



## **STOCK OPTION RETURNS AND STOCK ANOMALIES: CROSS MARKET EFFICIENCY AND THE COST OF HEDGING VALUE VS GROWTH FIRMS STOCK RETURNS**

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### **KEYWORDS**

Stock Anomalies, Value Investing, Option Returns, Hedging

### **ABSTRACT**

The empirical literature on stock returns shows overwhelming evidence of stock anomalies related to value investing. This paper studies the relative performance of stock options of value and growth stocks. This yields insight into different strategies in attempting to hedge some of these types of stocks. Monthly option returns are examined from 1995 to 2004. The returns of calls and puts are analyzed with a corresponding discussion of other strategies directly linked to these results. In particular, evidence is found that the option returns on some growth stocks and the option returns on some value stocks outperform the average option return for puts deep out of the money. For puts deep in the money, buying puts for the most extreme decile of value stocks is significantly less expensive than other deciles. For value stocks deep out of the money call options had significantly higher returns (20%) than growth stocks (negative option returns). For both puts and calls across the value and growth deciles, writing options had higher returns than buying options. Strategies with profitable returns over the decade included bear spreads using calls on value stocks and bull spreads on value stocks and growth stocks (but not the highest decile for growth). A third strategy that was profitable for the decade included buying deep out of the money puts for deciles 2, 3 (growth) and 10 (value). The relative cost of hedging stocks in the options markets does depend on value vs. growth characteristics.

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## **1. INTRODUCTION**

The finance literature has searched exhaustively for factors relating to abnormal performance relative to existing models. The Fama-French model using beta, size and value expressed as a M/B ratio is one commonly used standard for investment performance. The value and size anomalies show significant abnormal returns for companies displaying those characteristics. The option markets, therefore, should reflect such behavior.

In this study, we examine the option returns to different types of stocks on a monthly basis to determine if option returns display different characteristics depending on whether the stock is a value stock or a growth stock, as defined by Fama-French. In addition, we study the size anomaly and rank firms based on market capitalization to determine if there are significant differences in

the option returns. These results will help portfolio managers determine the relative costs of hedging portfolios depending on the characteristics of the underlying assets.

If the option returns are significantly different, then the relative costs of hedging will differ. If option returns are not different, then the cross market efficiency is resolved and the issue of whether the option market has correctly priced the volatility of the stock return is answered. Given the asymmetric distribution of the anomalies and of stock option returns, it seems that inter-market or cross market efficiency is an important issue for both the stock market and the options markets.

The basic questions addressed in this paper include: Are stock anomalies priced in the options markets? Are there differences in the option returns of growth stocks versus value stocks? Are the costs of hedging stock returns different for value versus growth stocks.

The paper will proceed in section 2 with a literature review. In section 3 the data and methodology are discussed. Section 4 examines the empirical results and section 5 summarizes the paper.

## **2. LITERATURE REVIEW**

The empirical literature in finance has studied many anomalies in a variety of ways in an attempt to gain insight into the factors that affect stock returns. From Basu (1981) and Reinganum (1982) documenting a size effect to Fama-French (1993,1994, 2005) documenting a value premium, finance has been fascinated with stock puzzles or anomalies. Stock market anomalies pose an interesting problem for options markets since the original asset (stocks) is often considered mispriced. How does a derivative of a “mispriced” asset behave? Other anomalies that have been documented include the momentum effect by Carhart(1997). The January anomaly with many tax implications is another well studied anomaly. Mutual fund persistence and studies on winners and losers have, also, been popular. The literature for these anomalies has created a great deal of knowledge regarding stock returns and will continue to do so in the future. This study examines the option returns surrounding these events. In particular, the value anomaly is examined to identify option return characteristics for these firms. De Bondt and Thaler (1985,1987) examine market overreactions to firm characteristics. Schwert (2003) discusses market anomalies and the puzzles in finance. The conclusion from all of these papers indicates that stock anomalies exist and are persistent. This implication has tremendous implications for the options markets on stocks with these characteristics. This paper will concentrate on the impact of hedging stocks that are regarded as value stocks and growth stocks according to the Fama-French model.

## **3. METHODOLOGY AND DATA**

The stock option returns from 1995 to 2004 are examined on a daily and monthly basis from Optionmetrics (IVY Database). Daily stock returns and the risk free rate are obtained from CRSP. The Compustat database is used to classify firms on a monthly basis into value or growth deciles. CRSP and Compustat data are used to sort firms into size deciles each month. Stock returns are sorted based on Fama-French deciles of M/B and size each month. The portfolios are then examined based on option returns for 5 different exercise prices each month. The five exercise prices include at the money, one price in the money, two prices in the money, one price out of the money and two prices out of the money. The option returns examined are one month or the closest option with at least one month left until expiration. Option prices and returns are individually accumulated and averaged for a portfolio. Each portfolio (decile) has roughly 270-300 individual stock returns and option returns each month. The daily observations per month are approximately 20 per security. Holding period returns are examined on a daily and monthly basis. Results are accumulated on a monthly basis to interpret and relate to existing stock return research. The

options studied have one month to two months until expiration. The formulations follow the Fama-French model and decile formation procedures for Market to Book ratios and Size (market cap) every month. The options data is applied to the monthly stock portfolio for value deciles each month.

The Fama-French Model indicates that beta, size (measured by market capitalization) and the market to book ratio are factors affecting the return on a stock. Formally the model is:

$$R_j = R_f + B_{j1}(R_m - R_f) + B_{j2} \text{Size} + B_{j3} \text{M/B},$$

where  $R_j$  is the expected return on stock  $j$  and  $B_{j1}$  is the beta for stock  $j$  that is measured by Covariance of  $j$  with the market return.  $B_{j1}$ ,  $B_{j2}$  and  $B_{j3}$  are coefficients in a regression. Size is measured by the market capitalization of a firm. M/B represents the market to book ratio of firm  $j$  and typically is considered a value stock if M/B is less than 1.5 or 2.  $R_m$  represents the return on the stock market index, typically the S&P 500 index is used.  $R_f$  is the risk free return and is the return on the US Treasury Bill.

## 4. EMPIRICAL RESULTS

### 4.1. Empirical Results for the Call Option Market

Table 1 indicates in column 3 (Option2O) that for call options two strike prices out of the money, value stocks outperformed growth stocks. The options on deep out of the money value stocks had positive monthly returns and the corresponding options on growth stocks had negative returns, on average for this decade. Deciles 9 and 10 (value stocks) had returns of 7.7% and 15.7% average monthly returns during this decade. While deciles 1,2 and 3 (growth stocks) had average monthly returns of -7.2%, -5.1% and -3.4%, respectively. This category had some returns with positive returns over this time period. This is significant and demonstrates that the type of stock being hedged will affect the cost of the hedging. Out of the money options are less expensive in terms of capital layout and are a viable tool for hedging tail risk and typical portfolio variation. This may be a very cost effective approach for portfolio managers to consider dividing the portfolio into high hedging cost and low hedging cost portions.

**Table 1: Call Option Market Monthly Returns**

Monthly returns from 1995-2004 for each Decile are ranked by value characteristics.

Decile	Stock Return	Option2O Return	Option 1O Return	Option AT Return	Option 1I Return	Option 2I Return
1	-.004	-.072*	-.105*	-.334*	-.371*	-.547*
2	-.001	-.051*	-.135*	-.366*	-.418*	-.583*
3	.004	-.034**	-.099*	-.333*	-.371*	-.626*
4	.005	-.004	-.083*	-.338*	-.419*	-.602*
5	.009	.048*	-.064*	-.316*	-.376*	-.667*
6	.010	.009	-.053*	-.328*	-.390*	-.633*
7	.009	.025	-.049*	-.307*	-.420*	-.707*
8	.011	.018	-.047*	-.311*	-.457*	-.674*
9	.010	.077*	-.028	-.338*	-.412*	-.670*
10	.005	.153*	-.050*	-.332*	-.442*	-.712*

Decile 10 is Value and Decile 1 is Growth. There are approximately 270 – 300 firms per day for 20 days per month. \*Significant at a one percent level. \*\*Significant at a 5 percent level.

Table 1 demonstrates that viable alternatives do exist that are useful for hedging stocks in the option markets. Strategies that use call options to hedge such as butterfly spreads, bull spreads and bear spreads may be conducted using out of the money call options.

Option1O represents the monthly option return 1 strike price out of the money. Column 4 indicates that call options one strike price out of the money (Option1O) were significantly more expensive for growth stocks than value stocks during this decade. The average return on these options for deciles 1, 2 and 3 were -10.5%, -13.5% and -9.9%, respectively. The option returns for deciles 9 and 10 were -2.8% and -5%. The difference in returns between value and growth deciles is significant. Column 5 results show that buying call options at the money during this decade was expensive for all deciles. Average costs or returns were between -30% to -37% per month.

Columns 6 (Option1I) and 7 (Option2I) have similar results for with returns approximately -40% for most deciles in Table four (in the money calls) and -60% for Table five (deep in the money calls). This is consistent with the previous literature given that these are short term options (approximately one month until expiration). Any strategy that requires buying call options that were at the money, in the money or deep in the money (2 strike prices in) were, on average, expensive as a hedging tool. Columns 6 and 7 indicate that using in the money options is expensive in the call option market. A return of a negative 40 % is a difficult return to justify as a hedging tool. While the value of the portfolio may be protected, the cost of the insurance is extremely expensive using in the money call options.

#### **4.2 Empirical Results for the Put Options Market**

Table 2 and column 3 results indicate that many deciles had positive returns for deep in the money puts. This decade included the tech boom and subsequent bust. It appears the strategy of buying deep in the money puts was profitable over this decade for many deciles. This research divides data differently and defines one month as between one and two month intervals. The finding is relatively new because the time period is rounded up and not down as in previous studies. The time period includes daily data that differentiates option returns over 4-6 weeks depending on the expiration date of the option contract. This small difference in calculating the option return shows many options have very different uses for portfolio hedging. These are new results in the literature. Option2O represents a put option that is two strike prices out of the money. Option1O is one strike price out of the money. OptionAT represents put options at the money. Option1I lists the returns for put options that are one strike price in the money. Option2I represents options that are two strike prices in the money.

**Table 2: Put Option Monthly Returns**

Monthly Returns from 1995-2004 for each Decile are ranked by value characteristics.

Decile	Stock Return	Option2O Return	Option 1O Return	Option AT Return	Option II Return	Option 2I Return
1	.003	.036	-.123*	-.326*	-.257*	-.280*
2	.004	.264*	-.014	-.323*	-.243*	-.191*
3	.010	.315*	-.101*	-.366*	-.256*	-.251*
4	.011	.086*	-.141*	-.387*	-.257*	-.258*
5	.017	.056*	-.109*	-.411*	-.355*	-.441*
6	.018	.405*	-.075*	-.424*	-.378*	-.546*
7	.017	.086*	-.120*	-.401*	-.391*	-.469*
8	.021	.062*	-.121*	-.398*	-.431*	-.574*
9	.020	.026	-.110*	-.374*	-.476*	-.043
10	.024	.338*	-.002*	-.197*	-.378*	-.119*

Decile 10 is Value and Decile 1 is Growth. There are approximately 270 – 300 firms per day for 20 days per month. \*Significant at a one percent level. \*\*Significant at a 5 percent level.

Column 4 results show negative 7% to -14% for most deciles, however, not for deciles 2 (growth) or 10 (deep value). These deciles had option returns that were not significantly different from zero. The cost of hedging using these deciles was different during this decade. One trend in the tables is the difference between deciles one and two in terms of option returns. The results in column 4 indicate that using these puts to hedge would be a viable long term strategy. The options are not cheap, however, the returns could potentially be justified as portfolio insurance for temporary market conditions.

Column 5 shows at the money put options and the average monthly returns for the deciles ranged from -19.7% (decile 10 deep value) to -42.4%. The growth stock option returns (deciles 1,2 and 3) were in the -32% range. Decile 10 was the least negative with a return a negative 19.7 percent. Columns 3, 4 and 5 are important because as a hedging tool they are the most obvious choices for a portfolio manager. Using at the money options is more efficient and more indicative of current market positions that most investors would rely on as a hedging tool, however, as can be seen with the empirical results at the money options are significantly more expensive than out of the money options. The returns from many tables indicate that across deciles there are major differences and that strike price selection is key to the success of a hedging strategy. A slight change in the type of strike price could result in an unsuccessful outcome for an investor. Options that are out of the money or at the money are much better choices for hedging based on the expense or return of each type of option. This is demonstrated in the next table. Column 6 indicates that using In-The-Money puts (one strike price in) results in option returns from -24% to -47% , on average per month. This cost could cause significant drag to a stock portfolio if used frequently. The expense for this type of option is contrasted with the last table to get large differences in expenses for hedging. A portfolio manager using the options in column 6 would find a large cost for hedging his/her portfolio. While there is a difference between value and growth stocks, in terms of hedging costs, both types are expensive with the selection of this strike price. As a result, the choice of strike price and the choice of type of security (value versus growth) is important in terms of the final expense and returns to the portfolio.

These options are expensive as a hedging tool, since the returns average a negative 24% to a negative 47%. In the money options are not an efficient tool for most investors to hedge a stock or a portfolio with on any consistent basis. Column 7 has option returns ranging from -4% to -54%. Deciles 9 and 10 have option returns of -4.3% and -11.9%. Deciles 1, 2 and 3 have option returns of -28%, -19.1% and -25.1%, respectively. Deciles five thru eight have the most negative returns.

The large negative returns are prominent in most academic research concerning short term options. This paper confirms this result and indicates that hedging can be very expensive, particularly if an investor uses at the money or in the money options. The returns in this table range from a negative 4% to a negative 54%, this is very expensive insurance for hedging.

## **5. CONCLUSION**

For the decade 1995-2004, the empirical evidence indicates that buying call options is expensive for calls at the money or in the money one strike price. The monthly option returns are negative (30%-60%) for almost all deciles for call options at the money or in the money one or two strike prices. There are significant differences between growth stocks and value stocks using call options that are out of the money one strike price. The value deciles have negative option monthly returns of 3-5% and the growth deciles have negative option monthly returns of 8-13.5%. Evidence is found that the option returns on some growth stocks and the option returns on some value stocks outperform the average option return for puts deep out of the money. For puts deep in the money, buying puts for the most extreme decile of value stocks is significantly less expensive than other deciles. For value stocks deep out of the money call options had significantly higher returns (20%) than growth stocks(negative option returns). For both puts and calls across the value and growth deciles, writing options had higher than buying options. Strategies with profitable returns over the decade included bear spreads using calls on value stocks and bull spreads on value stocks and growth stocks (but not the highest decile for growth). A third strategy that was profitable for the decade included buying deep out of the money puts for deciles 2, 3 (growth) and 10 (value).

### **Future Research**

Future research will break down specific strategies, include options with longer expiration dates, break down empirical results by years, business cycles, interest rate cycles, inflation and currency changes. A breakdown of the options return data before and after the tech boom and bust will be analyzed. The size effect is, also, being examined.

## REFERENCES

- Ball, R. 1978. Anomalies in Relationships Between Securities' Yields and Yield-Surrogates, *Journal of Financial Economics* 6, 103-26.
- Banz, R. 1981. The Relationship between Return and Market Value of Common Stock, *Journal of Financial Economics* 9, 3-18.
- Basu, S. 1977. Investment Performance of Common Stocks in Relation to their Price-Earnings Ratio: A Test of the Efficient Market Hypothesis, *Journal of Finance*, 32, June, 663-682.
- Blume, M. and R. Stambaugh. 1983. Biases in Computed Returns: An Application to the Size Effect, *Journal of Financial Economics* 12, 387-404.
- Brennan, M.J. 1970. Taxes, Market Valuation, and Corporate Financial Policy, *National Tax Journal* 23, 417-27.
- Brennan, M.J., T. Chordia and A. Subrahmanyam. 1998. Alternative factor specifications security characteristic, and the cross section of stock returns, *Journal of Financial Economics* 49, 345-373.
- Carhart, M.M. 1997. On the persistence in mutual fund performance, *Journal of Finance* 52, 57-82.
- De Bondt, W. and R. Thaler. 1985. Does the Stock Market Overreact? *Journal of Finance* 40, 793-805.
- De Bondt, W. and R. Thaler 1987. Further Evidence on Investor Overreactions and Stock Market Seasonality, *Journal of Finance* 42, 557-81.
- Fama, E. 1976. *Foundations of Finance* (Basic Books, New York).
- Fama, E. and K. French. 1992. The Cross Section of Expected Stock Returns, *Journal of Finance* 47, 427-466.
- Fama, E. and K. French. 1993. Common Risk Factors in the Returns of Stocks and Bonds, *Journal of Financial Economics* 33, 3-56.
- Fama, E. and K. French. Size, Value, and Momentum in International Stock Returns, National Bureau of Economic Research (NBER), 2011
- Graham, B. and D. Dodd. 1940. *Security Analysis: Principles and Technique*, McGraw-Hill Book Company, Inc., New York.
- Hawawini, G., and D. Keim. 2000. The Cross Section of Common Stock Returns: A Review of the Evidence and Some New Findings, in Keim, D.B. and W.T. Ziemba, *Security Market Imperfections in Worldwide Equity Markets* (Cambridge University Press, 2000).
- Jaffe, J., D. Keim and R. Westerfield. 1989. Earnings Yields, Market Values and Stock Returns, *Journal of Finance* 45, 135-148.
- Jegadeesh, N. and S. Titman. 1993. Returns to Buying Winners and Selling Losers: Implications for Stock Market Efficiency, *Journal of Finance* 48, 65-92.
- Keim, D. 1983. Size-Related Anomalies and Stock Return Seasonality: Further Empirical Evidence, *Journal of Financial Economics* 12, 13-32.

- Kothari, S., J. Shanken and R. Sloan. 1995. Another Look at the Cross-Section of Expected Stock Returns, *Journal of Finance* 50, 185-224.
- Kuhn, T. 1970. *The Structure of Scientific Revolutions*, (University of Chicago Press, Chicago).
- Lakonishok, J., A. Schleiffer, and R. Vishny. 1994. Contrarian investment, extrapolation and risk, *Journal of Finance* 49, 1541-1578.
- Litzenberger, R. and Ramaswamy, K. 1979. The Effects of Personal Taxes and Dividends on Capital Asset Prices: Theory and Empirical Evidence, *Journal of Financial Economics*, 163-195.
- Lo, A. and C. MacKinlay. 1990. When are Contrarian Profits due to Stock Market Overreaction, *Review of Financial Studies* 3, 175-205.
- Mehra, R. and E. Prescott. 1985. The equity premium: a puzzle *Journal of Monetary Economics* 15, 145-161.
- Miller, M. and M. Scholes. 1982. Dividend and taxes: Some empirical evidence *Journal of Political Economy* 90, 1118-41.
- Neiderhofer, V. and M.F.M. Osborne. 1966. Market making and reversal on the stock exchange, *Journal of the American Statistical Association* 61, 897-916.
- Reinganum, M. 1981. A Misspecification of Capital Asset Pricing: Empirical Anomalies Based on Earnings Yields and Market Values, *Journal of Financial Economics* 9, 19-46.
- Schwert, G.W. 2003. Anomalies and market efficiency, in G.M. Constantinides, M. Harris and R. Stulz, eds. *Handbook of the Economics of Finance* (Elsevier Science B.V.).