

Hoffman, A.O.I., and E.T.S Fischer. (2012), "Behavioral Aspects of Covered Call Writing: An Empirical Investigation", *The Journal of Behavioral Finance,* Vol. 13, pp. 66-79.

Hübner, G. (2016), "Option Replication and the Performance of a Market Timer", *Studies in Economics and Finance*, Vol. 33, No. 1, pp. 2-25.

Isakov, D., and B. Morard. (2001), "Improving Portfolio Performance with Option Strategies: Evidence from Switzerland", *European Financial Management*, Vol. 7, pp. 73-91.

Israelov, R., and L. Nielsen. (2014), "Covered Call Strategies: One Fact and Eight Myths", *Financial Analysts Journal*, Vol. 70, No. 6, pp. 23-31.

—— (2015), "Covered Calls Uncovered", *Financial Analysts Journal*, Vol. 71, No. 6, pp. 44-57.

Jarnecic, E. (2004), "The Buy-Write Strategy versus the Index Portfolio", *JASSA*, No. 2 (Winter), pp. 36-39.

Jensen, M.C. (1968), "The Performance of Mutual Funds in the Period 1945-1964", *The Journal of Finance*, Vol. 23, No. 2, pp. 389-416.

Kahneman, D., and A. Tversky. (1979), "Prospect Theory: An Analysis of Decision Under Risk", *Econometrica*, Vol. 47, No. 2, pp. 263–291.

Kapadia, N., and E. Szado. (2007), "The Risk and Return Characteristics of the Buy Write Strategy on the Russell 2000 Index", *The Journal of Alternative Investments*, Vol. 9, pp. 39-56.

Lakonishok, J., I. Lee, N.D. Pearson, and A.M. Poteshman. (2007), "Option Market Activity", *The Review of Financial Studies*, Vol. 20, pp. 813-857.

Leggio, K.B., and D. Lien. (2002), "Covered Call Investing in a Loss Aversion Framework", *The Journal of Psychology and Financial Markets*, Vol. 3, pp. 182-191.

Leland, H. E. (1999), "Beyond Mean-Variance: Performance Measurement in a Nonsymmetrical World", *Financial Analysts Journal*, Vol. 55, No. 1, pp. 27-36.

Lhabitant, F.S. (1999), "On the Performance of Option Strategies in Switzerland", *Finanzmarkt und Portfolio Management*, Vol. 13, pp. 318-338.

—— (2000), "Derivatives in Portfolio Management: Why Beating the Market is Easy", *Derivatives Quarterly*, Vol. 7, pp. 39-45.

Mahdavi, M. (2004), "Risk-Adjusted Return When Returns Are Not Normally Distributed: Adjusted Sharpe Ratio", *Journal of Alternative Investments*, Vol 6. No. 4, pp. 47-57.

Markowitz, H. (1952), "Portfolio Selection", *The Journal of Finance*, Vol. 7, No. 1, pp. 77-91.

—— (1959), "*Portfolio Selection: Efficient Diversification of Investments*, New Haven, CT: Wiley, Yale University Press.

McIntyre, M.L., and D. Jackson. (2007), "Great in Practice, Not in Theory: An Empirical Examination of Covered Call Writing", *Journal of Derivatives and Hedge Funds*, Vol. 13, pp. 66-79.

Merton, R. C., M. S. Scholes, and M. L. Gladstein. (1978), "The Returns and Risk of Alternative Call Option Portfolio Investment Strategies", *Journal of Business*, Vol. 51, No. 2, pp. 183-242.

Modigliani, F., and L. Modigliani. (1997), "Risk-adjusted Performance", *The Journal of Portfolio Management*, Vol. 23, No. 2, pp. 45-54.

Morard, B., and A. Naciri. (1990), "Options and Investment Strategies", *Journal of Futures Markets*, Vol. 10, No. 5, pp. 505-517.

Mugwagwa, T., V. Ramiah, T. Naughton, and I. Moosa. (2012), "The Efficiency of the Buy-Write Strategy: Evidence from Australia", *International Financial Markets, Institutions and Money*, Vol. 22, pp. 305-328.

Natter, M., M. Rohleder, D. Schulte and M. Wilkens. (2016), "The Benefits of Option Use by Mutual Funds", *Journal of Financial Intermediation*, Vol. 26, pp. 142-168.

O'Connell, D., and B. O'Grady. (2014), "The Buy-Write Strategy, Index Investment, and the Efficient Market Hypothesis: More Australian Evidence", *The Journal of Derivatives*, Vol. 22, No. 1, pp. 71-89.

Reilly, F. K., and K. C. Brown. (1997), *"Investment Analysis and Portfolio Management (5th ed.)"*, Fort Worth, TX: The Dryden Press.

Rendleman, R. (1981), "Optimal Long-Run Option Investment Strategies", *Financial Management*, Vol. 10, No. 1, pp. 61-76.

—— (1999), "Option Investing from a Risk-Return Perspective", *Journal of Portfolio Management*, Vol. 25, No. 5, pp. 109-121.

—— (2001), "Writing from an Expected Utility Perspective", *Journal of Derivatives*, No. 8, Vol. 3, pp. 63-75.

Sharpe, W.F. (1966), "Mutual Fund Performance", *Journal of Business*, Vol 39, No. 1, pp. 119-138.

Shefrin, H. (2002), *"Beyond Greed and Fear: Understanding Behavioral Finance and the Psychology of Investing"*, New York: Oxford University Press.

Shefrin, H., and M. Statman. (1993), "Behavioral Aspects of the Design and Marketing of Financial Products", *Financial Management*, Vol. 22, No. 2, pp. 123-134.

Siddiqi, H. (2015), "Relative Risk Perception and the Puzzle of Covered Call Writing", available at: https://rsmg.group.uq.edu.au/files/1246/WPF15_3.pdf (accessed 14 January 2016).

Simon, D.P. (2011), "The Anomalous Behavior of the S&P Covered Call Closed End Fund", *Journal of Derivatives and Hedge Funds*, Vol. 17, pp. 165-180.

—— (2013), "Active QQQ Covered Call Strategies", *The Journal of Alternative Investments*, Vol. 16, No. 3, pp. 25-36.

Sortino, F.A., and R. van der Meer. (1991), "Downside Risk", *The Journal of Portfolio Management*, Vol. 17, No. 4, pp. 27-31.

Sortino, F.A., R. van der Meer, A. Plantinga, and H. Forsey. (2003), "The Upside Potential Ratio: What are we Trying to Measure?", available at:

http://www.edge-fund.com/SMPF03.pdf (accessed 20 January 2016).

Standard and Poors. (2016), "S&P/ASX 20", available at:

http://au.spindices.com/indices/equity/sp-asx-20 (accessed 15 January 2016).

Stotz, O. (2011), "Conditional Strike Prices of Covered Call and Uncovered Put Strategies", *Applied Financial Economics*, Vol. 21, No. 16, pp. 1163-1174.

Thaler, R. (1985), "Mental Accounting and Consumer Choice", *Marketing Science*, Vol. 4, No. 3, pp. 199-214.

Thomsett, M.C. (2010), "The Covered Call: An Income-Generating Options Strategy", *AAII Journal*, Vol. 32, No. 8, pp. 14-18.

Treynor, J. (1965), "How to Rate Management of Investment Funds", *Harvard Business Review*, Vol. 43 (January-February), pp. 63-75.

Whaley, R. (2002), "Return and Risk of CBOE Buy Write Monthly Index", *The Journal of Derivatives*, Vol. 10, No. 2, pp. 35-42.

Endnotes

[1] CME Group (2015) claim that the popularity of options in the US post-global financial crisis (GFC) has grown from approximately 30 million contracts traded monthly in 2009 to 50 million in 2014.

[2] The covered call strategy increases relative income through the collection of sold OTM call option premiums and converts the prospects of uncertain future capital gains into immediate cash flows (Groothaert and Thomas, 2003; Thomsett, 2010). Further, the strategy reduces the average cost of acquiring the stock and offers defined payoffs (Figelman, 2008). If call options expire worthless at expiry date, the call writer receives an upfront cash inflow and has no further contractual obligation to the call taker (Leggio and Lien, 2002).

[3] Sometimes call options may be exercised before expiration to receive any dividends on the stock. However, early exercise is mostly avoided due to time value associated with bought call options (Financial Times, 2015).

[4] Israelov and Nielsen (2014) claim that call option overwriting provides long equity and short volatility exposure, which is essentially a version of selling volatility. If implied volatility is high relative to expectations, then covered call writing should be considered. If investors do not have a view on implied volatility, then they should not consider selling call options.

[5] Australian covered call performance studies have mostly produced similar findings to the US, predominantly employing strategies based around broad benchmark indexes (e.g. All Ordinaries and S&P/ASX 200 total return indexes). However, they seemingly omit market sentiment indexes (e.g. volatility indexes). In addition, Australian covered call studies examine time periods between 1987 and 2006 (with the exception of O'Connell and O'Grady (2014), who examine 1991 to 2013), exploit quarterly call writing strategies (with the exception of Mugwagwa et al., (2012)) and focus on OTM call options. A further omission is that franking credits have not been accounted for when evaluating Australian covered call performance.

[6] The S&P/ASX 20 is the narrowest capitalization-based index, covering 46% of Australian equity market capitalization (Standard and Poors, 2016).

[7] Costa et al. (2014) find that Australian capitalization indexes are highly positively correlated and demonstrate similar risk-return characteristics.

[8] Although S&P/ASX 20 constituents and weightings are determined on a quarterly basis, it is possible that changes to the S&P/ASX 20 occur intra-quarter if a vacancy is created by an index deletion and/or market capitalizations fluctuate significantly (Standard and Poors, 2016).

[9] ASX expiry for individual equity options is the fourth Thursday of each calendar month (ASX, 2016b).

[10] Hill et al. (2006) shows that writing one-month to maturity and slightly OTM call options generate higher premiums compared to longer-term and deeper OTM call options. This is primarily due to the maximization of time value and lower risk associated with the prediction of longer-term price fluctuations. Hill et al. also claims that writing shorter maturity and closer to the money call options offers adequate open interest and trading volume.

[11] It has been well documented that the existence of negative skewness renders variance inadequate as a risk measure and needs to be addressed when evaluating the performance of covered call portfolios. For instance, Harvey and Siddique (2000, p.1263) infer that the presence of conditional skewness in asset returns is "economically important and commands a risk premium". Even Markowitz (1959) suggests that semi-variance is a more appropriate risk metric than variance to measure downside risk.

[12] The modified Jensen alpha approach enables us to capture the impact of option premiums, dividends and franking credits on the risk-adjusted return performance of covered call portfolios versus the standalone 'benchmark' S&P/ASX 20 BH portfolio. Specifically, we adjust the conventional Jensen asset pricing model to improve overall explanatory power. This is necessary when evaluating the risk-adjusted return performance of alternative portfolios that are inclusive of franking credits. It also reveals the value of dividends and franking credits in large capitalized Australian covered call portfolios.

[13] Hill et al. (2006) assert that options sellers are compensated for large adverse movements (or 'crash' risk) through the volatility premium embedded in option prices and that high implied volatility is generally supportive of writing slightly OTM calls at higher premiums, while low implied volatility is more conducive to writing deeper OTM calls, albeit at lower premiums.

[14] We also investigated the effect of the different volatility settings on the slope of our model, but could not detect any significant effects.

Table 1. Annualized summary statistics

	1-ITM	1-OTM	2-OTM	3-OTM	4-OTM	5-OTM	BH	BAB
RETURN								
Total Return	8.03%	7.90%	8.56%	9.30%	9.65%	10.10%	9.59%	3.43%
Income Yield	39.89%	27.63%	19.39%	14.37%	11.37%	9.63%	6.66%	3.43%
Capital Growth	-31.87%	-19.73%	-10.83%	-5.06%	-1.72%	0.46%	2.92%	0.00%
Call Premium	33.23%	20.96%	12.73%	7.70%	4.71%	2.97%	N/A	N/A
Gross Return > 0	77.97%	74.58%	69.49%	66.10%	66.10%	64.41%	62.71%	100.00%
Gross Return < 0	22.03%	25.42%	30.51%	33.90%	33.90%	35.59%	37.29%	0.00%
Excess Return	-1.56%	-1.69%	-1.02%	-0.28%	0.06%	0.51%	N/A	-6.16%
Excess Return > 0	54.24%	57.63%	61.02%	64.41%	66.10%	74.58%	N/A	38.98%
Excess Return < 0	45.76%	42.37%	38.98%	35.59%	33.90%	25.42%	N/A	61.02%
Cumulative Performance ($1,000 investment)	$1,469.69	$1,453.66	$1,493.48	$1,540.77	$1,560.99	$1,590.09	$1,544.75	$1,183.26
Excess Cumulative Performance ($1,000 investment)	-$75.06	-$91.09	-$51.26	-$3.98	$16.24	$45.35	N/A	-$361.49
RISK								
Standard Deviation (σ)	5.84%	7.32%	8.72%	9.84%	10.65%	11.27%	12.03%	0.00%
Semi-Standard Deviation (σ_{DR})	4.79%	5.92%	6.89%	7.60%	8.05%	8.36%	8.71%	0.00%
Excess Standard Deviation	7.32%	5.74%	4.23%	3.03%	2.07%	1.28%	N/A	12.05%
OTHER								
Kurtosis	4.59	3.90	3.33	2.95	2.79	2.72	2.79	1.53
Skewness	-1.25	-1.10	-0.86	-0.66	-0.50	-0.36	-0.18	0.36
Jarque-Bera	21.66***	13.87***	7.57**	4.34	2.54	1.48	0.44	6.61**
Minimum Monthly Return	-4.77%	-5.66%	-6.33%	-6.77%	-7.05%	-7.22%	-7.48%	0.17%
Maximum Monthly Return	3.44%	4.17%	5.26%	5.95%	6.86%	7.64%	8.66%	0.41%
Range	8.20%	9.83%	11.60%	12.73%	13.91%	14.86%	16.13%	0.24%
Count	59	59	59	59	59	59	59	59
% Average Total Portfolio Exercise	53.43%	39.79%	27.34%	16.95%	10.61%	6.56%	N/A	N/A

Notes: Significance level: * 10%; ** 5%; *** 1%.

Table 2. Annualized performance measures

	1-ITM	**1-OTM**	**2-OTM**	**3-OTM**	**4-OTM**	**5-OTM**	**BH**
Sharpe Ratio	0.787	0.611	0.589	0.597	0.584	0.591	0.512
M^2 Ratio (σ)	3.30%	1.19%	0.92%	1.02%	0.87%	0.95%	N/A
Sortino Ratio	0.961	0.755	0.745	0.773	0.773	0.798	0.707
M^2 Ratio (σ_{DR})	5.40%	2.92%	2.80%	3.14%	3.14%	3.44%	N/A
Treynor Ratio	0.106	0.078	0.073	0.073	0.071	0.071	0.062
Information Ratio	-0.213	-0.294	-0.242	-0.094	0.031	0.396	N/A
Upside Potential Ratio	0.449	0.470	0.495	0.515	0.526	0.534	0.538
Jensen's Alpha (α_p)	1.93%	0.95%	0.82%	0.93%	0.82%	0.92%**	N/A
T-stat	1.584	0.855	0.886	1.193	1.382	2.230	N/A
Beta (β_p)	0.433***	0.571***	0.701***	0.803***	0.877***	0.934***	N/A
T-stat	11.608	14.503	18.775	23.214	31.130	47.108	N/A
Adj. R^2	0.793	0.881	0.934	0.963	0.981	0.992	N/A
Observations	59	59	59	59	59	59	59

Notes: Significance level: * 10%; ** 5%; *** 1%. *p*-values from the Newey-West *t*-statistics are adjusted for autocorrelation up to 3 lags using the automatic observation-based lag selection approach.

Table 3. Annualized 36-month rolling regressions

| Stats	1-ITM		1-OTM		2-OTM		3-OTM		4-OTM		5-OTM	
	α_p	β_p	α_p	β_p	α_p	β_p	α_p	β_p	α_p	β_p	α_p	β_p
Min	1.03%	0.377	0.50%	0.509	0.63%	0.645	0.84%	0.763	0.69%	0.85	0.68%	0.919
Max	3.17%	0.479	2.41%	0.628	2.25%	0.763	2.19%	0.866	1.76%	0.931	1.57%	0.976
Range	2.14%	0.103	1.91%	0.119	1.62%	0.118	1.36%	0.103	1.06%	0.082	0.89%	0.057
Sig. Obs.	10/24	24/24	10/24	24/24	12/24	24/24	16/24	24/24	20/24	24/24	23/24	24/24

Notes: 24 annualized 36-month rolling regressions starting with the period September 2010 – August 2013 and ending with the period August 2012 – July 2015. Significant observations are reported at the 10% level or better. *p*-values from the Newey-West *t*-statistics are adjusted for autocorrelation up to 3 lags using the automatic observation-based lag selection approach.

Table 4. Annualized volatility spread regressions

	1-ITM	1-OTM	2-OTM	3-OTM	4-OTM	5-OTM
Low (α_p)	0.39%	-0.94%	-1.56%	-1.74%	-1.69%	-1.12%
T-stat	0.126	-0.315	-0.577	-0.741	-0.886	-0.875
Moderate ($\alpha_p VSQ2$)	-0.12%	0.96%	1.88%	2.91%	3.05%	2.56%*
T-stat	-0.034	0.285	0.606	1.102	1.432	1.820
High ($\alpha_p VSQ3$)	2.39%	3.19%	3.96%	4.02%	3.62%*	2.79%*
T-stat	0.756	1.184	1.459	1.542	1.756	1.911
Extreme ($\alpha_p VSQ4$)	3.99%	3.52%	3.74%	3.80%	3.37%	2.81%*
T-stat	1.111	1.024	1.186	1.315	1.474	1.769
Beta (β_p)	0.431***	0.571***	0.702***	0.805***	0.880***	0.936***
T-stat	10.961	15.017	19.878	25.663	35.216	55.712
Adj. R^2	0.790	0.879	0.934	0.963	0.982	0.993
Observations	59	59	59	59	59	59

**Notes:** VS = Volatility Spread. Q = Quartile. Low = *VSQ1* <0.014. Moderate = *VSQ2* >0.014<0.036. High = *VSQ3* >0.036<0.048. Extreme = *VSQ4* >0.048. Significance level: * 10%; ** 5%; *** 1%. *p*-values from the Newey-West *t*-statistics are adjusted for autocorrelation up to 3 lags using the automatic observation-based lag selection approach.

Figure 1. Covered call payoff diagram

I. Long Stock

**II. Short Call**

III. Covered Call
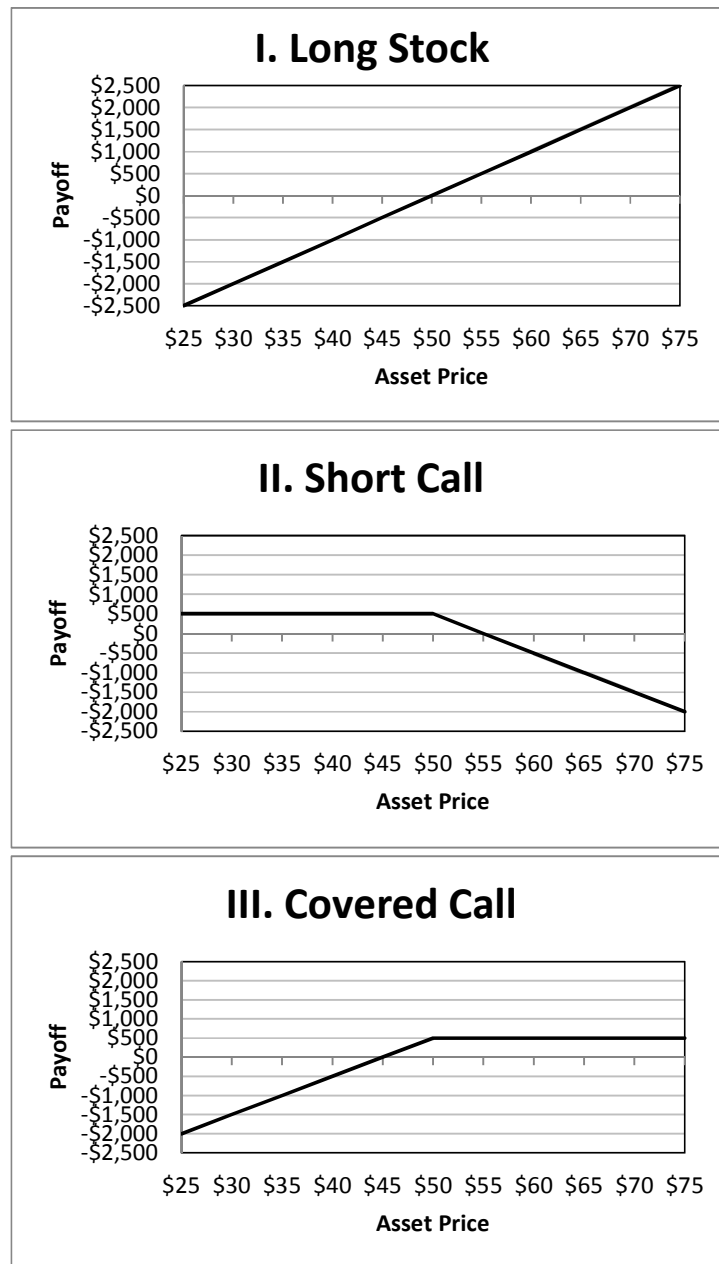
Notes: One (1) XYZ $50 at-the-money (ATM) call option contract gives the taker (or buyer) the right, but not the obligation, to buy 100 shares in XYZ for $50 per share, on or before the expiry date of the option for the outlay of an upfront 'one-off' $5 per share premium to the writer (or seller). If the share price rises above $50 by expiry date and is exercised, the writer of the call option is obligated to sell 100 XYZ shares to the taker for $50 per share. If the writer already owns 100 shares in XYZ, the call is 'covered'. The writer will keep the $5 premium earned per share. Alternatively, if the XYZ share price stays below $50 by expiry date, the call option will expire worthless and the writer will retain the $5 premium earned per share and their existing shares.

**Figure 2.** Theoretical distribution of long only versus covered call returns
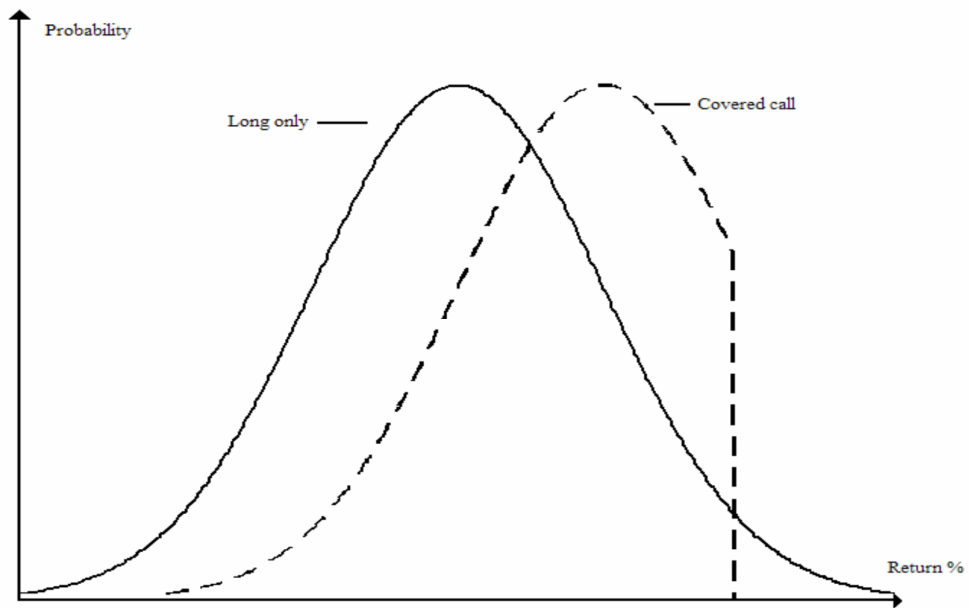
Source: Groothaert and Thomas (2003, p. 9)

**Figure 3.** S&P/ASX 200 volatility spread
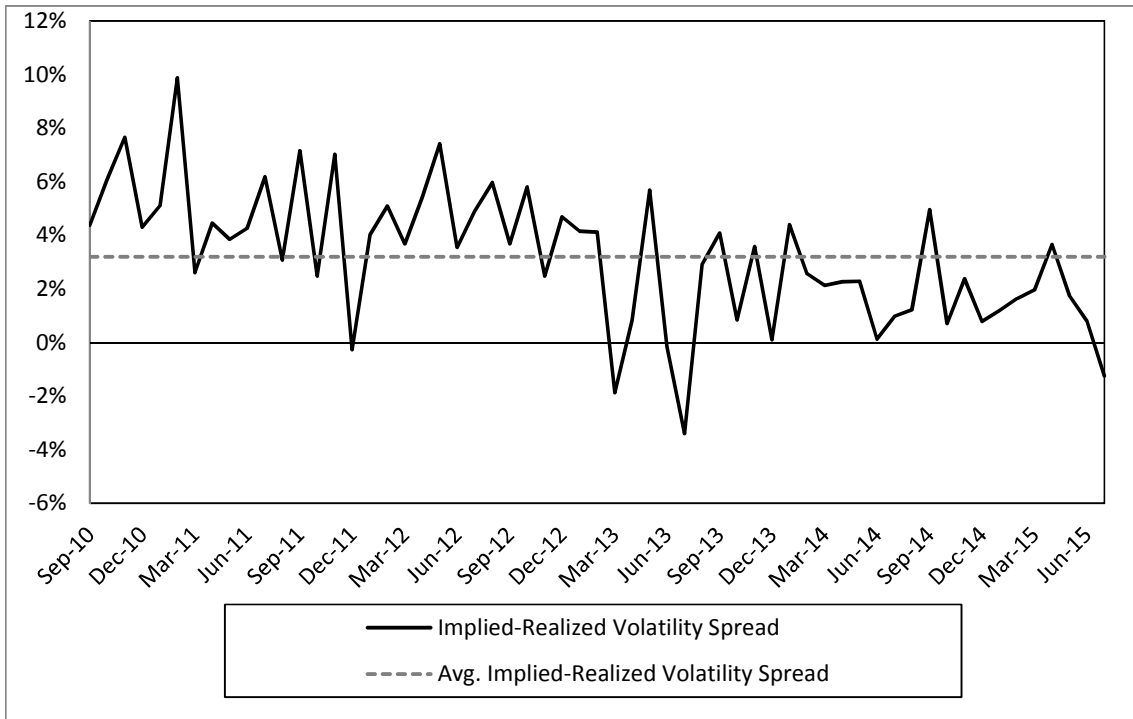
Notes: Market volatility levels are determined by the monthly volatility spread between S&P/ASX 200 implied (A-VIX) and realized volatility indexes over the total sample period: $VS_t = IV_t - RV_t$, where VS_t is the volatility spread, IV_t is annualized implied market volatility, and RV_t is annualized realized market volatility.

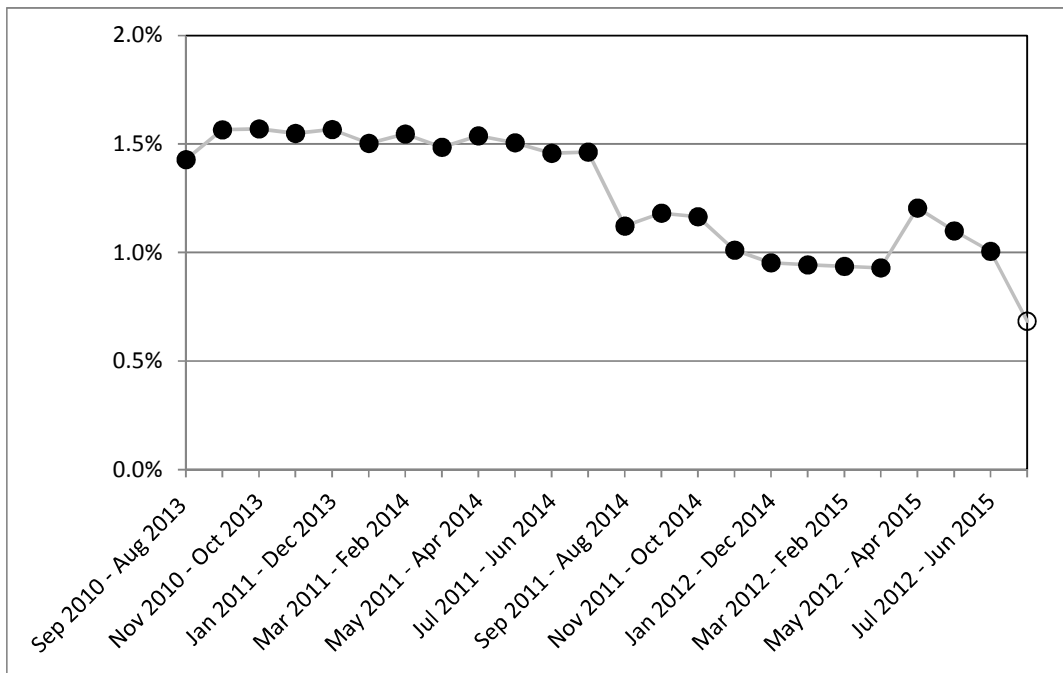**Figure 4.** Annualized return attributions for portfolios
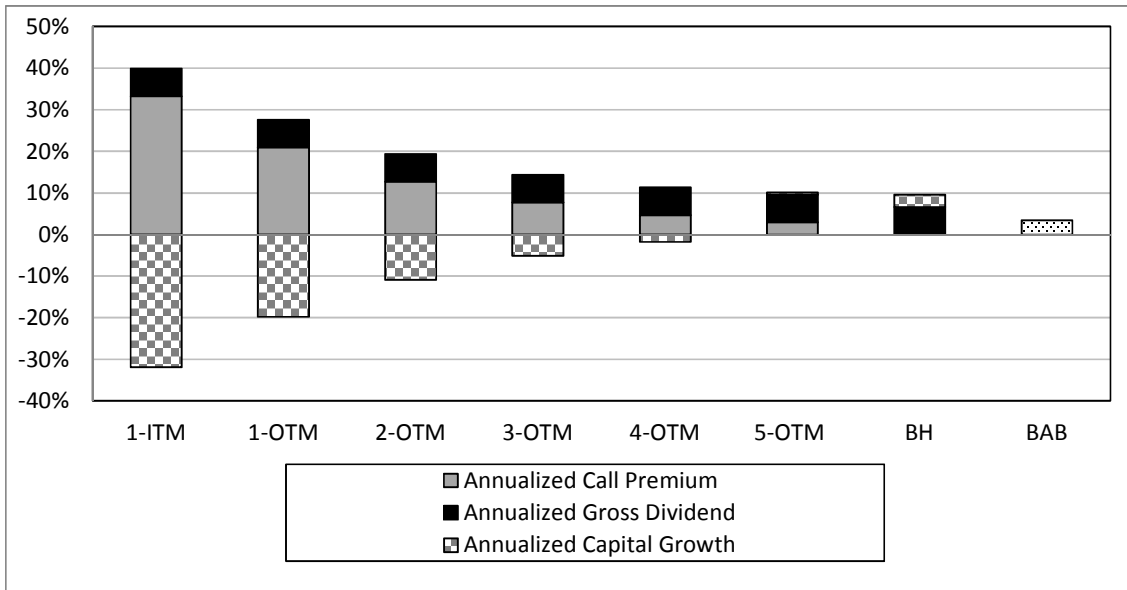
Notes: Annualized returns are broken down into call premium (if applicable), gross dividend (if applicable) and capital growth components across the six covered call portfolios, buy-and-hold portfolio (BH) and bank accepted bill (BAB), respectively.

Figure 5. Annualized 36-month rolling alphas for 1-ITM portfolio
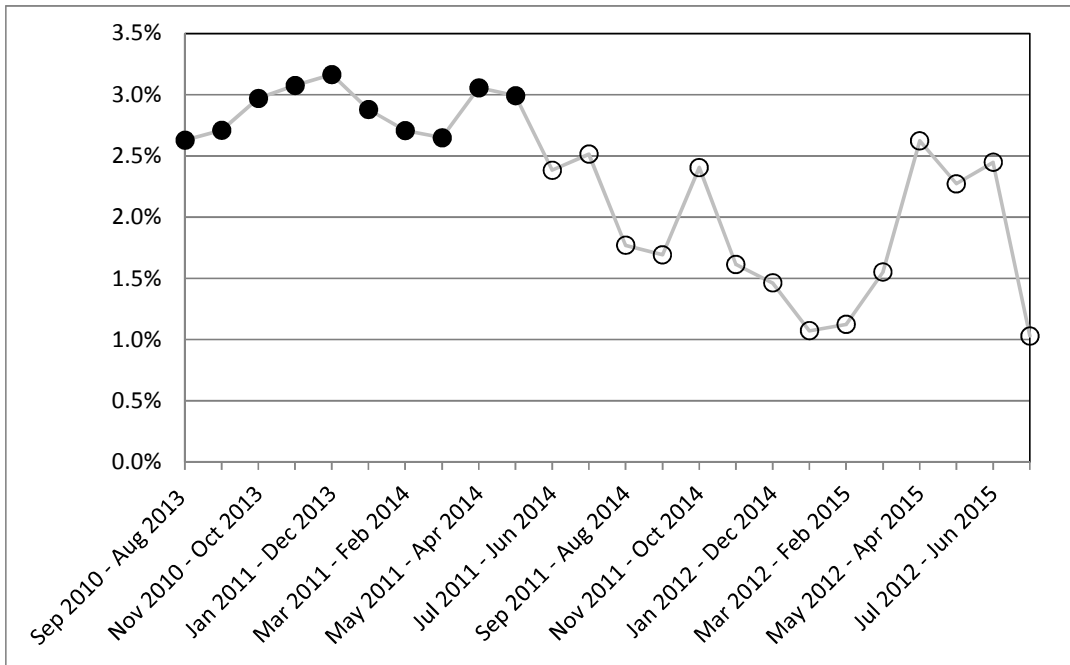
Notes: 24 annualized 36-month rolling alphas starting with the period September 2010 – August 2013 and ending with the period August 2012 – July 2015. ● Significant at the 10% level or better. ○ Not significant.

Figure 6. Annualized 36-month rolling alphas for 5-OTM portfolio

Notes: 24 annualized 36-month rolling alphas starting with the period September 2010 – August 2013 and ending with the period August 2012 – July 2015. ● Significant at the 10% level or better. ○ Not significant.