15 Years of the Russell 2000 Buy-Write

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Nikunj Kapadia[1] and Edward Szado[2], CFA

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[1] Associate Professor of Finance, Isenberg School of Management, University of Massachusetts, Amherst, MA 01003.
[2] Research Associate, CISDM, Isenberg School of Management, University of Massachusetts, Amherst, MA 01003.

Abstract

Using data from January 18, 1996 to March 31, 2011, we construct and evaluate returns on a buy-write strategy on the Russell 2000 index. The results demonstrate that the strategy has consistently outperformed the Russell 2000 index on a risk adjusted basis, when implemented with one month to expiration calls and when performance is evaluated using standard performance measures. Over the 182 month period of analysis, the RUT buy-write strategy using 2% out-of-the-money, one-month calls generated higher returns than the underlying index (8.87% versus 8.11%) at about three-quarters of the standard deviation (16.57% versus 21.06%). The outperformance is robust to measures which specifically consider the non-normal distribution of the strategy's returns. However, the consistent performance advantage does not remain if we utilize two month to expiration calls. To evaluate the performance in varying market conditions, we break our sample into sub-periods. Specifically, one of the worst market conditions for the buy-write strategy is March 2003 to October 2007, when the Russell 2000 experiences a high sustained growth at a relatively low volatility. Even in this market environment, we find that the 2% out-of-the-money one-month buy-write strategy outperforms the Russell 2000 on a risk adjusted basis, returning almost the same returns as the index return at three-quarters its volatility. We provide insight into the sources of the performance. On average, the expiration value of written calls exceeds the premium collected and the transaction costs of writing the call at the bid further increases the losses. However, the buy-write strategy benefits by writing calls at an implied volatility that is generally higher than the realized volatility. In fact, we find that the contribution of the volatility risk premium - the difference between implied and realized volatility – is typically larger than the net losses incurred by the call position or the transaction costs. It appears that the existence of the risk premium is critical to the performance of the strategy. In fact, the (Leland's) alpha of the strategy is typically significantly smaller than the risk premium implying that the buy-write strategy would not provide excess returns in the absence of the risk premium.

Introduction

The purpose of this study is to update the results of Kapadia and Szado [2007], "The Risk and Return Characteristics of the Buy-write Strategy on the Russell 2000 Index" to include performance through the recent financial crisis[3]. The initial study included approximately 10 years of data from January 19, 1996 through November 17, 2006. This new study adds almost five years of data, extending the analysis through March 31, 2011[4].

The purpose of this paper is to assess the risk and return characteristics of a buy-write (covered call) strategy on the Russell 2000[5]. The equity index buy-write strategy entails the writing of a call on an equity index against a long position in the corresponding underlying equity index. A buy-write is utilized as a return enhancement strategy, although the extra cash flow from call writing does produce some risk mitigation by providing a cushion against losses in the underlying. Typically, the buy-write strategy would be implemented passively, without attempting to time the market. The original paper (Kapadia and Szado [2007]) was motivated by the growing interest in the use of buy-write strategies for investment purposes. The interest was reflected in CBOE's introduction of a number of buy-write indices based on a variety of equity indices such as the S&P 500, the Dow Jones Industrial Average, the NASDAQ 100 and the Russell 2000. Although a number of papers have examined the returns on the strategy for the S&P 500[6], the risk and return characteristics of the buy-write strategy on the Russell 2000 has not been extensively examined. Previous studies have consistently found that the buy-write strategy on the S&P 500 outperformed the S&P 500 on a risk adjusted basis prior to the financial crisis. It is certainly worthwhile to determine whether the results associated with the earlier papers are robust across other indices and across varying market conditions, including the financial crisis. The financial crisis has provided a backdrop for testing the strategy in particularly turbulent times. More generally, the analysis of the returns of the buy-write strategy also allows us insight into how options are priced and traded in the market. If the assumptions underlying the Black Scholes analysis held precisely, it would be straightforward to understand the returns of a buy-write strategy. In practice, however, the returns are impacted by both transaction costs and the actual market value of the options, which tends to be higher than the prices suggested by the Black Scholes formula. This price differential manifests itself in

[3] It is worth noting that the results in this paper vary somewhat from the original paper due to subsequent data cleaning by Optionmetrics and some small changes in methodology outlined in the body of the paper.
[4] The analysis is based on monthly returns for the period of February 1, 1996 to March 31, 2011.
[5] The Russell 2000 (RUT) was utilized for the original study rather than the more easily investable iShares Russell 2000 Index exchange traded fund (IWM) due to the much longer available time series of the RUT.
[6] See Whaley (2002), Feldman and Roy (2004), Renicker and Mallick (2005), and Hill et al (2006).

implied volatilities that are consistently higher than realized historical volatilities[7]. Our objective is to use the analysis of the buy-write strategy to provide insight into the economic importance of these potentially offsetting effects. While the original study provided a comprehensive analysis of the buy-write strategy for the Russell 2000 over the period from January 19, 1996 to November 17, 2006, this update extends the analysis through to March 31, 2011. The length of the sample period allows us to assess the performance in different market conditions. In addition, we provide a comparison of the strategy over a range of implementations with differing call strikes and maturities. Consistent with the previous literature, we find that the buy-write strategy may outperform the index. However, the performance depends on the option selection criteria of the particular implementation. We find that the one-month two-percent OTM strategy outperforms the index using a variety of measures. Over the 182 month period of analysis, the RUT buy-write strategy using 2% OTM, one-month calls generated a higher return than the underlying index (8.87% versus 8.11%) at about three-quarters of the standard deviation (16.57% versus 21.06%). More significantly, it outperforms the index in possibly the worst market environment for the strategy, when the index experiences large sustained positive returns with low volatility. Over the 56-month period from March 2003 to October 2007, the Russell 2000 had an annualized return of 20.92% and a volatility of 14.08%. Even in this unfavorable market environment, the 2% OTM buy-write strategy returned almost the same return as the Russell 2000 at about two-thirds the latter's volatility, easily outperforming the market by standard measures. As mentioned earlier, the selection criteria for the calls are important in determining the strategy's returns. This is the case because both transaction costs and the volatility risk premium (the premium of implied volatility over realized volatility) have a significant impact on returns, and the magnitude of both these factors varies significantly across options with differing moneyness and time to expiration. In fact, the risk premium of the call is critical to the returns of the strategy as our results suggest that the strategy would not outperform the index if options were priced at realized volatility. Overall, we find that the buy-write strategy can outperform the underlying index. However, both transaction costs and the choice of the option contract are central factors in determining the performance.

Data and Methodology

For this update and for the original study, we utilized option data from Optionmetrics. The dataset comprises of closing bids and offers of all options and indices quoted across all the exchanges for the period from January 1996 through March 2011. The Optionmetrics data also provides us with computed implied volatilities. The returns on the Russell 2000 are combined

[7] The measured differential assumes the distributional assumptions of the Black Scholes model. Implied volatilities are measured based on the Black Scholes model. If lognormality does not hold, both realized and implied volatilities may suffer from measurement errors.

with a daily cash dividend to create a total return index. The daily total return of the Russell 2000 index is calculated as:

$$RUT\ TR_t = \frac{RUT_t - RUT_{t-1} + Div_t}{RUT_{t-1}},$$

Daily data is utilized to allow us to create daily buy-write strategy returns. While the original study calculated monthly returns from expiration to expiration, this update calculates monthly returns from month end to month end to more closely match the typical focus of investors. The Russell 2000 total return index, combined with the returns of the short call positions, determines the returns of our buy-write strategy. For the analysis, we construct a buy-write index, closely following the methodology in Whaley (2002). The CBOE indices are also based on a similar methodology. Details of the index construction are as follows: Once each month, at the close on the day before the expiring option settles (usually the third Thursday of the month), a new call is written.

On the business day following the day a new call is written[8], the buy-write return is calculated as:

$$Buy\ Write\ Rtn_t = \frac{(RUT_t + Div_t - RUT_{t-1}) - (Call\ Mid_t - Call\ Bid_{t-1})}{RUT_{t-1} - Call\ Bid_{t-1}},$$

On the day a new call is written (and an old call position is closed), the buy-write return is calculated as:

$$Buy\ Write\ Rtn_t = \frac{(RUT_t + Div_t - RUT_{t-1}) - (Call\ Intrinsic_t - Call\ Mid_{t-1})}{RUT_{t-1} - Call\ Mid_{t-1}},$$

On all other days, the buy-write return is calculated as:

$$Buy\ Write\ Rtn_t = \frac{(RUT_t + Div_t - RUT_{t-1}) - (Call\ Mid_t - Call\ Mid_{t-1})}{RUT_{t-1} - Call\ Mid_{t-1}},$$

In order to perform the analysis on monthly data, monthly return series are constructed from the daily return series for each buy-write implementation.

We compare several different implementations of the index. First, for each maturity, we construct 5 indices corresponding to the at-the-money (ATM) as well as 2% and 5% in-the-money (ITM) calls and out-of-the money calls (OTM), respectively. We use two different maturities, one-month and two-month, so that we have a total of 10 indices. The main body of the paper includes the results for the one-month strategies. The results for the two-month implementations are provided in the appendix. For all strategies, the option is held until

[8] In order to capture transaction costs, we write the new call at the bid price.

expiration[9]. The short call position is closed at the intrinsic value of the call. There is a slight inaccuracy imposed by this procedure. Although in practice, the call is settled based on the Russell 2000 component trade prices on the morning of the day before expiration, we are effectively settling the options based on the closing prices of the previous day. We do this because our options dataset does not include opening prices. In order to include a representation of transaction costs, the new call is written at the current bid. For all days between the roll in date for the new call and the roll out (expiration) of the call, the call is marked-to-market for return calculations at the mid-point between the bid and the ask. In performing our analysis, we face a data limitation in that bid-ask quotes across all strikes are not available over the entire period (although the data availability improves significantly in more recent years). To ensure that the index is representative of actual close and bid-ask prices, we only use options which have a full set of bid-ask close prices available over their holding period. It is worth noting that this puts a greater restriction on the available data than the original study in which we only require prices on roll dates.

Since option strike prices are not continuous, the available strikes are not expected to exactly match the desired moneyness. When a specific option quote is not available, we substitute it with the option of the nearest available strike[10]. Exhibit 1a provides details of the average deviation from the desired strike, both as a percentage of the underlying level and on an absolute basis.

Exhibit 1a: Deviation of Utilized Strikes from Calculated Strikes

1-Month Call Buy Write						
	5% OTM	2% OTM	ATM	2% ITM	5% ITM	Overall
Average Percentage Deviation	0.30%	0.03%	0.01%	-0.03%	-0.14%	0.03%
Average Deviation	1.35	0.14	0.14	0.06	-0.52	0.23
2-Month Call Buy Write						
	5% OTM	2% OTM	ATM	2% ITM	5% ITM	Overall
Average Percentage Deviation	0.28%	-0.05%	0.04%	0.04%	-0.21%	0.02%
Average Deviation	1.36	-0.16	0.31	0.45	-0.75	0.24

[9] More specifically, the call position is closed at the close price on the afternoon before the morning expiration settlement.

[10] In the original study, for out of the money calls, we substituted the next available strike towards the at-the-money. For the ATM calls, we used the closest available strike.

On average, across all the one month indices we construct, the average percentage deviation was 0.03% from the desired strike (see Exhibit 1a). However, the magnitude of deviation from the desired strike varies across the different strategy implementations and over time. Exhibits 1b and 1c provide the time series of the deviations over the period of analysis for the one month and two month strategies, respectively. The one-month ATM strategy is the most pure of the buy-write strategies we consider, with a mean deviation from the desired strike of 0.01% of the underlying. It is worth noting that the deviations from the desired strikes are a result of discrete strikes as well as data limitations. Quotes are not always available for the all of the actual discrete strikes resulting in the use of the closest available strike. In a practical application of these strategies, one would not encounter these quote availability limitations. The strategy could be implemented at the discrete strike nearest the calculated strike, since the market would provide the required quotes.

The returns of the strategy will be impacted by both transaction costs as well as any consistent deviation of the implied volatility from the historical realized volatility. The primary transaction cost associated with the implementation of the strategy is the bid-ask spread of the option. To understand the impact of the bid-ask spread as well as to allow for the possibility that a call may be written within the spread, we calculate the returns using two different procedures. In the first, we assume the calls are written at the bid. In the second we assume the calls are written at the midpoint between the bid and ask.

Exhibit 1b: Time Series of Initial Moneyness of Utilized Strikes, One-Month Calls

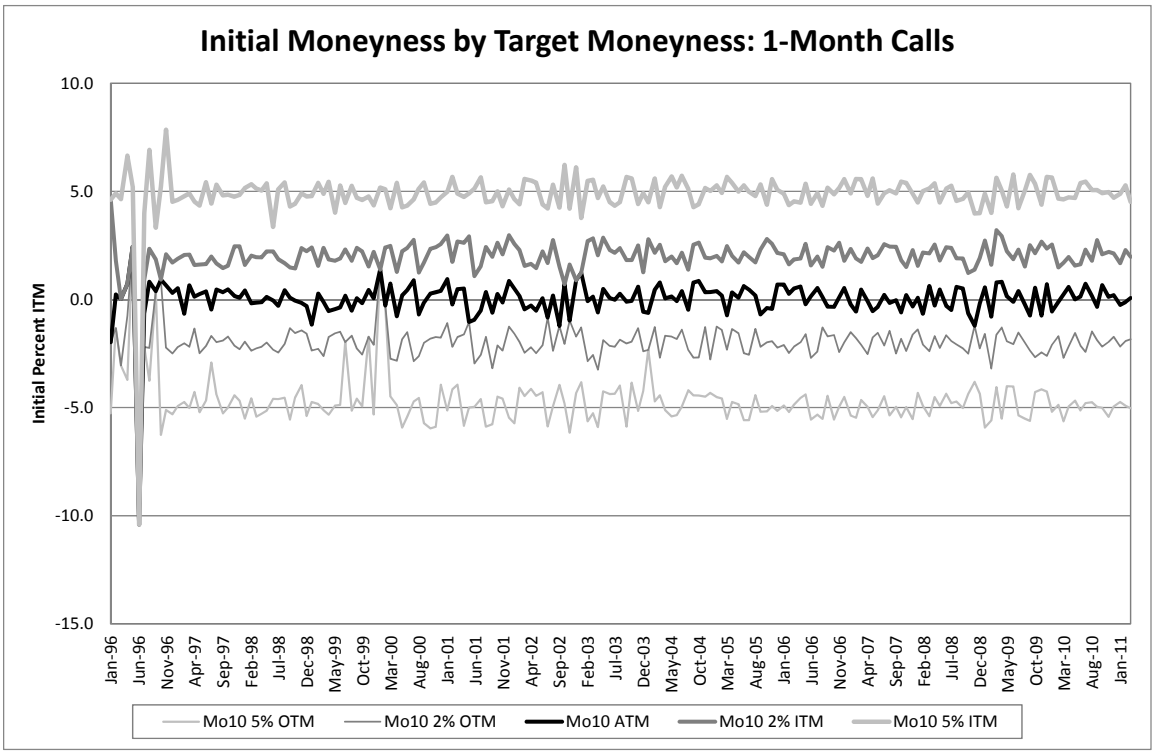


Exhibit 1c: Time Series of Initial Moneyness of Utilized Strikes, Two-Month Calls

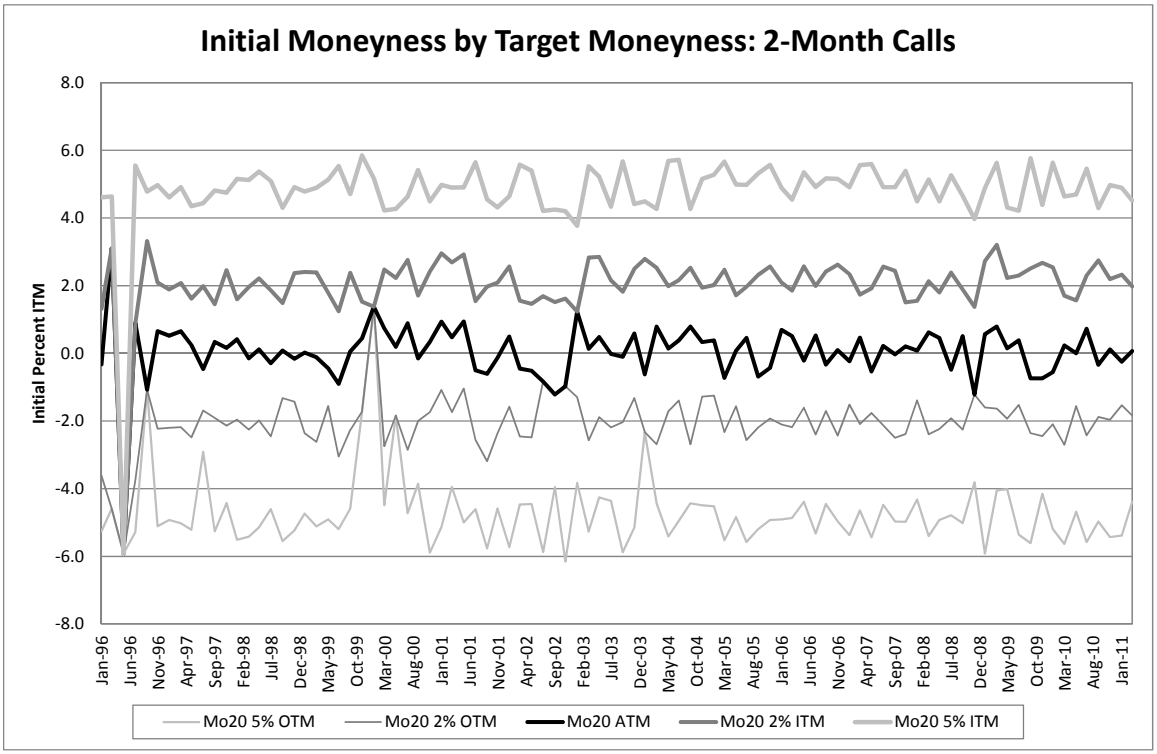


Exhibit 2: Growth of $100 in the 1-Month 2% OTM Buy-write Strategy, Considering Different Treatments of Transactions Costs

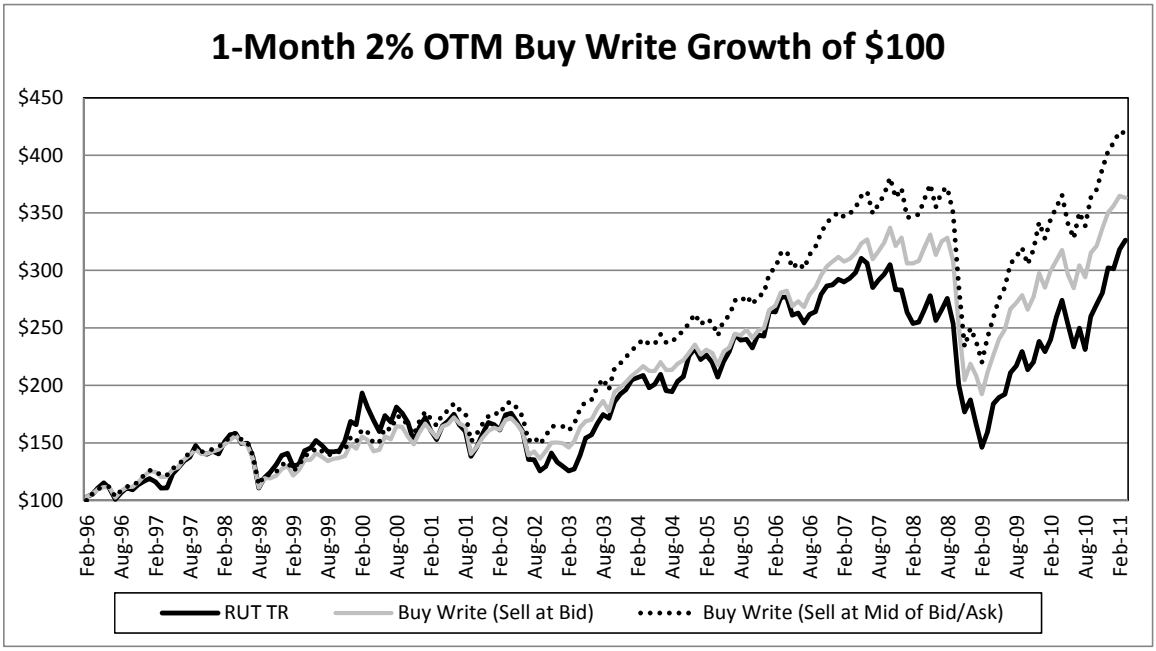
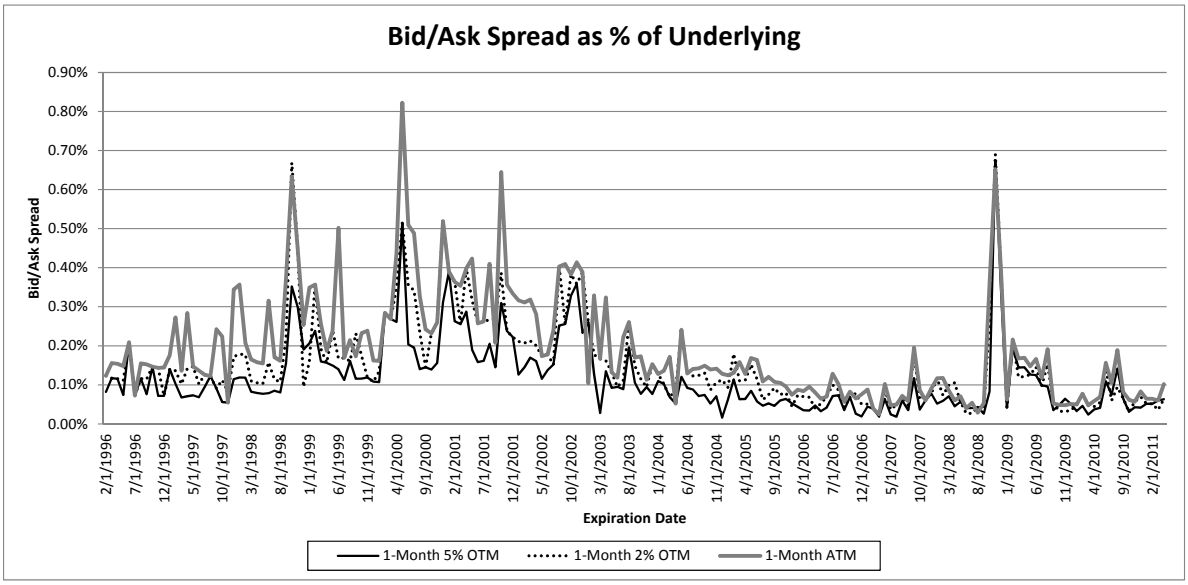


Exhibit 2 provides a graphical presentation of the cumulative impact of the difference between these two treatments for the 1-month 2% OTM buy-write strategy. It is evident from Exhibit 2 that if we disregard transaction costs, the cumulative growth of the ATM buy-write strategy over the 15 years of our study far surpasses that of the Russell 2000, with less volatility. The significance of the impact of transaction costs is also quite clear. Exhibits 3a and 3b provide details on the magnitude of transactions costs as a percentage of the underlying price.

Exhibit 3a: Bid-ask Spreads and Volatility Differentials

Average Bid/Ask Spread (as % of Underlying)					
	5% OTM	**2% OTM**	**ATM**	**2% ITM**	**5% ITM**
1-Month	0.12%	0.15%	0.19%	0.24%	0.30%
2-Month	0.17%	0.23%	0.26%	0.31%	0.34%
Average Volatility Spread (Implied Minus Realized)					
	5% OTM	**2% OTM**	**ATM**	**2% ITM**	**5% ITM**
1-Month	1.4%	2.5%	3.4%	4.6%	6.4%
2-Month	1.5%	2.4%	3.4%	4.3%	5.6%

Exhibit 3b: Bid-ask Spreads as % of Underlying Level Time Series, 1-Month Buy-write



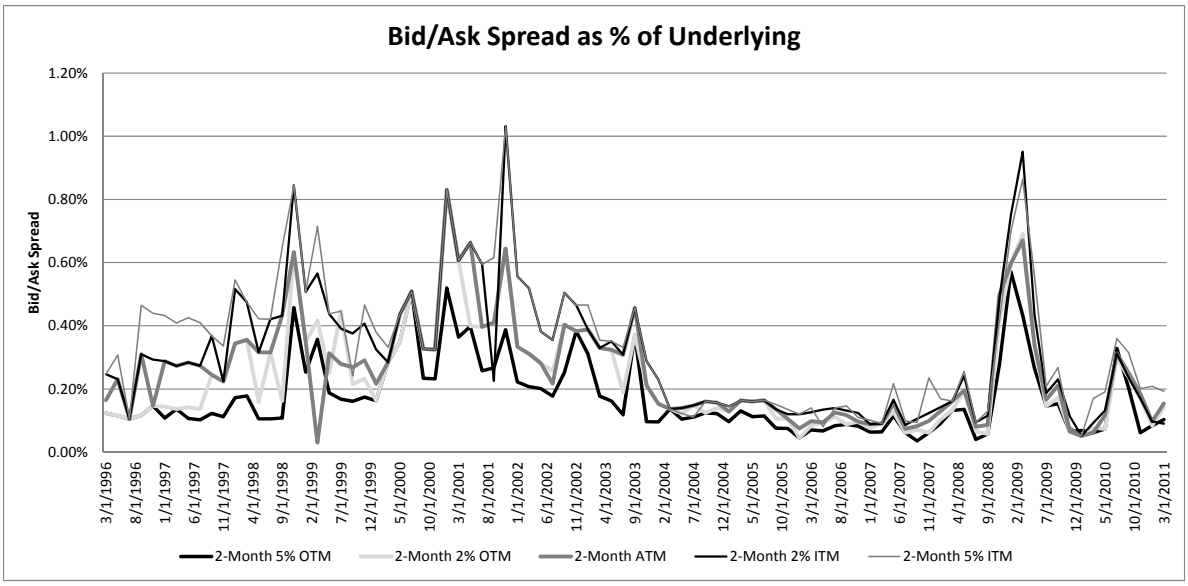
The average initial bid-ask spread[11] as a percentage of the underlying price for the one-month strategies range from 0.12% to 0.30%, smaller for calls that are further OTM. The percentage spreads for the two-month options are higher than those for the one-month options, ranging from 0.17% to 0.34%. The spreads for the 2% OTM one-month and two-month strategies (the main options of interest) are 0.15% and 0.23%, respectively[12]. To put these numbers in

[11] The bid-ask spread quoted on the day on which the calls are written. This does not include spreads on subsequent days.

[12] While the original study focused on the ATM strategies, the update focuses on the 2% OTM strategies to be consistent with other literature (see for example, Szado and Schneeweis [2010]).

perspective, a 2% OTM one-month buy-write, would incur transactions costs of approximately 0.9% per year[13] if the calls are written at the bid price.

Exhibit 3c: Bid-ask Spreads as % of Underlying Level Time Series, 2-Month Buy-write



The time series of the spreads are provided in Exhibits 3b and 3c. While spreads have decreased substantially over time, they experienced significant positive spikes during the financial crisis. One would expect the general trend toward lower transaction costs as well as the spikes in transaction costs during the crisis to have significant impacts on the profitability of the buy-write strategy.

As has been documented in the literature for options on the S&P 500 (for example, see Bakshi and Kapadia [2003]), the Black Scholes implied volatility is consistently higher than the historical realized volatility over the remaining lifetime of the option. The average realized volatility risk premium (defined as the implied volatility less the realized volatility) is 2.5% and 2.4% for the 2% OTM strategies for the one-month and two-month times to expiration, respectively. Since this is one of the drivers of the buy-write strategy returns, the volatility risk premium would be expected to help provide a favorable environment for the implementation of the strategy. While the differential between implied volatility and realized volatility is generally positive, as Exhibit 4a and 4b indicate, the realized differential varies considerably over time and is at times significantly negative. This is particularly the case when realized volatility exhibits sudden upward spikes.

[13] ½ of the bid-ask spread for each of the 12 months = 0.5*0.15%*12.

Exhibit 4a: Realized Volatility Differentials, 1-Month Buy-write

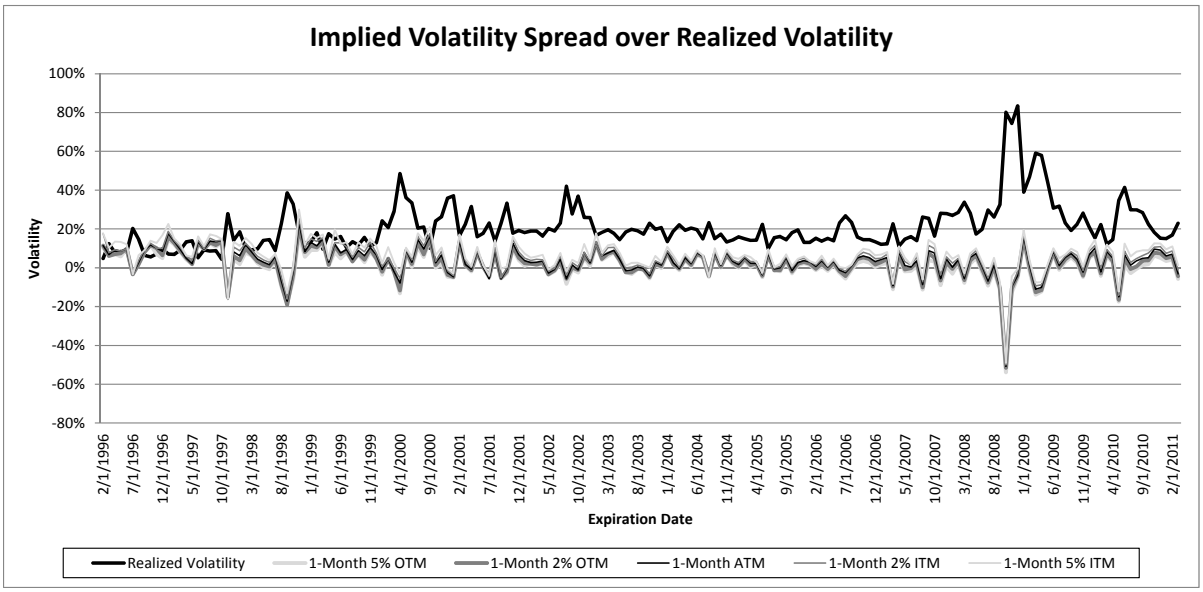
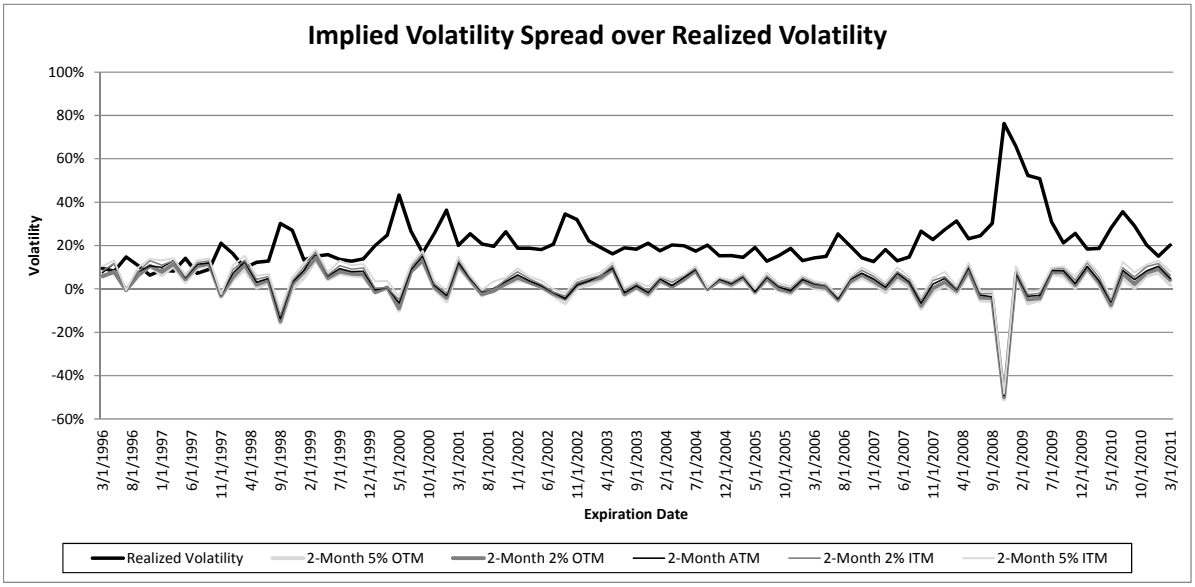


Exhibit 4b: Realized Volatility Differentials, 2-Month Buy-write



Risk and Return Characteristics

Full Sample Results

Exhibit 5 provides summary statistics for the one-month buy-write strategy for the entire sample period from February 1, 1996 to March 31, 2011. In addition, Exhibit 6 provides a graphical presentation of the performance over the period. We report both annualized returns and annualized standard deviations for each strategy implementation. As the returns on the

buy-write strategy are not normally distributed[14], we also report the higher moments of the distribution including the excess kurtosis and the skewness. Since standard deviation may not be an effective measure of risk for non-normal distributions, we report alternative measures such as the range of the realized return distribution and the maximum drawdown and run up. To be consistent with extant literature, we report standard risk adjusted performance measures including the Sharpe ratio, Treynor ratio, and Jensen's alpha. Since these measures are not robust to non-normal return distributions, we also report two robust risk adjusted performance measures: the Stutzer index and Leland's alpha.

In what follows, we will focus mostly on the strategy for the 2% OTM one-month buy-write although we continue to report the numbers for other strikes. Details for all two-month strategies are provided in the appendix. The annualized return for the 2% OTM one-month strategy over the 182 months of our sample period is 8.87% compared to the Russell 2000 return of 8.11%. It is of great interest that the volatility of the strategy for the 2% OTM buy-write is much lower than that of the index. The annualized standard deviation for the 1-month 2% OTM buy-write strategy is 16.57% compared to 21.06% for the Russell 2000. However, the mean return and volatility are not sufficient to characterize the distribution of returns since the buy-write strategy's return distribution would be non-normal even if the underlying Russell 2000 distribution was normal[15]. The buy-write strategy's returns are significantly more fat-tailed and negatively skewed than the returns of the index. The excess kurtosis and the skewness of the 2% OTM strategy are 3.49 and -1.40 compared with 0.81 and -0.56 for the underlying index.

Given that the return distribution is non-normal, it is particularly important to consider measures of risk other than volatility. Exhibit 5 reports the minimum monthly return and the maximum drawdown over the full period. The worst monthly return for the 2% OTM strategy is -18.69%, which is better than the worst monthly return of -20.80% for the Russell 2000. The largest drawdown for the 2% OTM strategy is -42.9%, compared with the maximum drawdown of -52.9% for the index. Conversely, the best monthly return is far higher for the index at 16.51%, compared with 9.68% for the 2% OTM strategy. In contrast, the maximum run up is lower for the index at 226.2%, compared with 264.7% for the 2% OTM strategy. These measures suggest that the buy-write strategy had a lower realized risk over this period when compared to the underlying index. This argument is further supported by the buy-write's Leland beta of 0.74. From a risk adjusted performance perspective, the Sharpe ratio and Treynor ratio suggest that the 2% OTM buy-write outperformed the Russell 2000 over the

[14] Since the buy-write strategy essentially truncates the upper end of the return distribution, one would expect the returns to be non-normal.
[15] For details of the non-normality of the return distributions see the original study.

period of study. The Sharpe ratio is 0.33 for the buy-write and 0.23 for the underlying index. Similarly, the Treynor ratios are 0.08 and 0.05, respectively.

Exhibit 5: 1-Month Buy-write Strategy Summary Statistics, Full Period

1-Month Call Buy Write Feb 1, 1996 to Mar 31, 2011	Russell 2000 TR	5% OTM	2% OTM	ATM	2% ITM	5% ITM
Annualized Return	8.11%	10.21%	8.87%	7.30%	6.94%	5.54%
Annualized Standard Deviation	21.06%	18.63%	16.57%	14.66%	13.24%	10.99%
Skewness	-0.56	-1.04	-1.40	-1.76	-2.16	-2.72
Excess Kurtosis	0.81	1.85	3.49	5.45	8.15	12.37
Correlation with RUT	1.00	0.96	0.92	0.87	0.81	0.72
Sharpe Ratio	0.23	0.37	0.33	0.27	0.27	0.20
Treynor Ratio	0.05	0.08	0.08	0.07	0.07	0.06
Stutzer Index	0.21	0.33	0.30	0.24	0.24	0.18
CAPM Beta	1.00	0.84	0.72	0.60	0.51	0.38
Jensen's Monthly Alpha		0.21%	0.15%	0.06%	0.07%	0.01%
Leland's Beta	1.00	0.86	0.74	0.63	0.53	0.40
Leland's Monthly Alpha		0.20%	0.14%	0.05%	0.06%	0.00%
Mean Monthly Return	0.84%	0.96%	0.83%	0.68%	0.64%	0.50%
Median Monthly Return	1.68%	1.74%	1.77%	1.62%	1.33%	0.91%
Minimum Monthly Return	-20.80%	-18.86%	-18.69%	-17.84%	-17.69%	-16.43%
Maximum Monthly Return	16.51%	10.57%	9.68%	10.16%	10.01%	8.26%
Maximum Drawdown	-52.9%	-46.0%	-42.9%	-37.7%	-34.8%	-31.3%
Maximum Run Up	226.2%	337.1%	264.7%	193.0%	178.0%	130.7%
% Down Months	38%	36%	33%	31%	27%	23%
% Up Months	62%	64%	67%	69%	73%	77%
Number of Months	182	182	182	182	182	182

As mentioned earlier, these measures are not robust against a deviation from normality. For this reason, Leland's alpha and the Stutzer index are presented. The former is a robust alternative for Jensen's alpha and the latter is an alternative for the Sharpe ratio. The 2% OTM buy-write exhibited a positive 0.15% monthly Leland alpha over the period of study (risk adjusted performance above the Russell 2000). In addition, the Stutzer index of the buy-write is significantly greater than that of the Russell 2000 (0.30 and 0.21, respectively).

Exhibit 6: 1-Month Buy-write Strategy Growth of $100, Full Period

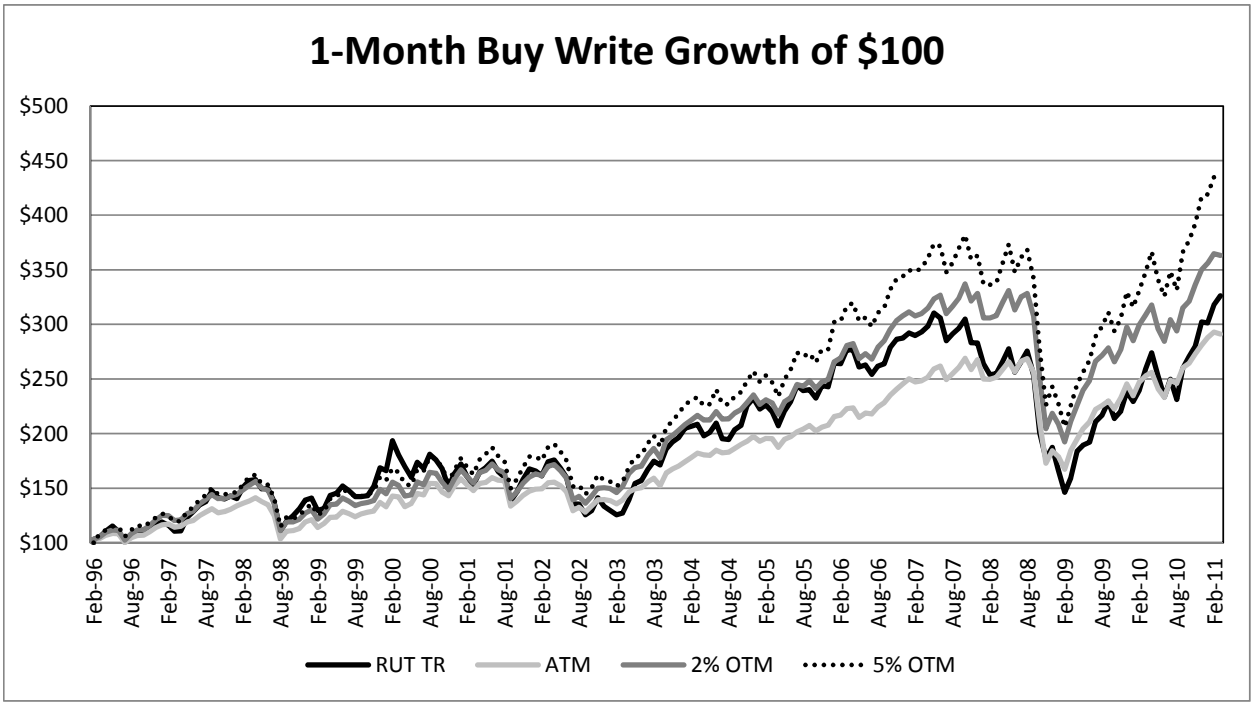


Exhibit 7 illustrates the 24-month rolling average annualized returns of the 2% OTM buy-write strategy. While the absolute performance gap between the buy-write and the Russell 2000 fluctuates significantly, the gap is often extremely small. In contrast, Exhibit 8 shows a relatively consistent 24-month rolling annualized standard deviation gap between the buy-write and the Russell 2000, with the 2% OTM buy-write typically exhibiting a 5 to 7% lower rolling volatility.

Exhibit 7: 24-Month Rolling Annualized Returns

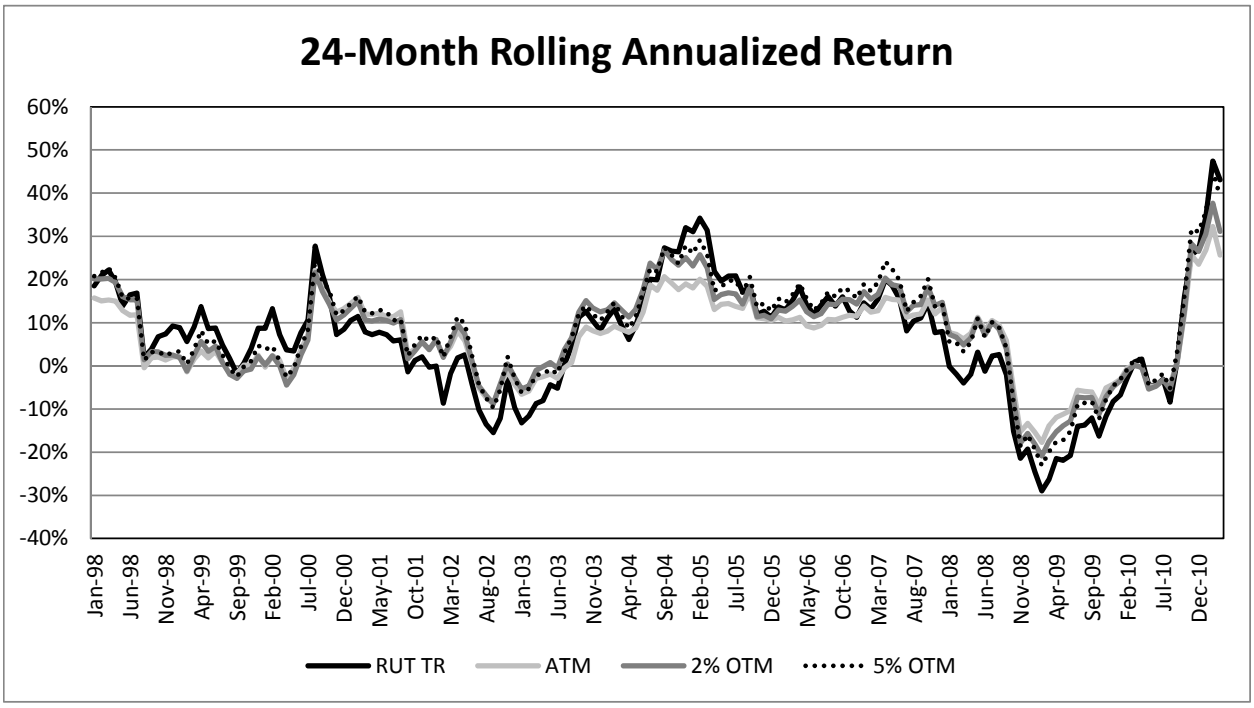
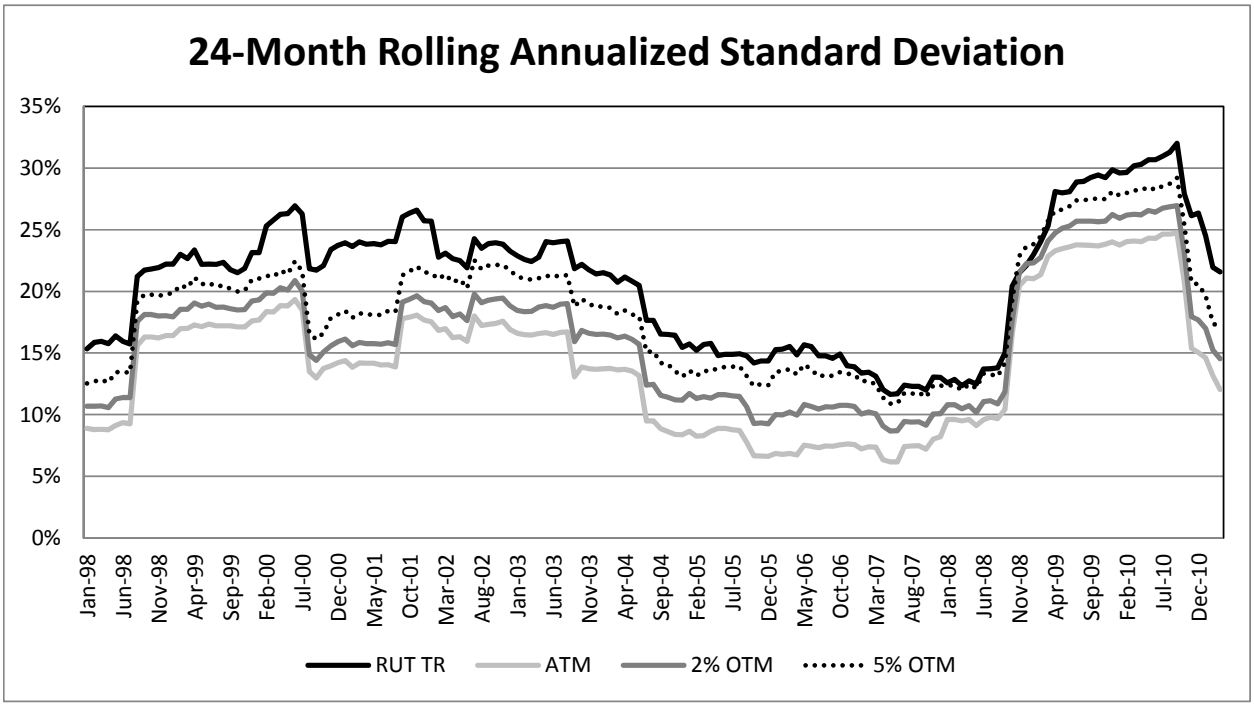


Exhibit 8: 24-Month Rolling Annualized Standard Deviation



The performance of the buy-write strategy is sensitive to market conditions. In particular, we expect the strategy to underperform relative to the index in a strong upward trending market which consistently moves through the strike price of the written call at low volatility. To observe the impact of varying market conditions on the performance of the buy-write, we split the overall data period into three sub-periods: February 1, 1996 to February 28, 2003; March 1, 2003 to October 31, 2007; and November 1, 2007 to March 31, 2011. The break points were chosen specifically to capture the strong and steady four-plus year run up the Russell 2000 experienced from its local minimum in March 2003 to its local pre-crisis maximum in October 2007 (as can be observed in Exhibit 2) as well as isolating the financial crisis.

Exhibit 9: 1-Month Buy-write Strategy Summary Statistics, Favorable Period

1-Month Call Buy Write Feb 1, 1996 to Feb 28, 2003	Russell 2000 TR	5% OTM	2% OTM	ATM	2% ITM	5% ITM
Annualized Return	3.28%	6.07%	5.49%	4.40%	5.22%	3.95%
Annualized Standard Deviation	21.83%	18.84%	16.76%	15.09%	13.71%	11.25%
Skewness	-0.39	-0.88	-1.28	-1.57	-1.89	-2.34
Excess Kurtosis	0.50	1.40	2.75	4.07	5.77	8.64
Correlation with RUT	1.00	0.96	0.92	0.89	0.83	0.77
Sharpe Ratio	-0.06	0.08	0.05	-0.02	0.04	-0.06
Treynor Ratio	-0.01	0.02	0.01	0.00	0.01	-0.02
Stutzer Index	-0.06	0.07	0.05	-0.01	0.04	-0.06
Information Ratio with RUT		0.29	0.09	-0.07	-0.03	-0.15
CAPM Beta	1.00	0.83	0.71	0.61	0.52	0.40
Jensen's Monthly Alpha		0.19%	0.12%	0.02%	0.08%	-0.04%
Leland's Beta	1.00	0.83	0.72	0.62	0.53	0.40
Leland's Monthly Alpha		0.19%	0.12%	0.02%	0.08%	-0.04%
Mean Monthly Return	0.47%	0.64%	0.57%	0.46%	0.51%	0.38%
Median Monthly Return	0.91%	1.02%	1.25%	1.15%	1.16%	0.92%
Minimum Monthly Return	-19.42%	-18.86%	-18.38%	-17.31%	-16.59%	-14.20%
Maximum Monthly Return	16.51%	9.85%	8.18%	7.33%	7.32%	6.46%
Maximum Drawdown	-35.1%	-29.3%	-28.9%	-26.7%	-23.5%	-17.7%
Maximum Run Up	93.3%	90.6%	72.1%	59.7%	58.7%	50.3%
% Down Months	44%	44%	38%	34%	33%	27%
% Up Months	56%	56%	62%	66%	67%	73%
Number of Months	85	85	85	85	85	85

Buy-write Strategy in Favorable Market Environment

The period from February 1, 1996 to February 28, 2003 is a somewhat favorable period for the buy-write (relative to the underlying performance). The second half of the period seems particularly favorable for the buy-write (relative to the underlying) since the underlying exhibits a downward trend and a generally high positive spread of implied volatility over realized volatility (see Exhibit 10). During this period, the underlying experienced a low annualized return of 3.28% at a high standard deviation of 21.83 (volatility was particularly high in the second half of the period as shown in Exhibit 4a). While the period includes some strong run ups, they are not nearly as strong and sustained as in the second (unfavorable) period or in the third (crisis) period. Exhibit 9 provides summary statistics for the buy-write performance in this favorable market environment.

As expected, in this period, the 2% OTM buy-write outperforms the underlying index. The buy-write generates almost twice the return (5.49% versus 3.28%) at about three-quarters the volatility (16.76% versus 21.83%). The 2% OTM buy-write's outperformance in this period is further confirmed by the Stutzer index (0.05 versus -0.06) and Leland's alpha (+0.12%). A graphical presentation of the performance over this period is provided in Exhibit 10.

Exhibit 10: 1-Month Buy-write Strategy Growth of $100, Favorable Period

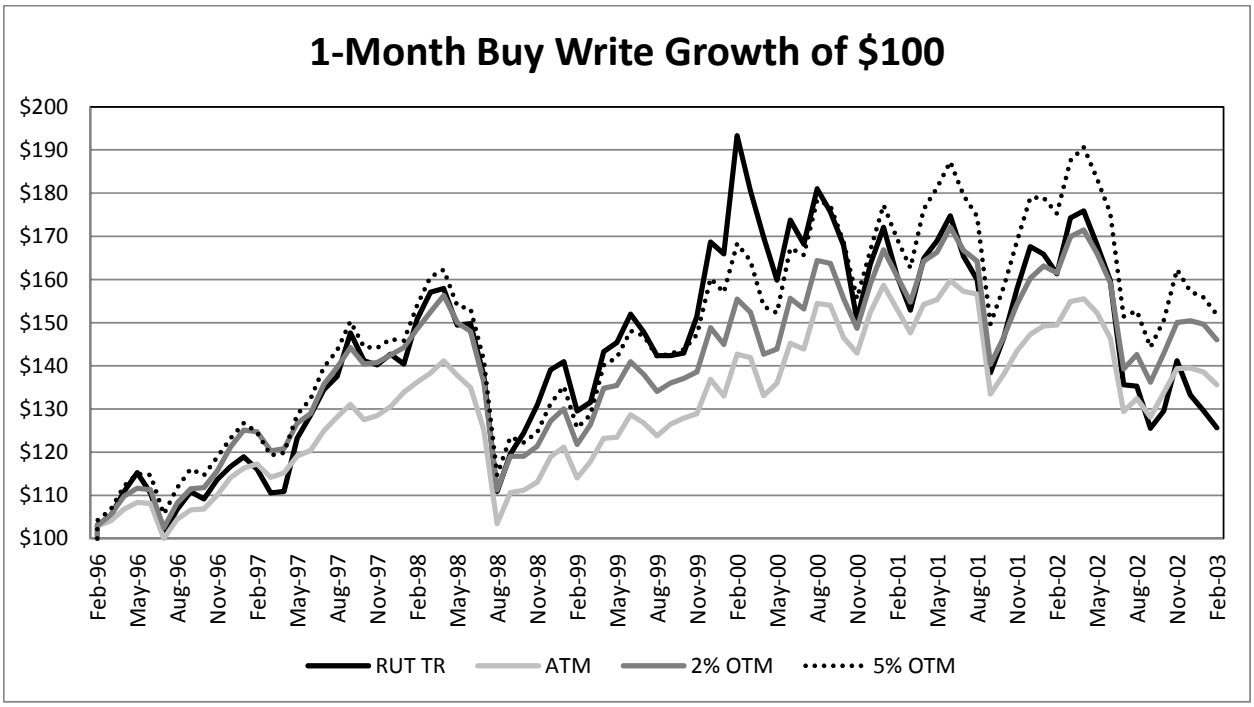


Exhibit 11: 1-Month Buy-write Strategy Summary Statistics, Unfavorable Period

1-Month Call Buy Write Mar 1, 2003 to Oct 31, 2007	Russell 2000 TR	5% OTM	2% OTM	ATM	2% ITM	5% ITM
Annualized Return	20.92%	21.86%	19.63%	15.79%	13.17%	9.57%
Annualized Standard Deviation	14.08%	12.66%	10.52%	7.89%	5.90%	3.36%
Skewness	-0.05	-0.30	-0.23	-0.64	-0.95	-1.45
Excess Kurtosis	-0.09	-0.07	0.59	1.69	2.65	4.76
Correlation with RUT	1.00	0.95	0.89	0.81	0.69	0.48
Sharpe Ratio	1.27	1.48	1.58	1.61	1.71	1.94
Treynor Ratio	0.18	0.22	0.25	0.28	0.36	0.58
Stutzer Index	1.09	1.31	1.41	1.42	1.48	1.61
Information Ratio with RUT		0.11	-0.26	-0.59	-0.72	-0.87
CAPM Beta	1.00	0.85	0.66	0.45	0.28	0.11
Jensen's Monthly Alpha		0.25%	0.34%	0.34%	0.38%	0.34%
Leland's Beta	1.00	0.88	0.69	0.49	0.32	0.14
Leland's Monthly Alpha		0.22%	0.31%	0.30%	0.34%	0.32%
Mean Monthly Return	1.68%	1.73%	1.55%	1.25%	1.05%	0.77%
Median Monthly Return	1.70%	2.03%	1.94%	1.82%	1.29%	0.84%
Minimum Monthly Return	-6.84%	-6.39%	-5.21%	-4.74%	-4.14%	-3.12%
Maximum Monthly Return	10.73%	9.22%	9.47%	7.70%	5.82%	2.84%
Maximum Drawdown	-10.8%	-9.1%	-7.5%	-5.1%	-4.1%	-3.1%
Maximum Run Up	147.1%	151.5%	130.8%	98.2%	78.1%	53.2%
% Down Months	30%	25%	23%	21%	16%	11%
% Up Months	70%	75%	77%	79%	84%	89%
Number of Months	56	56	56	56	56	56

Buy-write Strategy in Unfavorable Market Environment

The period from March 1, 2003 to October 31, 2007 is perhaps the epitome of an unfavorable environment for the performance of a buy-write strategy (relative to the performance of the underlying index)[16]. The annualized return for the Russell 2000 over this 56 month period was 20.92%. In comparison, the annualized return in the earlier period of February 1996 to February 2003 is 3.28%. In addition, the run up occurs with low volatility - the annualized volatility in the March 2003 to October 2007 period is 14.08% compared with 21.83% for the earlier period. Thus, focusing on the results from March 2003 to October 2007 allows us to understand how "badly" the buy-write strategy performed relative to the index in what one would expect to be one of the least favorable 56-month periods in our entire sample period. Interestingly, even in

[16] This is particularly the case for ATM or deep ITM buy-write strategies in which the options often expired deep ITM during the period due to the sustained rally in the underlying.

this unfavorable market environment, Exhibit 11 shows that the 2% OTM buy-write strategy performs credibly with an annualized return of 19.63% almost equaling the return of the index (20.92%). The annualized volatility of the strategy was only 10.52% compared to the Russell's volatility of 14.08%. In other words, the buy-write strategy achieved almost the same return as the index at about two-thirds the index volatility.

Of course, in this environment one would expect that an ATM or ITM buy-write would perform significantly worse that an OTM strategy. In fact, since the median monthly return of the Russell 2000 (1.70%) over the period is close to the moneyness of the 2% OTM calls, a deeper OTM strategy may be more appropriate for assessing a near "worse-case scenario". However, even the ATM or 5% ITM buy-write strategies outperformed the Russell 2000 on a risk-adjusted basis, by some measures. While the absolute returns of the ATM and 5% ITM buy-write strategies (15.79% and 9.57%, respectively) were much lower than the Russell 2000 (20.92%), the buy-write standard deviations were far lower (7.89% and 3.36%, respectively). Thus, the ATM buy-write generated two-thirds of the return of the Russell 2000 at about half the volatility and the 5% ITM buy-write generated half the return of the Russell 2000 at one-fifth of the standard deviation. The risk adjusted outperformance is confirmed by the Stutzer index (1.42 and 1.61, versus 1.09 for the underlying) and Leland's monthly alpha (positive 0.30% and 0.32%, respectively).

Exhibit 12: 1-Month Buy-write Strategy Growth of $100, Unfavorable Period

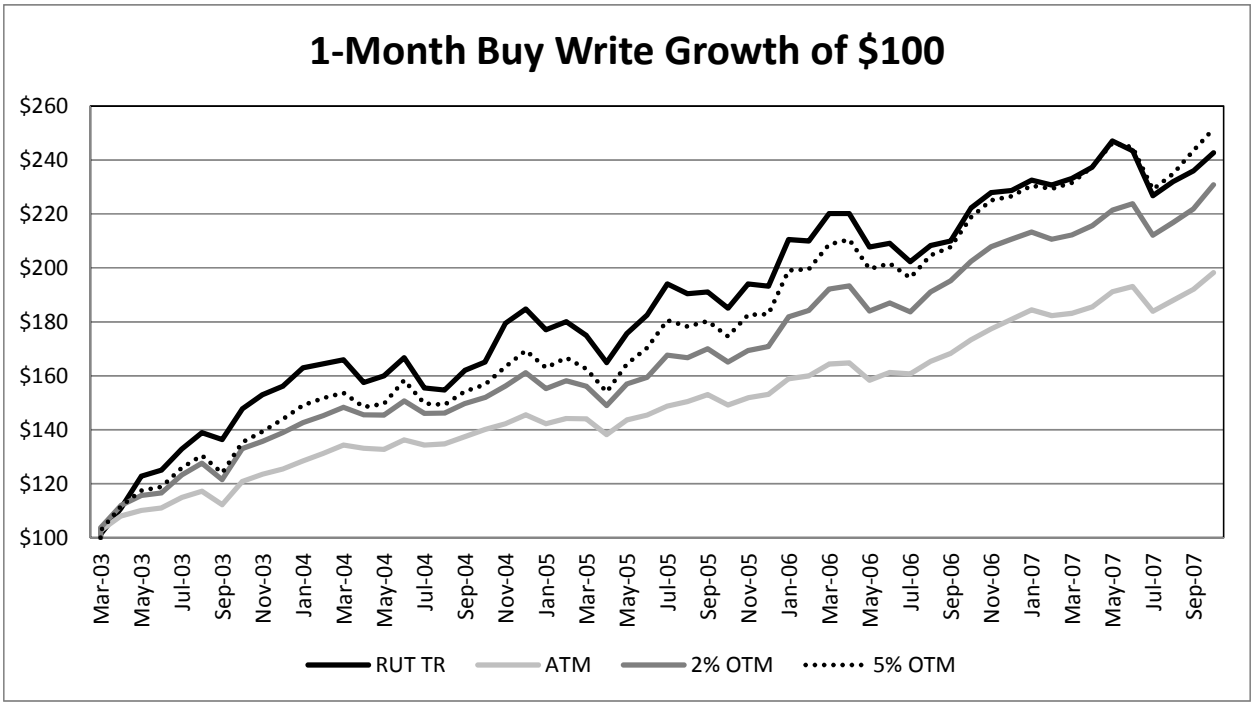


Exhibit 13: 1-Month Buy-write Strategy Summary Statistics, Financial Crisis Period

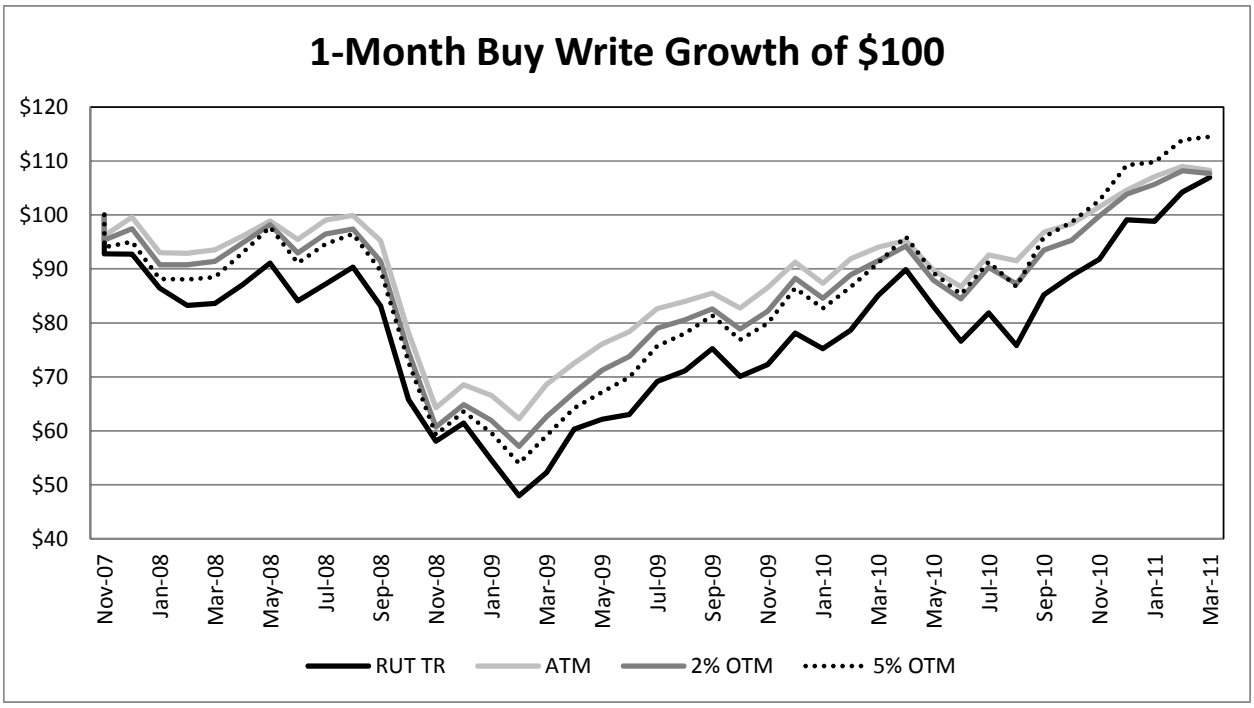
1-Month Call Buy Write Nov 1, 2007 to Mar 31, 2011	Russell 2000 TR	5% OTM	2% OTM	ATM	2% ITM	5% ITM
Annualized Return	1.99%	4.03%	2.20%	2.36%	2.35%	3.47%
Annualized Standard Deviation	26.78%	24.30%	22.07%	20.02%	18.60%	16.23%
Skewness	-0.58	-1.04	-1.28	-1.49	-1.77	-2.14
Excess Kurtosis	0.03	0.88	1.94	3.13	4.72	6.66
Correlation with RUT	1.00	0.96	0.92	0.87	0.82	0.75
Sharpe Ratio	0.03	0.12	0.05	0.06	0.07	0.15
Treynor Ratio	0.01	0.03	0.01	0.02	0.02	0.05
Stutzer Index	0.03	0.11	0.05	0.06	0.06	0.14
Information Ratio with RUT		0.14	-0.13	-0.15	-0.17	-0.13
CAPM Beta	1.00	0.86	0.75	0.65	0.57	0.45
Jensen's Monthly Alpha		0.16%	0.02%	0.03%	0.04%	0.14%
Leland's Beta	1.00	0.88	0.77	0.67	0.59	0.48
Leland's Monthly Alpha		0.16%	0.01%	0.03%	0.03%	0.13%
Mean Monthly Return	0.46%	0.58%	0.39%	0.37%	0.34%	0.40%
Median Monthly Return	3.01%	3.10%	2.21%	1.74%	1.60%	1.04%
Minimum Monthly Return	-20.80%	-18.81%	-18.69%	-17.84%	-17.69%	-16.43%
Maximum Monthly Return	15.46%	10.57%	9.68%	10.16%	10.01%	8.26%
Maximum Drawdown	-52.0%	-46.0%	-42.9%	-37.7%	-34.8%	-31.3%
Maximum Run Up	123.0%	112.0%	89.5%	75.0%	60.9%	52.1%
% Down Months	39%	34%	37%	37%	32%	29%
% Up Months	61%	66%	63%	63%	68%	71%
Number of Months	41	41	41	41	41	41

Buy-write Strategy during the Financial Crisis

The period from November 1, 2007 to March 31, 2011 covers the financial crisis. In this period, the Russell 2000 exhibited a rapid and very significant loss in value followed by a strong recovery. In addition, the period also exhibited large spikes in realized and implied volatilities. Exhibit 4a provides a graphic representation of the severity of the spikes in realized volatility. Perhaps the single statistic that best defines the impact of the financial crisis on the Russell 2000 is the maximum drawdown. Over the 41 months of this period, the Russell 2000 experienced a maximum drawdown of -52.0%. This was significantly larger than that of the previous two periods (-35.1% and 10.8%, respectively). In such an environment, one would expect the extra income that call writing generates may have benefited performance by providing a cushion to the drawdowns. However, this benefit is mitigated by the reduced

participation in the market recovery (as well as the significant increase experienced in transactions costs). Exhibits 13 and 14 suggest that the buy-write strategies did provide a small degree of return enhancement over the period with a significant reduction in standard deviation. The 2% OTM buy-write generated a 2.20% annualized return (1.99% for the underlying) at an annualized standard deviation of 22.07% (26.78% for the underlying). Therefore, the buy-write generated a slightly higher return at about 4/5 the standard deviation. Similarly, the Stutzer index was somewhat higher for the buy-write (0.05 versus 0.03) and Leland's monthly alpha was positive 0.01% for the buy-write. Finally, maximum drawdown was reduced from -52.0% for the underlying to -42.9% for the buy-write. In this period, the 2% OTM strategy was the worst performing of the 1-month buy-write strategies. The other implementations outperformed the underlying by a far greater margin.

Exhibit 14: 1-Month Buy-write Strategy Growth of $100, Financial Crisis Period



Return Attribution

In order to better understand the drivers of returns, we break the buy-write returns down into their source components[17]. The most obvious (and most significant) source of returns is the movement of the underlying Russell 2000 index. In addition to this obvious source, we isolate two other factors which contribute to the returns. As previously mentioned, option writing is subject to significant transaction costs. These costs were found to have a significant negative impact on returns. On the other hand, option writing benefits from the fact that implied volatilities are typically higher than historical realized volatilities. This section of the paper focuses on understanding the relative contribution of these two factors to the performance of the strategy. We begin by breaking down the buy-write strategy return into the Russell 2000 returns, the transaction cost returns and the call returns. We then further decompose the call return into the returns at the realized volatility, the returns from the volatility risk premium of the call, and once again, the transaction cost returns. We first decompose the buy-write return into its components, expressing each component as a partial return on the total investment in the strategy (long index, short call).

In this framework, the buy-write returns consist of the following:

The returns generated by the long position in the underlying Russell 2000 index;

$$RUT\ Rtn_t = \frac{RUT_t - RUT_{t-1} + Div_t}{RUT_{t-1} - Call@Bid_{t-1}},$$

the returns that would be generated by selling the call at the midpoint of the bid-ask spread;

$$Call\ Rtn@Mid\ Bid/Ask_t = \frac{-(Call\ Intrinsic@Expir_t - Call@Mid\ Bid/Ask_{t-1})}{RUT_{t-1} - Call@Bid_{t-1}},$$

and the (negative) returns generated by selling the call at the bid, rather than the midpoint of the bid and ask;

$$Transaction\ Cost\ Rtn_t = \frac{-(Call@Mid\ Bid/Ask_{t-1} - Call@Bid_{t-1})}{RUT_{t-1} - Call@Bid_{t-1}}.$$

The total return of the buy-write index is given as:

$$Buy\ Write\ Rtn_t = RUT\ Rtn_t + Call\ Rtn@Mid\ Bid/Ask_t + Trans.Cost\ Rtn_t\ ,$$

[17] For the purpose of return attribution, we calculate "monthly" returns from expiration to expiration rather than month-end to month-end.

Exhibit 15: 1-Month Buy-write Strategy Return Attribution

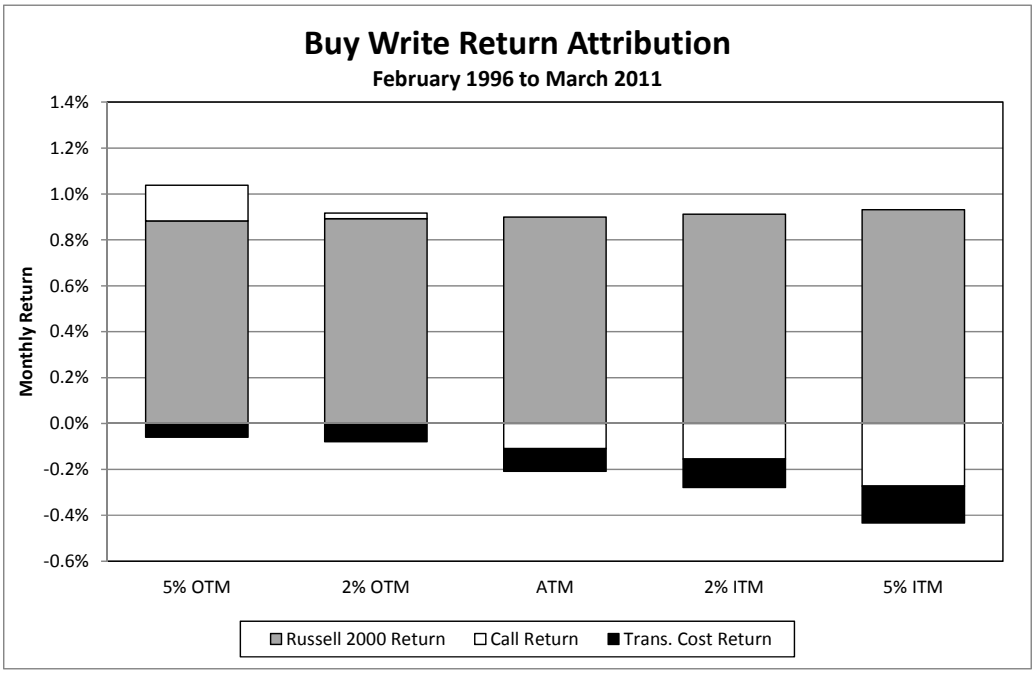


Exhibit 15 illustrates this return decomposition. We can see that the underlying Russell 2000 index is by far the main contributor to the overall returns of the buy-write strategy, averaging close to 1% per month. It is worthwhile to note that the Russell 2000 returns vary slightly from strategy to strategy due to the different call premiums affecting the net investment position each month, and therefore the basis by which the return is calculated. The ATM and ITM one-month strategies presented in the chart experience an average before transaction cost loss from the call position, typically around 0.2% per month. Transaction costs have a very significant contribution to returns. In fact, after transactions costs, the call positions for all strategies except the 5% OTM generate a loss for the portfolio. The loss due to transaction costs is generally close to the loss generated by the call position before transactions costs.

We now further decompose the call returns.

The call returns consist of the following:

Returns that would be generated if the calls had been sold at the Black Scholes price associated with the realized volatility over the holding period of the call position; [18]

$$Call@Realized\ Volatility\ Rtn_t = \frac{-(Call\ Intrinsic@Expir_t - Call@Realized\ Vol_{t-1})}{RUT_{t-1} - Call@Bid_{t-1}},$$

[18] For the sake of clarity, we utilize the same denominator in the attribution formulas. If a strategy could be devised that captured only a single component of the returns such as selling the calls at the ex-post realized volatility, the return basis (denominator) would also change correspondingly.

the extra returns that are generated by selling the call at the Black Scholes implied volatility rather than selling at the realized volatility. We referred to this differential earlier as the volatility risk premium of the call. This is the difference between selling at the midpoint of the bid ask spread and selling at the Black Scholes price associated with the realized volatility. On average, this would represent the volatility risk premium;

$$Call\ Volatility\ Premium\ Rtn_t = \frac{-(Call@Realized\ Vol_{t-1} - Call\ Mid\ Bid/Ask@Expir_{t-1})}{RUT_{t-1} - Call@Bid_{t-1}},$$

and the (negative) returns generated by selling the call at the bid, rather than the midpoint of the bid and ask;

$$Transaction\ Cost\ Rtn_t = \frac{-(Call@Mid\ Bid/Ask_{t-1} - Call@Bid_{t-1})}{RUT_{t-1} - Call@Bid_{t-1}},$$

The total return of the short call position is given as:

$$Call\ Rtn_t = Call@Realized\ Vol.Rtn_t + Call\ Vol.Prem.Rtn_t + Trans.Cost\ Rtn_t,$$

Exhibit 16: 1-Month Buy-write Strategy Short Call Return Attribution

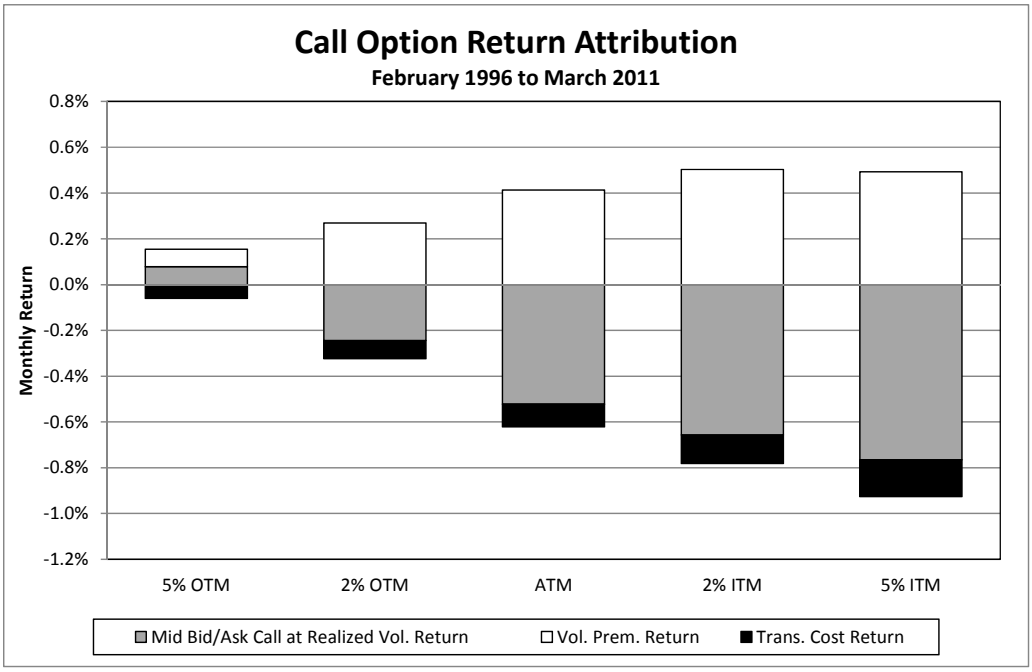
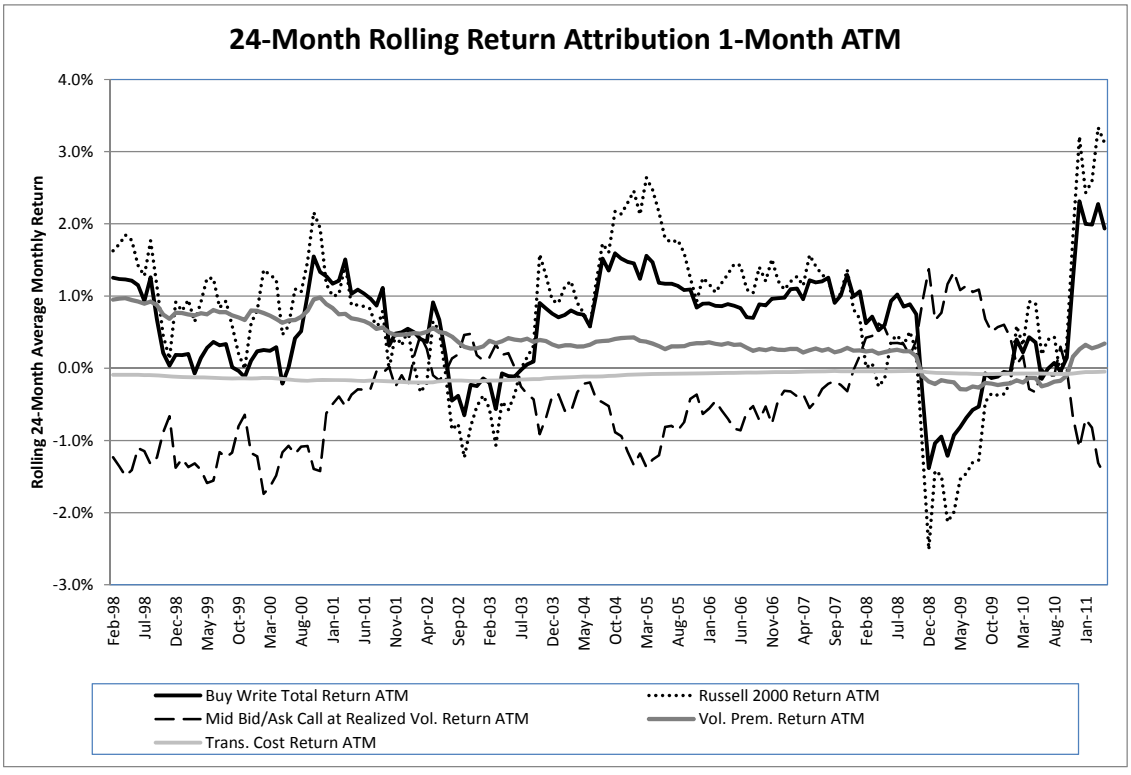


Exhibit 16 provides a clear illustration of the attribution of the call returns. It is immediately evident that with the exception of the 5% OTM strategy, the calls would generate a significant loss if sold at the Black Scholes price suggested by the realized volatility. We can see an average

monthly loss for these implementations of about 0.2% to 0.8% at the realized volatility, without even including transaction costs. It is interesting that the volatility risk premium of the call is reasonably close in magnitude to the call loss at the realized volatility. In fact we can see that the return generated by the risk premium of the call greatly reduces the losses of the calls. For example, the 2% OTM 1-month strategy's call losses are almost perfectly matched by the risk premium gain. This return attribution analysis illustrates the importance of the volatility risk premium to the returns on the buy-write strategy. While the primary driver of the returns is clearly the Russell 2000 index, Exhibit 15 suggests that the volatility premium drives the outperformance which we see generated by the buy-write strategy over the period in study.

Exhibit 15 and 16 provide a snapshot of the average return attribution of the buy-write strategy. However, they do not provide details on the dynamic nature of the return attribution. One would expect that the contribution of the Russell 2000 to the returns of the buy-write would vary significantly over time due to the volatility of the returns. Likewise, one would expect the contribution of the call position priced at the realized volatility to show similar, albeit negatively correlated, movements.

Exhibit 17a: 1-Month ATM Buy-write Strategy Return Attribution Time Series



Exhibits 17a, 17b and 17c provide a graphical presentation of the 24-month rolling average return contributions. The Exhibits illustrate the significant changes in the contribution of the excess implied volatility as well as a gradual decrease in the impact of transaction costs. For the 1-month 2% OTM buy-write, the average rolling return attributed to the volatility premium has gradually decreased over time from about 1% per month at the start of the period. In fact, during the financial crisis, the average return was relatively steady at about -0.3% per month, before once again turning positive at the end of the period.

Exhibit 17b: 1-Month 2% OTM Buy-write Strategy Return Attribution Time Series

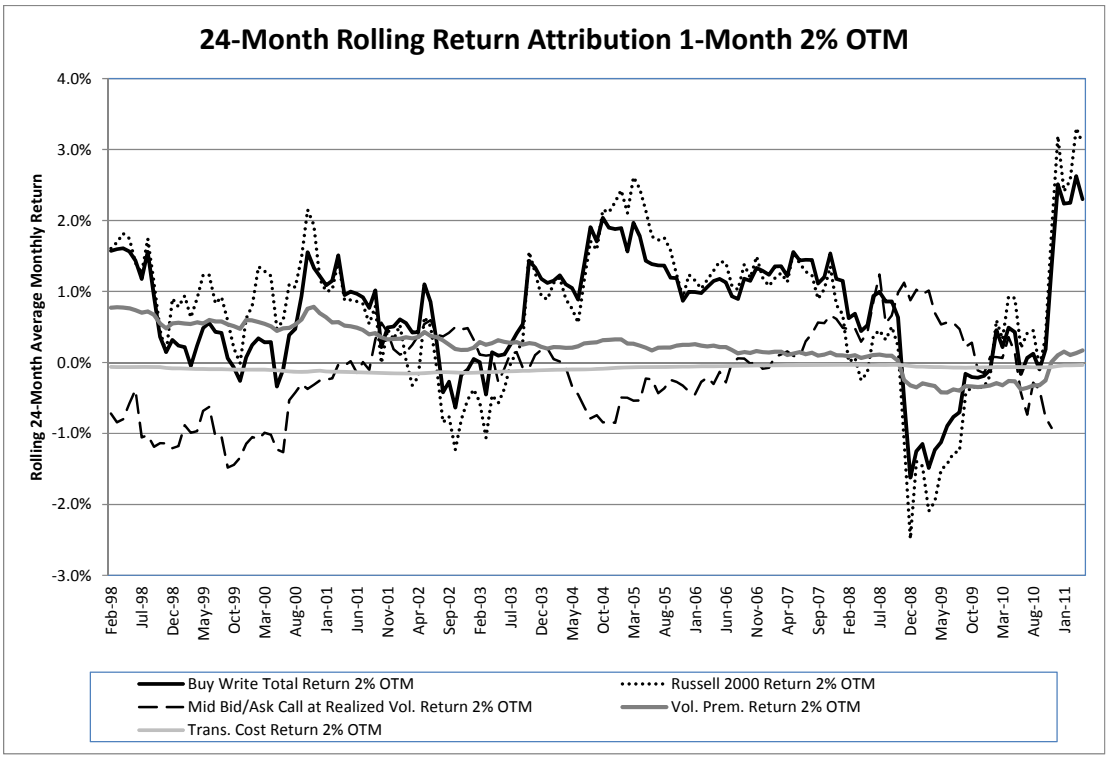
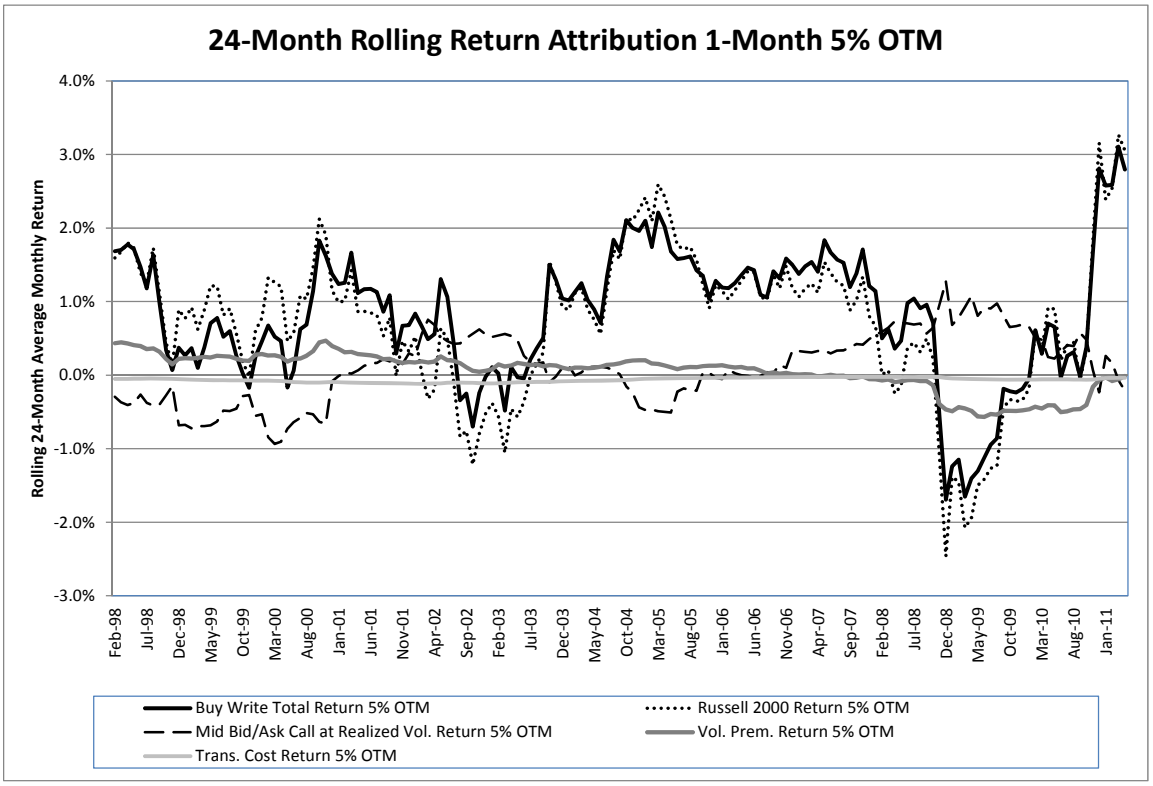


Exhibit 17c: 1-Month 5% OTM Buy-write Strategy Return Attribution Time Series



Conclusion

We examine the returns on buy-write strategies on the Russell 2000 over the period of February 1996 to March 2011, extending the analysis of Kapadia and Szado [2007] by approximately five years. Overall, our results suggest that the buy-write strategy can outperform the index under standard performance measures. This risk adjusted outperformance also holds during the unfavorable market conditions of March 2003 to October 2007, where the Russell 2000 was steadily trending upwards. The outperformance is largely limited to writing one-month calls while the strategy of writing two-month calls typically underperforms both the one-month strategy and the index. To provide economic insight into the performance of the strategy, we investigate the components of the returns. Although the main driver of the return is the underlying index, both transaction costs and the option volatility risk premium (defined as the implied volatility less the realized volatility) are critical to the performance of the strategy. Our results indicate that if the option was written at the Black Scholes price associated with the realized volatility, the buy-write strategy would underperform the index over our sample period. It is clearly evident that the method of execution of the

strategy as well as the choice of the options has a large impact on the performance of the strategy. In this light, we have provided a somewhat conservative analysis of the buy-write strategy's performance, in the sense that our implementation does not allow for an active selection of the moneyness or time to expiration of the calls. There is some evidence in the literature that a more active approach to call selection can result in significantly higher absolute and risk adjusted returns[19].

[19] See, for example, Renicker and Mallick [2005] and Szado and Schneeweis [2010].

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Appendix: 2-Month Buy-write Strategy Performance

The two-month buy-write strategies, in general, underperform the Russell 2000 and the corresponding one-month strategies. The underperformance holds for both the entire period as well as the first and last sub-periods. It is only in the shorter sub-period of March 2003 to October 2007 that the two-month strategies outperform the Russell 2000 index and some of the corresponding one-month buy-write strategies both from an absolute return and risk adjusted return basis. Part of the general underperformance may be due to the fact that the time value of the two-month calls decays slower than the shorter maturity one-month calls since decay tends to increase as expiration approaches. Furthermore, Exhibit 3a provides evidence that the two-month calls on average experienced lower excess implied volatility (over realized volatility) and lager bid-ask spreads than one-month calls (although two-month strategies roll the call positions half as frequently as one-month strategies). Exhibits 18 through 21 provide summary statistics for two-month buy-write strategies for the entire sample period and the three sub-periods. In addition, a graphical presentation of the two-month strategy performance relative to the underlying and the one-month buy-write is provided in Exhibit 22.

Exhibit 18: 2-Month Buy-write Strategy Summary Statistics, Full Period

2-Month Call Buy Write Feb 1, 1996 to Mar 31, 2011	Russell 2000 TR	5% OTM	2% OTM	ATM	2% ITM	5% ITM
Annualized Return	8.11%	7.21%	6.80%	6.43%	5.79%	5.27%
Annualized Standard Deviation	21.06%	17.80%	16.30%	15.01%	14.06%	12.71%
Skewness	-0.56	-1.39	-1.80	-2.24	-2.72	-3.37
Excess Kurtosis	0.81	3.57	5.76	8.21	11.36	16.32
Correlation with RUT	1.00	0.94	0.90	0.86	0.81	0.74
Sharpe Ratio	0.23	0.22	0.21	0.21	0.17	0.15
Treynor Ratio	0.05	0.05	0.05	0.05	0.05	0.04
Stutzer Index	0.21	0.29	0.28	0.27	0.24	0.21
Information Ratio with RUT		-0.23	-0.26	-0.29	-0.32	-0.34
CAPM Beta	1.00	0.79	0.70	0.61	0.54	0.44
Jensen's Monthly Alpha		0.00%	0.00%	0.00%	-0.02%	-0.02%
Leland's Beta	1.00	0.81	0.72	0.64	0.57	0.48
Leland's Monthly Alpha		-0.01%	-0.02%	-0.02%	-0.04%	-0.04%
Mean Monthly Return	0.84%	0.72%	0.67%	0.62%	0.56%	0.50%
Median Monthly Return	1.68%	1.74%	1.71%	1.46%	1.31%	1.03%
Minimum Monthly Return	-20.80%	-21.18%	-21.70%	-21.70%	-22.32%	-22.74%
Maximum Monthly Return	16.51%	10.66%	10.23%	8.12%	8.14%	8.27%
Maximum Drawdown	-52.9%	-47.2%	-44.8%	-41.7%	-41.6%	-40.2%
Maximum Run Up	226.2%	193.7%	178.4%	174.0%	150.7%	139.5%
% Down Months	38%	33%	33%	31%	30%	25%
% Up Months	62%	67%	67%	69%	70%	75%
Number of Months	182	182	182	182	182	182

Exhibit 19: 2-Month Buy-write Strategy Summary Statistics, Favorable Period

2-Month Call Buy Write Feb 1, 1996 to Feb 28, 2003	Russell 2000 TR	5% OTM	2% OTM	ATM	2% ITM	5% ITM
Annualized Return	3.28%	2.53%	2.48%	2.06%	1.77%	2.28%
Annualized Standard Deviation	21.83%	18.12%	16.66%	15.39%	14.42%	12.95%
Skewness	-0.39	-1.07	-1.43	-1.87	-2.28	-2.79
Excess Kurtosis	0.50	2.20	3.81	5.82	8.00	11.02
Correlation with RUT	1.00	0.95	0.93	0.90	0.86	0.80
Sharpe Ratio	-0.06	-0.12	-0.13	-0.17	-0.20	-0.18
Treynor Ratio	-0.01	-0.03	-0.03	-0.04	-0.05	-0.05
Stutzer Index	-0.06	-0.02	-0.04	-0.08	-0.12	-0.11
Information Ratio with RUT		-0.24	-0.24	-0.27	-0.29	-0.24
CAPM Beta	1.00	0.79	0.71	0.63	0.57	0.47
Jensen's Monthly Alpha		-0.10%	-0.12%	-0.16%	-0.19%	-0.16%
Leland's Beta	1.00	0.80	0.72	0.64	0.58	0.49
Leland's Monthly Alpha		-0.10%	-0.12%	-0.16%	-0.19%	-0.16%
Mean Monthly Return	0.47%	0.35%	0.32%	0.27%	0.24%	0.26%
Median Monthly Return	0.91%	1.29%	1.21%	1.21%	0.98%	0.89%
Minimum Monthly Return	-19.42%	-19.47%	-19.47%	-19.35%	-19.24%	-18.69%
Maximum Monthly Return	16.51%	10.00%	8.42%	7.63%	6.90%	6.08%
Maximum Drawdown	-35.1%	-28.4%	-26.2%	-25.2%	-24.1%	-21.3%
Maximum Run Up	93.3%	59.2%	54.4%	54.1%	52.7%	52.7%
% Down Months	44%	40%	41%	39%	38%	34%
% Up Months	56%	60%	59%	61%	62%	66%
Number of Months	85	85	85	85	85	85

Exhibit 20: 2-Month Buy-write Strategy Summary Statistics, Unfavorable Period

2-Month Call Buy Write Mar 1, 2003 to Oct 31, 2007	Russell 2000 TR	5% OTM	2% OTM	ATM	2% ITM	5% ITM
Annualized Return	20.92%	19.68%	18.24%	17.20%	16.01%	12.78%
Annualized Standard Deviation	14.08%	10.64%	8.68%	7.30%	5.91%	4.31%
Skewness	-0.05	-0.38	-0.57	-0.60	-0.45	-0.57
Excess Kurtosis	-0.09	0.21	1.20	2.10	3.63	4.05
Correlation with RUT	1.00	0.92	0.84	0.75	0.65	0.50
Sharpe Ratio	1.27	1.56	1.75	1.94	2.19	2.26
Treynor Ratio	0.18	0.24	0.29	0.37	0.48	0.65
Stutzer Index	1.09	1.44	1.58	1.72	1.93	1.97
Information Ratio with RUT		-0.27	-0.39	-0.43	-0.49	-0.67
CAPM Beta	1.00	0.69	0.51	0.39	0.27	0.15
Jensen's Monthly Alpha		0.30%	0.43%	0.53%	0.61%	0.54%
Leland's Beta	1.00	0.72	0.55	0.43	0.31	0.18
Leland's Monthly Alpha		0.28%	0.40%	0.50%	0.57%	0.50%
Mean Monthly Return	1.68%	1.55%	1.44%	1.35%	1.26%	1.02%
Median Monthly Return	1.70%	1.88%	1.72%	1.57%	1.33%	0.98%
Minimum Monthly Return	-6.84%	-5.35%	-5.18%	-4.57%	-4.07%	-3.48%
Maximum Monthly Return	10.73%	8.19%	7.19%	6.45%	6.47%	4.20%
Maximum Drawdown	-10.8%	-7.4%	-5.2%	-4.6%	-4.1%	-3.5%
Maximum Run Up	147.1%	131.2%	118.6%	109.7%	100.0%	75.3%
% Down Months	30%	21%	18%	16%	14%	7%
% Up Months	70%	79%	82%	84%	86%	93%
Number of Months	56	56	56	56	56	56

Exhibit 21: 2-Month Buy-write Strategy Summary Statistics, Financial Crisis

2-Month Call Buy Write Nov 1, 2007 to Mar 31, 2011	Russell 2000 TR	5% OTM	2% OTM	ATM	2% ITM	5% ITM
Annualized Return	1.99%	1.18%	1.25%	1.78%	1.05%	1.70%
Annualized Standard Deviation	26.78%	23.90%	22.40%	20.87%	19.95%	18.64%
Skewness	-0.58	-1.38	-1.66	-1.98	-2.30	-2.77
Excess Kurtosis	0.03	2.33	3.66	5.11	6.86	9.70
Correlation with RUT	1.00	0.92	0.89	0.86	0.81	0.74
Sharpe Ratio	0.03	0.00	0.01	0.03	0.00	0.03
Treynor Ratio	0.01	0.00	0.00	0.01	0.00	0.01
Stutzer Index	0.03	0.13	0.12	0.14	0.10	0.13
Information Ratio with RUT		-0.19	-0.20	-0.17	-0.23	-0.20
CAPM Beta	1.00	0.82	0.74	0.66	0.60	0.51
Jensen's Monthly Alpha		-0.06%	-0.05%	0.00%	-0.05%	0.01%
Leland's Beta	1.00	0.84	0.76	0.69	0.63	0.54
Leland's Monthly Alpha		-0.06%	-0.05%	-0.01%	-0.06%	0.01%
Mean Monthly Return	0.46%	0.35%	0.32%	0.34%	0.26%	0.30%
Median Monthly Return	3.01%	2.33%	2.36%	2.34%	1.86%	1.47%
Minimum Monthly Return	-20.80%	-21.18%	-21.70%	-21.70%	-22.32%	-22.74%
Maximum Monthly Return	15.46%	10.66%	10.23%	8.12%	8.14%	8.27%
Maximum Drawdown	-52.0%	-47.2%	-44.8%	-41.7%	-41.6%	-40.2%
Maximum Run Up	123.0%	97.3%	89.1%	81.4%	70.9%	62.7%
% Down Months	39%	34%	37%	37%	37%	29%
% Up Months	61%	66%	63%	63%	63%	71%
Number of Months	41	41	41	41	41	41

Exhibit 22: 2-Month Buy-write Strategy Growth of $100, Full Period