

# The S&P/ASX Buy Write Index – an analysis



Prepared by Garrie Lette, Principal and Jack Kewalram,  
Associate of Mercer Investment Consulting.

## Contents

	<i>Page</i>
I. Introduction.....	1
II. Background.....	1
III. Option pricing basics .....	2
IV. The BXM and the XBW – some more detail ..	3
V. Naked calls versus covered calls.....	3
VI. Risk/return outcomes – a priori expectations .....	3
VII. Buy Write – historical results.....	5
Introduction.....	5
A. US data – Ibbotson Associates .....	5
B. Australian data.....	6
(a) SIRCA, Capital Markets Cooperative Research Centre .....	6
(b) The University of Technology, Sydney (UTS).....	7
(c) Updated S&P/ASX200 Buy Write strategy data .....	8
(d) Citigroup equity derivatives research .....	9
C. Historical results – conclusion.....	10
VIII. Explaining the historical results – some considerations related to volatility ....	10
A. Studies on the relationship between historical, realised and implied volatility .....	10
B. The falling level of volatility over time .....	13
IX. Conclusion .....	14

## I. Introduction

An investment strategy known as ‘Buy Write’ or ‘Selling Covered Calls’ has been in use for many years but has become more popular recently. The strategy involves buying individual shares or portfolios of shares and selling or granting call options on those shares. By using a Buy Write strategy, an investor generates revenue at the outset, being the price of the call options that are sold. This is called the option premium. The investor’s potential upside on the shares is limited, however, as the increase in the share price beyond the strike price of the call option is effectively passed on to the option purchaser. Is the up-front option premium generated from the sale of call options on owned shares worth more than the potential capital growth that comes from investing in shares? In this paper, we aim to enhance readers’ understanding of the merits of the strategy as well as any identifiable risks. Our focus is largely on the Australian market although the experience from the US is also considered.

## II. Background

Options have been traded for many centuries. Nor is the selling of Covered Call options a recent development. As early as 1976, the strategy was sufficiently widespread amongst retail investors in the US to attract the attention of industry analysts<sup>1</sup>. In Australia, the strategy was commonly used by institutional investors at least as early as the 1980s. It has, however, gained greater prominence recently. To draw attention to the strategy, the Chicago Board Options Exchange launched the world’s first Buy Write Index (BXW) in April 2002. The Australian Stock Exchange (ASX) launched the S&P/ASX Buy Write Index (XBW) in July 2004<sup>2</sup>. Investment banks have also participated in the trend by using the Buy Write strategy in structured products marketed to retail investors.

<sup>1</sup> The Louis Harris Survey found that covered calls are particularly attractive to older investors who consider current income an important investment objective.

<sup>2</sup> Both the BXW and the XBW replicate the performance generated from holding an equity portfolio managed passively against a market index and selling call options against that index. More detail is provided in section IV.



'Buy Write' can be seen as a low risk way to enhance the return on stocks which are already owned and are expected to be retained as 'core' holdings. An investor in shares normally has two sources of return, being dividends and capital growth over time. By selling a call option on a stock (or portfolio of stocks), the investor receives an option premium up-front, thereby creating a third source of return. The trade-off is that over the term of the option, the investor forfeits the potential upside on the growth of the stock or portfolio beyond the strike price.

Since the seller of the call option has effectively capped his/her return, in periods when stock prices rise strongly, this strategy will generally underperform an equivalent investment in shares without the sale of the call. In such a market, the price of the stock on expiry of the option can be expected to exceed the strike price agreed in the option contract and the stock will be called away from the holder of the stock (i.e. the option seller or grantor will be required to deliver the stock to the option buyer in exchange for the strike price). In flat to negative markets, however, the option premium can be expected to boost returns above those accruing on investment in stocks without the sale of call options. Because of this tendency to reduce overall returns when stock returns are high, and increase overall returns when stock returns are low, Buy Write will generally result in volatility below that of share investment without sale of call options.

A portfolio investor can execute a Buy Write strategy by simply selling options on stocks already owned. The strategy has also been commonly used as part of a structured product that aims to provide a capital guarantee and an income component from option premiums as well as dividends on the stocks owned. Analysis of such structured products is beyond the scope of this paper.

### III. Option pricing basics

Before proceeding with analysis of the Buy Write strategy, we provide a brief summary of the factors which influence option prices. The Black-Scholes and Binomial models are the two models most commonly used to calculate option prices. Both models have advantages and disadvantages but in most circumstances they deliver similar results. For simplicity, we consider here the Black-Scholes model only. Under this model, there are five key determinants of the price of an option: stock price, strike price, volatility, time to expiry and risk free interest rate. A short definition of each follows, together with a brief comment on its influence on option pricing.

1. The **stock price** is simply the current market price of the stock (or the level of the index) which is the subject of the option contract. All other things (including the strike price) being equal, the higher the current stock price the greater the likelihood that the price on expiry of the option contract will exceed the strike price and the likely margin between the two. Accordingly, the higher the stock price the higher the option premium or price.
2. The **strike price** is the price at which the grantor of the option agrees to sell the stock to the option buyer. All other things being equal, the higher the strike price, the less likely that the stock price on expiry will exceed the strike price and, hence, the lower the option premium.
3. **Volatility** is a measure of the variability of the stock price. The more volatile the stock price, the greater the potential margin between the stock price on option expiry and the strike price and, hence, the more expensive the option.
4. The **time to expiry** is the period between the current date and expiry of the contract. The greater the period, the more expensive the option as the time available for the stock price to attain and exceed the strike price is greater. In other words, the option writer is subject to the exposure for a longer period.
5. The **risk free interest rate** is the yield on Treasury Notes or other high quality short term investments. Higher interest rates mean that the present value of the strike price is lower and, accordingly, the price of the call option is higher.



## IV. The BXM and the XBW – some more detail

As mentioned above, the Chicago Board Options Exchange launched the world's first Buy Write Index (BXM) in April 2002. The BXM is designed to track the performance of a hypothetical Buy Write strategy on the S&P 500 Index. In particular, the BXM is a passive total return index based on (1) buying an S&P 500 stock index portfolio, and (2) writing (or selling) the near-term S&P 500 Index call option, generally on the third Friday of each month.

The S&P/ASX Buy Write Index (XBW) represents a Buy Write strategy on the Australian sharemarket. The methodology underlying the XBW is based on investing in a portfolio managed passively against the S&P/ASX200 Index and writing a nearby, just out of the money<sup>3</sup> 3 month call option on that index. In Australia, the index option series expire each quarter, so at the time of selection, each option used in the XBW will have 3 months to expiry. Once an option series has been selected, it is held to maturity. As each series incorporated in the index expires, a new series is selected based on the criteria covered above.

## V. Naked calls versus covered calls

When a call is written on a stock without actually owning the stock, the writer is said to have written a Naked Call option. Option premium is earned up-front without a capital outlay. With this strategy, however, the option writer is left open to an unlimited loss. If the option expires in the money, the option writer must supply the underlying stock to the counterparty and there is theoretically no limit on the price to which the stock could rise. Accordingly, the gain for writers of naked calls is limited to the option premium received up-front but the potential loss is unlimited.

A Covered Call alters the payout structure by removing the potential for unlimited loss. In the event that the stock price exceeds the strike price on expiry of the option, the option holder will exercise. The writer of the option must simply transfer the stock in return for receipt of the strike price. The option writer has effectively covered his/her position with ownership of the underlying share. The gain on the overall position is also no longer limited to the option premium received. Rather, it also now includes any dividends on the underlying stock, plus growth in the stock price up to the level of the strike price under the option contract. In this scenario, many investors will be comfortable with any outcome which can emerge.

## VI. Risk/return outcomes – a priori expectations

It can be helpful in assessing the merits of an investment strategy to consider the risk/return pattern which is to be expected given the underlying fundamental nature of the strategy. This is not necessarily a straightforward exercise however. In the case of Buy Write, writing of the call options which form part of the strategy can be considered either as stand alone transactions (i.e. Naked Call writing) or as part of the integrated Buy Write strategy. Perspectives on likely risk/return outcomes will differ depending on which of these approaches is adopted.

Viewing options as stand alone transactions, it could be expected that premiums earned on sale of calls will be more or less offset over time by the losses incurred when options expire in the money<sup>4</sup>. If this is not the case, then either buyers or sellers will on average lose money and a query arises as to why they would persist with their strategy. Of course, if the profits and losses of buyers and sellers do match over time, then Buy Write would be expected over the long term to deliver returns very similar to those of a passive equity investment without call options.

As an example of such thinking, Binnewies<sup>5</sup> suggested in a 1992 article that:

*'Many people believe the yield enhancement produced by covered options writing is the trading world's version of a free lunch.....The writer of the call option agrees to sell a portion of the future upside appreciation of a long stock position; in exchange the writer gains a one-time cash receipt of the option's premium. The only way the seller of the call option can gain from this deal is for a buyer to pay more than the option is worth consistently. However, common sense says this can't always happen.'*

*More believable is that, over the long term, the transaction price is not really an advantage to either the buyer or the seller. In actuality, the bid-ask spread creates a disadvantage to both the buyer and the seller.'*

<sup>3</sup> A call which is out of the money is one where the strike price exceeds the stock price.

<sup>4</sup> These losses can be considered to be the costs incurred in purchasing stock in the market to replace stock called away when option holders exercise their options, net of the strike price.

<sup>5</sup> See Binnewies (1992), page 32.



Alternatively, it can be argued that, as a stand alone transaction, writing calls entails greater risk than buying calls, as outlined in section V. On this basis, call writers might expect to 'win' on average over time to reflect their greater risk. With such an outcome, the Buy Write strategy should deliver higher returns than a passive equity investment over the long term.

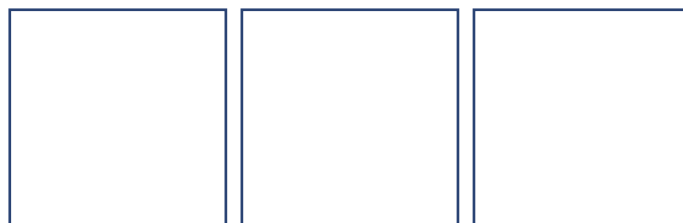
Viewing the options transactions as part of the Buy Write strategy produces a different perspective. In particular, as discussed above, writing call options on a covered basis has the attractive characteristic of reducing the volatility of an equity portfolio. This could be expected to result in the price of call options being below the level where buyers and sellers will break-even over the long term when the options transactions are viewed in isolation. Buy Write returns would then be below those of straight equity investment, consistent with the lower risk of the strategy. As an example of this thinking, Whaley<sup>6</sup> states that:

*'In an efficiently functioning capital market, the risk-adjusted return of a buy-write strategy using S&P index options should be no different from returns of the S&P 500 portfolio.'*

In practice, of course, both the buyers and sellers in options markets are many and varied. Even for a given market participant, the motivation for buying and selling, and hence the price he/she is prepared to bid/offer, will vary between transactions. With this background, we turn now to an examination of the historical results recorded by the Buy Write strategy.

---

<sup>6</sup> See Whaley (2002), page 40.



## VII. Buy Write – historical results

### Introduction

The merits of the Buy Write strategy have been considered in a number of studies. Buy Write has been examined both as an alternative to holding a stock portfolio as a stand-alone strategy and as part of a diversified portfolio.

### A. US data – Ibbotson Associates

Feldman & Roy of Ibbotson Associates<sup>7</sup> conducted an analysis of the investment merit of the BXM covering a 190-month time period from 1 June 1988 to 31 March 2004. The return of the BXM Index over the period of almost 16 years was higher than that of the S&P 500 index, albeit by a narrow margin (12.39% pa compared to 12.20% pa). The BXM, however, displayed volatility substantially below that of the S&P 500 index. As a result, risk adjusted performance as measured by the Stutzer index was 0.22 for the BXM vs. 0.16 for the S&P 500<sup>8</sup>. The findings of the Ibbotson study are summarised in the following table.

Statistic	CBOE BXM	S&P 500	Russell 2000	MSCI AEFE	LB Aggregate Bond Index	30 Day T-Bill
Monthly Arithmetic Mean	1.02%	1.05%	1.03%	0.52%	0.68%	0.38%
Monthly Compound Rate of Return	0.98%	0.96%	0.88%	0.40%	0.68%	0.38%
Monthly Standard Deviation	2.83%	4.22%	5.31%	4.91%	1.15%	0.17%
Excess Return	0.64%	0.67%	0.64%	0.13%	0.30%	---
Monthly Sharpe ratio	0.225	0.1592	0.1210	0.0273	0.266	---
Monthly Stutzer index	0.216	0.1577	0.1201	0.0273	0.263	---
Autocorrelation	-0.012	-0.046	0.125	-0.045	0.151	0.961
Skew	-1.249	-0.456	-0.530	-0.111	-0.361	-0.050
Excess Kurtosis	3.963	0.609	1.047	0.321	0.356	-0.462
Annualized Arithmetic Mean	12.93%	13.40%	13.04%	6.38%	8.53%	4.68%
Annualized Compound Rate of Return	12.39%	12.20%	11.14%	4.86%	8.45%	4.68%
Ann. Standard Deviation	10.99%	16.50%	20.73%	18.12%	4.29%	0.60%
Annualized Sharpe Ratio	0.752	0.529	0.402	0.093	0.907	---

The results of the Ibbotson study broadly confirmed those of analyses which had been conducted at earlier dates and therefore covered shorter periods<sup>9</sup>.

<sup>7</sup> Feldman & Roy (2004).

<sup>8</sup> The Stutzer Index is based on the Sharpe Ratio but takes into account relative skewness of excess returns.

<sup>9</sup> See for instance, Whaley (2002).



## B. Australian data

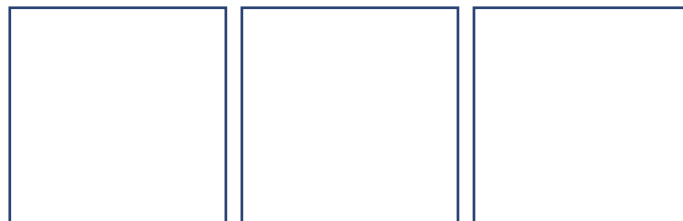
### (a) SIRCA, Capital Markets Cooperative Research Centre

The Buy Write strategy in the Australian market has been examined by SIRCA and the Capital Markets Cooperative Research Centre<sup>10</sup>. Data covered the 15 year period from 31 December 1987 to 31 December 2002. Option contracts used in the study had quarterly maturities and were just out of the money at the point at which they were assumed to be sold. The methodology effectively matched the basis on which the XBW is now constructed. A summary of the results of the study follows.

	Buy Write Portfolio	All Ordinaries/S&P/ASX200 Accumulation Index	Bank Bills
Number of Quarters	60	60	60
Mean	2.96%	2.40%	1.98%
Median	2.47%	1.93%	1.52%
Standard Deviation	5.78%	6.15%	1.00%
Skewness	-0.15	-0.03	1.32
Kurtosis	-0.40	-0.49	0.55
Max	14.04%	13.79%	4.53%
Min	-11.79%	-12.60	1.05%

In this study, the Buy Write strategy recorded a significantly higher return than an investment in the S&P/ASX200, as well as a lower standard deviation. The characteristics of higher kurtosis and negative skewness are consistent with the findings of Whaley and Ibbotson.

<sup>10</sup> SIRCA – CMCRC (2004).



**(b) The University of Technology, Sydney (UTS)**

Researchers from the UTS<sup>11</sup> took an alternative approach and studied the impact of the Buy Write strategy on a balanced portfolio invested in Australian equity (40% of total assets), international equity (25%), fixed income (20%), property (10%) and cash (5%). In this study, data covering the period 1 July 1997 to 24 June 2004 was used. To test the merits of the Buy Write strategy, the 40% allocation to Australian shares within the balanced portfolio was assumed to be replaced by an equivalent allocation to Buy Write. Allocations were rebalanced monthly. Key findings of the analysis are shown below.

	Balanced Portfolio – no Covered Calls	Balanced Portfolio with Covered Calls
<b>Annual Statistics</b>		
Mean (annualised)	5.93%	6.09%
Standard Deviation (annualised)	8.41%	7.80%
Probability of negative Return (annualised)	24.06%	21.72%
Semi-Variance	0.0039	0.0032
Semi-Standard Deviation	6.25%	5.69%
Sortino Ratio	0.1156	0.1547
Sharpe Ratio	0.0829	0.1120
<b>Monthly Statistics</b>		
Number of Months	84	84
Mean	0.494%	0.508%
Standard Deviation	2.43%	2.25%
Maximum Return	5.36%	5.43%
Minimum Return	-5.20%	-4.84%
Skewness	-0.31	-0.43

The authors of the study pointed out that the higher average returns on the balanced portfolio with the Buy Write strategy can be attributed to the call premium income generated in the years 2000-2003 when the Australian equity market recorded negative returns. Over the remainder of the study period, the balanced portfolio with Buy Write underperformed. Nevertheless, over the full period of the analysis the balanced portfolio with the Buy Write strategy outperformed on both risk and return dimensions.

<sup>11</sup> See El-Hassan, Hall & Kobarg (2004).



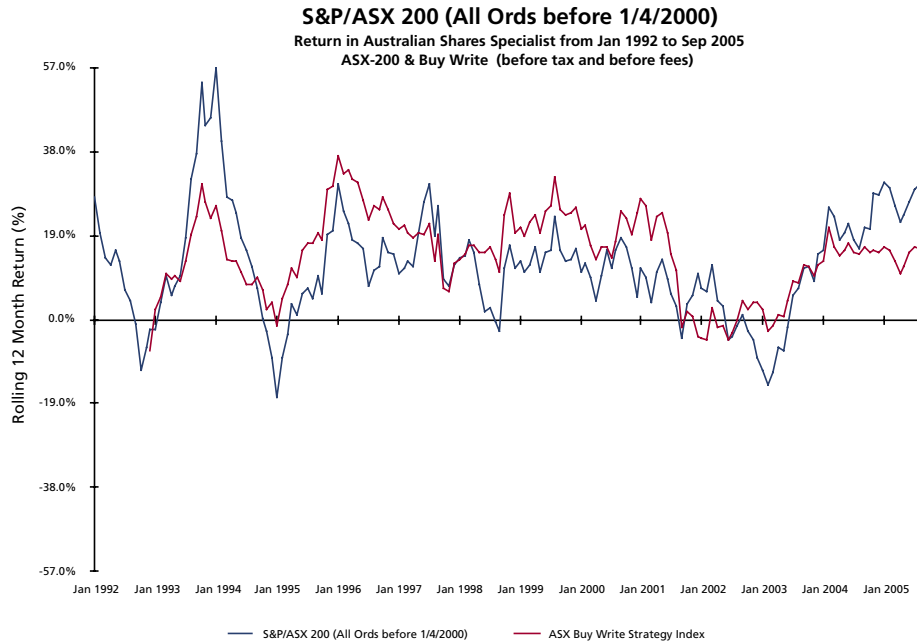
**(c) Updated S&P/ASX200 Buy Write strategy data**

When the ASX released the XBW in July 2004, it provided a back history of returns commencing in January 1992. We have combined the historical data for the period before July 2004 with the live data for the period since that date through to December 2005 and analysed this combined data set. The results are shown in the following table:

	<b>S&amp;P/ASX 200 XBW</b>	<b>S&amp;P/ASX 200</b>
<b>Returns (%pa)</b>		
Annual	14.2	12.1
Excess	2.1	na
Standard Deviation (%pa)	8.4	12.1
Reward to Risk Ratio	1.7	1.0
<b>Semi Standard Deviation (% per month)</b>		
Against mean	1.9	2.6
Against zero	1.4	2.1
Tracking Error (%pa)	7.0	na
Information Ratio	0.3	na
T-score on IR	0.8	na
<b>Distribution of Excess Returns</b>		
Skewness	-0.3	2.4
Kurtosis	1.3	18.1
<b>Regression Analysis (y=alpha+beta *index)</b>		
Alpha (% pa)	7.0	na
Beta	0.57	na
R-squared (%)	68	na
Correlation	0.82	na
T-score – Alpha <>0	5.1	na
Confidence of Value Added	100	na

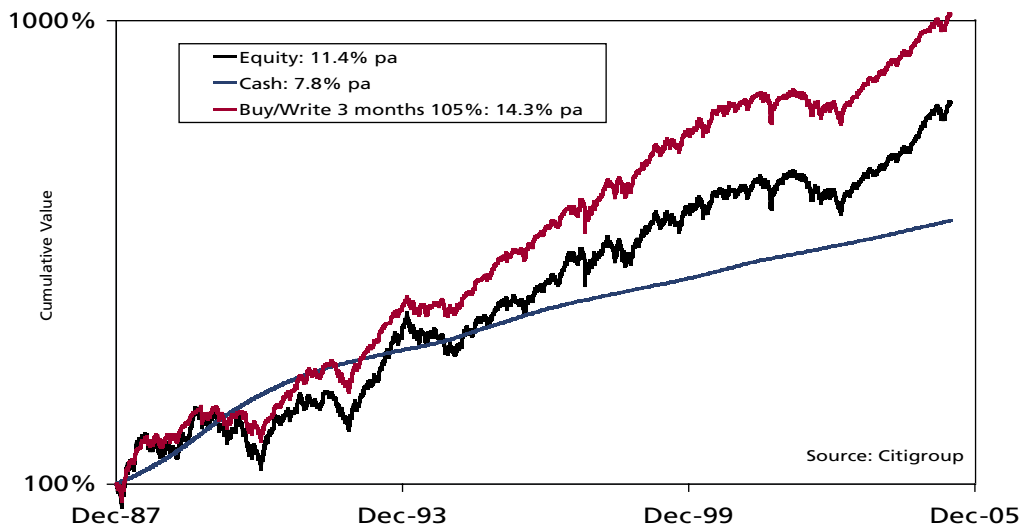
The XBW recorded a significant margin of return over the S&P/ASX 200 index over this period, and a substantially lower volatility. These results are consistent with those quoted above. The tracking error for the XBW relative to the ASX/S&P 200 index of 7.0% pa exceeds that which would normally be expected of an active investment strategy. This indicates that investors considering the XBW as an alternative to an active strategy benchmarked against the ASX/S&P 200 index would have to expect substantial variations in returns over shorter periods between these alternatives. The very low beta and relatively low correlation with the broader market confirm this position.

The returns on the XBW and the S&P/ASX200 are illustrated on a rolling 12 month basis in the following chart. The S&P/ASX 200 index outperformed the XBW by a wide margin from January 1992 to late 1994, a period during which the sharemarket rose extremely strongly. Following that period, the XBW outperformed the S&P/ASX200 index through most of the period from January 1994 to the early part of this decade, a period where the returns from Australian shares were generally strong but on a rolling 12 month basis rarely reached the peaks seen in 1993/94 or in the most recent period. The XBW also clearly outperformed during the worst periods for Australian shares, including the early years of this decade, although the XBW also displayed a negative return through some of these periods. In recent years, however, the strong rally in the Australian stock market has seen the XBW underperform the S&P/ASX200 index. Clearly, in a strong market environment, the Buy-Write strategy sacrifices return beyond the strike price on the written call options and as a result underperforms an exposure to the equity index without the sale of a call option.



**(d) Citigroup equity derivatives research**

Citigroup’s Equity Derivatives Research team<sup>12</sup> has studied the Buy Write strategy over a longer period commencing December 1987 and running through to October 2005. Citigroup considered strategies involving selling calls at varying levels of strike price. In particular, strike prices of 100%, 105%, 110% and 115% of the index level at the date that the option was written were used. In all cases, the Buy Write strategy outperformed a passive equity portfolio but selling calls at 105% of the stock price achieved the highest return. A strike price above the current market level provides the option writer with some room to participate on the upside as well as generating a reasonable option premium. The results for the 105% strategy are illustrated in the following chart.



The Buy/Write strategy using calls with a strike price of 105% of the index level outperformed the S&P ASX 200 index by an annualised 2.9% over the period of almost 18 years.

<sup>12</sup> See Gillespie & Ulinder (2005)



### C. Historical results – conclusion

The analysis presented in this section indicates that the Buy Write strategy has delivered favourable outcomes relative to those of a passive investment in the corresponding equity market without index call options. This analysis covers considerable time periods and both the US and Australian markets<sup>13</sup>.

In both markets, the expectation that sale of Covered Calls will enhance overall returns on an equity portfolio when returns are low and reduce them when they are high (hence delivering lower volatility for the Buy Write strategy) is confirmed.

In the US, the returns on the Buy Write strategy have been similar to those on a passive equity portfolio. The fact that an index call option can be sold to reduce volatility of an equity portfolio does not appear to have been reflected in a reduction of the price of the calls to the level where the returns to the Buy Write strategy reflect the lower risk of the strategy. Rather, premiums earned on sale of call options have apparently been broadly equivalent over time to profits foregone, resulting in similar returns for Buy Write compared with passive sharemarket investment without sale of calls. Accordingly, users of the Buy Write strategy have received a ‘free lunch’ (equivalent returns to passive equity investment but lower risk).

In Australia, the outcome has been even more favourable for the Buy Write strategy. As well as the lower risk which is to be expected compared with passive equity investment, returns have been enhanced over the full period of the analysis. This indicates that not only have prices of index calls not been competed down in recognition of the ability of covered call writing to reduce volatility of equity investment, the premium income generated by selling calls has, in absolute terms, more than offset the losses incurred when the stock index has exceeded the strike price at option expiry.

Naturally, in both markets the outcomes have varied over time depending on the prevailing market conditions.

## VIII. Explaining the historical results – some considerations related to volatility

Volatility is crucial to the pricing of options and, hence, to the returns accruing to users of the Buy Write strategy. In this section, we address some points related to volatility.

### A. Studies on the relationship between historical, realised and implied volatility

The five factors which influence option pricing are covered in section III. Of these five, four are known with certainty at the outset of the transaction. The exception is volatility. Four connotations of volatility are worth considering:

**Historical Volatility** – At the point of entering into an options transaction, buyers and sellers will have information on the historical volatility of the underlying stock or index.

**Expected Future Volatility** – To determine a price for an option transaction, buyers and sellers need an unbiased estimate of the future volatility of the underlying stock or index. Whilst the historical volatility provides a guide as to the future volatility, it is not a perfect guide.

**Realised Volatility** – Realised volatility is the volatility which actually occurs over the term of the option contract. This cannot be measured until after expiry.

**Implied Volatility** – Once the option price is determined, because all of the other factors which determine option prices are known with certainty, it is possible to determine the volatility which is implied by the price.

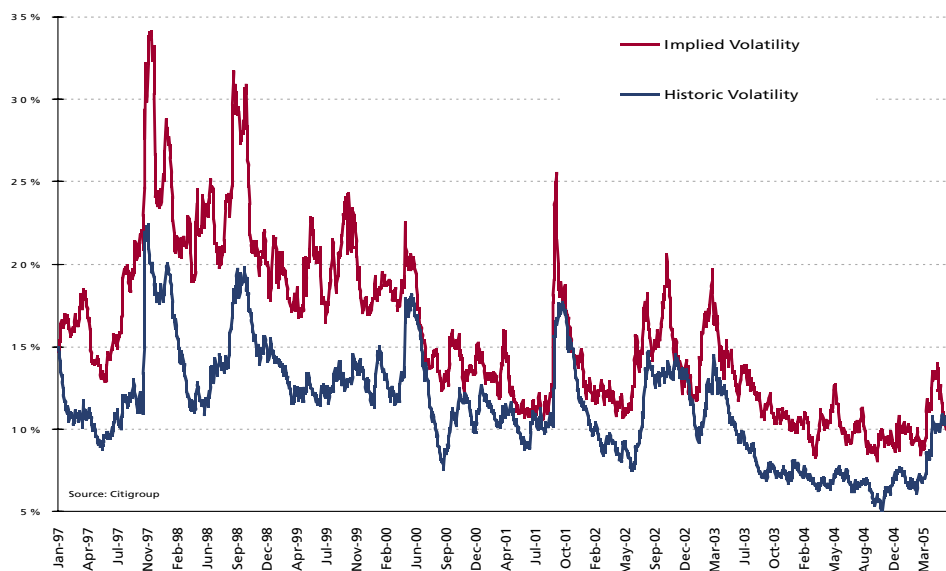
Of course, over the term of each option contract, it is possible to observe only the path which the stock price actually follows rather than the full range of possible outcomes. As a result, the realised volatility on the stock or index underlying an individual contract, over the life of that contract, provides little assistance in understanding pricing of options in general. If implied volatility embedded in option prices exceeds realised volatility on average across transactions and over time, however, then options can be said to be ‘overpriced’ in the sense that option sellers, including users of Buy Write strategies, will profit over time at the expense of buyers.

<sup>13</sup> The favourable results are attributable to ‘overpricing’ of the call options which are sold as part of the strategy. Interestingly, Bodarenko (2003) finds evidence that put options also are considerably overpriced.



A number of studies have been undertaken to determine the difference between the volatility implied by the option price and the realised volatility. In such studies it has generally been found that the implied volatility on index options has exceeded realised volatility<sup>14</sup>. This confirms the favourable results presented above in relation to returns on the Buy Write strategy<sup>15</sup>.

The relationship between implied volatility and historical volatility has also been analysed in a number of studies. For instance, Whaley (2002) found that implied volatility on S&P 500 index options has exceeded historical volatility of the index. In Australia, the relationship between historical volatility on the S&P/ASX200 index and the implied volatility on index calls over the period from January 1997 to March 2005 was studied by Gillespie & Ulinder (2005). The results are presented in the following chart.



The volatility implied in option pricing exceeded historical index volatility virtually throughout this period, frequently by a substantial margin.

Differences between historical and implied volatility could arise because buyers and sellers expect future volatility to differ from that experienced in the past, either correctly or incorrectly. Buyers and sellers are, however, naturally influenced by historical outcomes when considering option pricing. Accordingly, any persistent discrepancy between historical and implied volatility provides tentative evidence of forces in the market that drive pricing away from the level which could be expected to deliver balanced outcomes (in cashflow terms) between buyers and sellers over time.

<sup>14</sup> For instance, Whaley (2002) found that the implied volatility on at the money calls on the S&P500 exceeded realized volatility by 167 basis points per annum on average over the period of his study, from June 1998 to December 2001. Ibbotson Associates (2004) found that over the longer period from June 1998 to March 2004, implied volatility on S&P 500 options was 16.5% pa on average, compared with realised volatility of 14.9% pa, indicating a margin similar to that identified by Whaley. Brace & Hodgson (2001) found consistent results in the Australian market.

<sup>15</sup> Outcomes under which implied volatility is approximately equal to realised volatility across transactions and over time indicates that option pricing is 'fair' in the sense that neither buyers nor sellers profit at the others' expense.



In an effort to understand these market forces, Bollen & Whaley (2004)<sup>16</sup> examined trading patterns in S&P 500 index options and options on 20 individual stocks to determine whether buying pressure for options affected volatilities and prices. They found that put option trades as a proportion of total option trades were much higher for index options than for individual stock options. They also examined the mix of trades depending on whether they were out of the money, at the money or in the money and concluded that the evidence is consistent with the use of S&P 500 index put options by equity portfolio managers for portfolio insurance purposes. Bollen & Whaley found that the strong demand for **index puts** drove up the price of these options (and the implied volatility). The price (and implied volatility) of **index call options** was also driven up due to arbitrage activity related to the put-call parity relationship<sup>17</sup>. By way of contrast, for options on **individual stocks**, demand for call options was the key factor in determining changes in implied volatility. Bollen & Whaley tested the returns on a series of strategies involving selling of options on the index and on individual stocks. They found that whereas writing **index options** was profitable, abnormal returns from selling **options on individual stocks** were close to zero.

Feldman & Roy (2004) advance explanations for the overpricing of options based on two well-documented behavioural tendencies, overconfidence and confirmatory bias. They postulate that call purchasers are amongst the most confident of all investors, often having strong expectations of economic performance and a desire for leveraged investment performance and that the demand for calls from such buyers creates an upward bias in implied volatility and prices.

Gillespie & Ulinder (2005) also examined the relationship between implied and historical volatility on options for a basket of highly liquid shares listed in Australia. Implied volatility was found to exceed historical volatility on average although the margin was substantially lower than that recorded in respect of the S&P/ASX 200 index. Also, implied volatility was below historical volatility in some periods. These results from the Australian market are consistent with those of Bollen & Whaley in the US and suggest that the drivers of pricing of index and individual stock options differ. In particular, market forces appear to push pricing of index options to a level which favours sellers.

---

<sup>16</sup> See Bollen & Whaley (2004), pg 731-739.

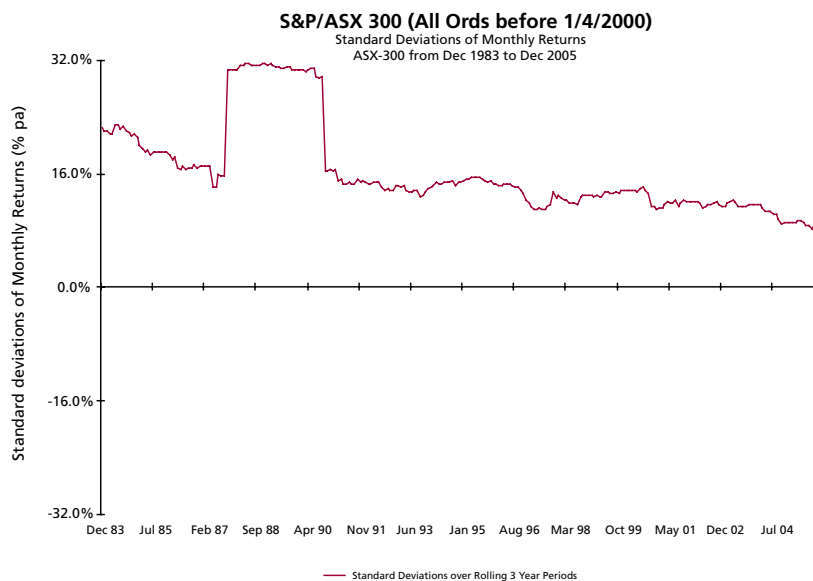
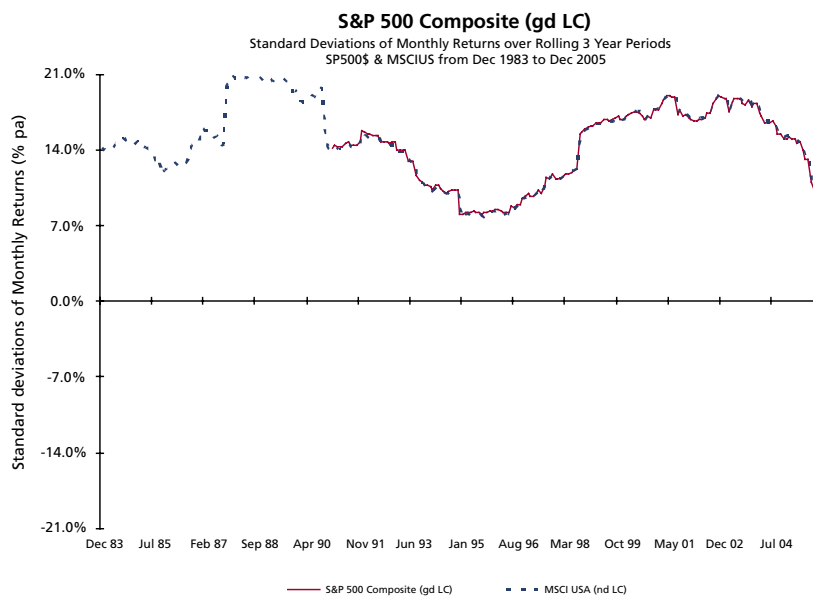
<sup>17</sup> The put-call parity relationship implies that there is a direct relationship between the price of European put and call options with the same expiry, strike price and underlying stock or index. If the relationship does not apply, an arbitrage opportunity exists. A European option is exercisable only at maturity whereas an American option can be exercised at any date up until maturity.



## B. The falling level of volatility over time

As mentioned above, volatility is crucial in the pricing of options and therefore to the returns to the Buy Write strategy. Trends over time in volatility are therefore worthy of consideration.

In the charts below, we show the volatility over time of the S&P 500 index and the ASX/S&P 200 index measured on a rolling 3 year basis, i.e. each observation represents annualised standard deviation of monthly returns over the three years up to the date of the observation. The data covers the period from 1983 to the end of 2005<sup>18</sup>.



<sup>18</sup> Participants in options markets generally look at volatility over timeframes considerably shorter than 3 years, consistent with the shorter term of options. Volatility is very volatile over periods as short as one month or three months however. Focusing on outcomes over rolling 3 year periods highlights the broad trends and allows us to provide the information for a total period similar to that over which results for Buy Write are illustrated in this paper.



Except for the period around the sharemarket crash of 1987, volatility of the Australian market has been on a steady downward trend virtually throughout the 22 year period of data covered in the chart. Volatility of the S&P 500 has varied over time but has not displayed the same long term downward trend.

The downward trend in volatility over a number of years provides a plausible alternative explanation for the particularly favourable results delivered by the Buy Write strategy over time in Australia. As mentioned above, it is reasonable to expect that buyers and sellers of options would be influenced by historical information when deciding the estimate of future volatility to use in determining a fair price on an option transaction under consideration. To the extent that this is the case, in a period of falling volatility, it would be expected that implied volatility would exceed realised volatility, i.e. that options would be 'overpriced' given the market environment of lower volatility which subsequently emerged.

If in a future period volatility surprises on the upside, perhaps moving back to previous levels, then the opposite outcome could occur. In particular, options may be sold too cheaply given the environment which subsequently emerges as market participants will be basing their estimate of future volatility on the relatively low levels recorded over the period prior to the transactions. If so, a Buy Write strategy would perform less favourably than has been the case in the past.

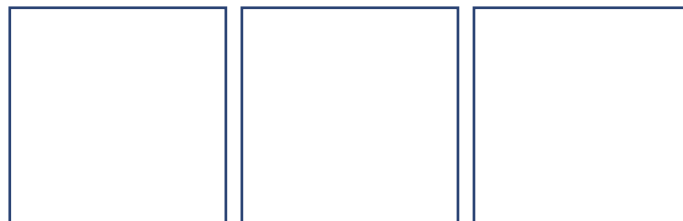
Other possible implications of the downward trend in volatility over time are:

- If sustained, the lower volatility could reduce the attractiveness of selling call options as part of a Buy Write strategy as options should become cheaper.
- On the other hand, if despite the lower volatility in the market, implied volatility remains high, the Buy Write strategy would be more attractive as there would be a lower opportunity cost in foregoing upside potential that comes with the sale of the call options. In other words, call options would remain 'overpriced' and selling call options on shares already owned would continue to be a profitable strategy.

## IX. Conclusion

As is invariably the case in matters related to financial markets, it is difficult to draw definitive conclusions as to future returns to the Buy Write strategy. Much will depend on volatility, in particular, the level of volatility and the relationship between implied volatility and realised volatility. Nevertheless, we consider that the following points are valid and will provide useful guidance to investors considering using the strategy:

- A Buy Write strategy using index call options has delivered favourable outcomes over long periods in the past, both in the US and Australia. In particular, in the US the strategy has recorded favourable outcomes on risk-adjusted terms relative to straight passive equity whilst in Australia it has delivered higher returns as well as lower risk. Naturally, there have been shorter periods during which passive equity investment without sale of call options has outperformed the Buy Write strategy.
- Given the varying objectives of market participants, it is plausible that the enhanced returns delivered in the Australian case can be sustained. That is, we do not consider that this outcome necessarily represents a short term anomaly which cannot continue into the future. Rather, the outcome may represent the outworking of the balance between buyers and sellers of index options, with the buyers as a group being comfortable with their transactions despite the fact that when viewed in isolation they lose money on average. Indeed, plausible explanations for the observed results have been advanced.
- That being said, it should be recognised that the historical results have been recorded during a period during which volatility of the Australian market has been on a downward trend. This may have created a tendency for market participants to over-estimate future volatility thereby causing upward pressure on option prices. An environment of increasing market volatility could result in the opposite tendency and this would be less favourable for the Buy Write strategy.



- It should also be recognised that the balance between buyers and sellers of options is not static over time. If use of the Buy Write strategy was to become more widespread, the return profile could deteriorate.
- Regardless of the future overall returns to the Buy Write strategy over the long term, the following points are pertinent:
  - In an environment of strong equity returns, the strategy is likely to underperform compared with equity investment without writing calls because the upside beyond the strike price is foregone.
  - Conversely, in periods of flat to negative market returns, the strategy is likely to outperform a straight equity investment due to the premium income.
  - More generally, Buy Write reduces the volatility of an equity investment by reducing returns when the market is strong and increasing returns when the market is weak. Many investors will find this feature attractive.
- There is less evidence that the Buy Write strategy generates favourable long term results when applied at the individual stock level.
- A Buy Write strategy can be successfully used by investors with the ability to recognise cases where volatility implied in the option price is excessive, i.e. options are overpriced given the upcoming market environment. This is the case at both at the index and individual stock level.
- A Buy Write strategy may also suit equity investors with a preference for income over capital growth.

## References

Australian Stock Exchange, 'The S&P/ASX Buy Write Index (XBW) – A New Australian Equity Benchmark for Active Managers', brochure, 2004.

Binnewies, R, 'What's Wrong with Covered Writes', Futures, July 1992.

Bollen, N P B & R E Whaley, 'Does Net Buying Pressure Affect the Shape of Implied Volatility Functions?', The Journal of Finance, April 2004.

Brace, A & A Hodgson, 'Index Futures Options in Australia – An Empirical Focus on Volatility' Accounting and Finance, 31, 2001.

Bondarenko, O, 'Why are put options so expensive?', Working Paper, University of Chicago at Illinois.

Chicago Board Options Exchange, 'The CBOE Buy Write Monthly Index (BXM)', brochure, 2002.

El-Hassan, N, A Hall & J-P Kobarg, 'Risk and Return of Covered Call Strategies for Balanced Funds: Australian Evidence', University of Technology, Sydney, September 2004.

Feldman, B & D Roy, "Passive Options-based Investment Strategies: The Case of the CBOE S&P 500 Buy Write Index, Ibbotson Associates, July 2004.

Gillespie, P, & J Ulinder, 'Options Strategies for 2005', Citigroup Global Markets Australia Pty Limited, November 2005.

Gillespie, P, D Thomas & G Fowler, 'Derivatives Strategies for Fund Managers', Citigroup Global Markets Australia Pty Limited, September 2003.

SIRCA & Capital Markets Cooperative Research Centre, 'Return and Risk of Buy-Write Strategies using Index Options: Australian Evidence', February 2004.

Whaley, R, 'Return and Risk of CBOE Buy Write Monthly Index', The Journal of Derivatives, Winter 2002.

## Disclaimer

© 2006, Mercer Human Resource Consulting Pty Ltd

The content in this paper is proprietary information of Mercer Human Resource Consulting Pty Ltd trading as Mercer Investment Consulting ('Mercer IC'). This paper has been prepared without taking into account the objectives, financial situation and needs of any individual investor. Accordingly, before acting on this paper you should consider the appropriateness of any advice in it, having regard to your objectives, financial situation and needs, and seek advice from an appropriately authorised financial adviser. This paper may not be modified, sold, or otherwise provided, in whole or in part, to any person or entity without Mercer IC's written permission. Mercer IC papers and opinions on investment products are based on information that has been obtained from the investment management firms and other sources. Mercer IC gives no representations or warranties as to the accuracy of such information, and accepts no responsibility or liability (including for indirect, consequential or incidental damages) for any error, omission or inaccuracy in such information other than in relation to information which Mercer IC has expressly stated that it has verified. Any opinions on or ratings of investment products contained herein are not intended to convey any guarantees as to the future investment performance of these products. In addition:

- Past performance cannot be relied upon as a guide to future performance.
- The value of investments can go down as well as up and you may not get back the amount you have invested.
- Investments denominated in a foreign currency will fluctuate with the value of the currency.

*Mercer Investment Consulting is a leading global provider of investment consulting services, and offers customised guidance at every stage of the investment decision, risk management, and investment monitoring process. We have been dedicated to meeting the needs of clients for more than 30 years, and work with the fiduciaries of pension funds, foundations, endowments, and other investors in some 35 countries.*

*In Australia, Mercer Investment Consulting is a registered business name of Mercer Human Resource Consulting Pty Ltd ABN 32 005 315 917, which is a corporate authorised representative #260851 of Mercer Investment Nominees Limited ABN 79 004 717 533, AFS licence #235906.*

*Mercer Investment Consulting is a unit of Mercer Human Resource Consulting, an operating company of Marsh & McLennan Companies, Inc. (MMC). MMC lists its stock (ticker symbol: MMC) on the New York, Chicago, Pacific, and London stock exchanges.*

### Prepared by:

#### Garrie Lette

Principal and Authorised Representative  
#264380 of Mercer Investment Nominees Ltd  
AFS License #264390

#### Jack Kewalram

Associate and Authorised Representative  
#296633 of Mercer Investment Nominees Ltd  
AFS License #264390

### For further enquiries contact:

#### Sydney

+61 2 8864 6800

#### Melbourne

+61 3 9623 5555

[www.mercerIC.com.au](http://www.mercerIC.com.au)

Copyright 2006

Mercer Human Resource Consulting Pty Ltd  
ABN 32 005 315 917

All rights reserved.