EFFICIENT CAPITAL MARKETS AND INVESTMENT RETURNS:

A Study of Three Stock Selection Strategies

by

Norman M. Mayer

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MASTER OF SCIENCE

CERTIFICATE

Certified that the work embodied in this thesis entitled, "EFFICIENT CAPITAL MARKETS AND INVESTMENT RETURNS: A Study of Three Stock Selection Strategies," by Norman M. Mayer has been carried out under my supervision and that this has not been submitted elsewhere for a degree.

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April 8, 1986

I hereby declared that I am the sole author of this thesis, titled Efficient Capital Markets and Investment Returns: A Study of Three Stock Selection Strategies.

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Norman M. Mayer

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A WORD ON NOTATION

All mathematical symbols and notation associated with Modern Portfolio Theory (MPT) and the Capital Asset Pricing Model (CAPM) are defined and explained when first introduced into the text of Chapters 1, 2, and 3. In particular, the majority of such symbols are defined within the compass of pages 8-9 and 33-36. The symbols and variable names used in the computer program written to do the analysis for this thesis are defined on page 111, Appendix B.

The reader might initially find the system of numbering tables in Appendix B somewhat confusing. Each table has a number to the right of the first title line. This number is the page number used by the SAS program that did the analysis for this thesis. Where two tables have been combined to simplify the presentation the two page numbers produced by the SAS program have been placed on the same line and connected with an ampersand (&) sign (for an example see page 144). Where one page of the output had to be placed on separate pages in the Appendix, the SAS system page numbers have been used for both tables but lower case letters have been appended to better distinguish between them (e.g., 29a and 29b on pages 131-132). This peculiar system for numbering tables was employed so that anyone tracing through the computer program in Appendix A could readily determine what the program had produced from an examination of the contents of Appendix B.

ABSTRACT

The basic tenets of Modern Portfolio Theory (MPT) and the Capital Asset Pricing Model (CAPM) are reviewed and outlined. Three measures or indices of portfolio performance derived from the CAPM are discussed along with other performance measures relying on less restrictive assumptions (i.e., stochastic dominance criteria). The three measures of market efficiency are presented along with the consensus opinion of the majority of researchers on the nature and degree of efficiency to be found in capital markets. It is concluded that inefficiencies do exist but that their utility to the small investor is in doubt.

Two fundamentally different approaches to stock selection are reviewed: low price-earnings ratio (P/E) and low price sales ratio (P/S). A refinement of earlier low P/E strategies, recently put forth by Bowen and Ganucheau (1984), and a new P/S strategy developed by Fisher (1984a) are outlined along with a proposal for testing them using data stored in the Financial Post Corporate Data Base. For comparative purposes an approach due to Graham will also be studied.

Using Jensen's performance index, employed in many existing studies, and Jobson and Korkie's (1981) modified Sharpe index, the performance of each of the three portfolios constructed is compared with that of the others and with a strategy of "purchasing" a market index. The three portfolios each outperform the TSE Total Return Index, establishing the existence of market inefficiencies but no significant differences were found between the three approaches.

Chapter 1

INTRODUCTION & LITERATURE REVIEW

Modern portfolio and capital market theory can be traced to a seminal article by Markovitz (1952) in which he establishes certain portfolio construction principles. Assuming rationality on the part of investors (i.e. they try to maximize utility where utility is a positive function of returns and a negative function of variability of returns or risk), certain implications can be drawn regarding risk-return relationships in capital markets. Many of these implications have been tested and there is general consensus that capital markets are highly efficient in a number of senses; although a few anomalies have appeared in the literature on the score of efficiency that still remain to be resolved.

In this chapter I propose to outline the tenets and conclusions of Modern Portfolio Theory (MPT) and its associated Capital Asset Pricing Model (CAPM). Next, I propose to review the empirical tests of the predictions of the CAPM. We shall see that, in addition to similar earlier works (e.g. Graham, 1973), some recent popular publications advocating certain stock selection strategies (cf. Dreman (1982), Bowen and Ganucheau (1984), Fisher (1984a), and Train (1983)) directly attempt to capitalize on some of the apparent inefficiencies in capital markets that have come to light in recent tests of the CAPM.

In the second chapter I will outline a proposed study intended to test the efficacy of both Fisher's and Bowen and Ganucheau's stock selection strategies since, of all the existing strategies published in the popular press, Bowen and Ganucheau's represents a significant refinement of Graham's classic value approach and Fisher's represents, in many ways, a significant departure from previous approaches to stock selection. For comparative purposes the most recent formulation of Graham's strategy will also be tested (cf. Blustein (1977)). Historical data on stocks traded on the Toronto Stock Exchange (TSE) and the Montreal Stock Exchange (MSE) that are stored in the Financial Post Corporate Data Base will be employed to test the effect of employing these three strategies, assuming a certain starting level of wealth. Numerous studies of low price-earnings (P/E) strategies have been done on stocks traded on the New York Stock Exchange (NYSE), the American Stock Exchange (AMEX), and other U.S. exchanges but very few such studies have been conducted on equity issues traded on Canadian exchanges (a notable exception is Ambachsheer (1977)). To date virtually no such studies have been done at all on the low price-sales (P/S) strategy advocated by Fisher.

Modern Portfolio Theory:

Modern Portfolio Theory or MPT is both a normative or prescriptive theory of individual behaviour and a positive or descriptive theory of market behaviour. On the normative side, specific rules for the formation of portfolios by investors are derived on the basis of certain assumptions about investors' attitudes toward risk and return. The positive side of MPT, namely the Capital Asset Pricing Model or CAPM, derives certain implications regarding market risk-return relationships on the supposition that investors act in accordance with the assumptions of MPT plus certain additional assumptions regarding investors' expectations and the availability of information.

MPT postulates that investors' behaviour can be understood in terms of their attitudes toward the risk and return characteristics of different investment opportunities, where return is measured by the proportional or percentage increase in the value of an investment and risk is measured by the variability of these returns (usually the variance or standard deviation of returns). As far as investors' preferences are concerned, higher returns are always preferred to lower while, where risk is concerned, less is always considered better. Various investment opportunities and alternatives can then be ranked employing the following mean-variance criterion:

Definition: An investment option A dominates (i.e., is preferred to) option B if and only if:

$$E(R_A) \geq E(R_B) \quad \text{and} \quad Var(R_A) \leq Var(R_B)$$

provided at least one strong inequality holds.

Investment opportunities can also be compared by means of various stochastic-dominance criteria, each of which involves certain assumptions regarding the shape of investors' utility functions and their attitudes toward risk.

With a knowledge of the expected returns and variances of all available securities, as well as the covariances between all possible pairs of these securities, it is possible, using mathematical optimization techniques, to trace out an efficiency frontier or locus in either mean-variance or mean-standard deviation space. Basically this locus provides the maximum expected return obtainable for each possible level of risk (i.e., variance or standard deviation of returns). Alternatively, it can be viewed as indicating the minimum risk that must be incurred for each possible level of expected return attainable on all possible portfolios constructed by holding the available securities in various proportions. In mean-variance space this locus traces out a parabola (for proof, see Merton (1972), pp. 1851-1854). In Figure 1.1, the locus ab traces out the efficient frontier facing the typical investor (see page 6).

Assuming the existence of a risk-free rate of interest (e.g. the rate of return on 91-day Treasury Bills) and the possibility of unlimited borrowing or lending at this rate, then everyone, in order to maximize utility, would hold a portfolio of risky assets, known as the market portfolio, in identical proportions. Depending on their willingness to assume risk, investors would either lend part of their money at the risk-free rate and invest the remainder in the market portfolio, invest all of their funds in the market portfolio, or borrow additional funds at the risk-free rate and invest all of their available funds in this market portfolio (producing what is known as a leveraged portfolio). The efficiency frontier available to investors would, in this case, be represented by a straight line, as seen in Figure 1.2 (see page 6). This model can be made more realistic, and more complex, by introducing such additional assumptions as: higher borrowing than lending interest rates, limits on the amount of money that can be borrowed, etc.

Given the broad array of securities available in current-day capital markets, the computational requirements of Markovitz's model are formidable in the extreme. By employing certain simplifying assumptions, computational requirements can be reduced appreciably through either single- or multi-index models. In the single-index model returns are regressed on some index of market or economy-wide activity. Multi-index models might also include industry-specific and even firm-specific variables. If there are n securities available to investors, then the full Markovitz model requires the estimation of a total of $(n^2 + 3n + 2)/2$ parameters, while the single-index model

Figure 1.1

Locus of Efficient Portfolios, ab

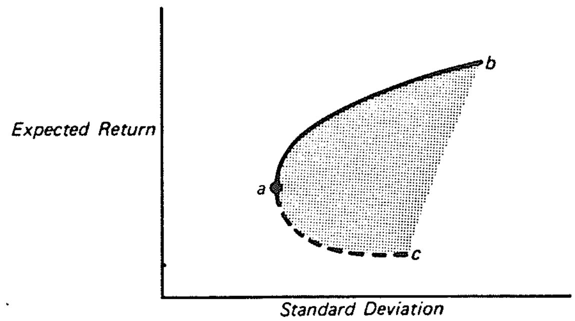
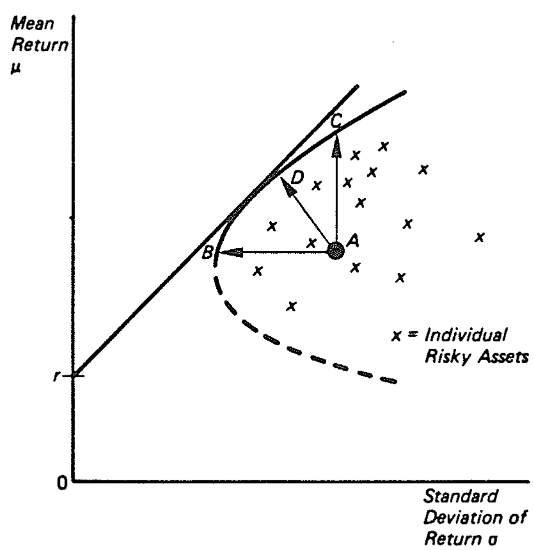


Figure 1.2

Efficiency Frontier with Borrowing and Lending



(Source: Levy & Sarnat, 1984, pages 298 and 309) requires the estimation of only 3n + 3 parameters (cf. Levy and Sarnat (1984), pp. 358 and 362).

Capital Asset Pricing Model:

The model outlined in the preceding section is normative in that it provides guidelines or prescriptions for investment decisions, given certain assumptions regarding investors' attitudes toward risk and return. The CAPM is descriptive in that it predicts certain relationships between risk and return measures of actual securities and portfolios under the following set of assumptions (cf. Levy and Sarnat (1984), pp. 395-397):

1. Investors in securities are risk-averse (i.e. they are guided by the mean-variance criterion in ranking securities).

2. Distributions of returns approximate a normal distribution.

3. The capital market is perfectly competitive in that there are many buyers and sellers, none of whom is large enough to affect prices individually.

4. There are no transactions costs (brokers' fees) or taxes.

5. Investors have homogeneous expectations regarding expected returns, variances, and covariances of all investment opportunities.

6. Investors can lend or borrow any amount at a common riskless rate of interest.

7. The decision period and time horizon are the same for all investors.

These assumptions are used to develop the most common and readily derivable models of capital market behaviour and relationships. More realistic models have been derived by relaxing one or more of the above assumptions (with the exception of the one on risk-aversiveness, which is the <u>sine qua non</u> of investor behaviour). These models all yield similar conclusions regarding the pattern of prices and returns to be observed in the market place. Only the simpler, and more commonly used, models will be discussed in detail here.

Three testable models or sets of equations relating risk and return for both securities and portfolios can be derived on the basis of this set of assumptions. The first, the <u>capital market line</u>, summarizes the expected risk and return relationship for efficient portfolios (efficient in the mean-variance dominance sense). The second model, the <u>security market line</u>, summarizes the relationship to be expected between the return on both individual securities and inefficient portfolios and the risk (or beta) associated with these assets. The third model, the <u>security characteristic line</u>, relates expected return on individual securities to the return realized on the "market" portfolio.

The <u>capital market line</u> can be summarized by the following equation:

$$E(R_P) = R_F + [(E(R_M)-R_F)/\sigma_M]\cdot\sigma_P$$

Where the symbols have the following definitions:

R_F = risk-free rate of return (e.g. on 91-day Treasury Bills)

R_M = rate of return on "market" portfolio - i.e., any portfolio containing all existing securities in amounts proportional to the total capitalization of the issuing company

R_P = rate of return on any arbitrary (but efficient) portfolio

$\sigma_M = \sqrt{Var(R_M)}$

$\sigma_P = \sqrt{Var(R_P)}$

$E(\cdot)$ = expected value operator

The equation for the <u>security market line</u> can be expressed in any one of the following three equivalent forms:

i) $E(R_i) = R_F + [E(R_M)-R_F]\cdot\sigma_{iM}/\sigma_M^2$

ii) $E(R_i) = R_F + [E(R_M)-R_F]\cdot\beta_i$

iii) $E(R_i) = R_F + [E(R_M)-R_F]\cdot\rho_{iM}\cdot\sigma_i/\sigma_M$

Where:

σ_{iM} = covariance between security i's return and the market return $\beta_i = \sigma_{iM}/\sigma_M^2$

ρ_{iM} = correlation between security i and market return

R_i = rate of return on security i

β_i = measure of security's volatility relative to the market

All other symbols have meanings as previously defined when discussing the capital market line.

Finally, the <u>security characteristic line</u> is expressed by the following relationship:

$$E(R_i) - R_F = \alpha_i + \beta_i\cdot[E(R_M) - R_F]$$

Where:

α_i = expected excess return on security i

Now, if capital markets are efficient as predicted, then $E(\alpha_i)=0$. This serves as one possible test of the CAPM.

Efficiency of capital markets can be tested by testing the relationships expressed in the above three models. Other tests of market efficiency examine the impact of various forms of information on security returns. If the assumptions of the CAPM are valid, then security prices should adjust rapidly enough so that no one can expect to earn above average rates of return merely by following those developments that can be expected to have an impact on security prices and returns.

It may be objected that the models outlined in this section are simplistic in the extreme. However, more complicated models have been developed by relaxing one or more of the seven assumptions discussed at the beginning of this section. These models lend themselves to testing in precisely the same way that the three models discussed in this section do. The next section discusses measures of portfolio performance derived from these models as well as stochastic dominance criteria for comparing the performance of portfolios with each other and with the "market".

Portfolio Performance Measures:

The CAPM and its derivatives can be used to measure the performance of portfolios and the performance of the managers of these portfolios. It is not sufficient that one portfolio earn a higher rate of return to be judged superior to another but its return must be higher on a risk-adjusted basis as well. What is more, these differences must satisfy certain statistical tests to be deemed significant. The three performance measures developed within the framework of the classical CAPM are: (1) Jensen's differential return or α, (2) Treynor's reward-to-volatility measure, and (3) Sharpe's reward-to-variability measure. Of these three measures, Jensen's has been most frequently used in statistical hypothesis testing because all it involves is testing the null hypothesis H_O: $\alpha=0$ in the regression equation fitted to the security characteristic line. Treynor's and Sharpe's indices, while calculated and used in numerous studies, are notable for their lack of use in statistical hypothesis testing since, until very recently (cf. Jobson and Korkie, 1981), little work had been done on the sampling distributions of these two indices. In addition there are tests of first-, second-, and third-degree stochastic dominance that can be used to compare portfolio performance without relying on many of the restrictive assumptions of MPT and the CAPM.

Jensen's differential return is derived from the security characteristic line discussed in the previous section - where 'security' can also be used to mean any inefficient portfolio. An α in the equation significantly greater than zero indicates superior performance.

Treynor's measure of performance measures the risky asset's return in excess of the riskless rate R_F per unit on non-diversifiable or systematic risk (i.e. beta). Further, Treynor's index:

> . . . measures the success of a portfolio (a mutual fund) or a single risky security under the assumption that investors hold many other assets in addition to the asset under consideration. We know that in the context of such a well-diversified portfolio the security's beta is indeed the appropriate risk index. (Levy and Sarnat (1984), p. 525)

Finally, Sharpe's "index measures the risky asset's excess return . . . per unit of standard deviation." (ibid, p. 522) Thus, it would seem that Sharpe's index would be more appropriately used to evaluate the performance of a fund that is not exceptionally well diversified.

One problem with the preceding three measures is that they are all derived from the CAPM and thus their validity stands or falls with the validity of the CAPM itself. The CAPM assumes that investors' utility functions are quadratic or else that security returns are normally distributed. However, this may not be that much of a problem as Fama (1977) showed that daily stock returns are normally distrubted and that monthly stock returns are close to normally distributed. Be that as it may, Stochastic dominance criteria avoid much of this difficulty as they are based on much less restrictive assumptions. In fact, they are based solely on certain very general assumptions regarding the shape of investors' preferences which, in turn, are the <u>sine qua non</u> of all modern day economic theorizing.

First-degree stochastic dominance (FSD) assumes only that the first derivative of an investor's utility function (of investment returns) is non-negative (this allows equally for risk-loving, risk-neutral, and risk-averse investors). Under FSD, investment option A is preferred to investment option B if the distribution function of A is less than or equal to the distribution function of B for all possible rates of return. This is equivalent to the requirement that the two distribution functions do not intersect.

By assuming risk aversion on the part of investors (i.e. the second derivative of the utility function is negative) it is possible to choose between some investment alternatives where the distribution functions do intersect. The second-degree stochastic dominance (SSD) criterion states that option A is preferred to option B if the cumulative difference between the distribution function for B and that for A remains non-negative throughout the whole range of returns.

If we introduce the further assumption of decreasing absolute risk aversion on the part of investors we have that the third derivative of investors' utility functions must be non-negative. This, along with the preceeding two restrictions on utility functions, provides the basis for employing the third-degree stochastic dominance (TSD) criterion. It should be noted that these three criteria are increasingly restrictive - i.e. TSD produces the smallest efficient set, SSD the next smallest, and FSD the largest set of efficient portfolios.

The Efficient Market Hypothesis:

While the concept of market efficiency in finance has not been defined with the same degree of rigor and common agreement as has the notion of Pareto efficiency in economics, most definitions at base state that, for markets to be efficient, security prices must fully reflect all available relevant information (since, as will be seen later, information has different degrees of availability, we actually have three different formulations of the efficient market hypothesis rather than just one as has been implied up to this point). Further, all that is required for capital markets to be efficient is that investors' behaviour be adequately described by MPT or some refinement thereof. What this implies for the average investor is that a simple strategy of buying and holding a randomly selected portfolio of stocks is likely to do as well as any other strategy open to him (and better than any strategy relying on a large amount of trading - because of the high transaction costs or brokers' fees involved).

It might be noted in passing that the whole concept of efficient capital markets entails, in a sense, a paradox. Efficiency implies that no amount of research can possibly have payoffs in the sense of yielding higher (risk-adjusted) rates of return since, at any given time, security prices fully reflect all available information. In fact, once research costs are taken into consideration, any conceivable approach open to the investor would be expected to do worse than a naive strategy of buying and holding a randomly selected portfolio of stocks. However, it is this very (albeit unprofitable) research and information-gathering process that ensures that stocks are correctly priced in the first place. If research and information services ceased operation entirely, opportunities could be expected to arise whereby exceptional profits could be garnered through information collection and analysis, thus serving to make those activities highly profitable that are currently held to yield no returns at all. The question, then, is not one of whether resources should or should not be spent on this kind of analysis and research but whether, from either an industry or societal point of view, the current level of expenditure on this activity is optimal (i.e., could the same degree of efficiency in capital markets be achieved but with a smaller expenditure of resources). In the same vein, Levy and Sarnatt (1984, p. 687) acknowledge the self-defeating nature of much security analysis and maintain that "the main task left to the financial analyst and the investment consultant is to construct a portfolio with risk-return profile suitable for the individual customer."

As already mentioned, there is more than one efficient market hypothesis (there are, in fact, three) depending on the nature and type of information that it is assumed that stock market prices reflect. Markets are said to be weak-form efficient if all information regarding past prices and trading volumes is reflected in the current stock price. This concept of efficiency in turn implies that "no amount of charts or analysis based solely on past prices can help to obtain abnormal profit." (Levy and Sarnatt (1984), p. 666) Markets are said to be semi-strong form efficient when:

> . . . all publicly available information is reflected in the stock price. Thus, if the market is indeed semi-strong efficient, one cannot make an abnormal profit by looking at any of the publicly available information, such as stock price movements, volume of trade, volume of short sales, the firm's income statements, etc. (loc. cit.)

These authors go on to define strong-form market efficiency as implying that "all the information, in particular including the non-public information, is reflected in the stock price." What this means specifically is that an examination of insider trading should reveal no higher rates of return being received by insiders than by other traders in the market.

At present, a voluminous literature exists testing these three efficiency hypotheses. While considerable consensus exists within the academic community, it must be kept in mind that no set of findings can ever be wholly conclusive - after all, the validity of any universal statement is completely destroyed by the discovery of just one counter-example. At present, most researchers agree that markets exhibit both weak and semi-strong forms of efficiency - although, as we shall see in the next section, there is by no means complete agreement on the question of semi-strong form efficiency. There is also general agreement that markets do not possess strong-form efficiency - i.e. a number of studies have shown that corporate insiders can earn above average returns on the basis of information presumably only they possess.

The Evidence on Low P/E Ratios:

While most of the theory and much of the empirical work surrounding capital markets would lead one to conclude that, at any one time, the existing market price of a security represents the best estimate of its true worth, there nonetheless persists a strong belief that at any point in time a certain proportion of stocks is undervalued in relation to their "true" worth and that there exist systematic selection procedures that give the individual investor a much better than even chance of identifying these "bargain" stocks.

Proponents of this view often base it on some variant of Gustave LeBon's theory of mob or crowd psychology (cf. Basu (1977), Train (1983), Dreman (1982), and Bowen and

Ganucheau (1984)). However, recent psychological research has provided a much more valid scientific basis for this view of investor behaviour (cf. De Bondt and Thaler, 1985, p. 793):

> It has now been well-established that Bayes' rule is not an apt characterization of how individuals actually respond to new data. . . . In revising their beliefs, individuals tend to overweight recent information and underweight prior (or base rate) data.

According to this thesis, there is a tendency on the part of investors to over-react to both favourable and unfavourable news regarding a company's prospects. When a stock, for whatever reason, falls out of favour with the investment community, there is a tendency for its price to be driven below what is warranted on the basis of the company's earnings and growth potential. Eventually, of course, the market will recognize its error and the stock will rise to a value more commensurate with its true worth - but, in the meantime, opportunities for unusual investment returns exist should there be some way of identifying these stocks. Similar opportunities exist with over-priced stock - but here the unusual returns are to be realized through selling the stock short rather than through purchasing it. However, this latter strategy is risky in the extreme as an already over-priced stock could conceivably continue to rise for quite some time before market corrections came into play - thus raising the spectre of financial ruin for the unhappy investor. It is for this reason that most proponents of investing in mis-priced stocks confine their efforts to the identification of under-priced stocks and largely ignore over-priced issues. In this section I will review some of the studies that report attempts, both successful and unsuccessful, to establish criteria for the selection of under-priced stocks.

One of the earliest and most persistent advocates of investing in under-valued stocks has been the late Benjamin Graham. As recently as 1974, a couple of years before his death, he maintained that:

> . . . among the 500-odd NYSE issues selling below seven time earnings today, there are plenty to be found for which the prices are not 'correct' ones, in any meaningful sense of the term. They are clearly worth more than current selling prices, and any security analyst worth his salt should be able to make up an attractive portfolio out of this universe (Graham (1974), p. 23)

Oppenheimer and Schlarbaum (1981), and Oppenheimer (1984), among others, have put Graham's advice to the test, with rather interesting results. Oppenheimer and Schlarbaum screened stocks according to criteria elaborated by Graham in various editions of his book <u>The Intelligent Investor</u>. A stock, to be considered a candidate for purchase, had to satisfy four criteria: (1) a continuous record of dividend payment for 13 or more years, (2) either assets or annual sales had to exceed $50-million plus the firm had to be at least in the upper 1/3 of its industry in size, (3) equity had to be at least 50% of capitalization for industrial companies and 30% of capitalization for utilities, and (4) P/E ratio not to exceed 20 times past five years' average earnings. A total of 60 stocks were selected at random satisfying the above criteria. Their performance was then compared with the performance of the NYSE-500 index (on a risk-adjusted basis). It should be noted that criterion (2) removes the risk of confounding the low P/E effect with the small-firm effect (cf. Roll (1981)). Basically, Oppenheimer and Schlarbaum (p. 356) conclude:

> . . . an investor using Graham's selection rules could have earned positive risk-adjusted returns. When transactions costs and taxes are ignored, the results suggest that an investor using the selection rules could have earned 3 to 3 1/2 percent more per year than an investor who purchased a market portfolio of equivalent risk and held it. When taxes and transactions costs are taken into account (in a way that biases the results against the selection rules), the annual risk-adjusted returns amount to 2 to 2 1/2 percent.

The authors then went on to demonstrate "that management costs could not consume the extra returns" (p. 357) earned employing this approach.

Graham, in collaboration with Rea (cf. Blustein (1977)), formulated another set of stock selection criteria (ten in all). These were put to an empirical test by Oppenheimer (1984). Portfolios of up to 35 securities were selected at random using various combinations of Graham and Rea's criteria. Regression analysis was then employed to calculate each portfolio's differential return (alpha) which was then tested for significance using Student's t-test. Oppenheimer discovered that, even after adjusting for the effect of firm size, stocks screened on the basis of the following two criteria gave consistently superior risk-adjusted rates of return: (1) earnings to price yield at least twice the AAA bond yield and (2) total debt less than book value.

Basu (1977) tested the results of a buy-and-hold strategy, with annual replacement of stocks no longer meeting the original selection criterion, employing only a P/E selection rule. Stocks traded on the NYSE were divided into quintiles and the performance of the five resulting portfolios was analyzed in terms of each portfolio's excess return, or alpha (i.e. Jensen's differential return). Basu also analyzed portfolio performance by computing both Treynor's reward-to-volatility measure and Sharpe's reward-to-variability measure for each of these portfolios. While using only a P/E-ratio criterion, Basu's conclusions are very similar to those of Oppenheimer (1984) and Oppenheimer and Schlarbaum (1981):

> . . . if we ignore differential tax effects regarding dividends and capital gains, the [two lowest] P/E portfolios . . . earned about 4 1/2% and 2% per annum . . . more than that implied by their levels of risk, while the high P/E portfolios earned 2 1/2% to 3% per annum less than that implied by their levels of risk. Furthermore, assuming normality, these differential returns are statistically significant at the 0.05 level or higher. (Basu (1977), p. 668)

This strategy still provided significant advantages even after allowance was made for taxes and transactions costs:

> . . . portfolio reallocation could have earned returns, after cost and after tax, amounting to 2% -3 1/2% per annum more than the associated random portfolios of equivalent risk. These incremental returns are statistically significant at the 0.05 level or higher. (ibid, p. 680)

Goodman and Peavy (1983) obtained similar results to Basu's while at the same time controlling for more factors that could influence security risk and, hence, return. In all, they controlled for three possible sources of bias: firm size, frequency of trading, and industry effect. Stocks were consigned to portfolios on the basis of their price-earning relative (PER) rather than their price-earning ratio (P/E). PER was defined as the ratio of an individual firm's P/E-ratio to the mean for all firms in the same industry. Stocks were grouped into quintiles on the basis of their PERs and risk-adjusted excess returns (using Treynor's method) were computed for each of the five portfolios constructed by this ranking scheme. Basically, their findings were consistent with Basu's:

> . . . low PER stocks substantially outperformed their high PER counterparts as well as the overall sample. In fact, portfolio excess returns declined smoothly as portfolio mean PER increased, suggesting an inverse relation between portfolio excess returns and portfolio average PER. (Goodman and Peavy (1983), p. 63)

Stocks were shifted between the five portfolios as changes in PERs warranted. Unfortunately, no attempt was made to adjust portfolios' excess returns for either taxes or transactions costs. Although obtaining results consistent with Basu's, Goodman and Peavy drew diametrically opposite conclusions. While Basu (1977, p. 680) felt his results pointed to inefficiencies in capital markets, Goodman and Peavy felt it more likely that "the CAPM is misspecified because of the omission of yet to be defined risk factors." (p. 64)

As should be evident by now, the above studies are not simply testing the hypothesis of market efficiency but rather are testing the much more complex "joint hypothesis that (i) the asset pricing models employed . . . have descriptive validity and (ii) security price behaviour is consistent with the efficient market." (Basu (1977), p. 680) It is precisely because of this indeterminacy that Levy and Lerman (1985) set themselves the task of:

> . . . analyzing the performance of various P/E portfolios within the Stochastic Dominance (SD) framework. Unlike the CAPM, SD rules are theoretically unimpeachable. They are known to be universally valid for all investors in certain well-defined risk preference classes, such as all risk-averters or all risk-averters with decreasing absolute risk-aversion. Therefore, by substituting SD analysis of P/E portfolio performance for the CAPM analysis, we do away with the joint hypothesis and concentrate on the simple null hypothesis that security prices are consistent with the efficient market hypothesis, or , rephrased, that low P/E stocks do not outperform high P/E stocks. (pp. 31-32)

Employing stochastic dominance criteria, Levy and Lerman discovered significant market inefficiencies of use to certain classes of investors (particularly institutional investors) - but not the extreme inefficiencies described by Basu:

> An individual investor cannot enjoy the benefit of the high performance of the low P/E stocks so long as he has to pay substantial transaction costs. Dealers, brokers and large institutional investors who have zero or very small transaction costs can benefit from the investment in the low P/E group, since without transaction costs or with sufficiently low costs the low P/E portfolios

> definitely dominate other portfolios including random buy-and-hold portfolios. (p. 37)

Thus, their research leads them to the conclusion that the market for securities is not semi-strong form efficient, but that the inefficiency is not sufficiently pronounced to offer much comfort to the small investor.

The Low Price-Sales Ratio Approach:

As an approach to investment selection, Fisher's low P/S ratio strategy hasn't been around long enough to have been subjected to the degree of scrutiny enjoyed by such approaches as the various low P/E strategies or the many wondrous and complicated strategies put forth by technical analysts (all in the face of a voluminous amount of research showing that day-to-day price fluctuations are essentially random in nature). Fisher (1984a) does present a number of examples from the 1930s showing that many companies, if selected on the basis of low P/S ratios, subsequently did better than many that would have been selected had a low P/E criterion been employed instead. However, one wonders if hindsight didn't play a part in the selection process.

Two recent articles by Kichen (1984a, 1984b) examined the performance of some companies with low P/S ratios but, again, no comparison was made with the results of employing other strategies. A recent article by Fisher (1984b) also attempts to put his theory to an empirical test. By taking the seven lowest and nine lowest stocks on the basis of both P/E and P/S ratios from the list of stocks making up the Dow Jones Industrial Average (DJIA), he found that the low P/S strategy out performed the low P/E strategy for both portfolio sizes. While the differences were quite large and, hence, most likely statistically significant, no actual statistical significance testing was done. Also, since the DJIA only contains 30 companies in total it could be argued that it does not represent the full universe of stocks facing the investing public. There thus seems to be a need to subject Fisher's approach to the same sort of scientific scrutiny accorded many other investment approaches. This I propose to do in the course of this study.

Three Strategies Outlined:

Bowen and Ganucheau claim (op. cit. p. 98) that their selection strategy is based on the works of Graham (1973) and Buffett (1982) so their approach is really a refinement of some that we have already examined.

Bowen and Ganucheau have actually identified three investment approaches in their book which they label Philosophies A, B, and C. In Philosophy A (the least sophisticated of the three) they suggest buying stocks solely on the basis of P/E ratios. Philosophy B selects stocks on the basis of low P/E ratios as well as a number of additional filters that are employed in the selection process: "(1) low debt-to-equity ratio, (2) high dividend yield, (3) strong current ratio, (4) no loss years in the past five years, (5) earnings growth of at least 7% per year over the past five years, (6) a Standard & Poor's quality rating on the companies' (sic) of A or better, and (7) an above-average return-on-equity over the past five years." (p. 104)

These criteria or screening filters are very similar to those reported on by Blustein (1977) as representing Graham's thinking shortly before he died. Ten criteria were proposed that can be employed in the business of stock selection. However, not all turned out to be equally necessary or effective in practice:

> The simplest way to use the criteria . . . is this: First, eliminate stocks that fail to meet the acid test of financial soundness - a debt-to-equity ratio of less than one. . . . Next, choose companies that meet one or more of the most important "reward" criteria . . . low P/E, . . . high yield, . . . and discount from current assets being the best. . . . Then buy a well-diversified package of qualifying stocks . . . (Blustein, 1977, pp. 43-44)

The first criterion can be seen as simply trying to pick stocks possessing characteristics of low risk. The purpose of the other three criteria is to identify stocks with an expectation of high returns. In future, when I refer to Bowen and Ganucheau's Philosophy B, I shall be using the procedure recommended in Blustein as my operationalization of it.

A third approach, Philosophy C, calls for a slightly more detailed analysis of a company's financial statements. However, their discussion of it is such that it is very difficult to develop an unequivocal operationalization of it. Basically, though, their third approach seems to involve two key elements or criteria for selecting stocks. The first criterion screens stocks on the basis of their returns:

> The key to investment success is to buy stock in a company whose return-on-equity remains in a high range and to buy it at a price as close as possible to stockholders' equity, i.e., book value. This results in buying a stock at a low P/E ratio. (p. 123)

The second screening criterion, free cash flow, is calculated by subtracting annual dividends and capital spending from annual cash flow figures. Since these figures could be misleading if calculated for only one year, they should, therefore, be cumulated over a five to ten year period (op. cit. p. 116):

> . . . the free cash-flow figure, whether positive or negative, can give a false signal. A company that fails to maintain its plant and has a lower-than-needed capital spending program may appear to have a positive free cash flow. Over time, a company that continually fails to meet its capital requirements will eventually see its profitability fall as plant and equipment deteriorate.
>
> Contrarily, a company with a temporarily negative free cash flow may not be all bad if the reason is a current increase in capital spending for expansion purposes. This points to the importance of viewing the figures over several years.

The investment strategy recommended by Bowen and Ganucheau is basically as follows:

1. Invest in companies screened using their Philosophy C.

2. If too few companies are selected with this approach, use Philosophy B to select stocks.

3. If stock prices are such that too few are selected using (1) and (2) then invest the remaining funds in good quality medium term (3 to 5 years) bonds.

4. Overall they recommend investing in about 20 stocks (i.e. about 5% of assets invested in each company) to obtain maximum benefits from diversification. This would mean, for example, that if only 8 stocks were selected employing these screens, then 60% of ones assets should be invested in bonds.

Fisher's approach represents a significant departure from the two just considered in that he leaves companies with negative P/E ratios (i.e., losses) open to consideration. He focuses on company sales rather than earnings, arguing that sales generate earnings and not vice versa. Companies with low P/S ratios, it is maintained, are often those that have consistently shown good sales and earnings growth but are temporarily experiencing reorgainzational or product development difficulties. Once the temporary problems are resolved, a significant growth in sales can be expected with a consequent rise in share prices. However, as Kichen (1984a, p. 208) reminds us, companies on the verge of bankruptcy almost invariably have low P/S ratios also; so this screening device must be supplemented by additional information on the financial soundness and viability of the company, just as with the low P/E approaches.

In the next chapter I shall outline a study where I propose to test the efficacy of Fisher's low P/S ratio approach and a simplified version of Bowen and Ganucheau's strategy and compare them with the results of using Graham's latest thinking (as reported by Blustein, 1977) as a basis for portfolio construction. Operationalizations of all three approaches will be presented along with a discussion of statistical tests to compare the results of employing the three sets of criteria. The universe of stocks from which securites are to be selected is those contained in the Financial Post Corporate Data Base which contains the majority of companies making up the TSE 300 Index as well as a number of other companies that have consistently attracted investor attention over the years, some 470 stocks in all.

Chapter 2

DESIGN OF THE STUDY

In this study I propose to test the semi-strong market efficiency hypothesis by examining the efficacy of three stock selection strategies: Graham's most recent formulation as reported by Blustein (1977), a simplified version of Bowen and Ganucheau's strategy, and Fisher's low P/S ratio approach. Stocks will be selected from among those included in the Financial Post Corporate Data Base. The performance of the portfolios constructed for this study will be tested relative to each other and relative to the market by means of Jensen's and Sharpe's indices.

It must also be borne in mind that, while practitioners of all three approaches would factor non-quantitative considerations such as quality of management, nature of a company's competitors, etc. into any decision to purchase a company's stock, in order to use an existing data base to conduct the type of study here under consideration, it is necessary to employ an unequivocal, numerical operationalization of each approach, all the while being mindful that some injustice to each approach might thereby be committed.

Selection Strategies:

Portfolios will be constructed effective the end of January, 1980 using an assumed starting wealth of $100,000 for each portfolio. Each portfolio will contain precisely 20 stocks purchased initially in equal dollar amounts of $5,000. The number 20 has been chosen for portfolio size because Brealey (1983, pp. 111-113) has shown that, on average, 93% of diversifiable risk can be eliminated by holding portfolios containing only 20 stocks. Thereafter, risk drops off slowly with additional increases in portfolio size. Also, the number 20 makes it feasible to monitor and review a portfolio on a regular basis.

Portfolios based on the low P/E approaches (i.e., Bowen and Ganucheau's and Graham's) will be constructed from the 60 stocks having the lowest (but still positive) P/E ratios of those contained in the Financial Post Corporate Data Base. It should be noted that even though this data base contains information on approximately 470 companies, we are not necessarily examining stocks from the first octile of P/E ratios because those companies with negative P/E ratios (i.e. those companies recording losses) have been excluded for purposes of studying the two low P/E ratio approaches. We are initially examining 60 stocks because both of these approaches employ a secondary screening device in addition to the primary one of a low P/E ratio. This will not be necessary with Fisher's approach since, as we will see subsequently, his approach can be operationalized in terms of one number, an adjusted price sales ratio, and, therefore, we can select all 20 shares of interest in one pass of the data base.

The first selection strategy to be employed, based on the work of Graham, requires that the 20 stocks with the lowest P/E ratios be selected, provided long term debt is less than equity. An equal amount of money ($5,000) will be invested in the companies so selected. Should there not be 20 companies satisfying these two conditions, then the remainder of the portfolio will be made up of those companies having the lowest ratio of long term debt to equity that exceeds 1 (again, selected form amongst those 60 companies with the lowest P/E ratio).

The second selection strategy, based on the work of Bowen and Ganucheau, requires that the 20 stocks with the lowest P/E ratios be selected so long as cumulative free cash flow (= cash flow - dividend payments - capital expenditures) for the most recent five year period is positive. If there are not 20 stocks satisfying these conditions, then the remainder will be selected on the basis of those having the lowest negative cumulative free cash flow expressed as a percentage of equity.

In a recent article, Fisher and Brill (1985) outlined the numerical criterion to be employed in selecting stocks according to the low P/S approach. The stocks to be selected are those scoring lowest on the following adjusted price-sales ratio:

$$(P/S) \div X$$

where:

$$X = ADJ = (EQUITY/ASSETS + CR/4) \text{ if } ADJ > 1$$

otherwise $X = ADJ^3$ if $ADJ < 1$ and CR is the company's current ratio.

Their criterion is based on the following line of reasoning (pp., 11-12):

> Industrial companies are usually believed healthy with current ratios of about two to one. . . Thus when you divide a healthy company's current ratio by four, you would get a figure close to 0.5.

Also, according to these authors, "when you divide shareholders' equity by total assets for a healthy company, you again get a number that is about 0.5." (p. 12) Thus if these two factors are added together they should total about 1.0 or higher for a healthy company. The adjustment factor is cubed if less than one "to penalize companies with poor balance sheets." (p. 12) Thus, companies with low P/S ratios and strong balance sheets would tend to get selected while those with weak balance sheets would tend to be excluded if this adjusted price-sales ratio were used.

The portfolios thus constructed will be reviewed annually by re-employing the above criteria. Stocks that no longer satisfy the relevant criteria will be dropped (or "sold") from the portfolio and new ones that do satisfy the criteria will be added (i.e. "purchased").

Performance of these three portfolios, as well as being compared with each other, will be compared with a strategy of constructing a portfolio of those stocks making up the TSE 300 Index in the same proportions as they enter into that index. The TSE Total Return Index will be utilized for comparison purposes as it takes into account the effects of dividends as well as share price changes.

Performance Measures:

One of the most commonly employed tests (e.g., cf. Oppenheimer and Schlarbaum, 1981) of portfolio performance is based on the security characteristic line discussed in the last chapter:

$$R_{pt} - R_{Ft} = \alpha_p + \beta_p(R_{Mt} - R_{Ft})$$

To estimate this equation, monthly data on portfolio returns (R_{pt}), market returns (R_{Mt}), and returns on a risk-free asset (R_{Ft}) are required. If capital markets are semi-strong form efficient, then $E(\alpha_p) = 0$. Thus, the hypothesis to test becomes:

$$H_O\text{:}\ \ \alpha_p \leq 0 \qquad \text{with} \qquad H_A\text{:}\ \ \alpha_p > 0$$

The desired statistical analysis would require that the parameters α_p and β_p be first estimated by linear regression techniques and then the hypothesis concerning α_p would be tested using Student's t-test. If H_O were rejected, then it would have to be concluded that the portfolio's excess returns over the market were likely due to other than chance factors.

Although both Treynor's and Sharpes's indices, based respectively on the security market line and the capital market line, have been employed extensively in studies of portfolio performance, rarely have any tests of statistical significance been done to determine whether observed performance differences were real or merely apparent. This deficiency in many early studies is due to the fact that, until relatively recently (cf. Jobson and Korkie, 1981), the sampling distributions of these two indices were unknown.

Jobson and Korkie (1981) examine both the theoretical and the practical (via Monte Carlo simulation) distributional properties of the Sharpe and Treynor indices. They conclude that the Treynor index is too sensitive to sampling errors in estimating the correlation between portfolio and market performance to be of any practical utility. However, they do conclude that a transformed difference of Sharpe performance indices has practical utility for performance comparison testing. They recommend that the following hypothesis for two portfolios, say p and q, be tested:

$$H_O: \; Sh_{pq} = s_q r_p - s_p r_q = 0$$

where s_p and s_q are the sample standard deviations and r_p and r_q are the sample means of the two series $(R_{pt} - R_{Ft})$ and $(R_{qt} - R_{Ft})$ respectively.

Now, the transformed difference Sh_{pq} is biased since:

$$E(Sh_{pq}) \approx (\sigma_q \mu_p - \sigma_p \mu_q)(1 - 1/(4T) + 1/(32T^2))$$

where T is the sample size or number of time periods (months) for which the portfolio is observed. However, Sh_{pq} is asymptotically normally distributed with variance given by:

$$\Theta = [1/T][2\sigma_p^2\sigma_q^2 - 2\sigma_p\sigma_q\sigma_{pq} + \tfrac{1}{2}\mu_p^2\sigma_q^2 + \tfrac{1}{2}\mu_q^2\sigma_p^2 - \tfrac{1}{2}\mu_p\mu_q(\sigma_{pq}^2 + \sigma_p^2\sigma_q^2)/(\sigma_p\sigma_q)]$$

If sample values are substituted for the σ's and μ's , then the hypothesis H_O: $Sh_{pq} = 0$ can be tested by means of the following test statistic:

$$z = Sh_{pq}/\sqrt{\hat{\Theta}}$$

which happens to be distributed N(0,1).

In the next chapter I shall discuss the construction of the three portfolios discussed in this chapter and analyze their performance by employing statistical tests on both the Jensen and Sharpe indices.

Chapter 3

RESULTS & CONCLUSIONS

The portfolios constructed according to the three sets of criteria (Graham's, Bowen & Ganucheau's, and Fisher's) outlined in Chapter 2 were analyzed using SAS (Statistical Analysis System). The log of the computer program that performed the analysis for this study is included in Appendix A while the output of the program is found in Appendix B. The computer log has been reproduced exactly while some rearrangement of the output from the program was found necessary. Numbers found to the right of the table titles are the page numbers produced by the system and referred to in the SAS log. However, some tables were combined while others were split to provide more reasonable page margins. Where this has occurred should be obvious from an examination of the table numbers.

Portfolio Members:

The year by year composition of the three sets of portfolios constructed from the Financial Post Corporate Data Base is listed on pages 112-120, Appendix B. A careful examination of these pages indicates that each of the three investment approaches do indeed differ from the other two in that they all include stocks that would be rejected by the others as unfit for consideration. In each of the six years, FCFR (5-year cumulative free cash flow expressed as a percent of equity) is negative for anywhere from one to four companies. These stocks, while selected by Graham's approach, would be rejected employing our interpretation of Bowen & Ganucheau's approach. If we examine the yearly composition of the portfolio constructed along Bowen & Ganucheau's lines we find that, in five out of six years, KRAT (ratio of long term debt to equity) is greater than one for at least one company. Obviously these companies would have been rejected by any approach employing our version of Graham's criteria.

When we examine the composition of the portfolios constructed using Fisher's adjusted price-sales ratio we find that each year anywhere from two to seven companies have a negative FCFR and would therefore be rejected on the B & G approach. Also, in four of the six years, stocks with negative price-earnings ratios have been selected. They would have been rejected by both the other investment approaches we are studying. It should also be noted that some companies with extremely high PE ratios (in one instance as high as 81.25) are included in some of the years. These values are much higher than any of the PE values for stocks picked by the other two approaches (which never exceed 6.6).

Since the decision to study Fisher's approach to investing was made after the data was collected for the two low PE approaches to investing, it is impossible to say how many stocks were selected by these two methods that would have been obviously eliminated by employing Fisher's criterion. However, in any event it does seem that, of the three approaches, Graham's and Bowen & Ganucheau's are the most similar in terms of the companies that they would consider desirable investment candidates. It should also be noted that while it was conceived that 20 stocks would be purchased annually, held for one year, and then "sold" at year end to purchase 20 new stocks, in practice there is quite a "carry-over" from year to year in terms of the companies making up the portfolios. While we have not explicitly considered taxes and transactions costs (i.e., brokers' fees) in this study, in real life situation this would have the effect of reducing brokers' fees and capital gains taxes that would have to be paid.

Exploratory Data Analysis:

The SAS procedure PROC UNIVARIATE was performed on the monthly returns of each of the three portfolios, the return on the TSE 300 Total Return Index, and the monthly rates for 91-Day Treasury Bills. This procedure provides relatively complete descriptive statistics and examines the distributional properties of any variable.

Three graphical techniques are used by this procedure to display the distribution of a variable. The stem-and-leaf plot is just a modified histogram of the data. According to the SAS User's Guide: Basics, the box plot is to be interpreted as follows:

> The bottom and top edges of the box are located at the sample 25th and 75th percentiles. The center horizontal line is drawn at the sample median and the central plus sign (+) is at the sample mean. . . . The central vertical lines, called "whiskers", extend from the box as far as the data extend, to a distance of at most 1.5 interquartile ranges. (pp. 1187-1188)

The manual goes on the explain the normal probability plot as follows:

> The third plot, normal probability plot, is a quantile-quantile plot of the data. The empirical quantiles are plotted against the quantiles of a standard normal distribution. Asterisks (*) mark the data values. . . . The plus signs (+) provide a reference straight line that is drawn using the sample mean and standard deviation. If the data are from a normal distribution, they should tend to fall along the reference line. (p. 1188)

In addition to providing three graphical depictions of a variable, PROC UNIVARIATE calculates several standard statistics for studying the shape of the distribution and for testing the hypothesis that the mean of the distribution is zero. Such standard parameters as mean, median, mode, standard deviation, skewness, and kurtosis are supplied. Also, a signed rank statistic is provided for testing the hypothesis that the population mean is 0 and Kolmogorov's D is calculated to test the hypotheses that each of the variables are normally distributed. The results of these analyses are to be found on pages 125, 130, 135, 138, and 141 of Appendix B. Several conclusions regarding the distributions of R_A, R_B, R_C, R_M, and R_F are readily apparent. The p-values associated with tests of the hypotheses of a zero mean and a normally distributed variable are reproduced below in Table 3.1:

Table 3.1

Tests for Zero Mean and Normality

Variable	Mean=0 (Student's t)	Normally Distributed (Kolmogorov's D)
R_A	$p = .0006$	$p > .15$
R_B	$p = .0008$	$p > .15$
R_C	$p = .0001$	$p > .15$
R_M	$p = .144$	$p > .15$
R_F	$p = .0001$	$p < .01$

Thus it can be readily seen that, with the exception of R_M, we must conclude that all variables differ significantly from zero and that, except in the case of R_F, we cannot reject the hypothesis that each variable is normally distributed.

Descriptive information on the relationships between the returns on each of the three portfolios, the return on the "market", and the return on 91-Day Treasury Bills was obtained using the SAS procedure PROC CORR which calculates both the covariances and correlations between all possible pairs of variables. The results are to be found on page 144, Appendix B. It can be seen that all the variables are significantly inter-correlated but that, while the returns on each of the three portfolios and the "market" are positively related, the return on 91-Day Treasury Bills is negatively correlated with all the other returns.

Performance Testing Using Sharpe's Index:

In the last chapter we saw that Jobson and Korkie (1981) recommend that the following hypothesis for two portfolios, say p and q, be tested:

$$H_O: \quad Sh_{pq} = s_q r_p - s_p r_q = 0$$

where s_p and s_q are the sample standard deviations and r_p and r_q are the sample means of the two series $(R_{pt} - R_{Ft})$ and $(R_{qt} - R_{Ft})$ respectively. This hypothesis is testing whether or not two portfolios p and q differ significantly in performance in terms of their risk-adjusted rates of return. In this section we shall look at the results of comparing the three portfolios we have constructed with each other and with the market (i.e., with returns on our market index, the TSE 300 Total Return Index).

In the last chapter we also saw that Sh_{pq} is asymptotically normally distributed with variance given by:

$$\Theta = [1/T][2\sigma_p^2\sigma_q^2 - 2\sigma_p\sigma_q\sigma_{pq} + \tfrac{1}{2}\mu_p^2\sigma_q^2 + \tfrac{1}{2}\mu_q^2\sigma_p^2 - \tfrac{1}{2}\mu_p\mu_q(\sigma_{pq}^2 + \sigma_p^2\sigma_q^2)/(\sigma_p\sigma_q)]$$

If sample values are substituted for the σ's and μ's , then the hypothesis H_O: $Sh_{pq} = 0$ can be tested by means of the following test statistic:

$$z = Sh_{pq}/\sqrt{\hat{\Theta}}$$

which happens to be distributed N(0,1).

This test statistic, z, was calculated for all possible pairs of portfolios (where the "market" is considered to be one of the portfolios being compared). The results of this analysis are reported on page 146, Appendix B. They are reproduced below in Table 3.2.

Table 3.2

Test Statistics Using Sharpe's Index

Comparison	Sh_{pq}	Θ	z	p^*
A with B	0.4720	0.53321	0.64632	> .51
A with C	-0.9310	2.22957	-0.62349	> .52
A with M	6.5602	6.09665	2.65689	< .008
B with C	-1.3164	2.09871	-0.90868	> .36
B with M	5.8960	5.40497	2.53607	< .011
C with M	6.6677	5.82943	2.76162	< .006

* approximate probability values for two-tailed test of the null hypothesis

A = Graham's portfolio
B = Bowen & Ganucheau's portfolio
C = Fisher's portfolio
M = TSE 300 Total Return Index

A number of conclusions readily follow from the data in Table 3.2. Where each of the three investment approaches are compared with the "market", the null hypothesis must be rejected. This would seem to imply that, contrary to the tenets of Modern Portfolio Theory, financial markets do indeed display some forms of inefficiency. However, when the three investment approaches are compared with each other we must accept the null hypothesis and conclude that there is no significant difference between the investment approaches of Graham, Bowen & Ganucheau, and Fisher in terms of the returns one is likely to realize. Thus, in practical terms it is possible to conclude that there are strategies that will "beat" the market but that of the three approaches studied here there is little to choose between them, except perhaps on practical grounds. Since Graham's approach involves the least calculation of the three and utilizes more readily available information, it would seem that his approach is the most practical to use.

Performance Testing Using Jensen's Index:

The statistical tests of our three selection strategies were done employing Jensen's alpha. An equation was fitted to the two time series $R_{pt} - R_{Ft}$ and $R_{Mt} - R_{Ft}$ by least square linear regression where p stands for any of the three investment approaches under investigation. If the strategy being tested has a regression equation where the vertical intercept (or alpha) is significantly greater than 0, then we would have to conclude that the selection method was able to pick a portfolio of stocks that earned an above average rate of return. The results of the regression analysis for each of the three approaches can be found on pages 147-152, Appendix B. The regression equations that resulted are reproduced below. The subscripts A, B, and C stand for Graham's, Bowen & Ganucheau's, and Fisher's approaches respectively. The two estimated coefficients in each equation are Jensen's alpha and the portfolio's beta respectively. The number in parentheses below each estimated parameter is the Student's t statistic for testing the null hypothesis that the corresponding estimated value is in fact 0. As can be seen all estimated alphas and betas for each of the three approaches are significantly different from 0.

Table 3.3
Results of Regression Analysis

$$R_A - R_F = \underset{(.0057)}{1.153} + \underset{(.0001)}{.688}(R_M - R_F)$$

$$R_B - R_F = \underset{(.0086)}{1.036} + \underset{(.0001)}{.688}(R_M - R_F)$$

$$R_C - R_F = \underset{(.0034)}{1.170} + \underset{(.0001)}{.537}(R_M - R_F)$$

An examination of these equations indicates that once again we can conclude that each of the three investment approaches earns above average rates of return. Another interesting point is that each portfolio has a beta well under 1, indicating that these portfolios have relatively low risk (a beta of 1 indicates a level of risk equivalent to that of the market as a whole). This seems to run counter to the conventional wisdom that above average returns can be obtained only by under taking above average risks.

Conclusions:

On the basis of the analysis done here we would have to conclude that those researchers who maintain that capital markets do not exhibit semi-strong form efficiency seem to be on the right track. While most of the research done to date seems to have employed Jensen's alpha for significance testing, we got the same results using both Jensen's alpha and Jobson and Korkie's formulation of Sharpe's index. Further, while much of the literature has focussed on low PE selection strategies, we found that employing Fisher's, until now untested, low price-sales ratio approach to investing also produced above-average returns.

However, a few caveats must be kept in mind in interpreting the results of this study. A more realistic study would have taken full account of the tax implications of all four investment strategies (where purchasing and holding shares in some market-index fund is now considered to be one of the possible investment strategies). Also the costs of conducting the research to use one of the three active investment strategies analyzed in this study should also be taken into consideration. Since the returns realized on the three portfolios were so much in excess of the gains on the

TSE 300 Total Return Index, it is unlikely that the gains to be realized would be totally nullified by considering the additional costs. It must also be kept in mind that taxes likewise have to be paid on any passively held index fund and with the promised capital gains tax exemption in the Federal Budget of 1985 the tax penalty for a more active investment strategy is reduced considerably (at least as long as the $500,000 capital gains limit has not yet been reached).

Two other limitations inherent in a study of this nature must also be considered. The study was conducted on data from the 1980-1985 period. Market relations may be such that these same strategies might not perform equally well under some other set of market and economic conditions. Finally, this study relied on the data stored in an historical data base. The data extracted from the Financial Post Corporate Data Base effective a given data might not have been nearly as readily available had an attempt been made to implement these strategies on an ongoing basis starting in January of 1980. This is most assuredly true since the dates attached to the data in this data base are the historical dates to which it applies and not the dates when the Financial Post Corporation first acquired the information and most certainly not the dates when they were entered into the data base by clerical staff.

A final qualification concerns the nature of the market index or proxy itself. Recently the Toronto Stock Exchange changed the companies making up the TSE 300 Composite Index. A number of resource-based companies were dropped from the index and replaced with service and "high tech" companies. Since we have just recently gone through a period where many economic observers feel structural changes are occurring in industrialized economies where resource and other basic industries will figure less prominently in the future, it is quite possible that the index we have been using does not adequately represent the whole universe of stocks actually available to the investor. A more representative index might have performed better with the corollary that our three stock selection strategies might not have displayed quite as strong a performance as they seemed to in this study.

Directions for Further Study:

As is always the case, it seems that a study of this nature raises more questions than it settles. As was indicated in the concluding section, an attempt could be made to generalize the results of this study by considering other historical periods. The study could be made more realistic by attempting to take full account of all the costs associated with each of the investment approaches. It must be kept in mind, though, any investment approach must be compared to some other method of handling ones finances and this approach too will undoubtedly have cost associated with it.

During the conduct of this study it became very apparent that further research of a theoretical nature must be done. Many of the classic articles in the field study market returns and compare the performance of both investment approaches and portfolio managers without doing any significance testing whatsoever. A number of earlier studies do perform tests on Jensen's alpha and some studies have employed stochastic dominance criteria. Part of the problem is that the distributional properties of many of the performance indices are inadequately known. Another glaring inadequacy relates to the way in which average returns are computed. We have been working with arithmetic means of monthly returns in this study because all of the available models do likewise. However, since we are working in a world characterized by compound interest and compound growth when we are discussing investment returns it would seen much more relevant to work with geometric means of returns rather then arithmetic means. Unfortunately, theory has not been developed to adequately handle this. (If we were to calculate annual geometric mean rates of return we would get 27.0%, 25.3%, and 27.9% for Graham's, Bowen & Ganucheau's, and Fisher's approaches respectively; but, as mentioned, there is no way currently of doing hypothesis testing concerning the equality of these means.)

Another interesting possibility would be to do a feasibility study of completely automating one or more of the investment approaches examined in this study. We have deviated from the approach recommended by the proponents of our three strategies in that we have totally ignored qualitative factors in making our investment selections. Since we were working with historical data this of course was necessary since to do otherwise would have been attempting to judge management and other corporate factors in a situation where the outcome was already known. However, to take into consideration these qualitative factors in making investment decisions has quite definite time and cost implications. With current advances in computer and data base technology it should be possible to set up an automated investment selection and management system. Even if the returns were less than with an approach that examined a large number of non-quantitative factors, the costs of managing a portfolio in this manner should be most decidedly less.

APPENDIX A

COMPUTER PROGRAM & LOG

This appendix contains the computer program written using SAS to perform the analysis on the three portfolios constructed for this study. The results produced by this program are to be found in Appendix B. The page numbers referred to throughout the SAS log are not the page numbers found at the tops of the pages in Appendix B but are rather the numbers appearing beside the table headings.

```
1        S A S   L O G    OS SAS 82.4        VS2/MVS JOB MAYER    STEP GO
PROC                    21:46 TUESDAY, MARCH 18, 1986
 NOTE: THE JOB MAYER HAS BEEN RUN UNDER RELEASE 82.4 OF SAS AT THE UNIVERSITY OF
MANITOBA (02246001). NOTE: CPUID   VERSION = 82  SERIAL = 000103  MODEL = 0580.
 NOTE: SAS OPTIONS SPECIFIED ARE:  SORT=4

           OPTIONS ERRORS=0 LS=65;
           *

           READS IN TSE INDICES AND TREASURY BILL RATES

           ;
           DATA TSE;
             INFILE BLACK;
             INPUT  YEAR MONTH TSE1 TSE2 R1 R2;
               VM=TSE2;
               RF=R1;
           *  CONVERTING ANNUAL TO MONTHLY RETURNS  ;
               RF=RF/12;
           *

           THIS SECTION READS IN DATA ON SHARES TO BE ANALYZED
           EMPLOYING FISHER'S LOW PRICE-SALES STRATEGY

           ;

 NOTE: INFILE BLACK IS:
       DSNAME=NMAYER.DATA.TSE,
       UNIT=DISK,VOL=SER=USER05,DISP=SHR,
       DCB=(BLKSIZE=80,LRECL=80,RECFM=FB)
 NOTE: 73 LINES WERE READ FROM INFILE BLACK.
 NOTE: DATA SET WORK.TSE HAS 73 OBSERVATIONS AND 8 VARIABLES. 280
 OBS/TRK
 NOTE: THE DATA STATEMENT USED 0.06 SECONDS AND 340K.

           DATA F1A;
             INFILE BROWN OBS=20;
             INPUT NAME $ 1-31 SYMB1 $ 32-34 PR 42-48 PSADJ 52-57
  ASSET 59-66
                     SPS 68-75 EQTY 77-84 CR 87-93 SHR 95-102 EPS1
 104-111
                     PE 113-120 YREND $ 123-132;

 NOTE: INFILE BROWN IS:
       DSNAME=NMAYER.FISHER.DATA,
       UNIT=DISK,VOL=SER=USER04,DISP=SHR,
       DCB=(BLKSIZE=2556,LRECL=142,RECFM=FB)
 NOTE: 20 LINES WERE READ FROM INFILE BROWN.
 NOTE: DATA SET WORK.F1A HAS 20 OBSERVATIONS AND 12 VARIABLES. 158
  OBS/TRK
 NOTE: THE DATA STATEMENT USED 0.04 SECONDS AND 340K.

           DATA F1B;
```

```
2       S A S   L O G    OS SAS 82.4          VS2/MVS JOB MAYER
                                    21:46 TUESDAY, MARCH 18, 1986
          ARRAY CASH (I) CASH1-CASH5;
          ARRAY DIV (I) DIV1-DIV5;
          ARRAY CAPT (I) CAPT1-CAPT5;
          INFILE BROWN FIRSTOBS=21 OBS=40;
          INPUT SYMB2 $ 1-3 @10 (CASH1-CASH5) (7.0 +1)
           @51 (DIV1-DIV5) (7.0 +1) @92 (CAPT1-CAPT5) (7.0 +1);
          DO OVER CASH;
            IF CASH=. THEN CASH=0;
            IF DIV=. THEN DIV=0;
            IF CAPT=. THEN CAPT=0;
          END;
            FCF=CASH1+CASH2+CASH3+CASH4+CASH5-DIV1-DIV2-DIV3-D
IV4-DIV5-
                CAPT1-CAPT2-CAPT3-CAPT4-CAPT5;

NOTE: INFILE BROWN IS:
      DSNAME=NMAYER.FISHER.DATA,
      UNIT=DISK,VOL=SER=USER04,DISP=SHR,
      DCB=(BLKSIZE=2556,LRECL=142,RECFM=FB)
NOTE: 20 LINES WERE READ FROM INFILE BROWN.
NOTE: DATA SET WORK.F1B HAS 20 OBSERVATIONS AND 18 VARIABLES. 133
 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.05 SECONDS AND 340K.

        DATA F1C;
          INFILE BROWN FIRSTOBS=41 OBS=60;
          INPUT SYMB3 $ 1-3 @10 (P1-P12) (9.3 +1);

NOTE: INFILE BROWN IS:
      DSNAME=NMAYER.FISHER.DATA,
      UNIT=DISK,VOL=SER=USER04,DISP=SHR,
      DCB=(BLKSIZE=2556,LRECL=142,RECFM=FB)
NOTE: 20 LINES WERE READ FROM INFILE BROWN.
NOTE: DATA SET WORK.F1C HAS 20 OBSERVATIONS AND 13 VARIABLES. 185
 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.03 SECONDS AND 340K.

        DATA F1D;
          ARRAY DP (I) DP1-DP4;
          INFILE BROWN FIRSTOBS=61 OBS=80;
          INPUT NAME2 $ 1-30 SYMB4 $ 32-34 SPLDT $ 44-49 NEW 5
9-62
                OLD 77 DP1 88-93 DP2 100-105 DP3 112-117 DP4 1
24-129;
          DO OVER DP;
            IF DP=. THEN DP=0;
          END;

NOTE: INFILE BROWN IS:
      DSNAME=NMAYER.FISHER.DATA,
      UNIT=DISK,VOL=SER=USER04,DISP=SHR,
```

```
3       S A S   L O G    OS SAS 82.4          VS2/MVS JOB MAYER
                                     21:46 TUESDAY, MARCH 18, 1986
      DCB=(BLKSIZE=2556,LRECL=142,RECFM=FB)
NOTE: 20 LINES WERE READ FROM INFILE BROWN.
NOTE: DATA SET WORK.F1D HAS 20 OBSERVATIONS AND 10 VARIABLES. 192
 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.04 SECONDS AND 340K.

           DATA F1;
             MERGE F1A F1B F1C F1D;
               FCFR=FCF/EQTY;

NOTE: DATA SET WORK.F1 HAS 20 OBSERVATIONS AND 53 VARIABLES. 42 O
BS/TRK
NOTE: THE DATA STATEMENT USED 0.05 SECONDS AND 408K.

           DATA F2A;
             INFILE BROWN FIRSTOBS=81 OBS=100;
             INPUT NAME $ 1-31 SYMB1 $ 32-34 PR 42-48 PSADJ 52-57
 ASSET 59-66
                   SPS 68-75 EQTY 77-84 CR 87-93 SHR 95-102 EPS1
104-111
                   PE 113-120 YREND $ 123-132;

NOTE: INFILE BROWN IS:
      DSNAME=NMAYER.FISHER.DATA,
      UNIT=DISK,VOL=SER=USER04,DISP=SHR,
      DCB=(BLKSIZE=2556,LRECL=142,RECFM=FB)
NOTE: 20 LINES WERE READ FROM INFILE BROWN.
NOTE: DATA SET WORK.F2A HAS 20 OBSERVATIONS AND 12 VARIABLES. 158
 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.04 SECONDS AND 340K.

           DATA F2B;
             ARRAY CASH (I) CASH1-CASH5;
             ARRAY DIV (I) DIV1-DIV5;
             ARRAY CAPT (I) CAPT1-CAPT5;
             INFILE BROWN FIRSTOBS=101 OBS=120;
             INPUT SYMB2 $ 1-3 @10 (CASH1-CASH5) (7.0 +1)
                   @51 (DIV1-DIV5) (7.0 + 1) @92 (CAPT1-CAPT5) (7
.0 +1);
             DO OVER CASH;
               IF CASH=. THEN CASH=0;
               IF DIV=. THEN DIV=0;
               IF CAPT=. THEN CAPT=0;
             END;
               FCF=CASH1+CASH2+CASH3+CASH4+CASH5-DIV1-DIV2-DIV3-D
IV4-DIV5-
                   CAPT1-CAPT2-CAPT3-CAPT4-CAPT5;

NOTE: INFILE BROWN IS:
      DSNAME=NMAYER.FISHER.DATA,
      UNIT=DISK,VOL=SER=USER04,DISP=SHR,
      DCB=(BLKSIZE=2556,LRECL=142,RECFM=FB)
```

```
4        S A S   L O G    OS SAS 82.4        VS2/MVS JOB MAYER
                                          21:46 TUESDAY, MARCH 18, 1986
NOTE: 20 LINES WERE READ FROM INFILE BROWN.
NOTE: DATA SET WORK.F2B HAS 20 OBSERVATIONS AND 18 VARIABLES. 133
 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.05 SECONDS AND 340K.

72           DATA F2C;
73             INFILE BROWN FIRSTOBS=121 OBS=140;
74             INPUT SYMB3 $ 1-3 @10 (P1-P12) (9.3 +1);

NOTE: INFILE BROWN IS:
      DSNAME=NMAYER.FISHER.DATA,
      UNIT=DISK,VOL=SER=USER04,DISP=SHR,
      DCB=(BLKSIZE=2556,LRECL=142,RECFM=FB)
NOTE: 20 LINES WERE READ FROM INFILE BROWN.
NOTE: DATA SET WORK.F2C HAS 20 OBSERVATIONS AND 13 VARIABLES. 185
 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.04 SECONDS AND 340K.

75           DATA F2D;
76             ARRAY DP (I) DP1-DP4;
77             INFILE BROWN FIRSTOBS=141 OBS=160;
78             INPUT NAME2 $ 1-30 SYMB4 $ 32-34 SPLDT $ 44-49 NEW 5
9-62
79                   OLD 77 DP1 88-93 DP2 100-105 DP3 112-117 DP4 1
24-129;
80             DO OVER DP;
81               IF DP=. THEN DP=0;
82             END;

NOTE: INFILE BROWN IS:
      DSNAME=NMAYER.FISHER.DATA,
      UNIT=DISK,VOL=SER=USER04,DISP=SHR,
      DCB=(BLKSIZE=2556,LRECL=142,RECFM=FB)
NOTE: 20 LINES WERE READ FROM INFILE BROWN.
NOTE: DATA SET WORK.F2D HAS 20 OBSERVATIONS AND 10 VARIABLES. 192
 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.04 SECONDS AND 340K.

83           DATA F2;
84             MERGE F2A F2B F2C F2D;
85               FCFR=FCF/EQTY;

NOTE: DATA SET WORK.F2 HAS 20 OBSERVATIONS AND 53 VARIABLES. 42 O
BS/TRK
NOTE: THE DATA STATEMENT USED 0.05 SECONDS AND 408K.

86           DATA F3A;
87             INFILE BROWN FIRSTOBS=161 OBS=180;
88             INPUT NAME $ 1-31 SYMB1 $ 32-34 PR 42-48 PSADJ 52-57
 ASSET 59-66
89                   SPS 68-75 EQTY 77-84 CR 87-93 SHR 95-102 EPS1
104-111
90                   PE 113-120 YREND $ 123-132;
```

```
5       S A S   L O G    OS SAS 82.4          VS2/MVS JOB MAYER
                                        21:46 TUESDAY, MARCH 18, 1986

NOTE: INFILE BROWN IS:
      DSNAME=NMAYER.FISHER.DATA,
      UNIT=DISK,VOL=SER=USER04,DISP=SHR,
      DCB=(BLKSIZE=2556,LRECL=142,RECFM=FB)
NOTE: 20 LINES WERE READ FROM INFILE BROWN.
NOTE: DATA SET WORK.F3A HAS 20 OBSERVATIONS AND 12 VARIABLES. 158
 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.04 SECONDS AND 340K.

           DATA F3B;
             ARRAY CASH (I) CASH1-CASH5;
             ARRAY DIV (I) DIV1-DIV5;
             ARRAY CAPT (I) CAPT1-CAPT5;
             INFILE BROWN FIRSTOBS=181 OBS=200;
             INPUT SYMB2 $ 1-3 @10 (CASH1-CASH5) (7.0 +1)
                   @51 (DIV1-DIV5) (7.0 + 1) @92 (CAPT1-CAPT5) (7
.0 +1);
             DO OVER CASH;
               IF CASH=. THEN CASH=0;
               IF DIV=. THEN DIV=0;
               IF CAPT=. THEN CAPT=0;
             END;
               FCF=CASH1+CASH2+CASH3+CASH4+CASH5-DIV1-DIV2-DIV3-D
IV4-DIV5-
                   CAPT1-CAPT2-CAPT3-CAPT4-CAPT5;

NOTE: INFILE BROWN IS:
      DSNAME=NMAYER.FISHER.DATA,
      UNIT=DISK,VOL=SER=USER04,DISP=SHR,
      DCB=(BLKSIZE=2556,LRECL=142,RECFM=FB)
NOTE: 20 LINES WERE READ FROM INFILE BROWN.
NOTE: DATA SET WORK.F3B HAS 20 OBSERVATIONS AND 18 VARIABLES. 133
 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.05 SECONDS AND 340K.

           DATA F3C;
             INFILE BROWN FIRSTOBS=201 OBS=220;
             INPUT SYMB3 $ 1-3 @10 (P1-P12) (9.3 +1);

NOTE: INFILE BROWN IS:
      DSNAME=NMAYER.FISHER.DATA,
      UNIT=DISK,VOL=SER=USER04,DISP=SHR,
      DCB=(BLKSIZE=2556,LRECL=142,RECFM=FB)
NOTE: 20 LINES WERE READ FROM INFILE BROWN.
NOTE: DATA SET WORK.F3C HAS 20 OBSERVATIONS AND 13 VARIABLES. 185
 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.04 SECONDS AND 340K.

           DATA F3D;
             ARRAY DP (I) DP1-DP4;
```

```
6        S A S   L O G    OS SAS 82.4          VS2/MVS JOB MAYER
                                    21:46 TUESDAY, MARCH 18, 1986
110           INFILE BROWN FIRSTOBS=221 OBS=240;
111           INPUT NAME2 $ 1-30 SYMB4 $ 32-34 SPLDT $ 44-49 NEW 5
9-62
112                OLD 77 DP1 88-93 DP2 100-105 DP3 112-117 DP4 1
24-129;
113           DO OVER DP;
114             IF DP=. THEN DP=0;
115           END;

NOTE: INFILE BROWN IS:
      DSNAME=NMAYER.FISHER.DATA,
      UNIT=DISK,VOL=SER=USER04,DISP=SHR,
      DCB=(BLKSIZE=2556,LRECL=142,RECFM=FB)
NOTE: 20 LINES WERE READ FROM INFILE BROWN.
NOTE: DATA SET WORK.F3D HAS 20 OBSERVATIONS AND 10 VARIABLES. 192
 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.04 SECONDS AND 340K.

116         DATA F3;
117           MERGE F3A F3B F3C F3D;
118             FCFR=FCF/EQTY;

NOTE: DATA SET WORK.F3 HAS 20 OBSERVATIONS AND 53 VARIABLES. 42 O
BS/TRK
NOTE: THE DATA STATEMENT USED 0.05 SECONDS AND 408K.

119         DATA F4A;
120           INFILE BROWN FIRSTOBS=241 OBS=260;
121           INPUT NAME $ 1-31 SYMB1 $ 32-34 PR 42-48 PSADJ 52-57
 ASSET 59-66
122                SPS 68-75 EQTY 77-84 CR 87-93 SHR 95-102 EPS1
104-111
123                PE 113-120 YREND $ 123-132;

NOTE: INFILE BROWN IS:
      DSNAME=NMAYER.FISHER.DATA,
      UNIT=DISK,VOL=SER=USER04,DISP=SHR,
      DCB=(BLKSIZE=2556,LRECL=142,RECFM=FB)
NOTE: 20 LINES WERE READ FROM INFILE BROWN.
NOTE: DATA SET WORK.F4A HAS 20 OBSERVATIONS AND 12 VARIABLES. 158
 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.04 SECONDS AND 340K.

124         DATA F4B;
125           ARRAY CASH (I) CASH1-CASH5;
126           ARRAY DIV (I) DIV1-DIV5;
127           ARRAY CAPT (I) CAPT1-CAPT5;
128           INFILE BROWN FIRSTOBS=261 OBS=280;
129           INPUT SYMB2 $ 1-3 @10 (CASH1-CASH5) (7.0 +1)
130                @51 (DIV1-DIV5) (7.0 + 1) @92 (CAPT1-CAPT5) (7
.0 +1);
131           DO OVER CASH;
132             IF CASH=. THEN CASH=0;
```

```
7       S A S   L O G    OS SAS 82.4         VS2/MVS JOB MAYER
                                   21:46 TUESDAY, MARCH 18, 1986
              IF DIV=. THEN DIV=0;
              IF CAPT=. THEN CAPT=0;
            END;
              FCF=CASH1+CASH2+CASH3+CASH4+CASH5-DIV1-DIV2-DIV3-D
IV4-DIV5-
                  CAPT1-CAPT2-CAPT3-CAPT4-CAPT5;

NOTE: INFILE BROWN IS:
      DSNAME=NMAYER.FISHER.DATA,
      UNIT=DISK,VOL=SER=USER04,DISP=SHR,
      DCB=(BLKSIZE=2556,LRECL=142,RECFM=FB)
NOTE: 20 LINES WERE READ FROM INFILE BROWN.
NOTE: DATA SET WORK.F4B HAS 20 OBSERVATIONS AND 18 VARIABLES. 133
 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.05 SECONDS AND 340K.

          DATA F4C;
            INFILE BROWN FIRSTOBS=281 OBS=300;
            INPUT SYMB3 $ 1-3 @10 (P1-P12) (9.3 +1);

NOTE: INFILE BROWN IS:
      DSNAME=NMAYER.FISHER.DATA,
      UNIT=DISK,VOL=SER=USER04,DISP=SHR,
      DCB=(BLKSIZE=2556,LRECL=142,RECFM=FB)
NOTE: 20 LINES WERE READ FROM INFILE BROWN.
NOTE: DATA SET WORK.F4C HAS 20 OBSERVATIONS AND 13 VARIABLES. 185
 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.04 SECONDS AND 340K.

          DATA F4D;
            ARRAY DP (I) DP1-DP4;
            INFILE BROWN FIRSTOBS=301 OBS=320;
            INPUT NAME2 $ 1-30 SYMB4 $ 32-34 SPLDT $ 44-49 NEW 5
9-62
                  OLD 77 DP1 88-93 DP2 100-105 DP3 112-117 DP4 1
24-129;
            DO OVER DP;
              IF DP=. THEN DP=0;
            END;

NOTE: INFILE BROWN IS:
      DSNAME=NMAYER.FISHER.DATA,
      UNIT=DISK,VOL=SER=USER04,DISP=SHR,
      DCB=(BLKSIZE=2556,LRECL=142,RECFM=FB)
NOTE: 20 LINES WERE READ FROM INFILE BROWN.
NOTE: DATA SET WORK.F4D HAS 20 OBSERVATIONS AND 10 VARIABLES. 192
 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.04 SECONDS AND 340K.

          DATA F4;
            MERGE F4A F4B F4C F4D;
```

```
8        S A S   L O G    OS SAS 82.4          VS2/MVS JOB MAYER
                                        21:46 TUESDAY, MARCH 18, 1986
              FCFR=FCF/EQTY;

NOTE: DATA SET WORK.F4 HAS 20 OBSERVATIONS AND 53 VARIABLES. 42 O
BS/TRK
NOTE: THE DATA STATEMENT USED 0.05 SECONDS AND 408K.

           DATA F5A;
             INFILE BROWN FIRSTOBS=321 OBS=340;
             INPUT NAME $ 1-31 SYMB1 $ 32-34 PR 42-48 PSADJ 52-57
 ASSET 59-66
                   SPS 68-75 EQTY 77-84 CR 87-93 SHR 95-102 EPS1
104-111
                   PE 113-120 YREND $ 123-132;

NOTE: INFILE BROWN IS:
      DSNAME=NMAYER.FISHER.DATA,
      UNIT=DISK,VOL=SER=USER04,DISP=SHR,
      DCB=(BLKSIZE=2556,LRECL=142,RECFM=FB)
NOTE: 20 LINES WERE READ FROM INFILE BROWN.
NOTE: DATA SET WORK.F5A HAS 20 OBSERVATIONS AND 12 VARIABLES. 158
 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.04 SECONDS AND 340K.

           DATA F5B;
             ARRAY CASH (I) CASH1-CASH5;
             ARRAY DIV (I) DIV1-DIV5;
             ARRAY CAPT (I) CAPT1-CAPT5;
             INFILE BROWN FIRSTOBS=341 OBS=360;
             INPUT SYMB2 $ 1-3 @10 (CASH1-CASH5) (7.0 +1)
                   @51 (DIV1-DIV5) (7.0 + 1) @92 (CAPT1-CAPT5) (7
.0 +1);
             DO OVER CASH;
               IF CASH=. THEN CASH=0;
               IF DIV=. THEN DIV=0;
               IF CAPT=. THEN CAPT=0;
             END;
               FCF=CASH1+CASH2+CASH3+CASH4+CASH5-DIV1-DIV2-DIV3-D
IV4-DIV5-
                   CAPT1-CAPT2-CAPT3-CAPT4-CAPT5;

NOTE: INFILE BROWN IS:
      DSNAME=NMAYER.FISHER.DATA,
      UNIT=DISK,VOL=SER=USER04,DISP=SHR,
      DCB=(BLKSIZE=2556,LRECL=142,RECFM=FB)
NOTE: 20 LINES WERE READ FROM INFILE BROWN.
NOTE: DATA SET WORK.F5B HAS 20 OBSERVATIONS AND 18 VARIABLES. 133
 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.05 SECONDS AND 340K.

           DATA F5C;
             INFILE BROWN FIRSTOBS=361 OBS=380;
             INPUT SYMB3 $ 1-3 @10 (P1-P12) (9.3 +1);
```

```
9       S A S   L O G    OS SAS 82.4        VS2/MVS JOB MAYER
                                  21:46 TUESDAY, MARCH 18, 1986
NOTE: INFILE BROWN IS:
      DSNAME=NMAYER.FISHER.DATA,
      UNIT=DISK,VOL=SER=USER04,DISP=SHR,
      DCB=(BLKSIZE=2556,LRECL=142,RECFM=FB)
NOTE: 20 LINES WERE READ FROM INFILE BROWN.
NOTE: DATA SET WORK.F5C HAS 20 OBSERVATIONS AND 13 VARIABLES. 185
 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.04 SECONDS AND 340K.

174         DATA F5D;
175           ARRAY DP (I) DP1-DP4;
176           INFILE BROWN FIRSTOBS=381 OBS=400;
177           INPUT NAME2 $ 1-30 SYMB4 $ 32-34 SPLDT $ 44-49 NEW 5
9-62
178                 OLD 77 DP1 88-93 DP2 100-105 DP3 112-117 DP4 1
24-129;
179           DO OVER DP;
180             IF DP=. THEN DP=0;
181           END;

NOTE: INFILE BROWN IS:
      DSNAME=NMAYER.FISHER.DATA,
      UNIT=DISK,VOL=SER=USER04,DISP=SHR,
      DCB=(BLKSIZE=2556,LRECL=142,RECFM=FB)
NOTE: 20 LINES WERE READ FROM INFILE BROWN.
NOTE: DATA SET WORK.F5D HAS 20 OBSERVATIONS AND 10 VARIABLES. 192
 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.04 SECONDS AND 340K.

182         DATA F5;
183           MERGE F5A F5B F5C F5D;
184             FCFR=FCF/EQTY;

NOTE: DATA SET WORK.F5 HAS 20 OBSERVATIONS AND 53 VARIABLES. 42 O
BS/TRK
NOTE: THE DATA STATEMENT USED 0.05 SECONDS AND 408K.

185         DATA F6A;
186           INFILE BROWN FIRSTOBS=401 OBS=420;
187           INPUT NAME $ 1-31 SYMB1 $ 32-34 PR 42-48 PSADJ 52-57
 ASSET 59-66
188                 SPS 68-75 EQTY 77-84 CR 87-93 SHR 95-102 EPS1
104-111
189                 PE 113-120 YREND $ 123-132;

NOTE: INFILE BROWN IS:
      DSNAME=NMAYER.FISHER.DATA,
      UNIT=DISK,VOL=SER=USER04,DISP=SHR,
      DCB=(BLKSIZE=2556,LRECL=142,RECFM=FB)
NOTE: 20 LINES WERE READ FROM INFILE BROWN.
NOTE: DATA SET WORK.F6A HAS 20 OBSERVATIONS AND 12 VARIABLES. 158
 OBS/TRK
```

```
10      S A S   L O G    OS SAS 82.4         VS2/MVS JOB MAYER
                                   21:46 TUESDAY, MARCH 18, 1986
NOTE: THE DATA STATEMENT USED 0.04 SECONDS AND 340K.

           DATA F6B;
             ARRAY CASH (I) CASH1-CASH5;
             ARRAY DIV (I) DIV1-DIV5;
             ARRAY CAPT (I) CAPT1-CAPT5;
             INFILE BROWN FIRSTOBS=421 OBS=440;
             INPUT SYMB2 $ 1-3 @10 (CASH1-CASH5) (7.0 +1)
                   @51 (DIV1-DIV5) (7.0 + 1) @92 (CAPT1-CAPT5) (7
.0 +1);
             DO OVER CASH;
               IF CASH=. THEN CASH=0;
               IF DIV=. THEN DIV=0;
               IF CAPT=. THEN CAPT=0;
             END;
               FCF=CASH1+CASH2+CASH3+CASH4+CASH5-DIV1-DIV2-DIV3-D
IV4-DIV5-
                   CAPT1-CAPT2-CAPT3-CAPT4-CAPT5;

NOTE: INFILE BROWN IS:
      DSNAME=NMAYER.FISHER.DATA,
      UNIT=DISK,VOL=SER=USER04,DISP=SHR,
      DCB=(BLKSIZE=2556,LRECL=142,RECFM=FB)
NOTE: 20 LINES WERE READ FROM INFILE BROWN.
NOTE: DATA SET WORK.F6B HAS 20 OBSERVATIONS AND 18 VARIABLES. 133
 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.05 SECONDS AND 340K.

           DATA F6C;
             INFILE BROWN FIRSTOBS=441 OBS=460;
             INPUT SYMB3 $ 1-3 @10 (P1-P12) (9.3 +1);

NOTE: INFILE BROWN IS:
      DSNAME=NMAYER.FISHER.DATA,
      UNIT=DISK,VOL=SER=USER04,DISP=SHR,
      DCB=(BLKSIZE=2556,LRECL=142,RECFM=FB)
NOTE: 20 LINES WERE READ FROM INFILE BROWN.
NOTE: DATA SET WORK.F6C HAS 20 OBSERVATIONS AND 13 VARIABLES. 185
 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.04 SECONDS AND 340K.

           DATA F6D;
             ARRAY DP (I) DP1-DP4;
             INFILE BROWN FIRSTOBS=461 OBS=480;
             INPUT NAME2 $ 1-30 SYMB4 $ 32-34 SPLDT $ 44-49 NEW 5
9-62
                   OLD 77 DP1 88-93 DP2 100-105 DP3 112-117 DP4 1
24-129;
             DO OVER DP;
               IF DP=. THEN DP=0;
             END;
```

```
11      S A S   L O G    OS SAS 82.4          VS2/MVS JOB MAYER
                                       21:46 TUESDAY, MARCH 18, 1986
NOTE: INFILE BROWN IS:
      DSNAME=NMAYER.FISHER.DATA,
      UNIT=DISK,VOL=SER=USER04,DISP=SHR,
      DCB=(BLKSIZE=2556,LRECL=142,RECFM=FB)
NOTE: 20 LINES WERE READ FROM INFILE BROWN.
NOTE: DATA SET WORK.F6D HAS 20 OBSERVATIONS AND 10 VARIABLES. 192
 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.04 SECONDS AND 340K.

           DATA F6;
             MERGE F6A F6B F6C F6D;
               FCFR=FCF/EQTY;
           *

           THIS SECTION READS IN DATA TO BE EMPLOYED IN TESTING
           THE TWO LOW P/E RATIO STRATEGIES.
           EXTENSIVE RECODING OF DATA IS NECESSARY SINCE ERRORS
           AROSE IN KEYING IN DATA BY HAND.

           ;

NOTE: DATA SET WORK.F6 HAS 20 OBSERVATIONS AND 53 VARIABLES. 42 O
BS/TRK
NOTE: THE DATA STATEMENT USED 0.05 SECONDS AND 408K.

           DATA TAPE;
              INFILE GREEN;
           INPUT NAME $ 1-30 SYMB1 $ 31-33 YREND $ 35-42 PR 44-50
                 EARN 52-57 PE 59-63 EPS1 65-70 EPS2 72-77 SHR 79
-84
                 LTD 86-92 EQTY 94-100 RATIO 102-107
              #2 SYMB2 $ 1-3 @4 (CASH1-CASH5) (+1 6.0) @39 (DIV1-
DIV5) (+1 6.0)
                 @74 (CAPT1-CAPT5) (+1 7.0)
              #3 SYMB3 $ 1-3 (P1-P12) (+1 7.0)
              #4 SYMB4 $ 1-3 SPLDT $ 5-10 NEW 12-16 OLD 18 @19 (D
P1-DP4) (+1 6.3)
                 ;
           *

           THIS SECTION CORRECTS ERRORS IN DATA TO BE USED IN LOW
           P/E TESTS.

           ;
           IF _N_ <= 60 THEN YEAR=1980;
           IF 61 <= _N_ <= 120 THEN YEAR=1981;
           IF 121 <= _N_ <= 180 THEN YEAR=1982;
           IF 181 <= _N_ <= 240 THEN YEAR=1983;
           IF 241 <= _N_ <= 300 THEN YEAR=1984;
           IF 301 <= _N_ <= 360 THEN YEAR=1985;
           IF _N_=21 THEN DO;
             P6=12.750;
             CASH4=-892;
             CASH5=-103;
           END;
           IF _N_=55 THEN CASH4=-1988;
```

```
      IF _N_=64 THEN CAPT5=90898;
      IF _N_=66 THEN DIV4=50000;
      IF _N_=68 THEN DO;
        DP1=0;
        DP2=0;
        DP3=0;
        DP4=0;
        CASH4=-2354;
        CASH5=-7034;
      END;
      IF _N_=75 THEN CASH5=-1988;;
      IF _N_=82 THEN DO;
        CASH1=1312000;
        CASH2=1132000;
      END;
      IF _N_=97 THEN CASH4=-1356;
      IF _N_=124 THEN CASH5=-1356;
      IF _N_=126 THEN DO;
        CASH4=-69;
        CASH5=-424;
      END;
      IF _N_=139 THEN CASH1=-3532;
      IF _N_=142 THEN CASH5=-124;
      IF _N_=153 THEN SYMB2='GL';
      IF _N_=173 THEN DO;
        CASH2=-1605;
        CASH3=-1007;
        CASH4=-970;
        CASH5=-448;
      END;
      IF _N_=181 THEN CASH2=-3532;
      IF _N_=192 THEN DO;
        CASH1=1707000;
        CASH2=1483000;
        CASH3=1226000;
        CASH4=1213000;
        CASH5=1022000;
      END;
      IF _N_=217 THEN DO;
        CASH3=6727;
        CASH5=-384;
      END;
      IF _N_=220 THEN DO;
        CASH3=-1605;
        CASH4=-1007;
        CASH5=-970;
      END;
      IF _N_=235 THEN CASH2=-894;
      IF _N_=239 THEN CASH5=-69;
      IF _N_=240 THEN P4=3.313;
      IF _N_=275 THEN CASH2=-2295;
      IF _N_=283 THEN CASH3=-3532;
      IF _N_=286 THEN DO;
        P1=8.063;
        P2=7.938;
        P3=8.5;
        P4=8.188;
```

```
13      S A S   L O G    OS SAS 82.4          VS2/MVS JOB MAYER
                                   21:46 TUESDAY, MARCH 18, 1986
            P5=9.75;
            P6=9.438;
            P7=10.188;
            P8=10.5;
            P9=11.188;
            P10=11.688;
            P11=12.125;
            P12=14.250;
          END;
          IF _N_=287 THEN CASH2=-2661;
          IF _N_=290 THEN CASH2=-2847;
          IF _N_=291 THEN DO;
            CASH4=-1605;
            CASH5=-1007;
          END;
          IF _N_=294 THEN CASH2=-477;
          IF _N_=298 THEN CASH2=-307;
          IF _N_=299 THEN DO;
            CASH5=8341;
            CAPT1=6035;
          END;
          IF _N_=300 THEN CASH3=-894;
          IF _N_=323 THEN CASH4=-3532;
          IF _N_=324 THEN CASH2=-363;
          IF _N_=326 THEN CASH3=-1563;
          IF _N_=327 THEN CASH5=-1605;
          IF _N_=329 THEN DO;
            SYMB1='OMH';
            SYMB2='OMH';
            SYMB3='OMH';
            SYMB4='OMH';
          END;
          IF _N_=333 THEN CASH3=-477;
          IF _N_=340 THEN CASH3=-1767;
          IF _N_=342 THEN P1=16.625;
          IF _N_=353 THEN CASH4=-894;
          IF _N_=354 THEN CASH3=-2661;
          IF _N_=356 THEN CASH3=-307;
          IF _N_=357 THEN CASH3=-2847;
          IF _N_=360 THEN CASH3=-120060;
          *

          KRAT AND FCFR ARE SECONDARY SCREENING CRITERIA TO BE
          USED IN THE TWO LOW P/E SELECTION STRATEGIES.

          ;
          KRAT=LTD/EQTY;
          FCF=CASH1+CASH2+CASH3+CASH4+CASH5-DIV1-DIV2-DIV3-DIV4-
DIV5-
              CAPT1-CAPT2-CAPT3-CAPT4-CAPT5;
          FCFR=FCF/EQTY;
            KEEP NAME YEAR SYMB1 PR PE P1-P12 DP1-DP4 KRAT FCFR;
          *

          EXTRACTING ANNUAL DATA FROM LOW P/E FILE

          ;
```

```
14      S A S   L O G    OS SAS 82.4        VS2/MVS JOB MAYER
                                   21:46 TUESDAY, MARCH 18, 1986

NOTE: INFILE GREEN IS:
      DSNAME=NMAYER.DATA.PORT,
      UNIT=DISK,VOL=SER=USER05,DISP=SHR,
      DCB=(BLKSIZE=120,LRECL=120,RECFM=FB)
NOTE: INVALID DATA FOR CASH4 IN LINE 82 26-31.     231:40
NOTE: INVALID DATA FOR CASH5 IN LINE 82 33-38.     231:40
NOTE: FURTHER ERRORS OF THIS TYPE WILL NOT BE PRINTED.
      OPTIONS ERRORS=NN; * LIMIT REACHED.
RULE:     1234567 101234567 201234567 301234567 401234567 50
81        ENHEAT LTD. CL.A               EH 0197912310005.000
    51    001.17004.274001.170001.330000030200000926000005513
    101   013.5700110
82        EH 0000768000056200007730000-892000-103000000000000
    51    000000000000000000000220000028700000267000000206000
    101   00000000001140120
83        EH 0003.7500004.0000005.0000005.0000005.0000006.00
    51    00005.0000005.0000005.0000005.0000005.0000005.0000
    101   130
84        EH 0000000000.0000000.000000.000000.000000.0000140
    51
    101
NAME=ENHEAT LTD. CL.A SYMB1=EH YREND=19791231 PR=5 EARN=1.17
PE=4.274 EPS1=1.17 EPS2=1.33 SHR=302 LTD=926 EQTY=5513
RATIO=13.57 SYMB2=EH CASH1=768 CASH2=562 CASH3=773 CASH4=-892
CASH5=-103 DIV1=0 DIV2=0 DIV3=0 DIV4=0 DIV5=22 CAPT1=287
CAPT2=267 CAPT3=206 CAPT4=0 CAPT5=114 SYMB3=EH P1=3.75 P2=4 P3=5
P4=5 P5=5 P6=12.75 P7=5 P8=5 P9=5 P10=5 P11=5 P12=5 SYMB4=EH
SPLDT=000000 NEW=0 OLD=0 DP1=0 DP2=0 DP3=0 DP4=0 YEAR=1980
KRAT=0.1679666 FCF=212 FCFR=0.03845456  _ERROR_=1 _N_=21
NOTE: 1440 LINES WERE READ FROM INFILE GREEN.
NOTE: DATA SET WORK.TAPE HAS 360 OBSERVATIONS AND 23 VARIABLES. 9
3 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.52 SECONDS AND 340K.

367        DATA YR1 YR2 YR3 YR4 YR5 YR6;
368          SET TAPE;
369          IF YEAR=1980 THEN OUTPUT YR1;
370        ELSE IF YEAR=1981 THEN OUTPUT YR2;
371        ELSE IF YEAR=1982 THEN OUTPUT YR3;
372        ELSE IF YEAR=1983 THEN OUTPUT YR4;
373        ELSE IF YEAR=1984 THEN OUTPUT YR5;
374        ELSE IF YEAR=1985 THEN OUTPUT YR6;

NOTE: DATA SET WORK.YR1 HAS 60 OBSERVATIONS AND 23 VARIABLES. 93
OBS/TRK
NOTE: DATA SET WORK.YR2 HAS 60 OBSERVATIONS AND 23 VARIABLES. 93
OBS/TRK
NOTE: DATA SET WORK.YR3 HAS 60 OBSERVATIONS AND 23 VARIABLES. 93
OBS/TRK
NOTE: DATA SET WORK.YR4 HAS 60 OBSERVATIONS AND 23 VARIABLES. 93
OBS/TRK
NOTE: DATA SET WORK.YR5 HAS 60 OBSERVATIONS AND 23 VARIABLES. 93
OBS/TRK
```

```
15      S A S   L O G    OS SAS 82.4        VS2/MVS JOB MAYER
                                   21:46 TUESDAY, MARCH 18, 1986
NOTE: DATA SET WORK.YR6 HAS 60 OBSERVATIONS AND 23 VARIABLES. 93
OBS/TRK
NOTE: THE DATA STATEMENT USED 0.13 SECONDS AND 432K.

375         PROC SORT DATA=YR1;  BY PE;

NOTE: 4 CYLINDERS DYNAMICALLY ALLOCATED ON SYSDA FOR EACH OF 3 SO
RT WORK DATA SETS
NOTE: DATA SET WORK.YR1 HAS 60 OBSERVATIONS AND 23 VARIABLES. 93
OBS/TRK
NOTE: THE PROCEDURE SORT USED 0.17 SECONDS AND 524K.

376         PROC SORT DATA=YR2;  BY PE;

NOTE: DATA SET WORK.YR2 HAS 60 OBSERVATIONS AND 23 VARIABLES. 93
OBS/TRK
NOTE: THE PROCEDURE SORT USED 0.11 SECONDS AND 524K.

377         PROC SORT DATA=YR3;  BY PE;

NOTE: DATA SET WORK.YR3 HAS 60 OBSERVATIONS AND 23 VARIABLES. 93
OBS/TRK
NOTE: THE PROCEDURE SORT USED 0.11 SECONDS AND 524K.

378         PROC SORT DATA=YR4;  BY PE;

NOTE: DATA SET WORK.YR4 HAS 60 OBSERVATIONS AND 23 VARIABLES. 93
OBS/TRK
NOTE: THE PROCEDURE SORT USED 0.13 SECONDS AND 524K.

379         PROC SORT DATA=YR5;  BY PE;

NOTE: DATA SET WORK.YR5 HAS 60 OBSERVATIONS AND 23 VARIABLES. 93
OBS/TRK
NOTE: THE PROCEDURE SORT USED 0.11 SECONDS AND 524K.

380         PROC SORT DATA=YR6;  BY PE;
381         *
382
383         COMPUTING MONTHLY PORTFOLIO VALUES UNDER
384         GRAHAM'S APPROACH
385
386         ;

NOTE: DATA SET WORK.YR6 HAS 60 OBSERVATIONS AND 23 VARIABLES. 93
OBS/TRK
NOTE: THE PROCEDURE SORT USED 0.11 SECONDS AND 524K.

387         DATA PORT1;
388           SET YR1;
389         KEEP NAME SYMB1 PE KRAT FCFR VAL0 VAL1-VAL12;
390         *
391
392         SELECTING 20 STOCKS FOR 1980 PORTFOLIO
393         USING GRAHAM'S CRITERIA.
394
395         ;
```

```
16      S A S   L O G    OS SAS 82.4          VS2/MVS JOB MAYER
                                   21:46 TUESDAY, MARCH 18, 1986
            IF _N_=1 THEN I=1;
          IF I<=20 AND KRAT<=1 THEN DO;
            I+1;
          *

          CALCULATING MONTH-BY-MONTH VALUES OF THE
          SHARES OF EACH OF THE 20 COMPANIES.

          ;
            VAL0=5000;
            SHRS=5000/PR;
            VAL1=SHRS*P1;
            SHRS=SHRS*(1+DP1/P2);
            VAL2=SHRS*P2;
            VAL3=SHRS*P3;
            VAL4=SHRS*P4;
            SHRS=SHRS*(1+DP2/P5);
            VAL5=SHRS*P5;
            VAL6=SHRS*P6;
            VAL7=SHRS*P7;
            SHRS=SHRS*(1+DP3/P8);
            VAL8=SHRS*P8;
            VAL9=SHRS*P9;
            VAL10=SHRS*P10;
            SHRS=SHRS*(1+DP4/P11);
            VAL11=SHRS*P11;
            VAL12=SHRS*P12;
            OUTPUT PORT1;
          END;
          *
          CUMULATING MONTHLY SHARE VALUES TO OBTAIN
          MONTHLY PORTFOLIO VALUES FOR 1980.
          ;

NOTE: DATA SET WORK.PORT1 HAS 20 OBSERVATIONS AND 18 VARIABLES. 1
15 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.07 SECONDS AND 344K.

          PROC MEANS DATA=PORT1 NOPRINT SUM;
            VAR VAL0 VAL1-VAL12;
            OUTPUT OUT=X1 SUM=S1-S13;
          *
          RETAINING 1980 YEAR-END PORTFOLIO VALUE
          TO USE AS STARTING VALUE FOR 1981 PORTFOLIO.
          ;

NOTE: DATA SET WORK.X1 HAS 1 OBSERVATIONS AND 13 VARIABLES. 176 O
BS/TRK
NOTE: THE PROCEDURE MEANS USED 0.06 SECONDS AND 402K.

          DATA Y1;
            SET X1;
            KEEP S13;

NOTE: DATA SET WORK.Y1 HAS 1 OBSERVATIONS AND 1 VARIABLES. 1588 O
BS/TRK
NOTE: THE DATA STATEMENT USED 0.03 SECONDS AND 336K.
```

```
17      S A S   L O G    OS SAS 82.4          VS2/MVS JOB MAYER
                                     21:46 TUESDAY, MARCH 18, 1986

          DATA PORT2;
            IF _N_=1 THEN SET Y1;
            SET YR2;
          KEEP NAME SYMB1 PE KRAT FCFR VAL0 VAL1-VAL12;
          *
          SELECTING 20 STOCKS FOR 1981 PORTFOLIO
          USING GRAHAM'S CRITERIA.
          ;
            IF _N_=1 THEN I=1;
          IF I<=20 AND KRAT<=1 THEN DO;
            I+1;
          *
          CALCULATING MONTH-BY-MONTH VALUES OF THE
          SHARES OF EACH OF THE 20 COMPANIES.
          ;
            VAL0=S13/20;
            SHRS=VAL0/PR;
            VAL1=SHRS*P1;
            SHRS=SHRS*(1+DP1/P2);
            VAL2=SHRS*P2;
            VAL3=SHRS*P3;
            VAL4=SHRS*P4;
            SHRS=SHRS*(1+DP2/P5);
            VAL5=SHRS*P5;
            VAL6=SHRS*P6;
            VAL7=SHRS*P7;
            SHRS=SHRS*(1+DP3/P8);
            VAL8=SHRS*P8;
            VAL9=SHRS*P9;
            VAL10=SHRS*P10;
            SHRS=SHRS*(1+DP4/P11);
            VAL11=SHRS*P11;
            VAL12=SHRS*P12;
            OUTPUT PORT2;
          END;
          *
          CUMULATING MONTHLY SHARE VALUES TO OBTAIN
          MONTHLY PORTFOLIO VALUES FOR 1981.
          ;

NOTE: DATA SET WORK.PORT2 HAS 20 OBSERVATIONS AND 18 VARIABLES. 1
15 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.08 SECONDS AND 344K.

          PROC MEANS DATA=PORT2 NOPRINT SUM;
            VAR VAL0 VAL1-VAL12;
            OUTPUT OUT=X2 SUM=S1-S13;
          *
          RETAINING 1981 YEAR-END PORTFOLIO VALUE
          TO USE AS STARTING VALUE FOR 1982 PORTFOLIO.
          ;

NOTE: DATA SET WORK.X2 HAS 1 OBSERVATIONS AND 13 VARIABLES. 176 O
BS/TRK
NOTE: THE PROCEDURE MEANS USED 0.07 SECONDS AND 402K.
```

```
18      S A S   L O G    OS SAS 82.4          VS2/MVS JOB MAYER
                                     21:46 TUESDAY, MARCH 18, 1986
          DATA Y2;
            SET X2;
            KEEP S13;

NOTE: DATA SET WORK.Y2 HAS 1 OBSERVATIONS AND 1 VARIABLES. 1588 O
BS/TRK
NOTE: THE DATA STATEMENT USED 0.04 SECONDS AND 336K.

          DATA PORT3;
            IF _N_=1 THEN SET Y2;
            SET YR3;
          KEEP NAME SYMB1 PE KRAT FCFR VAL0 VAL1-VAL12;
          *
          SELECTING 20 STOCKS FOR 1982 PORTFOLIO
          USING GRAHAM'S CRITERIA.
          ;
            IF _N_=1 THEN I=1;
          IF I<=20 AND KRAT<=1 THEN DO;
            I+1;
          *
          CALCULATING MONTH-BY-MONTH VALUES OF THE
          SHARES OF EACH OF THE 20 COMPANIES.
          ;
            VAL0=S13/20;
            SHRS=VAL0/PR;
            VAL1=SHRS*P1;
            SHRS=SHRS*(1+DP1/P2);
            VAL2=SHRS*P2;
            VAL3=SHRS*P3;
            VAL4=SHRS*P4;
            SHRS=SHRS*(1+DP2/P5);
            VAL5=SHRS*P5;
            VAL6=SHRS*P6;
            VAL7=SHRS*P7;
            SHRS=SHRS*(1+DP3/P8);
            VAL8=SHRS*P8;
            VAL9=SHRS*P9;
            VAL10=SHRS*P10;
            SHRS=SHRS*(1+DP4/P11);
            VAL11=SHRS*P11;
            VAL12=SHRS*P12;
            OUTPUT PORT3;
          END;
          *
          CUMULATING MONTHLY SHARE VALUES TO OBTAIN
          MONTHLY PORTFOLIO VALUES FOR 1982.
          ;

NOTE: DATA SET WORK.PORT3 HAS 20 OBSERVATIONS AND 18 VARIABLES. 1
15 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.08 SECONDS AND 344K.

          PROC MEANS DATA=PORT3 NOPRINT SUM;
            VAR VAL0 VAL1-VAL12;
            OUTPUT OUT=X3 SUM=S1-S13;
          *
          RETAINING 1982 YEAR-END PORTFOLIO VALUE
```

```
19      S A S   L O G    OS SAS 82.4         VS2/MVS JOB MAYER
                                         21:46 TUESDAY, MARCH 18, 1986
           TO USE AS STARTING VALUE FOR 1983 PORTFOLIO.
           ;

NOTE: DATA SET WORK.X3 HAS 1 OBSERVATIONS AND 13 VARIABLES. 176 O
BS/TRK
NOTE: THE PROCEDURE MEANS USED 0.07 SECONDS AND 402K.

           DATA Y3;
             SET X3;
             KEEP S13;

NOTE: DATA SET WORK.Y3 HAS 1 OBSERVATIONS AND 1 VARIABLES. 1588 O
BS/TRK
NOTE: THE DATA STATEMENT USED 0.04 SECONDS AND 336K.

           DATA PORT4;
             IF _N_=1 THEN SET Y3;
             SET YR4;
           KEEP NAME SYMB1 PE KRAT FCFR VAL0 VAL1-VAL12;
           *
           SELECTING 20 STOCKS FOR 1983 PORTFOLIO
           USING GRAHAM'S CRITERIA.
           ;
             IF _N_=1 THEN I=1;
           IF I<=20 AND KRAT<=1 THEN DO;
             I+1;
           *
           CALCULATING MONTH-BY-MONTH VALUES OF THE
           SHARES OF EACH OF THE 20 COMPANIES.
           ;
             VAL0=S13/20;
             SHRS=VAL0/PR;
             VAL1=SHRS*P1;
             SHRS=SHRS*(1+DP1/P2);
             VAL2=SHRS*P2;
             VAL3=SHRS*P3;
             VAL4=SHRS*P4;
             SHRS=SHRS*(1+DP2/P5);
             VAL5=SHRS*P5;
             VAL6=SHRS*P6;
             VAL7=SHRS*P7;
             SHRS=SHRS*(1+DP3/P8);
             VAL8=SHRS*P8;
             VAL9=SHRS*P9;
             VAL10=SHRS*P10;
             SHRS=SHRS*(1+DP4/P11);
             VAL11=SHRS*P11;
             VAL12=SHRS*P12;
             OUTPUT PORT4;
           END;
           *
           CUMULATING MONTHLY SHARE VALUES TO OBTAIN
           MONTHLY PORTFOLIO VALUES FOR 1983.
           ;

NOTE: DATA SET WORK.PORT4 HAS 20 OBSERVATIONS AND 18 VARIABLES. 1
15 OBS/TRK
```

```
20      S A S   L O G    OS SAS 82.4          VS2/MVS JOB MAYER
                                     21:46 TUESDAY, MARCH 18, 1986
NOTE: THE DATA STATEMENT USED 0.08 SECONDS AND 344K.

           PROC MEANS DATA=PORT4 NOPRINT SUM;
             VAR VAL0 VAL1-VAL12;
             OUTPUT OUT=X4 SUM=S1-S13;
           *
           RETAINING 1983 YEAR-END PORTFOLIO VALUE
           TO USE AS STARTING VALUE FOR 1984 PORTFOLIO.
           ;

NOTE: DATA SET WORK.X4 HAS 1 OBSERVATIONS AND 13 VARIABLES. 176 O
BS/TRK
NOTE: THE PROCEDURE MEANS USED 0.07 SECONDS AND 402K.

           DATA Y4;
             SET X4;
             KEEP S13;

NOTE: DATA SET WORK.Y4 HAS 1 OBSERVATIONS AND 1 VARIABLES. 1588 O
BS/TRK
NOTE: THE DATA STATEMENT USED 0.04 SECONDS AND 336K.

           DATA PORT5;
             IF _N_=1 THEN SET Y4;
             SET YR5;
           KEEP NAME SYMB1 PE KRAT FCFR VAL0 VAL1-VAL12;
           *
           SELECTING 20 STOCKS FOR 1984 PORTFOLIO
           USING GRAHAM'S CRITERIA.
           ;
             IF _N_=1 THEN I=1;
           IF I<=20 AND KRAT<=1 THEN DO;
             I+1;
           *
           CALCULATING MONTH-BY-MONTH VALUES OF THE
           SHARES OF EACH OF THE 20 COMPANIES.
           ;
             VAL0=S13/20;
             SHRS=VAL0/PR;
             VAL1=SHRS*P1;
             SHRS=SHRS*(1+DP1/P2);
             VAL2=SHRS*P2;
             VAL3=SHRS*P3;
             VAL4=SHRS*P4;
             SHRS=SHRS*(1+DP2/P5);
             VAL5=SHRS*P5;
             VAL6=SHRS*P6;
             VAL7=SHRS*P7;
             SHRS=SHRS*(1+DP3/P8);
             VAL8=SHRS*P8;
             VAL9=SHRS*P9;
             VAL10=SHRS*P10;
             SHRS=SHRS*(1+DP4/P11);
             VAL11=SHRS*P11;
             VAL12=SHRS*P12;
             OUTPUT PORT5;
           END;
```

```
21      S A S   L O G    OS SAS 82.4         VS2/MVS JOB MAYER
                                   21:46 TUESDAY, MARCH 18, 1986
        *
        CUMULATING MONTHLY SHARE VALUES TO OBTAIN
        MONTHLY PORTFOLIO VALUES FOR 1984.
        ;

NOTE: DATA SET WORK.PORT5 HAS 20 OBSERVATIONS AND 18 VARIABLES. 1
15 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.08 SECONDS AND 344K.

        PROC MEANS DATA=PORT5 NOPRINT SUM;
          VAR VAL0 VAL1-VAL12;
          OUTPUT OUT=X5 SUM=S1-S13;
        *
        RETAINING 1984 YEAR-END PORTFOLIO VALUE
        TO USE AS STARTING VALUE FOR 1985 PORTFOLIO.
        ;

NOTE: DATA SET WORK.X5 HAS 1 OBSERVATIONS AND 13 VARIABLES. 176 O
BS/TRK
NOTE: THE PROCEDURE MEANS USED 0.07 SECONDS AND 402K.

        DATA Y5;
          SET X5;
          KEEP S13;

NOTE: DATA SET WORK.Y5 HAS 1 OBSERVATIONS AND 1 VARIABLES. 1588 O
BS/TRK
NOTE: THE DATA STATEMENT USED 0.04 SECONDS AND 336K.

        DATA PORT6;
          IF _N_=1 THEN SET Y5;
          SET YR6;
        KEEP NAME SYMB1 PE KRAT FCFR VAL0 VAL1-VAL12;
        *
        SELECTING 20 STOCKS FOR 1985 PORTFOLIO
        USING GRAHAM'S CRITERIA.
        ;
          IF _N_=1 THEN I=1;
        IF I<=20 AND KRAT<=1 THEN DO;
          I+1;
        *
        CALCULATING MONTH-BY-MONTH VALUES OF THE
        SHARES OF EACH OF THE 20 COMPANIES.
        ;
          VAL0=S13/20;
          SHRS=VAL0/PR;
          VAL1=SHRS*P1;
          SHRS=SHRS*(1+DP1/P2);
          VAL2=SHRS*P2;
          VAL3=SHRS*P3;
          VAL4=SHRS*P4;
          SHRS=SHRS*(1+DP2/P5);
          VAL5=SHRS*P5;
          VAL6=SHRS*P6;
          VAL7=SHRS*P7;
          SHRS=SHRS*(1+DP3/P8);
          VAL8=SHRS*P8;
```

```
22      S A S   L O G    OS SAS 82.4          VS2/MVS JOB MAYER
                                   21:46 TUESDAY, MARCH 18, 1986
            VAL9=SHRS*P9;
            VAL10=SHRS*P10;
            SHRS=SHRS*(1+DP4/P11);
            VAL11=SHRS*P11;
            VAL12=SHRS*P12;
            OUTPUT PORT6;
          END;
          *
          CUMULATING MONTHLY SHARE VALUES TO OBTAIN
          MONTHLY PORTFOLIO VALUES FOR 1985.
          ;

NOTE: DATA SET WORK.PORT6 HAS 20 OBSERVATIONS AND 18 VARIABLES. 1
15 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.08 SECONDS AND 344K.

          PROC MEANS DATA=PORT6 NOPRINT SUM;
            VAR VAL0 VAL1-VAL12;
            OUTPUT OUT=X6 SUM=S1-S13;
          *
          TRANSPOSING VECTORS OF MONTHLY PORTFOLIO
          VALUES TO OBTAIN COLUMN VECTORS.
          ;

NOTE: DATA SET WORK.X6 HAS 1 OBSERVATIONS AND 13 VARIABLES. 176 O
BS/TRK
NOTE: THE PROCEDURE MEANS USED 0.07 SECONDS AND 402K.

          DATA V1;
            SET X1;
            VP=S1; OUTPUT;
            VP=S2; OUTPUT;
            VP=S3; OUTPUT;
            VP=S4; OUTPUT;
            VP=S5; OUTPUT;
            VP=S6; OUTPUT;
            VP=S7; OUTPUT;
            VP=S8; OUTPUT;
            VP=S9; OUTPUT;
            VP=S10; OUTPUT;
            VP=S11; OUTPUT;
            VP=S12; OUTPUT;
            VP=S13; OUTPUT;
            KEEP VP;

NOTE: DATA SET WORK.V1 HAS 13 OBSERVATIONS AND 1 VARIABLES. 1588
OBS/TRK
NOTE: THE DATA STATEMENT USED 0.04 SECONDS AND 336K.

          DATA V2;
            SET X2;
            VP=S2; OUTPUT;
            VP=S3; OUTPUT;
            VP=S4; OUTPUT;
            VP=S5; OUTPUT;
            VP=S6; OUTPUT;
            VP=S7; OUTPUT;
```

```
23      S A S   L O G    OS SAS 82.4          VS2/MVS JOB MAYER
                                        21:46 TUESDAY, MARCH 18, 1986
            VP=S8; OUTPUT;
            VP=S9; OUTPUT;
            VP=S10; OUTPUT;
            VP=S11; OUTPUT;
            VP=S12; OUTPUT;
            VP=S13; OUTPUT;
            KEEP VP;

NOTE: DATA SET WORK.V2 HAS 12 OBSERVATIONS AND 1 VARIABLES. 1588
OBS/TRK
NOTE: THE DATA STATEMENT USED 0.05 SECONDS AND 336K.

          DATA V3;
            SET X3;
            VP=S2; OUTPUT;
            VP=S3; OUTPUT;
            VP=S4; OUTPUT;
            VP=S5; OUTPUT;
            VP=S6; OUTPUT;
            VP=S7; OUTPUT;
            VP=S8; OUTPUT;
            VP=S9; OUTPUT;
            VP=S10; OUTPUT;
            VP=S11; OUTPUT;
            VP=S12; OUTPUT;
            VP=S13; OUTPUT;
            KEEP VP;

NOTE: DATA SET WORK.V3 HAS 12 OBSERVATIONS AND 1 VARIABLES. 1588
OBS/TRK
NOTE: THE DATA STATEMENT USED 0.05 SECONDS AND 336K.

          DATA V4;
            SET X4;
            VP=S2; OUTPUT;
            VP=S3; OUTPUT;
            VP=S4; OUTPUT;
            VP=S5; OUTPUT;
            VP=S6; OUTPUT;
            VP=S7; OUTPUT;
            VP=S8; OUTPUT;
            VP=S9; OUTPUT;
            VP=S10; OUTPUT;
            VP=S11; OUTPUT;
            VP=S12; OUTPUT;
            VP=S13; OUTPUT;
            KEEP VP;

NOTE: DATA SET WORK.V4 HAS 12 OBSERVATIONS AND 1 VARIABLES. 1588
OBS/TRK
NOTE: THE DATA STATEMENT USED 0.04 SECONDS AND 336K.

          DATA V5;
            SET X5;
            VP=S2; OUTPUT;
            VP=S3; OUTPUT;
            VP=S4; OUTPUT;
```

```
24      S A S   L O G    OS SAS 82.4          VS2/MVS JOB MAYER
                                     21:46 TUESDAY, MARCH 18, 1986
             VP=S5; OUTPUT;
             VP=S6; OUTPUT;
             VP=S7; OUTPUT;
             VP=S8; OUTPUT;
             VP=S9; OUTPUT;
             VP=S10; OUTPUT;
             VP=S11; OUTPUT;
             VP=S12; OUTPUT;
             VP=S13; OUTPUT;
             KEEP VP;

NOTE: DATA SET WORK.V5 HAS 12 OBSERVATIONS AND 1 VARIABLES. 1588
OBS/TRK
NOTE: THE DATA STATEMENT USED 0.05 SECONDS AND 336K.

           DATA V6;
             SET X6;
             VP=S2; OUTPUT;
             VP=S3; OUTPUT;
             VP=S4; OUTPUT;
             VP=S5; OUTPUT;
             VP=S6; OUTPUT;
             VP=S7; OUTPUT;
             VP=S8; OUTPUT;
             VP=S9; OUTPUT;
             VP=S10; OUTPUT;
             VP=S11; OUTPUT;
             VP=S12; OUTPUT;
             VP=S13; OUTPUT;
             KEEP VP;
           *
           CONCATINATING DATA SETS TO OBTAIN ONE
           COLUMN VECTOR OF ALL PORTFOLIO VALUES.
           ;

NOTE: DATA SET WORK.V6 HAS 12 OBSERVATIONS AND 1 VARIABLES. 1588
OBS/TRK
NOTE: THE DATA STATEMENT USED 0.05 SECONDS AND 336K.

           DATA JOIN1;
             SET V1 V2 V3 V4 V5 V6;
             VA=VP;
             KEEP VA;
           *

           CALCULATING MONTHLY PORTFOLIO RETURNS

           ;

NOTE: DATA SET WORK.JOIN1 HAS 73 OBSERVATIONS AND 1 VARIABLES. 15
88 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.08 SECONDS AND 336K.

           DATA RETURNS1;
             SET JOIN1;
             RETAIN VL;
             IF _N_ NE 1 THEN DO;
```

```
25      S A S   L O G    OS SAS 82.4          VS2/MVS JOB MAYER
                                        21:46 TUESDAY, MARCH 18, 1986
            RA=(VA-VL)*100/VL;
           END;
           VL=VA;
         IF  N =1 THEN DELETE;
         KEEP RA;
         *
         CONSTRUCTING MONTHLY RETURNS ON THE TSE
         TOTAL RETURN INDEX.
         ;

NOTE: DATA SET WORK.RETURNS1 HAS 72 OBSERVATIONS AND 1 VARIABLES.
 1588 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.07 SECONDS AND 336K.

         DATA MARKET;
           SET TSE;
           RETAIN VL;
           IF  N  NE 1 THEN DO;
           RM=(VM-VL)*100/VL;
           END;
            VL=VM;
           IF  N =1 THEN DELETE;
           KEEP RM RF YEAR MONTH;
         *

         COMPUTING MONTHLY PORTFOLIO VALUES UNDER
         BOWEN & GANUCHEAU'S APPROACH

         ;

NOTE: DATA SET WORK.MARKET HAS 72 OBSERVATIONS AND 4 VARIABLES. 5
29 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.03 SECONDS AND 336K.

         DATA PORTA;
         SET YR1;
         KEEP NAME SYMB1 PE KRAT FCFR VAL0 VAL1-VAL12;
         *
         SELECTING 20 STOCKS FOR 1980 PORTFOLIO
         USING B&G'S CRITERIA.
         ;
         IF  N =1 THEN I=1;
         IF I<=20 AND FCFR>=0 THEN DO;
           I+1;
         *
         CALCULATING MONTH-BY-MONTH VALUES OF THE
         SHARES OF EACH OF THE 20 COMPANIES.
         ;
           VAL0=5000;
           SHRS=5000/PR;
           VAL1=SHRS*P1;
           SHRS=SHRS*(1+DP1/P2);
           VAL2=SHRS*P2;
           VAL3=SHRS*P3;
           VAL4=SHRS*P4;
           SHRS=SHRS*(1+DP2/P5);
           VAL5=SHRS*P5;
```

```
26      S A S   L O G    OS SAS 82.4          VS2/MVS JOB MAYER
                                       21:46 TUESDAY, MARCH 18, 1986
              VAL6=SHRS*P6;
              VAL7=SHRS*P7;
              SHRS=SHRS*(1+DP3/P8);
              VAL8=SHRS*P8;
              VAL9=SHRS*P9;
              VAL10=SHRS*P10;
              SHRS=SHRS*(1+DP4/P11);
              VAL11=SHRS*P11;
              VAL12=SHRS*P12;
              OUTPUT PORTA;
            END;
            *
            CUMULATING MONTHLY SHARE VALUES TO OBTAIN
            MONTHLY PORTFOLIO VALUES FOR 1980.
            ;

NOTE: DATA SET WORK.PORTA HAS 20 OBSERVATIONS AND 18 VARIABLES. 1
15 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.07 SECONDS AND 344K.

            PROC MEANS DATA=PORTA NOPRINT SUM;
              VAR VAL0 VAL1-VAL12;
              OUTPUT OUT=XA SUM=S1-S13;
            *
            RETAINING 1980 YEAR-END PORTFOLIO VALUE
            TO USE AS STARTING VALUE FOR 1981 PORTFOLIO.
            ;

NOTE: DATA SET WORK.XA HAS 1 OBSERVATIONS AND 13 VARIABLES. 176 O
BS/TRK
NOTE: THE PROCEDURE MEANS USED 0.06 SECONDS AND 402K.

            DATA YA;
              SET XA;
              KEEP S13;

NOTE: DATA SET WORK.YA HAS 1 OBSERVATIONS AND 1 VARIABLES. 1588 O
BS/TRK
NOTE: THE DATA STATEMENT USED 0.04 SECONDS AND 336K.

            DATA PORTB;
              IF _N_=1 THEN SET YA;
            SET YR2;
            KEEP NAME SYMB1 PE KRAT FCFR VAL0 VAL1-VAL12;
            *
            SELECTING 20 STOCKS FOR 1981 PORTFOLIO
            USING B&G'S CRITERIA.
            ;
            IF _N_=1 THEN I=1;
            IF I<=20 AND FCFR>=0 THEN DO;
            *
            CALCULATING MONTH-BY-MONTH VALUES OF THE
            SHARES OF EACH OF THE 20 COMPANIES.
            ;
              I+1;
              VAL0=S13/20;
              SHRS=VAL0/PR;
```

```
27      S A S   L O G    OS SAS 82.4          VS2/MVS JOB MAYER
                                   21:46 TUESDAY, MARCH 18, 1986
             VAL1=SHRS*P1;
             SHRS=SHRS*(1+DP1/P2);
             VAL2=SHRS*P2;
             VAL3=SHRS*P3;
             VAL4=SHRS*P4;
             SHRS=SHRS*(1+DP2/P5);
             VAL5=SHRS*P5;
             VAL6=SHRS*P6;
             VAL7=SHRS*P7;
             SHRS=SHRS*(1+DP3/P8);
             VAL8=SHRS*P8;
             VAL9=SHRS*P9;
             VAL10=SHRS*P10;
             SHRS=SHRS*(1+DP4/P11);
             VAL11=SHRS*P11;
             VAL12=SHRS*P12;
             OUTPUT PORTB;
           END;
           *
           CUMULATING MONTHLY SHARE VALUES TO OBTAIN
           MONTHLY PORTFOLIO VALUES FOR 1981.
           ;

NOTE: DATA SET WORK.PORTB HAS 20 OBSERVATIONS AND 18 VARIABLES. 1
15 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.08 SECONDS AND 344K.

           PROC MEANS DATA=PORTB NOPRINT SUM;
             VAR VAL0 VAL1-VAL12;
             OUTPUT OUT=XB SUM=S1-S13;
           *
           RETAINING 1981 YEAR-END PORTFOLIO VALUE
           TO USE AS STARTING VALUE FOR 1982 PORTFOLIO.
           ;

NOTE: DATA SET WORK.XB HAS 1 OBSERVATIONS AND 13 VARIABLES. 176 O
BS/TRK
NOTE: THE PROCEDURE MEANS USED 0.07 SECONDS AND 402K.

           DATA YB;
             SET XB;
             KEEP S13;

NOTE: DATA SET WORK.YB HAS 1 OBSERVATIONS AND 1 VARIABLES. 1588 O
BS/TRK
NOTE: THE DATA STATEMENT USED 0.04 SECONDS AND 336K.

           DATA PORTC;
             IF _N_=1 THEN SET YB;
           SET YR3;
           KEEP NAME SYMB1 PE KRAT FCFR VAL0 VAL1-VAL12;
           *
           SELECTING 20 STOCKS FOR 1982 PORTFOLIO
           USING B&G'S CRITERIA.
           ;
           IF _N_=1 THEN I=1;
           IF I<=20 AND FCFR>=0 THEN DO;
```

```
28      S A S   L O G    OS SAS 82.4            VS2/MVS JOB MAYER
                                       21:46 TUESDAY, MARCH 18, 1986
              I+1;
            *
            CALCULATING MONTH-BY-MONTH VALUES OF THE
            SHARES OF EACH OF THE 20 COMPANIES.
            ;
              VAL0=S13/20;
              SHRS=VAL0/PR;
              VAL1=SHRS*P1;
              SHRS=SHRS*(1+DP1/P2);
              VAL2=SHRS*P2;
              VAL3=SHRS*P3;
              VAL4=SHRS*P4;
              SHRS=SHRS*(1+DP2/P5);
              VAL5=SHRS*P5;
              VAL6=SHRS*P6;
              VAL7=SHRS*P7;
              SHRS=SHRS*(1+DP3/P8);
              VAL8=SHRS*P8;
              VAL9=SHRS*P9;
              VAL10=SHRS*P10;
              SHRS=SHRS*(1+DP4/P11);
              VAL11=SHRS*P11;
              VAL12=SHRS*P12;
              OUTPUT PORTC;
            END;
            *
            CUMULATING MONTHLY SHARE VALUES TO OBTAIN
            MONTHLY PORTFOLIO VALUES FOR 1982.
            ;

NOTE: DATA SET WORK.PORTC HAS 20 OBSERVATIONS AND 18 VARIABLES. 1
15 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.08 SECONDS AND 344K.

            PROC MEANS DATA=PORTC NOPRINT SUM;
              VAR VAL0 VAL1-VAL12;
              OUTPUT OUT=XC SUM=S1-S13;
            *
            RETAINING 1982 YEAR-END PORTFOLIO VALUE
            TO USE AS STARTING VALUE FOR 1983 PORTFOLIO.
            ;

NOTE: DATA SET WORK.XC HAS 1 OBSERVATIONS AND 13 VARIABLES. 176 O
BS/TRK
NOTE: THE PROCEDURE MEANS USED 0.08 SECONDS AND 402K.

            DATA YC;
              SET XC;
              KEEP S13;

NOTE: DATA SET WORK.YC HAS 1 OBSERVATIONS AND 1 VARIABLES. 1588 O
BS/TRK
NOTE: THE DATA STATEMENT USED 0.04 SECONDS AND 336K.

            DATA PORTD;
              IF _N_=1 THEN SET YC;
            SET YR4;
```

```
29      S A S   L O G    OS SAS 82.4         VS2/MVS JOB MAYER
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        KEEP NAME SYMB1 PE KRAT FCFR VAL0 VAL1-VAL12;
        *
        SELECTING 20 STOCKS FOR 1983 PORTFOLIO
        USING B&G'S CRITERIA.
        ;
        IF _N_=1 THEN I=1;
        IF I<=20 AND FCFR>=0 THEN DO;
          I+1;
        *
        CALCULATING MONTH-BY-MONTH VALUES OF THE
        SHARES OF EACH OF THE 20 COMPANIES.
        ;
          VAL0=S13/20;
          SHRS=VAL0/PR;
          VAL1=SHRS*P1;
          SHRS=SHRS*(1+DP1/P2);
          VAL2=SHRS*P2;
          VAL3=SHRS*P3;
          VAL4=SHRS*P4;
          SHRS=SHRS*(1+DP2/P5);
          VAL5=SHRS*P5;
          VAL6=SHRS*P6;
          VAL7=SHRS*P7;
          SHRS=SHRS*(1+DP3/P8);
          VAL8=SHRS*P8;
          VAL9=SHRS*P9;
          VAL10=SHRS*P10;
          SHRS=SHRS*(1+DP4/P11);
          VAL11=SHRS*P11;
          VAL12=SHRS*P12;
          OUTPUT PORTD;
        END;
        *
        CUMULATING MONTHLY SHARE VALUES TO OBTAIN
        MONTHLY PORTFOLIO VALUES FOR 1983.
        ;

NOTE: DATA SET WORK.PORTD HAS 20 OBSERVATIONS AND 18 VARIABLES. 1
15 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.08 SECONDS AND 344K.

        PROC MEANS DATA=PORTD NOPRINT SUM;
          VAR VAL0 VAL1-VAL12;
          OUTPUT OUT=XD SUM=S1-S13;
        *
        RETAINING 1983 YEAR-END PORTFOLIO VALUE
        TO USE AS STARTING VALUE FOR 1984 PORTFOLIO.
        ;

NOTE: DATA SET WORK.XD HAS 1 OBSERVATIONS AND 13 VARIABLES. 176 O
BS/TRK
NOTE: THE PROCEDURE MEANS USED 0.07 SECONDS AND 402K.

        DATA YD;
          SET XD;
          KEEP S13;
```

```
30      S A S   L O G    OS SAS 82.4        VS2/MVS JOB MAYER
                                     21:46 TUESDAY, MARCH 18, 1986
NOTE: DATA SET WORK.YD HAS 1 OBSERVATIONS AND 1 VARIABLES. 1588 O
BS/TRK
NOTE: THE DATA STATEMENT USED 0.04 SECONDS AND 336K.

         DATA PORTE;
           IF _N_=1 THEN SET YD;
         SET YR5;
         KEEP NAME SYMB1 PE KRAT FCFR VAL0 VAL1-VAL12;
         *
         SELECTING 20 STOCKS FOR 1984 PORTFOLIO
         USING B&G'S CRITERIA.
         ;
         IF _N_=1 THEN I=1;
         IF I<=20 AND FCFR>=0 THEN DO;
           I+1;
         *
         CALCULATING MONTH-BY-MONTH VALUES OF THE
         SHARES OF EACH OF THE 20 COMPANIES.
         ;
           VAL0=S13/20;
           SHRS=VAL0/PR;
           VAL1=SHRS*P1;
           SHRS=SHRS*(1+DP1/P2);
           VAL2=SHRS*P2;
           VAL3=SHRS*P3;
           VAL4=SHRS*P4;
           SHRS=SHRS*(1+DP2/P5);
           VAL5=SHRS*P5;
           VAL6=SHRS*P6;
           VAL7=SHRS*P7;
           SHRS=SHRS*(1+DP3/P8);
           VAL8=SHRS*P8;
           VAL9=SHRS*P9;
           VAL10=SHRS*P10;
           SHRS=SHRS*(1+DP4/P11);
           VAL11=SHRS*P11;
           VAL12=SHRS*P12;
           OUTPUT PORTE;
         END;
         *
         CUMULATING MONTHLY SHARE VALUES TO OBTAIN
         MONTHLY PORTFOLIO VALUES FOR 1984.
         ;

NOTE: DATA SET WORK.PORTE HAS 20 OBSERVATIONS AND 18 VARIABLES. 1
15 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.08 SECONDS AND 344K.

         PROC MEANS DATA=PORTE NOPRINT SUM;
           VAR VAL0 VAL1-VAL12;
           OUTPUT OUT=XE SUM=S1-S13;
         *
         RETAINING 1984 YEAR-END PORTFOLIO VALUE
         TO USE AS STARTING VALUE FOR 1985 PORTFOLIO.
         ;

NOTE: DATA SET WORK.XE HAS 1 OBSERVATIONS AND 13 VARIABLES. 176 O
BS/TRK
```

```
31      S A S   L O G    OS SAS 82.4          VS2/MVS JOB MAYER
                                        21:46 TUESDAY, MARCH 18, 1986
NOTE: THE PROCEDURE MEANS USED 0.07 SECONDS AND 402K.

        DATA YE;
          SET XE;
          KEEP S13;

NOTE: DATA SET WORK.YE HAS 1 OBSERVATIONS AND 1 VARIABLES. 1588 O
BS/TRK
NOTE: THE DATA STATEMENT USED 0.04 SECONDS AND 336K.

        DATA PORTF;
          IF _N_=1 THEN SET YE;
        SET YR6;
        KEEP NAME SYMB1 PE KRAT FCFR VAL0 VAL1-VAL12;
        *
        SELECTING 20 STOCKS FOR 1985 PORTFOLIO
        USING B&G'S CRITERIA.
        ;
        IF _N_=1 THEN I=1;
        IF I<=20 AND FCFR>=0 THEN DO;
          I+1;
        *
        CALCULATING MONTH-BY-MONTH VALUES OF THE
        SHARES OF EACH OF THE 20 COMPANIES.
        ;
          VAL0=S13/20;
          SHRS=VAL0/PR;
          VAL1=SHRS*P1;
          SHRS=SHRS*(1+DP1/P2);
          VAL2=SHRS*P2;
          VAL3=SHRS*P3;
          VAL4=SHRS*P4;
          SHRS=SHRS*(1+DP2/P5);
          VAL5=SHRS*P5;
          VAL6=SHRS*P6;
          VAL7=SHRS*P7;
          SHRS=SHRS*(1+DP3/P8);
          VAL8=SHRS*P8;
          VAL9=SHRS*P9;
          VAL10=SHRS*P10;
          SHRS=SHRS*(1+DP4/P11);
          VAL11=SHRS*P11;
          VAL12=SHRS*P12;
          OUTPUT PORTF;
        END;
        *
        CUMULATING MONTHLY SHARE VALUES TO OBTAIN
        MONTHLY PORTFOLIO VALUES FOR 1985.
        ;

NOTE: DATA SET WORK.PORTF HAS 20 OBSERVATIONS AND 18 VARIABLES. 1
15 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.08 SECONDS AND 344K.

        PROC MEANS DATA=PORTF NOPRINT SUM;
          VAR VAL0 VAL1-VAL12;
          OUTPUT OUT=XF SUM=S1-S13;
```

```
32      S A S   L O G    OS SAS 82.4          VS2/MVS JOB MAYER
                                  21:46 TUESDAY, MARCH 18, 1986
1099        *
1100        TRANSPOSING VECTORS OF MONTHLY PORTFOLIO
1101        VALUES TO OBTAIN COLUMN VECTORS.
1102        ;

NOTE: DATA SET WORK.XF HAS 1 OBSERVATIONS AND 13 VARIABLES. 176 O
BS/TRK
NOTE: THE PROCEDURE MEANS USED 0.07 SECONDS AND 402K.

1103        DATA VA;
1104          SET XA;
1105          VP=S1; OUTPUT;
1106          VP=S2; OUTPUT;
1107          VP=S3; OUTPUT;
1108          VP=S4; OUTPUT;
1109          VP=S5; OUTPUT;
1110          VP=S6; OUTPUT;
1111          VP=S7; OUTPUT;
1112          VP=S8; OUTPUT;
1113          VP=S9; OUTPUT;
1114          VP=S10; OUTPUT;
1115          VP=S11; OUTPUT;
1116          VP=S12; OUTPUT;
1117          VP=S13; OUTPUT;
1118          KEEP VP;

NOTE: DATA SET WORK.VA HAS 13 OBSERVATIONS AND 1 VARIABLES. 1588
OBS/TRK
NOTE: THE DATA STATEMENT USED 0.05 SECONDS AND 336K.

1119        DATA VB;
1120          SET XB;
1121          VP=S2; OUTPUT;
1122          VP=S3; OUTPUT;
1123          VP=S4; OUTPUT;
1124          VP=S5; OUTPUT;
1125          VP=S6; OUTPUT;
1126          VP=S7; OUTPUT;
1127          VP=S8; OUTPUT;
1128          VP=S9; OUTPUT;
1129          VP=S10; OUTPUT;
1130          VP=S11; OUTPUT;
1131          VP=S12; OUTPUT;
1132          VP=S13; OUTPUT;
1133          KEEP VP;

NOTE: DATA SET WORK.VB HAS 12 OBSERVATIONS AND 1 VARIABLES. 1588
OBS/TRK
NOTE: THE DATA STATEMENT USED 0.05 SECONDS AND 336K.

1134        DATA VC;
1135          SET XC;
1136          VP=S2; OUTPUT;
1137          VP=S3; OUTPUT;
1138          VP=S4; OUTPUT;
1139          VP=S5; OUTPUT;
1140          VP=S6; OUTPUT;
```

```
33       S A S   L O G    OS SAS 82.4          VS2/MVS JOB MAYER
                                        21:46 TUESDAY, MARCH 18, 1986
1141          VP=S7; OUTPUT;
1142          VP=S8; OUTPUT;
1143          VP=S9; OUTPUT;
1144          VP=S10; OUTPUT;
1145          VP=S11; OUTPUT;
1146          VP=S12; OUTPUT;
1147          VP=S13; OUTPUT;
1148          KEEP VP;

NOTE: DATA SET WORK.VC HAS 12 OBSERVATIONS AND 1 VARIABLES. 1588
OBS/TRK
NOTE: THE DATA STATEMENT USED 0.05 SECONDS AND 336K.

1149        DATA VD;
1150          SET XD;
1151          VP=S2; OUTPUT;
1152          VP=S3; OUTPUT;
1153          VP=S4; OUTPUT;
1154          VP=S5; OUTPUT;
1155          VP=S6; OUTPUT;
1156          VP=S7; OUTPUT;
1157          VP=S8; OUTPUT;
1158          VP=S9; OUTPUT;
1159          VP=S10; OUTPUT;
1160          VP=S11; OUTPUT;
1161          VP=S12; OUTPUT;
1162          VP=S13; OUTPUT;
1163          KEEP VP;

NOTE: DATA SET WORK.VD HAS 12 OBSERVATIONS AND 1 VARIABLES. 1588
OBS/TRK
NOTE: THE DATA STATEMENT USED 0.05 SECONDS AND 336K.

1164        DATA VE;
1165          SET XE;
1166          VP=S2; OUTPUT;
1167          VP=S3; OUTPUT;
1168          VP=S4; OUTPUT;
1169          VP=S5; OUTPUT;
1170          VP=S6; OUTPUT;
1171          VP=S7; OUTPUT;
1172          VP=S8; OUTPUT;
1173          VP=S9; OUTPUT;
1174          VP=S10; OUTPUT;
1175          VP=S11; OUTPUT;
1176          VP=S12; OUTPUT;
1177          VP=S13; OUTPUT;
1178          KEEP VP;

NOTE: DATA SET WORK.VE HAS 12 OBSERVATIONS AND 1 VARIABLES. 1588
OBS/TRK
NOTE: THE DATA STATEMENT USED 0.05 SECONDS AND 336K.

1179        DATA VF;
1180          SET XF;
1181          VP=S2; OUTPUT;
1182          VP=S3; OUTPUT;
```

```
34      S A S   L O G    OS SAS 82.4          VS2/MVS JOB MAYER
                                       21:46 TUESDAY, MARCH 18, 1986
           VP=S4; OUTPUT;
           VP=S5; OUTPUT;
           VP=S6; OUTPUT;
           VP=S7; OUTPUT;
           VP=S8; OUTPUT;
           VP=S9; OUTPUT;
           VP=S10; OUTPUT;
           VP=S11; OUTPUT;
           VP=S12; OUTPUT;
           VP=S13; OUTPUT;
           KEEP VP;
         *

         CONCATINATING DATA SETS TO OBTAIN ONE
         COLUMN VECTOR OF ALL PORTFOLIO VALUES.

         ;

NOTE: DATA SET WORK.VF HAS 12 OBSERVATIONS AND 1 VARIABLES. 1588
OBS/TRK
NOTE: THE DATA STATEMENT USED 0.05 SECONDS AND 336K.

         DATA JOINA;
           SET VA VB VC VD VE VF;
           VB=VP;
           KEEP VB;
         *

         CALCULATING MONTHLY PORTFOLIO RETURNS

         ;

NOTE: DATA SET WORK.JOINA HAS 73 OBSERVATIONS AND 1 VARIABLES. 15
88 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.09 SECONDS AND 336K.

         DATA RETURNSA;
           SET JOINA;
           RETAIN VL;
           IF _N_ NE 1 THEN DO;
            RB=(VB-VL)*100/VL;
           END;
           VL=VB;
         IF _N_=1 THEN DELETE;
         KEEP RB;
         *

         COMPUTING MONTHLY PORTFOLIO VALUES UNDER
         FISHER'S APPROACH

         ;

NOTE: DATA SET WORK.RETURNSA HAS 72 OBSERVATIONS AND 1 VARIABLES.
 1588 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.07 SECONDS AND 336K.

         DATA FISHER1;
```

```
35      S A S   L O G    OS SAS 82.4         VS2/MVS JOB MAYER
                                     21:46 TUESDAY, MARCH 18, 1986
          SET F1;
        KEEP NAME SYMB1 VAL0 VAL1-VAL12;
        *
        CALCULATING MONTH-BY-MONTH VALUES OF THE
        SHARES OF EACH OF THE 20 COMPANIES.
        ;
          VAL0=5000;
          SHRS=5000/PR;
          VAL1=SHRS*P1;
          SHRS=SHRS*(1+DP1/P2);
          VAL2=SHRS*P2;
          VAL3=SHRS*P3;
          VAL4=SHRS*P4;
          SHRS=SHRS*(1+DP2/P5);
          VAL5=SHRS*P5;
          VAL6=SHRS*P6;
          VAL7=SHRS*P7;
          SHRS=SHRS*(1+DP3/P8);
          VAL8=SHRS*P8;
          VAL9=SHRS*P9;
          VAL10=SHRS*P10;
          SHRS=SHRS*(1+DP4/P11);
          VAL11=SHRS*P11;
          VAL12=SHRS*P12;
        *
        CUMULATING MONTHLY SHARE VALUES TO OBTAIN
        MONTHLY PORTFOLIO VALUES FOR 1980.
        ;

NOTE: DATA SET WORK.FISHER1 HAS 20 OBSERVATIONS AND 15 VARIABLES.
 134 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.06 SECONDS AND 344K.

        PROC MEANS DATA=FISHER1 NOPRINT SUM;
          VAR VAL0 VAL1-VAL12;
          OUTPUT OUT=XF1 SUM=S1-S13;
        *
        RETAINING 1980 YEAR-END PORTFOLIO VALUE
        TO USE AS STARTING VALUE FOR 1981 PORTFOLIO.
        ;

NOTE: DATA SET WORK.XF1 HAS 1 OBSERVATIONS AND 13 VARIABLES. 176
OBS/TRK
NOTE: THE PROCEDURE MEANS USED 0.05 SECONDS AND 402K.

        DATA YF1;
          SET XF1;
          KEEP S13;

NOTE: DATA SET WORK.YF1 HAS 1 OBSERVATIONS AND 1 VARIABLES. 1588
OBS/TRK
NOTE: THE DATA STATEMENT USED 0.03 SECONDS AND 336K.

        DATA FISHER2;
          IF _N_=1 THEN SET YF1;
          SET F2;
          KEEP VAL0 VAL1-VAL12;
```

```
36      S A S   L O G    OS SAS 82.4          VS2/MVS JOB MAYER
                                    21:46 TUESDAY, MARCH 18, 1986
        *
        CALCULATING MONTH-BY-MONTH VALUES OF THE
        SHARES OF EACH OF THE 20 COMPANIES.
        ;
          VAL0=S13/20;
          SHRS=VAL0/PR;
          VAL1=SHRS*P1;
          SHRS=SHRS*(1+DP1/P2);
          VAL2=SHRS*P2;
          VAL3=SHRS*P3;
          VAL4=SHRS*P4;
          SHRS=SHRS*(1+DP2/P5);
          VAL5=SHRS*P5;
          VAL6=SHRS*P6;
          VAL7=SHRS*P7;
          SHRS=SHRS*(1+DP3/P8);
          VAL8=SHRS*P8;
          VAL9=SHRS*P9;
          VAL10=SHRS*P10;
          SHRS=SHRS*(1+DP4/P11);
          VAL11=SHRS*P11;
          VAL12=SHRS*P12;
        *
        CUMULATING MONTHLY SHARE VALUES TO OBTAIN
        MONTHLY PORTFOLIO VALUES FOR 1981.
        ;

NOTE: DATA SET WORK.FISHER2 HAS 20 OBSERVATIONS AND 13 VARIABLES.
 176 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.07 SECONDS AND 344K.

        PROC MEANS DATA=FISHER2 NOPRINT SUM;
          VAR VAL0 VAL1-VAL12;
          OUTPUT OUT=XF2 SUM=S1-S13;
        *
        RETAINING 1981 YEAR-END PORTFOLIO VALUE
        TO USE AS STARTING VALUE FOR 1982 PORTFOLIO.
        ;

NOTE: DATA SET WORK.XF2 HAS 1 OBSERVATIONS AND 13 VARIABLES. 176
OBS/TRK
NOTE: THE PROCEDURE MEANS USED 0.06 SECONDS AND 402K.

        DATA YF2;
          SET XF2;
          KEEP S13;

NOTE: DATA SET WORK.YF2 HAS 1 OBSERVATIONS AND 1 VARIABLES. 1588
OBS/TRK
NOTE: THE DATA STATEMENT USED 0.04 SECONDS AND 336K.

        DATA FISHER3;
          IF _N_=1 THEN SET YF2;
          SET F3;
          KEEP VAL0 VAL1-VAL12;
        *
        CALCULATING MONTH-BY-MONTH VALUES OF THE
```

```
37      S A S   L O G    OS SAS 82.4        VS2/MVS JOB MAYER
                                     21:46 TUESDAY, MARCH 18, 1986
        SHARES OF EACH OF THE 20 COMPANIES.
        ;
          VAL0=S13/20;
          SHRS=VAL0/PR;
          VAL1=SHRS*P1;
          SHRS=SHRS*(1+DP1/P2);
          VAL2=SHRS*P2;
          VAL3=SHRS*P3;
          VAL4=SHRS*P4;
          SHRS=SHRS*(1+DP2/P5);
          VAL5=SHRS*P5;
          VAL6=SHRS*P6;
          VAL7=SHRS*P7;
          SHRS=SHRS*(1+DP3/P8);
          VAL8=SHRS*P8;
          VAL9=SHRS*P9;
          VAL10=SHRS*P10;
          SHRS=SHRS*(1+DP4/P11);
          VAL11=SHRS*P11;
          VAL12=SHRS*P12;
        *
        CUMULATING MONTHLY SHARE VALUES TO OBTAIN
        MONTHLY PORTFOLIO VALUES FOR 1982.
        ;

NOTE: DATA SET WORK.FISHER3 HAS 20 OBSERVATIONS AND 13 VARIABLES.
 176 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.07 SECONDS AND 344K.

        PROC MEANS DATA=FISHER3 NOPRINT SUM;
          VAR VAL0 VAL1-VAL12;
          OUTPUT OUT=XF3 SUM=S1-S13;
        *
        RETAINING 1982 YEAR-END PORTFOLIO VALUE
        TO USE AS STARTING VALUE FOR 1983 PORTFOLIO.
        ;

NOTE: DATA SET WORK.XF3 HAS 1 OBSERVATIONS AND 13 VARIABLES. 176
OBS/TRK
NOTE: THE PROCEDURE MEANS USED 0.06 SECONDS AND 402K.

        DATA YF3;
          SET XF3;
          KEEP S13;

NOTE: DATA SET WORK.YF3 HAS 1 OBSERVATIONS AND 1 VARIABLES. 1588
OBS/TRK
NOTE: THE DATA STATEMENT USED 0.03 SECONDS AND 336K.

        DATA FISHER4;
          IF _N_=1 THEN SET YF3;
          SET F4;
          KEEP VAL0 VAL1-VAL12;
        *
        CALCULATING MONTH-BY-MONTH VALUES OF THE
        SHARES OF EACH OF THE 20 COMPANIES.
        ;
```

```
38      S A S   L O G    OS SAS 82.4          VS2/MVS JOB MAYER
                                       21:46 TUESDAY, MARCH 18, 1986
             VAL0=S13/20;
             SHRS=VAL0/PR;
             VAL1=SHRS*P1;
             SHRS=SHRS*(1+DP1/P2);
             VAL2=SHRS*P2;
             VAL3=SHRS*P3;
             VAL4=SHRS*P4;
             SHRS=SHRS*(1+DP2/P5);
             VAL5=SHRS*P5;
             VAL6=SHRS*P6;
             VAL7=SHRS*P7;
             SHRS=SHRS*(1+DP3/P8);
             VAL8=SHRS*P8;
             VAL9=SHRS*P9;
             VAL10=SHRS*P10;
             SHRS=SHRS*(1+DP4/P11);
             VAL11=SHRS*P11;
             VAL12=SHRS*P12;
           *
           CUMULATING MONTHLY SHARE VALUES TO OBTAIN
           MONTHLY PORTFOLIO VALUES FOR 1983.
           ;

NOTE: DATA SET WORK.FISHER4 HAS 20 OBSERVATIONS AND 13 VARIABLES.
 176 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.07 SECONDS AND 344K.

           PROC MEANS DATA=FISHER4 NOPRINT SUM;
             VAR VAL0 VAL1-VAL12;
             OUTPUT OUT=XF4 SUM=S1-S13;
           *
           RETAINING 1983 YEAR-END PORTFOLIO VALUE
           TO USE AS STARTING VALUE FOR 1984 PORTFOLIO.
           ;

NOTE: DATA SET WORK.XF4 HAS 1 OBSERVATIONS AND 13 VARIABLES. 176
OBS/TRK
NOTE: THE PROCEDURE MEANS USED 0.06 SECONDS AND 402K.

           DATA YF4;
             SET XF4;
             KEEP S13;

NOTE: DATA SET WORK.YF4 HAS 1 OBSERVATIONS AND 1 VARIABLES. 1588
OBS/TRK
NOTE: THE DATA STATEMENT USED 0.03 SECONDS AND 336K.

           DATA FISHER5;
             IF _N_=1 THEN SET YF4;
             SET F5;
             KEEP VAL0 VAL1-VAL12;
           *
           CALCULATING MONTH-BY-MONTH VALUES OF THE
           SHARES OF EACH OF THE 20 COMPANIES.
           ;
             VAL0=S13/20;
             SHRS=VAL0/PR;
```

```
39      S A S   L O G    OS SAS 82.4          VS2/MVS JOB MAYER
                                    21:46 TUESDAY, MARCH 18, 1986
             VAL1=SHRS*P1;
             SHRS=SHRS*(1+DP1/P2);
             VAL2=SHRS*P2;
             VAL3=SHRS*P3;
             VAL4=SHRS*P4;
             SHRS=SHRS*(1+DP2/P5);
             VAL5=SHRS*P5;
             VAL6=SHRS*P6;
             VAL7=SHRS*P7;
             SHRS=SHRS*(1+DP3/P8);
             VAL8=SHRS*P8;
             VAL9=SHRS*P9;
             VAL10=SHRS*P10;
             SHRS=SHRS*(1+DP4/P11);
             VAL11=SHRS*P11;
             VAL12=SHRS*P12;
           *
           CUMULATING MONTHLY SHARE VALUES TO OBTAIN
           MONTHLY PORTFOLIO VALUES FOR 1983.
           ;

NOTE: DATA SET WORK.FISHER5 HAS 20 OBSERVATIONS AND 13 VARIABLES.
 176 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.08 SECONDS AND 344K.

           PROC MEANS DATA=FISHER5 NOPRINT SUM;
             VAR VAL0 VAL1-VAL12;
             OUTPUT OUT=XF5 SUM=S1-S13;
           *
           RETAINING 1984 YEAR-END PORTFOLIO VALUE
           TO USE AS STARTING VALUE FOR 1985 PORTFOLIO.
           ;

NOTE: DATA SET WORK.XF5 HAS 1 OBSERVATIONS AND 13 VARIABLES. 176
OBS/TRK
NOTE: THE PROCEDURE MEANS USED 0.06 SECONDS AND 402K.

           DATA YF5;
             SET XF5;
             KEEP S13;

NOTE: DATA SET WORK.YF5 HAS 1 OBSERVATIONS AND 1 VARIABLES. 1588
OBS/TRK
NOTE: THE DATA STATEMENT USED 0.04 SECONDS AND 336K.

           DATA FISHER6;
             IF _N_=1 THEN SET YF5;
             SET F6;
             KEEP VAL0 VAL1-VAL12;
           *
           CALCULATING MONTH-BY-MONTH VALUES OF THE
           SHARES OF EACH OF THE 20 COMPANIES.
           ;
             VAL0=S13/20;
             SHRS=VAL0/PR;
             VAL1=SHRS*P1;
             SHRS=SHRS*(1+DP1/P2);
```

```
40      S A S   L O G    OS SAS 82.4          VS2/MVS JOB MAYER
                                     21:46 TUESDAY, MARCH 18, 1986
          VAL2=SHRS*P2;
          VAL3=SHRS*P3;
          VAL4=SHRS*P4;
          SHRS=SHRS*(1+DP2/P5);
          VAL5=SHRS*P5;
          VAL6=SHRS*P6;
          VAL7=SHRS*P7;
          SHRS=SHRS*(1+DP3/P8);
          VAL8=SHRS*P8;
          VAL9=SHRS*P9;
          VAL10=SHRS*P10;
          SHRS=SHRS*(1+DP4/P11);
          VAL11=SHRS*P11;
          VAL12=SHRS*P12;
        *
        CUMULATING MONTHLY SHARE VALUES TO OBTAIN
        MONTHLY PORTFOLIO VALUES FOR 1985.
        ;

NOTE: DATA SET WORK.FISHER6 HAS 20 OBSERVATIONS AND 13 VARIABLES.
 176 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.07 SECONDS AND 344K.

        PROC MEANS DATA=FISHER6 NOPRINT SUM;
          VAR VAL0 VAL1-VAL12;
          OUTPUT OUT=XF6 SUM=S1-S13;
        *
        TRANSPOSING VECTORS OF MONTHLY PORTFOLIO
        VALUES TO OBTAIN COLUMN VECTORS.
        ;

NOTE: DATA SET WORK.XF6 HAS 1 OBSERVATIONS AND 13 VARIABLES. 176
OBS/TRK
NOTE: THE PROCEDURE MEANS USED 0.06 SECONDS AND 402K.

        DATA VF1;
          SET XF1;
          VP=S1; OUTPUT;
          VP=S2; OUTPUT;
          VP=S3; OUTPUT;
          VP=S4; OUTPUT;
          VP=S5; OUTPUT;
          VP=S6; OUTPUT;
          VP=S7; OUTPUT;
          VP=S8; OUTPUT;
          VP=S9; OUTPUT;
          VP=S10; OUTPUT;
          VP=S11; OUTPUT;
          VP=S12; OUTPUT;
          VP=S13; OUTPUT;
          KEEP VP;

NOTE: DATA SET WORK.VF1 HAS 13 OBSERVATIONS AND 1 VARIABLES. 1588
 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.05 SECONDS AND 336K.

        DATA VF2;
```

```
41       S A S   L O G    OS SAS 82.4          VS2/MVS JOB MAYER
                                      21:46 TUESDAY, MARCH 18, 1986
              SET XF2;
              VP=S2; OUTPUT;
              VP=S3; OUTPUT;
              VP=S4; OUTPUT;
              VP=S5; OUTPUT;
              VP=S6; OUTPUT;
              VP=S7; OUTPUT;
              VP=S8; OUTPUT;
              VP=S9; OUTPUT;
              VP=S10; OUTPUT;
              VP=S11; OUTPUT;
              VP=S12; OUTPUT;
              VP=S13; OUTPUT;
              KEEP VP;

NOTE: DATA SET WORK.VF2 HAS 12 OBSERVATIONS AND 1 VARIABLES. 1588
 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.04 SECONDS AND 336K.

            DATA VF3;
              SET XF3;
              VP=S2; OUTPUT;
              VP=S3; OUTPUT;
              VP=S4; OUTPUT;
              VP=S5; OUTPUT;
              VP=S6; OUTPUT;
              VP=S7; OUTPUT;
              VP=S8; OUTPUT;
              VP=S9; OUTPUT;
              VP=S10; OUTPUT;
              VP=S11; OUTPUT;
              VP=S12; OUTPUT;
              VP=S13; OUTPUT;
              KEEP VP;

NOTE: DATA SET WORK.VF3 HAS 12 OBSERVATIONS AND 1 VARIABLES. 1588
 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.04 SECONDS AND 336K.

            DATA VF4;
              SET XF4;
              VP=S2; OUTPUT;
              VP=S3; OUTPUT;
              VP=S4; OUTPUT;
              VP=S5; OUTPUT;
              VP=S6; OUTPUT;
              VP=S7; OUTPUT;
              VP=S8; OUTPUT;
              VP=S9; OUTPUT;
              VP=S10; OUTPUT;
              VP=S11; OUTPUT;
              VP=S12; OUTPUT;
              VP=S13; OUTPUT;
              KEEP VP;

NOTE: DATA SET WORK.VF4 HAS 12 OBSERVATIONS AND 1 VARIABLES. 1588
 OBS/TRK
```

```
42      S A S   L O G    OS SAS 82.4          VS2/MVS JOB MAYER
                                    21:46 TUESDAY, MARCH 18, 1986
NOTE: THE DATA STATEMENT USED 0.04 SECONDS AND 336K.

         DATA VF5;
           SET XF5;
           VP=S2; OUTPUT;
           VP=S3; OUTPUT;
           VP=S4; OUTPUT;
           VP=S5; OUTPUT;
           VP=S6; OUTPUT;
           VP=S7; OUTPUT;
           VP=S8; OUTPUT;
           VP=S9; OUTPUT;
           VP=S10; OUTPUT;
           VP=S11; OUTPUT;
           VP=S12; OUTPUT;
           VP=S13; OUTPUT;
           KEEP VP;

NOTE: DATA SET WORK.VF5 HAS 12 OBSERVATIONS AND 1 VARIABLES. 1588
 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.05 SECONDS AND 336K.

         DATA VF6;
           SET XF6;
           VP=S2; OUTPUT;
           VP=S3; OUTPUT;
           VP=S4; OUTPUT;
           VP=S5; OUTPUT;
           VP=S6; OUTPUT;
           VP=S7; OUTPUT;
           VP=S8; OUTPUT;
           VP=S9; OUTPUT;
           VP=S10; OUTPUT;
           VP=S11; OUTPUT;
           VP=S12; OUTPUT;
           VP=S13; OUTPUT;
           KEEP VP;
         *
         CONCATINATING DATA SETS TO OBTAIN ONE
         COLUMN VECTOR OF ALL PORTFOLIO VALUES.
         ;

NOTE: DATA SET WORK.VF6 HAS 12 OBSERVATIONS AND 1 VARIABLES. 1588
 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.05 SECONDS AND 336K.

         DATA JOINF;
           SET VF1 VF2 VF3 VF4 VF5 VF6;
           VC=VP;
           KEEP VC;
         *

         CREATING A DATA SET TO CONTAIN ALL MONTHLY
         PORTFOLIO VALUES AS WELL AS THE TSE TOTAL
         RETURN INDEX.

         ;
```

```
43      S A S   L O G    OS SAS 82.4          VS2/MVS JOB MAYER
                                     21:46 TUESDAY, MARCH 18, 1986

NOTE: DATA SET WORK.JOINF HAS 73 OBSERVATIONS AND 1 VARIABLES. 15
88 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.09 SECONDS AND 336K.

           DATA VP;
             MERGE JOIN1 JOINA JOINF TSE;
             KEEP VA VB VC VM YEAR MONTH;
           *
           CALCULATING MONTHLY PORTFOLIO RETURNS
           ;

NOTE: DATA SET WORK.VP HAS 73 OBSERVATIONS AND 6 VARIABLES. 366 O
BS/TRK
NOTE: THE DATA STATEMENT USED 0.15 SECONDS AND 412K.

           DATA RETURNSF;
             SET JOINF;
             RETAIN VL;
             IF _N_ NE 1 THEN DO;
              RC=(VC-VL)*100/VL;
             END;
             VL=VC;
           IF _N_=1 THEN DELETE;
           KEEP RC;
           *
           MERGING RETURNS FROM GRAHAM'S, B&G'S, AND FISHER'S
           PORTFOLIOS WITH MARKET RETURNS.
           ;

NOTE: DATA SET WORK.RETURNSF HAS 72 OBSERVATIONS AND 1 VARIABLES.
 1588 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.06 SECONDS AND 336K.

           DATA FINAL;
             MERGE RETURNS1 RETURNSA RETURNSF MARKET;
             KEEP YEAR MONTH RA RB RC RM RF;
           *
           COMPUTING PORTFOLIO AND MARKET RETURNS IN EXCESS
           OF THE "RISK-FREE" RATE (I.E., RP-RF AND RM-RF).
           ;

NOTE: DATA SET WORK.FINAL HAS 72 OBSERVATIONS AND 7 VARIABLES. 31
7 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.12 SECONDS AND 412K.

           DATA REGRESS;
             SET FINAL;
             RRA=RA-RF;
             RRB=RB-RF;
             RRC=RC-RF;
             RRM=RM-RF;
             KEEP RRA RRB RRC RRM;
           *PROC PRINT DATA=FINAL;
           *
           THIS SECTION PRINTS COMPANY NAMES AND VALUES OF
           SELECTION CRITERIA FOR ALL PORTFOLIOS CONSTRUCTED
```

```
44      S A S   L O G    OS SAS 82.4          VS2/MVS JOB MAYER
                                       21:46 TUESDAY, MARCH 18, 1986
           FOR THE PURPOSES OF THIS STUDY.
           ;

NOTE: DATA SET WORK.REGRESS HAS 72 OBSERVATIONS AND 4 VARIABLES.
529 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.07 SECONDS AND 336K.

           PROC PRINT DATA=PORT1;
             VAR NAME SYMB1 PE KRAT FCFR;
             TITLE1 STOCKS SELECTED USING GRAHAMS;
             TITLE2 CRITERIA FOR 1980;

NOTE: THE PROCEDURE PRINT USED 0.08 SECONDS AND 388K
      AND PRINTED PAGE 1.

           PROC PRINT DATA=PORT2;
             VAR NAME SYMB1 PE KRAT FCFR;
             TITLE1 STOCKS SELECTED USING GRAHAMS;
             TITLE2 CRITERIA FOR 1981;

NOTE: THE PROCEDURE PRINT USED 0.08 SECONDS AND 388K
      AND PRINTED PAGE 2.

           PROC PRINT DATA=PORT3;
             VAR NAME SYMB1 PE KRAT FCFR;
             TITLE1 STOCKS SELECTED USING GRAHAMS;
             TITLE2 CRITERIA FOR 1982;

NOTE: THE PROCEDURE PRINT USED 0.08 SECONDS AND 388K
      AND PRINTED PAGE 3.

           PROC PRINT DATA=PORT4;
             VAR NAME SYMB1 PE KRAT FCFR;
             TITLE1 STOCKS SELECTED USING GRAHAMS;
             TITLE2 CRITERIA FOR 1983;

NOTE: THE PROCEDURE PRINT USED 0.07 SECONDS AND 388K
      AND PRINTED PAGE 4.

           PROC PRINT DATA=PORT5;
             VAR NAME SYMB1 PE KRAT FCFR;
             TITLE1 STOCKS SELECTED USING GRAHAMS;
             TITLE2 CRITERIA FOR 1984;

NOTE: THE PROCEDURE PRINT USED 0.07 SECONDS AND 388K
      AND PRINTED PAGE 5.

           PROC PRINT DATA=PORT6;
             VAR NAME SYMB1 PE KRAT FCFR;
             TITLE1 STOCKS SELECTED USING GRAHAMS;
             TITLE2 CRITERIA FOR 1985;

NOTE: THE PROCEDURE PRINT USED 0.07 SECONDS AND 388K
      AND PRINTED PAGE 6.

           PROC PRINT DATA=PORTA;
             VAR NAME SYMB1 PE FCFR KRAT;
```

```
45      S A S   L O G    OS SAS 82.4        VS2/MVS JOB MAYER
                                     21:46 TUESDAY, MARCH 18, 1986
             TITLE1 STOCKS SELECTED USING BOWEN & GANUCHEAU;
             TITLE2 CRITERIA FOR 1980;

NOTE: THE PROCEDURE PRINT USED 0.07 SECONDS AND 388K
      AND PRINTED PAGE 7.

           PROC PRINT DATA=PORTB;
             VAR NAME SYMB1 PE FCFR KRAT;
             TITLE1 STOCKS SELECTED USING BOWEN & GANUCHEAU;
             TITLE2 CRITERIA FOR 1981;

NOTE: THE PROCEDURE PRINT USED 0.07 SECONDS AND 388K
      AND PRINTED PAGE 8.

           PROC PRINT DATA=PORTC;
             VAR NAME SYMB1 PE FCFR KRAT;
             TITLE1 STOCKS SELECTED USING BOWEN & GANUCHEAU;
             TITLE2 CRITERIA FOR 1982;

NOTE: THE PROCEDURE PRINT USED 0.07 SECONDS AND 388K
      AND PRINTED PAGE 9.

           PROC PRINT DATA=PORTD;
             VAR NAME SYMB1 PE FCFR KRAT;
             TITLE1 STOCKS SELECTED USING BOWEN & GANUCHEAU;
             TITLE2 CRITERIA FOR 1983;

NOTE: THE PROCEDURE PRINT USED 0.07 SECONDS AND 388K
      AND PRINTED PAGE 10.

           PROC PRINT DATA=PORTE;
             VAR NAME SYMB1 PE FCFR KRAT;
             TITLE1 STOCKS SELECTED USING BOWEN & GANUCHEAU;
             TITLE2 CRITERIA FOR 1984;

NOTE: THE PROCEDURE PRINT USED 0.07 SECONDS AND 388K
      AND PRINTED PAGE 11.

           PROC PRINT DATA=PORTF;
             VAR NAME SYMB1 PE FCFR KRAT;
             TITLE1 STOCKS SELECTED USING BOWEN & GANUCHEAU;
             TITLE2 CRITERIA FOR 1985;

NOTE: THE PROCEDURE PRINT USED 0.07 SECONDS AND 388K
      AND PRINTED PAGE 12.

           PROC PRINT DATA=F1;
             VAR NAME SYMB1 PSADJ PE FCFR;
             TITLE1 STOCKS SELECTED USING FISHERS;
             TITLE2 CRITERIA FOR 1980;

NOTE: THE PROCEDURE PRINT USED 0.07 SECONDS AND 388K
      AND PRINTED PAGE 13.

           PROC PRINT DATA=F2;
             VAR NAME SYMB1 PSADJ PE FCFR;
             TITLE1 STOCKS SELECTED USING FISHERS;
```

```
46      S A S   L O G    OS SAS 82.4          VS2/MVS JOB MAYER
                                       21:46 TUESDAY, MARCH 18, 1986
1660          TITLE2 CRITERIA FOR 1981;

NOTE: THE PROCEDURE PRINT USED 0.07 SECONDS AND 388K
      AND PRINTED PAGE 14.

1661        PROC PRINT DATA=F3;
1662          VAR NAME SYMB1 PSADJ PE FCFR;
1663          TITLE1 STOCKS SELECTED USING FISHERS;
1664          TITLE2 CRITERIA FOR 1982;

NOTE: THE PROCEDURE PRINT USED 0.08 SECONDS AND 388K
      AND PRINTED PAGE 15.

1665        PROC PRINT DATA=F4;
1666          VAR NAME SYMB1 PSADJ PE FCFR;
1667          TITLE1 STOCKS SELECTED USING FISHERS;
1668          TITLE2 CRITERIA FOR 1983;

NOTE: THE PROCEDURE PRINT USED 0.07 SECONDS AND 388K
      AND PRINTED PAGE 16.

1669        PROC PRINT DATA=F5;
1670          VAR NAME SYMB1 PSADJ PE FCFR;
1671          TITLE1 STOCKS SELECTED USING FISHERS;
1672          TITLE2 CRITERIA FOR 1984;

NOTE: THE PROCEDURE PRINT USED 0.07 SECONDS AND 388K
      AND PRINTED PAGE 17.

1673        PROC PRINT DATA=F6;
1674          VAR NAME SYMB1 PSADJ PE FCFR;
1675          TITLE1 STOCKS SELECTED USING FISHERS;
1676          TITLE2 CRITERIA FOR 1985;

NOTE: THE PROCEDURE PRINT USED 0.07 SECONDS AND 388K
      AND PRINTED PAGE 18.

1677        PROC PRINT DATA=VP;
1678          TITLE1 MONTHLY VALUES OF THE TSE TOTAL RETURN INDEX;
1679          TITLE2 AND THE THREE PORTFOLIOS CONSTRUCTED ;
1680          TITLE3 FOR THIS STUDY;
1681          VAR YEAR MONTH VA VB VC VM;

NOTE: THE PROCEDURE PRINT USED 0.12 SECONDS AND 388K
      AND PRINTED PAGES 19 TO 20.

1682        PROC PRINT DATA=FINAL;
1683          TITLE1 MONTHLY RETURNS ON PORTFOLIOS, THE "MARKET",
1684          TITLE2 AND TREASURY BILLS;
1685          VAR YEAR MONTH RA RB RC RM RF;
1686        *
1687        COMPUTES DESCRIPTIVE STATISTICS FOR RETURNS ON PORTFOL
IOS,
1688        THE "MARKET", AND T-BILLS.
1689        ALLOWS FOR TEST OF ASSUMPTION OF NORMALITY OF RETURNS.
1690        ;
```

```
47      S A S   L O G    OS SAS 82.4         VS2/MVS JOB MAYER
                                    21:46 TUESDAY, MARCH 18, 1986
NOTE: THE PROCEDURE PRINT USED 0.11 SECONDS AND 392K
      AND PRINTED PAGES 21 TO 22.

         PROC UNIVARIATE DATA=FINAL PLOT FREQ NORMAL;
           TITLE1 DESCRIPTIVE STATISTICS ON PORTFOLIO AND;
           TITLE2   MARKET RETURNS;
           VAR RA RB RC RM RF;

NOTE: THE PROCEDURE UNIVARIATE USED 0.25 SECONDS AND 416K
      AND PRINTED PAGES 23 TO 39.

         PROC CORR DATA=FINAL COV;
           TITLE1 CORRELATIONS AND COVARIANCES BETWEEN PORTFOLI
O;
           TITLE2 RETURNS, MARKET RETURNS, AND T-BILL RATES;
           VAR RA RB RC RM RF;
         *
         ANALYSIS TO USE JOBSON AND KORKIE'S TEST STATISTICS
         ;

NOTE: THE PROCEDURE CORR USED 0.09 SECONDS AND 384K
      AND PRINTED PAGES 40 TO 41.

         PROC CORR DATA=REGRESS COV OUTP=SIGNIFY;
           TITLE1 CORRELATIONS AND COVARIANCES BETWEEN EXCESS;
           TITLE2 RETURNS ON PORTFOLIOS AND THE MARKET;
           VAR RRA RRB RRC RRM;

NOTE: DATA SET WORK.SIGNIFY HAS 11 OBSERVATIONS AND 6 VARIABLES.
366 OBS/TRK
NOTE: THE PROCEDURE CORR USED 0.12 SECONDS AND 404K
      AND PRINTED PAGES 42 TO 43.

         DATA SAB1 SAB2 SAB3 SAB4;
           SET SIGNIFY;
          IF  N =6 THEN DO;
             OUTPUT SAB1;
           END;
           IF  N =5 THEN DO;
             OUTPUT SAB2;
           END;
           IF  N =1 THEN DO;
             OUTPUT SAB3;
           END;
           IF  N =7 THEN DO;
             OUTPUT SAB4;
           END;

NOTE: DATA SET WORK.SAB1 HAS 1 OBSERVATIONS AND 6 VARIABLES. 366
OBS/TRK
NOTE: DATA SET WORK.SAB2 HAS 1 OBSERVATIONS AND 6 VARIABLES. 366
OBS/TRK
NOTE: DATA SET WORK.SAB3 HAS 1 OBSERVATIONS AND 6 VARIABLES. 366
OBS/TRK
NOTE: DATA SET WORK.SAB4 HAS 1 OBSERVATIONS AND 6 VARIABLES. 366
OBS/TRK
NOTE: THE DATA STATEMENT USED 0.08 SECONDS AND 396K.
```

```
48      S A S   L O G    OS SAS 82.4          VS2/MVS JOB MAYER
                                      21:46 TUESDAY, MARCH 18, 1986

          DATA STAB1;
             SET SAB1;
                SP=RRA;
                SQ=RRB;
             KEEP SP SQ;

NOTE: DATA SET WORK.STAB1 HAS 1 OBSERVATIONS AND 2 VARIABLES. 953
 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.03 SECONDS AND 336K.

          DATA STAB2;
             SET SAB2;
                MP=RRA;
                MQ=RRB;
             KEEP MP MQ;

NOTE: DATA SET WORK.STAB2 HAS 1 OBSERVATIONS AND 2 VARIABLES. 953
 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.03 SECONDS AND 336K.

          DATA STAB3;
             SET SAB3;
                COVPQ=RRB;
             KEEP COVPQ;

NOTE: DATA SET WORK.STAB3 HAS 1 OBSERVATIONS AND 1 VARIABLES. 158
8 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.03 SECONDS AND 336K.

          DATA STAB4;
             SET SAB4;
                T=RRA;
             KEEP T;

NOTE: DATA SET WORK.STAB4 HAS 1 OBSERVATIONS AND 1 VARIABLES. 158
8 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.03 SECONDS AND 336K.

          DATA COMPAB;
             MERGE STAB1 STAB2 STAB3 STAB4;

NOTE: DATA SET WORK.COMPAB HAS 1 OBSERVATIONS AND 6 VARIABLES. 36
6 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.05 SECONDS AND 412K.

          DATA STATAB;
             SET COMPAB;
             COMPARE='A WITH B';
             SHPQ=SQ*MP-SP*MQ;
             THETA=(1/T)*(2*SQ**2*SP**2 - 2*SP*SQ*COVPQ
                        + .5*MP**2*SQ**2 + .5*MQ**2*SP**2
           - .5*MP*MQ*(COVPQ**2+SP**2*SQ**2)/(SP*SQ));
             Z=SHPQ/SQRT(THETA);
             KEEP COMPARE SHPQ THETA Z;

NOTE: DATA SET WORK.STATAB HAS 1 OBSERVATIONS AND 4 VARIABLES. 52
9 OBS/TRK
```

```
49      S A S   L O G    OS SAS 82.4          VS2/MVS JOB MAYER
                                     21:46 TUESDAY, MARCH 18, 1986
NOTE: THE DATA STATEMENT USED 0.05 SECONDS AND 336K.

           DATA SAC1 SAC2 SAC3 SAC4;
             SET SIGNIFY;
            IF _N_ =6 THEN DO;
               OUTPUT SAC1;
             END;
             IF _N_ =5 THEN DO;
               OUTPUT SAC2;
             END;
             IF _N_ =1 THEN DO;
               OUTPUT SAC3;
             END;
             IF _N_ =7 THEN DO;
               OUTPUT SAC4;
             END;

NOTE: DATA SET WORK.SAC1 HAS 1 OBSERVATIONS AND 6 VARIABLES. 366
OBS/TRK
NOTE: DATA SET WORK.SAC2 HAS 1 OBSERVATIONS AND 6 VARIABLES. 366
OBS/TRK
NOTE: DATA SET WORK.SAC3 HAS 1 OBSERVATIONS AND 6 VARIABLES. 366
OBS/TRK
NOTE: DATA SET WORK.SAC4 HAS 1 OBSERVATIONS AND 6 VARIABLES. 366
OBS/TRK
NOTE: THE DATA STATEMENT USED 0.08 SECONDS AND 396K.

           DATA STAC1;
             SET SAC1;
               SP=RRA;
               SQ=RRC;
             KEEP SP SQ;

NOTE: DATA SET WORK.STAC1 HAS 1 OBSERVATIONS AND 2 VARIABLES. 953
 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.03 SECONDS AND 336K.

           DATA STAC2;
             SET SAC2;
               MP=RRA;
               MQ=RRC;
             KEEP MP MQ;

NOTE: DATA SET WORK.STAC2 HAS 1 OBSERVATIONS AND 2 VARIABLES. 953
 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.03 SECONDS AND 336K.

           DATA STAC3;
             SET SAC3;
               COVPQ=RRC;
             KEEP COVPQ;

NOTE: DATA SET WORK.STAC3 HAS 1 OBSERVATIONS AND 1 VARIABLES. 158
8 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.03 SECONDS AND 336K.

           DATA STAC4;
```

```
50      S A S   L O G    OS SAS 82.4          VS2/MVS JOB MAYER
                                    21:46 TUESDAY, MARCH 18, 1986
             SET SAC4;
               T=RRA;
             KEEP T;

NOTE: DATA SET WORK.STAC4 HAS 1 OBSERVATIONS AND 1 VARIABLES. 158
8 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.03 SECONDS AND 336K.

           DATA COMPAC;
             MERGE STAC1 STAC2 STAC3 STAC4;

NOTE: DATA SET WORK.COMPAC HAS 1 OBSERVATIONS AND 6 VARIABLES. 36
6 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.05 SECONDS AND 412K.

           DATA STATAC;
             SET COMPAC;
             COMPARE='A WITH C';
             SHPQ=SQ*MP-SP*MQ;
             THETA=(1/T)*(2*SQ**2*SP**2 - 2*SP*SQ*COVPQ
                      + .5*MP**2*SQ**2 + .5*MQ**2*SP**2
            - .5*MP*MQ*(COVPQ**2+SP**2*SQ**2)/(SP*SQ));
             Z=SHPQ/SQRT(THETA);
             KEEP COMPARE SHPQ THETA Z;

NOTE: DATA SET WORK.STATAC HAS 1 OBSERVATIONS AND 4 VARIABLES. 52
9 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.05 SECONDS AND 336K.

           DATA SAM1 SAM2 SAM3 SAM4;
             SET SIGNIFY;
            IF _N_=6 THEN DO;
               OUTPUT SAM1;
             END;
             IF _N_=5 THEN DO;
               OUTPUT SAM2;
             END;
             IF _N_=1 THEN DO;
               OUTPUT SAM3;
             END;
             IF _N_=7 THEN DO;
               OUTPUT SAM4;
             END;

NOTE: DATA SET WORK.SAM1 HAS 1 OBSERVATIONS AND 6 VARIABLES. 366
OBS/TRK
NOTE: DATA SET WORK.SAM2 HAS 1 OBSERVATIONS AND 6 VARIABLES. 366
OBS/TRK
NOTE: DATA SET WORK.SAM3 HAS 1 OBSERVATIONS AND 6 VARIABLES. 366
OBS/TRK
NOTE: DATA SET WORK.SAM4 HAS 1 OBSERVATIONS AND 6 VARIABLES. 366
OBS/TRK
NOTE: THE DATA STATEMENT USED 0.08 SECONDS AND 396K.

           DATA STAM1;
             SET SAM1;
               SP=RRA;
```

```
51      S A S   L O G    OS SAS 82.4          VS2/MVS JOB MAYER
                                    21:46 TUESDAY, MARCH 18, 1986
              SQ=RRM;
            KEEP SP SQ;

NOTE: DATA SET WORK.STAM1 HAS 1 OBSERVATIONS AND 2 VARIABLES. 953
 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.03 SECONDS AND 336K.

          DATA STAM2;
            SET SAM2;
              MP=RRA;
              MQ=RRM;
            KEEP MP MQ;

NOTE: DATA SET WORK.STAM2 HAS 1 OBSERVATIONS AND 2 VARIABLES. 953
 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.03 SECONDS AND 336K.

          DATA STAM3;
            SET SAM3;
              COVPQ=RRM;
            KEEP COVPQ;

NOTE: DATA SET WORK.STAM3 HAS 1 OBSERVATIONS AND 1 VARIABLES. 158
8 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.03 SECONDS AND 336K.

          DATA STAM4;
            SET SAM4;
              T=RRA;
            KEEP T;

NOTE: DATA SET WORK.STAM4 HAS 1 OBSERVATIONS AND 1 VARIABLES. 158
8 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.03 SECONDS AND 336K.

          DATA COMPAM;
            MERGE STAM1 STAM2 STAM3 STAM4;

NOTE: DATA SET WORK.COMPAM HAS 1 OBSERVATIONS AND 6 VARIABLES. 36
6 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.05 SECONDS AND 412K.

          DATA STATAM;
            SET COMPAM;
            COMPARE='A WITH M';
            SHPQ=SQ*MP-SP*MQ;
            THETA=(1/T)*(2*SQ**2*SP**2 - 2*SP*SQ*COVPQ
                     + .5*MP**2*SQ**2 + .5*MQ**2*SP**2
           - .5*MP*MQ*(COVPQ**2+SP**2*SQ**2)/(SP*SQ));
           Z=SHPQ/SQRT(THETA);
           KEEP COMPARE SHPQ THETA Z;

NOTE: DATA SET WORK.STATAM HAS 1 OBSERVATIONS AND 4 VARIABLES. 52
9 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.05 SECONDS AND 336K.

          DATA SBC1 SBC2 SBC3 SBC4;
```

```
52      S A S   L O G    OS SAS 82.4          VS2/MVS JOB MAYER
                                        21:46 TUESDAY, MARCH 18, 1986
           SET SIGNIFY;
          IF  N =6 THEN DO;
             OUTPUT SBC1;
           END;
           IF  N =5 THEN DO;
             OUTPUT SBC2;
           END;
           IF  N =2 THEN DO;
             OUTPUT SBC3;
           END;
           IF  N =7 THEN DO;
             OUTPUT SBC4;
           END;

NOTE: DATA SET WORK.SBC1 HAS 1 OBSERVATIONS AND 6 VARIABLES. 366
OBS/TRK
NOTE: DATA SET WORK.SBC2 HAS 1 OBSERVATIONS AND 6 VARIABLES. 366
OBS/TRK
NOTE: DATA SET WORK.SBC3 HAS 1 OBSERVATIONS AND 6 VARIABLES. 366
OBS/TRK
NOTE: DATA SET WORK.SBC4 HAS 1 OBSERVATIONS AND 6 VARIABLES. 366
OBS/TRK
NOTE: THE DATA STATEMENT USED 0.09 SECONDS AND 396K.

         DATA STBC1;
           SET SBC1;
             SP=RRB;
             SQ=RRC;
           KEEP SP SQ;

NOTE: DATA SET WORK.STBC1 HAS 1 OBSERVATIONS AND 2 VARIABLES. 953
 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.03 SECONDS AND 336K.

         DATA STBC2;
           SET SBC2;
             MP=RRB;
             MQ=RRC;
           KEEP MP MQ;

NOTE: DATA SET WORK.STBC2 HAS 1 OBSERVATIONS AND 2 VARIABLES. 953
 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.03 SECONDS AND 336K.

         DATA STBC3;
           SET SBC3;
             COVPQ=RRC;
           KEEP COVPQ;

NOTE: DATA SET WORK.STBC3 HAS 1 OBSERVATIONS AND 1 VARIABLES. 158
8 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.04 SECONDS AND 336K.

         DATA STBC4;
           SET SBC4;
             T=RRA;
           KEEP T;
```

```
53      S A S   L O G    OS SAS 82.4          VS2/MVS JOB MAYER
                                   21:46 TUESDAY, MARCH 18, 1986

NOTE: DATA SET WORK.STBC4 HAS 1 OBSERVATIONS AND 1 VARIABLES. 158
8 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.03 SECONDS AND 336K.

           DATA COMPBC;
             MERGE STBC1 STBC2 STBC3 STBC4;

NOTE: DATA SET WORK.COMPBC HAS 1 OBSERVATIONS AND 6 VARIABLES. 36
6 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.06 SECONDS AND 412K.

           DATA STATBC;
             SET COMPBC;
             COMPARE='B WITH C';
             SHPQ=SQ*MP-SP*MQ;
             THETA=(1/T)*(2*SQ**2*SP**2 - 2*SP*SQ*COVPQ
                      + .5*MP**2*SQ**2 + .5*MQ**2*SP**2
            - .5*MP*MQ*(COVPQ**2+SP**2*SQ**2)/(SP*SQ));
             Z=SHPQ/SQRT(THETA);
             KEEP COMPARE SHPQ THETA Z;

NOTE: DATA SET WORK.STATBC HAS 1 OBSERVATIONS AND 4 VARIABLES. 52
9 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.05 SECONDS AND 336K.

           DATA SBM1 SBM2 SBM3 SBM4;
             SET SIGNIFY;
            IF  N =6 THEN DO;
               OUTPUT SBM1;
             END;
             IF  N =5 THEN DO;
               OUTPUT SBM2;
             END;
             IF  N =2 THEN DO;
               OUTPUT SBM3;
             END;
             IF  N =7 THEN DO;
               OUTPUT SBM4;
             END;

NOTE: DATA SET WORK.SBM1 HAS 1 OBSERVATIONS AND 6 VARIABLES. 366
OBS/TRK
NOTE: DATA SET WORK.SBM2 HAS 1 OBSERVATIONS AND 6 VARIABLES. 366
OBS/TRK
NOTE: DATA SET WORK.SBM3 HAS 1 OBSERVATIONS AND 6 VARIABLES. 366
OBS/TRK
NOTE: DATA SET WORK.SBM4 HAS 1 OBSERVATIONS AND 6 VARIABLES. 366
OBS/TRK
NOTE: THE DATA STATEMENT USED 0.09 SECONDS AND 396K.

           DATA STBM1;
             SET SBM1;
               SP=RRB;
               SQ=RRM;
             KEEP SP SQ;
```

```
54      S A S   L O G    OS SAS 82.4          VS2/MVS JOB MAYER
                                      21:46 TUESDAY, MARCH 18, 1986
NOTE: DATA SET WORK.STBM1 HAS 1 OBSERVATIONS AND 2 VARIABLES. 953
 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.03 SECONDS AND 336K.

        DATA STBM2;
          SET SBM2;
            MP=RRB;
            MQ=RRM;
          KEEP MP MQ;

NOTE: DATA SET WORK.STBM2 HAS 1 OBSERVATIONS AND 2 VARIABLES. 953
 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.03 SECONDS AND 336K.

        DATA STBM3;
          SET SBM3;
            COVPQ=RRM;
          KEEP COVPQ;

NOTE: DATA SET WORK.STBM3 HAS 1 OBSERVATIONS AND 1 VARIABLES. 158
8 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.03 SECONDS AND 336K.

        DATA STBM4;
          SET SBM4;
            T=RRA;
          KEEP T;

NOTE: DATA SET WORK.STBM4 HAS 1 OBSERVATIONS AND 1 VARIABLES. 158
8 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.03 SECONDS AND 336K.

        DATA COMPBM;
          MERGE STBM1 STBM2 STBM3 STBM4;

NOTE: DATA SET WORK.COMPBM HAS 1 OBSERVATIONS AND 6 VARIABLES. 36
6 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.06 SECONDS AND 412K.

        DATA STATBM;
          SET COMPBM;
          COMPARE='B WITH M';
          SHPQ=SQ*MP-SP*MQ;
          THETA=(1/T)*(2*SQ**2*SP**2 - 2*SP*SQ*COVPQ
                    + .5*MP**2*SQ**2 + .5*MQ**2*SP**2
         - .5*MP*MQ*(COVPQ**2+SP**2*SQ**2)/(SP*SQ));
         Z=SHPQ/SQRT(THETA);
          KEEP COMPARE SHPQ THETA Z;

NOTE: DATA SET WORK.STATBM HAS 1 OBSERVATIONS AND 4 VARIABLES. 52
9 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.05 SECONDS AND 336K.

        DATA SCM1 SCM2 SCM3 SCM4;
          SET SIGNIFY;
         IF _N_=6 THEN DO;
            OUTPUT SCM1;
```

```
55      S A S   L O G    OS SAS 82.4            VS2/MVS JOB MAYER
                                       21:46 TUESDAY, MARCH 18, 1986
          END;
          IF _N_ =5 THEN DO;
            OUTPUT SCM2;
          END;
          IF _N_ =3 THEN DO;
            OUTPUT SCM3;
          END;
          IF _N_ =7 THEN DO;
            OUTPUT SCM4;
          END;

NOTE: DATA SET WORK.SCM1 HAS 1 OBSERVATIONS AND 6 VARIABLES. 366
OBS/TRK
NOTE: DATA SET WORK.SCM2 HAS 1 OBSERVATIONS AND 6 VARIABLES. 366
OBS/TRK
NOTE: DATA SET WORK.SCM3 HAS 1 OBSERVATIONS AND 6 VARIABLES. 366
OBS/TRK
NOTE: DATA SET WORK.SCM4 HAS 1 OBSERVATIONS AND 6 VARIABLES. 366
OBS/TRK
NOTE: THE DATA STATEMENT USED 0.09 SECONDS AND 396K.

        DATA STCM1;
          SET SCM1;
            SP=RRC;
            SQ=RRM;
          KEEP SP SQ;

NOTE: DATA SET WORK.STCM1 HAS 1 OBSERVATIONS AND 2 VARIABLES. 953
 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.03 SECONDS AND 336K.

        DATA STCM2;
          SET SCM2;
            MP=RRC;
            MQ=RRM;
          KEEP MP MQ;

NOTE: DATA SET WORK.STCM2 HAS 1 OBSERVATIONS AND 2 VARIABLES. 953
 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.03 SECONDS AND 336K.

        DATA STCM3;
          SET SCM3;
            COVPQ=RRM;
          KEEP COVPQ;

NOTE: DATA SET WORK.STCM3 HAS 1 OBSERVATIONS AND 1 VARIABLES. 158
8 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.03 SECONDS AND 336K.

        DATA STCM4;
          SET SCM4;
            T=RRA;
          KEEP T;

NOTE: DATA SET WORK.STCM4 HAS 1 OBSERVATIONS AND 1 VARIABLES. 158
8 OBS/TRK
```

```
56      S A S   L O G    OS SAS 82.4          VS2/MVS JOB MAYER
                                   21:46 TUESDAY, MARCH 18, 1986
NOTE: THE DATA STATEMENT USED 0.03 SECONDS AND 336K.

           DATA COMPCM;
             MERGE STCM1 STCM2 STCM3 STCM4;

NOTE: DATA SET WORK.COMPCM HAS 1 OBSERVATIONS AND 6 VARIABLES. 36
6 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.06 SECONDS AND 412K.

           DATA STATCM;
             SET COMPCM;
             COMPARE='C WITH M';
             SHPQ=SQ*MP-SP*MQ;
             THETA=(1/T)*(2*SQ**2*SP**2 - 2*SP*SQ*COVPQ
                     + .5*MP**2*SQ**2 + .5*MQ**2*SP**2
           - .5*MP*MQ*(COVPQ**2+SP**2*SQ**2)/(SP*SQ));
             Z=SHPQ/SQRT(THETA);
             KEEP COMPARE SHPQ THETA Z;

NOTE: DATA SET WORK.STATCM HAS 1 OBSERVATIONS AND 4 VARIABLES. 52
9 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.05 SECONDS AND 336K.

           DATA TESTS;
             SET STATAB STATAC STATAM STATBC STATBM STATCM;

NOTE: DATA SET WORK.TESTS HAS 6 OBSERVATIONS AND 4 VARIABLES. 529
 OBS/TRK
NOTE: THE DATA STATEMENT USED 0.12 SECONDS AND 336K.

           PROC PRINT DATA=TESTS;
             TITLE1 COMPARISON OF PORTFOLIO PERFORMANCE USING;
             TITLE2 JOBSON AND KORKIE TEST EMPLOYING;
             TITLE3 SHARPE INDEX;
           *
           REGRESSION EQUATIONS TO TEST JENSEN'S ALPHA.
           ;

NOTE: THE PROCEDURE PRINT USED 0.10 SECONDS AND 388K
      AND PRINTED PAGE 44.

           PROC PLOT DATA=REGRESS;
             TITLE1 "EXCESS" RETURNS ON GRAHAM PORTFOLIO;
             TITLE2 PLOTTED AGAINST "EXCESS" RETURNS;
             TITLE3 ON TSE TOTAL RETURN INDEX;
             PLOT RRA*RRM;

NOTE: THE PROCEDURE PLOT USED 0.10 SECONDS AND 386K
      AND PRINTED PAGE 45.

           PROC GLM DATA=REGRESS;
             TITLE JENSEN ALPHA FOR GRAHAM PORTFOLIO;
             MODEL RRA = RRM;

NOTE: THE PROCEDURE GLM USED 0.13 SECONDS AND 498K
      AND PRINTED PAGE 46.
```

```
57      S A S   L O G    OS SAS 82.4         VS2/MVS JOB MAYER
                                    21:46 TUESDAY, MARCH 18, 1986
             PROC PLOT DATA=REGRESS;
               TITLE1 "EXCESS" RETURNS ON B-G PORTFOLIO;
               TITLE2 PLOTTED AGAINST "EXCESS" RETURNS;
               TITLE3 ON TSE TOTAL RETURN INDEX;
               PLOT RRB*RRM;

NOTE: THE PROCEDURE PLOT USED 0.09 SECONDS AND 386K
      AND PRINTED PAGE 47.

             PROC GLM DATA=REGRESS;
               TITLE1 JENSEN ALPHA FOR BOWEN & GANUCHEAU;
               TITLE2    PORTFOLIO;
               MODEL RRB = RRM;

NOTE: THE PROCEDURE GLM USED 0.12 SECONDS AND 498K
      AND PRINTED PAGE 48.

             PROC PLOT DATA=REGRESS;
               TITLE1 "EXCESS" RETURNS ON FISHER PORTFOLIO;
               TITLE2 PLOTTED AGAINST "EXCESS" RETURNS;
               TITLE3 ON TSE TOTAL RETURN INDEX;
               PLOT RRC*RRM;

NOTE: THE PROCEDURE PLOT USED 0.09 SECONDS AND 386K
      AND PRINTED PAGE 49.

             PROC GLM DATA=REGRESS;
               TITLE JENSEN ALPHA FOR FISHER PORTFOLIO;
               MODEL RRC = RRM;

NOTE: THE PROCEDURE GLM USED 0.13 SECONDS AND 498K
      AND PRINTED PAGE 50.
NOTE: SAS INSTITUTE INC.
      SAS CIRCLE
      PO BOX 8000
      CARY, N.C.  27511-8000
```

APPENDIX B

RESULTS OF COMPUTER ANALYSIS

MEANING OF SYMBOLS

This Appendix contains the results of the analysis perfomed by the program in Appendix A. The symbols appearing in the computer print out reproduced in this Appendix have the following meanings:

KRAT = ratio of long term debt to equity

FCFR = 5-year cummulative free cash flow as a proportion of equity

PE = price-earnings ratio effective the end of January

PSADJ = Fisher's adjusted price-sales ratio

VA = month-end value of portfolio constructed using Graham's criteria

VB = month-end value of portfolio constructed using Bowen & Ganucheau's criteria

VC = month-end value of portfolio constructed using Fisher's criteria

VM = month-end value of TSE total return index

RA = monthly percentage increase in VA

RB = monthly percentage increase in VB

RC = monthly percentage increase in VC

RM = monthly percentage increase in VM

RF = Treasury Bill returns converted to a monthly rate (i.e., the risk-free rate)

RRA = RA - RF

RRB = RB - RF

RRC = RC - RF

RRM = RM - RF

STOCKS SELECTED USING GRAHAM'S CRITERIA FOR 1980 1

OBS	NAME	SYMB1	PE	KRAT	FCFR
1	MITCHELL ROBERT CO. CL B	MIT	2.053	0.063630	0.49892
2	VESTGRON MINES	VGM	2.385	0.000000	0.86034
3	WHONNOCK CORP. CL. A	WHN	2.526	0.239328	0.38870
4	KELSEY-HAYES CANADA	KEL	2.599	0.000000	0.61777
5	ROLLAND INC. CL. A	RL	2.665	0.546148	0.18350
6	CONSOLTEX CANADA	CTX	2.717	0.416292	0.30940
7	BUDD CANADA INC.	BUD	2.864	0.435255	0.58175
8	NOMA INDUSTRIES LTD. CL. A	NMA	2.984	0.400764	0.45954
9	GOODYEAR CANADA INC.	GT	3.135	0.601610	0.37683
10	WELDWOOD OF CANADA	WLW	3.169	0.155080	0.33418
11	BECKER MILK CO. CL B SPECIAL	BEK	3.333	0.012581	0.18560
12	INTERNATIONAL PAPER	IP	3.558	0.386923	-0.01013
13	CANBRA FOODS LTD.	CBF	3.594	0.000000	0.49897
14	WESTINGHOUSE CANADA	WXC	3.596	0.113269	0.38825
15	SHEPHERD PRODUCTS	SEP	3.689	0.138281	0.43944
16	CANADIAN CORPORATE MGMT. CL. Y	CCM	3.710	0.210983	0.47132
17	BOMBARDIER INC. CL.A	BBD	3.738	0.474573	0.29444
18	E-L FINANCIAL CORPORATION LTD.	ELF	3.739	0.024212	0.42567
19	PINE POINT MINES	PPT	3.755	0.002107	-0.33637
20	CANADA DEVELOPMENT CORP.	CDC	3.815	0.930375	-0.66693

STOCKS SELECTED USING GRAHAM'S CRITERIA FOR 1981 2

OBS	NAME	SYMB1	PE	KRAT	FCFR
1	CONWEST EXPLORATION CL.B	CEX	2.201	0.024109	0.311311
2	CANADA DEVELOPMENT CORP.	CDC	2.778	0.780417	-0.081933
3	CASSIDY'S LIMITED	CYL	3.178	0.423750	0.145615
4	PEERLESS CARPET CORP.	PRG	3.226	0.534913	0.274370
5	KERR ADDISON MINES	KER	3.452	0.000000	0.322095
6	GOODYEAR CANADA INC.	GT	3.665	0.541502	0.487138
7	GT LAKES FOREST PRODUCTS	GL	3.886	0.269592	0.256323
8	CCL INDUSTRIES CL.B	CCQ	3.889	0.317688	0.268116
9	CANBRA FOODS LTD.	CBF	3.918	0.000000	0.491357
10	BRENDA MINES	BND	4.063	0.000000	0.605697
11	CONSOLIDATED-BATHURST CL A	CB	4.151	0.488867	0.149117
12	KELSEY-HAYES CANADA	KEL	4.192	0.000000	0.553633
13	MITCHELL, ROBERT CO. CL B	MIT	4.206	0.048013	0.462307
14	FRUEHAUF CANADA	FRH	4.418	0.000000	0.208529
15	E-L FINANCIAL CORPORATION LTD.	ELF	4.422	0.020529	0.480487
16	WESTINGHOUSE CANADA	WXC	4.422	0.092334	0.312274
17	BECKER MILK CO. CL B SPECIAL	BEK	4.483	0.033794	0.040225
18	CANADIAN CORPORATE MGMT. CL.Y	CCM	4.580	0.504197	0.389254
19	UNITED CORPORATIONS LIMITED	UNC	4.621	0.043710	0.210983
20	UNICAN SECURITY SYSTEMS LTD.	UCS	4.639	0.513208	0.280338

STOCKS SELECTED USING GRAHAM'S CRITERIA FOR 1982 3

OBS	NAME	SYMB1	PE	KRAT	FCFR
1	YELLOWKNIFE BEAR RES.	YB	2.254	0.000000	0.2934
2	ENHEAT LTD. CL.A	EH	2.597	0.142094	0.3569
3	SOBEYS STORES CL A	SYS	2.754	0.751715	0.0577
4	SLATER STEELS CORP. CL. A	SSI	2.830	0.513078	0.4009
5	MITCHELL ROBERT CO. CL B	MIT	2.882	0.036374	0.4092
6	GOODYEAR CANADA INC.	GT	2.929	0.428521	0.4843
7	CANADIAN FOUNDATION	CDF	2.965	0.000000	-1.7008
8	KERR ADDISON MINES	KER	3.061	0.000000	0.3498
9	REDPATH INDUSTRIES	RIN	3.374	0.683306	-0.4109
10	CDN IMPERIAL BANK OF COMMERCE	CM	3.514	0.317166	0.3668
11	CANBRA FOODS LTD.	CBF	3.656	0.000000	0.4266
12	SHEPHERD PRODUCTS	SEP	3.731	0.082448	0.4130
13	ALGOMA STEEL CORP.	ALG	3.733	0.330970	0.2732
14	WESTINGHOUSE CANADA	WXC	3.758	0.079517	0.2855
15	BANK OF MONTREAL	BMO	3.795	0.357572	0.0782
16	MAJECTIC CONTRACTORS LTD.	MJC	3.884	0.000000	0.3825
17	ABITIBI-PRICE	A	3.949	0.644731	-0.0636
18	FIRST CITY FINANCIAL CORP.	FCY	3.985	0.872820	0.4448
19	CONSOLIDATED-BATHURST CL A	CB	3.997	0.687150	-0.0246
20	ROTHMAN'S INC.	ROC	4.010	0.180096	0.2869

STOCKS SELECTED USING GRAHAM'S CRITERIA FOR 1983 4

OBS	NAME	SYMB1	PE	KRAT	FCFR
1	NOMA INDUSTRIES LTD CL. A	NMA	3.785	0.623437	0.5501
2	WESTFIELD MINERALS	WFD	4.024	0.000000	0.1443
3	HAMILTON GROUP, CL A	HGL	4.098	0.128649	-1.1010
4	INGLIS LTD.	ING	4.143	0.583279	0.3780
5	MAJESTIC CONTRACTORS LTD.	MJC	4.235	0.000000	0.1065
6	E-L FINANCIAL CORPORATION LTD.	ELF	4.333	0.019863	0.3879
7	COOPER CANADA	CPC	4.486	0.543562	0.4814
8	CORPORATE FOODS	CFL	4.758	0.307346	0.3694
9	MITCHELL ROBERT CO. CL B	MIT	4.847	0.026681	0.4088
10	NORTH CANADIAN OILS	NCO	4.912	0.717902	0.2635
11	CDN IMPERIAL BANK OF COMMERCE	CM	4.959	0.469515	0.3653
12	IPSCO INC.	ISP	4.989	0.361460	0.1398
13	WESTINGHOUSE CANADA	WXC	5.163	0.068929	0.2740
14	SOBEYS STORES CL A	SYS	5.410	0.582318	0.4077
15	TORONTO-DOMINION BANK	TD	5.456	0.238864	0.4551
16	BANK OF NOVA SCOTIA	BNS	5.504	0.427804	0.4129
17	KELLY DOUGLAS & CO. CL A	KLD	5.682	0.084335	0.0767
18	CANADA MALTING CO.	CMG	5.826	0.224447	0.0988
19	BECKER MILK CO. CL B SPECIAL	BEK	5.839	0.135945	0.1890
20	AGRA A	AGR	5.857	0.936200	-0.2789

STOCKS SELECTED USING GRAHAM'S CRITERIA FOR 1984 5

OBS	NAME	SYMB1	PE	KRAT	FCFR
1	E-L FINANCIAL CORPORATION LTD.	ELF	3.306	0.015488	0.4692
2	ROLLAND INC. CL. A	RL	3.326	0.345860	0.2874
3	ENHEAT LTD. CL. A	EH	3.578	0.039551	0.2542
4	HAMILTON GROUP CL A	HGL	3.777	0.000000	-1.0855
5	CANADIAN GENERAL INVESTMENTS	CGI	3.777	0.000000	0.1357
6	INGLIS LTD.	ING	3.849	0.169867	0.4763
7	FARADAY RESOURCES INC.	CFY	4.063	0.222311	-0.4889
8	UNICAN SECURITY SYSTEMS LTD.	UCS	4.196	0.538184	0.3849
9	CANADIAN FOUNDATION	CDF	4.706	0.000000	-0.0944
10	DOMCO INDUSTRIES	DOC	4.918	0.235317	0.1032
11	CDN IMPERIAL BANK OF COMMERCE	CM	4.936	0.487634	0.3661
12	NATIONAL BANK OF CANADA	NA	4.955	0.356757	0.1171
13	CONSOLTEX CANADA	CTX	5.285	0.463443	0.2111
14	CCL INDUSTRIES CL.B	CCQ	5.403	0.801693	0.0605
15	ROMAN CORP.	RMN	5.573	0.110133	0.6111
16	MINERAL RESOURCES COMMON	MRI	5.588	0.309057	1.0428
17	MONTREAL CITY SAVINGS BANK	BEM	5.667	0.234391	-1.2389
18	BANK OF NOVA SCOTIA	BNS	5.928	0.388376	0.5019
19	PEERLESS CARPET CORP.	PRG	6.019	0.600989	0.3962
20	FIRST CITY FINANCIAL CORP.	FCY	6.078	0.946614	0.4769

STOCKS SELECTED USING GRAHAM'S CRITERIA FOR 1985 6

OBS	NAME	SYMB1	PE	KRAT	FCFR
1	FORD MOTOR CO. OF CDA	FMC	3.850	0.100774	-0.1048
2	DOMCO INDUSTRIES	DDC	3.913	0.157912	0.1560
3	ENHEAT LTD. CL.A	EH	3.934	0.157417	0.2028
4	ROLLAND INC. CL. A	RL	4.188	0.374755	0.0137
5	CONSOLTEX CANADA	CTX	4.200	0.329850	0.0048
6	E-L FINANCIAL CORPORATION LTD.	ELF	4.452	0.013266	0.5002
7	UNICAN SECUTY SYSTEMS LTD.	UCS	4.464	0.939807	0.3524
8	YELLOWKNIFE BEAR RES.	YB	4.736	0.000000	-2.2401
9	ROMAN CORP.	RMN	5.081	0.064980	0.5702
10	GOODYEAR CANADA INC.	GT	5.146	0.292770	0.4073
11	REDPATH INDUSTRIES	RIN	5.353	0.271490	0.0589
12	GSW INC. CL B	GSW	5.423	0.221748	0.3924
13	NATIONAL BANK OF CANADA	NA	5.590	0.445466	0.1643
14	HAMILTON GROUP, CL A	HGL	5.639	0.202514	0.1009
15	BUDD CANADA INC.	BUD	6.209	0.448872	-0.0132
16	KELSEY-HAYES CANADA	KEL	6.315	0.000000	0.3740
17	CDN IMPERIAL BANK OF COMMERCE	CM	6.429	0.443063	0.3133
18	SOBEYS STORES CL A	SYS	6.432	0.718363	0.3074
19	COMPUTALOG GEARHART LTD.	CGH	6.587	0.000000	0.1433
20	DU PONT CANADA CL.A SER. 1	DUP	6.587	0.464406	0.5071

STOCKS SELECTED USING BOWEN & GANUCHEAU'S CRITERIA FOR 1980 7

OBS	NAME	SYMB1	PE	FCFR	KRAT
1	MITCHELL ROBERT CO. C. B	MIT	2.053	0.49892	0.06363
2	VESTGRON MINES	VGM	2.385	0.86034	0.00000
3	CRESTBROOK FOREST INDUSTRIES	CFI	2.412	1.91378	3.11018
4	WHONNOCK CORP. CL. A	WHN	2.526	0.38870	0.23933
5	KELSEY-HAYES CANADA	KEL	2.599	0.61777	0.00000
6	ROLLAND INC. CL. A	RL	2.665	0.18350	0.54615
7	CONSOLTEX CANADA	CTX	2.717	0.30940	0.41629
8	BUDD CANADA INC.	BUD	2.864	0.58175	0.43525
9	NOMA INDUSTRIES LTD. CL. A	NMA	2.984	0.45954	0.40076
10	GOODYEAR CANADA INC.	GT	3.135	0.37683	0.60161
11	WELDWOOD OF CANADA	WLW	3.169	0.33418	0.15508
12	BECKER MILK CO. CL B SPECIAL	BEK	3.333	0.18560	0.01258
13	CANBRA FOODS LTD.	CBF	3.594	0.49897	0.00000
14	WESTINGHOUSE CANADA	WXC	3.596	0.38825	0.11327
15	SHEPHERD PRODUCTS	SEP	3.689	0.43944	0.13828
16	CANADIAN CORPORATE MGMT. CL. Y	CCM	3.710	0.47132	0.21098
17	BOMBARDIER INC. CL.A	BBD	3.738	0.29444	0.47457
18	E-L FINANCIAL CORPORATION LTD.	ELF	3.739	0.42567	0.02421
19	PEERLESS CARPET CORP.	PRG	3.825	0.36491	0.39906
20	ABITIBI-PRICE	A	3.826	0.15684	0.55762

STOCKS SELECTED USING BOWEN & GANUCHEAU'S CRITERIA FOR 1981 8

OBS	NAME	SYMB1	PE	FCFR	KRAT
1	CONWEST EXPLORATION CL.B	CEX	2.201	0.31131	0.02411
2	CASSIDY'S LIMITED	CYL	3.178	0.14561	0.42375
3	PEERLESS CARPET CORP.	PRG	3.226	0.27437	0.53491
4	KERR ADDISON MINES	KER	3.452	0.32210	0.00000
5	GOODYEAR CANADA INC.	GT	3.665	0.48714	0.54150
6	CRESTBROOK FOREST INDUSTRIES	CFI	3.721	1.74708	1.28113
7	GT LAKES FOREST PRODUCTS	GL	3.886	0.25632	0.26959
8	CCL INDUSTRIES CL.B	CCQ	3.889	0.26812	0.31769
9	CANBRA FOODS LTD.	CBF	3.918	0.49136	0.00000
10	BRENDA MINES	BND	4.063	0.60570	0.00000
11	CONSOLIDATED-BATHURST CL A	CB	4.151	0.14912	0.48887
12	KELSEY-HAYES CANADA	KEL	4.192	0.55363	0.00000
13	MITCHELL, ROBERT CO. CL B	MIT	4.206	0.46231	0.04801
14	FRUEHAUF CANADA	FRH	4.418	0.20853	0.00000
15	E-L FINANCIAL CORPORATION LTD.	ELF	4.422	0.48049	0.02053
16	WESTINGHOUSE CANADA	WXC	4.422	0.31227	0.09233
17	BECKER MILK CO. CL B SPECIAL	BEK	4.483	0.04023	0.03379
18	CANADIAN CORPORATE MGMT. CL.Y	CCM	4.580	0.38925	0.50420
19	UNITED CORPORATIONS LIMITED	UNC	4.621	0.21098	0.04371
20	UNICAN SECURITY SYSTEMS LTD.	UCS	4.639	0.28034	0.51321

STOCKS SELECTED USING BOWEN & GANUCHEAU'S CRITERIA FOR 1982 9

OBS	NAME	SYMB1	PE	FCFR	KRAT
1	YELLOWKNIFE BEAR RES.	YB	2.254	0.29336	0.00000
2	ENHEAT LTD. CL.A	EH	2.597	0.35688	0.14209
3	SOBEYS STORES CL A	SYS	2.754	0.05769	0.75171
4	SLATER STEELS CORP. CL. A	SSI	2.830	0.40092	0.51308
5	MITCHELL ROBERT CO. CL B	MIT	2.882	0.40917	0.03637
6	GOODYEAR CANADA INC.	GT	2.929	0.48430	0.42852
7	KERR ADDISON MINES	KER	3.061	0.34981	0.00000
8	MINERAL RESOURCES COMMON	MRI	3.224	1.26238	2.12404
9	CDN IMPERIAL BANK OF COMMERCE	CM	3.514	0.36676	0.31717
10	CANBRA FOODS LTD.	CBF	3.656	0.42658	0.00000
11	SHEPHERD PRODUCTS	SEP	3.731	0.41301	0.08245
12	ALGOMA STEEL CORP.	ALG	3.733	0.27317	0.33097
13	WESTINGHOUSE CANADA	WXC	3.758	0.28551	0.07952
14	BANK OF MONTREAL	BMO	3.795	0.07818	0.35757
15	MAJECTIC CONTRACTORS LTD.	MJC	3.884	0.38254	0.00000
16	FIRST CITY FINANCIAL CORP.	FCY	3.985	0.44479	0.87282
17	ROTHMAN'S INC.	ROC	4.010	0.28687	0.18010
18	POWER CORP.	POW	4.106	0.34130	0.45965
19	DOFASCO INC.	DFS	4.143	0.09389	0.43854
20	KELLY DOUGLAS & CO. CL A	KLD	4.183	0.02287	0.11097

STOCKS SELECTED USING BOWEN & GANUCHEAU'S CRITERIA FOR 1983 10

OBS	NAME	SYMB1	PE	FCFR	KRAT
1	NOMA INDUSTRIES LTD CL. A	NMA	3.785	0.550138	0.623437
2	WESTFIELD MINERALS	WFD	4.024	0.144336	0.000000
3	INGLIS LTD.	ING	4.143	0.377999	0.583279
4	MAJESTIC CONTRACTORS LTD.	MJC	4.235	0.106512	0.000000
5	E-L FINANCIAL CORPORATION LTD.	ELF	4.333	0.387919	0.019863
6	COOPER CANADA	CPC	4.486	0.481439	0.543562
7	CORPORATE FOODS	CFL	4.758	0.369358	0.307346
8	MITCHELL ROBERT CO. CL B	MIT	4.847	0.408841	0.026681
9	NORTH CANADIAN OILS	NCO	4.912	0.263515	0.717902
10	CDN IMPERIAL BANK OF COMMERCE	CM	4.959	0.365294	0.469515
11	IPSCO INC.	ISP	4.989	0.139772	0.361460
12	WESTINGHOUSE CANADA	WXC	5.163	0.273968	0.068929
13	SOBEYS STORES CL A	SYS	5.410	0.407727	0.582318
14	TORONTO-DOMINION BANK	TD	5.456	0.455132	0.238864
15	BANK OF NOVA SCOTIA	BNS	5.504	0.412888	0.427804
16	KELLY DOUGLAS & CO. CL A	KLD	5.682	0.076704	0.084335
17	CANADA MALTING CO.	CMG	5.826	0.098757	0.224447
18	BECKER MILK CO. CL B SPECIAL	BEK	5.839	0.189001	0.135945
19	FEDERAL PIONEER LTD.	FPE	5.924	0.298891	0.074054
20	HARRIS STEEL CL.A	HSG	6.034	0.101229	0.297173

STOCKS SELECTED USING BOWEN & GANUCHEAU'S CRITERIA FOR 1984 11

OBS	NAME	SYMB1	PE	FCFR	KRAT
1	E-L FINANCIAL CORPORATION LTD.	ELF	3.306	0.46918	0.01549
2	ROLLAND INC. CL. A	RL	3.326	0.28742	0.34586
3	ENHEAT LTD. CL. A	EH	3.578	0.25423	0.03955
4	CANADIAN GENERAL INVESTMENTS	CGI	3.777	0.13571	0.00000
5	INGLIS LTD.	ING	3.849	0.47634	0.16987
6	UNICAN SECURITY SYSTEMS LTD.	UCS	4.196	0.38486	0.53818
7	NORTH CANADIAN OILS	NCO	4.508	0.25418	1.07637
8	DOMCO INDUSTRIES	DOC	4.918	0.10324	0.23532
9	CDN IMPERIAL BANK OF COMMERCE	CM	4.936	0.36613	0.48763
10	NATIONAL BANK OF CANADA	NA	4.955	0.11712	0.35676
11	CONSOLTEX CANADA	CTX	5.285	0.21111	0.46344
12	CCL INDUSTRIES CL.B	CCQ	5.403	0.06049	0.80169
13	ROMAN CORP.	RMN	5.573	0.61113	0.11013
14	MINERAL RESOURCES COMMON	MRI	5.588	1.04280	0.30906
15	BANK OF NOVA SCOTIA	BNS	5.928	0.50190	0.38838
16	PEERLESS CARPET CORP.	PRG	6.019	0.39621	0.60099
17	FIRST CITY FINANCIAL CORP.	FCY	6.078	0.47688	0.94661
18	LEON'S FURNITURE LTD.	LNF	6.117	0.23578	0.33487
19	TORONTO-DOMINION BANK	TD	6.180	0.50498	0.21617
20	ROTHMAN'S INC.	ROC	6.313	0.19868	0.09152

STOCKS SELECTED USING BOWEN & GANUCHEAU'S CRITERIA FOR 1985 12

OBS	NAME	SYMB1	PE	FCFR	KRAT
1	NORTH CANADIAN OILS	NCO	3.786	0.22577	2.52676
2	DOMCO INDUSTRIES	DDC	3.913	0.15600	0.15791
3	ENHEAT LTD. CL.A	EH	3.934	0.20285	0.15742
4	ROLLAND INC. CL. A	RL	4.188	0.01375	0.37475
5	CONSOLTEX CANADA	CTX	4.200	0.00479	0.32985
6	E-L FINANCIAL CORPORATION LTD.	ELF	4.452	0.50019	0.01327
7	UNICAN SECUTY SYSTEMS LTD.	UCS	4.464	0.35244	0.93981
8	FIRST CITY FINANCIAL CORP.	FCY	4.563	0.54275	1.67728
9	ROMAN CORP.	RMN	5.081	0.57018	0.06498
10	GOODYEAR CANADA INC.	GT	5.146	0.40730	0.29277
11	REDPATH INDUSTRIES	RIN	5.353	0.05892	0.27149
12	WARDAIR INTERNATIONAL CL. A	WDR	5.417	4.87293	8.59617
13	GSW INC. CL B	GSW	5.423	0.39236	0.22175
14	NATIONAL BANK OF CANADA	NA	5.590	0.16426	0.44547
15	HAMILTON GROUP, CL A	HGL	5.639	0.10094	0.20251
16	KELSEY-HAYES CANADA	KEL	6.315	0.37401	0.00000
17	CDN IMPERIAL BANK OF COMMERCE	CM	6.429	0.31328	0.44306
18	SOBEYS STORES CL A	SYS	6.432	0.30741	0.71836
19	COMPUTALOG GEARHART LTD.	CGH	6.587	0.14329	0.00000
20	DU PONT CANADA CL.A SER. 1	DUP	6.587	0.50708	0.46441

STOCKS SELECTED USING FISHER'S CRITERIA FOR 1980 13

OBS	NAME	SYMB1	PSADJ	PE	FCFR
1	FRUEHAUF CANADA	FRH	0.178	4.212	0.32133
2	WESTINGHOUSE CANADA	WXC	0.174	3.596	0.38825
3	WOODWARD'S LTD.	WDS	0.166	8.392	0.03500
4	DRG INC. CL. A	DRG	0.166	8.712	0.14252
5	BOMBARDIER INC. CL.A	BBD	0.162	3.738	0.29444
6	SILCORP LTD.	SIL	0.159	5.631	0.14586
7	VS SERVICES	VSL	0.158	6.154	0.32374
8	D.H. HOWDEN & CO. LTD.	HDH	0.154	5.097	-0.08971
9	HOLLINGER INC., COMMON	HLG	0.151	6.132	-0.04182
10	BECKER MILK CO. CL B SPECIAL	BEK	0.149	3.333	0.18560
11	OSHAWA GROUP CL A	OSH	0.138	7.200	0.09323
12	HERITAGE GROUP CL.A	HI	0.117	6.430	0.11399
13	KELSEY-HAYES CANADA	KEL	0.116	2.599	0.61777
14	BUDD CANADA INC.	BUD	0.109	2.864	0.58175
15	GOODYEAR CANADA INC.	GT	0.109	3.135	0.37683
16	INGLIS LTD.	ING	0.108	4.470	0.37858
17	MITCHELL, ROBERT CO. CL B	MIT	0.102	2.053	0.49892
18	ROLLAND INC. CL. A	RL	0.099	2.665	0.18350
19	CANADA PACKERS INC.	CK	0.090	8.157	0.23824
20	KELLY DOUGLAS & CO. CL A	KLD	0.042	4.958	-0.23667

STOCKS SELECTED USING FISHER'S CRITERIA FOR 1981 14

OBS	NAME	SYMB1	PSADJ	PE	FCFR
1	BOMBARDIER INC. CL.A	BBD	0.200	-10.87	0.0930
2	HOLLINGER INC., COMMON	HLG	0.193	7.05	-0.0949
3	VAN DER HOUT ASSOCIATES LTD.	VDH	0.193	-120.00	0.0055
4	VS SERVICES	VSL	0.187	7.34	0.4800
5	CONSOLTEX CANADA	CTX	0.183	13.61	0.0670
6	OSHAWA GROUP CL A	OSH	0.175	7.03	-0.0336
7	MARSHALL DRUMMOND MCCALL CL A	MDM	0.174	10.22	0.0290
8	DONOHUE INC.	DHC	0.157	2.06	-1.1515
9	KELSEY-HAYES CANADA	KEL	0.156	4.19	0.5536
10	FRUEHAUF CANADA	FRH	0.151	4.42	0.2085
11	CANADIAN CORPORATE MGMT. CL.Y	CCM	0.140	4.58	0.3893
12	MITCHELL, ROBERT CO. CL B	MIT	0.124	4.21	0.4623
13	HERITAGE GROUP CL.A	HI	0.111	6.86	0.2623
14	E-L FINANCIAL CORPORATION LTD.	ELF	0.104	4.42	0.4805
15	INGLIS LTD.	ING	0.102	8.26	0.3210
16	D.H. HOWDEN & CO. LTD.	HDH	0.097	5.25	-0.0900
17	GOODYEAR CANADA INC.	GT	0.096	3.66	0.4871
18	CANADA PACKERS INC.	CK	0.082	7.47	0.1930
19	ROLLAND INC. CL. A	RL	0.075	5.71	0.0056
20	KELLY DOUGLAS & CO. CL A	KLD	0.053	5.80	-0.3656

STOCKS SELECTED USING FISHER'S CRITERIA FOR 1982 15

OBS	NAME	SYMB1	PSADJ	PE	FCFR
1	MITCHELL, ROBERT CO. CL B	MIT	0.147	2.882	0.4092
2	SOBEYS STORES CL A	SYS	0.142	2.754	0.0577
3	COOPER CANADA	CPC	0.140	9.058	0.5125
4	CANADIAN CORPORATE MGMT. CL.Y	CCM	0.139	4.321	0.3271
5	NOMA INDUSTRIES LTD. CL. A	NMA	0.136	4.464	0.4360
6	HERITAGE GROUP CL.A	HI	0.134	17.143	0.1359
7	DONOHUE INC.	DHC	0.126	1.760	-1.1537
8	FRUEHAUF CANADA	FRH	0.122	7.649	0.2188
9	FARADAY RESOURCES INC.	CFY	0.118	5.962	0.6891
10	SHEPHERD PRODUCTS	SEP	0.117	3.731	0.4130
11	BUDD CANADA INC.	BUD	0.108	6.250	0.4505
12	INGLIS LTD.	ING	0.097	5.440	0.2069
13	GOODYEAR CANADA INC.	GT	0.093	2.929	0.4843
14	ENHEAT LTD. CL.A	EH	0.087	2.597	0.3569
15	CONSOLTEX CANADA	CTX	0.086	33.333	0.0129
16	MASSEY-FERGUSON	MF	0.085	-0.253	-3.9026
17	CANADA PACKERS INC.	CK	0.077	6.287	0.1511
18	E-L FINANCIAL CORPORATION LTD.	ELF	0.072	-20.833	0.4303
19	ROLLAND INC. CL. A	RL	0.067	-60.000	0.1245
20	KELLY DOUGLAS & CO. CL A	KLD	0.049	4.183	0.0229

STOCKS SELECTED USING FISHER'S CRITERIA FOR 1983 16

OBS	NAME	SYMB1	PSADJ	PE	FCFR
1	NOMA INDUSTRIES LTD. CL. A	NMA	0.182	3.785	0.55014
2	CANBRA FOODS LTD.	CBF	0.179	8.287	0.41647
3	WOODWARD'S LTD.	WDS	0.178	24.569	-0.20596
4	FRUEHAUF CANADA	FRH	0.161	51.705	0.22580
5	CANADIAN FOUNDATION	CDF	0.160	5.914	-0.51272
6	INGLIS LTD.	ING	0.153	4.143	0.37800
7	INTERMETCO LTD.	INT	0.144	-5.109	-0.14565
8	WESTINGHOUSE CANADA	WXC	0.144	5.163	0.27397
9	CANADIAN CORPORATE MGMT. CL.Y	CCM	0.134	6.824	0.20852
10	MITCHELL, ROBERT CO. CL B	MIT	0.131	4.847	0.40884
11	UAP INC. CL.A	UAP	0.113	7.266	0.23584
12	COOPER CANADA	CPC	0.104	4.486	0.48144
13	GOODYEAR CANADA INC.	GT	0.104	-22.704	0.46876
14	HERITAGE GROUP CL.A	HI	0.099	12.381	0.20079
15	CANADA PACKERS INC.	CK	0.095	10.172	0.13291
16	CONSOLTEX CANADA	CTX	0.092	-1.447	0.03360
17	D.H. HOWDEN & CO. LTD.	HDH	0.079	-12.500	0.23003
18	ROLLAND INC. CL. A	RL	0.062	-10.817	0.16062
19	KELLY DOUGLAS & CO. CL A	KLD	0.049	5.682	0.07670
20	E-L FINANCIAL CORPORATION LTD.	ELF	0.026	4.333	0.38792

STOCKS SELECTED USING FISHER'S CRITERIA FOR 1984 17

OBS	NAME	SYMB1	PSADJ	PE	FCFR
1	UNICAN SECURITY SYSTEMS LTD.	UCS	0.234	4.196	0.385
2	VS SERVICES	VSL	0.234	11.386	0.313
3	EMCO LTD.	EML	0.232	21.831	0.338
4	CANBRA FOODS LTD.	CBF	0.214	7.974	0.459
5	MITCHELL, ROBERT CO. CL B	MIT	0.213	12.692	0.382
6	BECKER MILK CO. CL B SPECIAL	BEK	0.210	6.480	0.300
7	BOMBARDIER INC. CL.A	BBD	0.200	15.733	-0.213
8	CANADA MALTING CO.	CMG	0.190	7.842	0.456
9	UAP INC. CL.A	UAP	0.180	6.806	0.297
10	HERITAGE GROUP CL.A	HI	0.174	11.026	0.307
11	ENHEAT LTD. CL.A	EH	0.169	3.578	0.254
12	OSHAWA GROUP CL A	OSH	0.168	9.153	0.194
13	D.H. HOWDEN & CO. LTD.	HDH	0.160	7.729	-0.175
14	ROLLAND INC. CL. A	RL	0.153	3.326	0.287
15	CONSOLTEX CANADA	CTX	0.147	5.285	0.211
16	GOODYEAR CANADA INC.	GT	0.144	6.435	0.376
17	CANADA PACKERS INC.	CK	0.142	14.226	0.107
18	VAN DER HOUT ASSOCIATES LTD.	VDH	0.142	-6.020	-10.645
19	E-L FINANCIAL CORPORATION LTD.	ELF	0.096	3.306	0.469
20	KELLY DOUGLAS & CO. CL A	KLD	0.075	7.117	0.054

STOCKS SELECTED USING FISHER'S CRITERIA FOR 1985 18

OBS	NAME	SYMB1	PSADJ	PE	FCFR
1	INTERMETCO LTD.	INT	0.231	6.988	-0.3088
2	NEWFOUNDLAND CAPITAL, CL. B	NCC	0.230	81.250	-0.0322
3	CASSIDY'S LIMITED	CYL	0.225	10.303	-0.1450
4	WESTINGHOUSE CANADA	WXC	0.225	9.030	0.2024
5	DOMCO INDUSTRIES	DOC	0.216	3.913	0.1560
6	VAN DER HOUT ASSOCIATES LTD.	VDH	0.214	27.875	-3.1725
7	FRUEHAUF CANADA	FRH	0.214	6.887	0.2313
8	CANRON INC. CL A	CL	0.209	39.453	-0.1839
9	LEON'S FURNITURE LTD.	LNF	0.198	9.917	0.4275
10	CANBRA FOODS LTD.	CBF	0.183	27.586	0.3579
11	WOODWARD'S LTD.	WDS	0.168	63.194	-0.5521
12	HERITAGE GROUP CL.A	HI	0.157	9.908	0.3109
13	RAYROCK YELLOWKNIFE RES. INC.	RAY	0.153	17.308	0.5023
14	GOODYEAR CANADA INC.	GT	0.151	5.146	0.4073
15	CANADA PACKERS INC.	CK	0.146	14.123	0.1380
16	E-L FINANCIAL CORPORATION LTD.	ELF	0.121	4.452	0.5002
17	CONSOLTEX CANADA	CTX	0.118	4.200	0.0048
18	ROLLAND INC. CL. A	RL	0.116	4.188	0.0137
19	KELLY DOUGLAS & CO. CL A	KLD	0.086	7.785	-0.0068
20	D.H. HOWDEN & CO. LTD.	HDH	0.066	8.626	0.1640

MONTHLY VALUES OF THE TSE TOTAL RETURN INDEX
AND THE THREE PORTFOLIOS CONSTRUCTED
FOR THIS STUDY

OBS	YEAR	MONTH	VA	VB	VC	VM
1	80	1	100000	100000	100000	2327.62
2	80	2	110138	108920	104881	2524.47
3	80	3	100269	99198	97339	2079.19
4	80	4	98375	95593	96065	2167.01
5	80	5	103029	100773	99972	2294.76
6	80	6	103636	102581	103444	2411.25
7	80	7	110531	110286	105851	2577.58
8	80	8	113910	112097	111545	2609.33
9	80	9	117807	116808	117318	2668.43
10	80	10	117725	115891	121182	2648.72
11	80	11	125185	124414	124093	2850.94
12	80	12	123756	122395	122500	2705.51
13	81	1	123301	123373	124651	2658.85
14	81	2	123429	123717	126561	2611.52
15	81	3	136828	136366	131162	2807.32
16	81	4	142179	142206	136120	2778.42
17	81	5	148374	149271	139388	2866.99
18	81	6	148817	149066	139831	2869.25
19	81	7	139331	140061	131433	2745.31
20	81	8	132266	134236	126382	2659.84
21	81	9	115815	119561	116982	2311.46
22	81	10	115652	120047	114683	2265.88
23	81	11	117421	119221	112878	2486.19
24	81	12	117984	120649	112720	2428.29
25	82	1	109870	112964	107672	2224.23
26	82	2	110714	110089	105849	2087.86
27	82	3	109953	107184	102481	1998.61
28	82	4	106695	104980	102999	1952.15
29	82	5	104446	103610	104801	1931.99
30	82	6	93545	92067	96246	1745.70
31	82	7	96117	96199	96727	1808.33
32	82	8	103160	102636	100775	2074.04
33	82	9	107787	105827	104955	2071.64
34	82	10	112055	112639	112431	2297.60
35	82	11	116485	116037	116430	2393.66
36	82	12	126871	125260	129990	2562.85
37	83	1	133097	131001	140787	2663.29
38	83	2	147608	145416	154888	2751.20
39	83	3	161499	160469	165373	2850.42
40	83	4	175260	173461	184138	3100.13
41	83	5	185785	183981	194108	3215.38
42	83	6	186584	184643	201988	3263.28
43	83	7	200997	198332	216800	3309.45
44	83	8	202493	197376	221401	3325.25
45	83	9	209204	201526	225966	3359.74
46	83	10	209574	201693	231221	3179.01
47	83	11	216214	205880	245945	3442.98
48	83	12	218881	208808	246150	3472.33

MONTHLY VALUES OF THE TSE TOTAL RETURN INDEX
AND THE THREE PORTFOLIOS CONSTRUCTED
FOR THIS STUDY

OBS	YEAR	MONTH	VA	VB	VC	VM
49	84	1	231293	219457	264383	3364.18
50	84	2	233201	218594	259017	3306.70
51	84	3	230852	218461	261474	3269.40
52	84	4	226109	215485	261437	3194.12
53	84	5	220308	208154	256581	3075.06
54	84	6	221570	209158	253981	3078.32
55	84	7	215121	202925	249873	2973.02
56	84	8	226238	213413	263169	3328.25
57	84	9	224550	214304	264911	3346.41
58	84	10	223935	212645	267143	3296.98
59	84	11	238849	224160	279764	3328.00
60	84	12	255472	241460	296995	3389.25
61	85	1	260079	247613	313498	3669.57
62	85	2	281558	265527	349075	3677.69
63	85	3	288014	273957	352717	3720.81
64	85	4	283478	281330	350569	3759.58
65	85	5	319626	309676	369170	3917.24
66	85	6	332912	323050	374919	3899.51
67	85	7	346604	337097	386161	4001.53
68	85	8	363714	352013	403041	4031.91
69	85	9	346929	332394	396949	3814.15
70	85	10	358487	340864	384412	3882.56
71	85	11	396541	373129	414475	4157.03
72	85	12	410646	389340	428905	4238.78
73	86	1	419177	387431	437820	4159.78

MONTHLY RETURNS ON PORTFOLIOS, THE "MARKET", AND TREASURY BILLS 21

OBS	YEAR	MONTH	RA	RB	RC	RM	RF
1	80	2	10.138	8.920	4.8807	8.457	1.12917
2	80	3	-8.961	-8.926	-7.1904	-17.639	1.27000
3	80	4	-1.889	-3.634	-1.3093	4.224	1.26250
4	80	5	4.731	5.418	4.0677	5.895	0.96500
5	80	6	0.589	1.794	3.4724	5.076	0.86500
6	80	7	6.653	7.511	2.3268	6.898	0.83833
7	80	8	3.057	1.642	5.3793	1.232	0.87417
8	80	9	3.421	4.202	5.1757	2.265	0.91250
9	80	10	-0.070	-0.785	3.2937	-0.739	0.99250
10	80	11	6.337	7.354	2.4018	7.635	1.14167
11	80	12	-1.141	-1.623	-1.2835	-5.101	1.41750
12	81	1	-0.367	0.799	1.7556	-1.725	1.40500
13	81	2	0.104	0.279	1.5326	-1.780	1.40250
14	81	3	10.855	10.224	3.6352	7.498	1.37000
15	81	4	3.911	4.283	3.7799	-1.029	1.44583
16	81	5	4.357	4.968	2.4012	3.188	1.53583
17	81	6	0.299	-0.137	0.3175	0.079	1.56917
18	81	7	-6.375	-6.041	-6.0055	-4.320	1.69083
19	81	8	-5.071	-4.159	-3.8428	-3.113	1.73500
20	81	9	-12.438	-10.932	-7.4382	-13.098	1.61250
21	81	10	-0.140	0.407	-1.9655	-1.972	1.49667
22	81	11	1.530	-0.689	-1.5733	9.723	1.25583
23	81	12	0.479	1.198	-0.1399	-2.329	1.20083
24	82	1	-6.877	-6.370	-4.4789	-8.403	1.19500
25	82	2	0.768	-2.545	-1.6926	-6.131	1.21500
26	82	3	-0.687	-2.638	-3.1822	-4.275	1.25583
27	82	4	-2.963	-2.056	0.5056	-2.325	1.24833
28	82	5	-2.108	-1.305	1.7496	-1.033	1.26500
29	82	6	-10.438	-11.141	-8.1632	-9.642	1.36083
30	82	7	2.750	4.488	0.4995	3.588	1.27083
31	82	8	7.327	6.691	4.1855	14.694	1.14167
32	82	9	4.485	3.109	4.1474	-0.116	1.06083
33	82	10	3.960	6.437	7.1231	10.907	0.93417
34	82	11	3.953	3.016	3.5567	4.181	0.89333
35	82	12	8.916	7.948	11.6470	7.068	0.81667
36	83	1	4.908	4.583	8.3057	3.919	0.79833
37	83	2	10.903	11.004	10.0160	3.301	0.76917
38	83	3	9.411	10.351	6.7694	3.606	0.76417
39	83	4	8.520	8.096	11.3471	8.760	0.76000
40	83	5	6.006	6.065	5.4144	3.718	0.77083
41	83	6	0.430	0.360	4.0597	1.490	0.76417
42	83	7	7.725	7.414	7.3332	1.415	0.77000
43	83	8	0.745	-0.482	2.1221	0.477	0.77667
44	83	9	3.314	2.102	2.0617	1.037	0.77000
45	83	10	0.177	0.083	2.3258	-5.379	0.77000
46	83	11	3.168	2.076	6.3678	8.304	0.79000
47	83	12	1.234	1.422	0.0832	0.852	0.80917

MONTHLY RETURNS ON PORTFOLIOS, THE "MARKET", AND TREASURY BILLS 22

OBS	YEAR	MONTH	RA	RB	RC	RM	RF
48	84	1	5.670	5.100	7.4075	-3.115	0.81083
49	84	2	0.825	-0.393	-2.0295	-1.709	0.81833
50	84	3	-1.008	-0.061	0.9484	-1.128	0.87750
51	84	4	-2.054	-1.362	-0.0143	-2.303	0.88250
52	84	5	-2.566	-3.402	-1.8571	-3.727	0.94083
53	84	6	0.573	0.482	-1.0137	0.106	1.00917
54	84	7	-2.911	-2.980	-1.6174	-3.421	1.06083
55	84	8	5.168	5.169	5.3214	11.948	1.01083
56	84	9	-0.7460	0.4176	0.6620	0.5456	1.00167
57	84	10	-0.2741	-0.7740	0.8422	-1.4771	0.95167
58	84	11	6.6598	5.4149	4.7246	0.9409	0.87500
59	84	12	6.9600	7.7178	6.1591	1.8404	0.82000
60	85	1	1.8032	2.5482	5.5566	8.2709	0.79167
61	85	2	8.2586	7.2347	11.3487	0.2213	0.93917
62	85	3	2.2929	3.1750	1.0431	1.1725	0.86667
63	85	4	-1.5748	2.6914	-0.6090	1.0420	0.81417
64	85	5	12.7515	10.0756	5.3060	4.1936	0.79250
65	85	6	4.1568	4.3189	1.5573	-0.4526	0.77750
66	85	7	4.1129	4.3482	2.9985	2.6162	0.75500
67	85	8	4.9363	4.4247	4.3714	0.7592	0.74583
68	85	9	-4.6149	-5.5733	-1.5115	-5.4009	0.72917
69	85	10	3.3314	2.5482	-3.1585	1.7936	0.71083
70	85	11	10.6153	9.4656	7.8206	7.0693	0.73750
71	85	12	3.5571	4.3445	3.4814	1.9665	0.77000
72	86	1	2.0773	-0.4901	2.0786	-1.8637	0.93500

DESCRIPTIVE STATISTICS ON PORTFOLIO AND MARKET RETURNS 23

UNIVARIATE

VARIABLE=RA

MOMENTS

N	72	SUM WGTS	72
MEAN	2.13385	SUM	153.637
STD DEV	5.0157	VARIANCE	25.1572
SKEWNESS	-0.404945	KURTOSIS	0.52816
USS	2114	CSS	1786.16
CV	235.054	STD MEAN	0.591106
T:MEAN=0	3.60992	PROB>|T|	.000567102
SGN RANK	647	PROB>|S|	0.00028567
NUM = 0	72		
D:NORMAL	0.0624429	PROB>D	>0.15

QUANTILES(DEF=4)

100% MAX	12.7515	99%	12.7515
75% Q3	5.11003	95%	10.6993
50% MED	2.1851	90%	8.79731
25% Q1	-0.607204	10%	-4.11935
0% MIN	-12.438	5%	-7.6064
		1%	-12.438
RANGE	25.1895		
Q3-Q1	5.71723		
MODE	-12.438		

EXTREMES

LOWEST	HIGHEST
-12.438	10.1382
-10.4376	10.6153
-8.96093	10.8554
-6.87703	10.9031
-6.37455	12.7515

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             DESCRIPTIVE STATISTICS ON PORTFOLIO AND           24
                         MARKET RETURNS

                           UNIVARIATE

VARIABLE=RA

        STEM LEAF                       #         BOXPLOT
          12 8                          1            |
          11                                         |
          10 1699                       4            |
           9 4                          1            |
           8 359                        3            |
           7 037                        3            |
           6 0377                       4            |
           5 27                         2         +-----+
           4 001245799                  9         |     |
           3 1233469                    7         |     |
           2 138                        3         *--+--*
           1 258                        3         |     |
           0 1234566788                10         |     |
          -0 774311                     6         +-----+
          -1 9610                       4            |
          -2 9611                       4            |
          -3 0                          1            |
          -4 6                          1            |
          -5 1                          1            |
          -6 94                         2            |
          -7                                         |
          -8                                         |
          -9 0                          1            |
         -10 4                          1            0
         -11
         -12 4                          1            0
             ----+----+----+----+
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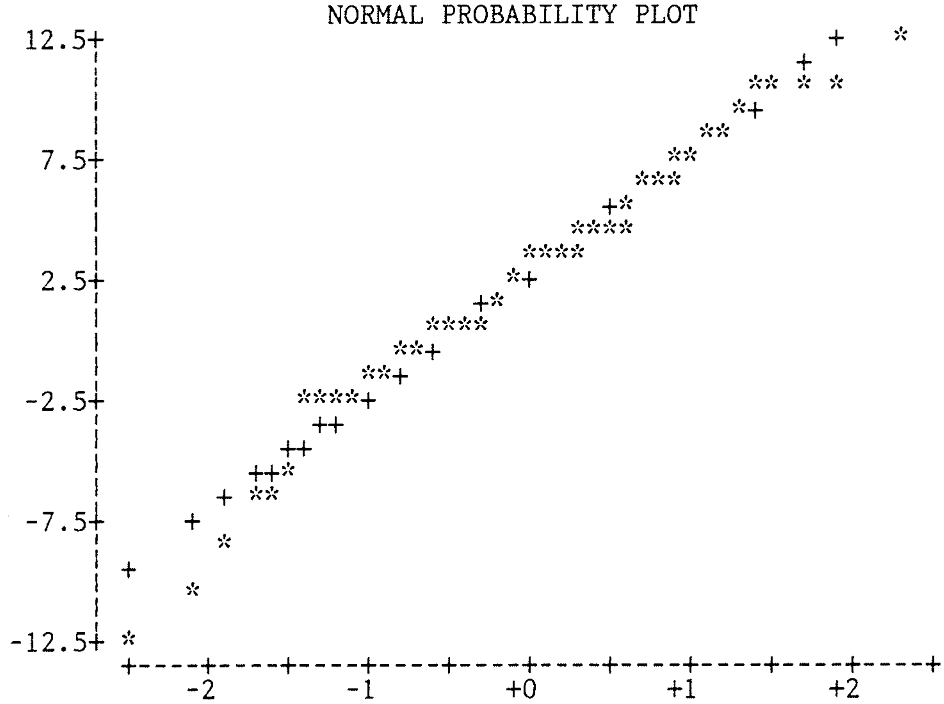
DESCRIPTIVE STATISTICS ON PORTFOLIO AND MARKET RETURNS 25a

UNIVARIATE

VARIABLE=RA

NORMAL PROBABILITY PLOT



DESCRIPTIVE STATISTICS ON PORTFOLIO AND MARKET RETURNS 25b

UNIVARIATE

VARIABLE=RA

FREQUENCY TABLE

		PERCENTS				PERCENTS	
VALUE	COUNT	CELL	CUM	VALUE	COUNT	CELL	CUM
-12.438	1	1.4	1.4	-.367418	1	1.4	26.4
-10.4376	1	1.4	2.8	-.274073	1	1.4	27.8
-8.96093	1	1.4	4.2	-.140429	1	1.4	29.2
-6.87703	1	1.4	5.6	-.070045	1	1.4	30.6
-6.37455	1	1.4	6.9	0.103563	1	1.4	31.9
-5.07071	1	1.4	8.3	0.177275	1	1.4	33.3
-4.61488	1	1.4	9.7	0.299138	1	1.4	34.7
-2.9631	1	1.4	11.1	0.429909	1	1.4	36.1
-2.91056	1	1.4	12.5	0.478942	1	1.4	37.5
-2.56579	1	1.4	13.9	0.572677	1	1.4	38.9
-2.10809	1	1.4	15.3	0.589391	1	1.4	40.3
-2.05418	1	1.4	16.7	0.744503	1	1.4	41.7
-1.88897	1	1.4	18.1	0.768466	1	1.4	43.1
-1.57478	1	1.4	19.4	0.825212	1	1.4	44.4
-1.14127	1	1.4	20.8	1.2335	1	1.4	45.8
-1.00753	1	1.4	22.2	1.52987	1	1.4	47.2
-.745995	1	1.4	23.6	1.80321	1	1.4	48.6
-.687133	1	1.4	25.0	2.07729	1	1.4	50.0

DESCRIPTIVE STATISTICS ON PORTFOLIO AND MARKET RETURNS 26

UNIVARIATE

VARIABLE=RA

FREQUENCY TABLE (CONT.)

VALUE	COUNT	PERCENTS CELL	CUM	VALUE	COUNT	PERCENTS CELL	CUM
2.2929	1	1.4	51.4	5.16794	1	1.4	76.4
2.75018	1	1.4	52.8	5.67026	1	1.4	77.8
3.05744	1	1.4	54.2	6.0055	1	1.4	79.2
3.16828	1	1.4	55.6	6.33696	1	1.4	80.6
3.31384	1	1.4	56.9	6.65311	1	1.4	81.9
3.33144	1	1.4	58.3	6.65981	1	1.4	83.3
3.42105	1	1.4	59.7	6.96001	1	1.4	84.7
3.55712	1	1.4	61.1	7.32716	1	1.4	86.1
3.91072	1	1.4	62.5	7.72469	1	1.4	87.5
3.95328	1	1.4	63.9	8.2586	1	1.4	88.9
3.95985	1	1.4	65.3	8.5204	1	1.4	90.3
4.11292	1	1.4	66.7	8.91599	1	1.4	91.7
4.15675	1	1.4	68.1	9.41071	1	1.4	93.1
4.35706	1	1.4	69.4	10.1382	1	1.4	94.4
4.4852	1	1.4	70.8	10.6153	1	1.4	95.8
4.73064	1	1.4	72.2	10.8554	1	1.4	97.2
4.90757	1	1.4	73.6	10.9031	1	1.4	98.6
4.9363	1	1.4	75.0	12.7515	1	1.4	100.0

DESCRIPTIVE STATISTICS ON PORTFOLIO AND MARKET RETURNS 27

UNIVARIATE

VARIABLE=RB

MOMENTS

N	72	SUM WGTS	72
MEAN	2.017	SUM	145.224
STD DEV	4.90197	VARIANCE	24.0293
SKEWNESS	-0.451109	KURTOSIS	0.192262
USS	1999	CSS	1706.08
CV	243.033	STD MEAN	0.577703
T:MEAN=0	3.49142	PROB>|T|	.000830685
SGN RANK	609	PROB>|S|	.000638487
NUM ^= 0	72		
D:NORMAL	0.0748847	PROB>D	>0.15

QUANTILES(DEF=4)

100% MAX	11.0042	99%	11.0042
75% Q3	5.35329	95%	10.1276
50% MED	2.08919	90%	8.05185
25% Q1	-0.752704	10%	-4.00138
0% MIN	-11.1409	5%	-7.26461
		1%	-11.1409
RANGE	22.1452		
Q3-Q1	6.10599		
MODE	-11.1409		

EXTREMES

LOWEST	HIGHEST
-11.1409	9.46558
-10.9322	10.0756
-8.92601	10.2243
-6.37002	10.3514
-6.0409	11.0042

DESCRIPTIVE STATISTICS ON PORTFOLIO AND MARKET RETURNS 28

UNIVARIATE

VARIABLE=RB

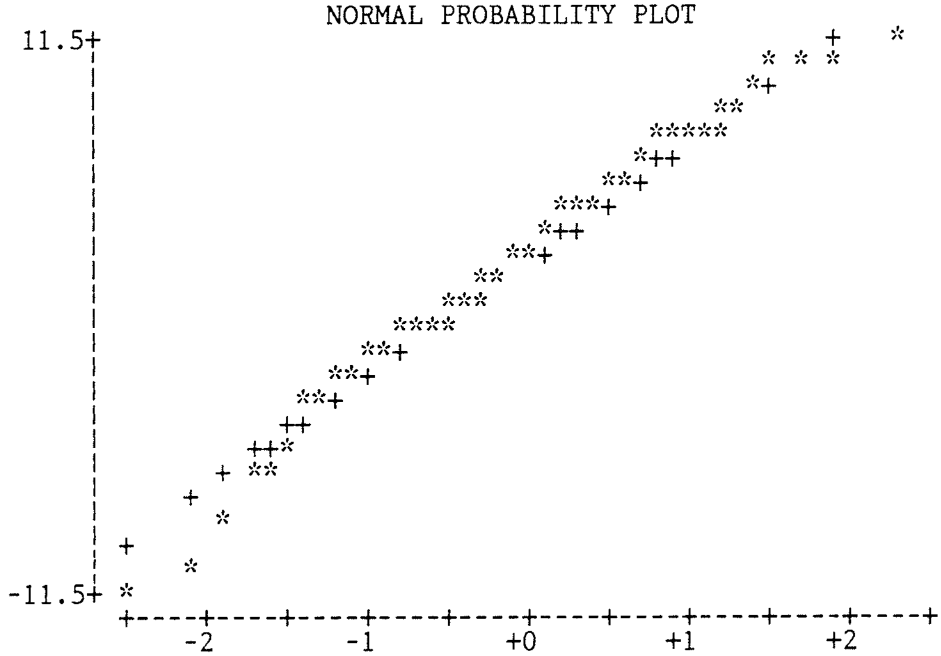
```
      STEM LEAF                     #          BOXPLOT
        11 0                        1             |
        10 124                      3             |
         9 5                        1             |
         8 19                       2             |
         7 244579                   6             |
         6 147                      3             |
         5 01244                    5          +-----+
         4 23333456                 8          |     |
         3 012                      3          |     |
         2 11557                    5          *--+--*
         1 2468                     4          |     |
         0 1344458                  7          |     |
        -0 88755411                 8          +-----+
        -1 643                      3             |
        -2 651                      3             |
        -3 640                      3             |
        -4 2                        1             |
        -5 6                        1             |
        -6 40                       2             |
        -7                                        |
        -8 9                        1             |
        -9
       -10 9                        1             0
       -11 1                        1             0
           ----+----+----+----+
```

DESCRIPTIVE STATISTICS ON PORTFOLIO AND MARKET RETURNS 29a

UNIVARIATE

VARIABLE=RB

NORMAL PROBABILITY PLOT



DESCRIPTIVE STATISTICS ON PORTFOLIO AND MARKET RETURNS 29b

UNIVARIATE

VARIABLE=RB

FREQUENCY TABLE

VALUE	COUNT	PERCENTS CELL	PERCENTS CUM	VALUE	COUNT	PERCENTS CELL	PERCENTS CUM
-11.1409	1	1.4	1.4	-.482123	1	1.4	29.2
-10.9322	1	1.4	2.8	-0.39318	1	1.4	30.6
-8.92601	1	1.4	4.2	-0.1372	1	1.4	31.9
-6.37002	1	1.4	5.6	-.060891	1	1.4	33.3
-6.0409	1	1.4	6.9	.0831861	1	1.4	34.7
-5.57333	1	1.4	8.3	0.278826	1	1.4	36.1
-4.15892	1	1.4	9.7	0.35953	1	1.4	37.5
-3.63377	1	1.4	11.1	0.406806	1	1.4	38.9
-3.40197	1	1.4	12.5	0.417573	1	1.4	40.3
-2.98038	1	1.4	13.9	0.482279	1	1.4	41.7
-2.6385	1	1.4	15.3	0.79857	1	1.4	43.1
-2.54478	1	1.4	16.7	1.198	1	1.4	44.4
-2.05627	1	1.4	18.1	1.42182	1	1.4	45.8
-1.62272	1	1.4	19.4	1.64228	1	1.4	47.2
-1.36211	1	1.4	20.8	1.79436	1	1.4	48.6
-1.30531	1	1.4	22.2	2.0759	1	1.4	50.0
-.784776	1	1.4	23.6	2.10248	1	1.4	51.4
-0.77404	1	1.4	25.0	2.54823	1	1.4	52.8
-.688693	1	1.4	26.4	2.54823	1	1.4	54.2
-.490125	1	1.4	27.8	2.69139	1	1.4	55.6

DESCRIPTIVE STATISTICS ON PORTFOLIO AND MARKET RETURNS 30

UNIVARIATE

VARIABLE=RB

FREQUENCY TABLE (CONT.)

VALUE	COUNT	PERCENTS CELL	PERCENTS CUM	VALUE	COUNT	PERCENTS CELL	PERCENTS CUM
3.01593	1	1.4	56.9	6.065	1	1.4	79.2
3.10939	1	1.4	58.3	6.43716	1	1.4	80.6
3.17498	1	1.4	59.7	6.69107	1	1.4	81.9
4.20197	1	1.4	61.1	7.2347	1	1.4	83.3
4.28321	1	1.4	62.5	7.3544	1	1.4	84.7
4.31888	1	1.4	63.9	7.41406	1	1.4	86.1
4.34449	1	1.4	65.3	7.51096	1	1.4	87.5
4.34818	1	1.4	66.7	7.71776	1	1.4	88.9
4.42472	1	1.4	68.1	7.94845	1	1.4	90.3
4.48842	1	1.4	69.4	8.09616	1	1.4	91.7
4.58328	1	1.4	70.8	8.92029	1	1.4	93.1
4.96754	1	1.4	72.2	9.46558	1	1.4	94.4
5.09993	1	1.4	73.6	10.0756	1	1.4	95.8
5.16851	1	1.4	75.0	10.2243	1	1.4	97.2
5.41488	1	1.4	76.4	10.3514	1	1.4	98.6
5.41839	1	1.4	77.8	11.0042	1	1.4	100.0

DESCRIPTIVE STATISTICS ON PORTFOLIO AND MARKET RETURNS 31

UNIVARIATE

VARIABLE=RC

MOMENTS

N	72	SUM WGTS	72
MEAN	2.16099	SUM	155.592
STD DEV	4.28212	VARIANCE	18.3365
SKEWNESS	-0.0993193	KURTOSIS	0.130831
USS	1638.13	CSS	1301.89
CV	198.155	STD MEAN	0.504652
T:MEAN=0	4.28214	PROB>|T|	0.0001
SGN RANK	711	PROB>|S|	0.0001
NUM = 0	72		
D:NORMAL	0.052776	PROB>D	>0.15

QUANTILES(DEF=4)

100% MAX	11.647	99%	11.647
75% Q3	5.10196	95%	10.4819
50% MED	2.22395	90%	7.38521
25% Q1	-0.912511	10%	-3.17511
0% MIN	-8.16318	5%	-6.4202
		1%	-8.16318
RANGE	19.8102		
Q3-Q1	6.01447		
MODE	-8.16318		

EXTREMES

LOWEST	HIGHEST
-8.16318	8.30573
-7.43817	10.016
-7.19041	11.3471
-6.00546	11.3487
-4.47889	11.647

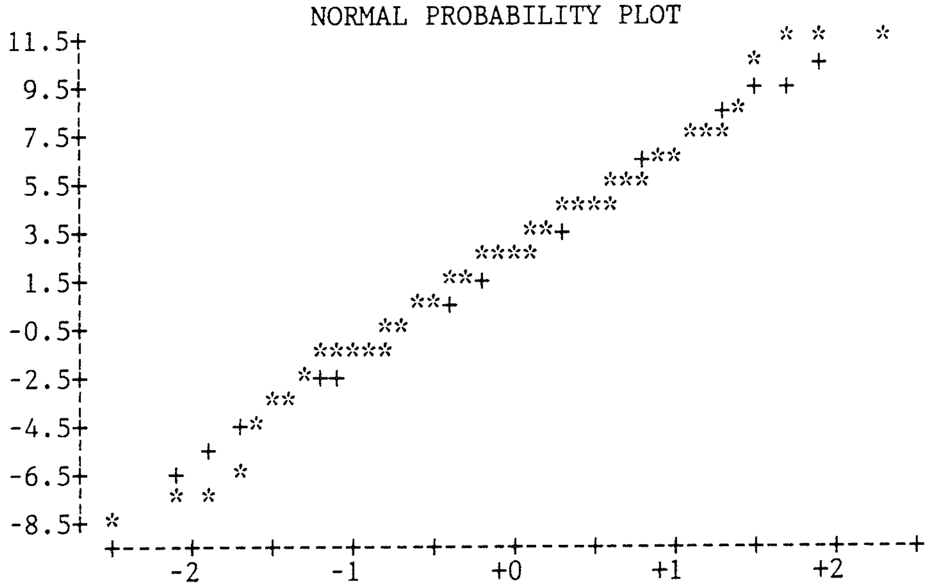
DESCRIPTIVE STATISTICS ON PORTFOLIO AND MARKET RETURNS 32

UNIVARIATE

VARIABLE=RC

```
STEM LEAF                     #        BOXPLOT
  11 336                      3           |
  10 0                        1           |
   9                                      |
   8 3                        1           |
   7 1348                     4           |
   6 248                      3           |
   5 233446                   6        +-----+
   4 1112479                  7        |     |
   3 0355668                  7        |     |
   2 1113344                  7        *--+--*
   1 05678                    5        |     |
   0 1355789                  7        |     |
  -0 610                      3        +-----+
  -1 97665330                 8           |
  -2 00                       2           |
  -3 822                      3           |
  -4 5                        1           |
  -5                                      |
  -6 0                        1           |
  -7 42                       2           |
  -8 2                        1           |
     ----+----+----+----+
```

NORMAL PROBABILITY PLOT



DESCRIPTIVE STATISTICS ON PORTFOLIO AND MARKET RETURNS

UNIVARIATE

VARIABLE=RC

FREQUENCY TABLE

VALUE	COUNT	PERCENTS CELL	PERCENTS CUM	VALUE	COUNT	PERCENTS CELL	PERCENTS CUM
-8.16318	1	1.4	1.4	2.32578	1	1.4	51.4
-7.43817	1	1.4	2.8	2.3268	1	1.4	52.8
-7.19041	1	1.4	4.2	2.40117	1	1.4	54.2
-6.00546	1	1.4	5.6	2.4018	1	1.4	55.6
-4.47889	1	1.4	6.9	2.99851	1	1.4	56.9
-3.84283	1	1.4	8.3	3.29374	1	1.4	58.3
-3.18224	1	1.4	9.7	3.47239	1	1.4	59.7
-3.15848	1	1.4	11.1	3.48142	1	1.4	61.1
-2.02952	1	1.4	12.5	3.55666	1	1.4	62.5
-1.96553	1	1.4	13.9	3.63516	1	1.4	63.9
-1.85708	1	1.4	15.3	3.77992	1	1.4	65.3
-1.69262	1	1.4	16.7	4.05966	1	1.4	66.7
-1.61739	1	1.4	18.1	4.0677	1	1.4	68.1
-1.57326	1	1.4	19.4	4.14737	1	1.4	69.4
-1.5115	1	1.4	20.8	4.18549	1	1.4	70.8
-1.3093	1	1.4	22.2	4.37137	1	1.4	72.2
-1.28349	1	1.4	23.6	4.72458	1	1.4	73.6
-1.0137	1	1.4	25.0	4.88066	1	1.4	75.0
-.608951	1	1.4	26.4	5.17572	1	1.4	76.4
-.139919	1	1.4	27.8	5.30598	1	1.4	77.8
-.014317	1	1.4	29.2	5.32135	1	1.4	79.2
.0832283	1	1.4	30.6	5.37927	1	1.4	80.6
0.317524	1	1.4	31.9	5.41443	1	1.4	81.9
0.499549	1	1.4	33.3	5.5566	1	1.4	83.3
0.505553	1	1.4	34.7	6.15906	1	1.4	84.7
0.661999	1	1.4	36.1	6.36776	1	1.4	86.1
0.842242	1	1.4	37.5	6.7694	1	1.4	87.5
0.948409	1	1.4	38.9	7.12306	1	1.4	88.9
1.04306	1	1.4	40.3	7.33319	1	1.4	90.3
1.5326	1	1.4	41.7	7.4075	1	1.4	91.7
1.55728	1	1.4	43.1	7.8206	1	1.4	93.1
1.74961	1	1.4	44.4	8.30573	1	1.4	94.4
1.75557	1	1.4	45.8	10.016	1	1.4	95.8
2.06175	1	1.4	47.2	11.3471	1	1.4	97.2
2.07858	1	1.4	48.6	11.3487	1	1.4	98.6
2.12212	1	1.4	50.0	11.647	1	1.4	100.0

DESCRIPTIVE STATISTICS ON PORTFOLIO AND MARKET RETURNS 34

UNIVARIATE

VARIABLE=RM

MOMENTS

N	72	SUM WGTS	72
MEAN	0.961506	SUM	69.2285
STD DEV	5.52345	VARIANCE	30.5085
SKEWNESS	-0.369065	KURTOSIS	1.44138
USS	2232.66	CSS	2166.1
CV	574.458	STD MEAN	0.650944
T:MEAN=0	1.47709	PROB>|T|	0.144072
SGN RANK	284	PROB>|S|	0.111629
NUM = 0	72		
D:NORMAL	0.0812407	PROB>D	>0.15

QUANTILES(DEF=4)

100% MAX	14.6937	99%	14.6937
75% Q3	4.11543	95%	10.1375
50% MED	0.89666	90%	8.29373
25% Q1	-1.94487	10%	-5.29584
0% MIN	-17.6386	5%	-8.83708
		1%	-17.6385
RANGE	32.3322		
Q3-Q1	6.0603		
MODE	-17.6385		

EXTREMES

LOWEST	HIGHEST
-17.6385	8.76046
-13.0978	9.72293
-9.64239	10.9073
-8.40344	11.9485
-6.13111	14.6937

DESCRIPTIVE STATISTICS ON PORTFOLIO AND MARKET RETURNS 35

UNIVARIATE

VARIABLE=RM

```
STEM LEAF                     #          BOXPLOT
  14 7                        1             0
  12
  10 99                       2             |
   8 33587                    5             |
   6 91156                    5             |
   4 22219                    5          +-----+
   2 036236679                9          |     |
   0 1125589900224588        16          *--+--*
  -0 98775100751             11          +-----+
  -2 74113330                 8             |
  -4 44133                    5             |
  -6 1                        1             |
  -8 64                       2             |
 -10
 -12 1                        1             0
 -14
 -16 6                        1             0
     ----+----+----+----+
```

NORMAL PROBABILITY PLOT

```
  15+                                                    *
    |                                                 +
    |                                               *  *
    |                                           ****
    |                                        ****
    |                                     +**+
    |                                  ++****
    |                              ******
 -1+                           *****+
    |                        ***++
    |                     ****++
    |                   +*++
    |                 *  *
    |              +
    | +            *
-17+ *
     +----+----+----+----+----+----+----+----+----+----+
         -2        -1        +0        +1        +2
```

DESCRIPTIVE STATISTICS ON PORTFOLIO AND MARKET RETURNS 36

UNIVARIATE

VARIABLE=RM

FREQUENCY TABLE

		PERCENTS				PERCENTS	
VALUE	COUNT	CELL	CUM	VALUE	COUNT	CELL	CUM
-17.6385	1	1.4	1.4	0.940861	1	1.4	51.4
-13.0978	1	1.4	2.8	1.03722	1	1.4	52.8
-9.64239	1	1.4	4.2	1.04198	1	1.4	54.2
-8.40344	1	1.4	5.6	1.17247	1	1.4	55.6
-6.13111	1	1.4	6.9	1.23178	1	1.4	56.9
-5.40091	1	1.4	8.3	1.41483	1	1.4	58.3
-5.37928	1	1.4	9.7	1.48971	1	1.4	59.7
-5.10112	1	1.4	11.1	1.79358	1	1.4	61.1
-4.3196	1	1.4	12.5	1.84044	1	1.4	62.5
-4.27471	1	1.4	13.9	1.96655	1	1.4	63.9
-3.72747	1	1.4	15.3	2.26495	1	1.4	65.3
-3.4207	1	1.4	16.7	2.61623	1	1.4	66.7
-3.11462	1	1.4	18.1	3.18778	1	1.4	68.1
-3.11331	1	1.4	19.4	3.3008	1	1.4	69.4
-2.32886	1	1.4	20.8	3.58767	1	1.4	70.8
-2.32462	1	1.4	22.2	3.60643	1	1.4	72.2
-2.30256	1	1.4	23.6	3.71759	1	1.4	73.6
-1.97191	1	1.4	25.0	3.91907	1	1.4	75.0
-1.86374	1	1.4	26.4	4.18088	1	1.4	76.4
-1.78009	1	1.4	27.8	4.19355	1	1.4	77.8
-1.72463	1	1.4	29.2	4.22376	1	1.4	79.2
-1.70859	1	1.4	30.6	5.07635	1	1.4	80.6
-1.47711	1	1.4	31.9	5.89522	1	1.4	81.9
-1.12801	1	1.4	33.3	6.89808	1	1.4	83.3
-1.03271	1	1.4	34.7	7.06825	1	1.4	84.7
-1.02945	1	1.4	36.1	7.0693	1	1.4	86.1
-.738637	1	1.4	37.5	7.49755	1	1.4	87.5
-.452615	1	1.4	38.9	7.63463	1	1.4	88.9
-.115716	1	1.4	40.3	8.27086	1	1.4	90.3
.0788283	1	1.4	41.7	8.30353	1	1.4	91.7
0.106014	1	1.4	43.1	8.45714	1	1.4	93.1
0.221279	1	1.4	44.4	8.76046	1	1.4	94.4
0.477421	1	1.4	45.8	9.72293	1	1.4	95.8
0.545632	1	1.4	47.2	10.9073	1	1.4	97.2
0.75921	1	1.4	48.6	11.9485	1	1.4	98.6
0.852459	1	1.4	50.0	14.6937	1	1.4	100.0

DESCRIPTIVE STATISTICS ON PORTFOLIO AND MARKET RETURNS 37

UNIVARIATE

VARIABLE=RF

MOMENTS

N	72	SUM WGTS	72
MEAN	1.02476	SUM	73.7825
STD DEV	0.273561	VARIANCE	0.0748358
SKEWNESS	0.884194	KURTOSIS	-0.295494
USS	80.9225	CSS	5.31334
CV	26.6952	STD MEAN	0.0322395
T:MEAN=0	31.7858	PROB>|T|	0.0001
SGN RANK	1314	PROB>|S|	0.0001
NUM ^= 0	72		
D:NORMAL	0.16216	PROB>D	<0.01

QUANTILES(DEF=4)

100% MAX	1.735	99%	1.735
75% Q3	1.25396	95%	1.58433
50% MED	0.934583	90%	1.43733
25% Q1	0.791875	10%	0.764167
0% MIN	0.710833	5%	0.742917
		1%	0.710833
RANGE	1.02417		
Q3-Q1	0.462083		
MODE	0.77		

EXTREMES

LOWEST	HIGHEST
0.710833	1.53583
0.729167	1.56917
0.7375	1.6125
0.745833	1.69083
0.755	1.735

DESCRIPTIVE STATISTICS ON PORTFOLIO AND
MARKET RETURNS

UNIVARIATE

VARIABLE=RF

```
     STEM LEAF                          #         BOXPLOT
       17 3                             1            |
       16 9                             1            |
       16 1                             1            |
       15 7                             1            |
       15 04                            2            |
       14 5                             1            |
       14 002                           3            |
       13 67                            2            |
       13                                            |
       12 5666677                       7         +-----+
       12 01                            2         |     |
       11 9                             1         |     |
       11 344                           3         |     |
       10 66                            2         |     |
       10 011                           3         |  +  |
        9 569                           3         |     |
        9 13344                         5         *-----*
        8 6777889                       7         |     |
        8 01112224                      8         |     |
        7 5566677777788999             16         +-----+
        7 134                           3            |
          ----+----+----+----+
          MULTIPLY STEM.LEAF BY 10**-01
```

```
                      NORMAL PROBABILITY PLOT
1.725+                                                          *
     |                                                      *   +
1.625+                                                    *
     |                                                  *   +
1.525+                                                 *  +
     |                                               * +
1.425+                                              ***++
     |                                            * ++
1.325+                                              +
     |                                         ***+
1.225+                                        *++
     |                                       *+
1.125+                                     +**
     |                                   ++**
1.025+                                  + **
     |                                ++ **
0.925+                              ++ ***
     |                            ++ ***
0.825+                          ++****
     |                    **********
0.725+ *    * * *+++++
       +----+----+----+----+----+----+----+----+----+----+
           -2        -1        +0        +1        +2
```

DESCRIPTIVE STATISTICS ON PORTFOLIO AND MARKET RETURNS

UNIVARIATE

VARIABLE=RF

FREQUENCY TABLE

VALUE	COUNT	PERCENTS CELL	CUM	VALUE	COUNT	PERCENTS CELL	CUM
0.710833	1	1.4	1.4	0.939167	1	1.4	52.8
0.729167	1	1.4	2.8	0.940833	1	1.4	54.2
0.7375	1	1.4	4.2	0.951667	1	1.4	55.6
0.745833	1	1.4	5.6	0.965	1	1.4	56.9
0.755	1	1.4	6.9	0.9925	1	1.4	58.3
0.76	1	1.4	8.3	1.00167	1	1.4	59.7
0.764167	2	2.8	11.1	1.00917	1	1.4	61.1
0.769167	1	1.4	12.5	1.01083	1	1.4	62.5
0.77	4	5.6	18.1	1.06083	2	2.8	65.3
0.770833	1	1.4	19.4	1.12917	1	1.4	66.7
0.776667	1	1.4	20.8	1.14167	2	2.8	69.4
0.7775	1	1.4	22.2	1.195	1	1.4	70.8
0.79	1	1.4	23.6	1.20083	1	1.4	72.2
0.791667	1	1.4	25.0	1.215	1	1.4	73.6
0.7925	1	1.4	26.4	1.24833	1	1.4	75.0
0.798333	1	1.4	27.8	1.25583	2	2.8	77.8
0.809167	1	1.4	29.2	1.2625	1	1.4	79.2
0.810833	1	1.4	30.6	1.265	1	1.4	80.6
0.814167	1	1.4	31.9	1.27	1	1.4	81.9
0.816667	1	1.4	33.3	1.27083	1	1.4	83.3
0.818333	1	1.4	34.7	1.36083	1	1.4	84.7
0.82	1	1.4	36.1	1.37	1	1.4	86.1
0.838333	1	1.4	37.5	1.4025	1	1.4	87.5
0.865	1	1.4	38.9	1.405	1	1.4	88.9
0.866667	1	1.4	40.3	1.4175	1	1.4	90.3
0.874167	1	1.4	41.7	1.44583	1	1.4	91.7
0.875	1	1.4	43.1	1.49667	1	1.4	93.1
0.8775	1	1.4	44.4	1.53583	1	1.4	94.4
0.8825	1	1.4	45.8	1.56917	1	1.4	95.8
0.893333	1	1.4	47.2	1.6125	1	1.4	97.2
0.9125	1	1.4	48.6	1.69083	1	1.4	98.6
0.934167	1	1.4	50.0	1.735	1	1.4	100.0
0.935	1	1.4	51.4				

CORRELATIONS AND COVARIANCES BETWEEN PORTFOLIO RETURNS, MARKET RETURNS, AND T-BILL RATES 40 & 41

COVARIANCE MATRIX

	RA	RB	RC	RM	RF
RA	25.1572	23.8638	18.0802	20.5093	-.659251
RB	23.8638	24.0293	17.7216	20.5235	-.625572
RC	18.0802	17.7216	18.3365	15.7504	-.648624
RM	20.5093	20.5235	15.7504	30.5085	-.506759
RF	-.659251	-.625572	-.648624	-.506759	.0748358

VARIABLE	N	MEAN	STD DEV	SUM	MINIMUM	MAXIMUM
RA	72	2.13385	5.01570	153.637	-12.4380	12.7515
RB	72	2.01700	4.90197	145.224	-11.1409	11.0042
RC	72	2.16099	4.28212	155.592	-8.1632	11.6470
RM	72	0.96151	5.52345	69.228	-17.6386	14.6937
RF	72	1.02476	0.27356	73.782	0.7108	1.7350

CORRELATION COEFFICIENTS / PROB > ¦R¦ UNDER H0:RHO=0 / N = 72

	RA	RB	RC	RM	RF
RA	1.00000 0.0000	0.97059 0.0001	0.84181 0.0001	0.74030 0.0001	-0.48047 0.0001
RB	0.97059 0.0001	1.00000 0.0000	0.84426 0.0001	0.75800 0.0001	-0.46650 0.0001
RC	0.84181 0.0001	0.84426 0.0001	1.00000 0.0000	0.66592 0.0001	-0.55371 0.0001
RM	0.74030 0.0001	0.75800 0.0001	0.66592 0.0001	1.00000 0.0000	-0.33538 0.0040
RF	-0.48047 0.0001	-0.46650 0.0001	-0.55371 0.0001	-0.33538 0.0040	1.00000 0.0000

CORRELATIONS AND COVARIANCES BETWEEN EXCESS RETURNS ON PORTFOLIOS AND THE MARKET 42 & 43

COVARIANCE MATRIX

	RRA	RRB	RRC	RRM
RRA	26.5506	25.2235	19.4629	21.7502
RRB	25.2235	25.3553	19.0707	21.7307
RRC	19.4629	19.0707	19.7086	16.9806
RRM	21.7502	21.7307	16.9806	31.5968

VARIABLE	N	MEAN	STD DEV	SUM	MINIMUM	MAXIMUM
RRA	72	1.10909	5.15273	79.8545	-14.0505	11.9590
RRB	72	0.99225	5.03541	71.4417	-12.5447	10.2351
RRC	72	1.13624	4.43944	81.8090	-9.5240	10.8304
RRM	72	-0.06325	5.62110	-4.5540	-18.9086	13.5520

CORRELATION COEFFICIENTS / PROB > ¦R¦ UNDER HO:RHO=0 / N = 72

	RRA	RRB	RRC	RRM
RRA	1.00000 0.0000	0.97215 0.0001	0.85083 0.0001	0.75094 0.0001
RRB	0.97215 0.0001	1.00000 0.0000	0.85311 0.0001	0.76774 0.0001
RRC	0.85083 0.0001	0.85311 0.0001	1.00000 0.0000	0.68046 0.0001
RRM	0.75094 0.0001	0.76774 0.0001	0.68046 0.0001	1.00000 0.0000

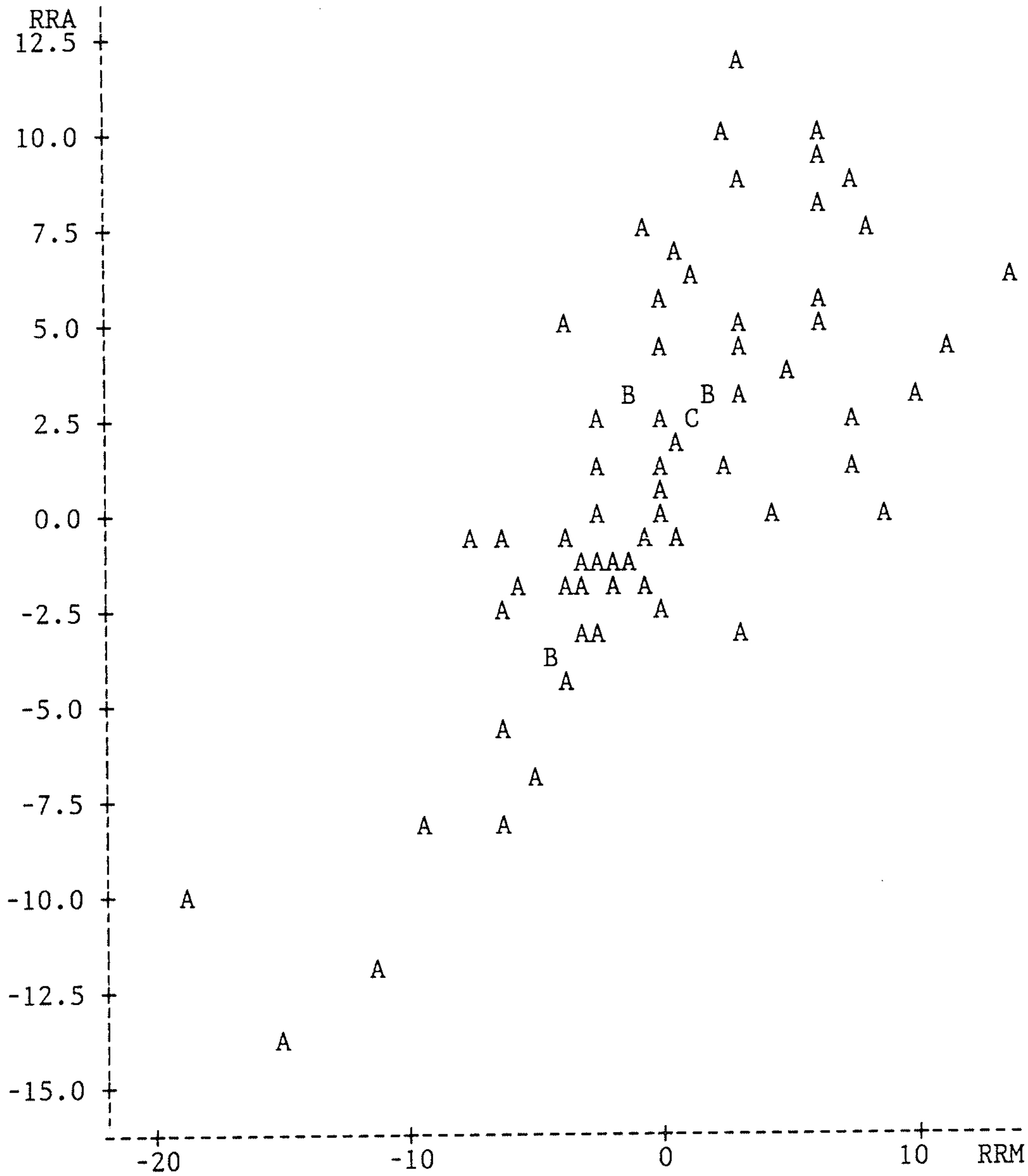
COMPARISON OF PORTFOLIO PERFORMANCE USING JOBSON AND KORKIE TEST EMPLOYING SHARPE INDEX 44

OBS	COMPARE	SHPQ	THETA	Z
1	A WITH B	0.4720	0.53321	0.64632
2	A WITH C	-0.9310	2.22957	-0.62349
3	A WITH M	6.5602	6.09665	2.65689
4	B WITH C	-1.3164	2.09871	-0.90868
5	B WITH M	5.8960	5.40497	2.53607
6	C WITH M	6.6677	5.82943	2.76162

"EXCESS" RETURNS ON GRAHAM PORTFOLIO
PLOTTED AGAINST "EXCESS" RETURNS
ON TSE TOTAL RETURN INDEX

45

PLOT OF RRA*RRM LEGEND: A = 1 OBS, B = 2 OBS, ETC.



JENSEN ALPHA FOR GRAHAM PORTFOLIO 46

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: RRA

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE
MODEL	1	1063.01635394	1063.01635394
ERROR	70	822.07452660	11.74392181
CORRECTED TOTAL	71	1885.09088054	

MODEL F = 90.52 PR > F = 0.0001

R-SQUARE	C.V.	ROOT MSE	RRA MEAN
0.563907	308.9866	3.42694059	1.10909049

SOURCE	DF	TYPE I SS	F VALUE	PR > F
RRM	1	1063.01635394	90.52	0.0001

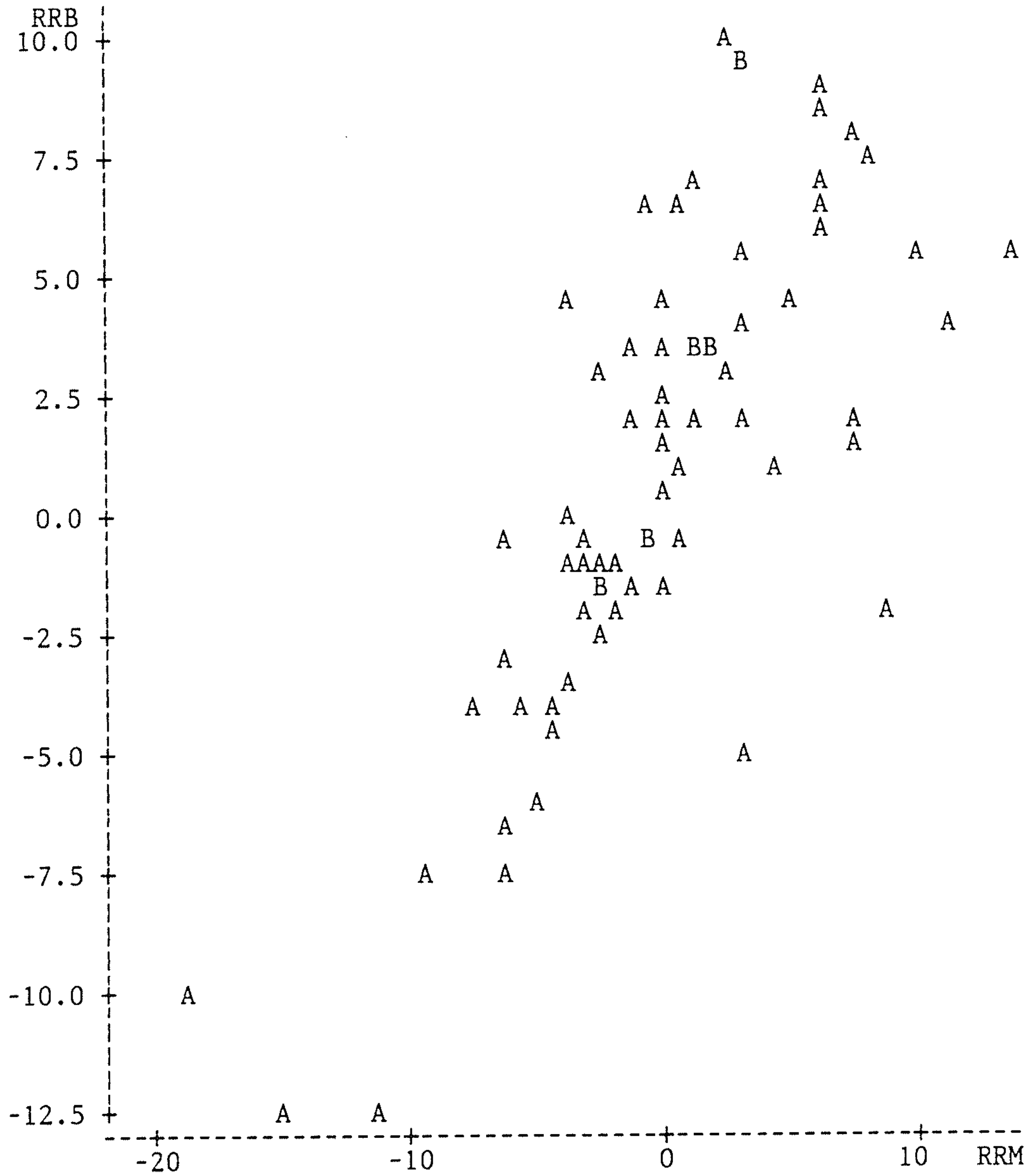
SOURCE	DF	TYPE III SS	F VALUE	PR > F
RRM	1	1063.01635394	90.52	0.0001

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	PR > ¦T¦	STD ERROR OF ESTIMATE
INTERCEPT	1.15263002	2.85	0.0057	0.40389475
RRM	0.68836563	9.51	0.0001	0.07235287

"EXCESS" RETURNS ON B-G PORTFOLIO
PLOTTED AGAINST "EXCESS" RETURNS
ON TSE TOTAL RETURN INDEX

47

PLOT OF RRB*RRM   LEGEND: A = 1 OBS, B = 2 OBS, ETC.



JENSEN ALPHA FOR BOWEN & GANUCHEAU PORTFOLIO

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: RRB

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE
MODEL	1	1061.11109799	1061.11109799
ERROR	70	739.11573889	10.55879627
CORRECTED TOTAL	71	1800.22683688	

MODEL F = 100.50 PR > F = 0.0001

R-SQUARE	C.V.	ROOT MSE	RRB MEAN
0.589432	327.4825	3.24943015	0.99224535

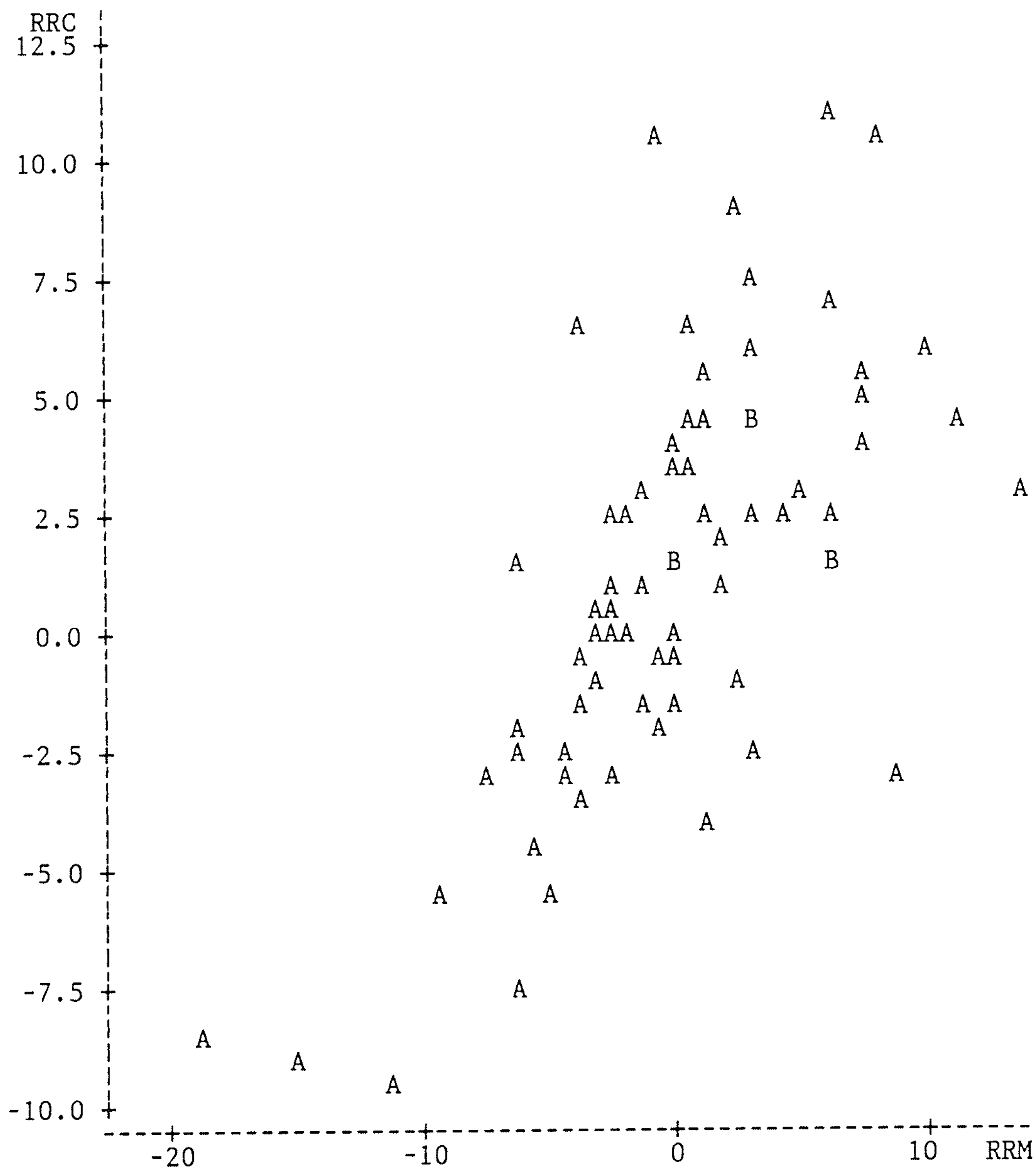
SOURCE	DF	TYPE I SS	F VALUE	PR > F
RRM	1	1061.11109799	100.50	0.0001

SOURCE	DF	TYPE III SS	F VALUE	PR > F
RRM	1	1061.11109799	100.50	0.0001

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	1.03574585	2.70	0.0086	0.38297360
RRM	0.68774847	10.02	0.0001	0.06860510

"EXCESS" RETURNS ON FISHER PORTFOLIO 49
PLOTTED AGAINST "EXCESS" RETURNS
ON TSE TOTAL RETURN INDEX

PLOT OF RRC*RRM LEGEND: A = 1 OBS, B = 2 OBS, ETC.



JENSEN ALPHA FOR FISHER PORTFOLIO 50

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: RRC

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE
MODEL	1	647.92226720	647.92226720
ERROR	70	751.38990035	10.73414143
CORRECTED TOTAL	71	1399.31216756	

MODEL F = 60.36 PR > F = 0.0001

R-SQUARE	C.V.	ROOT MSE	RRC MEAN
0.463029	288.3467	3.27629996	1.13623626

SOURCE	DF	TYPE I SS	F VALUE	PR > F
RRM	1	647.92226720	60.36	0.0001

SOURCE	DF	TYPE III SS	F VALUE	PR > F
RRM	1	647.92226720	60.36	0.0001

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	1.17022815	3.03	0.0034	0.38614044
RRM	0.53741608	7.77	0.0001	0.06917240

APPENDIX C

BIBLIOGRAPHY

BIBLIOGRAPHY

Ambechtsheer, Keith, "Profit Potential in an 'Almost Efficient' Market," in Bernstein (ed.)

Arbel, Avner and Paul Strebel, "Pay Attention to Neglected Firms!", The Journal of Portfolio Management, Winter, 1983.

Basu, S., "Investment Performance of Common Stocks in Relation to Their Price-Earnings Ratios: A Test of the Efficient Market Hypothesis," The Journal of Finance, 23(3), 1977.

Bernstein, Peter L. (ed.), Portfolio Management and Efficient Markets, New York: Institutional Investor Books, 1977.

Block, Frank E., "The Place of Book Value in Common Stock Evaluation," Financial Analysts Journal, March-April, 1964.

Blume, Marshall E., "The use of 'Alphas' to Improve Performance," The Journal of Portfolio Management, Fall, 1984.

Blustein, Paul, "Ben Graham's Last Will and Testament," Forbes, August 1, 1977.

Boeckh, J. Antony, and Richard T. Coghlan (eds.), Homewood, Illinois: Dow Jones-Irwin, 1982.

Boland, John C., Wall Street's Insiders, New York: William Morrow and Co., 1985.

Bowen IV, William M., and Frank P. Ganucheau III, The Investor's Equation, Chicago: Probus Publishing, 1984.

Brealey, Richard A., An Introduction to Risk and Return form Common Stocks, 2nd. ed., Cambridge, Mass.: MIT Press, 1983.

Buffett, Warren E., "How Inflation Swindles the Equity Investor," in Boeckh and Coghlan (eds.).

Chen, Kung H., and Thomas A. Shimerda, "An Empirical Analysis of Useful Financial Ratios," Financial Management, Spring, 1981.

De Bondt, Werner F. M., and Richard Thaler, "Does the Stock Market Overreact?," Journal of Finance, 40(3), 1985.

Dietz, Peter O. and Jeannette R. Kirschman, "Evaluating Portfolio Performance," in Maginn and Tuttle (eds.).

Dreman, David, The New Contrarian Investment Strategy, New York: Random House, 1982.

Elton, Edwin J., and Martin J. Gruber, Modern Portfolio Theory and Investment Analysis, New York: John Wiley and Sons, 1981.

Fama, Eugene F., Foundations of Finance: Portfolio Decisions and Securities Prices, Oxford, England: Blackwell, 1977.

Fisher, Kenneth L., Super Stocks, Homewood, Illinois: Dow Jones-Irwin, 1984a.

Fisher, Kenneth L., "Price-Sales Ratios: A new Tool for Measuring Stock Popularity," AAII Journal, June, 1984b.

Fisher, Kenneth L., "Why Glamour Doesn't Pay," Forbes, August 13, 1984c.

Fisher, Kenneth L., "How to Cash in on Whizzers," Forbes, December 3, 1984d.

Fisher, Kenneth L. and Margaret A. Brill, "Stock Valuation: A new Technique to Adjust for Debt," AAII Journal, May, 1985.

Fisher, L., and J. H. Lorie, "Rates of Return on Investments in Common Stocks," Journal of Business, 37(1), 1964.

Francis, Jack Clark, and Stephen H. Archer, Portfolio Analysis, Englewood Cliffs, N.J.: Prentice-Hall, 1971.

Friend, Irwin, and Marshall Blume, "Measurement of Portfolio Performance Under Uncertainty," American Economic Review, 60(4), 1970.

Fuller, Russell J., and Glenn H. Petry, "Inflation, Return on Equity, and Stock Prices," The Journal of Portfolio Management, Summer, 1981.

Goodman, David A., and John W. Peavy, III, "Industry Relative Price-Earnings Ratios as Indicators of Investment Returns," Financial Analysts Journal, July-August, 1983.

Goodman, David A., and John W. Peavy, III, "The Risk Universal Nature of the P/E Effect," The Journal of Portfolio Management, Summer, 1985.

Graham, Benjamin, The Intelligent Investor, 4th. ed., New York: Harper & Row, 1973.

Graham, Benjamin, "The Future of Common Stocks," Financial Analysts Journal, September-October, 1974.

Graham, Benjamin, and Charles McGolrick, The Interpretation of Financial Statements, 3rd. rev. ed., New York: Harper & Row, 1975.

Greenblatt, Joel M., Richard Pzena, and Bruce L. Newberg, "How the Small Investor Can Beat the Market," The Journal of Portfolio Management, Summer, 1981.

Harrington, Diana R., Modern Portfolio Theory and the Capital Asset Pricing Model, Englewood Cliffs, N.J.: Prentice-Hall, 1983.

Helfert, Erich A., Techniques of Financial Analysis, 5th. ed., Homewood, Illinois: Houghton Mifflin, 1981.

Horrigan, James O., "A Short History of Financial Ratio Analysis," Accounting Review, vol. 43, April, 1968.

Jensen, Michael C., "The Performance of Mutual Funds in the Period 1945-1964," Journal of Finance, 23(2), May, 1968.

Jobson, J. D., and Bob M. Korkie, "Performance Hypothesis Testing with the Sharpe and Treynor Measures," Journal of Finance, 36(4), 1981.

Khoury, Sarkis J., Investment Management: Theory and Application, New York: MacMillan, 1983.

Kichen, Steve, "A New Way to Spot Bargains," Forbes, March 12, 1984a.

Kichen, Steve, "PSRs Revisited," Forbes, December 3, 1984b.

Koutsoyiannis, A., Theory of Econometrics, 2nd. ed., London: MacMillan, 1977.

Levy, Haim and Zvi Lerman, "Testing P/E Ratios Filters with Stochastic Dominance," The Journal of Portfolio Management, Winter, 1985.

Levy, Haim and Marshall Sarnatt, Portfolio and Investment Selection: Theory and Practice, Englewood Cliffs, N. J.: Prentice-Hall, 1984.

Maginn, John L. and Donald L. Tuttle (eds.), Managing Investment Portfolios: A Dynamic Process, Boston: Warren, Gorham, and Lamont, Inc., 1983.

Malkiel, Burton G., A Random Walk Down Wall Street, 2nd. ed., New York: W. W. Norton, 1981.

Markovitz, Harry, "Portfolio Selection," The Journal of Finance, vol. 7, 1952.

Markese, John, "Price-Sales Ratios," AAII Journal, July, 1985a.

Markese, John, "An Easy-to-Use Format for Selecting Stocks," AAII Journal, Sept., 1985b.

Merton, Robert C., "An analytic Derivation of the Efficient Portfolio Frontier," Journal of Financial and Quantitative Analysis, September, 1972.

Minard, Lawrence, "The Case Against Price/Earnings Ratios," Forbes, February 13, 1984.

Nourse, Thomas M., "Screening Screens: Selections for a Sequential Approach," AAII Journal, October, 1984.

Oppenheimer, Henry R., "A Test of Ben Graham's Stock Selection Criteria," Financial Analysts Journal, September-October, 1984.

Oppenheimer, Henry R., and Gary G. Schlarbaum, "Investing with Ben Graham: An Ex Ante Test of the Efficient Markets Hypothesis," Journal of Financial and Quantitative Analysis, 16(3), 1981.

Philippatos, George C., and Nicola Gressis, "Conditions of Equivalence Among E-V, SSD, and E-H Portfolio Selection Criteria: The Case for Uniform, Normal, and Lognormal Distributions," Management Science, 21(6), February, 1975.

Philippatos, George C., and Charles J. Wilson, "Entropy, Market Risk, and the Selection of Efficient Portfolios," Applied Economics, vol. 4, 1972.

Philippatos, George C., and Charles J. Wilson, "Entropy, Market Risk, and the Selection of Efficient Portfolios: Reply," Applied Economics, vol. 6, 1974.

Purcell, W. R., Jr., Understanding a Company's Finances, Boston: Houghton Mifflin, 1981.

Reinganum, Marc R., "A Direct Test of Roll's Conjecture on the Firm Size Effect," The Journal of Finance, 37(1), 1982.

Roll, Richard, "Ambiguity when Performance is Measured by the Securities Market Line," The Journal of Finance, 33(4), 1978.

Roll, Richard, "A Possible Explanation of the Small Firm Effect," The Journal of Finance, 36(4), 1981.

SAS User's Guide: Basis, Version 5 Edition, Cary, North Carolina: SAS Institute, Inc., 1985.

SAS User's Guide: Statistics, Version 5 Edition, Cary, North Carolina: SAS Institute, Inc., 1985.

Sharpe, William F., "Mutual Fund Performance," Journal of Business, 39(1), 1966.

Sharpe, William F., Portfolio Theory and Capital Markets, New York: McGraw-Hill, 1970.

Stephens, M. A., "EDF Statistics for Goodness of Fit and Some Comparisons," Journal of the American Statistical Association, volume 69, number 347, 1974.

Strischek, Dev, "Financial Analysis with Ratios," Credit and Financial Management, September, 1983.

Train, John, Preserving Capital and Making it Grow, New York, N.Y.: Penguin Books, 1983.

Treynor, Jack L., "How to Rate the Management of Investment Funds," Harvard Business Review, Jan.-Feb., 1965.

Treynor, Jack L., and Kay K. Mazuy, "Can Mutual Funds Outguess the Market?," Harvard Business Review, July-Aug., 1966.

Ullman, Neil R., Statistics: An Applied Approach, Lexington, Mass.: Xerox College Publishing, 1972.

White, D. J., "Entropy, Market Risk, and the Selection of Efficient Portfolios: Comment," Applied Economics, 6, 1974.