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A REEVALUATION OF THE VALUE LINE INVESTMENT  
STRATEGY; CAN ACTIVE COMMON STOCK PORTFOLIO  
MANAGEMENT PRODUCE SUPERIOR RETURNS?

by

JOHN HARRY FEINGOLD

B.S., Massachusetts Institute of Technology  
(1978)

SUBMITTED IN PARTIAL FULFILLMENT  
OF THE REQUIREMENTS FOR THE  
DEGREE OF

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at the

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

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Submitted to the Sloan School of Management  
on January 19, 1979 in partial fulfillment  
of the requirements for the degree of  
Master of Science

ABSTRACT

Value Line Investment Survey asserts that their Group 1 ranked securities have outperformed lower ranked stocks with remarkable consistency for over twelve years. However, many have criticized their tests as inconclusive.

This thesis is a Value Line performance analysis covering the period of November 1971 through December 1977. The sample includes the 100 stocks ranked 1 for year ahead appreciation, assembled in an equally weighted portfolio. The test utilizes regression analysis to compare the excess returns on the Value Line portfolio (Value Line portfolio returns - Treasury Bill returns), the dependent variable, and the excess market return, (three different indices, equally and value weighted, Standard and Poor's "500") the independent variable.

The Value Line ex-post alpha, for trading on the publication date (-5, 0, 5, 10, 20 days delay analyzed), regressed on the equally weighted portfolio (the best performing of the market indices), indicates a positive 12% yearly extra return, with a t-statistic of 3.6, significant at over the 99% confidence level.

This result, significant and large, suggests that Value Line recommended investment strategies which consistently outperform the market, contradicting extensive literature documenting the efficiency of capital markets.

Thesis Supervisor: Fischer Black

Title: Professor of Finance

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PREFACE

The author encourages comments, suggestions and questions regarding this thesis. Please direct correspondence to:

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## INTRODUCTION

Samuelson, in a short article,<sup>1</sup> touches upon many of the points which the careful reader should keep in mind while reading this performance evaluation of the Value Line investment service.

He speaks of the advantage of portfolio diversification, and warns that holding a large number of securities does not in itself ensure efficient diversification since they may be strongly positively correlated.

He also speaks of portfolio performance evaluation, and the appearance of superior performance by increasing risk through leverage in upmarket periods. Use of regression analysis and the capital asset pricing model will aid in a clearer understanding of the results of this study.

Samuelson also warns that even if an investment advisory service such as Value Line should beat the market, it may be due only to chance. Within this thesis the statistical tests will be performed to provide proof or rejection of the null hypothesis at a statistically significant level.

After reading this paper, one question is still sure to remain. If Value Line has produced better results than a passive strategy, does this imply anything for their expected future performance?

## Chapter 1

### VALUE LINE: WHAT DOES IT ALL MEAN?

Arnold Bernhard, Research Director of the Value Line Investment Survey, in a 1970 presentation at the University of Chicago, presented exhibits which indicated Value Line Investment Survey had a consistently good predictive ability. He said that unless his results of statistical analysis are pure luck, they contradict the random walk hypothesis.<sup>1</sup>

Fischer Black, my thesis advisor, entered this debate at the conference by presenting the evidence for passive portfolio management. He felt that the Value Line performance results were impressive, but that the statistical tests were inadequate. His objection is based on the fact that Value Line order ranked utilizing cross-sectional tests which indicated little about statistical significance. Black prefers the use of regression testing for consistency of performance. It is this method which I will employ in the original research contained in this thesis.

The objective of an actively managed portfolio of common stocks is to choose securities so that there is a greater return than when an index fund is purchased.<sup>2</sup> The choice of misvalued securities must overcome the consequential costs of churning the portfolio. In addition, a

market timing approach can be taken to take advantage of financial market movements, and hopefully help avoid having funds invested during declining periods in the equities markets. The active/passive investment decision will be examined in detail, including an overview of current research in financial theory of efficient markets.

Value Line ranks 100 stocks in Group 1, the highest category for year ahead performance. Implied is an advantage to holding more than one security, otherwise investing a large portion of your assets in what they consider the number one best stock would be recommended.<sup>3</sup>

Harry Markowitz analyzed investor behavior and discovered that investors generally try to maximize returns while avoiding risk.<sup>4</sup> He believes that the important characteristics of a portfolio of stocks are the expected return and the riskiness. Intelligent rational investors should naturally hold that combination of risky assets which maximize expected returns for a given degree of risk. Markowitz identified that with the knowledge of a securities expected return, variance, and covariance with the market, that efficient portfolios could be created. This is the theory which Value Line simplifies into the recommendation that each investor should hold at least 16 to 25 of their Group 1 securities, and also the reason I chose to analyze the portfolio of all Group 1 securities. The general formula for

computing the variance of a portfolio is: <sup>5</sup>

$$\sigma_p^2 = \sum_{i=1}^N \sum_{y=1}^N x_i x_y \text{ cov}_{iy}$$

$x_i$  = proportion invested in security i

$x_y$  = proportion invested in security y

$\text{cov}_{iy}$  = covariance between the rates of return  
on i and y

also

$$r_{ab} = \frac{C_{AB}}{S_A S_B}$$

where

$C_{AB}$  = covariance between return on A and  
return on B

$r_{ab}$  = coefficient of correlation between  
return on A and return on B

$S_A$  = standard deviation of A

$S_B$  = standard deviation of B

These equations show that diversification does not help when security returns are perfectly positively correlated. However diversification can eliminate risk with perfectly negatively correlated securities. In the case of partial correlation as found in Value Line portfolios Group 1, diversification lends an advantage, since in theory an investor is only rewarded for bearing market risk represented

by beta rather than total risk<sup>6</sup> represented by sigma - or what Value Line has computed by the name "Rank for Safety."

Value Line recommends that if one holds fewer than 15 of their Group 1 securities, the "safety rank" or total risk view, is a valid measure. But if one holds more than 15 securities, in different industries, one should be only concerned with betas, since the portfolio would then be fairly well diversified.

In order to better understand how Value Line makes stock recommendations, let us examine the criteria used in their performance studies and analyses.

Value Line computes the rank of approximately 1700 stocks each week. The financial analysis is condensed into two numbers, one conveying information about how the stock rates in the sample of about 1700, relative to expected price performance in the next 12 months. The second measure is an indication of investment safety, or total risk of the individual security.

Value Line publishers explain their rankings as follows: Value Line rank definitions,

100 stocks      Rank 1:    Expect the best price performance  
                                 relative to the other stocks covered in the  
                                 survey.

300 stocks      Rank 2:    Expect above average price performance.

900 stocks      Rank 3: Expect price performance in line  
                  with the market.

300 stocks      Rank 4: Expect below average price performance.

100 stocks      Rank 5: Expect poorest price performance in  
                  relation to the other covered stocks.

Other studies of Value Line have examined the stocks in each of these rank portfolios to determine if the expected results hold true. Value Line claims "not every stock will perform in accordance with its rank in every year. But such a high percentage have in the past for logical reasons based on earnings, growth rates, and risk, that the probabilities definately stand in your favor when you line up your stocks with the Value Line Ranks." <sup>7</sup>

If Value Line does have the ability to discriminate between securities in the ranking method, an obvious strategy would involve the purchase of Rank 1 securities and the short sale of Rank 5 securities. Although according to Value Line literature this would be a strategy, it is not examined in the paper.

I studied only those securities ranked 1, to determine whether their Rank 1 performance was superior to that of various market indices. Value Line is mailed on a schedule that is aimed to assure delivery to the subscriber on Friday. In my analysis I refer to "x" days delay in acting upon Value Line advice. A zero delay means you would



act on the Friday you receive the survey. A five day delay is five Stock Exchange days, or most likely seven days. Likewise, a delay of 20 Stock Exchange days would be about four weeks. I also analyze a negative delay, a hypothetical strategy of acting on the advice five days early. I consider this important both academically and because it is a strategy which could be followed by a person who understands how the Value Line ranks are computed.

In a letter of June 2, 1978 written by Samuel Eisenstadt, Chief Statistician of Value Line to Fischer Black;

"Most subscribers receive the survey on Friday, some even on Thursday. The rankings are determined 7-12 days prior to the subscriber's receipt of the survey ... subscribers that are acquainted with the mechanics of the ranking system can successfully anticipate rank changes by following earnings reports in the Wall Street Journal. For example if a Group 1 stock comes out with a poor quarterly earnings report he need not wait 7-12 days to be told that the ranking has been lowered."<sup>8</sup>

Therefore I thought it would be interesting to look at the five day negative time delay. However although rankings appear to be about a week 'stale' by the time the subscriber receives the survey, I am sure that in the case of a major development, the ranking could be altered until the survey is printed on Wednesday evening. I do not believe in the likelihood that a subscriber could duplicate the results obtained by following Value Line a week early.

However the zero day delay is the strategy that subscribers could duplicate.

Value Line's performance record is regularly reported in their publication as demonstrated in Tables 1 and 2. These two tables, assembled by Value Line, show the results that an investor would have received following Value Line recommendations from April 1965 through July 5, 1978. The Value Line analysis assumes, in the case of no allowance for rank changes, that an investor buys an equal dollar amount of each stock of each rank at the start of each year and holds an unchanged portfolio for the entire year. At the start of the next year the portfolio is rebalanced. Allowance for rank changes in the portfolio is updated weekly. There are no allowances for transaction costs.

The compilation of Value Line table statistics utilizes geometric averages of price changes in each period. When dealing with portfolio performance,<sup>9</sup> a compounding of arithmetic averages of price changes would have simulated an actual portfolio strategy.

Tables 3 and 4 present data compiled by Value Line applied to an institutional universe of common stocks -- Standard and Poor's "500" stock Composite Index. This analysis was executed to disprove the belief by some that Value Line is capable of discriminating only in that segment of the market made up of small, inactively traded "secondary

Table 1

## RECORD OF VALUE LINE RANKINGS FOR TIMELINESS

APRIL 16, 1965 - JULY 5, 1978

(ALLOWING FOR CHANGES IN RANK)

	<u>1965*</u>	<u>1966</u>	<u>1967</u>	<u>1968</u>	<u>1969</u>	<u>1970</u>	<u>1971</u>	<u>1972</u>	<u>1973</u>	<u>1974</u>	<u>1975</u>
Group 1	+28.8%	-5.5%	+53.4%	+37.1%	-10.4%	+7.3%	+30.6%	+12.6%	-19.1%	-11.1%	+75.6%
Group 2	+18.5	-6.2	+36.1	+26.9	-17.5	-3.2	+13.7	+7.4	28.9	-29.5	+47.4
Group 3	+6.7	-13.9	+27.1	+24.0	-23.8	-8.0	+9.3	+3.5	-33.6	-34.1	+40.7
Group 4	-.4	-15.7	+23.8	+20.9	-33.3	-16.3	+8.4	-7.1	-37.9	-40.6	+39.3
Group 5	-3.2	18.2	+21.5	+11.8	-44.9	-23.3	-5.5	-13.4	-43.8	-55.7	+40.9
VL Comp.	+8.2	-12.3	+29.1	+19.8	-28.7	-20.6	+9.0	+1.0	-34.3	-34.7	+44.4
	<u>1976</u>	<u>1977</u>	<u>1978**</u>	<u>1965 to mid-1978</u>							
Group 1	+54.0%	+26.6%	+26.6%	+1028%							
Group 2	+31.2	+13.4	+17.6	+ 142							
Group 3	+29.0	+1.3	+9.2	0							
Group 4	+28.8	-6.9	+2.9	-55							
Group 5	+26.7	-17.6	+6.2	-85							
VL Comp.	+29.9	+1.7	+10.3	-17							

\*April through December  
\*\*Dec. 28, 77 July 5, 78Table from Value Line  
July 21, 1978, page 658

Table 2

RECORD OF VALUE LINE RANKINGS FOR TIMELINESSApril 16, 1965 - July 5, 1978(WITHOUT ALLOWANCE FOR CHANGES IN RANK)

	<u>1965*</u>	<u>1966</u>	<u>1967</u>	<u>1968</u>	<u>1969</u>	<u>1970</u>	<u>1971</u>	<u>1972</u>	<u>1973</u>	<u>1974</u>	<u>1975</u>
Group 1	+33.6%	-3.1%	+39.2%	+31.2%	-17.7%	-8.9%	+26.5%	+10.1%	-17.1%	-23.1%	+51.6%
Group 2	+18.9	-6.0	+31.9	+26.3	-16.3	-4.0	+17.4	+7.5	-26.2	-27.8	+53.0
Group 3	+8.9	-9.7	+30.1	+21.4	-20.7	-5.5	+12.2	+6.2	-27.0	-28.5	+52.9
Group 4	+8	-7.2	+25.1	+25.1	-26.8	-11.7	+14.2	+3.2	-29.1	-33.6	+48.4
Group 5	-1.2	-12.4	+28.4	+25.9	-35.7	-13.1	+10.5	-2.9	-43.1	-36.8	+42.1
Avg. all Stocks	+10.1	-7.9	+29.9	+24.6	-22.1	-7.5	+14.9	+5.5	-27.7	-29.6	+51.2
	<u>1976</u>	<u>1977</u>	<u>1978**</u>	<u>1965 to mid 1978</u>							
Group 1	+35.3%	+15.8%	+19.0%	+347%							
Group 2	+36.3	+12.7	+16.5	+175							
Group 3	+33.8	+5.2	+12.0	+ 74							
Group 4	+36.1	-.2	+9.0	+ 14							
Group 5	+38.2	-2.8	+9.8	- 37							
Avg. all Stocks	+35.1	+5.8	+12.5	+ 78							

Dow Jones Industries -13  
+ 78 NYSE Composite + 9

Table from Value Line, July 21, 1978, pge 659

\*April through December  
\*\*Dec. 28,77 July 5,78

stocks" that may be inefficiently priced. Therefore Value Line assembled this data to demonstrate performance on that segment of the market considered by most to be the most well analyzed and efficiently priced.

The rankings assume that a position was taken at the beginning of each year and held for 12 months without ranks changes.<sup>10</sup> Table 3 summarizes recent changes in price for an equally weighted portfolio. Table 4 contains total returns figures, change in price plus dividends, and is also equally weighted. These tables show that results for the Standard and Poor's "500" stocks show discrimination, and question the validity of efficient market theory.

Value Line describes their statistical analytical technique as "Investing in Common Stocks." I will summarize Value Line's criteria for computing a rank for price performance of the next 12 months. Their four main criteria are:

1. Non-parametric value position
2. Magnitude of over or underevaluation
3. Earnings momentum
4. Earnings surprise factor

<sup>11</sup> The non-parametric value position of each stock concerns a price-earnings measure. Relative earning and prices of all Value Line stocks for the same period."<sup>11</sup> A price momentum factor is also included in order to help

Table 3

PERCENT CHANGE IN PRICE - EQUALLY WEIGHTEDSTANDARD AND POOR'S "500", VALUE LINE UNIVERSE

	<u>1965*</u>	<u>1966</u>	<u>1968</u>	<u>1969</u>	<u>1970</u>	<u>1971</u>	<u>1972</u>	<u>1973</u>	<u>1974</u>	<u>1975</u>
Group 1	28.15	-5.69	24.28	-14.43	-1.86	33.47	14.30	-14.66	-20.98	45.42
Group 2	-10.46	27.60	19.82	-9.24	2.33	20.87	17.61	-21.15	-26.51	59.44
Group 3	8.17	-8.95	33.24	21.54	-11.21	- .07	15.39	11.84	-19.05	-27.67
Group 4	- .60	-11.71	29.26	22.48	-15.82	2.37	12.45	5.12	-28.99	-30.64
Group 5	1.66	-16.09	33.40	23.19	-23.12	-4.52	13.28	13.45	-22.38	-25.19
	<u>1976</u>	<u>1977</u>	<u>1978**</u>	<u>April 1965 to June 1978</u>						
Group 1	28.03	4.38	13.56	+273%						
Group 2	26.88	1.83	9.53	+173						
Group 3	24.16	-6.12	5.62	+103						
Group 4	27.59	-9.58	1.75	+ 28						
Group 5	33.80	-16.09	2.22	+ 38						

\* April to December

\*\* December to June

Table from Value Line, November 17, 1978,  
Page 946

Table 4

TOTAL RETURN - EQUALLY WEIGHTED

		<u>STANDARD AND POOR'S "500", VALUE LINE UNIVERSE</u>										
		<u>1965*</u>	<u>1966</u>	<u>1967</u>	<u>1968</u>	<u>1969</u>	<u>1970</u>	<u>1971</u>	<u>1972</u>	<u>1973</u>	<u>1974</u>	<u>1975</u>
Group 1		30.49	-2.65	33.99	27.81	-11.44	1.25	36.07	17.27	-11.53	-17.06	52.00
Group 2		17.75	-7.41	31.36	22.98	-6.29	5.06	23.07	20.30	-18.14	-22.08	65.48
Group 3		10.34	-5.97	37.01	24.74	-8.45	3.37	18.76	14.70	-16.15	-23.48	60.54
Group 4		1.58	-8.73	33.32	25.75	-13.06	6.35	15.84	8.09	-26.19	-26.01	62.39
Group 5		3.96	-13.30	36.83	25.77	-21.03	-1.34	16.34	16.27	-19.75	-19.75	62.21
		<u>1976</u>	<u>1977</u>	<u>1978**</u>	<u>April 1965 to June 1978</u>							
Group 1		30.79	7.81	15.07	+463%							
Group 2		30.75	5.07	11.50	+318							
Group 3		28.88	-1.79	8.11								
Group 4		33.06	-4.94	4.48								
Group 5		38.76	-12.05	4.76								

\*April to December

\*\*December to June

Table from Value Line, November 17, 1978,  
Page 946

predict future action. This measure is used to combine earnings, rank, price rank, and price momentum into one figure.

The magnitude of over or underevaluation is a measure used by Value Line's analysts to "measure the disparity between current price-earnings ratio of a stock and its historical norm."<sup>12</sup>

Earnings momentum is a function of the year-to-year change in quarterly earnings per share of each stock.

The earning surprise factor seems to be a convenient way to integrate new or unexpected information into the ratings.

This explanation is what Value Line claims they do to estimate stock values. Of course we don't know their method for sure -- however this is what they claim to do.

Utilizing these many measures of performance and analytical predictive ability, Value Line attempts to refute the efficient market hypothesis by demonstrating accurate active portfolio management.

Burton G. Malkiel defines the random walk as "The history of stock-price movements contains no useful information that will enable an investor consistently to outperform or buy and hold strategy in managing a portfolio."<sup>13</sup>

Scholars have defined three forms of the efficient market hypothesis. The weak form asserts that current stock



prices reflect all information from historical prices, i.e., one cannot apply a mechanical formula to past stock prices to beat the market. The semistrong form of the hypothesis is that in analyzing public knowledge or charting the underlying companies does not produce superior investment results. The strong form does not produce superior investment results. The strong form goes so far as to say that even those individuals with insider information cannot make use of this information to produce superior stock market returns.<sup>14</sup> If these strong forms of the efficient market hypothesis are true, it appears Value Line could not achieve superior stock market returns.

## Chapter 2

### PREVIOUS RESEARCH ON VALUE LINE INVESTMENT SURVEY

A survey of recent financial literature on previous empirical research on Value Line, produced five outstanding performance analysis articles. This section summarizes the findings and relates the highlights of earlier works.

John P. Shelton in "The Value Line Contest - A Test of the Predictability of Stock Price Changes,"<sup>1</sup> studies the results of a large number of individual investment decisions on the 1965-1966 Value Line contest. The contest was a promotional device. Appropriately named, a contest of stock market judgment, which attracted 18,565 entrants.

Each contestant chose 25 stocks from a list supplied by Value Line made up of securities they ranked four or five on November 26, 1965. The rules assumed that each contestant would form an equally weighted portfolio with a value computed at the close of the market on December 31, 1965. Value Line analysts selected their own portfolio of stocks from those that were ranked Group 1. Prizes were awarded to those individuals who chose portfolios which outperformed Value Line by the greatest margins.

The question Shelton asks is "Did the 18,565 contestants select portfolios, on average, that differed from the performance of the 350 stocks to which the selection was

confined by enough to conclude that the result was not likely to have happened by chance?"<sup>2</sup> Shelton found that the 350 stocks ranked four and five experienced a 5.9 loss in value over the 26 week contest period. The range of stock price changes for individual securities ranged from a doubling in value to 202.5% to a two-thirds decline in value to 64.7%. Shelton discovered that the average score achieved by the contestants was approximately 49 standard deviations greater than the expected mean. He states, "It is extremely unlikely that a difference as large as this would have occurred if the price changes during those six months were so truly random."<sup>3</sup>

Shelton seriously questions the existence of efficient markets, based on the superior performance of a large sample of individual investors. This doubt is limited, of course, to the six month period of the Value Line contest.

Warren H. Hausman in "A Note on the Value Line Contest: A Test of the Predictability of Stock-Price Changes" calls attention to what he considers an inappropriate statistical test used in Shelton's paper. He concludes "The fact that investors (or contest entrants) tend to agree with each other (as Shelton found) need not mean that they know anything of value. Neither does the fact that, on a single occasion, they outperformed a random selection of stocks."<sup>4</sup> Hausman suggests additional observations during different time periods.

John Michael Murphy studied and performed analysis on the 1969 Value Line contest.<sup>5</sup> Murphy's results are in agreement with Shelton's and cast doubt on the usefulness of the random walk hypothesis when describing the stock market. The 1969 contest rules differed from those in 1965. Contestants were allowed to choose their portfolios from any of the 1,258 stocks Value Line analyzed at the time. One of Murphy's conclusions is: "The results reported are significant and inconsistent with the spirit of the random walk hypothesis, but statistical, logical, and methodological considerations preclude a claim that the hypothesis has been rejected."<sup>6</sup>

The next Value Line inquiry was conducted by Robert S. Kaplan and Roman L. Weil in an article, "Risk and the Value Line Contest."<sup>7</sup> This contest covered the period from August 18, 1972 to February 16, 1973. The authors hypothesized that given efficient markets, stock prices would simultaneously adjust at the publication or release of all new information, including analysis performed by Value Line. They believed that a high beta, high risk, portfolio should do well when the market rises, and perform poorly when there is a general drop in price levels. A low risk portfolio should perform better than the high risk portfolio when there is a market decline.

Kaplan and Weil did not believe they could pick 25 stocks that could outperform the market. They thought that it made sense to enter two portfolios, a very high beta portfolio, and a very low beta portfolio. If the market moved in either direction, they could take advantage of the situation. The high beta portfolio had a beta of 2.13 and the low risk portfolio by their estimates a beta of 0.21. The average Value Line rank of the two portfolios was about equal, which would naturally lead to an expectation from Value Line of about equal performance.

Their results were computed during a period when prices for all stocks in the Value Line survey declined 6.7%. The author's low beta portfolio actually increased in value 3.8%, placing it in the top 2,043 of the 85,744 portfolios entered. The high beta portfolio declined 22.9% and scored in the bottom 519 of the 89,744 portfolios entered.

The results support the authors' hypothesis. They showed the expected results according to the beta theory of portfolio performance. In their conclusion, Kaplan and Weil say "The rankings are flawed, since much of the variation in performance is caused by differences in the risk of stocks in each group."<sup>8</sup> The Kaplan and Weil study chose portfolios with equal Value Line rank but with different levels of risk. The return on these portfolios differs by more than 26 percentage points. During the same time period, Value

Line Group 1 and Group 5 portfolios had approximately equal risk in a beta context, but return differed by only 3 percentage points in performance, despite differential Value Line ratings. They concluded that detailed investigation of individual securities is not worthwhile and that stock market movements are dominated by systematic risk.

The next study of Value Line was performed by Professor Fischer Black, "Yes Virginia, There Is Hope; Tests of the Value Line Ranking System."<sup>9</sup> This thesis is closely modeled after Black's paper, with three important differences. 1) Black's observations of Value Line rankings and stock prices were monthly, while mine are weekly; 2) Black looked at all the Value Line ranks in his study period. This study looks into Group 1 rank and compares Group 1 stock performance to various market indices; 3) Black did his study in cooperation with Value Line, who performed the actual computations. This thesis is independently written and researched.

Black states "According to the analysis that Value Line performed with my help, its ranking system appears to be one of the few exceptions to the rule that attempts to separate good stocks from bad stocks is futile."<sup>10</sup> Professor Black observed of Value Line, "The system tends to assign high marks to stocks with low price earning ratios, relative to historical norms, and relative to the price earnings ratio of the market."<sup>11</sup>

Discussing shortcomings of previous Value Line analysis, Black says "Cross-sectional tests generally tell you nothing about statistical significance, or whether performance in one period is likely to be repeated in future periods."<sup>12</sup> Black favors regression testing which is the method he suggested for this thesis. He also examines the implications of transaction costs and he discusses ways of utilizing the ranks to minimize transaction costs. In concluding, he states "The net result of the portfolio simulation, assuming transaction costs of two percent or less in and out, was that the strategy continued to give significant results over the five year period, although the level of significance was reduced somewhat."<sup>13</sup>

This has been a survey of the research leading up to my analysis of Value Line. Each study concentrated on a slightly different aspect of active portfolio management. Nevertheless each concluded that there is at least some question as to the validity of the efficient market hypothesis. Hopefully this performance study will provide another piece of evidence.

Chapter 3

FINANCIAL THEORY - EFFICIENT MARKET - RANDOM WALK

The efficient market hypothesis is at the heart of this research. If Value Line can discriminate undervalued securities, then surely a re-evaluation is due to the pre-supposed degree of efficiency in markets. This section will provide an overview of the most well known previous investigations into efficient markets and stock market performance studies.

In a test of efficient markets, Fama<sup>1</sup> studied the proportionate price changes of the 30 Dow Jones industrial stock for the period 1957-1967. He found serial correlations very low, the average being 03.<sup>2</sup> To adjust for the domination in his correlation coefficients of just a few extreme observations, Fama also examined only signs, (+ or -), rather than size of successive days, statistics to determine if runs persisted. He found a negligible departure from randomness. His study provides strong support for the random walk hypothesis.<sup>3</sup>

Another test of efficient markets was performed by William F. Sharpe.<sup>4</sup> He studied 34 mutual funds from 1954 to 1963. Sharpe takes account of rates of return as measured by total risk, variability,<sup>5</sup> utilizing the capital asset pricing model. The capital asset pricing model expresses a linear relationship between risk and return on a portfolio.



This presupposes the condition that the portfolio is efficient, meaning that the portfolio provides maximum returns for a given level of risk. Sharpe found that if expenses of the funds are ignored, 15 of the 34 funds outperform the Dow Jones industrial average after risk adjusting. If expenses are considered only 11 funds beat the Dow Jones average while 23 did worse. Sharpe's conclusion is that mutual funds failed to consistently outperform the market, implying an efficient market.<sup>6</sup> He states "... support(ing) to the view that capital market is largely efficient and that good managers concentrate on evaluating risk and providing diversification, spending little effort (and money) on the search for incorrectly priced securities."<sup>7</sup>

Another study of mutual fund performance was undertaken by Michael Jensen<sup>8</sup> covering the performance of 115 mutual funds from 1945-1964. Jensen understood that variations in fund performance was expected because of difference in the fund's risk. His method involved comparison of an individual fund's performance with the performance of a randomly selected portfolio of equal risk.<sup>9</sup>

When ignoring mutual fund expenses, about half of the funds did better, and half worse than expected. "This is the result that would be expected if the market were highly efficient with market prices fully reflecting all that was knowable through public announcement or

ascertainable through the efforts of individual security analysts."<sup>10</sup>

When accounting for expenses only 43 out of 115 mutual funds showed superior performance. Jensen's work in the evaluation of mutual fund performance provided additional support for the random walk hypothesis. "The evidence on mutual fund performance discussed above indicates not only that these 115 mutual funds were on average not able to predict security prices well enough to outperform or buy and hold policy, but also that there is very little evidence that any individual fund was able to do significantly better than that which we expected from mere random chance."<sup>11</sup>

William Sharpe in "Adjusting for Risk in Portfolio Performance Measurement"<sup>12</sup> shows that adjusting for risk properly is the way to accurate performance evaluations. Sharpe describes methodology used in this Value Line study involving the computation of the excess return for each period, being the difference behind a portfolio return and Treasury Bill returns.<sup>13</sup> He states that in times of greatly varying short term interest rates, it is essential to utilize the excess return methodology to obtain meaningful study results. He also speaks of a reward to variability, measure and a model of naive investor behavior as necessary parts of a performance study. Exactly what he is advising is to be aware of risk, as it is important measure on performance

evaluation.

William Sharpe wrote another article "Likely Gains from Market Timing"<sup>14</sup> which I include in this overview because of the suspicion that Value Line may attempt market timing decisions in the adjustment of the average beta of their portfolios. This article tries to address the question, how superior must one's predictions be to implement a market timing style effectively? "Attempts to time the market are not likely to produce incremental returns of more than four per cent per year over the long run. Moreover, unless a manager can predict whether the market will be good or bad each year with considerable accuracy (e.g., be right at least seven times out of ten) he should probably avoid attempts to time the market altogether."<sup>15</sup>

Jeffrey Jaffee in "Special Information and Insider Trading"<sup>16</sup> provides insights regarding the strong form of the efficient market hypothesis. He summarized that only "intensive trading samples yield profits greater than commissions" regarding usefulness of insider information.<sup>17</sup> Jaffee's study also suggested a profit opportunity: but one smaller than is found in this Value Line study. Roger Ibbotson also supports the efficient market hypothesis as it applies to new issues of common stock. "We cannot reject the hypothesis that an investor in a single random issue has an equal chance for a gain or loss ... The results generally confirm

that there are no departures from market efficiency in the after market."<sup>18</sup>

Fischer Black and Myron Scholes lend insight into the determinant of active portfolio management. They state that as an individual trading on superior information, such as Value Line recommendations, you are competing with other individuals who are following the same strategy:

"As a group those who trade on information cannot make money. If some individuals make money by deviating from the market portfolio, then other individuals must lose money by deviation from the market portfolio. All individuals together hold the market portfolio... An investor who trades on information incurs substantial costs from his activity. He may spend money gathering and analyzing the information he uses. He incurs transaction costs when he buys and sells. He may realize gains that he does not have to realize, and then pay taxes sooner than he has to. He holds a portfolio that is not as well diversified as the market." <sup>19</sup>

Black and Scholes state that although information traders do not generally earn superior returns, they help keep the market efficient by integrating all information into current stock prices. Black contends that the cost of in and out brokerage changes on a \$40.00 stock is about 3% for a round lot, but this was before negotiated commissions. This research all seems to say that Value Line must show impressive performance to overcome all of the disadvantages of active portfolio management and provide its subscribers with risk adjusted superior returns.

## Chapter 4

### METHODOLOGY

This section of the thesis describes topics ranging from data collection to regression testing. The intent is to provide a precise explanation of the research in enough detail to support further research and expansion by a future historian. It is important for the reader to understand that this performance study was done independently of Value Line, or of any other commercial enterprise. No direct contact was made with the Value Line organization, nor was any data supplied directly by them.

All Value Line information was hand collected from publicly available sources. The data from November 5, 1971 to December 30, 1977 was collected and put into machine readable form. The Value Line Group 1 portfolio, each containing 100 stocks, were recorded on a weekly basis. The Dewey Library at M.I.T., Harvard's Baker Library, Boston Public Library as well as the libraries at Northeastern, Boston University and Wellesley College, were cooperative in locating back dated Value Line reports. Mr. Evan Shulman of Batterymarch helped fill in the final gaps.

Study was concentrated on those 100 stocks Value Line ranked highest for year ahead performance. Initially we thought this would encompass hand coding the 100 stocks

each week for the entire 321 week period.

It is more efficient to code only the initial portfolio on November 5, 1971, and record only the weekly additions and deletions. With this information a computer program can generate weekly stock portfolios, resulting in a 90% savings in information quantity which it was necessary for computer readable form.

This method provided ease in obtaining many spot accuracy checks. Each week's portfolio updates were recorded on 3x5 index cards which were headed with the date. The analysis is limited to those Value Line securities listed on the New York and American Stock Exchanges. This is because the CRSP data base included only those securities. However, the index card weekly update file contains listings of over-the-counter securities for possible future research efforts.

Upon completion of the index card weekly update file, each company name was manually coded with its unique identifier, an eight digit ICUSIP number. It is this identifier, supplied by the Stock Exchange, which is punched onto weekly update computer cards to act as input to the portfolio generation program. The ICUSIP numbers were coded from a list containing all stocks on the above mentioned exchanges. Whenever a stock name from the index card file was not located on the computer generated tape identifier number list, it was assumed to be a security listed on the over-the-

counter market and therefore outside the realm of this study. Roughly three per cent of the Value Line Group 1 recommendations are over-the-counter securities. I believe ignoring these stocks will have little effect on this analysis since I see no obvious reason that Value Line should be better able to discriminate over-the-counter securities. One may consider the over-the-counter portion of the market less efficient, and more open to fundamental and technical analysis. If that were truly the case, Value Line would include more over-the-counter securities in their universe.

Compilation of the portfolio update list is straightforward for the two most recent years. For this period, Value Line presents newly added securities to Group 1 rank with a box next to the name. From 1975 chronologically reversed, the task is more difficult in that weekly updates are not easily identified. The method is standardized by reliance on the "Summary of Advice Section," a list of 100 Group 1 rank for year ahead performance. Adjacent week lists are compared, and additions and differences were discerned by discrepancies in the adjacent lists.

The Value Line publication is only satisfactory in transmitting their analyst's recommendations to the subscriber. The publisher lets pass many spelling and alphabetization errors serious enough to cause doubt in the subscriber's mind as to exactly what action was recommended.

Value Line utilizes an up arrow symbol ( $\Delta$ ) to indicate an upward valuation in rank, similarly a down arrow indicates a drop in rank ( $\nabla$ ). Mysteiously, in copies of the reports I found triangle arrows pointing in most conceivable rotations.

The recorded errors in Value Line are diverse. In some cases, the same stock was dropped from Group 1 in two consecutive weeks, or just claim to drop it, only to confuse the subscriber by it's appearance as a Group 1 on the following week. Although the restraint of the portfolio remaining stable at the 100 stock level implies an equal number of additions and deletions per week, this is not always the case.

Prior to 1975, the Value Line information supplied was more difficult to utilize. For example, on April 11, 1975 the recommendation was made to drop Norton-Simon from Rank 1. This was confusing considering that the previous week's Group 1 did not contain Norton-Simon. Value Line also recommended dropping Outlet Company, which was not in Rank 1. On July 21, 1974 Value Line identified Tyler Corporation as in Group 2 with an up arrow ( $\Delta$ ), signifying that it had just been promoted from Group 3. However, in the Summary of Advice section, Value Line recommended that this stock be dropped from the Group 1 portfolio. The arrow had been reversed. Furthermore, the July 21, 1974 survey may have been incorrectly dated July 19, 1974. Value Line recommended



adding Entex to Group 1 on April 29, 1977, even though it was already in the Group 1 portfolio. On December 28, 1973 Barber Oil was listed with an (Δ) as an addition to Group 1, however it was not added to the Summary of Advice Group 1 list. To compound the error, and maintain 100 stocks in the portfolio, Value Line continued to maintain Greater Washington Investments as Group 1, while listing it as a drop candidate with a down arrow (∇). Again on December 28, 1973, Koehring was dropped from the Summary of Advice's Group 1 -- however, it was not labeled with a 2 down arrow (∇), but was maintained a Group 1. It was lowered in rank a week later, without mention of the apparent discrepancy. A more serious error occurred on December 21, 1973 when 101 stocks were listed as belonging to Group 1. In trying to cope with these errors one must rely on the Summary of Advice section as being correct and one must behave as a typical, rational investor. Note that one cannot go back to the original reports for verification since those full page reports are published only four times a year, and therefore are likely to be out-dated.

When the data was coded it consisted of 917 different companies with roughly five additions and five deletions each week. Some weeks there were no changes to the portfolio, and other weeks, those which coincided with many quarterly company earnings reports publication contained

roughly 30 portfolio updates. The data span a 321 week period.

Computer Program 1: Weekly Portfolio Generation

The function of computer Program 1, which was written in FORTRAN, was to translate the initial stock portfolio and weekly updates into a sequence of data identified weekly portfolios. For input, the Program required the initial portfolio and data cards in the following format:

Date	+ or -	ICUSIP Number (8 digit)
YYMMDD	+	Stock 1, Stock 2, Stock 3 ....

The Program generated output to a disk storage file. This output consisted of: weekly portfolios, cumulative stock list and number, date list and week number. As a verification of sample data check, the program detected and printed error messages if the add or drop symbol was incorrect, if an attempt was made to drop a company not in the current portfolio, or if one tried to add a stock that already existed in the Group 1 domain. The program maintained updated portfolios in numerical (alphabetical) order. The programs are reproduced in the Appendices.

Computer Program 2: Stock Name Portfolio Verification

Program 2 was designed solely for data verification purposes. It consists of two parts. The first reads the CRSP (Chicago Research in Security Prices) computer tapes and stores the names of the companies previously identified

by ICUSIP numbers. The second half of the Program prints weekly portfolios, identifying companies by name. Inputs included two volume CRSP data tapes, disk file of weekly portfolios from Program 1, and a disk file of the cumulative company list from Program 1. The output is a cumulative list of companies names, a printout of weekly stock portfolios by name, and a list of bad ICUSIP numbers, that is, numbers not found on the CRSP tapes. This may be due to read errors, or more likely because there is no company issued to that ICUSIP number, in which case a keypunch error is uncovered. This output was compared to the original Value Line survey to provide data verification.

Computer Program 3: Variable Vector Displacement  
Returns Generation.

Program 3 performed all of the computation for the thesis. It required two megabytes of core storage and ten cylinders of temporary disk storage. (Including tape mounting charges it cost roughly \$50.00 per run.) Inputs to Program 3 included complete CRSP daily stock returns, 2 volume tapes, a cumulative list of 917 companies, a weekly data list, weekly portfolio composition, and calendar of vector addresses of returns on tape. Output of Program 3 contains a disk file of weekly market returns, a disk file of weekly Group 1 portfolio returns, and cumulative returns.

This program computed weekly market returns from the daily returns on the tape. It also calculated Group 1 portfolio weekly returns from the individual stock daily returns and then formed the 100 stock portfolio.

Two decisions were made when writing Program 3. The first was to equally weight the Value Line portfolio of Group 1 securities. The second involved the choice of the market indices to read from the CRSP tape. This program also provided the researcher with the option to simulate different purchasing acquisitions delays around the Value Line publication date. It was run for each of these variations:

Days (-) Acceleration/Delay Before Trading  
on Value Line Recommendation

Run 1	-5 Business days, prior Friday
Run 2	0 Delay, publication date
Run 3	5 Business days, delay, subsequent Friday
Run 4	10 Business days, delay, two weeks
Run 5	20 Business days, delay, four weeks

Most investors receive their copy of the Value Line survey in the Friday mail. (This was discovered by examination of the library reception stamps on survey copies.) Due to the Friday market closing, those prices were used as the base, zero delay case for my analysis.

When deciding the choice of a market index, some believe the best choice was one that most closely represented the whole market. Such a decision is independent of this, or any other survey. Another view involves comparing Value Line's performance with a passive strategy demonstrating a high correlation, mixed with lending or borrowing. This could be a technical buy and hold strategy. The comparison with a highly correlated index would provide a good measure of whether Value Line does really do better.

Definition of a surrogate for the market is difficult. Therefore, one must compare the Value Line portfolio to the three indices; the equally weighted market, the value weighted market, and the Standard and Poor's "500" composite. The Value Line portfolio is assembled weekly, buying an equal dollar amount of each stock ranked 1, selling at the end of the week, producing a return figure and repeating weekly.

The weighting of an index reflects the representative importance of each stock. Value weighted indexes are dominated by the larger high capitalization companies. Equally weighted indexes give greater weight to smaller companies. A value weighted index oriented or ranked strategy can be followed by all investors when the individual stocks are weighted in relation to the company's value. In order for all investors to hold an equally weighted portfolio, major capital redistribution must occur.

The Standard and Poor's "500" composite index includes 425 industries, 25 railroads and 50 utilities. The market value of the stocks in this value weighted index comprise about 80% of the value of the New York Stock Exchange.

Professor Fischer Black made the suggestion that an equally weighted index of the stocks listed on the New York and American Stock Exchanges, may behave similarly to a value weighted proxy of all capital assets, which is really the ideal index representation from some points of view.

Another important issue regards market indices and portfolio evaluation as methods of averaging. These two most commonly used methods are an arithmetic mean, or a geometric mean. Value Line uses geometric averages for their in-house research. Most others use arithmetic measures. Indices based on geometric means will increase more slowly and decrease more rapidly than an index based on an arithmetic mean. Utilization of an arithmetic mean makes more sense for comparative performance research. It corresponds to the performance that could be duplicated by an investor who rebalances his portfolio each period, to include equal dollar weights of each included stock. The geometric mean is the  $N^{\text{th}}$  root of the product of  $N$  observations. The arithmetic mean is the simple average.

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Computer Program 4: Ibbotson - Sinquifield  
Treasury Bill Program

The only program run in the batch mode was the one to read the Ibbotson - Sinquifield tapes. These tapes provide the monthly U.S. Treasury Bill returns. This index of short term rates, of Treasury Bills of the shortest maturity greater than one month, was utilized as the risk free rate in the capital asset pricing mode equation. The tapes M.I.T.'s Sloan School of Management own (supplied by the Center for Research in Security Prices) end in 1976. I coded by hand the 1977 returns according to the Ibbotson - Sinquifield procedure:

$$R_{FT} = P_{F, T/P_r, (T-1)} - 1$$

Where T=month,  $R_F$ =Treasury Bill Returns,  $P_r$ =Price. I collected the data from the Wall Street Journal. All monthly returns were compounded to a weekly series for the regression.

The program environment consisted of FORTRAN, executed on the conversational monitor system operated under the IBM Virtual Machine Facility 370. The interactive mode of operation made data correction, location and verification easier than under a batch system. The CRSP computer tapes provided daily stock returns for the American and New York Stock Exchange universe. Stock return is defined as a change in total value of an investment for a common stock



for a period. The returns are completely adjusted for dividends and other distributions.

The last program was written in TSP, Time Series Processor. It calculates ordinary least square linear regressions on the return data generated by the previous programs. The output of TSP included estimates of regressional coefficients, estimates of standard errors, and t-statistics for the null hypothesis that individual regression coefficients are not zero, and  $R^2$ .

TSP produces a least square linear regression equation such that:

$$\hat{y} = a + bx \text{ such that}$$

$$\sum (y, -\hat{y})^2 \text{ is minimized}$$

$$\beta = \frac{\sum (x_1 - \bar{x})(y, -\bar{y})}{\sum (x_1 - \bar{x})^2}$$

$$\alpha = \bar{y} - b\bar{x}$$

coefficient of determination

$$r^2 = \frac{\sum (\hat{y}, -\bar{y})^2}{\sum (\hat{y}, -\bar{y})^2}$$

$$\text{t-statistic} \quad \frac{(\alpha) \text{ or } (\beta)}{\sqrt{\frac{\sum (y, -\bar{y})^2}{N-2}}}$$

$$\sqrt{\frac{\sum (y, -\bar{y})^2}{N-2}}$$

The TSP program takes as inputs; weekly portfolio returns, weekly equally weighted market returns, weekly Standard and Poor's "500" returns, and weekly Treasury Bill returns. The program generates excess returns variables and performs the following regressions:

Dependent Variable		Independent Variable
(Value Line Portfolio -Treasury Bill Returns)	/	(Equally weighted port- folio -Treasury Bill)
(Value Line Portfolio -Treasury Bill)	/	(Value weighted portfolio - Treasury Bill)
(Value Line Portfolio -Treasury Bill)	/	(Standard and Poor's port- folio -Treasury Bill)

Regressions are performed for the total period as well as yearly sub-periods. Professor Black recommended the regression method of testing which he utilized in his Value Line survey because of its ability to demonstrate consistency of performance. In order to compare different portfolios a method must be used to relate the beta, or relative risk, and interpret the rate of return. Adjustment for the effect of beta were conducted by examination of the extra return of the Value Line portfolio after regressing the excess returns of Value Line on the excess returns of the market (by subtracting out the Treasury Bill Rate). The extra return is represented by the alpha ( $\alpha$ ) in the regression equation. The Value Line portfolio excess return is the dependent variable.

$$R_{VL} - R_F = \alpha_p + \beta_p (R_m - R_F) + \epsilon_p$$

$R_{VL}$  = weekly return on Value Line portfolio

$R_F$  = one week Treasury Bill rate, updated monthly

$R_m$  = return on marked index

$\beta_{VL}$  = beta of Value Line

$\alpha_{VL}$  = extra return of Value Line portfolio

$\epsilon_{VL}$  = error term, assuming normal distribution  
should be zero

If the market is truly efficient, and Value Line does not have the ability to discriminate over/under valued securities, alpha ( $\alpha$ ) should be zero. The t-statistic of the alpha is the important statistic, dividing alpha by the standard error, a t-statistic greater than 2 is considered to allow rejection of the hypothesis that alpha is zero at the 95% confidence level.

In estimating alpha, considered the measure of Value Line's performance, the effect of varying risk is adjusted regardless of general economic conditions. Market movements should have no effect on this measure of performance.

Chapter 5  
RESULTS

This thesis tests the hypothesis; the Value Line investment strategy produces no extra return on a market portfolio over an eight year test period. Regression testing adjusts for different sensitivity and risk of various portfolios. In addition, simple growth figures are presented. These are not risk normalized, but are still a good performance measure because the test period is an almost flat period for the value weighted portfolios in the growth of equities. This is verified by the performance of market indices. Observations were weekly unless identified otherwise.

Table 5 summarizes the results of unadjusted market growth over the 1971-1977 period. During this eight year period an initial investment in the Standard and Poor's "500" index would have just maintained its dollar value, (non-inflation adjusted), growing to only 1.01 times its initial investment. (This is an arithmetic average of the returns presented on the Table.) A value weighted index did slightly better growing to 1.28 the initial investment. The equally weighted portfolio showed better performance growing to 2.35 times the initial investment.

It is difficult to say which index best describes the true market movements for the period. I favor the

Table 5

<u>TOTAL PORTFOLIO GROWTH 1971-1977 (1971 = 1.00)</u>				
<u>Days to follow Value Line advice</u>	<u>Equally weighted market portfolio</u>	<u>Value weighted market portfolio</u>	<u>Standard &amp; Poor's "500"</u>	<u>Value Line portfolio</u>
-5	2.3	1.3	.99	5.8
0	2.3	1.3	1.0	4.7
5	2.4	1.3	1.0	3.2
10	2.4	1.3	1.0	2.9
20	2.3	1.2	.98	2.5

Treasury Bill growth 1.4

1521

Graph 1

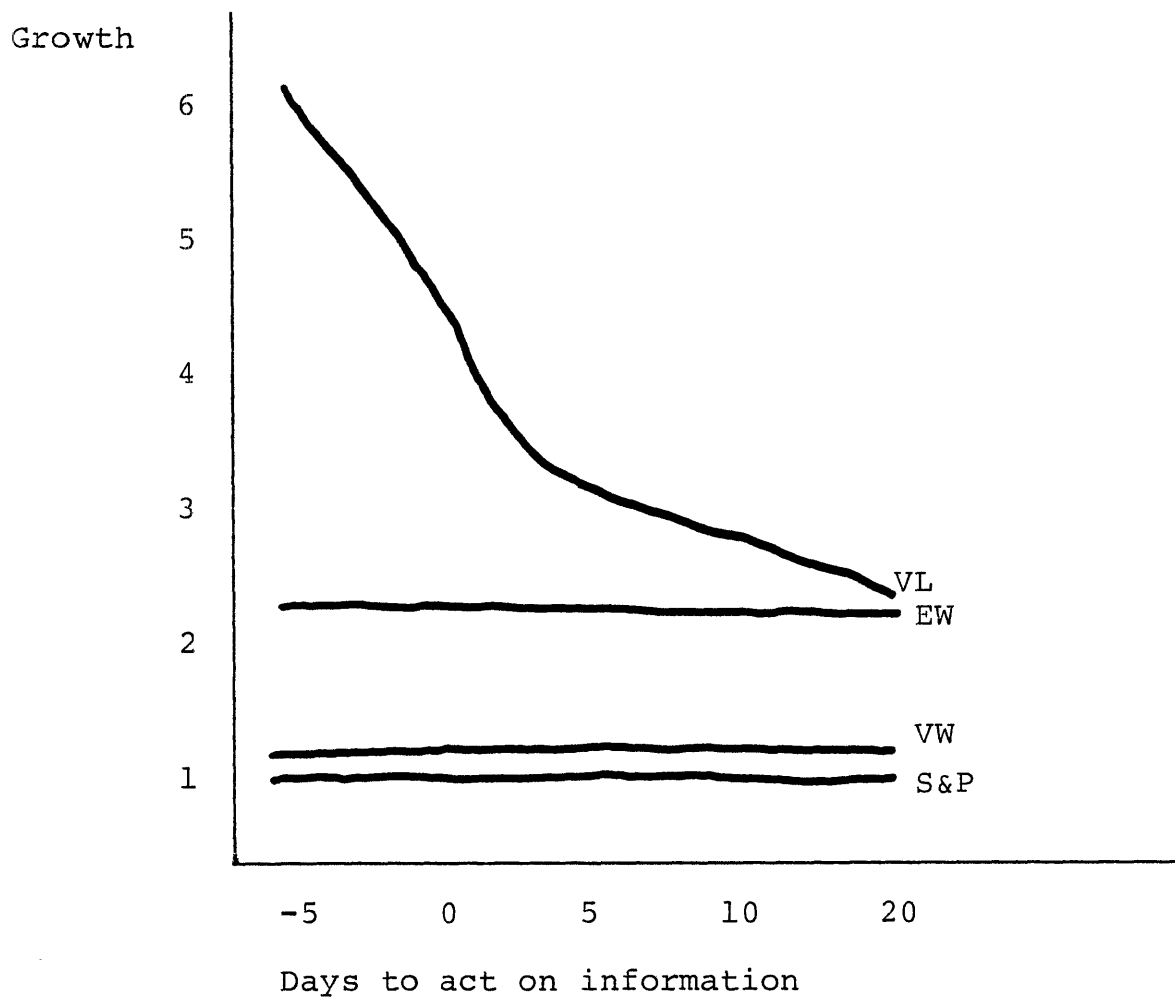
TOTAL PORTFOLIO GROWTH

Value Line = V.L.

Equally weighted = E.W.

Value weighted = V.W.

Standard and Poor's "500" = S&P



equally weighted index. It represents a broad selection of construction of the Value Line portfolio presented in this paper. This point may be inconsequential however, since, as mentioned earlier, the choice of a market index may be independent of my Value Line portfolio construction.

It appears that smaller companies performed better than the large capitalization companies for the survey period. This fact helps explain the superiority of performance of the equally weighted index.

In evaluating the growth of the Value Line portfolio, one may notice that if one pursued the hypothetical but impossible strategy of purchasing the recommended stocks five days before receipt of the recommendations in the mail, one would have realized growth of 5.8 times the initial investment. This would be impossible for the casual investor. However, it is possible to keep track of current earning reports, and be especially observant of falling earnings -- leading to an early prediction of an upcoming Value Line drop recommendation. It is more difficult to predict a Value Line upcoming add recommendation. The investor must scan the set of 300 stocks ranked 2 to search for sharply increasing earnings which may signal an upgrading in rank. Whereas the investor must only scan the 100 Group 1 securities in search of a drop recommendation.

Furthermore, academicians may find this result fascinating, since it is very likely after the date on which the Value Line computer oriented mechanized stock valuation formula is applied a trading date on which Value Line utilizes the information to manage their supervisory funds.

To purchase stocks on the same day as receipt of the publication is the first strategy that can easily be adhered to. Following this strategy, the initial investment would grow 4.8 times. These figures make no provision for transaction costs, brokerage commission, or taxes which would become due when following a trading strategy. Those taxes would be deferred when following a buy and hold strategy such as buying one of the indices. Even with these negative factors, 4.8 times growth compared with 2.3 times growth for the equally weighted portfolio has value as a strategy and could absorb considerable expenses and continue to maintain its superiority.

Investment strategies simulating delays of 5, 10, and 20 days before purchase or sale of the Value Line Rank 1 securities were tested. Growth was 3.2, 2.9 times and 2.5 times respectively. Notice growth was perfectly inversely ranked with trading delay. If one followed the alternative of delaying a month before acting upon the Value Line recommendation, the total portfolio growth of 2.5 times would be very close to the growth of the equally



weighted portfolio of 2.4 times. Of course the active trading strategy is subject to many expenses the buy and hold strategy avoids.

Even waiting four weeks after the report publication, the Value Line return does not drop below that of the best of the market indices. In addition, it was observed, non risk adjusted, that for all trading delays, in terms of total growth, Value Line did better than the value weighted portfolio and the Standard and Poor's "500" index.

During this same period, an investment in Treasury Bills grew to 1.4 times the initial investment. Treasury Bills are considered the risk free investment. The reader should notice that the risk free investment outperformed two of the market indices, doing better than the value weighted combined New York and American Stock Exchange index, and the Standard and Poor's "500" index.

It is not wise to rely heavily on the unadjusted growth figures without considering the regression results. The Value Line portfolios are not as well diversified as the market indices and not all of the portfolio movements are described by the market. When stocks were purchased on the Friday of publication,  $R^2$  terms were:  $R^2=.85$  for regression on the equally weighted portfolios;  $R^2=.79$  for regression on the value weighted portfolios;  $R^2=.73$  for regression on the Standard and Poor's "500". Correlation

coefficients are:

Equally weighted portfolio	.92
Value weighted portfolio	.89
Standard and Poor's "500"	.86

This demonstrates that most of the Value Line portfolio movement is explained by market movement. It is this divergence from returns predicted by market movements that allows the portfolio to achieve superior performance.

If the Value Line portfolio is a riskier portfolio, modern portfolio theory would lead us to expect extra return to compensate for this risk. Modern portfolio theory states that an investor should be rewarded only for the non-diversifiable risk associated with the market. There should be no benefit for holding company specific risk. One would expect an extra reward to induce holding an undiversified stock portfolio. In addition, if the Value Line portfolio is riskier, (more volatile), than the market indexes, in an up market, it would be expected to produce more growth. This growth however would not be a measure of special predictive ability, but the result of holding a risky portfolio.

Of course, it is possible that there exists a market timing element in the Value Line analysis which indicates the proper periods in which to shift into high or low beta portfolios. Naturally, Value Line should choose

high beta portfolios when an up market is anticipated, and low beta portfolios if a downturn is evident. If a downturn is evident, however, another strategy is to get out of stocks completely, or invest in negative beta securities. This question in regard to Value Line must be studied elsewhere.

Table 5 also provides the answer of a valid question. Suppose Value Line really does not have any ability to discriminate. Suppose that the subscribers have been led to believe that the Value Line analysts have predictive ability. This may just be a rationalization for spending the approximately \$300.00 for the yearly Value Line subscription, or it may be they like executing trades with their brokers, enjoy receiving mail, reading the Value Line research, or are non-value maximizers. If investors automatically followed Value Line advice, the recommended stocks would rise in price in the short run. However, if there was really no information content in the Value Line report, one might suspect that by the time one month elapsed, the fairly efficient market would once again correctly price each security. The growth figure for Value Line with the 20 day delay would be below that of the equally weighted portfolio. Therefore, Value Line recommendations probably contain some information not yet disseminated to the efficient market before publication.

Table 6 will allow us to quantify the Value Line advantage. It summarizes the results of the 1971-1977 regressions, together with the important statistics, the alpha, t-statistic for the alpha, the beta coefficients calculated for each trading delay purchase of sale. All of the  $R^2$  were high and the t-statistics of the betas were very high (10 and above)).

The striking observation derived from Table 2 is the perfect rank correlation of alphas for each of the market indices. Notice all of the alphas are positive. In all cases, they decrease with increased trading delay. The alphas are adjusted to be meaningful yearly percentage indicators.

I believe the most profound single figure of this thesis is presented in Table 6. Taking market action on the Friday of publication, the Value Line portfolio, when regressed against an equally weighted market index, (the best representative proxy for the market), resulted in a positive alpha of 12. significant with a t-statistic of 3.6 and a beta of 1.04. This strongly suggests that Value Line recommendations do produce investment strategies which consistently outperform the market by over 10%. This figure is large enough to absorb considerable transaction expense.

Table 6

SUMMARY OF 1971-1977 DATA  
VALUE LINE VS. MARKET INDICES

Equally Weighted Portfolio			
<u>Days until acting on Value Line recommendations</u>	<u>Alpha%</u>	<u>t-statistic</u>	<u>Beta</u>
-5 days	15.	4.5	1.0
0 days	12.	3.6	1.0
5 days	4.6	1.4	1.0
10 days	3.2	1.0	1.0
20 days	1.6	.49	.99
Value Weighted Portfolio			
<u>Alpha%</u>	<u>t-statistic</u>	<u>Beta</u>	
26.	6.5	1.1	
22.	5.7	1.1	
15.	3.9	1.1	
14.	3.4	1.1	
12.	3.1	1.1	
Standard and Poor's "500"			
<u>Alpha%</u>	<u>t-statistic</u>	<u>Beta</u>	
30.	6.5	1.1	
26.	6.0	1.1	
19.	4.3	1.0	
18.	3.9	1.0	
10.	3.7	1.0	

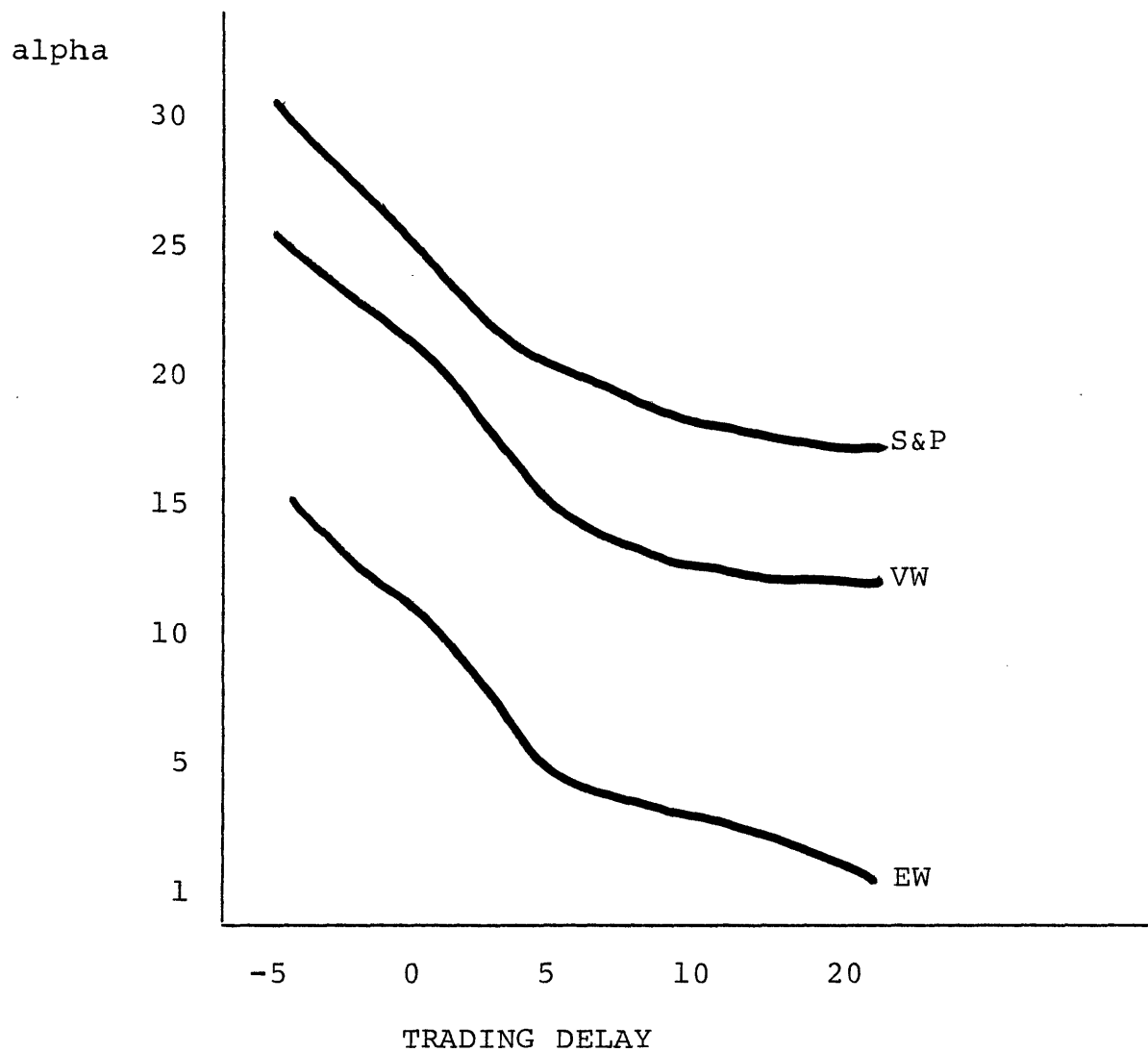
Graph 2

EXTRA RETURN 1971-1977 DATA VS. DELAY IN DAYS

Value Weighted = V.W.

Equally Weighted = E.W.

Standard and Poor's "500" = S&P



Concentrating on the equally weighted portfolio, the alphas were positive and statistically significant for -5 days and 0 days delay, 15. (t-statistic 4.5) and 12. (t-statistic 3.5) respectively. The time delay between acting on the Value Line recommendation immediately and waiting a week are the most noticeable in terms of extra returns. After a week's delay the alpha is reduced to 4.5 (t-statistic 1.4) with a low t-statistic which does not disprove the null hypothesis at the 95% confidence level.

For delays of 10 and 20 days the alphas were lower: 3.2 and 1.6, with low t-statistics of 1.0 and .49. The beta of the regressions varied from 1.04 to .99, all approximately equal to the market beta of 1.0. Of course all of the market indices do not have the same level of risk. This would suggest that an equally weighted index, accentuating the effect of smaller companies compared to a value weighted index, stressing larger companies, would be more volatile, since the smaller companies in general may be riskier than the larger ones.

Both the value weighted and the Standard and Poor's "500" index show the same rank ordering of alpha over the entire study period. However, from Table 6, recorded alphas are higher for 0 days delay; 22.2% (5.66) for value weight and 26.2% (5.95) for the Standard and Poor's "500". The Value Line portfolio regressed against these

two market indices produced significant t-statistics, (over 2), for all trading day displacements.

In the same way as demonstrated earlier the t-statistic declines as the trading delay increases.

Alpha decline Trading - 5 to 20 days

Equally weighted	15. to 1.5
Value weight	26. to 12.
Standard & Poor's "500"	30. to 16.

This table confirms that regardless of which market index one prefers, there is a Value Line strategy that produces large significantly positive alphas, ignoring transaction costs and taxes.

Tables 7 through 11 provide yearly extra return figures, t-statistic and betas.

Market Rundown

		Equally weighted	Value weighted
1972	Up year	5.%	17.%
1973	Down year	-26.%	-17.%
1974	Down year	-20.%	-22.%
1975	Up year	58.%	31.%
1976	Up year	49.%	18.%
1977	mixed	17.%	-2.%



Table 7 summarizes results for -5 trading days for the three market indices. All of the alphas are positive ranging from 38.% to 1.7%. However, for many of the yearly periods, the t-statistic does not demonstrate an alpha appreciably different from zero at the 95% confidence level. However the majority of our conclusion can be drawn from the total period results. I would not look for significance within the yearly figures.

Table 8 presents yearly data for 0 days market action delay. This table shows two negative alphas. Both are less than 1% yearly and they have very low t-statistics. The equally weighted portfolio regression demonstrates alphas of 23.% and 24.% for 1973 and 1974 with significant t-statistics. The value weighted indices show significance for 1974 through 1977 with yearly alphas in the 30% range.

Table 9 represents yearly data, observing a five day delay before acting on Value Line recommendations. The general level of t-statistics decreased with four negative alpha observations. Otherwise, in general, alphas are positive and large.

Table 10 summarizes results for a two week, (10 day), trading delay period. Once again there are four negative observations of alphas. Although a t-statistic of -1.6 on a two tailed test is not significant at the 95%

Table 7

SUMMARY OF DATA FOR STOCK PURCHASE 5 DAYS  
BEFORE VALUE LINE PUBLICATION

Equally Weighted Portfolio

<u>Year</u>	<u>Alpha%</u>	<u>t-statistic</u>	<u>Beta</u>
1971-1977	15.	4.5	1.0
1972	10.	1.7	.86
1973	24.	3.2	1.0
1974	28.	3.3	1.1
1975	12.	.90	1.0
1976	4.	.90	1.0
1977	7.	.52	1.1

Value Weighted Portfolio

<u>Year</u>	<u>Alpha%</u>	<u>t-statistic</u>	<u>Beta</u>
1971-1977	26.	6.5	1.1
1972	1.6	.36	1.1
1973	11.	1.1	1.2
1974	33.	2.3	.89
1975	31.	3.1	1.3
1976	22.	2.9	1.5
1977	39.	6.1	1.3

Standard and Poor's "500"

<u>Year</u>	<u>Alpha%</u>	<u>t-statistic</u>	<u>Beta</u>
1971-1977	30.	6.4	1.1
1972	4.0	.77	1.1
1973	9.7	.82	1.2
1974	34.	2.2	.85
1975	37.	3.3	1.3
1976	32.	3.7	1.4
1977	47.	6.4	1.2

Table 8

SUMMARY OF DATA FOR STOCK PURCHASE ON DAY OF  
VALUE LINE RECEIPT

Equally Weighted Portfolio

<u>Year</u>	<u>Alpha%</u>	<u>t-statistic</u>	<u>Beta</u>
1971-1977	12.	3.6	1.0
1972	10.	1.7	.89
1973	23.	3.4	.99
1974	24.	2.8	1.1
1975	6.	.48	1.1
1976	-0.92	-.10	1.1
1977	4.1	.92	1.5

Value Weighted Portfolio

<u>Year</u>	<u>Alpha%</u>	<u>t-statistic</u>	<u>Beta</u>
1971-1977	22.	5.7	1.1
1972	-0.34	-.74	1.1
1973	15.	1.3	1.2
1974	27.	2.1	.88
1975	28.	2.7	1.3
1976	21.	2.6	1.5
1977	31.	5.4	1.3

Standard and Poor's "500"

<u>Year</u>	<u>Alpha%</u>	<u>t-statistic</u>	<u>Beta</u>
1971-1977	26.	5.9	1.1
1972	1.4	.28	1.0
1973	14.	1.1	1.2
1974	28.	1.9	.84
1975	35.	3.0	1.3
1976	31.	3.5	1.4
1977	40.	5.9	1.2

Table 9

SUMMARY OF DATA FOR STOCK PURCHASE FIVE DAYS AFTER  
RECEIPT OF VALUE LINE RECOMMENDATION

Equally Weighted Portfolio

<u>Year</u>	<u>Alpha%</u>	<u>t-statistic</u>	<u>Beta</u>
1971-1977	4.6	1.4	1.0
1972	7.5	1.6	.99
1973	16.	2.3	.97
1974	12.	1.3	.96
1975	-6.7	-.56	1.1
1976	-10.	-1.3	1.1
1977	2.7	.61	1.5

Value Weighted Portfolio

<u>Year</u>	<u>Alpha%</u>	<u>t-statistic</u>	<u>Beta</u>
1971-1977	15.	3.8	1.1
1972	-4.9	-1.1	1.1
1973	15.	1.1	1.1
1974	19.	1.5	.89
1975	14.	1.4	1.3
1976	12.	1.6	1.5
1977	24.	4.3	1.4

Standard and Poor's "500"

<u>Year</u>	<u>Alpha%</u>	<u>t-statistic</u>	<u>Beta</u>
1971-1977	19.	4.3	1.0
1972	-3.	-.68	1.0
1973	14.	.92	1.1
1974	21.	1.5	.86
1975	20.	1.8	1.2
1976	22.	2.5	1.4
1977	33.	4.9	1.3

Table 10

SUMMARY OF DATA FOR PURCHASE OF STOCK TEN DAYS AFTER  
RECEIPT OF VALUE LINE RECOMMENDATION

Equally Weighted Portfolio

<u>Year</u>	<u>Alpha%</u>	<u>t-statistic</u>	<u>Beta</u>
1971-1977	3.3	1.0	1.0
1972	7.8	1.7	1.0
1973	16.	2.5	.97
1974	6.9	.75	.94
1975	7.1	.63	1.1
1976	-12.	1.6	1.1
1977	-3.4	.71	1.5

Value Weighted Portfolio

<u>Year</u>	<u>Alpha%</u>	<u>t-statistic</u>	<u>Beta</u>
1971-1977	13.	3.3	1.1
1972	-6.1	-1.3	1.1
1973	15.	1.0	1.1
1974	19.	1.5	.89
1975	12.	1.2	1.3
1976	11.	1.4	1.4
1977	21.	3.6	1.4

Standard and Poor's "500"

<u>Year</u>	<u>Alpha%</u>	<u>t-statistic</u>	<u>Beta</u>
1971-1977	18.	3.9	1.0
1972	-5.0	-.97	1.0
1973	14.	.84	1.0
1974	20.	1.5	.86
1975	18.	1.5	1.2
1976	20.	2.3	1.3
1977	30.	4.4	1.3

Table 11

SUMMARY OF DATA FOR PURCHASE OF STOCK TWENTY DAYS AFTER  
RECEIPT OF VALUE LINE RECOMMENDATION

Equally Weighted Portfolio

<u>Year</u>	<u>Alpha%</u>	<u>t-statistic</u>	<u>Beta</u>
1971-1977	1.6	.49	.99
1972	5.8	1.3	1.0
1973	17.	2.6	.96
1974	2.3	.24	.92
1975	-11.	-1.1	1.2
1976	-11.	-1.4	1.1
1977	5.2	1.1	1.5

Value Weighted Portfolio

<u>Year</u>	<u>Alpha%</u>	<u>t-statistic</u>	<u>Beta</u>
1971-1977	12.	3.1	1.1
1972	-12.	-2.8	1.1
1973	20.	1.4	1.1
1974	16.	1.3	.92
1975	10.	1.1	1.3
1976	10.	1.4	1.4
1977	18.	3.5	1.4

Standard and Poor's "500"

<u>Year</u>	<u>Alpha%</u>	<u>t-statistic</u>	<u>Beta</u>
1971-1977	16.	3.6	1.0
1972	-12.	-2.5	1.1
1973	21.	1.3	1.1
1974	18.	1.4	.89
1975	16.	1.8	1.2
1976	19.	2.2	1.3
1977	27.	4.2	1.3

confidence level, the probability of achieving it by chance alone is still quite small. This is the t-statistic for a -12.% alpha in 1976 regressed against the equally weighted portfolio. Otherwise the results seen are similar to the 5 day delay.

Table 11 simulates a strategy of delays four weeks before action on Value Line advice. There are four negative alpha figures and two significant with t-statistics less than -2. The positive alphas are generally lower than the other delays, nevertheless they are primarily in the 10 and 20 percent range. It is shown that over the entire test period, results were significantly lower when there is delay in following the Value Line recommendations. However, even after four weeks delay, this table demonstrates that Value Line would prove useful in certain periods, although there were also significant negative alphas for the one month delay.

The issue of the extent to which Value Line projects, and practices market timing remains unresolved. The methodology did not provide discriminate information for beta movement analysis. Although the tables demonstrate that betas vary yearly, there is no strong support for the intent of this variance.

Table 12 supplies total period and yearly subdivided one month Treasury Bill returns. Notice interest

Table 12

TREASURY BILL RETURNS  
1971-1977

Total Period Return	40.
Yearly Returns	
1972	3.73%
1973	6.43%
1974	7.69%
1975	5.78%
1976	5.10%
1977	4.89%



rates were highest in 1974 ranking at 7.7% and lowest in 1977 at 3.7%.

Table 13 presents yearly cumulative growth of market returns, Treasury Bills and the Value Line portfolio. The choice of investment which would have produced the best results, at year end, independent of risk, may be determined in this table.

From November 1971 to the end of 1972, an investor would have done best if he had invested in a value weighted market portfolio, although the difference between any of the market alternatives were within a few percentage points. To the end of 1973, the Value Line strategy would have been the best decision with growth of 1.18 times the initial investment. By the end of 1974, because of a dramatic market decline, one would have done best by having initially invested in the risk free asset, Treasury Bills. Of course Treasury Bill returns may have been higher if longer maturities were purchased. For 1975, 1976, and 1977, it appears that the initial investment in Value Line would have been the best investment, demonstrating growth to 2.2 times, 3.6 times, and 4.7 times.

Table 14 presents market yearly growth. Volatility, can be observed, as well as the mixed returns of 1977, "zero" days, trading delay with the equally weighted index down 1.7%, Value Line up 29%, but the value weighted index

Table 13

CUMULATIVE MARKET RETURNZERO DAYS DELAY IN FOLLOWING VALUE LINERECOMMENDATION

	<u>Equally Weighted</u>	<u>Value Weighted</u>	<u>Standard &amp; Poor's "500"</u>	<u>Treasury Bill</u>	<u>Value Line Zero Days Delay</u>
End 1971	1.15	1.09	1.08	1.01	1.10
End 1972	1.21	1.29	1.26	1.05	1.29
End 1973	.890	1.07	1.05	1.11	1.18
End 1974	.709	.780	.740	1.20	1.17
End 1975	1.22	1.04	.951	1.27	2.21
End 1976	1.95	1.30	1.10	1.34	3.65
End 1977	2.30	1.27	1.00	1.40	4.7

-73-

November 1971 = 1.00

Graph 3

CUMULATIVE PORTFOLIO GROWTH

Treasury Bill = T.B.

Value Line = V.L.

Equally weighted = E.W.

Value Weighted = V.W.

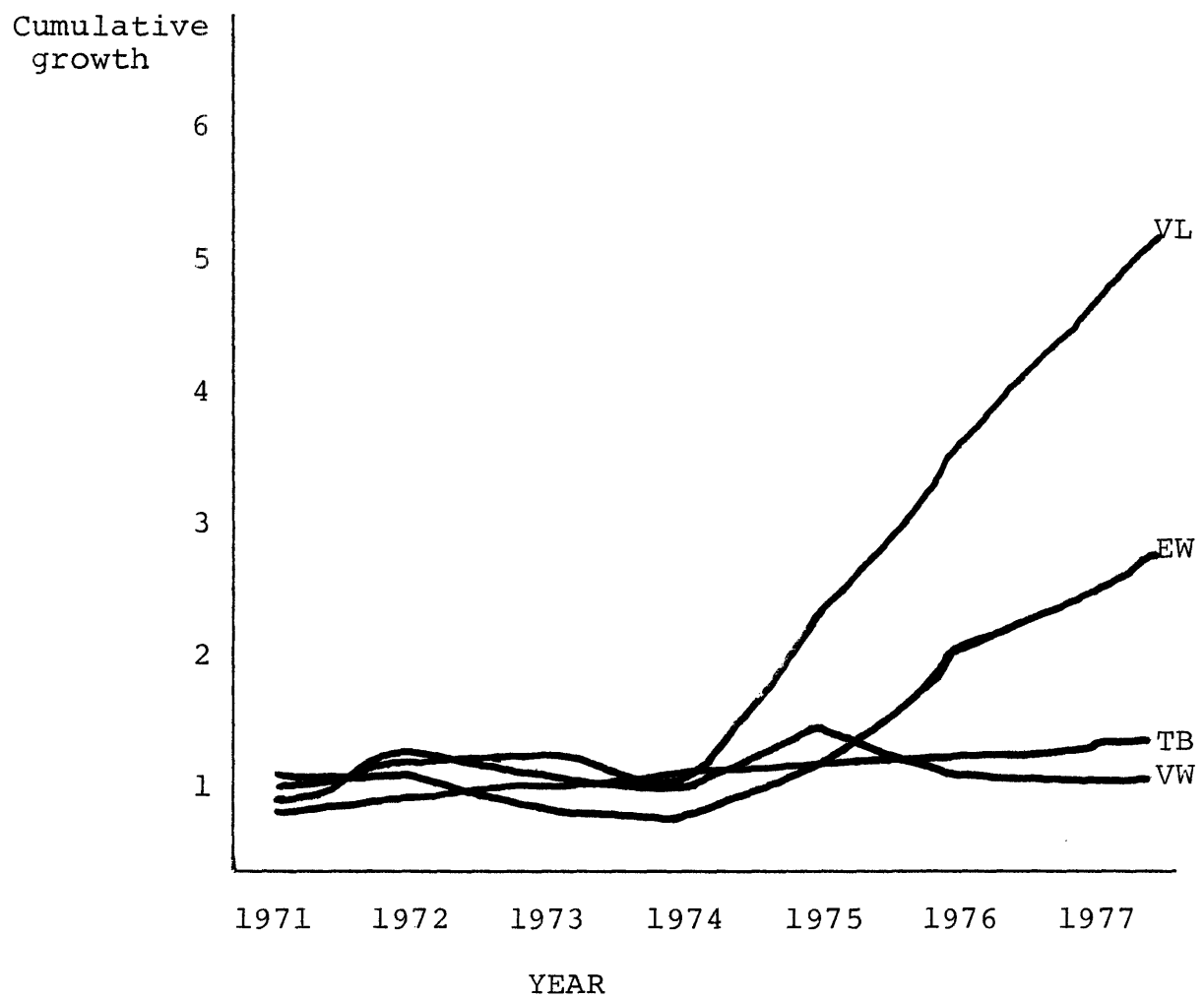


Table 14

YEARLY GROWTH PORTFOLIO

<u>(-5 Days)</u> <u>Year</u>	<u>Equally</u> <u>Weighted</u>	<u>Value</u> <u>Weighted</u>	<u>Standard &amp;</u> <u>Poor's "500"</u>	<u>Value</u> <u>Line</u>
1972	3.0%	14.%	12.%	17.%
1973	-34.%	-20.%	-20.%	-16.%
1974	-27.%	-31.%	-33.%	-5.1%
1975	66.%	31.%	27.%	90.%
1976	56.%	26.%	18.%	71.%
1977	16.%	-3.6%	-11.%	34.%
 ( 0 Days)	 Equally	 Value	 Standard &	 Value
 <u>Year</u>	 <u>Weighted</u>	 <u>Weighted</u>	 <u>Poor's "500"</u>	 <u>Line</u>
1972	5.3%	17.%	16.%	17.%
1973	-25.%	-17.%	-17.%	-8.1%
1974	-20.%	-22.%	.24%	1.0%
1975	58.%	31.%	27.%	79.%
1976	49.%	18.%	11.%	54.%
1977	17.%	-1.7%	-8.5%	29.%
 ( 5 Days)	 Equally	 Value	 Standard &	 Value
 <u>Year</u>	 <u>Weighted</u>	 <u>Weighted</u>	 <u>Poor's "500"</u>	 <u>Line</u>
1972	3.3%	16.%	15.%	11.%
1973	-26.%	-21.%	-22.%	-12.%
1974	-16.%	-24.%	-27.%	-5.%
1975	62.%	35.%	31.%	63.%
1976	43.%	15.%	7.8%	34.%
1977	17.%	-0.78%	-7.5%	20.%
 (10 Days)	 Equally	 Value	 Standard &	 Value
 <u>Year</u>	 <u>Weighted</u>	 <u>Weighted</u>	 <u>Poor's "500"</u>	 <u>Line</u>
1972	0.24%	15.%	15.%	8.0%
1973	-20.%	-15.%	-16.%	4.0%
1974	-12.%	-23.%	-26.%	-5.6%
1975	66.%	38.%	34.%	63.%
1976	39.%	12.%	5.0%	25.%
1977	17.%	0.19%	-6.3%	19.%

Table 14 (cont'd.)

YEARLY GROWTH PORTFOLIO

<u>(20 Days) Year</u>	<u>Equally Weighted</u>	<u>Value Weighted</u>	<u>Standard &amp; Poor's "500"</u>	<u>Value Line</u>
1972	-9.1%	7.7%	8.3%	-3.%
1973	-15.%	-14.%	-16.%	1.6%
1974	-3.%	-16.%	-18.%	-0.08%
1975	59.%	32.%	27.%	55.%
1976	29.%	8.0%	1.4%	20.%
1977	18.%	1.1%	-5.1%	19.%

down 1.7% and the Standard and Poor's "500" down 8.5%.

The empirical data presented in these tables provide strong support for the verification of Value Line Investment Survey as a useful investment advisory service.

## Chapter 6

### TAXATION AND TRADING STRATEGY

Taxation is an important determinant in the investor's behavior. This section is intended to be thought-provoking, however it is not a comprehensive dissertation on tax management in investment strategy.

People often talk about taxes, they usually complain about paying taxes which are too high. Frequently, they look for a way to minimize their tax liability; however, they continue to make investment decisions with little regard to the future tax consequences.

In my classes at Sloan there are many instances where I have been part of purely theoretical decisions where taxes and transaction costs are ignored. I have also witnessed taxation discussions which ignore the advanced management techniques necessary to do sophisticated financial planning. As C. P. Snow would say, I hope to bridge the gap between these two extremes and provide an investment framework which considers with a careful methodology the consequences due to taxation.

Textbooks seem to skim over the issue of personal taxation, yet they describe elaborate methods to maximize financial decisions. There are also books describing almost every one of the myriad of taxation issues -- yet no one

speaks of maximizing decisions after taxes. I admit my methods may show rough edges, but my goal is to examine tax strategies to maximize return after taxes.

I assume that an individual's primary goal is to maximize his economic welfare when involved in an investment strategy. This maximization to be realized must be net of taxes. My purpose is to develop a simple model example of taxation which takes explicit account of the individual's liabilities both for ordinary income and capital gains taxes. I hope to identify a set of guides and logical investment decisions.

This section will compare two stock trading strategies with the goal of maximizing profit while minimizing taxes. This is a study of a complex issue with a myriad of possible solutions. If I omit analysis of a situation it is usually because the analysis would be self cancelling -- I plan to attack those areas which will express differential results. My method will employ a scenario of "what ifs" and apply this guideline to the strategies I study.

I plan to discuss the following propositions:

- What is the Value Line trading strategy, and what are the tax consequences of the strategy to the individual investor?
- How does a similar analysis of the Standard and Poor's "500" stock index hold up?



- How are the returns distributed between dividends and capital gains?
- How do taxes impact upon market gain which is real gain, and extra gain due to the ability to pick stock by active trading?
- Does the government, by taxing gains and subsidizing losses, reduce risk to the individual investor?
- How to manage taxes to minimize them.
- Look at preliminary data.
- Ignore the approximately <1% stock transfer taxes.

When Value Line publishes a return for securities in a portfolio, they ignore brokerage costs, dividends, stock transfer taxes and all consequences of income taxes. The Group 1 portfolio I will be discussing for the remainder of this chapter will be an equally value weighted portfolio of only New York Stock Exchange Rank 1 securities. Weekly the portfolio will be updated and theoretically rebalanced to maintain equal weighting.

What tax issues relate to these tax trading strategies? The major point of interest is the differential treatment of long-term capital gains and ordinary income. Congress has extended special advantageous tax treatment to capital gains. The House Ways and Means Committee has

recently passed an amendment to reduce the capital gain tax to provide greater incentives to invest in growing companies. The May 8, 1978, Wall Street Journal included "the reduction in the maximum rate on capital gains taxes from the current level of 49.125% to 25% in 1980 would have a positive effect on economic growth while reducing the federal budget deficit."<sup>1</sup>

What was the law in 1977 regarding the taxation of capital gains? It was that one half of a long-term capital gain is included in an individual's income tax base, providing for an effective tax rate from 7% to 35%, according to a government publication, the President's 1978 Tax Program. There is a special rule which provides that 50,000 of these gains each year are not to be taxed at over the 25% rate.<sup>2</sup>

How do the capital gains rules affect our portfolio decisions? Our first realization is that we receive income from both capital gains and dividends. Dividends are received while the stock is held in the portfolio and are taxed at ordinary income. Capital gains are taxed at a lower rate if the stock was held long enough to qualify as a long-term gain.

The individual's portfolio should be managed to take advantage of long-term capital gains. This is a divergence from just following Value Line recommendations. In 1977, the gain or loss from the sale of stock held for more than nine months was long-term. In earlier years the cutoff was

six months, and this year and in the future it is 12 months.

Net short-term gains, or the excess of net short-term gains over net long-term loss is taxable as ordinary income, according to a November 4, 1977, note in Value Line. Taxation of long-term gains is explained above, however, the untaxed half of the gain is treated as preference income and may be subject to minimum tax. If tax preference for the year exceeds one half of the individual's regular income or \$10,000, whichever is greater, the excess is taxed at 15%.

Net short-term capital loss, or the excess of loss over net long-term capital gain are deductible from ordinary income starting in 1978 of \$3,000 per year with the excess carried forward as a short-term loss carover to future years. Further, one half any net long-term capital loss is deductible from ordinary income.

The portfolio may not commit a wash sale, that is, a loss not allowed for tax purposes, if the same security is sold and bought back within 30 days. This dictates that if you want to take a loss you must double up on the security you want to remain in the portfolio.

A possible strategy for an investor to gain tax advantages while trading under the Value Line strategy would be for the individual to realize losses to offset gains before the end of the tax year. Then these stocks could be brought back into the portfolio if they were still

rated Group 1.

This sounds simple, yet taxes are being deferred. When the government taxes gains and allows loss deduction it is essentially reducing the risk of any investment you make. Because of this risk reduction, individuals may be willing to hold more volatile portfolios than would otherwise be the case.

In "The Implications of the Capital Gains Tax for Investment Decisions,"<sup>3</sup> by Holt and Shelton, the being locked into an investment by the capital gains tax is discussed. The article was written in 1961, and recently the law has been changed; the capital gains tax can no longer be escaped by dying before selling. The new law values trading gains against the stock price as of December 1, 1976.

They ask how much extra yield is necessary in an alternative investment to overcome the disadvantage of incurring the capital gains tax. In this study capital gains tax cannot be avoided, only deferred. As long as it can be deferred it represents a free loan from the government. When following Value Line's recommendation to sell a stock and replace it with a new one the following question should be asked. Are the future dividends and capital gains on this new choice sufficient to overcome the amount lost in capital gains taxes? The article concludes that this yield differential is smaller than most investors realize -- often

on the order of 1%. So capital gains taxation may not be a major implication while following the Value Line system, although as we will shortly see, much of the Value Line portfolio does not qualify for long-term capital gains treatment, due to the high portfolio turnover ratio.

My next step is to examine the actual Value Line portfolios. The specifics are chosen from available data, which is really not in the proper form for this analysis, so many assumptions will have to be tolerated. I studied the most recent 21 weeks of data -- conclusions were drawn from the period of August 5, 1977 to December 30, 1977. At times comparisons may seem out of time frame -- and still, within a broad tolerable range this analysis is still useful in an educational and thought-provoking process.

Black's study "Yes Virginia, There is Hope; Tests the Value Line Ranking System,"<sup>4</sup> ignored tax consequences. Black revised portfolios on a monthly basis, while I am employing weekly updating, which might account for the higher turnover observed, or we may now be in a more volatile market (Figure 15). In Black's study extra return was measured at 10% per year with a "T" value of 4.0 a significant result. Diversification with the market showed a correlation coefficient of about .95.

Excluding transaction costs and taxes, Black's results may seem unrealistic for the investor, especially

Table 15

APPROXIMATE COMPOSITION OF VALUE LINE PORTFOLIO

Rank 1

22% of stocks qualify for long-term capital gains

78% short-term capital gains

Average price of stock            25.54

Average dividend                    1.11        or 4.35%

Turnover Rate                        According to Black study 130%-88%

   According to new data        225%-140%

Black found about 10% excess returns on Rank 1

7% excess returns on Rank 1-3 Hold

Our data is from December 31, 1976; August 5, 1977; and

December 30, 1977 Value Line

because of the 130% turnover ratio in the Rank 1 Group. This high turnover leads one to believe that the majority of the individual securities are held for less than one year, the length of time necessary to qualify for long-term capital gains. In my new study, it was found that turnover was closer to 225% creating large transaction costs. This is without the extra trading which would be necessary to maintain an exactly equally weighted portfolio which is an assumption which I will now relax. Turnover also increases because of the large number of rank changes when quarterly reports are issued.

Methods may be employed to reduce transaction frequency. These include selling a stock only after it falls to a Rank III, as suggested by Black. This would also tend to increase the probability that a stock will qualify for long-term capital gain treatment. Using this strategy, Black's volatility of turnover was reduced to 88%. According to my translation analysis I would predict a 140% turnover. Under this newly defined strategy extra return was also reduced to 7% with less trading, as reported by Black.

Now let us take a broad look at the application of the rules of taxation to the Value Line strategy between December 31, 1976 and December 30, 1977. 22% of the stocks ranked 1 remained in the portfolio, and therefore qualified for long-term capital gains treatment. Therefore, approximately 175 stocks were traded in and out of the portfolio

during the year -- all representing short-term gains.

As a statistic portfolio for snalysis I chose August 5 1977. 78 of the 100 stocks in this portfolio are traded on the New York Stock Exchange. The average price of a stock in this portfolio was \$25.54. The average dividend was \$1.11 or about 4.35% of the price of the stock represented yield on an annual basis.

According to Value Line the average percentage change in price between December 29, 1976 and June 29, 1977, for Group 1 stocks with weekly updates was a positive 15.4%. Approximately 13% of this gain is from stock appreciation and about 2.4% from dividend income. I also attribute about 22% of the capital gain to long-term capital gains under the one year holding period rule by extrapolating the assumptions made above. On an annual basis the gain distributes as follows:

Assumption #1	Long-Term Capital Gain	6.%
Value Line Rank 1	Short-Term Capital Gain	20.4%
Weekly Trading	Dividend-Ordinary Income	<u>4.4%</u>
	Total Annual Return	30.8%

This result is due largely to a very good time period for the market. Most of the gain is taxed as ordinary income. Would it be advantageous to try to hold stocks longer to take advantage of the favorable long-term capital



gains rate? This would reduce transaction costs conceivably. What would the situation look like if we viewed the same portfolio and time frame as under Assumption I, with one change, the restriction that only one portfolio change is allowed halfway through the time period at the six-month point. In this case the six-month gain was reduced from 15.4% to 10.1% according to Value Line. My estimate of the turn-over ratio under this assumption is about 50%. This is only a ball park figure and verification requires data collection of stock tracking them from Rank I all the way until they enter Rank III. This is beyond the scope of this thesis, so my 50% figure must suffice as an estimate. Under these conditions Assumption II is created:

Assumption II	Long-Term Capital Gain	7.9%
One Trade Only	Short-Term Capital Gain	7.9%
Rank 1-3 Value Line	Dividend Income	<u>4.4%</u>
	Total Annual Return	20.2%

Further insights may be provided by actually taking a dollar position in each of these portfolios. A hundred share of this portfolio as is on August 5, 1978, would cost \$2,554 in December 1977. (There are brokerage costs of about 3% and stock transfer taxes which I have not included. Also, the portfolios may not be valued exactly -- but the approximation is sufficient.) How do tax consequences vary under Assumptions I and II?

Before attempting an illustration I must restate the simplicity of this analysis and point out it is only for illustrative purposes of possible tax consequences. It is unusual to examine a period of such high return, which do provide us with capital gains and not losses, after all I have not studied securities individually. Another simplification of this analysis which may seriously bias results is the lack of a measure of capital losses. This is an important fault because the losses could be directly subtracted from gains for tax purposes.

Assumptions must be made about our hypothetical portfolio holder. They are as follows: 50% income tax bracket, with less than \$50,000 in capital gains so that capital gains are taxed at 25%. Another assumption of the portfolio size of \$11,500 provides for dividend payments of approximately \$500. which, taxed at 50% as ordinary income before the \$100. dividend exclusion, creates an effective tax rate of 40% on dividends.

The net gain after taxes on Assumption I was \$1,989.50 or a rate of return of 17% compared to a \$1,435.00 gain under Assumption II representing a 12% after tax return. So, at first glance it appears that it was not worthwhile to reduce portfolio turnover to seek capital gains preference tax rates. However, this is not necessarily the case. The increased trading costs associated with Assumption I could

easily consume the 5% differential and make the two assumptions finish in a dead heat.

There is still another comparison I would like to make before concluding this glimpse into taxation study. That is a comparison of Rank 1 Value Line stocks from 1970-1976 to the Standard and Poor's "500" composite index for the same time period.

The Standard and Poor's "500" stock index contains no trades, and therefore no trading costs for the entire period. Essentially, I am comparing a buy and hold strategy to active portfolio management. Again, unfortunately there is a major drawback to this analysis, and that is that I do not use a valid risk adjustment factor for Value Line, which may tend to overstate its returns.

Results for Standard and Poor's "500" show only a 27% after tax return from 1970-1977 (July). Using the same hypothetical \$11,500. investment and applying a 40% tax on dividends and a 25% capital gains tax, (actually I have omitted to account for the time value of dividend payments made seven years ago), however, since I am ignoring this dividend reinvestment for both Standard and Poor's "500" and Value Line, I believe the bias will remain small.

The total return for the entire period is 27% after tax for the Standard and Poor's "500" and 114% for Value Line's data. However, this comparison does not take account of the

transaction costs of the 13-225% turnover of the Value Line portfolio. To simulate this, I will recompute the Value Line returns reducing each yearly yield by 5% to account for the transfer tax and brokerage costs of such heavy trading.

After the recalculation of Value Line results, reducing the yearly returns by 5% yearly, the pretax profit is reduced to \$7,880. which, after taxes, reduces to the following:

Long-Term Capital Gains (22%)	$1733.60 \times 25\% = 433.40$
Short-Term Gain	$6146.40 \times 50\% = 3073.20$
Dividends	$5136.11 \times 40\% = \underline{2054.44}$
	Total Tax 5561.04

Total Gain \$7455.07

After Tax Gain 65%

I believe this to be a more realistic figure for the real Value Line return, which is still about two and a half times greater than the Standard and Poor's "500".

In conclusion, I have presented two views of after tax returns following the Value Line system. In each case the gain in return due to capital gains treatment was balanced against a lower excess return, or index, involved with the one year holding period. In all cases, the probability of error in analysis in this taxation section is high, due to high portfolio turnover, transaction costs,

offsetting gains and losses, and the capital gains holding period. When a more suitable data base is complete for taxation analysis, a complete story can be devised with more precision, less restrictions, and fewer assumptions. This is an area which is ripe for further study.

In the last few weeks the 1978 tax law revisions have already altered the analysis applied to the 1977 strategy presented here. Essentially stock investors have gained. The new law liberalizes the rules regarding capital gain. "The maximum rate falls from 49% to 28% once you pay taxes on 40% instead of 50% of long-term gains. "...15% minimum tax no longer applies to the untaxed part of capital gain." <sup>5</sup>

This is a major challenge to investors since the rules have been so dramatically changed. In a nutshell -- there is less of a deterrent to selling stocks which show capital gains. However, the holding period for capital gains is now 12 months. <sup>6</sup>

Chapter 7

CONCLUSION, SUMMARY AND TOPICS FOR FUTURE RESEARCH

Evaluation of investment performance is often considered an after-the-fact measure. However, it should be part of an on-going improvement process in state of the art finance theory. Investors who pay the costs associated with active portfolio management deserve to have a true performance measure.

At times it may be difficult to separate performance due to skill from that due to luck. The importance of these findings rest on Value Line's ex post alpha values, i.e., the vertical intercept obtained when an ex post characteristic line is fitted using excess returns in an ordinary least square regression. Value Line's ex post alpha should be interpreted as the average difference between its return and that of a passive buy and hold market strategy of equal risk.

This thesis has examined Value Line's historic alpha values. What does this imply about the future? The significantly high t-statistics demonstrated by Value Line data over many consecutive years demonstrates consistently superior performance which can be projected into the future.

The objective of an actively managed portfolio of common stocks is to choose securities so that a greater return results than that produced by an index fund or a naive investment strategy. The actively managed portfolio must

overcome additional costs not incurred in a passive portfolio strategy. These include the cost of gathering and analyzing information, transaction costs of executing trades, non-optimal taxation decisions, and non-efficient portfolio diversification.

This study analyzes the 100 stocks Value Line ranks "1" for year ahead appreciation. Transaction delays are computed for -5, 0, 5, 10 and 20 days. Value Line's four main criteria of security evaluation are: non-parametric value position, magnitude of over or underevaluation, earnings momentum and an earnings surprise factor.

In previous Value Line research, Shelton<sup>1</sup> found investors displayed superior performance than efficient market theory would suggest. Hausman<sup>2</sup> points out flaws in Shelton's statistical tests and recommends additional study. Murphy<sup>3</sup> essentially agrees with Shelton, discovering significant results consistent with the random walk. Conversely Kaplan and Weil's<sup>4</sup> results support the efficient market hypothesis. They believe that the Value Line rankings are flawed and that most performance variation is due to stock risk differentials. Black's<sup>5</sup> study concluded that even with the imposition of transaction costs, Value Line continues to give significant positive results over a five year period.

Fama<sup>6</sup> provides strong support for efficient markets in his study of the 30 Dow Jones industrial stocks from

1957 to 1967. Sharpe,<sup>7</sup> studying 34 mutual funds and Jensen,<sup>8</sup> studying the performance of 115 mutual funds each lend support to the view that capital markets are efficient.

This Value Line data was hand collected covering the period from November 5, 1971 to December 30, 1977. Computer programs were written to: 1) generate weekly portfolios; 2) name and verify portfolios; 3) compute individual portfolio and market returns for certain trading day delays; 4) calculate Treasury Bill returns; and, 5) calculate ordinary least square regressions.

Market indices studied included an equally weighted and value weighted New York and American Stock Exchange Index, as well as the Standard and Poor's "500" composite.

In the regression analysis the Value Line excess return was the dependent variable and the market index excess return was the independent variable.

Ignoring transaction costs, the Value Line portfolio would have grown to 5.8, 4.8 and 3.1 times the initial investment for trading delays of -5, 0, and 5 days respectively. Each of these is superior to the best of the market indices, the equally weighted index which grew 2.3 times. A similar investment in Treasury Bills would have grown 1.4 times.  $R^2$  terms were all high.

Executing market action on the Friday of publication the Value Line portfolio when regressed on the equally



weighted portfolio resulted in a positive alpha of about 12% with a t-statistic of 3.6. This result strongly refutes efficient market arguments and suggests that Value Line recommendations do produce investment strategies which consistently outperform the market. This figure is large enough to absorb considerable transaction expense.

Assuming an individual's investment goal is to maximize final economic wealth, consideration must be made for taxes and transaction costs. This requires balancing extra return against capital gains holding periods, and reduction of the aggressive Value Line trading turnover rate. The recent major tax revisions provide new opportunities for further investigation.

Many unanswered questions remain. Is Value Line analysis biased towards low price/earning multiple stocks, or do they favor smaller, inefficiently priced companies? To what extent do they rely on security analysis, or on adjusted beta and market timing? Further work would also be valuable in studying the optimal investment tradeoff between superior returns and transaction frequency.

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Appendix I

CUMULATIVE COMPANY LIST

1 = 147610 = A J INDS INC  
2 = 202410 = A P L CORP  
3 = 205010 = A S A LTD  
4 = 208010 = A T O INC  
5 = 621210 = ADAMS EXPRESS CO  
6 = 715810 = ADMIRAL CORP  
7 = 745510 = ADVANCE INVS CORP  
8 = 778810 = AEROJET GEN CORP  
9 = 814010 = AETNA LIFE & CAS CO  
10 = 867710 = AHMANSON H F & CO  
11 = 926610 = AIRBORNE FGHT CORP  
12 = 929210 = AIRCO INC  
13 = 1028410 = ALABAMA GAS CORP  
14 = 1160810 = ALAN WOOD STL CO  
15 = 1173410 = ALASKA INTST CO  
16 = 1310410 = ALBERTSONS INC  
17 = 1378810 = ALCO STD CORP  
18 = 1389610 = ALCON LAPS INC  
19 = 1475210 = ALEXANDERS INC  
20 = 1717610 = ALLEGHANY CORP  
21 = 1737210 = ALLEGHENY LUDLUM IND  
22 = 1763410 = ALLEN GRUP INC  
23 = 1908710 = ALLIED CHEM CORP  
24 = 1929510 = ALLIED MLS INC  
25 = 1941110 = ALLIED PRODS CORP DE  
26 = 1953710 = ALLIED SUPERMARKETS  
27 = 1964510 = ALLIS CHALMERS CORP  
28 = 2077110 = ALPHA PORTLAND INDS  
29 = 2277110 = AMALGAMATED SUGAR CO  
30 = 2314110 = AMBAC INDS INC  
31 = 2351910 = AMERACE CORP  
32 = 2355110 = AMERADA HESS CORP  
33 = 2375310 = AMERICAN AIR FILTER  
34 = 2377110 = AMERICAN AIRLS INC  
35 = 2390410 = AMCCRD INC  
36 = 2406910 = AMERICAN BAKERIES CO  
37 = 2473510 = AMERICAN BROADCASTIN  
38 = 2475310 = AMERICAN BLDG MAINT  
39 = 2510510 = AMERICAN CHAIN & CAB  
40 = 2523110 = AMERICAN CONSUMER IN  
41 = 2532110 = AMERICAN CYANAMID CO  
42 = 2553710 = AMERICAN ELEC PWR IN  
43 = 2581610 = AMERICAN EXPRESS CO  
44 = 2587010 = AMERICAN FAMILY CORP  
45 = 2635710 = AMERICAN GEN INS CO  
46 = 2657310 = AMERICAN HCIST & DER  
47 = 2668110 = AMERICAN HCSP SUPPLY  
48 = 2687910 = AMERICAN INVT CO  
49 = 2733920 = AMERICAN MAIZE PRODS  
50 = 2742910 = AMERICAN MED INTL IN  
51 = 2744710 = AMERICAN MEDICORP IN  
52 = 2762710 = AMERICAN MTRS CORP  
53 = 2926710 = AMERICAN RESH & DEV  
54 = 2946510 = AMERICAN SEATING CO  
55 = 2960910 = AMERICAN SHIP BLDG C

Cumulative company list.

56 = 2971710 = AMERICAN STD INC  
57 = 3008710 = AMERICAN STERILIZER  
58 = 3009510 = AMERICAN STORES CO  
59 = 3071010 = AMERON INC  
60 = 3114110 = AMFAC INC  
61 = 3203710 = AMPCO PITTSBURG CORP  
62 = 3217210 = AMSTAR CORP  
63 = 3217710 = AMSTED INDS INC  
64 = 3233910 = AMTEL INC  
65 = 3360910 = ANDERSON CLAYTON & C  
66 = 3531010 = ANKEN INDS  
67 = 3741110 = APACHE CORP  
68 = 3751910 = APCC OIL CORP  
69 = 3752810 = APECO CORP  
70 = 3937510 = ARCATA NATL CORP  
71 = 3948310 = ARCHER DANIELS MIDLA  
72 = 4055510 = ARIZONA PUB SVC CO  
73 = 4208310 = ARMADA CORP  
74 = 4219510 = ARMCO STL CORP  
75 = 4232110 = ARMSTRONG CORK CO  
76 = 4246510 = ARMSTRONG RUBR CO  
77 = 4333910 = ARVIN INDS INC  
78 = 4454010 = ASHLAND OIL INC  
79 = 4748310 = ATHLONE INDS INC  
80 = 4926730 = ATLAS CORP  
81 = 5251910 = AUSTRAL OIL INC  
82 = 5301510 = AUTOMATIC DATA PROCE  
83 = 5321310 = AUTOMATION INDS INC  
84 = 5350110 = AVCO CORP  
85 = 5362710 = AVERY INTL CORP  
86 = 5380710 = AVNET INC  
87 = 5489710 = AZTEC OIL & GAS CO  
88 = 5614710 = BABCOCK & WILCOX CO  
89 = 5635710 = BACHE GROUP INC  
90 = 5725510 = BAKER INDS INC  
91 = 6022110 = BANGOR PUNTA CORP  
92 = 6714910 = BARBER OIL CORP  
93 = 6986910 = BASIC INC  
94 = 7058110 = BATES MFG INC  
95 = 7170710 = BAUSCH & LOMB INC  
96 = 7189210 = BAXTER TRAVENOL LABS  
97 = 7323910 = BAYUK CIGARS INC  
98 = 7588710 = BECTON DICKINSON & C  
99 = 7663510 = BEECH AIRCRAFT CORP  
100 = 7741910 = BELCO PETE CORP  
101 = 7745510 = BELDEN CORP  
102 = 7749110 = BELDING HEMINWAY INC  
103 = 7785110 = BELL & HOWELL CO  
104 = 8143710 = BEMIS INC  
105 = 8441910 = BERKEY PHOTO INC  
106 = 8655110 = BEST PRODS INC  
107 = 8750910 = BETHLEHEM STL CORP  
108 = 9281510 = BLAIR JOHN & CO  
109 = 9354510 = BLISS & LAUGHLIN IND  
110 = 9367110 = BLOCK H & R INC

111 = 9529310 = BLUE BELL INC  
112 = 9677910 = BOBBIE BROOKS INC  
113 = 9702310 = BOEING CO  
114 = 9738310 = BOISE CASCADE CORP  
115 = 9854510 = BOOK MONTH CLUB INC  
116 = 10209710 = BOURNS INC  
117 = 10542510 = BRANIFF INTL CORP  
118 = 10904310 = BRIGGS & STRATTON CO  
119 = 11009710 = BRISTOL MYERS CO  
120 = 11533110 = BROWN CO  
121 = 11563720 = BROWN FORMAN DISTILL  
122 = 11704310 = BRUNSWICK CORP  
123 = 11742110 = BRUSH WELLMAN INC  
124 = 11883510 = BUDD CO  
125 = 11900710 = BUDGET INDS INC  
126 = 11952910 = BUFFALO FORGE CO  
127 = 12065530 = BUNKER RAMC CORP  
128 = 12237510 = BURNS INTL SEC SVCS  
129 = 12316910 = BUSH UNVL INC  
130 = 12488410 = C C I CORP  
131 = 12561510 = C L C AMER INC  
132 = 12650110 = C T S CORP  
133 = 12705510 = CABOT CORP  
134 = 12769510 = CAESARS WORLD INC  
135 = 12879310 = CALDOR INC  
136 = 13021710 = CALIFORNIA FINL CORP  
137 = 13106910 = CALLAHAN MNG CORP  
138 = 13441110 = CAMPBELL RED LAKE MI  
139 = 13442910 = CAMPBELL SOUP CO  
140 = 13644030 = CANADIAN PAC LTD  
141 = 13986110 = CAPITAL CITIES COMMU  
142 = 14233910 = CARLISLE CORP  
143 = 14414110 = CAROLINA PWR & LT CO  
144 = 14428510 = CARPENTER TECHNOLOGY  
145 = 14446510 = CARRIER CORP  
146 = 14450110 = CARRIERS & GEN CORP  
147 = 14628510 = CARTER WALLACE INC  
148 = 14842910 = CASTLE & COCKE INC  
149 = 14912310 = CATERPILLAR TRACTOR  
150 = 15003310 = CECO CORP  
151 = 15084310 = CELANESE CORP  
152 = 15130310 = CENCO INC  
153 = 15231210 = CENTEX CORP  
154 = 15360910 = CENTRAL HUDSON GAS &  
155 = 15389710 = CENTRAL LA ELEC INC  
156 = 15517710 = CENTRAL SOYA INC  
157 = 15544710 = CENTRAL TEL & UTILS  
158 = 15640210 = CENTRONICS DATA COMP  
159 = 15682510 = CERRO CORP  
160 = 15687910 = CERTAIN TEED CORP  
161 = 15850110 = CHAMPION HOME BLDRS  
162 = 15852510 = CHAMPION INTL CORP  
163 = 16278910 = CHECKER MTRS CORP  
164 = 16326710 = CHELSEA INDS INC  
165 = 16360010 = CHEMETRON CORP

166 = 16515910 = CHESAPEAKE CORP VA  
167 = 17026810 = CHOCK FULL O NUTS CO  
168 = 17110610 = CHROMALLOY AMERN COR  
169 = 17119610 = CHRYSLER CORP  
170 = 17158310 = CHURCHS FRIED CHICKE  
171 = 17217210 = CINCINNATI MILACRON  
172 = 17784610 = CITY INVESTING CO  
173 = 18148610 = CLARK OIL & REFNG CO  
174 = 18948610 = CLUETT PEARBODY & CO  
175 = 18987310 = COACHMEN INDS INC  
176 = 19055610 = COASTAL STS GAS CORP  
177 = 19325210 = COLDWELL BANKER & CO  
178 = 19337810 = COLECO INDS INC  
179 = 19355810 = COLEMAN INC  
180 = 19484610 = COLLINS FOODS INTL I  
181 = 19501810 = COLLINS RADIO CO  
182 = 19584610 = COLONIAL PENN GROUP  
183 = 19686410 = COLT INDS INC DEL  
184 = 19827910 = COLUMBIA PICTURES IN  
185 = 20010110 = COMBINED COMMUNICATI  
186 = 20029110 = COMBUSTION EQUIP ASS  
187 = 20238110 = COMMERCIAL SOLVENTS  
188 = 20265110 = COMMODORE CORP  
189 = 20320110 = COMMONWEALTH OIL REF  
190 = 20341710 = COMMUNICATIONS SATEL  
191 = 20490010 = COMPUGRAPHIC CORP  
192 = 20536310 = COMPUTER SCIENCES CO  
193 = 20681310 = CONE MLS CORP  
194 = 20719210 = CONGOLEUM CORP  
195 = 20829110 = CONRAC CORP  
196 = 20923710 = CONSOLIDATED FREIGHT  
197 = 21079510 = CONTINENTAL AIR LINE  
198 = 21129110 = CONTINENTAL COPPER &  
199 = 21132710 = CONTINENTAL CORP  
200 = 21148510 = CONTINENTAL ILL CORP  
201 = 21168710 = CONTINENTAL MTG INVS  
202 = 21207510 = CONTINENTAL STL CORP  
203 = 21209310 = CONTINENTAL TEL CORP  
204 = 21236310 = CONTROL DATA CORP DE  
205 = 21666910 = COOPER INDS INC  
206 = 21668710 = COOPER JARRETT INC  
207 = 21670510 = COOPER LABS INC  
208 = 21683110 = COOPER TIRE & RUBR C  
209 = 21721010 = COPELAND CORP  
210 = 21752510 = COPPER RANGE CO  
211 = 21768710 = COPPERWELD CORP  
212 = 21866110 = CORCURA CORP  
213 = 21932710 = CORNING GLASS WKS  
214 = 22029110 = CORROON & BLACK CORP  
215 = 22374110 = COWLES COMMUNICATION  
216 = 22400310 = COX BROADCASTING COR  
217 = 22439910 = CRANE CO  
218 = 22781310 = CROUSE HINDS CO  
219 = 22866910 = CROWN ZELLERBACH COR  
220 = 23002510 = CULLIGAN INTL CO

221 = 23102110 = CUMMINS ENGINE INC  
222 = 23112910 = CUNNINGHAM DRUG STOR  
223 = 23156110 = CURTISS WRIGHT CORP  
224 = 23216510 = CUTLER HAMMER INC  
225 = 23221910 = CUTTER LABS INC  
226 = 23252510 = CYCLOPS CORP  
227 = 23329110 = D P F INC  
228 = 23335110 = D W G CORP  
229 = 23577310 = DAN RIVER INC  
230 = 23581110 = DANA CORP  
231 = 23742410 = DART INDS INC  
232 = 23768810 = DATA GEN CORP  
233 = 23810020 = DATAPOINT CORP  
234 = 23810710 = DATAPRODUCTS CORP  
235 = 23975310 = DAYTON HUDSON CORP  
236 = 24419910 = DEERE & CO  
237 = 24521710 = DEL MONTE CORP  
238 = 24783820 = DELTEC INTL LTD ENG  
239 = 24863110 = DENNISON MFG CO  
240 = 24870310 = DENNYS INC  
241 = 25036110 = DESERET PHARMACEUTIC  
242 = 25059510 = DE SOTO INC  
243 = 25216510 = DEXTER CORP  
244 = 25243510 = DI GIORGIO CORP  
245 = 25246810 = DIAL CORP  
246 = 25274110 = DIAMOND SHAMROCK COR  
247 = 25357910 = DICTAPHONE CORP  
248 = 25384910 = DIGITAL EQUIP CORP  
249 = 25411110 = DILLINGHAM CORP  
250 = 25468710 = DISNEY WALT PRODTNS  
251 = 25612910 = DR PEPPER CO  
252 = 25707510 = DOME MINES LTD  
253 = 25709310 = DOME PETE LTD  
254 = 25714710 = DOMINICK FD INC  
255 = 25786710 = DONNELLEY R R & SONS  
256 = 25823710 = DORIC CORP  
257 = 25836310 = DORR OLIVER INC  
258 = 26000310 = DOVER CORP  
259 = 26218810 = DRUG FAIR INC  
260 = 26774110 = DYMO INDS INC  
261 = 26845710 = E G & G INC  
262 = 26915730 = E SYS INC  
263 = 27033010 = EASCO CORP  
264 = 27619110 = EASTERN AIR LINES IN  
265 = 27646110 = EASTERN GAS & FUEL A  
266 = 27874910 = ECHLIN MFG CO  
267 = 27878510 = ECKERD DRUGS INC DEL  
268 = 28087510 = EDISON BROS STORES I  
269 = 28166910 = EDWARDS A G & SONS I  
270 = 28336210 = EL PASO CO  
271 = 28555110 = ELECTRONIC ASSOC INC  
272 = 28643420 = ELGIN NATL INDS INC  
273 = 29110110 = EMERY AIR FGHT CORP  
274 = 29117310 = EMERY INDS INC  
275 = 29121010 = EMHART CORP VA

276 = 29171310 = EMPIRE GAS CORP  
277 = 29284810 = ENGELHARD MINERALS &  
278 = 29338910 = ENNIS BUSINESS FORMS  
279 = 29381510 = ENTEX INC  
280 = 29409810 = ENVIROTECH CORP  
281 = 29449710 = EQUITABLE GAS CO  
282 = 29647010 = ESMARK INC  
283 = 29665910 = ESQUIRE INC  
284 = 29742510 = ESTERLINE CORP  
285 = 29765910 = ETHYL CORP  
286 = 30369310 = FAIRCHILD CAMERA & I  
287 = 30371110 = FAIRCHILD INDS INC  
288 = 30608410 = FALCON SEABOARD INC  
289 = 30726110 = FANSTEEL INC  
290 = 30735110 = FAR WEST FINL CORP  
291 = 30738710 = FARAH MFG INC  
292 = 31322510 = FEDERAL CO  
293 = 31354910 = FEDERAL MOGUL CORP  
294 = 31358610 = FEDERAL NATL MTG ASS  
295 = 31369310 = FEDERAL PAPER BRD IN  
296 = 31376510 = FEDERAL RES CORP  
297 = 31385510 = FEDERAL SIGNAL CORP  
298 = 31412310 = FEDERATED DEV CO  
299 = 31540510 = FERRO CORP  
300 = 31571110 = FIBREBOARD CORP  
301 = 31654910 = FIELDCREST MLS INC  
302 = 31729710 = FILMWAYS INC  
303 = 31731510 = FILTROL CORP  
304 = 31749510 = FINANCIAL FEDN INC  
305 = 31831510 = FIRESTONE TIRE & RUB  
306 = 31944110 = FIRST CHARTER FINL C  
307 = 31945510 = FIRST CHICAGO CORP  
308 = 32048810 = FIRST HARTFORD CORP  
309 = 32104510 = FIRST MTG INVS  
310 = 33769310 = FISCHER & PORTER CO  
311 = 33781910 = FISHER FOODS INC  
312 = 33802710 = FISHER SCIENTIFIC CO  
313 = 33909910 = FLEETWOOD ENTERPRISE  
314 = 33937610 = FLEXI VAN CORP  
315 = 34063910 = FLORIDA EAST COAST R  
316 = 34108110 = FLORIDA PWR & LT CO  
317 = 34109910 = FLORIDA PWR CORP  
318 = 34317210 = FLORIDA STL CORP  
319 = 34386110 = FLUOR CORP  
320 = 34487210 = FOOTE CONE & BELDING  
321 = 34551410 = FOREMOST MC KESSON I  
322 = 34746010 = FORT HOWARD PAPER CO  
323 = 35024410 = FOSTER WHEELER CORP  
324 = 35160410 = FOXBORO CO  
325 = 35671510 = FREEPORT MINERALS CO  
326 = 35937010 = FRUEHAUF CORP  
327 = 36102310 = FUQUA INDS INC  
328 = 36142810 = G A F CORP  
329 = 36160610 = G F BUSINESS EQUIP I  
330 = 36464010 = GAMBLE SKOSMO INC



331 = 36762210 = GATEWAY INDS INC DEL  
332 = 36880210 = GENERAL AMERN INVS I  
333 = 36914010 = GENERAL BATTERY CORP  
334 = 36929810 = GENERAL CABLE CORP  
335 = 36935210 = GENERAL CINEMA CORP  
336 = 36955010 = GENERAL DYNAMICS COR  
337 = 37006410 = GENERAL HOST CORP  
338 = 37011810 = GENERAL INSTR CORP  
339 = 37029810 = GENERAL MED CORP  
340 = 37033410 = GENERAL MLS INC  
341 = 37051410 = GENERAL PORTLAND INC  
342 = 37062210 = GENERAL REFRACTORIES  
343 = 37085610 = GENERAL STL INDS INC  
344 = 37135210 = GENERAL TIRE & RUBR  
345 = 37245110 = GENSTAR LTD  
346 = 37329910 = GEORGIA PAC CORP  
347 = 37371210 = GERBER PRODS CO  
348 = 37453210 = GIANT PORTLAND & MAS  
349 = 37465810 = GIBRALTAR FINL CORP  
350 = 37504610 = GIDDINGS & LEWIS INC  
351 = 37576610 = GILLETTE CO  
352 = 37610910 = GINOS INC  
353 = 37735210 = GLEASON WKS  
354 = 37737010 = GLEN ALDEN CORP  
355 = 37935210 = GLOBAL MARINE INC  
356 = 37956810 = GLOBE UN INC  
357 = 38131710 = GOLDEN WEST FINL COR  
358 = 38238810 = GOODRICH B F CO  
359 = 38274810 = GORDON JEWELRY CORP  
360 = 38349210 = GOULD INC  
361 = 38515410 = GRANBY MNG LTD  
362 = 38741210 = GRANITE MGMT SVCS IN  
363 = 38747810 = GRANITEVILLE CO  
364 = 38928010 = GRAY DRUG STORES INC  
365 = 39060410 = GREAT LAKES DREDGE &  
366 = 39109010 = GREAT NORTHN NEKCOSA  
367 = 39144210 = GREAT WESTN FINL COR  
368 = 39151410 = GREAT WESTN UTD CORP  
369 = 39238810 = GREATER WASH INVS IN  
370 = 39304610 = GREEN GIANT CO  
371 = 40137010 = GUARDIAN INDS CORP  
372 = 40206410 = GULF & WESTN INDS IN  
373 = 40249610 = GULF RES & CHEM CORP  
374 = 40278410 = GULTON INDS INC  
375 = 40424510 = H M W INDS INC  
376 = 40589110 = HALL FRANK B & CO IN  
377 = 40609010 = HALL W F PRGTG CO  
378 = 40621610 = HALLIBURTON CO  
379 = 40830610 = HAMMERMILL PAPER CO  
380 = 41025210 = HANDLEMAN CO DEL  
381 = 41030610 = HANDY & HARMAN  
382 = 41034210 = HANES CORP  
383 = 41163110 = HARCOURT BRACE JOVAN  
384 = 41334210 = HARNISCHFEGGER CORP  
385 = 41361510 = HARRAHS

386 = 41387510 = HARPIS CORP DEL  
387 = 41619410 = HARTE HANKS COMMUNIC  
388 = 41740410 = HARTZ MTA CORP  
389 = 41986610 = HAWAIIAN ELEC INC  
390 = 42159610 = HAZELTINE CORP  
391 = 42268620 = HECKS INC  
392 = 42288410 = HEILEMAN G BREWING I  
393 = 42307410 = HEINZ H J CO  
394 = 42323610 = HELENE CURTIS INDS I  
395 = 42343410 = HELME PRODS INC  
396 = 42345210 = HELMERICH & PAYNE IN  
397 = 42786610 = HERSHEY FOODS CORP  
398 = 42818210 = HEUBLEIN INC  
399 = 42981210 = HIGH VOLTAGE ENGR CO  
400 = 43284810 = HILTON HOTELS CORP  
401 = 43443410 = HOFFMAN ELECTRS CORP  
402 = 43508110 = HOLIDAY INNS INC  
403 = 43609210 = HOLLY SUGAR CORP  
404 = 43761410 = HOMESTAKE MNG CO  
405 = 43812830 = HONDA MOTOR LTD  
406 = 44050610 = HORN & HARDART CO  
407 = 44106110 = HOSPITAL AFFILIATES  
408 = 44106510 = HOSPITAL CORP AMER  
409 = 44107410 = HOST INTL INC  
410 = 44156010 = HOUGHTON MIFFLIN CO  
411 = 44175810 = HOUSE FABRICS INC  
412 = 44227210 = HOUSTON NAT GAS CORP  
413 = 44228110 = HOUSTON OIL & MINERA  
414 = 44267210 = HOWARD JOHNSON CO  
415 = 44485910 = HUMANA INC  
416 = 44558230 = HUNT PHILIP A CHEM C  
417 = 44809610 = HUSKY OIL LTD  
418 = 44849910 = HUTTON E F GROUP INC  
419 = 44900610 = HYDROMETALS INC  
420 = 44974410 = I N A CORP  
421 = 45138010 = IDAHO PWR CO  
422 = 45154210 = IDEAL BASIC INDS INC  
423 = 45165010 = IDEAL TOY CORP  
424 = 45272210 = IMPERIAL CORP AMER  
425 = 45303820 = IMPERIAL OIL LTD  
426 = 45475810 = INDIANA GAS INC  
427 = 45629910 = INDUSTRIAL NATL CORP  
428 = 45662310 = INEXCO OIL CO  
429 = 45732630 = INLAND CONTAINER COR  
430 = 45764110 = INMONT CORP  
431 = 45765910 = INSILCO CORP  
432 = 45768610 = INSPIRATION CONS COP  
433 = 45810110 = INTEGON CORP  
434 = 45870210 = INTERLAKE INC  
435 = 45920010 = INTERNATIONAL PUSINE  
436 = 45950610 = INTERNATIONAL FLAVOR  
437 = 45957910 = INTERNATIONAL HARVES  
438 = 45965010 = INTERNATIONAL HLDGS  
439 = 45988410 = INTERNATIONAL MINERA  
440 = 46002010 = INTERNATIONAL MNG CO

441 = 46025410 = INTERNATIONAL RECTIF  
442 = 46059010 = INTERPUBLIC GROUP CO  
443 = 46075410 = INTERSTATE BRANDS CO  
444 = 46114310 = INTERWAY CORP  
445 = 46148810 = INVESTORS DIVERSIFIE  
446 = 46227710 = IOWA BEEF PROCESSORS  
447 = 46261410 = IPCC HOSP SUPPLY COR  
448 = 46563210 = ITEK CORP  
449 = 46564010 = ITEL CORP  
450 = 47024510 = JAMES FRED S & CO IN  
451 = 47101610 = JANTZEN INC  
452 = 47107010 = JAPAN FD INC  
453 = 47836610 = JOHNSON CTLS INC  
454 = 48003410 = JONES & LAUGHLIN STL  
455 = 48082710 = JORGENSEN EARLE M CO  
456 = 48108810 = JOSTENS INC  
457 = 48251610 = K L M ROYAL DUTCH AI  
458 = 48300810 = KAISER ALUM & CHEM C  
459 = 48304410 = KAISER CEM & GYPSUM  
460 = 48306210 = KAISER INDS CORP  
461 = 48309810 = KAISER STEEL CORP  
462 = 48409810 = KANE MILLER CORP  
463 = 48517010 = KANSAS CITY SOUTHN I  
464 = 48602610 = KATY INDS INC  
465 = 48638610 = KAWECKI BERYLCO INDS  
466 = 48731410 = KEENE CORP  
467 = 48765610 = KELLER INDS INC  
468 = 48804410 = KELLWOOD CO  
469 = 48917010 = KENNAMETAL INC  
470 = 49274620 = KEWANEE INDS INC  
471 = 49342210 = KEYSTONE CONS INDS I  
472 = 49378210 = KIDDE WALTER & CO IN  
473 = 49436310 = KIMBERLY CLARK CORP  
474 = 49589010 = KINGS DEPT STORES IN  
475 = 49765610 = KIRSCH CO  
476 = 50017010 = KOEHRING CO  
477 = 50060210 = KOPPERS INC  
478 = 50062010 = KORACORP INDS INC DE  
479 = 50102610 = KROEHLER MFG CO  
480 = 50185810 = L F E CORP  
481 = 50221010 = L T V CORP  
482 = 50244410 = L V O CORP  
483 = 50558810 = LACLEDE GAS CO  
484 = 51369610 = LAMSON & SESSIONS CO  
485 = 51839010 = LATROBE STL CO  
486 = 52189410 = LEAR SIEGLER INC  
487 = 52206610 = LEASEWAY TRANSN CORP  
488 = 52419210 = LEEDS & NORTHRUP CO  
489 = 52485810 = LEHIGH PORTLAND CEM  
490 = 52517410 = LEHMAN CORP  
491 = 52626410 = LENOX INC  
492 = 52736410 = LEVI STRAUSS & CO  
493 = 52748020 = LEVITZ FURNITURE COR  
494 = 53000010 = LIBREY OWENS FORD CO  
495 = 53001310 = LIBBY MC NEILL & LIB

496 = 53037010 = LIBERTY CORP S C  
497 = 53625710 = LIGNEL CORP  
498 = 53802110 = LITTON INDS INC  
499 = 53982110 = LOCKHEED CORP  
500 = 54042410 = LOEWS CORP  
501 = 54219510 = LONDONTOWN CORP  
502 = 54229010 = LONE STAR INDS INC  
503 = 54385910 = LORAL CORP  
504 = 54777910 = LOWENSTEIN M & SONS  
505 = 54927110 = LUBRIZOL CORP  
506 = 54986610 = LUKENS STL CO  
507 = 55089010 = LYKES CORP  
508 = 55265310 = M C A INC  
509 = 55271010 = M E I CORP  
510 = 55371310 = M S L INDS INC  
511 = 55420510 = MAC ANDREWS & FORBES  
512 = 55430710 = MAC DONALD E F CO  
513 = 55452830 = MACKE CO  
514 = 55479010 = MAC MILLAN INC  
515 = 55613910 = MACY R H & CO INC  
516 = 55748010 = MADISON FD INC  
517 = 55910810 = MAGIC CHEF INC  
518 = 56287610 = MANHATTAN INDS INC  
519 = 56418110 = MANPOWER INC  
520 = 56532110 = MARATHON MFG CO  
521 = 56631910 = MARCOR INC  
522 = 56647210 = MAREMONT CORP  
523 = 56971310 = MARION LABS INC  
524 = 57115410 = MARLEY CO  
525 = 57144310 = MARQUETTE CO  
526 = 57335010 = MARTIN PROCESSING IN  
527 = 57405510 = MARYLAND CUP CORP  
528 = 57621610 = MASSEY FERGUSON LTD  
529 = 57974610 = MC CORD CORP  
530 = 58003310 = MC DERMOTT J RAY & C  
531 = 58064510 = MC GRAW HILL INC  
532 = 58123810 = MC INTYRE MINES LTD  
533 = 58132910 = MC KEE CORP  
534 = 58210310 = MC LEAN TRUCKING CO  
535 = 58227310 = MC LOUTH STL CORP  
536 = 58283410 = MEAD CORP  
537 = 58507210 = MEDUSA CORP  
538 = 58574510 = MELVILLE CORP  
539 = 58600510 = MEMOREX CORP  
540 = 58644710 = MENASCO MFG CO  
541 = 58943310 = MEREDITH CORP  
542 = 59018810 = MERRILL LYNCH & CO I  
543 = 59065510 = MESA PETE CO  
544 = 59082510 = MESTA MACH CO  
545 = 59160510 = METRO GOLDWYN MAYER  
546 = 59169010 = METROMEDIA INC  
547 = 59450310 = MICHIGAN GAS UTILS C  
548 = 59472910 = MICHIGAN SUGAR CO  
549 = 59505010 = MICRODOT INC  
550 = 59515210 = MICROWAVE ASSOC INC

551 = 59539010 = MID CONTINENT TEL CO  
552 = 59583210 = MIDDLE SOUTH UTILS I  
553 = 59771510 = MIDLAND ROSS CORP  
554 = 59929210 = MILES LABS INC  
555 = 60175310 = MILTON BRADLEY CO  
556 = 60411010 = MINNESOTA PWR & LT C  
557 = 60508010 = MISSION INS GROUP IN  
558 = 60619110 = MISSOURI PAC CORP  
559 = 60619830 = MISSOURI PAC RR CO  
560 = 60803010 = MOHASCO CORP  
561 = 60818310 = MOHAWK DATA SCIENCES  
562 = 60830210 = MOHAWK RUBR CO  
563 = 60872720 = MOLYBDENITE CORP CDA  
564 = 60874410 = MOLYCORP INC  
565 = 60915010 = MONARCH MACH TOOL CO  
566 = 60976210 = MONOGRAM INDS INC DE  
567 = 61166210 = MONSANTO CO  
568 = 61579810 = MOOPE MC CORMACK RES  
569 = 61844810 = MORRISON KNUDSEN INC  
570 = 61907510 = MORSE SHOE INC  
571 = 61935610 = MORTON NORWICH PRODS  
572 = 62614410 = MUNFORD INC  
573 = 62671710 = MURPHY OIL CORP  
574 = 62715110 = MURRAY OHIO MFG CO  
575 = 62845420 = MYERS L E CO  
576 = 62886210 = N C R CORP  
577 = 62915610 = N L INDS INC  
578 = 62944910 = N V F CO  
579 = 62985310 = NALCO CHEM CO  
580 = 63085410 = NARCO SCIENTIFIC INC  
581 = 63122610 = NASHUA CORP  
582 = 63243110 = NATIONAL AIRLS INC  
583 = 63256710 = NATIONAL AVIATION &  
584 = 63489210 = NATIONAL BELLAS HESS  
585 = 63512310 = NATIONAL CAN CORP  
586 = 63541710 = NATIONAL CITY LINES  
587 = 63618010 = NATIONAL FUEL GAS CO  
588 = 63621410 = NATIONAL GEN CORP  
589 = 63631610 = NATIONAL GYPSUM CO  
590 = 63641810 = NATIONAL HOMES CORP  
591 = 63648610 = NATIONAL INDS INC  
592 = 63688210 = NATIONAL MED CARE IN  
593 = 63688610 = NATIONAL MED ENTERPR  
594 = 63721510 = NATIONAL PRESTO INDS  
595 = 63774210 = NATIONAL STD CO  
596 = 63777610 = NATIONAL STARCH & CH  
597 = 63784410 = NATIONAL STL CORP  
598 = 63809710 = NATIONAL TEA CO  
599 = 63835210 = NATIONAL UN ELEC COR  
600 = 63876010 = NATOMAS CO  
601 = 64021810 = NEISNER BROS INC  
602 = 64074510 = NEPTUNE INTL CORP  
603 = 64142310 = NEVADA PWR CO  
604 = 64405210 = NEW ENGLAND GAS & EL  
605 = 64821010 = NEW PROCESS CO

606 = 65011110 = NEW YORK TIMES CO  
607 = 65142710 = NEWFALL LD & FARMING  
608 = 65163910 = NEWMONT MNG CORP  
609 = 65352210 = NIAGARA MOHAWK PWR C  
610 = 65355610 = NIAGARA SH CORP  
611 = 65638910 = NORRIS INDS INC  
612 = 65678010 = NORTH AMERN COAL COR  
613 = 65704510 = NORTH AMERN PHILIPS  
614 = 65840810 = NORTH CENT AIRLS INC  
615 = 66550010 = NORTHERN NAT GAS CO  
616 = 66752810 = NORTHWEST INDS INC  
617 = 66860510 = NORTON CO  
618 = 66870710 = NORTON SIMON INC  
619 = 67034610 = NUCOR CORP  
620 = 67140010 = OAK INDS INC  
621 = 67459910 = OCCIDENTAL PETE CORP  
622 = 67634610 = OGDEN CORP  
623 = 67904310 = OKLAHOMA NAT GAS CO  
624 = 68066520 = OLIN CORP  
625 = 68206310 = OMARK INDS INC  
626 = 68250510 = ONEIDA LTD  
627 = 68900210 = OTIS ELEVATOR CO  
628 = 69002010 = OUTBOARD MARINE CORP  
629 = 69010510 = OUTLET CO  
630 = 69036810 = OVERSEAS SHIPHOLDING  
631 = 69073410 = OWENS CORNING FIBERGLASS  
632 = 69076810 = OWENS ILL INC  
633 = 69149730 = OXFORD INDS INC  
634 = 69350610 = P P G INDS INC  
635 = 69475010 = PACIFIC PETES LTD  
636 = 69562910 = PAINE WEBBER INC  
637 = 69648010 = PALM BEACH CO  
638 = 69764310 = PAMIDA INC  
639 = 69805710 = PAN AMERN WORLD AWYS  
640 = 69846510 = PANHANDLE EASTN PIPE  
641 = 69882210 = PAPERCRAFT CORP  
642 = 70111110 = PARKER PEN CO  
643 = 70254410 = PASCO INC  
644 = 70905110 = PENNSYLVANIA PWR & L  
645 = 70990310 = PENNZOIL CO  
646 = 71102110 = PEOPLES DRUG STORES  
647 = 71110610 = PEOPLES GAS CO  
648 = 71344810 = PEPSICO INC  
649 = 71404110 = PERKIN ELMER CORP  
650 = 71602610 = PETER PAUL INC  
651 = 71645110 = PETRO LEWIS CORP  
652 = 71654410 = PETROLANE INC  
653 = 71654910 = PETROLEUM & RES CORP  
654 = 71816710 = PHILIP MORRIS INC  
655 = 71832010 = PHILIPS INDS INC  
656 = 71915110 = PHOENIX STL CORP  
657 = 71996510 = PICKWICK INTL INC  
658 = 72019610 = PIEDMONT NAT GAS INC  
659 = 72447910 = PITNEY BOWES INC  
660 = 72510610 = PITTSBURGH FORGINGS

661 = 72570110 = PITTSTON CO  
662 = 72578610 = PITTSWAY CORP  
663 = 72811710 = PLAYBOY ENTERPRISES  
664 = 73109510 = POLAROID CORP  
665 = 73243610 = PONDEROSA SYS INC  
666 = 73620210 = PORTEC INC  
667 = 73762810 = POTLATCH CORP  
668 = 74051210 = PREMIER INDL CORP  
669 = 74310710 = PRODUCTS RESH & CHEM  
670 = 74449910 = PUBLIC SVC CO N MEX  
671 = 74463510 = PUBLICKER INDS INC  
672 = 74533210 = PUGET SOUND PWR & LT  
673 = 74579110 = PULLMAN INC  
674 = 74740210 = QUAKER OATS CO  
675 = 74928510 = R C A CORP  
676 = 74973810 = R T E CORP  
677 = 75215910 = RANCO INC  
678 = 75458610 = RAYBESTOS MANHATTAN  
679 = 75472210 = RAYMOND INTL INC  
680 = 75764010 = REDMAN INDS INC  
681 = 75826010 = REED TOOL CO  
682 = 75855610 = REEVES BROS INC  
683 = 75920010 = REICHOLD CHEMS INC  
684 = 75945710 = RELIANCE ELEC CO  
685 = 75946610 = RELIANCE GROUP INC  
686 = 76035420 = REPUBLIC CORP  
687 = 76040910 = REPUBLIC FINL SVCS I  
688 = 76077910 = REPUBLIC STL CORP  
689 = 76088110 = RESEARCH COTTRELL IN  
690 = 76133810 = REVCO D S INC  
691 = 76140610 = REVERE COPPER & BRAS  
692 = 76152510 = REVLON INC  
693 = 76168610 = REXHAM CORP  
694 = 76168810 = REXNORD INC  
695 = 76176310 = REYNOLDS METALS CO  
696 = 76312110 = RICHARDSON CO  
697 = 76317210 = RICHARDSON MERRELL I  
698 = 76648110 = RIEGEL TEXTILE CORP  
699 = 76775410 = RITE AID CORP  
700 = 77055310 = ROBERTSON H H CO  
701 = 77070610 = ROBINS A H INC  
702 = 77379410 = ROCKOWER BROS INC  
703 = 77571110 = ROLLINS INC  
704 = 77633810 = RONSON CORP  
705 = 77667810 = ROPER CORP  
706 = 77680610 = ROSARIO RES CORP  
707 = 78024010 = ROYAL CROWN COLA CO  
708 = 78029110 = ROYAL INDS INC  
709 = 78108810 = RUBBERMAID INC  
710 = 78120710 = RUCKER CO  
711 = 78224220 = RUSS TOGS INC  
712 = 78354910 = RYDER SYS INC  
713 = 78387810 = S C A SVCS INC  
714 = 78401510 = S C M CORP  
715 = 78462310 = S O S CONS INC

716 = 78659910 = SAGA CORP  
717 = 79744010 = SAN DIEGO GAS & ELEC  
718 = 79985010 = SANDERS ASSOC INC  
719 = 80068110 = SANGAMO ELEC CO  
720 = 80202010 = SANTA FE INDS INC  
721 = 80203710 = SANTA FE INTL CORP  
722 = 80370110 = SARGENT WELCH SCIENT  
723 = 80460010 = SAV A STOP INC  
724 = 80461710 = SAV ON DRUGS INC  
725 = 80517610 = SAVIN BUSINESS MACHS  
726 = 80685710 = SCHLUMBERGER LTD  
727 = 80912310 = SCSA INDS INC  
728 = 80918010 = SCOT LAD FOODS INC  
729 = 80974110 = SCOTT FORESMAN & CO  
730 = 81062310 = SCOTTYS INC  
731 = 81136920 = SEA CONTAINERS INC  
732 = 81151710 = SEABOARD COAST LINE  
733 = 81164110 = SEABOARD WORLD AIRLS  
734 = 81186210 = SEAGRAVE CORP  
735 = 81209810 = SEAELECTRO CORP  
736 = 81255710 = SEATRAN LINES INC  
737 = 81771510 = SERVOMATION CORP  
738 = 81913910 = SHAKESPEARE CO  
739 = 81947010 = SHAPELL INDS INC  
740 = 82086810 = SHEARSON HAYDEN STON  
741 = 82263510 = SHELL OIL CO  
742 = 82273720 = SHELLER GLOBE CORP  
743 = 82434810 = SHERWIN WILLIAMS CO  
744 = 82618020 = SIEGEL HENRY I INC  
745 = 82641410 = SIERRA PAC INDS  
746 = 82662210 = SIGNAL CCS INC  
747 = 82867510 = SIMMONDS PRECISION P  
748 = 82876010 = SIMON & SCHUSTER INC  
749 = 83016410 = SKAGGS COS INC  
750 = 83064310 = SKIL CORP  
751 = 83083010 = SKYLINE CORP  
752 = 83211010 = SMITH INTL INC  
753 = 83269610 = SMUCKER J M CO  
754 = 83408610 = SOLA BASIC INDS INC  
755 = 83571610 = SOO LINE RR CO  
756 = 84129710 = SOUTHDOWN INC  
757 = 84316310 = SOUTHERN INC GAS & E  
758 = 84345610 = SOUTHERN NAT RES INC  
759 = 84367310 = SOUTHERN RY CO  
760 = 84402810 = SOUTHERN UNION CO  
761 = 84723510 = SPARTON CORP  
762 = 84754110 = SPECTOR INDS INC  
763 = 84933910 = SPRAGUE ELEC CO  
764 = 85178310 = SPRINGS MLS INC  
765 = 85256310 = STALEY A E MFG CO  
766 = 85381010 = STANDARD PRESSED STL  
767 = 85387010 = STANDARD PRUDENTIAL  
768 = 85410610 = STANDARD SHS INC  
769 = 85423110 = STANDEX INTL CORP  
770 = 85461610 = STANLEY WKS



771 = 85772110 = STAUFFER CHEM CO  
772 = 85807610 = STEEL CO CDA LTD  
773 = 86016310 = STEVENS J P & CO INC  
774 = 86150410 = STOCKELY VAN CAMP INC  
775 = 86157210 = STONE & WEBSTER INC  
776 = 86158910 = STONE CONTAINER CORP  
777 = 86209710 = STOP & SHOP COS INC  
778 = 86386310 = STUDEBAKER WORTHINGT  
779 = 86664510 = SUN CHEM CORP  
780 = 86671310 = SUN ELEC CORP  
781 = 86676210 = SUN INC  
782 = 86732310 = SUNDSTRAND CORP  
783 = 86803510 = SUPER VALU STORES IN  
784 = 86844310 = SUPERMARKETS GEN COR  
785 = 86901920 = SURVEYOR FD INC DEL  
786 = 86971610 = SWANK INC  
787 = 87161610 = SYNTEX CORP  
788 = 87264910 = T R W INC  
789 = 87468710 = TALLEY INDS INC  
790 = 87512710 = TAMPA ELEC CO  
791 = 87538210 = TANDY CORP  
792 = 87604310 = TAPPAN CO  
793 = 87851210 = TECHNICARE CORP  
794 = 87852110 = TECHNICOLOR INC  
795 = 87854210 = TECHNICON CORP  
796 = 87913110 = TEKTRONIX INC  
797 = 87919910 = TELAUTOGRAPH CORP  
798 = 87933510 = TELEDYNE INC  
799 = 87986210 = TEMPLE INDS INC  
800 = 88160910 = TESORO PETE CORP  
801 = 88169410 = TEXACO INC  
802 = 88249110 = TEXAS INDS INC  
803 = 88250810 = TEXAS INSTRS INC  
804 = 88259310 = TEXAS OIL & GAS CORP  
805 = 88261010 = TEXAS PAC LD TR  
806 = 88289510 = TEXFI INDS INC  
807 = 88410210 = THICKOL CORP  
808 = 88475310 = THOMPSON J WALTER CO  
809 = 88634810 = TICOR  
810 = 88642310 = TIDEWATER INC  
811 = 88673510 = TIGER INTL INC  
812 = 88722410 = TIME INC  
813 = 88736010 = TIMES MIRROR CO  
814 = 88917510 = TOLEDO EDISON CO  
815 = 89027810 = TONKA CORP  
816 = 89051610 = TOOTSIE ROLL INDS IN  
817 = 89150810 = TOTAL PETE NORTH AME  
818 = 89234810 = TRACOR INC  
819 = 89289210 = TRANE CO  
820 = 89334910 = TRANS WORLD AIRLS IN  
821 = 89348510 = TRANSAMERICA CORP  
822 = 89355310 = TRANSCON LINES  
823 = 89384710 = TRANSOHIO FINL CORP  
824 = 89401510 = TRANSWAY INTL CORP  
825 = 89543610 = TRI CONTL CORP

826 = 89586110 = TRIANGLE INDS INC  
827 = 89589510 = TRIANGLE PAC CORP  
828 = 89652210 = TRINITY INDS INC  
829 = 89709010 = TROPICANA PRODS INC  
830 = 89881310 = TUCSON GAS & ELEC CO  
831 = 90122110 = TWENTIETH CENTY FOX  
832 = 90212010 = TYCO LABS INC  
833 = 90218210 = TYLER CORP  
834 = 90255010 = U A L INC  
835 = 90268610 = U G I CORP  
836 = 90287810 = U M C INDS INC  
837 = 90320010 = U O P INC  
838 = 90342210 = U V INDS INC  
839 = 90344310 = UARCO INC DEL  
840 = 90427410 = UNARCO INDS INC DEL  
841 = 90553010 = UNION CAMP CORP  
842 = 90558110 = UNION CARBIDE CORP  
843 = 90731810 = UNION PAC CORP  
844 = 90931310 = UNITED AIRCRAFT PROD  
845 = 90966010 = UNITED BRANDS CO  
846 = 91011010 = UNITED CORP  
847 = 91031410 = UNITED FINL CORP CAL  
848 = 91048490 = UNITED GAS CORP  
849 = 91056210 = UNITED GTY CORP  
850 = 91063710 = UNITED ILLUM CO  
851 = 91067110 = UNITED INDL CORP  
852 = 91068810 = UNITED INNS INC  
853 = 91121310 = UNITED NUCLEAR CORP  
854 = 91135810 = UNITED REFNG CO  
855 = 91153610 = UNITED STS & FGN SEC  
856 = 91182510 = UNITED STS FID & GTY  
857 = 91184210 = UNITED STS FILTER CO  
858 = 91202710 = UNITED STS GYPSUM CO  
859 = 91212910 = UNITED STS LEASING I  
860 = 91260510 = UNITED STS SHOE CORP  
861 = 91265610 = UNITED STS STL CORP  
862 = 91277510 = UNITED STS TOB CO  
863 = 91335310 = UNIVAR CORP  
864 = 91731810 = USLIFE CORP  
865 = 91819510 = V C A CORP  
866 = 91831410 = V S I CORP  
867 = 92220410 = VARIAN ASSOC INC  
868 = 92227210 = VARD INC  
869 = 92552610 = VIACOM INTL INC  
870 = 92916010 = VULCAN MATLS CO  
871 = 92976910 = WACHOVIA CORP  
872 = 92979410 = WACKENHUT CORP  
873 = 93235510 = WALLACE MURRAY CORP  
874 = 93316910 = WALTER JIM CORP  
875 = 93369610 = WANG LABS INC  
876 = 93405110 = WARD FOODS INC  
877 = 93440810 = WARNER & SWASEY CO  
878 = 93443610 = WARNER COMMUNICATION  
879 = 93883710 = WASHINGTON GAS LT CO  
880 = 93964010 = WASHINGTON POST CO

881 = 94014410 = WASHINGTON STL CORP  
882 = 94106310 = WASTE MGMT INC  
883 = 94701510 = WEAN UTD INC  
884 = 94715110 = WEATHERHEAD CO  
885 = 94742310 = WEBB DEL E CORP  
886 = 95081710 = WESCO FINL CORP  
887 = 95546510 = WEST POINT PEPPERELL  
888 = 95751810 = WESTCOAST TRANSMISSI  
889 = 95758610 = WESTERN AIR LINES IN  
890 = 95804310 = WESTERN CO NORTH AME  
891 = 95909010 = WESTERN PAC INDS INC  
892 = 95926550 = WESTERN PURG INC  
893 = 96154810 = WESTVACO CORP  
894 = 96199090 = WESTMORELAND INC  
895 = 96216610 = WEYERHAEUSER CO  
896 = 96289820 = WHEELABRATOR FRYE IN  
897 = 96315010 = WHEELING PITTSBURGH  
898 = 96362610 = WHITE CONS INDS INC  
899 = 96406610 = WHITE MTR CORP  
900 = 96668010 = WHITTAKER CORP  
901 = 96744310 = WICKES CORP  
902 = 97463710 = WINNEBAGO INDS INC  
903 = 97587610 = WINTER JACK INC  
904 = 97738510 = WITCO CHEM CORP  
905 = 97748010 = WITTER DEAN ORGANIZA  
906 = 97809710 = WOLVERINE WORLD WIDE  
907 = 97816510 = WOMETCO ENTERPRISES  
908 = 98006510 = WOODS CORP  
909 = 98088110 = WOOLWORTH F W CO  
910 = 98259410 = WURLITZER CO  
911 = 98412110 = XEROX CORP  
912 = 98413810 = XTRA CORP  
913 = 98885710 = ZALE CORP  
914 = 98907010 = ZAPATA CORP  
915 = 98939910 = ZENITH RADIC CORP  
916 = 98956910 = ZIMMER HOMES CORP  
917 = 98982410 = ZURN INDS INC

SAMPLE PORTFOLIO

PAGE 001

CELESTIAL HORTON VICTOR

FILE: COMPANY ALPHEA A

711115

715910-AMERICAN STERILIZER 3007710-AMERICAN STERILIZER  
327710-AMERICAN STERILIZER 7323910-BAYCO CIGARS INC  
7705110-BELL & HOWELL CO 1174210-BELL & HOWELL CO  
1042810-BELL & HOWELL CO 15087910-BELL & HOWELL CO  
15087910-BELL & HOWELL CO 20423710-BELL & HOWELL CO  
2106710-BELL & HOWELL CO 24783610-BELL & HOWELL CO  
2405110-BELL & HOWELL CO 23335110-BELL & HOWELL CO  
3135610-BELL & HOWELL CO 33781910-BELL & HOWELL CO  
34317210-BELL & HOWELL CO 36142610-BELL & HOWELL CO  
36080210-BELL & HOWELL CO 38274610-BELL & HOWELL CO  
42144310-BELL & HOWELL CO 45303920-BELL & HOWELL CO  
45029910-BELL & HOWELL CO 50424210-BELL & HOWELL CO  
56047210-BELL & HOWELL CO 60175310-BELL & HOWELL CO  
60141010-BELL & HOWELL CO 63641810-BELL & HOWELL CO  
63777610-BELL & HOWELL CO 69149710-BELL & HOWELL CO  
71404110-BELL & HOWELL CO 77070610-BELL & HOWELL CO  
78124110-BELL & HOWELL CO 80918010-BELL & HOWELL CO  
81151710-BELL & HOWELL CO 84129710-BELL & HOWELL CO  
86754110-BELL & HOWELL CO 86664510-BELL & HOWELL CO  
86603510-BELL & HOWELL CO 87919910-BELL & HOWELL CO  
88722410-BELL & HOWELL CO 90218210-BELL & HOWELL CO  
91268610-BELL & HOWELL CO 94014410-BELL & HOWELL CO  
95909010-BELL & HOWELL CO 97463310-BELL & HOWELL CO

711112

2553710-AMERICAN STERILIZER 3007710-AMERICAN STERILIZER  
3752810-AMERICAN STERILIZER 7323910-BAYCO CIGARS INC  
9854510-AMERICAN STERILIZER 1174210-BELL & HOWELL CO  
15544710-AMERICAN STERILIZER 14628510-CARTER WALLACE INC  
20275110-AMERICAN STERILIZER 17026610-CHOCK FULL O HUTS CO  
23221910-AMERICAN STERILIZER 21768710-CHOCK FULL O HUTS CO  
31358610-AMERICAN STERILIZER 23335110-BELL & HOWELL CO  
34317210-AMERICAN STERILIZER 33781910-BELL & HOWELL CO  
36080210-AMERICAN STERILIZER 36142610-BELL & HOWELL CO  
42343410-AMERICAN STERILIZER 45303920-BELL & HOWELL CO  
45303820-AMERICAN STERILIZER 50424210-BELL & HOWELL CO  
54242410-AMERICAN STERILIZER 60175310-BELL & HOWELL CO  
60175310-AMERICAN STERILIZER 63641810-BELL & HOWELL CO  
63641810-AMERICAN STERILIZER 69149710-BELL & HOWELL CO  
71404110-AMERICAN STERILIZER 77070610-BELL & HOWELL CO  
78124110-AMERICAN STERILIZER 80918010-BELL & HOWELL CO  
81151710-AMERICAN STERILIZER 84129710-BELL & HOWELL CO  
86754110-AMERICAN STERILIZER 86664510-BELL & HOWELL CO  
86603510-AMERICAN STERILIZER 87919910-BELL & HOWELL CO  
88722410-AMERICAN STERILIZER 90218210-BELL & HOWELL CO  
91268610-AMERICAN STERILIZER 94014410-BELL & HOWELL CO  
95909010-AMERICAN STERILIZER 97463310-BELL & HOWELL CO

Appendix II  
COMPUTER PROGRAMS

PROGRAM 1 EXEC FILE

PAGE 001

CONVERSATIONAL MONITOR SYSTEM

FILE: JOHN EXEC A

FI 5 DISK FI 52 A1 (LRECL 8) BLOCK 800 PFCFM FB PERM) 00001000  
FI 4 DISK WEEKLY PORT A1 00002000  
FI 6 DISK PRINTED OUTPUT A1 00003000  
FI 8 DISK CULMUL LIST A1 00004000  
FI 9 DISK DATE LIST A1 00005000  
BL TXLIB FORTMOD2 00006000  
LOAD JOHN (START MODUP) 00007000

## PROGRAM 1

PAGE 001

# CONVEYER SATICTIONAL MONITOR SYSTEM

FILE: JOHN FORTRAN A

```

00001000 JOHN H. BEINGOLD OCTOBER 27, 1978 PORTFOLIO VERIFICATION
00002000 ***** INITIALIZATION *****
00003000
00004000
00005000
00006000
00007000
00008000
00009000
00010000
00011000
00012000
00013000
00014000
00015000
00016000
00017000
00018000
00019000
00020000
00021000
00022000
00023000
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00030000
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00040000
00041000
00042000
00043000
00044000
00045000
00046000
00047000
00048000
00049000
00050000
00051000
00052000
00053000
00054000
00055000

INITIAT INTEGER (A-Z)
DIMENSION WKPORT(120), CUM1ST(1000), ADDR(7), DAT1ST(500)
DATA WKPORT/120*0/, CUM1ST/1000*0/, DAT1ST/71105,499*0/
*NEG/1*%403/1*%+
DAT1=711195
UNIT=5
DISC=4
WEEK=1

READ IN INITIAL PORTFOLIO
INITIALIZE WEEKLY PORTFOLIO

READ (UNIT,100) (CUM1ST(I), I=1,100)
FORMAT (8I10)

DO 200 I=1,100
  WKPORT(I)=CUM1ST(I)
CONTINUE

READ ADD/DROP WEEKLY UPDATE

READ (UNIT,30) TEMDAT,LIT, (ADDR(I), I=1,7)
FORMAT (I6,A1,I,X,7(I8,2X))

IF (TEMDAT.EQ.DATE) GO TO 600
BEACH IF PORTFOLIO HAS ALREADY BEEN PRINTED
PRINT PORTFOLIO AND ALSO STORE ON DISC
WRITE (6,35) DATE,(WKPORT(I), I=1,120)
FORMAT ('0',I6,/,10I12)
WRITE (DISC,40) DATE, (WKPORT(I), I=1,100)
FORMAT (I6,/,10I8)

ACCOUNTING FOR LIST OF WEEKLY DATES

IF (TEMDAT.EQ.0) GO TO 4200
WEEK = WEEK + 1
DAT1ST (WEEK) = TEMDAT
DATE = TEMDAT
IF (LIT.NE.NEG) GO TO 2000
DROP CARD
DO 400 K=1,7
  IF (ADDR(K).EQ.0) GO TO 2750
  DO 700 J=1,120
    IF (WKPORT(J).EQ.ADDR(K)) GO TO 750
CONTINUE

```

FILE: JOHN FORTRAN A CONVERSATIONAL MONITOR SYSTEM

```

125      WRITE (6,725) ADROP(K),DATE
      FORMAT ('0',18,'CANNOT BE DROPPED ON: ',I6)
      GO TO 800
C
750      DO THE DELETION OF STOCK FROM WEEKLY PORTFOLIO
      DO 775 L=1,119
      WKPORT(L)=WKPORT(L+1)
      CONTINUE
775      WKPORT(120)=0
      CONTINUE
      GO TO 250
C
2000     IF (LIT.EQ.POS) GO TO 2200
      WRITE (6,2100)
2100     FORMAT ('DATA CARDS MUST CONTAIN A + OR - IN THE 8TH COLUMN')
      STOP
C
C      ADD STOCK TO WEEKLY PORTFOLIO
C
2200     DO 4000 K=1,7
      IF (ADROP(K).EQ.0) GO TO 250
      NO ADDS TO PORTFOLIO THIS WEEK
      DO 2300 N=1,120
      IF (WKPORT(N).EQ.0) GO TO 2200
      ADD STOCK TO WEEKLY PORTFOLIO AT FIRST SPACE
      IF (WKPORT(N).GT.ADOF(K)) GO TO 2250
      MAKE SPACE FOR ADDITION
      IF (WKPORT(N).LT.ADOF(K)) GO TO 2300
      INCREMENT WEEKLY PORTFOLIO FOR INSERTION
      WRITE (6,2225) ADROP(K), DATE
      FORMAT ('0',18,'IS ALREADY PRESENT, CANNOT BE ADDED',I6)
      GO TO 4000
      CONTINUE
C
2300     MECHANICS OF ADDITION
C
C
2250     LIMIT=120-N
      DO 2275 L=1,LIMIT
      N=121-L
      WKPORT(N)=WKPORT(N-1)
      CONTINUE
      WKPORT(M)=ADROP(K)
C
      WORK ON CUMULATIVE LIST
C
      DO 3000 L=1,1000
      IF (CUMIST(L).EQ.0) GO TO 3600
      INSERT STOCK IN CUMULATIVE LIST
      IF (CUMIST(L).GT.ADOF(K)) GO TO 3100
      STOCK IS ALREADY ON CUMULATIVE LIST
      IF (CUMIST(L).EQ.ADOF(K)) GO TO 4000
      CONTINUE
      LIMIT=1000-L
      DO 3500 LL=1,LIMIT
      N=1001-LL

```

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00056000
00057000
00058000
00059000
00060000
00061000
00062000
00063000
00064000
00065000
00066000
00067000
00068000
00069000
00070000
00071000
00072000
00073000
00074000
00075000
00076000
00077000
00078000
00079000
00080000
00081000
00082000
00083000
00084000
00085000
00086000
00087000
00088000
00089000
00090000
00091000
00092000
00093000
00094000
00095000
00096000
00097000
00098000
00099000
01000000
01010000
01020000
01030000
01040000
01050000
01060000
01070000
01080000
01090000
01100000

```



CONVERSATIONAL MONITOR SYSTEM

FORTRAN A

FILE: JOHN

```

3500      CUMULST(N)=CUMULST(N-1)
3600      CONTINUE
3700      CUMULST(1)=ADROP(X)
4000      CONTINUE
      GO TO 250

C
C
C      PRINT CUMULATIVE DATA
C
C
C      DO 4500 NCUH=50,1000
      IF (CUMULST(NCUH*1)-EQ.0) GO TO 5000
4500      CONTINUE
5000      WRITE (6,5100) WEEK,NCUH
5100      FORMAT (50,5200)
      WRITE (6,5200) (CUMULST(I), I=1,NCUH)
      WRITE (DISK2,5222) (CUMULST(I), I=1,NCUH)
5222      FORMAT (10I8)
5230      FORMAT (' ',/, (10I12))
      WRITE (6,5430) (I,DATEST(I), I=1,WEEK)
5400      FORMAT ('0',/, (5('DATE ',I3,'-',I10,' ')))
      WRITE (9,5500) (DATEST(I), I=1,WEEK)
5500      FORMAT (13I6)
      END

```

```

00111000
00112000
00113000
00114000
00115000
00116000
00117000
00118000
00119000
00120000
00121000
00122000
00123000
00124000
00125000
00126000
00127000
00128000
00129000
00130000
00131000
00132000
00133000
00134000

```

PROGRAM 2 EXEC FILE

PAGE 001

CONVERSATIONAL MONITOR SYSTEM

FILE: CRSPX EXEC A

SET BLIP \*  
CP REWIND 181  
CP REWIND 182  
TAPF ESF 4 (TAP1  
TAPF PSF ("TAP2  
PI 2 TAP1 (LR ECL 15736 BLOCK 31476 RECFM VB PERM  
PI 3 TAP2 (LR ECL 15731 BLOCK 31476 RECFM VB PERM  
PI 4 DISK WEEKLY PORT A1 (LR ECL 80 BLOCK 800 RECFM FB PERM  
PI 5 DISK CUMUL LIST A1 (LR ECL 80 BLOCK 800 RECFM FB PERM  
PI 10 DISK XXXX NAME A1 (LR ECL 130 RECFM V PERM  
PI 12 DISK BAD NUMBS A1  
LOAD CRSPX (START NCRDP)

00001000  
00002000  
00003000  
00004000  
00005000  
00006000  
00007000  
00008000  
00009000  
00010000  
00011000  
00012000

CONVERSATIONAL MONITOR SYSTEM

FILE: CRSPX PORTPAN A

```

COMMON /DRPTRN/ IPERM,ICUSIP,NAME1(11),NAME2(11),LSTART,LFINIS,
*LAFTER,ISTPCD,SHPS,KEXCH,IFXCH(5),IEXCH(5),KSEC,ISFC(5),ISEC(5),
*RET1(3882)
DIMENSION ILIST(150),IPORT(100),ICUS(150),INAME(150,5)
DIMENSION ICUS(100),IINAME(100,5)
DIMENSION IDUMMY(3933)
EQUIVALENCE (IDUMMY(1),IPERM)
DATA NOPND/'*****'/
DATA NBLANK/' '
NCUM=900
NWEERS=321
IX=1

C
C 778 READ(5,99,END=778) (ILIST(I),I=1,NCUM)
C 99 FORMAT(10I5)
C
C 10 DO 100 I=1,NCUM
C 20 IF (IX.EQ.1) GO TO 25
C 25 READ(2,END=30) IDUMMY
C 30 GO TO 40
C 40 IF (3,END=101) IDUMMY
C 50 CONTINUE
C 60 IF (ICUSIP.EQ.ILIST(11)) GOTO 60
C 60 GOTO 20
C 60 ICUS(I)=ICUSIP
C INAME(I,1)=NAME2(2)
C INAME(I,2)=NAME2(3)
C INAME(I,3)=NAME2(4)
C INAME(I,4)=NAME2(5)
C INAME(I,5)=NAME2(6)
C ILIST(11)=0
C ICOUNT=ICOUNT+1
C IF (ICOUNT.EQ.NCUM) GO TO 101
C CONTINUE
C 100 CONTINUE
C 101 DO 109 I=1,NCUM
C 111 FORMAT(1X,I8,'=',5A4)
C 109 WRITE(10,111) ICUS(I), (INAME(I,J),J=1,5)
C CONTINUE
C 200 DO 200 I=1,NCUM
C IF (ILIST(I).EQ.0) GO TO 200
C WRITE(12,200) I,ILIST(I)
C 220 FORMAT(1X,'NUMBER=',14,' ICUS=',110,' NOT ON TAPE')
C 200 CONTINUE
C STOP
C END

```

PAGE 001

CONVERSATIONAL MONITOR SYSTEM

FILE: CRSPXY EXEC A

SET HUP \*  
PI 4 DISK REPLY PORT A1 (I RECL 80 BLOCK 800 RECFM FB PFCM  
PI 7 DISK CONAME ALPHA A1 (I RECL 131 RECFM F PFCM BLOCK 131  
PI 9 DISK CULMUL LISTPP A1 (I RECL 130 RECFM V PFCM  
PI 10 DISK YXXYX NAME A1 (I RECL 130 RECFM V PFCM  
LOAD CRSPXY (START NODUP)  
00001000  
00002000  
00003000  
00004000  
00005000  
00006000

CONVERSATIONAL MONITOR SYSTEM

FILE: CDSVY POFMAN A

```

COMMON /ORFTRH/ IDEFM,ICUS(I),NAME1(11),NAME2(11),LSTART,LFINIS,
*LAFTIF,IJSTPCD,NSHPS,KEXCH,IEXCH(5),IEXCH(5),KSEC,ISEC(5),ISEC(5),
*DET1(3082)
DIMENSION ILLIST(1000),IPOST(100),ICUS(1000),INAME(1000,5)
DIMENSION ICUS(100),INAME(100,5)
DIMENSION IDDPNY(3033)
LOGICAL FIND
EQUIVALENCE (IDUNNY(1),IPERF)
DATA ROPIND/'*****'/
DATA NBLANK/' '
NCUM=017
NWEFKS=321
TX=1

DO 100 I=1,NCUM
  DO 100 J=1,NCUM
    READ (10,11) ICUS(I),(INAME(I,J),J=1,5)
    FORMAT (1X,18,1X,5A4)
    WRITE (9,88) I,ICUS(I),(INAME(I,J),J=1,5)
    FORMAT (' ',14,' ',5,18,' ',5A4)
    CONTINUE
  100 CONTINUE

DO 500 IWEFK=1,NWEFKS
  READ (9,98) IDATE,(IPOST(I),I=1,100)
  98 FORMAT (16/(10IR))
  DO 400 I=1,100
    IF (IPOST(I)-EQ.0) GO TO 150
    ILOW=1
    FIND=.FALSE.
    IHIGH=NCUM
    IF (.NOT.FIND.AND.(IHIGH.GT.ILOW)) GO TO 2
    GO TO 3
  2 IF (IPOST(I)-LT.ICUS((IHIGH+ILOW)/2)) IHIGH=((IHIGH+ILOW)/2)-1
    IF (IPOST(I)-GT.ICUS((IHIGH+ILOW)/2)) ILOW=((IHIGH+ILOW)/2)+1
    IF (IPOST(I)-EQ.ICUS((IHIGH+ILOW)/2)) GO TO 51
    GO TO 1
  3 N=((IHIGH+ILOW)/2)
    FIND=.TRUE.
    IF (.NOT.FIND) GO TO 140
    ICUS(I)=ICUS(N)
    DO 300 J=1,5
      INAME(I,J)=INAME(N,J)
    CONTINUE
    GO TO 400
  400 CONTINUE
  140 ICUS(I)=IPOST(I)
  DO 350 J=1,5
    INAME(I,J)=NOPIND
  CONTINUE
  GO TO 400
  350 CONTINUE
  150 ICUS(I)=IPOST(I)
  DO 360 J=1,5
    INAME(I,J)=NOPIND
  CONTINUE
  GO TO 400
  360 CONTINUE
  400 CONTINUE
  500 CONTINUE

```

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CONVERSATIONAL MONITOR SYSTEM

FILE: CPSPY FORTRAN A

```
360      TIME(I,J)=BLANK
400      CONTINUE
767      WRITE(7,97)IDAT,(TICS(I),(JNAMT(I,J),J=1,5),I=1,100)
97      FORMAT(1X,17,/,1X,4(1X,18,/,5A4),/,4(1X,18,/,5A4))
WRITE(7,96)
96      FORMAT(' ',
*-----')
500      CONTINUE
      STOP
      END
```

00050000  
00057000  
00058000  
00059000  
00060000  
00061000  
00062000  
00063000  
00064000  
00065000  
00066000

PROGRAM 3 EXEC FILE

PAGE 001

CONVERSATIONAL MONITOR SYSTEM

A

FILE: PETRUNSP EXEC

```
SET RLLP *
CP REWIND 181
CP REWIND 182
TAPE FSE 4 (TAP1)
TAPE FSE (TAP2)
PI 2 TAP1 (IRFCL 15716 BLOCK 31476 RECFM VB PERM
PI 3 TAP2 (IRFCL 15731 BLOCK 31476 RECFM VB PERM
PI 4 DISK CUL4UL LIST A1 (IRFCL 80 BLOCK 800 RECFM FB PERM
PI 5 DISK DATE LIST A1 (IRFCL 80 BLOCK 800 RECFM FB PERM
PI 10 DISK WEEKLY PORT A1 (IRFCL 80 BLOCK 800 RECFM FB PERM
PI 12 DISK WMRK RET A1
PI 13 DISK WPORT RET A1
PI 14 DISK DATE VEC A1
PI 15 DISK CALEND RAW (IRFCL 120 BLOCK 120 RECFM F PERM
PI 7 DISK CUL MKRET A1
PI 8 DISK FINAL DATA0
GL TXC18 FORTMOD2
LOAD PETRUNSP (START MODIF)
```

00001000  
00002000  
00003000  
00004000  
00005000  
00006000  
00007000  
00008000  
00009000  
00010000  
00011000  
00012000  
00013000  
00014000  
00015000  
00016000  
00017000  
00018000

# CONVERSATIONAL MONITOR SYSTEM

FILE: RETPINSP FORTPAN A

```

CUMHON /DESTRN/ TIMEH,ICUSIP,NAME1(11),NAME2(11),I,START,LFINIS,
*IAFTER,ISTREC,D,NSRPS,KFEXCH,IFEXCH(5),KSEC,ISEC(5),ISEC(5),
*RET1(3002)
DIMENSION IDIMMY (3033)
DIMENSION IDATE (325),IVFC(325),ICUS(925),ICUS2(925)
DIMENSION WKRET (325),WKNETS (325,925),IPOFT (100)
REAL MKTRT (325),MKTRVAL (325),SPRET (325),PRET (325)
DIMENSION ICAL(3002),DSPI (3002),DSPE (3002),DVAR (3002),
*DDEWR (3002),ECAP (3002),DXRT (3002)
EQUIVALENCE (IDIMMY (1),IDERM)
NWEKKS=321
NCUM=917
IX=1
IDISP=0

READ IN CALENDAR

READ (15,11) (ICAL(I),DSPI (I),DSPP (I),DVAR (I),
*DDEWR (I),I=1,3002)
11 FORMAT (16,F15.6)
WRITE (6,11) (ICAL(I),DSPI (I),DVAR (I),DDEWR (I))

READ (5,99) (IDATE (I),I=1,NWEKKS)
99 FORMAT (13I6)
I=1
DO 1-9 J=1,3002
IF (IDATE (I)-GT,ICAL (J)) GOTO 100
IVEC (I)=J+IDISP
IF (IVEC (I)-GT,3002) IVEC (I)=3002
I=I+1
IF (I-EQ,NCUM+1) GO TO 301
100 CONTINUE
301 WRITE (14,99) (IDATE (I),IVEC (I),I=1,NWEKKS)
89 FORMAT (' ',IDATE=' ',J6,4X,'IVEC=' ,I4)
WRITE (13,90) (IDATE (I),IVEC (I),I=1,NWEKKS)
90 FORMAT (16,I4,I4)

WEEKLY MARKET RETURNS

1001 DO 1500 I=1,NWEKKS
PROD=1.0
PRON2=1.0
PRCD3=1.0
K=IVFC (I)
I=IVFC (I+1)-1
D3=1450 I=K,I

```



CONVERSATIONAL MONITOR SYSTEM

FILE: RETURNS FORTEAM

```

      PROD=PROD*(1.+DEVR(J))
      PROD2=PROD2*(1.+EVWF(J))
      PROD3=PROD3*(1.+RSPR(J))
145)  CONTINUE
      MKTRET(I)=PROD
      MKTVAL(I)=PROD2
      SPRET(I)=PROD3
150)  CONTINUE
      WRITE(12,84)(I,MKTRET(I),MKTVAL(I),SPRET(I),I=1,NWEEKS)
84)  FORMAT(' ',WEEK=I,13,' MKTRET=',F10.6,' MKTVAL=',F10.6,
*      SPRET=',F10.6)
      READ IN THE CUMULATIVE LIST OF COMPANIES
98)  READ(4,98) (ICUS(I),I=1,NCUM)
      FORMAT (1CI3)
C
C NOW READ RETURNS FROM CRSP TAPE
C
C DO 100) INUM=1,NCUM
C FIND PROPER TAPE RECORDS
102) IF (IX.EQ.1) GO TO 25
      IF (IX.NE.1) GO TO 30
25) READ(2,END=30) IDUMMY
      GO TO 4)
30) IX=2
      READ(3,END=100) IDUMMY
40) DO 150 I=1,NCUM
      IF (ICUSIP.EQ. ICUS(I)) GO TO 103
150) CONTINUE
      GO TO 102
C133) WRITE(6,83) ICUSIP, (NAME2(I),I=1,11),INUM
103) CONTINUE
88) FORMAT(' ',I8,2X,11A4,4X,'INUM=',I4)
C
C CALCULATE WEEKLY RETURNS
C
C DO 400 I=1,NWEEKS
      PROD=1.0
      K=IVWC(I)
      I=IVWC(I+1)-1
      DO 300 J=K,I
      IF (RPT1(J).LT.-1.0.OR.RPT1(J).GT.1.0) RET1(J)=0.0
      PROD=PROD*(1.0+PET1(J))
      CONTINUE
300) MKTRET(I)=PROD
400) CONTINUE
      DO 450 IWEEK=1,NWEEKS
      MKTETS(IWEEK,INUM)=MKTRET(IWEEK)
      ICUS2(INUM)=ICUSIP
450) CONTINUE
C
C READ IN WEEKLY PORTFOLIOS
C
C1030) CONTINUE
      DO 400 IWEEK=1,NWEEKS

```

00056000  
00057000  
00058000  
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00060000  
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00097000  
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00099000  
00100000  
00101000  
00102000  
00103000  
00104000  
00105000  
00106000  
00107000  
00108000  
00109000  
00110000



PAGE 004

CONVERSATIONAL MONITOR SYSTEM

00166000  
00167000

FILE: RETURNED FORTRAN A

STOP  
END

X

T-8.11.1

/\*EOJ \*\*\*\*\*  
//JF0036EC JOB 1,  
// 'STAN', REGION=140K ←  
/\*MITID USER=(M14266,P15995,,,VALUE) ←  
/\*SRI DEFER — S12222/612  
/\*MAIN TIME=2,CARDS=2  
/\*SETUP UNIT=TAPE9,ID=(CRSPIS,NORING,SAVE,SL),A=HFL,  
/\*C=OWNER=M20107,P13000,SLOT=000710,  
// EXEC FORCGO  
//C.SYSIN DD \*

DIMENSION MDTCAL(612),CSTOT(612),CSINC(612),CSCAP(612),  
\*GBTOT(612),GBINC(612),GBCAP(612),GBTOT(612),TBTOT(612),  
\*CPIR(612)

DATA NMONTH/612/  
READ(1,1000,END=999) (MDTCAL(I),CSTOT(I),CSINC(I),CSCAP(I),  
\*GBTOT(I),GBINC(I),GBCAP(I),GBTOT(I),TBTOT(I),CPIR(I),I=1,NMONTH)

1000 FORMAT(10A4)

WRITE(6,99) (TBTOT(I),MDTCAL(I),I=580,612)

99 FORMAT(' ',TBILL RATE = 'F10.6',DATE = 'I8)

WRITE(7,79) (TBTOT(I),MDTCAL(I),I=580,612)

79 FORMAT(F10.6,I10)

STOP

999 STOP 999

END

//G.FT01F001 DD DSN=IBB-SINQ.25127612,LABEL=(1,SL),UNIT=TAPE9,

// VOL=SER=CRSPIS,DISP=(OLD,PASS)

/\*EOJ \*\*\*\*\*

// 'ISON', REGION=680K

/\*MITID USER=(M14266,P15995,,,VALUE)

/\*SRI D

/\*MAIN TIME=3,LINES=8,CARDS=8

PROGRAM 5

PAGE 001

CONVERSATIONAL MONITOR SYSTEM

FILE: STOCK TSP A

```

$NAME STOCK VALUE.LINK$
LOAD$
SMPL 1 321 $
GENF PORTD=PORT-TBILL$
GENF EMARKD=EMARK-TRILL$
GENF VMARKD=VMARK-TRILL$
GENF SMARKD=SMARK-TRILL$
PIOT$
PRINT ID EMARKD VMARKD SMARKD PORTD$
PRINT EMARK VMARK SMARK TRILL PORT $
OLSQ PORTD C EMARKD$
OLSQ PORTD C VMARKD$
OLSQ PORTD C SMARKD$
SMPL 10 61 $
OLSQ PORTD C EMARKD$
OLSQ PORTD C VMARKD$
OLSQ PORTD C SMARKD$
SMPL 62 112 $
OLSQ PORTD C EMARKD$
OLSQ PORTD C VMARKD$
OLSQ PORTD C SMARKD$
SMPL 113 164$
OLSQ PORTD C EMARKD$
OLSQ PORTD C VMARKD$
OLSQ PORTD C SMARKD$
SMPL 165 216 $
OLSQ PORTD C EMARKD$
OLSQ PORTD C VMARKD$
OLSQ PORTD C SMARKD$
SMPL 217 269 $
OLSQ PORTD C EMARKD$
OLSQ PORTD C VMARKD$
OLSQ PORTD C SMARKD$
SMPL 270 321 $
OLSQ PORTD C EMARKD$
OLSQ PORTD C VMARKD$
OLSQ PORTD C SMARKD$
END$
SMPL 1 321 $
LOAD ID PORT EMARK VMARK SMARK $
71115 1.016434 1.004856 1.010116 1.008831
71112 0.966702 0.965335 0.972997 0.971833
71119 1.008288 0.999130 1.006684 1.007923
71126 0.948209 0.953393 0.971405 0.972860
711203 1.091493 1.081586 1.065862 1.049924
711210 1.030868 1.022165 1.014121 1.022350
711217 1.028385 1.031496 1.028012 1.028667
711224 1.010661 1.018139 1.014885 1.014435
711231 1.004469 1.008482 1.006456 1.005927
720107 1.026169 1.058623 1.010014 1.016994
720114 0.997389 1.015990 0.997696 0.994975
720121 1.019157 1.018752 1.009543 1.008638
720128 1.011520 1.000032 0.998459 0.996340
720204 1.119979 1.028619 1.014706 1.011012
720211 1.109989 1.012115 1.009532 1.009075

```

Appendix III

REGRESSION OUTPUT

VALUE LINE

EQUATION 1  
\*\*\*\*\*

ORDINARY LEAST SQUARES

DEPENDENT VARIABLE: PORTD

RIGHT-HAND VARIABLE	ESTIMATED COEFFICIENT	STANDARD ERROR	T- STATISTIC
C	.291192E-02	.641495E-03	4.53928
EMARKD	1.04273	.240915E-01	43.2901

LOG OF LIKELIHOOD FUNCTION = 978.887  
R-SQUARED = 0.9545  
DURBIN-WATSON STATISTIC (ADJ. FOR 0. GAPS) = 1.7525  
SUM OF SQUARED RESIDUALS = .419335E-01  
STANDARD ERROR OF THE REGRESSION = .114653E-01  
SUM OF RESIDUALS = .246614E-05  
NUMBER OF OBSERVATIONS = 321.  
MEAN OF DEPENDENT VARIABLE = .485051E-02  
P-STATISTIC( 1., 319.) = 1874.00

-] 33-

minus 5 days delay

ESTIMATE OF VARIANCE-COVARIANCE MATRIX OF ESTIMATED COEFFICIENTS

C	EMARKD
.....	.....
.411516E-06	-.137887E-05
-.107887E-05	.500403E-03
1	2

EMARKD

EQUATION 2  
\*\*\*\*\*

ORDINARY LEAST SQUARES

DEPENDENT VARIABLE: PORTD

RIGHT-HAND VARIABLE	ESTIMATED COEFFICIENT	STANDARD ERROR	T- STATISTIC
C	.490282E-02	.758348E-03	6.46513
VMARKD	1.11245	.315582E-01	35.2508

LOG OF LIKELIHOOD FUNCTION = 924.367  
P-SQUARED = 0.7957  
DURBIN-WATSON STATISTIC (ADJ. FOR 0. GAPS) = 1.5797  
SUM OF SQUARED RESIDUALS = .58886E-01  
STANDARD ERROR OF THE REGRESSION = .135869E-01  
SUM OF RESIDUALS = .858912E-05  
NUMBER OF OBSERVATIONS = 321.  
MEAN OF DEPENDENT VARIABLE = .485051E-02  
F-STATISTIC( 1., 319.) = 1242.59

-134-

minus five days

ESTIMATE OF VARIANCE-COVARIANCE MATRIX OF ESTIMATED COEFFICIENTS

C	VMARKD
.....	.....
.575091E-06	.457980E-07
.467980E-07	.995922E-03
1	2



minus five days

EQUATION 3  
\*\*\*\*\*

ORDINARY LEAST SQUARES

DEPENDENT VARIABLE: POKTD

RIGHT-HAND VARIABLE	ESTIMATED COEFFICIENT	STANDARD ERROR	T- STATISTIC
C	.568987E-02	.851359E-03	6.68328
SMARKD	1.07026	.352598E-01	30.3536

LOG OF LIKELIHOOD FUNCTION = 887.419  
R-SQUARED = 0.7428  
CURBIN-WATSON STATISTIC (ADJ. FOR 0. GAPS) = 1.5363  
SUM OF SQUARED RESIDUALS = .741417E-01  
STANDARD ERROR OF THE REGRESSION = .152453E-01  
SUM OF RESIDUALS = .813976E-05  
NUMBER OF OBSERVATIONS = 321.  
MEAN OF DEPENDENT VARIABLE = .485051E-02  
F-STATISTIC( 1.,319.) = 921.327

ESTIMATE OF VARIANCE-COVARIANCE MATRIX OF ESTIMATED COEFFICIENTS

C	SMARKD
.....	.....
.724811E-06	.974984E-06
.974984E-06	.124326E-02
1	2

LINE 10

VALUE LINE

DATE 1959

EQUATION 1  
\*\*\*\*\*

ORDINARY LEAST SQUARES

DEPENDENT VARIABLE: PORTD

RIGHT-HAND VARIABLE	ESTIMATED COEFFICIENT	STANDARD ERROR	F- STATISTIC
C	.227157E-02	.037773E-03	3.56173
EMALRD	1.04209	.242333E-01	43.0557

LOG OF LIKELIHOOD FUNCTION = 960.794  
R-SQUARED = 0.8512  
DURBIN-WATSON STATISTIC (ADJ. FOR C. GALS) = 1.7395  
SUM OF SQUARED RESIDUALS = .414363E-01  
STANDARD ERROR OF THE REGRESSION = .113974E-01  
SUM OF RESIDUALS = .103191E-05  
NUMBER OF OBSERVATIONS = 321.  
MEAN OF DEPENDENT VARIABLE = .423537E-02  
F-STATISTIC( 1.,319.) = 1853.75

ESTIMATE OF VARIANCE-COVARIANCE MATRIX OF ESTIMATED COEFFICIENTS

	C	EMALRD
C	.406755E-06	-.110394E-05
EMALRD	-.110394E-05	.565302E-03

1 2

zero day delay

LINE 10

VALUE, LINE:

31

EQUATION 2  
\*\*\*\*\*

ORDINARY LEAST SQUARES

DEPENDENT VARIABLE: PORTD

RIGHT-HAND VARIABLE	ESTIMATED COEFFICIENT	STANDARD ERROR	T- STATISTIC
C	-.427479E-02	.754927E-03	5.66252
MARKD	1.10472	.315765E-01	34.9812

LOG OF LIKELIHOOD FUNCTION = 925.839  
R-SQUARED = 0.7932  
DURBIN-WATSON STATISTIC (ADJ. FOR 0. GAPS) = 1.6773  
SUM OF SQUARED RESIDUALS = .583535E-01  
STANDARD ERROR OF THE REGRESSION = .135256E-01  
SUM OF RESIDUALS = .83707E-05  
NUMBER OF OBSERVATIONS = 321.  
MEAN OF DEPENDENT VARIABLE = .423537E-02  
F-STATISTIC( 1,319.) = 1223.79

-137-

zero day delay

ESTIMATE OF VARIANCE-COVARIANCE MATRIX OF ESTIMATED COEFFICIENTS

	C	MARKD
.....		
C	.569914E-06	.355608E-07
MARKD	.355608E-07	.997200E-03

1 2

LINE 11

VALUE LINE

EQUATION 3  
\*\*\*\*\*

ORDINARY LEAST SQUARES

DEPENDENT VARIABLE: PC1FD

RIGHT-HAND  
VARIABLE

ESTIMATED  
COEFFICIENT

STANDARD  
ERROR

T-  
STATISTIC

C  
SMARKD

-505251E-02  
1.05994

.848900E-03  
.352844E-01

5.95159  
30.0398

LOG OF LIKELIHOOD FUNCTION = 888.343  
R-SQUARED = 0.7388  
DURBIN-WATSON STATISTIC (ADJ. FOR 0. GAPS) = 1.6272  
SUM OF SQUARED RESIDUALS = .737162E-01  
STANDARD ERROR OF THE REGRESSION = .152015E-01  
SUM OF RESIDUALS = .838109E-05  
NUMBER OF OBSERVATIONS = 321.  
MEAN OF DEPENDENT VARIABLE = .423537E-02  
F-STATISTIC( 1.,319.) = 902.375

-138-

zero day delay

ESTIMATE OF VARIANCE-COVARIANCE MATRIX OF ESTIMATED COEFFICIENTS

C  
SMARKD

.720631E-06 .959534E-06  
.959534E-06 .124499E-02

1 2

EQUATION 1

ORDINARY LEAST SQUARES

DEPENDENT VARIABLE: POFD

RIGHT-HAND VARIABLE	ESTIMATED COEFFICIENT	STANDARD ERROR	T- STATISTIC
C	.900849E-03	.621505E-03	1.44946
EMARKD	1.01932	.235082E-01	43.3603

LOG OF LIKELIHOOD FUNCTION = 949.200  
R-SQUARED = 0.8549  
CURBIN-WATSON STATISTIC (ADJ. FOR 0. GAPS) = 1.6626  
SUM OF SQUARED RESIDUALS = .393238E-01  
STANDARD ERROR OF THE REGRESSION = .111028E-01  
SUM OF RESIDUALS = -.223517E-05  
NUMBER OF OBSERVATIONS = 321.  
MEAN OF DEPENDENT VARIABLE = .295423E-02  
F-STATISTIC( 1., 319.) = 1880.07

ESTIMATE OF VARIANCE-COVARIANCE MATRIX OF ESTIMATED COEFFICIENTS

C	EMARKD
.386268E-06	-.111326E-05
-.111326E-05	.552636E-03
1	2

five day delay

COIATION 2  
\*\*\*\*\*

GRBINARY IFAST SQUARES

DEPENDENT VARIABLE: PORTD

RIGHT-HAND VARIABLE	ESTIMATED COEFFICIENT	STANDARD ERROR	T- STATISTIC
C	.289480E-02	.749134E-03	3.86419
VMAKRD	1.07934	.313433E-01	34.4361

LOG OF LIKELIHOOD FUNCTION = 928.312  
P-SQUARED = 0.7880  
DUPBET-WATSON STATISTIC (ADJ. FOR O. GAPS) = 1.6290  
SUM OF SQUARED RESIDUALS = .574662E-01  
STANDARD ERROR OF THE REGRESSION = .134218E-01  
SUM OF RESIDUALS = .602007E-05  
NUMBER OF OBSERVATIONS = 321.  
MEAN OF DEPENDENT VARIABLE = .295423E-02  
P-STATISTIC( 1., 319.) = 1185.81

ESTIMATE OF VARIANCE-COVARIANCE MATRIX OF ESTIMATED COEFFICIENTS

C	VMAKRD
---	--------

C	.561202E-06	-.540956E-07
VMAKRD	-.540956E-07	.982402E-03

1	2
---	---

EQUATION 3  
\*\*\*\*\*

ORDINARY LEAST SQUARES

DEPENDENT VARIABLE: PORTD

RIGHT-HAND VARIABLE	ESTIMATED COEFFICIENT	STANDARD ERROR	T- STATISTIC
C	.365577E-02	.837344E-03	4.36591
SMARKD	1.03648	.348128E-01	29.7729

LOG OF LIKELIHOOD FUNCTION = 892.705  
R-SQUARED = 0.7354  
DURBIN-WATSON STATISTIC (ADJ. FOR 0. GAPS) = 1.5899  
SUM OF SQUARED RESIDUALS = .717397E-01  
STANDARD ERROR OF THE REGRESSION = .149963E-01  
SUM OF RESIDUALS = .675023E-05  
NUMBER OF OBSERVATIONS = 321.  
MEAN OF DEPENDENT VARIABLE = .295423E-02  
F-STATISTIC ( 1., 319.) = 886.414

ESTIMATE OF VARIANCE-COVARIANCE MATRIX OF ESTIMATED COEFFICIENTS

C SMARKD

C	.701145E-06	.820295E-06
SMARKD	.820295E-06	.121193E-02

1 2

five days delay

-142-

ten days delay

STOCK

:

VARF.F.I.F.

LINE 10

EQUATION 1

ORDINARY LEAST SQUARES

DEPENDENT VARIABLE: PORTD

RIGHT-HAND VARIABLE	ESTIMATED COEFFICIENT	STANDARD ERROR	T- STATISTIC
C	-.625377E-03	-.612748E-03	1.02061
EMARKD	1.00346	.227407E-01	44.1262

LOG OF LIKELIHOOD FUNCTION = 993.776  
R-SQUARED = 0.8592  
DURBIN-WATSON STATISTIC (ADJ. FOR 0. GAPS) = 1.6906  
SUM OF SQUARED RESIDUALS = .382185E-01  
STANDARD ERROR OF THE REGRESSION = .109457E-01  
SUM OF RESIDUALS = -.297651E-05  
NUMBER OF OBSERVATIONS = 321.  
MEAN OF DEPENDENT VARIABLE = .270850E-02  
F-STATISTIC( 1., 319.) = 1947.07

ESTIMATE OF VARIANCE-COVARIANCE MATRIX OF ESTIMATED COEFFICIENTS

C	EMARKD
.....	.....
.375460E-06	-.107355E-05
-.107355E-05	.517140E-03
1	2



## APPENDIX 2

# ORDINARY LEAST SQUARES

DEPENDENT VARIABLE: PORTD

RIGHT-HAND VARIABLE	ESTIMATED COEFFICIENT	STANDARD ERROR	T- STATISTIC
C	-264044E-02	.777865E-03	3.39447
VARBKD	1.06811	.325191E-01	32.8456

```
LOG OF LIKELIHOOD FUNCTION = 946.231
R-SQUARED = 0.7718
DUBFEN-WATSON STATISTIC (ADJ. FOR 0. GAPS) = 1.6988
SUM OF SQUARED RESIDUALS = .619585E-01
STANDARD ERROR OF THE REGRESSION = .139365E-01
SUM OF RESIDUALS = .55208E-05
NUMBER OF OBSERVATIONS = 321.
MEAN OF DEPENDENT VARIABLE = .270850E-02
F-STATISTIC( 1, 319.) = 1078.80
```

-143-

ten days delay

# ESTIMATE OF VARIANCE-COVARIANCE MATRIX OF ESTIMATED COEFFICIENTS

C  
VMARKD

(  
VNAFFD  
. .673895E-07  
. .605074E-C6  
-.673895F-07

12

EQUATION 3  
\*\*\*\*\*

ORDINARY LEAST SQUARES

DEPENDENT VARIABLE: PORTD

RIGHT-HAND VARIABLE	ESTIMATED COEFFICIENT	STANDARD ERROR	T- STATISTIC
C	.339294E-02	.869530E-03	3.90203
SMARKD	1.02064	.360740E-01	28.2930

LOG OF LIKELIHOOD FUNCTION = 880.595  
R-SQUARED = 0.7150  
DURBIN-WATSON STATISTIC (ADJ. FOR 0. GAPS) = 1.6537  
SUM OF SQUARED RESIDUALS = .773622E-01  
STANDARD ERROR OF THE REGRESSION = .155729E-01  
SUM OF RESIDUALS = .661612E-05  
NUMBER OF OBSERVATIONS = 321.  
MEAN OF DEPENDENT VARIABLE = .270850E-02  
F-STATISTIC( 1., 319.) = 800.485

ESTIMATE OF VARIANCE-COVARIANCE MATRIX OF ESTIMATED COEFFICIENTS

C	SMARKD
.....	.....
.756083E-06	.872663E-06
.872663E-06	.110114E-02

1 2

-144-

ten days delay

twenty days delay

VALUE LINE

EQUATION 1  
\*\*\*\*\*

ORDINARY LEAST SQUARES

DEPENDENT VARIABLE: PORTD

RIGHT-HAND VARIABLE	ESTIMATED COEFFICIENT	STANDARD ERROR	T- STATISTIC
C	.299166E-03	.602626E-03	.496438
EMARKD	.994190	.225125E-01	44.1616

LOG OF LIKELIHOOD FUNCTION = 999.015  
R-SQUARED = 0.8594  
DURBIN-WATSON STATISTIC (ADJ. FOR 0. GAPS) = 1.7301  
SUM OF SQUARED RESIDUALS = .369911E-01  
STANDARD ERROR OF THE REGRESSION = .107695E-01  
SUM OF RESIDUALS = -.222402E-05  
NUMBER OF OBSERVATIONS = 321.  
MEAN OF DEPENDENT VARIABLE = .223037E-02  
F-STATISTIC( 1., 319.) = 1950.20

ESTIMATE OF VARIANCE-COVARIANCE MATRIX OF ESTIMATED COEFFICIENTS

C	EMARKD
.....	.....
.363157E-06	-.984479E-06
-.984479E-06	.506814E-03
1	2

twnty days delay

EQUATION 2  
\*\*\*\*\*

CLIMAPY LEAST SQUARES

DEPENDENT VARIABLE: PORTD

RIGHT-HAND VARIABLE	ESTIMATED COEFFICIENT	STANDARD ERROR	T- STATISTIC
C	.234072E-02	.749589E-03	3.12267
VMAKD	1.07493	.348341E-01	33.7634

LOG OF LIKELIHOOD FUNCTION = 928.119  
 R-SQUARE = 0.7813  
 DURBIN-WATSON STATISTIC (ADJ. FOR 0. GAPS) = 1.5768  
 SUM OF SQUARED RESIDUALS = .575352E-01  
 STANDARD ERROR OF THE REGRESSION = .134299E-01  
 SUM OF RESIDUALS = .489876E-05  
 NUMBER OF OBSERVATIONS = 321.  
 MEAN OF DEPENDENT VARIABLE = .223037E-02  
 F-STATISTIC( 1., 319.) = 1139.94

ESTIMATE OF VARIANCE-COVARIANCE MATRIX OF ESTIMATED COEFFICIENTS

C	VMAKD
.561883E-06	.104049E-06
.104049E-06	.101341E-02

EQUATION 3

ORDINARY LEAST SQUARES

DEPENDENT VARIABLE: PORTD

RIGHT-HAND VARIABLE	ESTIMATED COEFFICIENT	STANDARD ERROR	T- STATISTIC
C	.309004E-02	.837659E-03	3.68890
SMARKD	1.03210	.353857E-01	29.1672

-147-

twenty days delay

LOG OF LIKELIHOOD FUNCTION = 892.656  
R-SQUARED = 0.7273  
DURBIN-WATSON STATISTIC (ADJ. FOR 0. GAPS) = 1.5212  
SUM OF SQUARED RESIDUALS = .717616E-01  
STANDARD ERROR OF THE REGRESSION = .149986E-01  
SUM OF RESIDUALS = .673532E-05  
NUMBER OF OBSERVATIONS = 321.  
MEAN OF DEPENDENT VARIABLE = .223037E-02  
F-STATISTIC ( 1., 319. ) = 850.710

ESTIMATE OF VARIANCE-COVARIANCE MATRIX OF ESTIMATED COEFFICIENTS

C	SMARKD
C	.701672E-06
SMARKD	.104296E-05
	.125215E-12
1	2

GLOSSARY OF TERMS AND EQUATIONS

Alpha ( $\alpha$ ). The alpha is the intercept of the regression line on the vertical axis. A positive alpha indicates Value Line has earned, on the average, a premium above that expected for the level of market variability. It's expected value is zero.

Beta ( $\beta$ ). Beta is the regression coefficient of the rate of return on the market in the market molded equation

$$R_1 = \alpha_1 + B_i R_m + \epsilon_i$$

Correlation coefficient ( $\rho$ ). This is a measure of the degree to which two variables move together

$$\rho_{1,2} = \sqrt{\frac{1 - S_{1.2}^2}{S_i^2}}$$

Covariance ( $\text{cov}, y$ ). Another measure of degree two variables move together. A positive covariance measures on merge the variables move together

$$\frac{\sum (x_i - \bar{x}) (x_2 - \bar{x}_2)}{N}$$

Efficient market. In an efficient market, current security prices fully reflect all available information.

Efficient portfolio. A fully diversified portfolio.

Geometric mean. A geometric mean is the  $N^{\text{th}}$  root of  $N$  observations.

Least square regression line. A least square regression line minimizes the sum of the square of the vertical deviations from observations points.

$$x_i = a + b x_j$$

Risk free rate. The risk free rate is the rate of return on virtually riskless assets, usually Treasury Bills.

t-statistic. A measure of statistical significance. An absolute value of 2 or greater is good.

FOOTNOTES

Chapter 1

Introduction

Introduction

1. Samuelson, Paul A. (35)

Chapter 1

1. Bernhard (6), pp. 13
2. Bergstrom (4)
3. Bernhard (5)
4. Markowitz (29)
5. Lorie Hamilton (29)
6. Sharpe (37)
7. Bernhard (5)
8. Letter from Value Line to Fischer Black
9. Sharpe (37)
10. Value Line "Selections & Opinions" November 17, 1978
11. Bernhard (5)
12. Bernhard (5)
13. Malkiel (30), pp. 107
14. Malkiel (30)



FOOTNOTES

Chapter 2

1. Shelton (42)
2. Shelton (42), pp. 285
3. Shelton (42), pp. 260
4. Hausman (20)
5. Murphy (31)
6. Murphy (31)
7. Kaplan & Weil (26)
8. Kaplan & Weil (26)
9. Black (9)
10. Black (9)
11. Black (9)
12. Black (9)
13. Black (9)

FOOTNOTES

Chapter 3

1. Fama (16), pp. 34
2. Lorie and Hamilton (29), pp. 75
3. Lorie and Hamilton (29), pp. 77
4. Sharpe (39), pp. 119
5. Lorie and Hamilton (29), pp. 89
6. Lorie and Hamilton (29), pp. 89
7. Sharpe (38), pp. 138
8. Jensen (25), pp. 389
9. Lorie and Hamilton (29), pp. 90
10. Lorie and Hamilton (29), pp. 91
11. Jensen (25), pp. 413
12. Sharpe (41), pp. 29
13. Sharpe (41), pp. 29
14. Sharpe (40), pp. 30
15. Sharpe (40), pp. w7
16. Jaffee (24), pp. 427
17. Jaffee (24), pp. 424
18. Ibbotson (22)
19. Black, Scholes (11)

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3. Implications of the Capital Gains Tax for Investment Decisions, Hold and Shelton
4. Black (9)
5. Business Week, November 13, 1978, pp. 172
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FOOTNOTES

Chapter 7

1. Shelton (42)
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3. Murphy (31)
4. Kaplan & Weil (26)
5. Black (9)
6. Fama (16)
7. Sharpe (39)
9. Jensen (25)

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