COMPETING DERIVATIVE EQUITY INSTRUMENTS: EMPIRICAL EVIDENCE ON HEDGED PORTFOLIO PERFORMANCE

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INTRODUCTION

The purpose of this article is to provide empirical evidence on the relative effectiveness of derivative security instruments available to effect risk-minimizing hedges for a long position in the S&P 500 spot index. Only a long position in the spot is considered since this is most frequently the position of the portfolio manager who wishes to hedge. This article compares the performance of seven portfolios hedged daily over the 27-month period from March, 1987 to June, 1989. Five portfolios are hedged with either index put options, index call options, futures put options, futures call options, or futures contracts. Two additional hedged portfolios are compound hedge portfolios that combine futures and futures options. Individual portfolio performance

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is first evaluated on the basis of realizing a target return, specified as the risk-free rate. Each portfolio is then compared on a risk adjusted basis to the other portfolios to assess the relative performance of the hedging vehicles.

While extensive work has been devoted to determining the advantages of different hedging strategies using a given instrument, little attention has been given to direct comparisons of competing hedging vehicles, perhaps due to an implicit assumption of efficient markets. Instead, recent studies have emphasized the analysis of two primary factors in the formation of hedged portfolios: the calculation of an optimal hedge ratio and the application of appropriate measures of effectiveness.

One recognized motivation for employing hedging strategies is to offset losses when adverse moves in the spot market are anticipated, thus allowing the portfolio to at least realize the risk-free rate of return. The use of futures contracts to hedge a spot position has been the focus of a considerable body of research seeking to improve on simple risk-minimizing hedge ratios. Simple strategies using futures contracts are based on an OLS regression, with the regression coefficient serving as the hedge ratio. More advanced approaches to hedge ratio calculation have not clearly established a method consistently superior to OLS [e.g., Figlewski, Landskroner, and Silber, (1991); Myers (1991); Grant and Eaker (1989)]. Cecchetti, Cumby, and Figlewski (1988) propose that the maximization of a risk/return utility function, not risk minimization, is the relevant goal of the hedger. Their results are inconclusive in determining the superiority of the approach over risk-minimizing strategies, particularly if the cost of determining and generating a utility function is considered.

A second body of futures literature focuses on the effectiveness measures used to reach conclusions about the performance of the hedge. Malliaris and Urrutia (1991) determined that the R-square from an OLS regression is an appropriate effectiveness measure, based on the finding that the hedge ratios from the regression of prices of S&P 500 spot and futures markets do exhibit a random pattern. Alternatively, Lindahl (1991) argues that the appropriate measure of hedge effectiveness for a risk-minimizing strategy is the mean absolute difference between a hedged portfolio's return and a specified target return.

This study is not intended to establish the optimality of a particular hedge ratio calculation or effectiveness measure. The motivation for this study is to address the absence of empirical research directly comparing alternative hedging vehicle performance.

MARKET MICROSTRUCTURE

This section provides a comparative guide to contract specifications and margin requirements for the derivative securities compared in this analysis.

Table I shows the contract specifications of the S&P 500 index options (puts and calls), the S&P 500 futures options (puts and calls), and the S&P 500 index futures. It is interesting to note that the index options and futures options have very little in common. By design, the futures options and futures contracts do have several similar features. In spite of the similarities between futures and futures options, it is helpful to keep the differences in mind. That is, the long position in a futures option holds the *right* to assume a position in the underlying futures, while the long position in a futures holds the *obligation* to settle in cash on the spot index.

The differences between index options, futures options and futures are of interest because the hypothesis of this study is that the performance of one contract type is not significantly different from another. Therefore, investors can base their choice of hedging vehicle on microstructure differences such as contract specifications, margin requirements, and transactions costs.

In Table II the margin requirements are shown for each contract. These requirements are subject to change without notice and may differ among investors, depending on transaction size.

For a long position in an index option or a futures option contract the premium must be paid in full. Brenner, Courtadon, and Subrahmanyam (1985) showed that premiums on index options and futures options are fairly close for a given contract size. When an investor has a short (covered or uncovered) position in an index option or futures option, the margin requirements are fairly similar. In addition, all of the contracts are marked-to-market. Thus, the major distinction between futures options and index options is the size of the contract. This difference will impact the cash required for margins, the premiums paid and the marked-to-market account.

DATA

The data for this study consists of daily prices over the 27-month period from March 3, 1987, to July 31, 1989. Approximately 585

TABLE I
Contract Specification

Contract	*S&P 500 Index Options*	*S&P 500 Futures Options*	*S&P 500 Futures*
Exchange	CBOE	CME	CME
Trading symbol	SPX/NSX	CS(Calls) PS(Puts)	SP
Contract size	Index 100	Futures × 500	Settle × 500
Minimum price	$5.00	$25.00	$25.00
Contract months	Three near term months plus two months in March Cycle	Three near term months plus two months March cycle	March cycle
Exercise provision	European	American	N/A
Strike prices	5-point intervals	5-point intervals	N/A
Position limit	15,000 contracts of either side of mkt −25,000 total	5000 combined futures & options positions on one side of the mkt.	None
Daily price limit	none	Close when future close	5 pt. first 10 mins; 12 pts next 30 mins; 30 pts. (expanding to 50 pts if there is a trading halt)
Settlement	Cash	Delivery of long or short position in underlying futures	Cash
Trading hours	9:30 AM to 4:15 PM EST	9:30 AM to 4:15 PM EST	9:30 AM to 4:15 PM EST

Source: Compiled from information contained in: Duffie, Darrell (1989): *Futures Markets*, Prentice-Hall. Fabozzi, Frank J., and Kipnis, Gregory M. (1989): *The Handbook of Stock Index Futures and Options*, Dow Jones Irwin. Kolb, Robert (1990): *Understanding Futures Markets*, Kolb.

observations are available for each price series.[1] Closing prices for the S&P 500 spot index and the index put and call contracts are from

[1]The stock market crash of October 1987 led to an almost complete halt in trading in some of the derivative equity markets. The period 10/17/87 to 11/20/87 is eliminated due to excessive missing data.

TABLE II
Margin Requirements[a]

Contract	*S&P 500 Option Index*	*S&P 500 Futures Option Index*
Long call or put	Pay premium in full	Pay premium in full
Short call or put (uncovered)	Deposit proceeds from short plus 15% of underlying index value[b]	Option settlement premium plus margin on futures minus 1/2 the amount the option is out-of-the money[c]
Short call or put (covered)	Deposit proceeds from short plus 15% of underlying index value minus out-of-money amount	Option settlement premium plus margin on futures minus 1/2 the amount the option is in-the-money[c,d]
Maintenance	Marked-to-market	Marked-to-market

[a]Futures contracts on the S&P 500 are marked-to-market and generally have a margin requirement of no less than $10,000.
[b]Sometimes the option proceeds plus 10% of the underlying index value is required as a margin.
[c]Or a minimum of option settlement premium plus $10,000.
[d]No distinction is made for out-of-money vs. in-(or at) the-money as in the case of the NYSE composite futures option.
Source: Compiled from information contained in: Duffie, Darrell (1989): *Futures Markets*, Prentice-Hall. Fabozzi, Frank J., and Kipnis, Gregory M. (1989): *The Handbook of Stock Index Futures and Options*, Dow Jones Irwin. Kolb, Robert (1990): *Understanding Futures Markets*, Kolb.

the Chicago Board Options Exchange (CBOE) data services. Settle prices for the S&P 500 futures, futures put, and futures call contracts are from the Chicago Mercantile Exchange (CME). Any missing data points are from the *Wall Street Journal.* Daily bid yields for 90 day T-bills listed in the CME Yearbook (1987, 1988, and 1989) are used to estimate a daily risk-free interest rate.

Seven portfolios are constructed to hedge an unexpected spot market decline. Five of the portfolios consist of one "share" of the S&P 500 hedged with: (1) a short position in index call options; (2) a long position in index put options; (3) a short position in futures call options; (4) a long position in futures put options; and, (5) a short position in equity index futures. The two remaining portfolios contain compound hedges—the spot position is hedged with a short futures position and the short futures position is hedged with: (6) a long futures call option position; and (7) a short futures put option position. Selection of the appropriate derivative instruments to construct the hedges is based on near contract and at-the-money contract criteria. For the option portfolios, rebalancings involving the same exercise price and those requiring a new at-the-money contract are treated equally.

The superiority of employing near contracts in short horizon strategies has been well established [e.g., Alderson and Zivney (1989); Cecchetti, Cumby, and Figlewski (1988); and, Grant and Eaker (1989)]. For purposes of this study, the near contract is defined as the contract with the closest "last trading-day" date.[2] Each contract series is utilized until the third Thursday of its expiration (delivery) month. For example, at the end of trading on the third Wednesday of August 1988, one portfolio is hedged with the at-the-money August index call. The hedge established for that portfolio at the end of the next trading day (the third Thursday) employs the at-the-money September index call.

The at-the-money restriction maximizes pricing efficiency and trading volume. To mitigate the introduction of the potential bias from utilizing only in-the-money or out-of-the-money options, an at-the-money contract is defined as the contract with the smallest absolute difference between its exercise price and the price of the underlying asset for each trading day. This definition results in 52% (48%) of the futures puts (calls) being purchased (sold) in-the-money, and 49% (51%) of the index puts (calls) being purchased (sold) in-the-money. In the event that two contracts satisfy this condition, the in-the-money contract is chosen. This occurs six times (0.5%) in the sample.

COMPARISON OF HEDGED PORTFOLIO RETURNS WITH THE TARGET

The Futures Hedged Portfolio

The futures hedge ratio is a simple OLS regression of the form:

$$R_{s,t} = \alpha + \beta_t R_{f,t} + \epsilon_t \tag{1}$$

where $R_{s,t}$ is the return on the S&P 500 spot index at time t, $R_{f,t}$ is the return on the S&P 500 futures index, and β_t is the optimal hedge ratio. The daily hedge ratios are estimated from a rolling 90 trading day regression of one day returns for the spot and futures. The returns calculated at the end of each day t replace the returns of day t-90 in the

[2]S&P 500 futures options contracts were not available on a serial month basis before July 1987. The September contract series is used from June 19 through July 8, the first day that the August contract traded.

regression series.[3] A new β_t is estimated and used as the ratio for the hedge created at the end of day t and held until the end of day $t + 1$.[4]

The return on the futures hedged portfolio, $R_{F,t}$, is defined as:

$$R_{F,t} = R_{s,t} - (H_{F,t-1} \cdot R_{f,t}) \tag{2}$$

where $H_{F,t-1}$ is the optimal hedge ratio obtained from lagged values of β_t in eq. (1) and all other variables are as previously defined. The average hedge ratio is 0.950 (see Table III). The target is the daily risk-free yield (approximated with T-bill rates).

The Options Hedged Portfolios

The hedge ratio for the index options is defined using the Black and Scholes (1973) delta hedge. The delta hedge is the cumulative normal of d_1, $N(d_1)$, with

$$d_{1,t} = \frac{\ln\left(\frac{I_t}{E}\right) + (r_t + 0.5 \cdot Var)T}{\sqrt{Var} \cdot \sqrt{T}} \tag{3}$$

where I_t is the spot value of the S&P 500 index, E is the at-the-money exercise price (as previously defined), Var is the variance of the S&P 500 index daily returns over the previous contract period, r_t is the annualized continuously compounded risk-free rate, and T is the fraction of a year until expiration (number of days/365). The average hedge ratio for the index call options is 1.866 and for the index put options is 2.259 (see

TABLE III
The Hedge Ratios for Single Hedge Portfolios

Instrument	*Average*	*Minimum*	*Maximum*
Futures	0.950	0.623	1.155
Index calls	1.866	1.297	4.011
Index puts	2.259	1.332	4.364
Futures calls	1.887	1.273	3.230
Futures puts	1.967	1.366	4.087

[3]The β_t of the first regression period is used as the hedge ratio for the first 90 days.

[4]The level variables are tested for the presence of unit roots using the Dickey–Pantula (1987) test procedure. One unit root is found to be contained within both level series but no unit roots are found in the return series used in eq. (1). The index options as well as the futures options are also tested for unit roots. Again, no unit roots are found in the return series, although the level series does contain one unit root.

Table III). The hedge ratio is revised daily to minimize the introduction of systematic risk into the position [Gilster (1990)].

To determine the number of call options to short, the hedge ratio is defined as $H_{C,t} = 1/N(d_{1,t})$. Similarly, the number of put options to purchase is $H_{P,t} = 1/(1 - N(d_{1,t}))$. The return on the call hedged portfolio, $R_{C,t}$, and the return on the put hedged portfolio, $R_{P,t}$, are defined below in eq. (4a) and (4b), respectively.

$$R_{C,t} = R_{s,t} - (H_{C,t-1} \cdot R_{c,t}) \tag{4a}$$

$$R_{P,t} = R_{s,t} + (H_{P,t-1} \cdot R_{p,t}) \tag{4b}$$

where $R_{c,t}$ and $R_{p,t}$ are the daily returns of the index call and put, respectively, and all other variables are as previously defined. The target return for put and call hedged portfolios is simply the daily risk-free rate.

The Futures Options Hedged Portfolios

To evaluate the returns on the futures call and futures put hedged portfolios, a similar approach to the one described above and shown in eqs. (4a) and (4b) is used, with certain modifications. First, following Black (1976), the value of $d_{1,t}$ is calculated without the risk-free rate, since the underlying asset is a futures contract rather than the spot index.[5] Second, the futures call option's optimal hedge ratio is defined as $H_{FC,t} = 1/N(d_{1,t}) \cdot H_{F,t}$, where $H_{F,t}$ is the future's optimal hedge ratio from eq. (2). Likewise the futures put optimal hedge ratio is defined as $H_{FP,t} = 1/(1 - N(d_{1,t})) \cdot H_{F,t}$. Notice that for both calls and puts the optimal option hedge ratio is multiplied by the optimal futures hedge ratio. This adjustment is made because the futures contract is the underlying asset rather than the spot S&P 500, and the portfolio does not actually contain one "share" of the futures. The average futures call option hedge ratio is 1.887 and the average futures put option hedge ratio is 1.967 (see Table III).

The Compound Hedged Portfolios

The compound hedged portfolios are constructed by first assuming that the spot position in the S&P 500 is hedged with a short futures position

[5] I_t is replaced with the index futures value and the variance is the variance of the index futures returns.

as previously described. To hedge the short futures position on the spot, a long position in the futures call or a short position in the futures puts is needed, resulting in the following compound hedge portfolio returns:

$$R_{KC,t} = R_{s,t} - 2(H_{F,t-1} \cdot R_{f,t}) + (H_{FC,t-1} \cdot R_{c,t}) \tag{5a}$$

$$R_{KP,t} = R_{s,t} - 2(H_{F,t-1} \cdot R_{f,t}) - (H_{FP,t-1} \cdot R_{p,t}) \tag{5b}$$

where $R_{KC,t}$ and $R_{KP,t}$ are the return on the call and put compound option portfolios, respectively, and all other variables are as previously defined. The target return for the compound portfolios is also the daily risk-free rate.

Comparison with the Risk-Free Rate

Difference t tests [Inman and Conover (1983)] are constructed to test the hypothesis of significant differences in the returns on the hedged portfolios, $R_{i,t}$ (for $i = F, C, P, FC, FP, KC$, and KP), and the risk-free rate, R_t. The test statistic is shown in eq. (6) below.

$$t = X/(S_x)(1/N_x)^{1/2} \tag{6}$$

Where,

X = the mean of the difference between $R_{i,t}$ and R_t;

S_x = the standard deviation of the mean difference series;

N_x = the number of observations for the mean difference series.

Table IV summarizes the results of the difference t tests for the futures, options, futures options, and compound hedge portfolio returns measured against the target return. A positive t value indicates that the return of the hedged portfolio exceeds the risk-free rate. The results show that there is no significant difference between the target return and any hedged portfolio return over the entire 27-month period. To evaluate whether the same result holds if evaluated over shorter time periods, the sample is divided into two sets of subsample periods. The first set is delineated by successive options expiration dates, resulting in 28 subsample periods. The second set is delineated by successive futures delivery dates, resulting in ten subsample periods, for a total of 38 subperiods. Since there are relatively few significant t values in the subperiod comparisons, only those periods with a significant observation for at least one portfolio are presented.

TABLE IV

Difference t Tests Comparing Mean Returns on the Hedged Portfolio with the Target[a]

Option Expiration Dates	*Index Call Hedged Portfolio*	*Index Put Hedged Portfolio*	*Futures Hedged Portfolio*	*Futures Call Hedged Portfolio*	*Futures Put Hedged Portfolio*	*Compound Futures Call Portfolio*	*Compound Futures Put Portfolio*
05/20/88	2.321[b]	0.789	−0.295	1.931	0.711	−1.938	−0.712
01/20/89	0.272	−2.091[b]	−1.062	0.456	−1.630	−0.461	1.623
02/17/89	−1.321	−2.967[b]	−0.428	−0.268	−1.097	0.268	1.096
06/16/89	−1.565	−2.029[b]	−0.141	−1.435	−2.089[b]	1.435	2.090[b]
Futures Delivery Dates							
12/16/88	0.136	−3.260[b]	−0.524	0.118	−0.861	−0.120	0.857
03/17/89	0.236	−1.160	−1.049	0.260	−2.200[b]	−0.264	2.194[b]
06/16/89	−0.801	−1.639	−0.805	−2.158[b]	−2.642[b]	2.156[b]	2.646[b]
Overall	−1.018	−1.586	−0.229	−0.865	−1.360	0.860	1.357

[a]All 38 subsample periods are tested. Only the subperiods with significant differences are shown. The remaining period results are available from the authors by request.
[b]Significant at 5% level.

As shown in Table IV, the difference between the return on the futures hedged portfolio and the risk-free rate is not significantly different from zero in any of the 38 subperiods. In an efficient market it is expected that hedged portfolios would not consistently earn rates different from the risk-free rate. The index call hedged portfolio outperforms the target in only one period, while the index put hedged portfolio under-performs the target in four periods. The signs of the t values are consistent with a priori expectations, given the ex post performance of the market (see Table V). For example, over the period 4/15/88 to 5/20/88 the market declines 2.6% and the index call outperforms its target. Likewise, the target outperforms the index put hedged portfolio during periods of market increases. The futures call hedged portfolio shows a significant difference from the target in one period and the futures put hedged portfolio generates three significant periods. The signs of these values are also consistent with a priori expectations in that the significant negative t values are associated with increases in the market.

The compound hedged portfolios do not perform noticeably different from the target. The result over the entire sample is not significant for either the compound futures call or compound futures put portfolios, and the number of significant subperiods is unremarkable, relative to the other portfolios.

TABLE V
Information on the Spot Market

Option Expiration Dates	*T-Bill Yields (%)*	*Return on the S&P 500 (%)*
03/20/87	5.59	4.40
06/19/87	5.64	2.90
07/18/87	5.69	1.44
08/21/87	5.81	7.87
09/18/87	6.27	−6.26
10/16/87	6.28	−5.33
11/20/87	5.46	−18.81
12/18/87	5.67	2.96
01/15/88	5.82	1.16
02/19/88	5.49	3.79
03/18/88	5.67	3.63
04/15/88	5.80	−4.19
05/20/88	6.06	−2.60
06/17/88	6.35	−6.98
07/15/88	6.48	0.51
08/19/88	6.85	−4.34
09/16/88	7.20	4.00
10/21/88	6.96	4.81
11/18/88	7.07	−6.10
12/16/88	7.95	3.68
01/20/89	8.17	3.74
02/17/89	7.94	3.53
03/17/89	8.59	−3.37
04/21/89	8.85	5.78
05/19/89	8.53	3.76
06/16/89	8.35	0.03
07/21/89	8.00	4.53
08/18/89	7.98	3.01
Futures Delivery Dates		
03/20/87	5.59	4.40
06/19/87	5.64	2.90
09/18/87	5.92	2.57
12/18/87	5.78	−20.80
03/18/88	5.65	8.80
06/17/88	6.07	−0.39
09/16/88	6.84	−0.01
12/16/88	7.28	2.10
03/17/89	8.22	5.90
06/16/89	8.60	9.79
Overall	6.72	7.83

Overall, the minimal number of significant differences indicates that no instrument consistently generates portfolio returns which differ from the targeted risk-free rate.

COMPARISONS OF HEDGED PORTFOLIO RETURNS

Single Hedged Portfolios

To test the efficiency of the use of one hedging vehicle versus another in any given time period, the returns of each of the five single hedged portfolios are compared, resulting in ten combinations.

A t test similar to the one shown in eq. (6) is utilized to test the significance of the difference between the paired portfolio returns.

The results are shown in Table VI, parts A and B. A significant t value indicates the rejection of the null hypothesis that the mean difference of the returns is zero. A positive value indicates the superiority of the first instrument of the pair in each column. Only those subperiods with at least one significant observation are presented. No hedged portfolio is found to outperform another over the entire sample period.

Table VIA, summarizes the results of the difference t tests on combinations of single hedged portfolios that show significance in four or more subperiods. It is not surprising that the four "opposite pairs" comparisons (those involving put versus call hedges) are the ones which show the largest number of significant subperiods. In all cases, the call options outperform the put options.

More specifically, the index call options outperform both the futures puts and index puts in ten subperiods. Futures calls dominate the index puts in seven subperiods. However, only one of these periods is unique relative to the index call–index put significant periods. With the exception of only one period, the spot market shows an increase over each of the significant options and futures subperiods. This result suggests that if the hedger is wrong about his prediction of a market decline, he would usually be better off hedging with call options than with put options.

Table VIB summarizes the results for instrument comparisons which show fewer than four significant subperiods. All option hedged portfolios generate returns which are not significantly different than the futures hedged portfolios overall and in most subperiods. In those few periods which are significant, the call options relative to futures show mixed results, but the futures do outperform the put options. None of the significant values contradict a priori expectations relative to the spot market returns for those periods. However, an accurate prediction of

TABLE VIA

Difference *t* Tests Comparing the Mean Returns on Single Hedged Portfolios[a]

Comparison of Portfolios Which Have Four or More Significant Subperiods

Option Expiration Dates	*Futures Calls to Futures Puts*	*Futures Calls to Index Puts*	*Futures Puts to Index Calls*	*Index Calls to Index Puts*
07/18/87[b]	1.518	2.160[d]	1.722	0.695
01/15/88	0.487	−1.564	−2.433[d]	−0.308
03/18/88	2.108[d]	3.157[d]	−1.735	2.837[d]
09/16/88	1.210	0.947	−1.476	2.078[d]
10/21/88	2.228[d]	2.361[d]	−3.426[d]	3.201[d]
12/16/88	2.695[d]	3.166[d]	−3.259[d]	3.845[d]
01/20/89	1.159	2.799[d]	−2.431[d]	4.142[d]
03/17/89	1.912	2.635[d]	−3.402[d]	2.119[d]
05/19/89	−0.020	0.018	−2.150[d]	2.256[d]
08/18/89[c]	0.202	1.405	−2.224[d]	2.484[d]
Futures Delivery Dates				
03/18/88	0.872	−0.360	−2.491[d]	−0.062
12/16/88	0.560	1.792	−3.197[d]	4.291[d]
03/17/89	2.651[d]	3.216[d]	−3.129[d]	2.441[d]
Overall	0.269	0.513	0.961	0.859

[a]All 38 subsample periods are tested. Only the subperiods with significant differences are shown. The remaining periods results are available from the authors by request.
[b]August contract is bought on July 8, 1987, the first day of the serial contract availability.
[c]Last observation is on July 31, 1989.
[d]Significant at 5% level.

the spot market trend does not appear to generate a consistently optimal decision rule for selecting futures or options.

The results shown in Tables VIA and VIB suggest that "like pairs" comparisons of futures calls(puts) to index calls(puts) exhibit virtually no significant differences in mean returns in any subperiod. It is reasonable to conclude that one single hedging instrument provides little benefit to the portfolio manager interested in directly hedging a spot position. Therefore, the manager's selection criteria must be based on the relative attractiveness of the margin requirements, contract size, transaction costs, and other features of the instrument, given the size of the trade.

Compound Hedged Portfolios

It may be possible that futures options provide superior performance when used in a compound hedging strategy, or to "hedge a hedge." To

TABLE VIB

Difference *t* Tests Comparing the Mean Returns on Single Hedged Portfolios

Comparison of Portfolios Which Have Fewer Than Four Significant SubperiodsU

Option Expiration Dates	*Futures Calls to Futures*	*Futures Puts to Futures*	*Futures to Index Puts*	*Futures to Index Calls*	*Futures Calls to Index Calls*	*Futures Puts to Index Puts*
05/20/88	1.936	0.711	−0.890	−2.620[a]	0.017	−0.213
01/20/89	0.457	−1.622	2.349[a]	−0.304	−0.190	1.988
06/16/89	−1.435	−2.089[a]	2.266[a]	1.389	−0.596	1.106
07/21/89	1.265	0.668	−0.463	−2.630[a]	1.215	1.122
Futures Delivery Dates						
09/16/88	1.311	0.708	1.500	−0.287	−0.766	2.160[a]
12/16/88	2.160[a]	−0.860	1.644	−0.141	−0.015	0.661
03/17/89	0.262	−2.197[a]	1.158	−0.238	0.035	0.013
06/16/89	0.175	−2.661[a]	2.866[a]	1.155	−0.793	0.094
Overall	−0.864	−1.358	1.639	1.348	1.044	0.371

[a]Significant at 5% level.

examine this possibility, the returns on the compound hedge portfolio are compared to the index option portfolios, resulting in four combinations. The results of these *t* tests are shown in Table VII.[6] Again, only those subperiods with at least one significant observation are presented.

No combination shows significance in the overall sample. However, the compound futures puts exhibit five significant superior performance subperiods when compared to the index puts. This suggests that the futures puts may provide hedging benefits when used as a compound hedge that direct hedging with index puts does not. The other combinations exhibit two or three significant subperiods, not sufficient to be remarkable.

The findings in Tables VIA, VIB, and VII suggest that competing derivative instruments are equally rational choices for the investment manager. The decision criteria can, therefore, be based on contract feature differences and relative costs.

CONCLUSION

This article empirically assesses the relative effectiveness of derivative security instruments available to effect risk-minimizing hedges for a

[6]The compound hedged portfolios are also compared to the futures portfolio and the minimal number of significant subperiods is unremarkable.

TABLE VII
Different t Tests Comparing Mean Returns on the Compound Hedge and Index Options Hedge Portfolios[a]

Option Expiration Dates	*Compound Futures Calls to Index Calls*	*Compound Futures Calls to Index Puts*	*Compound Futures Puts to Index Puts*	*Compound Futures Puts to Index Calls*	*Compound Futures Calls to Compound Futures Puts*
03/18/88	−1.391	0.790	1.690	−0.618	−2.108[b]
04/15/88	0.093	0.768	1.905[b]	1.630	−1.285
05/20/88	−2.868[b]	−1.273	−0.801	−1.058	0.202
10/21/88	−0.883	0.102	1.032	0.116	−2.281[b]
01/20/89	−0.515	0.928	2.720[b]	0.706	−1.158
06/16/89	1.677	1.955[b]	2.832[b]	2.624[b]	0.136
Futures Delivery Dates					
03/17/89	−0.354	0.787	2.056[b]	1.211	−2.651[b]
06/16/89	2.178[b]	2.677[b]	2.876[b]	2.172[b]	−0.259
Overall	1.506	1.409	1.515	1.594	−0.287

[a]All 38 subsample periods are tested. Only the subperiods with significant differences are shown. The remaining period results are available from the authors by request.
[b]Significant at 5% level.

long position in the S&P 500 spot index. A total of five single hedged portfolios and two compound hedged portfolios are constructed using daily data over the period March 3, 1987 to July 31, 1989.

When each of the seven hedged portfolios is compared to the risk-free rate, no portfolio significantly deviates from this target for the overall time period. In a relatively minor number of subperiods, a significant difference is observed, but not in any systematic fashion relative to spot market trends.

When each of the five single hedged portfolios is compared to the other hedged portfolios, only "opposite pairs" (calls versus puts) show a large number of significant subperiods and no dominance is observed in the overall sample by any hedged portfolio. In the few significant subperiods of "like pairs," the index options usually outperform the futures options and call options usually outperform put options. To further test the performance of futures options, compound hedges are constructed but reveal no unique benefit to using such a strategy. While the study shows there is no clearly superior instrument to use in hedging the S&P 500, the same can be said by inference for using one instrument over another in any particular setting.

The evidence presented in Tables VIA, VIB, and VII suggests that all hedging instruments are equally effective for hedging a spot position in the S&P 500. Thus, investors must evaluate the transactions costs, margin requirements, contract features, and the risks of each market to determine which instrument is best suited for their hedging needs.

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