10-1993

The Value Line Enigma Extended - An Examination Of the Performance Of Option Recommendations

Jack B. Broughton
Chapman University, broughto@chapman.edu

Don M. Chance
Louisiana State University

Recommended Citation

Broughton, John B., and Don M. Chance. "The Value Line enigma extended: An examination of the performance of option recommendations." *Journal of Business* (1993): 541-569.
DOI:10.1086/296617

John B. Broughton
Chapman University

Don M. Chance
Virginia Polytechnic Institute and State University

The Value Line Enigma Extended: An Examination of the Performance of Option Recommendations*

We extend the research on the Value Line Enigma by examining the performance of call recommendations in *Value Line Options*. Galai's hedge decomposition procedure identifies the components of the calls' returns. Abnormal call returns were most pronounced immediately following the purchase, which is consistent with studies of Value Line's stock rankings. The largest and most significant abnormal performance was by calls assigned the highest rank written on stocks judged by Value Line to be correctly priced. Abnormal call return performance by joint call and stock ranks was consistent with the hypothesis that Value Line identifies underpriced call options.

I. Introduction

The performance of investment recommendations has been studied at great length. Most of this research has focused on equities recommended by securities analysts (Groth et al. 1978, 1979; Stanley, Lewellen, and Schlarbaum 1981; Bjerring, Lakonishok, and Vermaelen 1983). A number of these studies have evaluated the performance of Value Line, a well-known investment advisory service. The results of Black (1973), Holloway (1981), Copeland and Mayers (1982), Stickel (1985), Huberman and Kandel (1987, 1990), Lee and Park (1987), Peterson (1987), and Hall and Tsay (1988) have shown that Value Line stock rankings have significant information content and that abnormal returns

* This article was presented at the eleventh annual AMEX Options Colloquium in New York, the Financial Management Association and Southern Finance Association. We would like to acknowledge comments, assistance, and encouragement from the referee, Doug Diamond (the editor), Steve Figlewski, Doug Patterson, Tom Gosnell, Vahan Janjigian, Jim Jordan, R. Stafford Johnson, Marti Subrahmanyam, Peter Abken, and Raman Kumar, Dilip Shome, and seminar participants at Florida State University, Groupe ESSEC, and Virginia Polytechnic Institute and State University. Financial support was provided by the finance departments at Florida State and Virginia Polytechnic Institute and State University.

(*Journal of Business*, 1993, vol. 66, no. 4)

0021-9398/93/6604-0002$01.50

might be possible for investors using the service. These findings have often been referred to as the "Value Line Enigma."

Value Line's stock recommendations are published in its *Value Line Investment Survey*. In addition, Value Line provides option recommendations in its *Value Line Options*. Both are published the first four Mondays of the month. A natural extension of tests of the "Value Line Enigma" with respect to equities is the examination and testing of option recommendations. The question is interesting in its own right, given the dearth of studies on the performance of option recommendations. However, since the recommendations are made by Value Line, with its well-documented history of superior stock recommendations, the question is even more interesting. Call (put) options can perform well because the underlying stocks perform well (poorly) and/or because the options are mispriced. Thus, if Value Line's option recommendations perform well, it will be necessary to identify whether the superior performance is simply a leveraging of the performance of Value Line's stock selections or whether Value line truly has the ability to identify options mispriced with respect to the stock.

This research has two specific objectives, which parallel the two major objectives of previous research on Value Line's stock rankings and recommendations: (1) to determine whether there is information in Value Line's option rankings and recommendations, and (2) to determine whether an investor following Value Line's option recommendations and prescribed strategy earns abnormal returns. To accomplish the first objective, we examine the impact of option recommendations on option returns around the recommendation dates. In addition, we analyze the relationship between option performance and option rank and the combined option and stock ranking. In pursuing the second objective, we examine the performance of option recommendations over holding periods defined by Value Line itself.

Our study focuses on recommendations to buy call options. Call buying, as opposed to put buying or combination strategies; is by far the largest single category of recommendations, and calls are well known to lead puts in volume. Although there may be some interest in examining other strategies, the recommendations are not available on computer disks or tape and had to be collected by hand. In addition, each recommendation has to be monitored every week thereafter. Thus, the time and expense of collecting and monitoring recommendations for puts and less popular option strategies would have been substantial and we deemed that their investigation should be left for future research.

This article is divided into five sections. Section II describes the methodology and the issues involved in testing the recommendations. Section III describes the data set and provides a summary of the characteristics of the sample. Section IV presents the results, and Section V contains a summary and our conclusions.

II. Methodology and Procedural Issues

A. *Value Line Options*

Each issue of *Value Line Options* contains two sections, the "Option Strategist" section and the "Option Evaluation" section. Value Line employs a ranking system with options ranked from 1 to 5, where 1 is the highest ranking and 5 is the lowest. This is the same ranking system Value Line uses to rank stocks. The Option Strategist recommends a group of options for each of the strategies of naked call buying, naked call writing, naked put buying, naked put writing, and covered call writing. These options are a subset of all options evaluated and are considered to be those most highly recommended. For example, options recommended for naked call buying are ranked 1 and their underlying stocks are ranked 1, 2, or 3, with 1 being the highest stock rank and 3 being the middle stock rank. Value Line provides a set of seven stock prices and an associated option price for each. The subscriber is instructed to execute the transaction if the option can be obtained at a price equal to or less than the one associated with the current stock price.[1] Consider the following recommendation on September 12, 1983, for the IBM October 110 call:

Stock Price	118.00	120.00	121.00	121.88	122.00	123.00	125.00
Option Price	10.61	12.14	12.92	13.63	13.73	14.54	16.23

The "recent stock price" was 121.88. The subscriber is instructed to determine the current stock price, locate it in the above table or interpolate, and buy the call if it can be obtained for an amount less than or equal to the indicated price. Thus, these call prices can be viewed as limit prices contingent on the stock price. Once purchased, the subscriber is advised to monitor the rank of the option in the Option Evaluation section of subsequent issues and to sell when the rank falls to 3 or below. While the Option Evaluation section is primarily used for monitoring the option ranks, it contains additional information including the stock rank and Value Line's opinion of the "normal" price of the option, which is based upon the recent stock price and the time to expiration from the publication date. The normal price is tantamount to Value Line's conditional estimate of the option's equilibrium value. Value Line uses a proprietary option pricing model.

1. Obviously, with only seven stock prices, some interpolation is necessary. Value Line indicates that its choice of the seven stock prices is based on what it calls the "recent stock price," which is usually the closing stock price (or an estimate thereof) for the Tuesday preceding the publication date. In almost all cases, stock prices on the Monday issue date are contained within this range.

Value Line prepares each issue on the Tuesday before the Monday publication date, and the issues are mailed two days later. This creates the possibility that an investor could receive the issue on Friday. With Saturday mail service available, some investors could receive it on Saturday. Most investors should receive theirs by Monday. We assume that serious users of the service will make arrangements to have the issue delivered in time to begin searching for transactions on Monday morning. Moreover, conversations with Value Line personnel indicate that they are relatively confident that the issues are in investors' hands by Monday morning.

B. Decomposing the Return on an Option

It is well known from the theory of option pricing that an option can be replicated by an appropriate weighting of positions in the stock and a risk-free bond. Boyle and Emanuel (1980), Galai (1983), and Galai and Geske (1984) have shown how an option's return can be decomposed into the interest on funds committed, the leveraging of the stock's return, any mispricing on the option, and a residual associated with adjustment of the hedge at discrete intervals. Here we present a summary of the Galai version of the model. Readers unfamiliar with the details are referred to Galai's paper.

Suppose that at time $t - 1$, an investor establishes a long position in a call, which has an actual price of C^A_{t-1}, and a short position in h shares of stock priced at S_{t-1}. The model price of the call is C^M_{t-1} and a continuously adjusted hedge where $h_{t-1} = \partial C^M_{t-1}/\partial S_{t-1}$ should yield a risk-free return. If it does not, there is an excess hedge return defined as

$$R_{XHt} = R^A_{Ct} - hR_{S_t} - I^A_{t-1}(e^r - 1), \tag{1}$$

where R^A_{Ct} is defined as the actual dollar call return, which is the call price at t minus the call price at $t - 1$, R_{S_t} is the dollar return on the stock, I^A_{t-1} is the investment in the hedge, and r is the risk-free rate per period. Since we are buying calls and shorting stock, I^A_{t-1} is negative. The excess hedge return results from a change in the difference between the model and actual call prices over the period $t - 1$ to t. We call this the "call selectivity," which is defined as

$$R_{G_t} = C^A_t - C^M_t - (C^A_{t-1} - C^M_{t-1}), \tag{2}$$

where the superscript M refers to the model, or theoretically correct, price of the call.

The actual return on the call can be decomposed as follows:

$$R^A_{C_t} = [I^A_{t-1} - (C^A_{t-1} - C^M_{t-1})](e^r - 1) + hR_{S_t} + R_{G_t} + \eta_t, \tag{3}$$

where η_t results from adjusting the hedge at discrete intervals rather than continuously. We shall refer to this as the hedge slippage. The components of the return on the call are, thus, the opportunity cost on the actual investment in the hedge adjusted for the difference between the actual and model call prices, the return on the stock, the change in the mispricing on the call and the hedge slippage. If the option were correctly priced and the hedge adjusted continuously, the return would consist of only the interest on the actual investment and the stock return. This highlights the comparability of options and margined stock positions. The interest is analogous to margin interest, and the hedge ratio reflects the leverage inherent in options.

There are a number of alternative option performance evaluation techniques. Galai and Geske (1984), in addition to illustrating the above method, propose a security market line (SML) approach, while Evnine and Rudd (1984) develop a multifactor model for option risk adjustment in the spirit of the arbitrage pricing theory (APT). While these methods have merits of their own, each is subject to potential problems in the choice of a market index and the relevant factors that determine asset prices, as well as econometric problems in the estimation of APT or SML parameters. Galai's hedging decomposition procedure, based as it is on option pricing theory, places far fewer restrictions on investor preferences than general equilibrium models. Furthermore, equation (3) is especially appropriate for evaluating Value Line's option recommendations. Value Line's stock selection ability should appear in hR_{S_t}, and its ability to find mispriced options should be manifested in R_{G_t}. Because the hedging decomposition procedure is based on the principle that risk enters the equations only by a failure to adjust the hedge continuously, there is no requirement to make a risk adjustment to the option returns. Risk is captured by η_t. With a synchronized data set, the procedure should give reasonable estimates of the performance of the calls and their components. We emphasize that investors would not necessarily establish risk-free hedges of a long call and a short stock. In fact, Value Line recommends that these calls simply be purchased outright. The hedge procedure is but a convenient methodology for decomposing a call's return. Our interest lies in the excess hedge returns, R_{XH_t}, and, especially, the call selectivity component, R_{G_t}.[2]

2. Relative to R_{XH_t}, the call selectivity component, R_{G_t} is a more robust measure of option performance. The excess hedge return can be written as

$$R_{XH_t} = R_{G_t} + (C^M_{t-1} - C^A_{t-1})(e^r - 1) + \eta_t.$$

We see from this equation that R_{XH_t} will differ from R_{G_t} by the amount of interest earned on the difference between the model and actual call prices at $t - 1$ and by the residual return associated with the hedge slippage, η_t. The interest earned on the call price differential is likely to be small in most cases, with the dominant cause of differences in the performance measures represented by η_t. Because R_{G_t} represents the *change* in

While Value Line's stock selection ability should appear in hR_{S_t}, we must recognize that it is not adjusted for risk. In a later section we shall discuss the adjustment of the stock component for risk.

Long call positions may be recommended for the following reasons: (1) the underlying stock is undervalued, or (2) the option is undervalued relative to the current stock price, or (3) both 1 and 2. At any point in time, an option can be classified along two dimensions: the option rank and the stock timeliness rank. Ceteris paribus, the higher the stock rank is, the higher the option rank is. It is, therefore, possible to develop hypotheses concerning call selectivity and excess hedge returns using the joint call and stock ranks. If Value Line is able to identify undervalued calls, we would expect that highly ranked calls written on nonhighly ranked stocks would exhibit the largest abnormal performance.

C. *The Empirical Procedures*

The selection of recommendations. The database, described in the following section, contains all quote and trade records on the Chicago Board Options Exchange (CBOE) over the period January 1983–December 1985. Beginning with the first week during this period, call options recommended in the Option Strategist section are screened for purchase. The search procedure involved screening all quotes on recommended calls and selecting the first quote for a given call in which the ask price was at or below the limit price. The search began on the Monday publication date and proceeded through the following Friday, stopping only when the transaction could be executed and, thus, allowing for the possibility that the ask price might never be less than or equal to the limit price.[3] We considered only quotes between 10:00 A.M. and 3:00 P.M. central time, which omits the first hour after the opening. This gives the market a period of time to adjust to overnight information that might cause unusual price behavior.

---

the deviation between market and model prices, it is relatively insensitive to systematic biases in actual or model call prices. A potential problem with this measure is that if the call option is held until expiration, the actual and model call prices must converge and result in a positive value of $\bar{R}_{G_t}$. In the present study, however, none of the options are held until expiration. Value Line decreases the ranks of options recommended for naked long positions if the actual and model call prices fail to converge and the rank reduction will trigger the termination of the option holding period. The measured value of $\bar{R}_{G_t}$ will be nonpositive in such cases and accurately reflect the failure of the Value Line model. If the actual and model prices do converge, Value Line will lower the option rank to reflect the correct market valuation of the option, and a positive value of $\bar{R}_{G_t}$ will be measured.

3. As noted earlier, only seven stock prices are shown by Value Line for each recommendation. Since the theoretical call price/stock price frontier is convex, linear interpolation induces a slight bias, which could permit options to be bought at higher than justified prices. We expect this bias is very slight, however. Moreover, Value Line specifically recommends linear interpolation so it would be inappropriate to test their recommendations without following their advice to the letter.

In screening recommendations for purchase, we used the actual ask quote for the call. Our database, however, did not provide bid-ask quotes for the stock. We considered using the method of capturing repeated reversions proposed by Bhattacharya (1983) to estimate stock bid-ask prices. Unfortunately, that technique results in jettisoning transactions with no price change and, thus, could omit many profitable opportunities. We, thus, decided to use the stock transaction price and, if it proved subsequently necessary, to adjust the returns by a percentage to reflect the stock bid-ask spread. Since we are not comparing stock prices against an equilibrium stock price, the bias of choosing transactions on the wrong side of the market (Phillips and Smith 1980) is a problem only for the call options since they must be executable at or below the limit price. Without the option bid-ask prices, we could not obtain the correct set of transactable recommendations, but, fortunately, our data set permits us to do so and, thus, to avoid the bias.

The hedge procedure. As noted by Galai (1983), the hedge decomposition procedure focuses on changes in the difference between market and model prices so that the effect of any systematic mispricing by the tested model is largely mitigated. In other words, the procedure is designed to detect whether there is a tendency for the market and model prices to converge, not whether the model generates prices that are unbiased estimates of the observed market price at every moment in time. Moreover, since our option sample spans a broad range of expirations and degrees of moneyness, any model pricing biases should be minor and unrelated to the options' ranks.

In the present study, the decomposition procedure is a vehicle for testing the accuracy of Value Line's (unobserved) option pricing model. Under ideal conditions, option prices and hedge ratios from the model would be available continuously. These data would then be used to determine whether movements in market call prices are anticipated by the Value Line model. Unfortunately, model information is updated only at weekly intervals. In order to adjust the position and measure returns at more frequent intervals, it is necessary to construct a proxy for the Value Line model.

Because the subject of our tests is an option pricing model that cannot be observed, the paramount criterion in selecting a proxy is that the selected model generate prices and hedge ratios that conform reasonably closely to those published weekly by Value Line. We have found that the Barone-Adesi and Whaley (1987) and MacMillan (1986) model (hereafter BWM), which is an analytic approximation for an American option, satisfies this criterion. The "normal" call price and the "recent stock price," which are reported weekly in the Option Evaluation section, represent an equilibrium call price/stock price combination from Value Line's unobserved option pricing model. We

use the BWM model in conjunction with the normal call and most recent stock prices to calculate an implied volatility. This serves as our estimate of Value Line's opinion of the standard deviation of the stock's return. The model call price and hedge ratio, which is obtained by differentiating the BWM formula with respect to the stock price, are calculated using this estimate and the current observed stock price. For each day up to and including the next issue date of Value Line Options, the volatility estimate is used with the observed stock price to estimate a model call price and hedge ratio. A new volatility estimate is calculated on the next issue date, and this estimate is used for the following week. The procedure of using the previous week's volatility estimate to calculate an issue date return precludes recording a large and positive call selectivity return through a sudden lowering of the Value Line volatility parameter on the issue date. The position is held until a new issue ranks the option at 3 or below or does not rank the option.[4] The position is terminated using the first quote after 10:00 A.M. on the Monday of the rank change.

In some cases an option we were holding did not have a quote during a given day. In those cases we did not record a return for that day. On the next day on which a quote was available, we did not, however, record a multiday return. Returns were calculated only if observations were available on consecutive trading days.

III. The Data

Option and stock price data are obtained from the resorted format of the Berkeley Options Data Base, which provides a time-stamped record of virtually every option trade and bid-ask quote on the CBOE. The risk-free rate is taken as the continuously compounded yield on the Treasury-bill with a maturity date closest to the expiration date of the option. The Treasury-bill rates were collected from the *Wall Street Journal* and were updated each Monday. Dividend information was provided in *Value Line Options*.

The tests covered the period 1983–85 and included all issues of *Value Line Options* over that period. There were 12,699 call purchase recommendations, ranging from a weekly low of 47 to a weekly high of 120. The average number of weekly recommendations was 88. All of the recommended calls were ranked 1 at the time of the recommendation and represent a subset of 27,019 calls ranked 1 over the 3-year period.

Because of the use of the Berkeley Options Data Base, the sample was restricted to CBOE options. There were 6,360 CBOE calls recommended, which is about 50% of all calls recommended.[5] The three most

4. In some cases an option was no longer ranked. We interpreted this as a rank of below 2 and thereupon terminated the position.

5. This is a slightly smaller percentage than the CBOE's market share of about 60%,

TABLE 1 **Sample Characteristics**

	Months					
	0–1	1–2	2–3	3–6	6–9	Total
A. All CBOE recommendations:						
In-the-money	371	588	443	841	446	2,689
At-the-money	68	39	51	881	734	1,773
Out-of-the-money	50	231	244	914	459	1,898
Total	489	858	738	2,636	1,639	6,360
			$\overline{M}$ = 1.06, $\overline{D}$ = 132			
B. All transactable recommendations:						
In-the-money	235	286	217	469	255	1,462
At-the-money	64	59	50	558	439	1,170
Out-of-the money	28	153	174	585	277	1,217
Total	327	498	441	1,612	971	3,849
			$\overline{M}$ = 1.04, $\overline{D}$ = 130			
C. Stratified random sample of transactable recommendations:						
In-the-money	32	31	27	46	47	183
At-the-money	12	6	5	62	83	168
Out-of-the-money	3	14	20	54	53	144
Total	47	51	52	162	183	495
			$\overline{M}$ = 1.04, $\overline{D}$ = 145			

NOTE.—These totals represent CBOE call options recommended for purchase by Value Line in 1983–85 (panel A), the subset of that sample that could be purchased by the end of the week of publication (panel B), and the final sample, a stratified random sample of the executable transactions (panel C). Totals are stratified by moneyness, M_t, where $M_t = S_t e^{-\delta T}/Xe^{-rT}$, where δ is the dividend yield, r is the risk-free rate, X is the exercise price, and T is the time to expiration. In-the-money is defined as $M_t > 1.05$, and out-of-the-money is defined as $M_t < 0.95$; $\overline{D}$ is the average number of days to expiration, and $\overline{M}$ is average moneyness. Number of months is a close approximation based on dividing number of days to maturity by average number of days per month.

heavily represented stocks were IBM (430), General Dynamics (417), and Merrill Lynch (410). Summary statistics are presented in panel A of table 1. About 42% were in-the-money, about 28% were within ± 5 percent of at-the-money, and the remaining 30% were out-of-the-money. About 41% of the calls had expirations of 3–6 months, and about 26% had expirations of 6–9 months. Thus, there is a tendency for the recommendations on CBOE calls to be intermediate- to long-term options. The average call was 6% in-the-money and expired in 132 days.

Of the 6,360 CBOE call recommendations, 3,849, or about 61%, had an ask quote at or below the limit price by Friday of the issue week.

which may suggest that CBOE options are more likely perceived by Value Line to be correctly priced. This is an interesting issue itself but one we do not pursue here.

Of these transactable recommendations, about 58% were purchased on Monday, 20% on Tuesday, 10% on Wednesday, 7% on Thursday, and 5% on Friday. Sample characteristics of the executable CBOE recommendations are presented in panel B of table 1. The ability to execute a trade for the recommended options is apparently not associated with any particular sample characteristics. The executable transactions also tended to be more intermediate to longer-term and in-the-money calls. The average call was in-the-money by 4% and had an expiration of 130 days. Of these 3,849 calls, over two-thirds were repeat recommendations. That is, the call was recommended in a given week and recommended again in the next week or a subsequent week. This left only 1,152 unique recommendations. Because of the enormous data collection requirements involved in monitoring open positions, we chose to pare this sample down to a set of 500, which were selected using a stratified random sample designed to obtain a distribution of moneyness and time to expiration comparable to the full set of 1,152. In executing the opening transactions, five short-term near-the-money options were lost due to nonconvergence of the implied volatility routine, leaving a final sample of 495. Sample characteristics of this group are presented in panel C of table 1. The final sample seems quite representative of the original sample. Calls tended to be intermediate- to long-term and in-the-money. By removing repeat recommendations, the average maturity will obviously be longer and was here 145 days. The average moneyness was about the same as that of the transactable recommendations at about 4% in-the-money. An average of less than two recommendations were executed on the same day. This is particularly favorable since it greatly minimizes the possibility that heteroskedasticity/contemporaneous mispricing will bias the results.

The mean holding period was 97.31 calendar days, and the median was 83 calendar days. Over the sample holding periods, these recommendations produced over 29,000 daily returns. Because of potential extreme errors in the data on the Berkeley options tape, we examined a sample of cases in which the market and model prices showed very large differences. When the price we had chosen was well out of line with the surrounding prices, we replaced it with the next price.

IV. Empirical Results

The first part of this section reports the results of our analysis of the periods immediately before and after the date on which a Value Line subscriber would establish a position. The second part of this section evaluates the performance of the call recommendations over the holding period specifically recommended by Value Line. As described earlier, this period begins on purchase of the option at or below the limit price and ends when the option is no longer ranked 1 or 2. The third

part of this section examines performance according to option rank and the combined option and stock rankings. In the fourth part, we evaluate the extent to which recommended call options are low priced relative to corresponding put options and the underlying stock in the period around the recommendation date. We conduct some additional tests in the fifth part of this section and conclude with an analysis of the underlying stock returns.

Our return measures are stated in terms of dollars per contract. Because of the small size of the initial value of the position, option returns are typically expressed in this fashion rather than as percentage returns (see, e.g., Galai 1977). Defining returns this way not only reduces skewness in the returns but also facilitates application of the per-contract trading costs reported by Phillips and Smith (1980). Because we do not anticipate that Value Line's advice will be perverse, we conduct one-tailed tests.

A. *Event Time Analysis*

In this section we evaluate the performance of the recommended calls in the window beginning 5 trading days prior to establishment of the position and extending to 10 trading days afterward. There are two important facts to note. First, recall that Value Line subscribers purchase recommended call options when the market ask price is at or below the limit price. This may or may not occur on the Monday recommendation date. Thus, we define day 0 as the date on which the market ask price satisfies the limit price. Second, the selection criterion guarantees that we observe a strong positive difference between the model and market prices on the day of the purchase. The questions of interest are, Is there subsequent convergence of the market and model prices and, if so, when does convergence take place? Significant convergence would support the notion that Value Line is capable of identifying underpriced calls, while lack of convergence would invalidate this notion. If Value Line's recommendations have information content, then convergence of the market and model prices should occur at or shortly after the purchase date.

Table 2 contains the mean difference between the model call price and the average of the bid and ask call prices for each trading day during the period beginning 1 week prior to the purchase date and ending 2 weeks afterward. We use the average of the bid and ask prices to facilitate comparison of returns between days. A graphical representation is provided in figure 1. Over the week prior to the purchase date the mean difference is positive and shows a slight tendency to decline. On day 0 (the purchase date) there is a sharp upward spike in the difference, averaging about $0.77 per call. This is the signal that subscribers act on when following Value Line's recommendations. The difference between the model and quote price drops sharply the next

TABLE 2 Performance around the Purchase Date

Day	$C_t^M - C_t^A$	R_{G_t}
−5	.537(.036)	.981(1.924)
−4	.504(.033)	2.198(1.738)
−3	.484(.030)	.852(1.874)
−2	.468(.028)	−1.090(1.400)
−1	.471(.030)	.424(1.965)
0	.766(.029)	−28.114*(2.621)
1	.551(.031)	21.222*(2.229)
2	.530(.032)	2.531(1.705)
3	.495(.031)	2.470(1.795)
4	.491(.032)	2.234(2.067)
5	.442(.032)	6.620*(1.846)
6	.451(.030)	−.416(1.903)
7	.455(.030)	−1.157(1.406)
8	.429(.029)	3.992*(1.609)
9	.410(.029)	1.302(1.528)
10	.357(.031)	4.407*(1.806)

NOTE.—These statistics are the sample mean values of the call selectivity measure, R_{G_t}, and the difference between the market and actual prices, $C_t^M - C_t^A$. Standard errors are in parentheses. The option is purchased at the midpoint of the bid-ask spread, and the hedge is adjusted daily using the midpoint of the bid-ask spread. All stock trades are executed at the stock transaction price. All means are interpreted as dollars per contract. All values for $C_t^M - C_t^A$ are significant at better than .01.

* Significant at the .01 level.

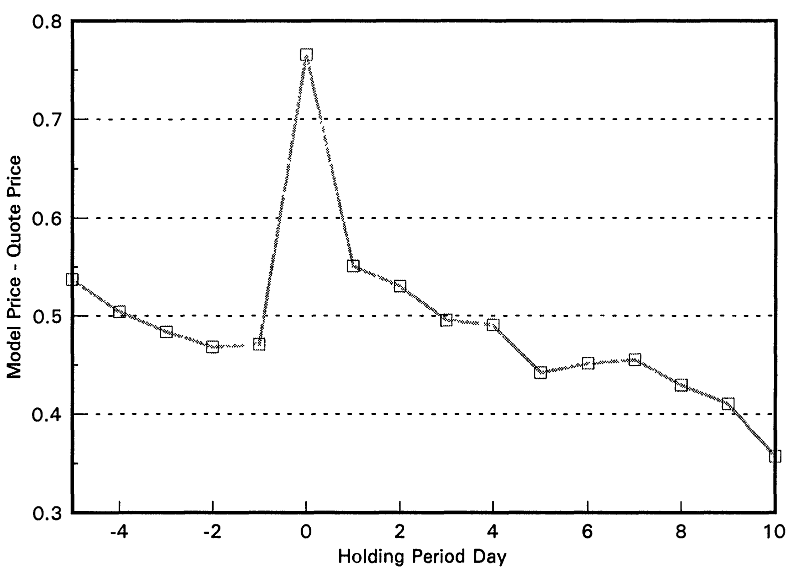

FIG. 1.—Difference between model price and quote price by day. The graph illustrates the average value of the difference by day. Day 0 is the first day of the holding period.

day to \$0.55 and declines steadily over the 2 weeks following the purchase date. Although only 10 trading days after the purchase are shown here, the difference stabilizes at around 30 cents after 20 days. This difference of just over 1/4 point is within a transaction cost of the Value Line price.

Table 2 also contains the mean values of the call selectivity component during the event period, while figure 2 provides a graphical representation. Note that positive (negative) values of R_{G_t} result from convergence (divergence) of model and market prices. Thus, consistent with the evidence in figure 1, we observe call selectivity returns near zero in the week prior to the purchase date. The large negative return on the purchase date reflects the divergence of the model and quote prices that triggers purchase. The large positive return on the first day of the holding period corresponds to the significant convergence of model and quote prices evident from figure 1. After day 1, we observe positive mean values of R_{G_t} on 7 of the 9 event days in the window, with 3 of these significant at .01. Although not shown here, the mean selectivity return follows a random pattern around zero for the remainder of the holding period.

There is some concern that dividends around the event date might impart a bias to these findings. Dividends and the attendant early exercise that they sometimes induce could affect these results. We reran

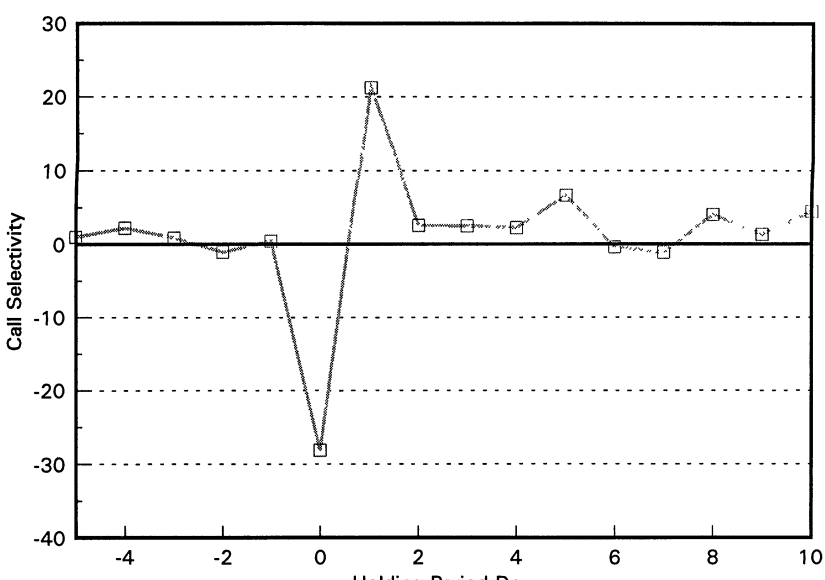

FIG. 2.—Call selectivity component by holding period day. The graph illustrates the average value of R_{G_t} by each day of the holding period. Day 0 is the first day of the holding period.

these tests removing all calls in which the stock went ex-dividend within 5 days of the purchase date. The results were nearly identical.

These results seem to indicate that Value Line does provide useful information and that most of the information in Value Line's recommendations is impounded very rapidly into the option's price. Most of the convergence between model and quote prices takes place on the first day of the holding period. Two weeks after the purchase date, mean call selectivity returns are essentially zero. As reported earlier, the average length of the holding period was 97.31 days. Thus, it appears that Value Line's recommendation to buy is timely, but its recommendation to sell is late. Holding the position beyond 2–4 weeks is at best a neutral position and ties up funds that might be more profitably used elsewhere.

B. Performance Analysis following Value Line's Recommended Strategy

In this section, we report the results from following Value Line's recommended strategy of holding the option positions until the option ranks are no longer 1 or 2. We report two sets of results in order to evaluate the impact of the bid-ask spread. In the first set, the call options are assumed to be purchased and sold at the midpoint of the bid-ask spread. We then adopt the more realistic assumption that the call options are purchased at the ask price and sold at the bid price. In both cases, our daily hedge adjustments are made through stock transactions, and the call price used in determining the appropriate hedge ratio is the average of the bid and ask price. We emphasize that an actual Value Line subscriber is not advised to form hedge portfolios. This methodology is used only to isolate the components of the options' returns.[6]

Panel A of table 3 contains the estimated means and standard deviations for the actual and model call returns and the call selectivity, the stock return, and the excess hedge return components. Without considering the effect of the bid-ask spread, the mean actual return is \$1.064 per contract and the mean model return is −\$0.315. This leads to a mean call selectivity component of \$1.379 per contract per trading day, which is significant at .01. (Note that the call selectivity return is the actual return minus the model return.) The stock return component is positive and significant, which likely reflects the normal positive rate

6. The hedge methodology has been used to decompose the actual return on a call option (see eq. [3]). The hedge is not riskless if the hedge slippage term, η, exhibits systematic risk. The correlation between the hedge slippage measure and the return on the value-weighted Center for Research in Security Prices (CRSP) market portfolio was .01. However, there are obviously some individual hedges in which some systematic risk remains and even some cases where the hedge slippage could have negative correlation with the market portfolio.

TABLE 3 Summary Statistics on Call and Stock Performance over Entire Holding Period

	$R^A_{C_t}$	$R^M_{C_t}$	R_{G_t}	hR_{S_t}	R_{XH_t}
A. Overall performance:					
Without bid-ask effects	1.064*	−.315	1.379**	1.336**	.894**
	(.517)	(.516)	(.193)	(.514)	(.193)
With bid-ask effects	.611	. . .	.927**	. . .	.442*
	(.517)		(.192)		(.193)
B. By call rank:					
Rank 1 (N = 18,682)	2.012**	.230	1.782**	1.742**	1.369**
	(.648)	(.644)	(.249)	(.642)	(.248)
Rank 2 (N = 10,350)	−.577	−1.175	.598*	.394	.152
	(.867)	(.874)	(.306)	(.901)	(.313)
Rank 3 (N = 111)	−6.627	−9.412	2.785	−3.698	−.676
	(7.508)	(6.665)	(3.584)	(6.749)	(3.557)
C. By call and stock rank:					
Call rank 1:					
Stock rank 1					
(N = 10,245)	2.411**	.745	1.666**	2.283*	1.239**
	(.905)	(.909)	(.358)	(.902)	(.357)
Stock rank 2					
(N = 7,490)	1.432	−.285	1.718**	1.1154	1.355**
	(1.005)	(.980)	(.357)	(.988)	(.354)
Stock rank 3					
(N = 923)	1.687	−2.043	3.734**	−.284	3.093**
	(2.116)	(2.113)	(1.016)	(2.120)	(1.032)
Call rank 2:					
Stock rank 1					
(N = 2,228)	.811	.810	.002	2.758	−.548
	(1.935)	(1.922)	(.644)	(1.863)	(.674)
Stock rank 2					
(N = 5,598)	−.778	−1.313	.535	.230	.179
	(1.157)	(1.173)	(.410)	(1.173)	(.416)
Stock rank 3					
(N = 2,491)	−1.475	−2.757	1.282*	−.989	.732
	(1.784)	(1.802)	(.646)	(1.789)	(.661)

NOTE.—These statistics reflect mean returns and standard errors of the means from daily adjusted hedges for call options recommended by Value Line. Panel A presents the results for the entire sample assuming the hedge ratio is adjusted daily using the midpoint of the bid-ask spread. The results without bid-ask effects assume purchase and sale of the option at the midpoint of the bid-ask spread. The results with bid-ask effects assume purchase at the ask and sale at the bid. Panel B presents the results according to the call rank, and panel C presents the results by call and stock rank. The value $R^A_{C_t}$ is the return based on the actual call price, $R^M_{C_t}$ is the return based on the model call price, R_{G_t} is the call selectivity, hR_{S_t} is the component of the option's return contributed by the stock, and R_{XH_t} is the excess hedge return. All figures are in dollars per contract. Standard errrors are in parentheses. Missing figures indicate that the figure is the same as the case listed directly above it.

* Significant at the .05 level.

** Significant at the .01 level.

of return on stocks. We shall make an adjustment of the stock component for risk in Subsection *F*. The mean excess hedge return per contract is $0.894, which is significant at .01.

The effect of the bid-ask spread was quite substantial. When the position is established at the ask and closed at the bid, the mean actual return is reduced by over 40%. The mean call selectivity component

is reduced by more than 30% and the mean excess hedge returns fall by over 50%. While both of these measures remain significant, it is clear that the bid-ask spread imposes a heavy burden.

In addition to the cost of the bid-ask spread, traders face other costs. Phillips and Smith (1980) estimate the explicit transaction costs incurred by arbitrageurs, option market makers, and individual traders. Floor trading and clearing costs are estimated to be \$1.50 and \$1.70 per option contract and \$1.00 to \$4.00 per round lot of stock for an arbitrageur, defined as a firm or individual with seats on both the options and stock exchanges. Blomeyer and Klemkosky (1983) assume mean trading and clearing costs of \$1.60 per option contract and \$2.50 per round lot of stock. This implies round-trip floor trading and clearing costs of \$8.20. Since the daily hedge adjustments are made in the stock, the appropriate adjustment is \$4.10 for the first and last days of each holding period and \$2.50 for each intermediate day. Even without considering bid-ask effects, these costs are sufficient to eliminate profit opportunities.

C. *Performance according to Option and Stock Ranks*

While all options considered in this study are initially ranked 1, their rankings may change over the course of the holding period. Ultimately, the holding period terminates when the rank falls below 2 or the option is no longer ranked. Thus, in the analysis performed in the previous section, the last trading day return involves an option having a rank of 3, 4, or 5 or an option that is unranked. In addition, over the course of the holding periods the ranking of the underlying stock may change. This section analyzes trading day returns by call rank and call and stock rank combinations and provides a direct test of the ranking system.[7]

To facilitate comparisons between ranks, returns are calculated using the average of the bid and ask prices. Panel B of table 3 presents the results by call rank. For rank 1 calls, the mean excess hedge return was \$1.369 per contract per trading day, which is significant at .01. The mean actual trading day return on a naked call contract was \$2.012, while the mean model call return was \$0.230. This results in a mean call selectivity return of \$1.782 per contract per trading day, which is significant at .01. Comparison of the average trading day return on a naked call contract to the call selectivity return indicates that a large portion of the naked call return is associated with the

7. A caveat needs to be noted here. Since we are using observations from our holding periods, a subtle selection bias may be introduced. We cannot state definitely that any differential performance between rankings is associated solely with the ranking. The fact that the option has been recommended may also affect subsequent returns. We are grateful to the referee for bringing this to our attention.

convergence of the Value Line model price and the market quote price of the call.

It is noteworthy that the excess hedge returns are aligned in magnitude according to the ranks. As we would have expected based on the results in Subsection *A*, call selectivity is large and significant for rank 1 calls. All returns measured in the week of purchase were for rank 1 calls, and we found that significant convergence of model and observed call prices occurs during this week. While the rank 2 call selectivity is significantly positive, it is much smaller than that of rank 1. The rank 3 call selectivity is quite high, but insignificant. Inspection of the data revealed that this average was influenced by two outliers whose removal would have resulted in a slightly negative call selectivity return. While this analysis has not considered brokerage commissions, inclusion of these costs would not alter the relative performance of the call options.[8]

As described earlier, an integral component of the option ranking process is the rank of the underlying stock. The stock ranks ranged from 1 to 4 over the course of the holding periods, though at the recommendation date all stock ranks were 1, 2, or 3. Ceteris paribus, call ranks are positively related to the rank of the underlying stock. Thus, if a call option carries a high rank despite a relatively low stock rank, then Value Line must consider the call to be significantly undervalued. In turn, this suggests the hypothesis that the mean excess performance of hedges involving calls of a given rank on relatively lowly ranked stocks should exceed the performance of hedges involving calls of equal rank on highly ranked stocks. We would also expect to observe a higher mean call selectivity component for calls of a given rank on relatively low ranked stocks. The presumption is that a high call rank on a relatively low ranked stock is associated with factors other than expectations of significant stock price performance and that the cardinal factor among these is the undervaluation of the call option.

Panel C of table 3 presents the results from stratifying the sample according to call and stock rank. The evidence supports the hypothesis that a high call rank combined with a relatively low stock rank leads to the best performance. For calls ranked 1 there is a monotonic increase in both the mean excess hedge return and the mean call selectivity as the stock rank declines from 1 to 3.[9] Of course, from our earlier

8. The average net investment in the hedge did not differ significantly or systematically according to option rank. In addition, the correlation between actual net investment and excess hedge return was very low at $-.01$. We may safely conclude, therefore, that the difference in the magnitude of excess hedge returns is not due to differences in the dollar scale of the investment in the hedge and consequently to the transaction costs of brokerage commissions.

9. For calls ranked 1 on stocks ranked 4, the mean excess hedge return was negative and insignificant. There were only 22 of these observations.

findings, we know that most of this difference occurs around the time of the recommendation. This suggests we should find much weaker evidence for calls ranked 2, and that is indeed the case. Although the averages line up as expected, none of the excess hedge returns were significant. However, the call selectivity for calls ranked 2 on stocks ranked 3 was marginally significant at the .05 level, suggesting that there may yet be some additional price adjustments while a call is still a recommended hold but the stock has a relatively low ranking.

It is also interesting to note that the stock return component lines up appropriately with the stock rank, which is consistent with the findings of others that the Value Line stock ranks do have some discriminatory power. However, again, these have not yet been adjusted for risk. Indeed, Copeland and Mayers (1982) found that the higher ranked stocks did have higher betas, so these findings may actually reflect only a normal return.

Table 4 presents results of tests of significance of the difference in mean excess hedge returns and call selectivity between call/stock rank combinations. There are twelve hypothesized relationships in which the expected sign of the difference is identifiable ex ante. The hypotheses may be summarized as follows:

HYPOTHESIS 1. For a given stock rank, abnormal call performance is larger the higher the call rank is.

HYPOTHESIS 2. For a given call rank, abnormal call performance is larger the lower the stock rank is.

HYPOTHESIS 3. For two given calls, abnormal performance is larger on the call having a higher call rank and lower stock rank.

For these hypotheses, one-tailed matched pairs t-tests are appropriate. As table 4 indicates, all twelve of the hypothesized relationships hold. For the excess hedge returns, the null hypothesis is rejected in 7 of 12 cases at the .05 level and in four cases at the .01 level. For the call selectivity returns, the null hypothesis is rejected in eight cases at the .05 level and in three cases at the .01 level. If Value Line can identify mispriced options, we would expect that the largest difference would be observed when the call is ranked highest (1) and the stock is ranked relatively low (3) in comparison to the case where the call is ranked relatively low (2) and the stock ranked highest (1). The results are consistent with that hypothesis.

D. *Relative Call, Put, and Stock Prices around the Recommendation Dates*

As noted earlier, Value Line does not provide complete details on its procedure in assigning ranks and formulating recommendations. If the prevalent reason for call option recommendations is that Value Line believes that the market has underestimated future stock price volatility, then we should observe simultaneous recommendations of put and

TABLE 4 Tests of Differences in Mean Performance according to Call/Stock Rank Combination

Call/Stock Rank Combination: Hypothesized Larger	Hypothesized Smaller	Mean Difference in R_{XH_t}	t	Mean Difference in R_{G_t}	t
1/3	1/1	1.854	1.70*	2.068	1.92*
1/3	1/2	1.738	1.59	2.016	1.87*
1/3	2/1	3.641	2.95**	3.731	3.10**
1/3	2/2	2.914	2.62**	3.199	2.92**
1/3	2/3	2.361	1.93*	2.452	2.04*
1/2	1/1	.116	.23	.052	.10
1/2	2/1	1.903	2.50**	1.716	2.33**
1/2	2/2	1.176	2.15*	1.183	2.18*
1/1	2/1	1.787	2.34**	1.663	2.26*
2/2	2/1	.727	.92	.533	.70
2/3	2/1	1.280	1.36	1.280	1.40
2/3	2/2	.553	.71	.747	.98

NOTE.—These statistics indicate the mean difference in excess hedge returns and call selectivity returns according to call rank/stock rank combination. The first column is the rank combination that is expected to exhibit higher abnormal call return performance under the hypothesis that Value Line is able to identify underpriced call options. Tests of the assumption of equal variances indicated that the variances were sufficiently unequal to warrant the use of an approximate t-statistic defined as $t = (\bar{R}_{XH,HL} - \bar{R}_{XH,HS})/\sqrt{S^2_{XH,HL} + S^2_{XH,HS}/n_{HS}}$, and similarly for R_{G_t}. The approximation for the degrees of freedom is

$$df = (S^2_{XH,HL}/n_{HL} + S^2_{XH,HS}/n_{HS})^2/[(S^2_{XH,HL}/n_{HL})^2/(n_{HL} - 1) + (S^2_{XH,HS}/n_{HS})^2/(n_{HS} - 1)],$$

where the n's are the respective sample sizes.

* Significant at the .05 level.

** Significant at the .01 level.

call options. To test this, we collected all put recommendations made during the 3-year period. For our sample of 495 call recommendations, there were only four stimultaneous put recommendations. This suggests that, in general, the basis for the recommendations is not a judgment that the market has underestimated future stock price volatility. Rather, for at least some of the recommended calls, Value Line must believe that call options are low priced relative to put options. In this section, we investigate the extent to which relative call, put, and stock prices correspond to option and stock rankings in the period immediately before and after the recommendation date.

All call options are ranked 1 on the recommendation date, but the underlying stocks may carry rankings of 1, 2, or 3. As described earlier, the lower the stock rank is, the more underpriced the call option is implicitly judged to be. To evaluate the extent to which calls are low-priced relative to puts and stock, we employ the put-call parity theorem for American options on dividend-paying stocks and a procedure similar to one used by Finucane (1991) and Figlewski and Webb (1993). In the case of known risk-free rates and up to three perfectly

forecasted dividends, these stock price boundary conditions apply: upper stock price boundary condition:

$$S_t \leq C_t^A - P_t^B + PV(D) + K = UB_t;$$

lower stock price boundary condition:

$$S_t \geq C_t^B - P_t^A + L = LB_t.$$

In the equations above, S_t, C_t, and P_t are the time t stock, call, and put prices, respectively, and B and A denote bid and ask prices, respectively; $PV(D)$ is the present value of the dividends paid over the life of the options, and L is the minimum of the present value of the exercise price, K, the present value of the exercise price plus the present value of the first dividend, and so on through the last dividend paid over the option's life. While there is no theoretical location of the stock price within its upper and lower bounds, in cases where the observed stock price falls relatively close to the lower boundary, call options would be high-priced relative to puts and/or stock. Conversely, if the observed stock price is relatively close to the upper boundary, call options are low-priced relative to puts and/or stock.

In order to evaluate the behavior of relative call, put, and stock prices in the period surrounding the recommendation date, the following statistic is defined:

$$S_t' = \frac{S_t - LB_t}{UB_t - LB_t}.$$

High (low) values of S_t' indicate that call options are low (high) priced relative to puts and/or stock.

For each recommended call option in our sample, we obtained a corresponding put and call quote pair for 5 trading days before and 10 trading days after the recommendation date, as well as the recommendation date itself. To qualify, the put quote had to occur within 5 minutes of the call quote, and each quote had to have the same associated stock price. We then calculated the statistics S' for each observation and computed means of the statistic separately for each event day and rank combination. Value Line assigns ranks on the Tuesday preceding the recommendation date, which corresponds to event day −4. Thus, to be consistent with the Value Line ranking system, the mean value of S' should be directly related to the numerical stock rank on event day −4. The process of price adjustment should subsequently cause differences in the mean values of S' between rank combinations to disappear or become random.

Figure 3 presents the mean values of S' by event day and rank combination. For each of the 5 trading days prior to the recommendation date, the relative price of the call is directly related to the stock rank. On the rank assignment day, −4, there is a spike in the statistic

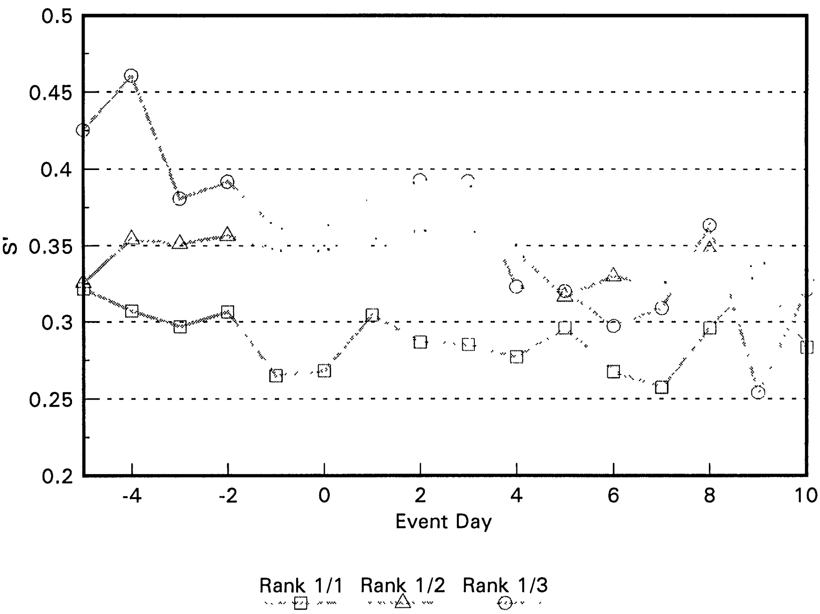

FIG. 3.—Relative put, call, and stock prices around recommendation date. The graph illustrates the average of the statistics S' for each call/stock rank combination centered around the recommendation date. Day 0 is the publication day of the issue in which Value Line recommends the call.

S' for the call/stock rank combination 1/3. The fact that these calls are relatively low priced in the context of the American put-call parity relationship is perfectly consistent with the assignment of a call rank of 1 and a stock rank of 3. The ordering according to stock rank persists until Thursday of the recommendation week, when the mean value of S' for the rank combination 1/3 dips below that of the rank combination 1/2. Beyond this point the ordering appears to become random.

E. Some Additional Tests

As a check on our results, we employed an alternative measure of abnormal call returns. Cox and Rubinstein (1985, p. 322) show that the call's expected percentage return can be expressed as a weighted average of the expected percentage return on the stock and the risk-free rate where the weight applied to the stock's return is the elasticity of the call. Since the elasticity requires only the option's delta and the option and stock prices, we can measure the call's expected return and use this in conjunction with the call's actual return to calculate an abnormal percentage call return. Applying this procedure, we obtained results that were in complete agreement with our previously reported findings for the call selectivity and excess hedge returns.

To examine the possible impact of outliers, we repeated the hedge decomposition tests excluding the top and bottom 1% of the excess hedge returns. Our primary conclusions remain robust. We also examined the performance of the recommendations according to the moneyness of the calls, the time to expiration, and the volatility of the underlying stock. The results do not provide strong evidence that any of these characteristics affect performance. At-the-money calls tended to be slightly less mispriced, intermediate- and longer-term calls were slightly more mispriced, and volatility was unrelated to performance.

In order to determine whether the reported results are methodology-dependent, we constructed a control sample of options. For each option in the Value Line sample, the procedure was as follows. First, we collected all quotes on the recommendation date for options that had the same expiration date and for which the absolute value of the ratio of stock price to exercise price was within .02 of the ratio for the corresponding Value Line sample option. We then eliminated duplicate options and evaluated the last recorded quotes for each of these options on the preceding Tuesday, which is Value Line's analysis date. The observed stock price and option ask price on this date were used to calculate an implied volatility and this was used to generate a series of seven option prices for stock prices centered around Tuesday's recorded stock price. These stock and call prices correspond to the limit prices provided by the Value Line recommendations. Using these prices, the options were screened for purchase on the associated recommendation date in the same way as the Value Line sample. In many cases, more than one option per Value Line sample option was executable by Friday of the recommendation week. In such cases, we retained the option whose moneyness ratio was closest to that of the Value Line sample option. It was then necessary to estimate model prices for the options in the control sample. This was accomplished by observing the percentage premium of the model price above the quote price for each Value Line sample option on the execution date and applying this same premium to the corresponding control sample option. We then used the model price and the stock price on the execution date to calculate an implied standard deviation for each of the control sample options. This volatility estimate was then used throughout the event period to calculate model prices for the control sample.

The important issue is whether the pattern of call selectivity for the control sample is similar to that observed for the Value Line sample. If so, we would conclude that the methodology is generating the results.[10] Our results, however, indicate a distinctly different pattern for the two samples. While we observe a large positive value for R_{G_t} for

10. This could result, for example, if our screening procedure systematically selects quotes on day 0 that are in error.

the Value Line sample on the first day of the holding period, the statistic for the control sample is much smaller and insignificant on this day. In contrast to the Value Line sample, where four of the call selectivity returns are significantly positive over the first 10 days of the holding period, none of the values of R_{G_t} are significant over this period for the control sample. Both samples yield negative values of R_{G_t} on day 0, which indicates an increase in the difference between the model and quote price. This is attributable to the screening procedure employed in which we select only those options satisfying the limit price. The critical difference is that the day 0 gap between model and actual quote price for the sample endures throughout the holding period, while for the Value Line sample the prices converge. These results do not support the notion that the results are methodology dependent.

We examined an alternative strategy, consisting of buying the call when initially recommended and selling it when it was downgraded to a rank of 2 or below. These tests omit cases where a call was downgraded and then upgraded back to a 1 and calls still held at the end of the sample period. These results included the full impact of the bid-ask spread. The findings revealed that the positive benefit of trading only rank 1 calls is still offset by the weight of the bid-ask spread and no abnormal returns after transaction costs can be earned.

Finally, we examined two filter rules, one involving the execution of trades when the limit price exceeded the ask price by at least $0.25 and the other involving trades when the limit price exceeded the ask price by at least 15%. As would be expected, both rules produced improved results with the 15% filter being the better rule. However, the improvements were not sufficient to cover explicit transaction costs.

F. The Adjustment of hR_{S_t} *for Risk*

So far we have generated a number of statistics on hR_{S_t}, the component of the option's return that is accounted for by the stock. This figure is a dollar amount and is not adjusted for risk. A risk adjustment, such as subtracting a risk premium based on the capital asset pricing model, would be difficult for several reasons. The stock returns are measured at different points during a trade day, based on when the first option transaction after 10:00 A.M. occurred. It would be necessary to construct or have available tick-by-tick data on the stocks' prices plus the market index to match simultaneously with the hR_{S_t} returns. As an alternative, we estimated the daily stock excess returns from the file of the Center for Research in Security Prices (CRSP). These returns would match according to the day but would run from close-to-close while the hR_{S_t} series would run from the first call transaction after 10:00 A.M. on one day to the first call transaction after 10:00 A.M. on the next day. However, the CRSP returns should suffice for our purposes since we simply wish to determine if the excess stock returns over the option holding periods were significant.

Abnormal percentage stock returns were calculated in the following manner. For each call option, C, in the sample, the market model parameters, $\hat{\alpha}_{CS}$, and $\hat{\beta}_{CS}$, were estimated for the underlying stock, S, over the 250 trading days following the end of the holding period for the option.[11] The abnormal stock return for day t, AR_{CS_t}, was then computed as $r^A_{S_t} - [\hat{\alpha}_{CS} + \hat{\beta}_{CS} r_{M_t}]$, where $r^A_{S_t}$ and r_{M_t} are the actual day t percentage returns on stock S and on the CRSP value-weighted portfolio of New York Stock Exchange and American Stock Exchange stocks, respectively. Note that there may be multiple options on a given day t that are written on the same stock and, unless the holding periods of these options terminate on the same day, the market model parameters used in calculating expected returns will be estimated over different periods. It is, therefore, necessary to determine an average abnormal return for each stock for each day t. The average percentage abnormal return for stock S on day t is defined as $\overline{AR}_{S_t} = (1/N) \Sigma^N_{C=1} [AR_{CS_t}]$, where N is the number of call options in the sample written on stock S on day t. We wish to test the abnormal return performance of stocks along two dimensions: (1) according to the rank of the stock and (2) according to the call/stock rank combination. In order to develop an average daily abnormal return for stocks of a given rank K, the arithmetic average of $\overline{AR}_{S_t}$ across all trading days and stocks having rank K is calculated and is denoted $\overline{AR}_K$. The average daily abnormal return for stocks having rank K and on which there are options having rank L is calculated similarly and denoted AR_{KL}.

Our results, not shown here, revealed that the mean excess stock return over the option holding period was not significant for any of the stock rank groups or combined call rank/stock rank combinations. This result is not necessarily inconsistent with previous studies that showed Value Line's superior ability to recommend stocks. Our tests consisted of calls on stocks ranked 1, 2, 3, or 4. There were no cases where the stock was ranked 5. Copeland and Mayers (1982) found abnormal performance only on stocks ranked 5. Moreover, their performance was measured over a period of 26 weeks after the stock had been given a specific rank. The evidence in their table 4 shows a clear

11. In developing timeliness rankings for common stocks, Value Line considers recent relative stock price performance. Stocks that perform unusually positively relative to the overall market are assigned higher rankings, ceteris paribus, than stocks that underperform the market. Thus, for highly ranked stocks, beta estimation during the period over which the stock exhibited positive relative price performance would lead to an upward bias in the calculated beta. Using this beta estimate during the test period to determine if there is an association between positive excess return performance and stock rankings results in an overstatement of the benchmark return and a bias against the finding of positive abnormal performance. For low-ranked stocks the reverse is true. The benchmark return is understated, and there is a bias against the finding of negative abnormal return performance. The use of a future period for the calculation of benchmark returns overcomes this problem. See Copeland and Mayers (1982).

and logical tendency for the most significant performance to occur shortly after the date on which the rank was assigned. This was confirmed by Stickel's (1985) results, which suggest that most of the response to a rank change occurs within a week. Our stock returns are measured over a period corresponding to the recommended option holding period. Since we do not have the necessary data, we are unable to determine whether the stock rank is reassigned at the time of the option recommendation. However, the beginning of the option holding period will not necessarily correspond to the reassignment of a stock rank.

Another interesting and related question is whether there is any abnormal performance in the underlying stocks prior to the release of the recommendation to purchase the call. To examine this issue, we estimated the market model parameters over a 250-trading-day period beginning 250 days after the option is purchased. Since the longest holding period was 189 calendar days, the future benchmark period would not overlap with any option holding period. We also used an historical benchmark period and achieved similar results. Then we estimated excess returns on the securities for a period of 60 days prior to the purchase date to 60 days after the purchase date.[12]

Cumulative average residuals are shown for the period of day -60 to day $+60$ in Figure 4. Several interesting results are revealed. The residuals are positive and rising for the period prior to day 0. This result is not surprising since Value Line is known to pay attention to the recent performance of the stock. On day 0, the average residual is 0.37% and has a t-statistic of 4.54. This is the largest average residual and t-statistic over the entire 121-day period. Combined with our earlier result, it is apparent that the stock price rises sharply, and the option mispricing is very large on the day the holding period begins. Of course, we must be careful not to link these two findings too tightly. The option return is measured from approximately 11:00 A.M. on the day it is purchased to approximately 11:00 A.M. the next day. The stock return is measured from the close on the day before the call is purchased until the close of the day the call is purchased. In addition, there is the possibility that for some options, the purchase date corresponds to the date of a stock rank change. Since we do not have data on the stock ranks prior to the date the option is recommended, we cannot address this question. However, our findings of significant positive cumulative average residuals prior to the date the option is purchased confirms that call options are recommended on stocks that show favorable performance.

12. Recall that the first day of the holding period does not necessarily correspond to the date of the publication of the recommendation. Fifty-eight percent of the options that could be bought for less than Value Line's limit price were bought on Monday.

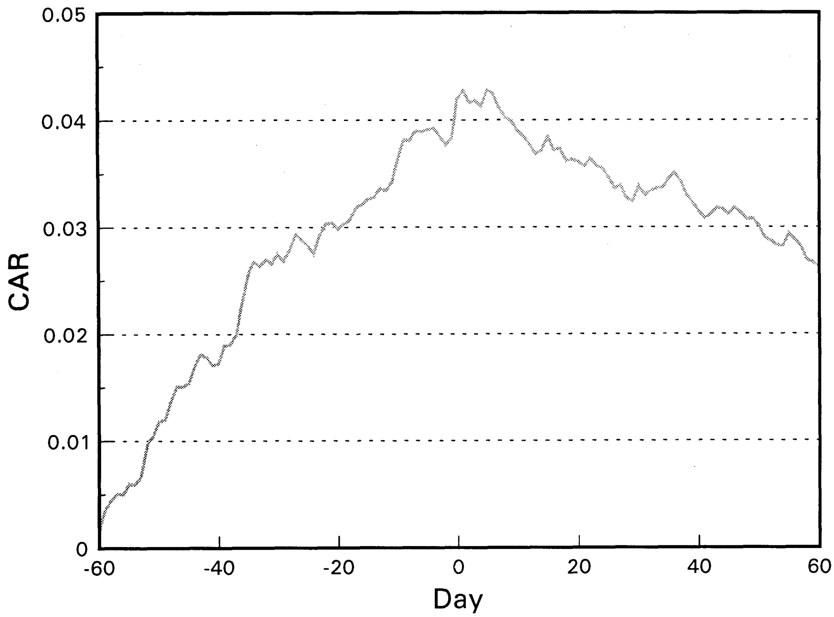

FIG. 4.—Cumulative average residuals of stocks on which Value Line recommends purchases of the call option on day 0. Market model parameters were estimated using a 250-day benchmark period beginning 250 days from day 0.

Figure 5 shows the cumulative average residuals for an event analysis in which day 0 is the day on which *Value Line Options* lowers the call's rank to 3 or below and, thus, is the end of the holding period. Significant negative average residuals of −0.39%, −0.52%, and −0.21% were observed on days −7, −6, −5, and −4. Day −4 is the day on which Value Line performs the analysis that downgrades the call. Thus, it appears that Value Line observes significant abnormal negative performance on the stock and then lowers the call's rank. This result is consistent with our first reported finding. Recall that we found that Value Line's recommendations to purchase calls revealed abnormal performance that quickly dissipated. There is little evidence that abnormal performance is earned by holding on to one's position until Value Line gives its sell recommendation, which appears to be triggered by a sharp stock price move. Thus, Value Line seems to have the ability to recommend when to open the position but not when to close it.

V. Conclusions

This research examines call option rankings and recommendations appearing in *Value Line Options* over the period 1983–85. The objectives

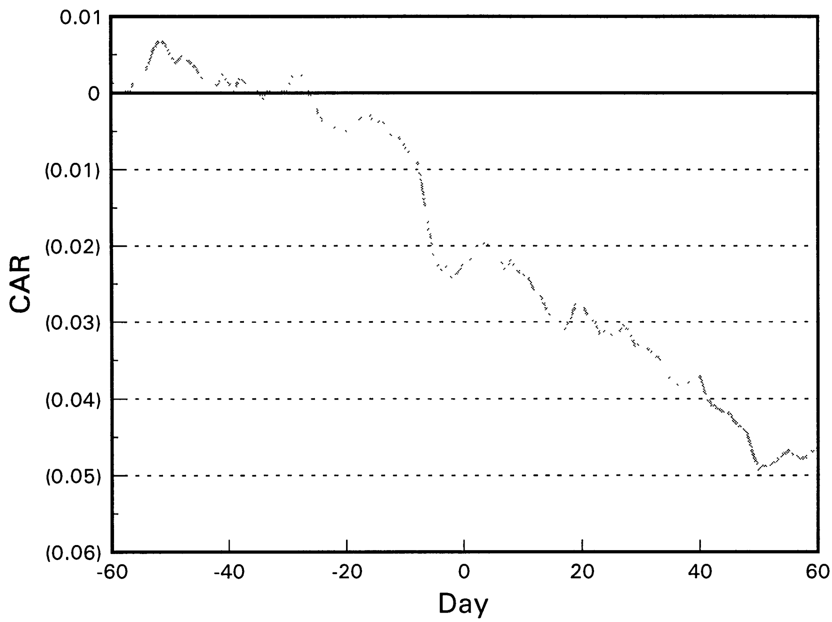

FIG. 5.—Cumulative average residuals of the stocks on which Value Line lowers the rank of the call option to 3 or below on day 0. Market model parameters were estimated using a 250-day benchmark period beginning 250 days from day 0.

of this research are to (1) determine whether there is information in Value Line's option rankings and recommendations and to (2) determine whether an investor following Value Line's option recommendations and prescribed strategy earns abnormal returns.

We find evidence of abnormal call returns in the period immediately following the recommended option purchase date, which is consistent with the results of *Value Line Investment Survey* stock ranking studies. An analysis of performance according to call rank and combined call and stock rank also supports the notion that Value Line rankings have information content. Abnormal returns were significantly positive for calls ranked 1. The largest and most significant abnormal call return performance was exhibited by calls ranked 1 written on stocks whose rank indicated that the stock was correctly priced. Hypothesis tests of differences in abnormal call performance among different call and stock rank combinations strongly support the ability of Value Line's rankings to discriminate ex ante the performance of call options.

Value Line's prescribed strategy of buying call options and holding them until they are no longer ranked 1 or 2 was found to yield significantly positive abnormal returns before consideration of explicit transactions costs. After consideration of floor trading and clearing costs,

however, the strategy of forming riskless hedge portfolios and rebalancing on a daily basis does not generate excess returns. Thus, we do not find evidence against market efficiency.

An analysis of Value Line's put recommendations indicated that only four of the 495 calls in our sample had simultaneous put recommendations. This suggests that, in general, Value Line is not basing its recommendations on judgments that the market has underestimated future stock price volatility. Rather, Value Line must believe that call options are low priced relative to put options and/or the underlying stock. We employed the American put-call parity relationship to investigate the extent to which call and stock rankings correspond to relative call, put and stock prices. Our results are consistent with a ranking system based on relative call, put, and stock prices in the week prior to the recommendation date.

The findings of this study further confirm Value Line's ability to ex ante separate winners from losers. While we have not been able to identify the specific procedure behind Value Line's recommendations, we are relatively confident that it is based on perceived mispricing of calls and is not simply a leveraging of its stock recommendation performance or the market's misestimation of the stock's volatility.

References

Barone-Adesi, G., and Whaley, R. E. 1987. Efficient analytic approximation of American option values. *Journal of Finance* 2 (June): 301–20.

Bhattacharya, M. 1983. Transactions data tests of efficiency of the Chicago Board Opotions Exchange. *Journal of Financial Economics* 12 (August): 161–85.

Bjerring, J. H.; Lakonishok, J.; and Vermaelen, T. 1983. Stock prices and financial analysts' recommendations. *Journal of Finance* 38 (March): 187–204.

Black, F. 1973. Yes, Virginia, there is hope: Tests of the Value Line ranking system. *Financial Analysts Journal* 29 (September–October): 10–14.

Black, F., and Scholes, M. 1973. The pricing of options and corporate liabilities. *Journal of Political Economy* 81 (May–June): 637–59.

Blomeyer, E. C., and Klemosky, R. C. 1983. Tests of market efficiency for American call options. In Menachem Brenner (ed.), *Option Pricing Theory and Application.* Lexington, Mass.: Heath.

Boyle, P., and Emanuel, D. 1980. Discretely adjusted option hedges. *Journal of Financial Economics* 8 (September): 259–82.

Copeland, T. E., and Mayers, D. 1982. The Value Line Enigma (1965–78): A case study of performance issues. *Journal of Financial Economics* 10 (November): 289–321.

Cox, J. C., and Rubinstein, M. 1985. *Option Markets.* Englewood Cliffs, N.J.: Prentice-Hall.

Evnine, J., and Rudd, A. 1984. Option portfolio risk analysis. *Journal of Portfolio Management* 10 (Winter): 23–27.

Figlewski, S., and Webb, G. P. 1993. Options, short sales and market completeness. *Journal of Finance* 48 (June): 76–77.

Finucane, T. J. 1991. Put-call parity and expected returns. *Journal of Financial and Quantitative Analysis* 26 (December): 445–57.

Galai, D., 1977. Tests of market efficiency of the Chicago Board Options Exchange. *Journal of Business* 50 (April): 167–97.

Galai, D., 1983. The components of the return from hedging options against stocks. *Journal of Business* 56 (January): 45–54.

Galai, D., and Geske, R. 1984. Option performance measurement. *Journal of Portfolio Management* 10 (Spring): 42–46.
Groth, J. C.; Lewellen, W. G.; Schlarbaum, G. G.; and Lease, R. C. 1978. Security analysts: Some are more equal. *Journal of Portfolio Management* 4 (Spring): 43–48.
Groth, J. C.; Lewellen, W. G.; Schlarbaum, G. G.; and Lease, R. C. 1979. An analysis of brokerage house recommendations. *Financial Analysts Journal* 35 (January–February): 32–40.
Hall, T. W., and Tsay, J. J. 1988. An evaluation of the performance of portfolios selected from Value Line rank one stocks: 1976–1982. *Journal of Financial Research* 11 (Fall): 227–40.
Holloway, C. 1981. A note on testing an aggressive investment strategy using Value Link ranks. *Journal of Finance* 36 (June): 711–19.
Huberman, G., and Kandel, S. 1987. Value Link rank and firm size. *Journal of Business* 60 (October): 577–89.
Huberman, G., and Kandel, S. 1990. Market efficiency and Value Line's record. *Journal of Business* 63 (April): 187–216.
Lee, C. F., and Park, H. Y. 1987. Value Line investment survey rank changes and beta coefficients. *Financial Analysts Journal* 43 (September–October): 70–72.
MacMillan, L. W. 1986. Analytic approximation for the American put option. *Advances in Futures and Options Research* 1:119–39.
Peterson, D. 1987. Security price reactions to initial reviews of common stock by the Value Line investment survey. *Journal of Financial and Quantitative Analysis* 22 (December): 483–94.
Phillips, S. M., and Smith, C. W., Jr. 1980. Trading costs for listed options: The implications for market efficiency. *Journal of Financial Economics* 8 (June): 179–201.
Stanley, K. L.; Lewellen, W. G.; and Schlarbaum, G. G. 1981. Further evidence on the value of professional investment research. *Journal of Financial Research* 4 (Spring): 1–9.
Stickel, S. 1985. The effect of Value Line investment survey rank changes on common stock prices. *Journal of Financial Economics* 14 (March): 121–43.