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City University of New York PH.D. 1982

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ECONOMIC DETERMINANTS OF BETA

BY

ROBERT MICHAEL RAINISH

A dissertation submitted to the Graduate Faculty of Business in partial fulfillment of the requirements for the degree of Doctor of Philosophy, The City University of New York.

1981

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April 22, 1982
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4/22/82
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The City University of New York

Abstract

ECONOMIC DETERMINANTS OF SYSTEMATIC RISK

by

Robert M. Rainish

Adviser: Professor Christopher Hessel

The objective of this dissertation is to test Turnbull's multi-period valuation model. Specifically I test (1) if investor expectations of future cash flows are a function of future economic outcomes, (2) if the expectations of future economic outcomes are the same for market returns and individual security returns, (3) if expectations of economic outcomes are the same for all securities, and (4) if the single index capital asset pricing model is ex-ante efficient.

The empirical testing used the National Bureau of Economic Research's set of leading economic variables, Standard & Poor's 500 Stock Index Returns, and a sample of 45 individual security returns for the time period of 21 years (January, 1955 to December, 1975). The empirical results show that Turnbull's model is correct. Investor expectations are a function of future economic outcomes. Market returns are generated based upon investor expectations of expected future outcomes of profitability, investment, employment, and money and credit. The results show that market returns and security returns are not

equally sensitive to economic indicators as one would expect.

The sensitivity to the economic indicators is shown to vary across securities. The results demonstrate that the single index market model is not ex-ante efficient as is usually assumed and thus supports Roll's critique of the methodology used in testing the capital asset pricing model and market efficiency. My results show that either a better single index needs to be formed or a multi-index model as suggested by Turnbull and others is appropriate.

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I wish to express my gratitude to Professor Christopher Hessel. My adviser exhibited great patience while awaiting the results contained in this thesis. I also appreciate the careful reading he gave my drafts for they yielded greater clarity of the reported results than some of those originally stated.

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TABLE OF CONTENTS

TABLE OF CONTENTS (CONT.)

LIST OF TABLES

LIST OF TABLES (CONT.)

LIST OF TABLES (CONT.)

CHAPTER 1.
REVIEW OF LITERATURE

The purpose of this review is to briefly show the development of the theory. This review makes no pretense of being complete; rather, it is a summary of the highlights of theoretical literature and empirical test studies that are relevant to this dissertation. The review will be presented in four (4) parts; theoretical articles, empirical non-monetary economic determinants of market returns articles; empirical monetary determinants of market returns articles; and financial accounting determinants of market return articles.

The theoretical determinants of market returns and systematic risk in a multi-period time period has been described by Myers (1976), Turnbull and Myers (1977), Fama (1977), and Turnbull (1977). All derive expressions for the valuation of assets assuming the capital asset pricing model holds for every time period.

Myers

Myers' paper is concerned with the real determinants of a systematic risk, beta, which is the key variable of the capital asset pricing model developed by Sharpe (1964) and Lintner (1965). Myers desired to show the relationship between real return of an asset (immediate cash flows less economic depreciation plus any change in the present value of future investment opportunities) and

financial return of an asset (dividends plus capital gains and losses) received by stockholders. Myers used a discrete time framed simple adaptive expectations multiperiod valuation model. He assumes (1) the capital asset pricing model is true every period, (2) the market price of risk is constant over time, (3) the one-period risk-free rate of interest is constant over time, (4) correlation of the asset's rate of return with the market return is assumed constant over time, and (5) the asset offers a long-lived level stream of expected cash flows. However, investors revise their expectations of the level using a simple adaptive model.

Using dynamic programming he finds the value of a firm has two (2) sources of risk: risk associated with the revision of expectations and risk associated with the next period's cash flow. Using his discrete time framed multiperiod valuation model, Myers derives determinants of systematic risk. He shows that the systematic risk is directly related to the covariability of investor expectations of a firm's cash flow with investor expectations of market returns. Myers also shows that systematic risk is inversely related to an asset's duration and growth rate.

Myers & Turnbull

Myers and Turnbull present a generalization of Myers' discrete time framed valuation model and Turnbull's index

continuous time framed model. The authors use the same assumptions as Myers except for how an asset's cash flows are determined. An asset's cash flows are assumed to be related to some general economic index and a firm specific component. Investors revise their expectations of a firm's cash flow based on unanticipated information concerning these factors.

Using dynamic programming, Myers and Turnbull derive the value of an asset and the determinants of systematic risk. The authors show that systematic risk depends upon the covariability of investor expectations of a firm's cash flows and a general economic index. They also conclude that systematic risk is inversely related to duration and growth rate of a firm's assets.

Fama

In his paper, Fama is concerned with the conditions under which a multiperiod valuation model using the capital asset pricing model is valid. Fama assumes (1) the capital asset pricing model is true every period, and (2) market parameters (risk-free rate and the market price of risk) evolve deterministically rather than assumed constant over time when using perfect competitive capital markets.

Fama's results are similar to the prior papers. The paper's major conclusions are (1) if there is uncertainty about the market value of a cash flow from an asset at a

future point in time, the intermediate uncertainty must be due to reassessments through time of the probability distribution of the cash flow, (2) uncertainty cannot be due to market parameters as Bogue and Roll (1974) had allowed, (3) the only admissable types of uncertainty must be concerned with the evolution of the expected value of the flow, (4) the current market value of a net cash flow can be expressed as a current expected value of the flow discounted by non-stochastic discount rates until the flow is realized, (5) risk adjustments of discount rates are due to the covariance between the uncertain assessments of the expected value of the flow and the corresponding assessment of the expected cash flow of all firms, (6) the market value of a firm is the sum of the market values of all its future net cash flows; but the risk-adjusted discount rates for the different periods preceding the realized cash flow need not be the same, as well as the rates relevant for a given period can differ across cash flows, (7) systematic risk for a firm is a weighted average of the systematic risk of a firm's projects' cash flows, and (8) systematic risk is directly related to the admissable uncertainty of the cash flow.

Turnbull

The major highlights of Turnbull's study are described below and are followed by a more complete description.

(1) Turnbull, in his study, derives an expression for the market value and rates of return of a firm within a continuous time context.

(2) A general, as well as an explicit, solution is derived.

(3) He shows how the variables that determined a firm's market value affect a firm's systematic risk. The determinants are identified as similar.

(4) The market value and systematic risk is found to be determined by investor expectations of a firm's future cash flows.

(5) Investors form their expectations about a firm's future cash flows conditional upon a set of economic indices and a firm's specific component.

(6) The effect of a firm's specific component will be eliminated by investor diversification.

Turnbull assumes all assets have limited liability; there are no transaction costs, taxes, or problems with indivisibilities of assets; there are a sufficient number of investors with comparable wealth levels, so that each investor believes that it is possible to buy or sell as much of an asset at the market price; the capital market is always in equalibrium; there exists an exchange market for borrowing and lending at the same rate of interest; short-sales of all assets, with full use of the proceeds is allowed; trading in assets takes place continuously in

time; the term structure of interest rates is "flat" and known with certainty; the dynamics for the value of the firm, V, through time can be described by a diffusion type of stochastic process with stochastic differential equation.

$$\frac{dV}{V} = \alpha dt + \sigma dZ$$

where

α is the instantaneous conditional expected percentage change in value per unit of time;

σ^2 is the instantaneous conditional variance per unit of time;

dZ is a standard Gauss-Weiner process such that E(dZ) = 0 and var (dZ) = dt;

a firm undertakes a single project which is realized at time T; the cash flow $\tilde{C}_{jt}$, is a random variable; investors form their expectations about future cash flows conditional upon an information set, ϕ_t, containing current values on a set of economic indices, $\tilde{I}_{kT}$, a firm's specific component, a_{tT}; the author initially assumes investors' preferences for hedging against changes in the investment opportunity set is zero or have logarithmic utility functions to obtain an explicit solution; Turnbull discusses the explicit solution by assuming the terminal cash flow is a linear function of the firm's specific component and the economic variables.

Given the above assumptions, Turnbull shows that the expected value of the asset's cash flows is conditional upon the current information set that can be decomposed into a linear two part function: the conditional expected value of a firm's specific component and a function of the conditional values of different economic components; that is,

$$E\left[C_T/\phi_t\right] = E\left[\tilde{a}_{TT}^{\gamma_o}/\phi_t\right] + \sum_{K=1}^{m} b_K\, E\left[\tilde{I}_{KT}^{\gamma_K}/\phi_t\right],$$

where

E() is the expectation operator,

b_K are firm specific constants for the K^{th} economic component,

γ_i are power exponents which are defined in the interval $0 < \gamma_i \leq 1$, i = 0, I, ...m.

Turnbull, using partial differential equations derives the market value and rate of return of a firm. The values of the equalibrium rate of return depends upon the parameters describing the dynamics of the different variables and how the value of a firm is related to changes in the underlying economic variables.

$$\alpha y = \frac{\partial y}{\partial t} + \sum_{K=1}^{m} h_K I_{Kt} \frac{\partial y}{\partial I_K} + A a_{tT} \frac{\partial y}{\partial a} + \frac{1}{2} B_{a_{tT}}^2 \frac{\partial^2 y}{\partial a^2}$$

$$+ \frac{1}{2} \sum_{K=1}^{m} g_K^2 I_{Kt}^2 \frac{\partial^2 y}{\partial I_K^2}$$

where

y is the equalibrium rate of return,

h_K is the instantaneous conditional expected change in value of the K^{th} economic variable per unit of time,

g_K^2 is the instantaneous conditional variance per unit of time, K=1, ...m,

A is the instantaneous conditional expected change in value of the firm specific variable per unit time;

B^2 is the instantaneous conditional variance per unit time.

Further, a firm's value is shown to change due to unanticipated changes in the operations of the firm as well as unanticipated changes in the economic variables that impact the firm's future cash flows, that is:

$$\nabla y dZ = Ba_{tT} \frac{\delta y}{\delta a} dZ_a + \sum_{K=1}^{m} g_K I_{Kt} \frac{\delta y}{\delta I_K} dZ_{I_K}$$

Systematic risk of a firm, β_v, using partial differentiation is defined. Systematic risk is "interpreted as the responsiveness between changes in the firm's specific component and the market portfolio, β_a, and as the responsiveness between changes in the economic variables and the market portfolio, β_{tIK}." Systematic risk, therefore, is composed on two (2) parts, that is

$$\beta_v = \frac{1}{y} \left(a_{tT} \frac{\delta y}{\delta a} B_{ta} + \sum_{K=1}^{m} I_{Kt} \frac{\delta y}{\delta I_K} \beta_{tI_K}\right)$$

These relationships are not required to be constant over time and therefore systematic risk of a firm need not

be constant over time. Further, since the firm's specific component can be assumed independent across firms and economic indices, their impact upon systematic risk can be eliminated by diversification.

An explicit solution for the value of a firm and systematic risk is found by assuming investors allocate their wealth between present and future consumption so as to maximize the expected utility of lifetime consumption and terminal value; and investors' preferences for hedging against changes in the investment opportunity set is zero. The results are generally the same as the partial differential solution. The additional insights are: (1) market value of a firm can be found when economic indices are correlated, (2) the firm's specific component, given a large number of firms, will have negligible impact on the market portfolio and therefore its value will be approximately zero, (3) systematic risk is a weighted average of the responsiveness of the firm with each of the economic variables, (4) the measure of responsiveness between the firm and each of the eocnomic variables are not expected to be stationary, (5) systematic risk of a firm is directly related to the leverage of the firm, and (6) systematic risk is a non-increasing function of duration and growth.

Turnbull then gives the continuous time analogue of the Capital Asset Pricing Model, the structure of returns is given by:

$$r_i - r_f = \beta_a \left[\frac{a}{y}\frac{\partial y}{\partial a}(r_m - r_f)\right] + \sum_{K=1}^{m} B_{I_K}\left[\frac{I_K}{y}\frac{\partial y}{\partial I_K}(r_m - r_f)\right]$$

where

r_i is the instantaneous return for firm i,

r_f is the instantaneous risk-free rate.

This equation shows that the return of a firm depends upon a set of coefficients measuring the responsiveness of changes in the firm specific and economic variables to changes in the value of the market portfolio of risky assets; the market portfolio return of risky assets is also dependent upon a general set of economic variables; and this model is consistent with a multi-index model but empirical testing is needed to test its validity.

The major results of the theoretical papers are (1) investors form expectations of a firm's cash flows conditional on the current information of a set of expectations of economic variables and a firm's specific component, (2) the uncertainty of a firm's future cash flows is the only admissable risk given the capital asset pricing model holds every period of time, (3) a firm's market value, market return, and systematic risk is a function of a set of economic variables and a firm's specific component, (4) the firm's specific component is expected to have negligible value, and (5) systematic risk is a non-increasing function of duration and growth.

Review of Previous Empirical Studies

The discussion of previous empirical studies for the determinants of systematic risk and market returns is partitioned into three (3) areas. The areas are non-monetary economic determinants, monetary determinants, and accounting or financial determinants.

The literature in the area of the economic determinants of systematic risk is miniscule. Each study is either interested in forecasting stock market returns or improving estimates of systematic risk. If Turnbull's model is correct, none of the tests should be able to forecast stock market returns, or the improvement in the estimates due to the serial correlation between the ex-post and ex-ante values of economic variables that investors use in forming their expectations. Below is a brief review of these studies.

Robichek and Cohn (1974) attempted to show systematic risk of equity securities is related to economic variables. Their objective was to show that if systematic risk is related to economic variables, then improved forecasts for beta could be generated by incorporating this relationship. Using no formal theory, they formulated and tested this hypothesis. Specifically, systematic risk is subject to change as changes occur in the rate of real economic growth and the rate of inflation. The former is measured by the rate of change in personal income deflated by the consumer price index and the latter by the rate of change

of the consumer price index. Their test period is from January, 1963 to June, 1970 with a sample of 814 firms.

They partitioned the test period into four (4) environments; low real growth and low inflation, low real growth and high inflation, high real growth and high inflation, and high real growth and low inflation. They calculated beta coefficients for each firm in the traditional manner and then for each of the four (4) environments. They tested for differences in the coefficients and found there were differences. As pointed out by Fisher (1974) in his review discussion, there were many problems in their testing procedures. Some of the weaknesses were ad-hoc formulation of hypothesis, small environmental samples, use of only two (2) economic variables, poor classification techniques and the statistical test for significance. All the authors do conclude is that further research investigating the relationship between systematic risk and economic factors is needed.

Heathcotte and Apilado (1974) test the predictive ability of leading economic indicators for future stock prices. Using the National Bureau of Economic Research's short list of economic indicators excluding stock prices, the authors constructed a diffusion index for the period December, 1959 to November, 1976. The authors, using filter rules, simulated and calculated the predictive

performance of each of these trading strategies over the entire period as well as for three (3) sub-periods. The results of the study were (1) some filters did generate excess returns, (2) the filter rules were temporarily unstable, (3) the diffusion index was biased upwards since dividends were excluded, and (4) the diffusion index did poorly during economic declines as it lagged considerably behind the stock price series.

In an article by Umstead (1977), the author attempts to forecast stock market prices using the composite index of leading indicators. The author uses the Box-Jenkins methodology to build a transfer function model relating changes in National Bureau of Economic Research's Leading Composite Index to subsequent stock price changes. The study covered the period 1948-1974 with the first half used to build the model and the second half for testing. The model forecasts stock prices changes one period ahead. The model was evaluated with respect to predicted R^2, and a buy and hold strategy. The following conclusions were drawn from the research (1) stock prices move in tandum with the leading composite index, (2) stock prices exhibit a half-cycle lag and move inversely to price changes in the leading composit index, (3) the test model's predicted R^2 was .066 which is significant at the .05 level, and (4) trading profits could have been obtained using the model.

Separate critiques of Umstead's study were done by

Whitcomb (1977), and Arzac (1977). The authors point out many flaws. The use of the Box-Jenkins technique had no theoretical basis and thus the results could be accidental since the leading composite indicators contain stock prices. Many prior models were used by Umstead unsuccessfully besides the published one. Some of his tests for significance were incorrectly formulated. When correctly formulated, significance for his buy and hold strategy disappears. The discussants concluded that additional research is necessary to examine the relationship between the stock market and leading economic variables.

Monetary Empirical Studies

The study of the relationship between money variables and the level of stock prices has been of interest to researchers since Sprinkel (1964) concluded by visual inspection that money variables can predict stock prices. Keran (1971), Hamburger and Kochin (1972), and Homa and Jaffee (1971) all found a strong relationship between their models using level money supply, growth of money and other money variables and the level of stock prices. In fact, all three have R^2's over .95. Pesando (1974) in a review of these three (3) articles pointed out the following problems; the trend relationship between the variables since levels of stock prices and money is not removed, and out of sample forecasting experiments were done. Further, Pesando, using Homa and Jaffee's simulation model, showed

that the profits found by the authors were sample sensitive when he re-did the study with a different set of data.

Malkiel and Quandt (1972) also analyzed Homa and Jaffee's article and also found that their model was sample sensitive. The authors tested an alternative model that used fiscal variables (consumer sentiment index, unemployment rate, labor contracts expiring, new orders for durables) as well as monetary variables (money supply, growth in money supply and bond rates). In an equation using only fiscal variables, the authors obtained an R^2 of .947 and when monetary variables were included the R^2 did not change, but the significance of the fiscal variables decreased. Malkiel and Quandt concluded that (1) the equations are sample and time period sensitive, (2) all equations failed to forecast important turning points, and (3) it is more intuitively desirable to predict percentage changes in the SP index than th predict the index itself.

Tests of money variables and stock market returns were done by Cooper (1974), Rozoff (1975), Kraft and Kraft (1977), and Rogalski and Vinso (1977). Cooper and Rozoff both test if money variables can be used to predict stock market returns. Rozoff, using trading rules proposed by Sprinkel, failed to outperform the naive buy and hold strategy. Cooper, using regression analysis and spectral analysis, tested the relationship between stock market returns and changes in the money supply. Cooper concluded

that the market was efficient, and money supply changes do not have an effect on stock market returns, but lag. Kraft and Kraft tested for causality between stock prices and money variables (money supply, percentage change in money supply, and interest rates on Moody AAA rated bonds). The authors concluded there was no causal relationship. Rogalski and Vinso also tested for causality, but they used stock market returns. The authors found there was causality from stock market returns to money supply.

Accounting or Financial Empirical Studies

This discussion is limited to the highlights and conclusions of prior studies. All of these studies have a similar important assumption. Each study assumes ex-post accounting changes are good proxies for ex-ante measures of investor expectations given by security returns. This, as Turnbull's theory shows, is a misspecification of his model as well as the capital asset pricing model since they are ex-ante models. This assumption would be true if systematic risk was invariant to time.

The studies by Beaver, Kettler and Scholes (1970), Hamada (1969) and others have empirically shown that security returns are significantly related to accounting measures of real returns. The studies in general found that an earnings beta and financial leverage are determinants of a security's systematic risk. Studies by

King (1966), Black, Jensen and Scholes (1972) and others have statistically tested and proven that security returns are significantly related to market returns. These studies prove the capital asset pricing model is correct to be used in estimating a security's systematic risk.

Conclusion of Empirical Studies

The reviewed empirical studies give statistical evidence to support the hypothesis that market returns and security returns are related to economic and accounting variables. All of these previous studies are flawed or weakly formulated in one way or another. They did not base their studies on a correctly specified theoretical model. They used ex-post or concurrent data as estimates for ex-ante expectations. The number of economic variables used in testing was extremely small. Only one study attempted to examine the relationship between economic variables changes and individual security returns; the others used market returns or market prices.

CHAPTER 2.
THE STUDY

The objective of this paper is to empirically test the multiperiod capital asset pricing valuation models derived separately by Turnbull, Myers, and Fama. These theoretical models suggest the following:

(1) Security returns and market returns are a function of investors expectations of future economic outcomes.

(2) A firm's expected future cash flows are a function of future economic outcomes.

(3) Real returns of a firm's assets are related to a firm's security returns; a firm's security returns are related to market portfolio returns; and security returns and market returns are a function of investor expectations of outcomes for a set of economic variables.

Given the previous discussed theoretical and empirical studies, my objective is to address five (5) related issues.

(1) Are investor expectations of future cash flows a function of future economic outcomes as suggested by theory?

(2) What set of economic variables best explain investor expectations for market returns and

expectations for individual security returns?

(3) Is the set of economic variables used to explain investor expectations of markets similar to the set investors use for individual security returns?

(4) Is the set of economic variables used to explain investor expectations the same for all securities?

(5) Is the traditionally used single index capital asset pricing model ex-ante efficient or are there possibly empirical benefits to be obtained by using a multi-index model consisting of the traditional market portfolio and economic indexes to explain individual security returns?

Set of Economic Variables

The selection of economic variables is confined to the 119 cyclical indicators as defined by the National Bureau of Economic Research and found in the Business Conditions Digest (1979). The NBER classifies variables as leading, concurrent, and lagging with regard to general economic movements. Using their classifications, the criteria for selection is that the economic variables had to be classified a leading economic variable for peaks, troughs, and generally for economic movements.(1) A total of 46 economic variables including Standard & Poor's 500 common stock index of stock prices met this criteria. Six series were omitted due to incomplete data for the test period.

Table 1 has the complete set of selected economic variables.

The set of selected economic variables measures a cross-section of economic movements. The set measures the following economic processes: employment and unemployment; consumption, trade, orders, and deliveries; fixed capital investment; inventories and inventory investment; prices, costs, and profits; money and credit. The only economic process not represented under my selective criteria was production and income.

Security Sample

A set of 45 securities representing 26 industries was selected. They are listed on Table 2. The securities represent all sectors of the economy. This will enable testing if the best set of explanatory economic variables of individual security returns is similar for all securities.

Data of security returns was obtained from the Center for Research in Security Prices tape of monthly returns for the sample period. The monthly returns were transformed to quarterly returns for testing purposes.

The security sample was further partitioned into two (2) sets, a durable goods group (21 securities) and a non-durable goods group (24 securities). The list of securities for each group can be found on Table 3. The statistical results were similar for both groups except for the test of normality.

TABLE 1
SET OF SELECTED ECONOMIC VARIABLES

SERIES NUMBER	ECONOMIC VARIABLE SERIES TITLE	ECONOMIC PROCESS	DATA REPORTED
1	Average Work Week of Production Workers	Employment	Monthly
2	Accession Rate	Employment	Monthly
3	Layoff Rate	Employment	Monthly
6	Value of Manufacturer's New Orders, Durable Goods, Current Dollars	Consumption, Trade, Orders and Deliveries	Monthly
7	Value of Manufacturer's New Orders, Durable Goods, 1972 Dollars	Consumption, Trade, Orders and Deliveries	Monthly
8	Value of Manufacturer's New Orders, Consumer Goods & Materials, 1972 Dollars	Consumption, Trade, Orders and Deliveries	Monthly
10	Contracts and Orders for Plant and Equipment, Current Dollars	Fixed Capital Investment	Monthly
12	Index of Net Business Formation	Fixed Capital Investment	Monthly
13	Number of New Business Incorporations	Fixed Capital Investment	Monthly
14	Current Liabilities of Business Failures	Money and Credit	Monthly
15	Profits After Taxes per Dollar of Sales, All Manufacturing Corporations	Prices, Costs, and Profits	Quarterly
16	Corporate Profits After Taxes, Current Dollars	Prices, Costs, and Profits	Quarterly
17	Ratio Price to Unit Labor Cost, Non-Farm Business	Prices, Costs, and Profits	Monthly
18	Corporate Profits After Taxes, 1972 Dollars	Prices, Costs, and Profits	Quarterly

TABLE 1 (CONT.)
SET OF SELECTED ECONOMIC VARIABLES

SERIES NUMBER	ECONOMIC VARIABLE SERIES TITLE	ECONOMIC PROCESS	DATA REPORTED
20	Contracts, Orders, Plant Equipment, 1972 Dollars	Fixed Capital Investment	Monthly
23	Index of Spot Market Prices, Raw Industrial Material	Prices, Costs, and Profits	Monthly
24	Value of Manufacturer's New Orders, Capital Goods Non-Defense, Current Dollars	Fixed Capital Investment	Monthly
25	Change in Manufacturer's Unfilled Orders, Durable Goods Industries	Consumption, Trade, Orders and Deliveries	Monthly
27	Value of Manufacturer's New Orders, Capital Goods Non-Defense, 1972 Dollars	Fixed Capital Investment	Monthly
28	New Private Housing	Fixed Capital Investment	Monthly
29	Index of New Private Housing Authorized by Local Building Permits	Fixed Capital Investment	Monthly
30	Gross Private Domestic Investment, Change in Business Inventories, All Industries, 1972 Dollars	Inventory and Inventory Investment	Quarterly
31	Change in Book Value Manufacturing Trade Inventories	Inventory and Inventory Investment	Monthly
32	Vendor Performance, % of Companies Receiving Slow Deliveries	Prices, Costs, and Profits	Monthly
34	Net Cash Flow, Corporate, Current Dollars	Prices, Costs, and Profits	Quarterly
35	Net Cash Flow, Corporate, 1972 Dollars	Prices, Costs, and Profits	Quarterly
36	Net Change in Inventories On Hand, On Order, 1972 Dollars	Inventory and Inventory Investment	Monthly

TABLE 1 (CONT.)
SET OF SELECTED ECONOMIC VARIABLES

SERIES NUMBER	ECONOMIC VARIABLES SERIES TITLE	ECONOMIC PROCESS	DATA REPORTED
36a	Smoothed	Inventory and Inventory Investment	Monthly
54	Sales Retail Stores, Current Dollars	Consumption, Trade, Orders and Deliveries	Monthly
89	Gross Private Domestic Fix Investment, Total Residential, 1972 Dollars	Fixed Capital Investment	Quarterly
92a	Change in Sensitive Crude Material Prices (Smoothed)	Prices, Costs, and Profits	Monthly
93	Free Reserves	Money and Credit	Monthly
104	Change in Total Liquid Assets	Money and Credit	Monthly
104a	Smoothed	Money and Credit	Monthly
105	Money Supply M1-B, 1972 Dollars	Money and Credit	Monthly
106	Money Supply M2, 1972 Dollars	Money and Credit	Monthly
110	Total Funds Raised, Private Non-Financial Borrowers Credit Market	Money and Credit	Quarterly
112	Net Change in Bank Loans to Businesses	Money and Credit	Monthly
113	Net Change in Consumer Credit	Money and Credit	Monthly

TABLE 2
LIST OF INDUSTRY AND SECURITY GROUPS

INDUSTRY GROUPINGS	SECURITIES
Aerospace	Boeing, United Technologies
Automobiles	Chrysler, General Motors
Chemicals	Allied Chemical, Dupont
Copper	Kennecott Copper, Phelps Dodge
Drugs	American Home Products, Bristol Myers
Entertainment	Columbia Pictures, Twentieth Century Fox
Foods (Processed)	Standard Brands
Machinery (Construction and Materials Handling)	Caterpiller Tractor, Clark Equipment
Machinery (Industrial)	Chicago Pneumatic Tool
Machinery (Specialty)	Joy Manufacturing
Metal Fabricating	General Cable, Revere Copper & Brass
Office & Business Equipment	Burroughs Corporation, I.B.M.
Oil-Integrated Domestic	Union Oil of CA
Paper	Crown Zellerbach, International Paper
Publishing	McGraw Hill
Railroad Equipment	General Signal, Pullman
Retail Stores (Department)	Federated Department Stores, Macy's (R.H.)
Retail Stores (Food Chains)	American Stores, Safeway Stores
Steel	Armco Steel, U.S. Steel
Textile (Apparel Mfg.)	Cluett Peabody, Munsingwear
Textile Products	Burlington Industries, Stevens (J.P.)
Textile (Synthetic Fibres)	Celanese
Transportation (Air)	American Air Lines, Pan American
Transportation (Rail)	Chessie Systems, Union Pacific
Utilities (Electric Power)	Commonwealth Edison, Pacific Gas & Electric
Utilities (Telephone)	AT&T
TOTAL	45 Securities

TABLE 3
LIST OF SECURITIES BY PRODUCT GROUP

NON-DURABLE GOODS	DURABLE GOODS
American Air Lines	Allied Chemical
American Home Products	Armco Steel
American Stores	Boeing
AT&T	Caterpiller Tractor
Bristol Myers	Chicago Pneumatic
Burlington Industries	Chrysler
Burroughs	Clark Equipment
Celanese	Crown Zellerbach
Chessie Systems	Dupont
Cluett Peabody	General Cable
Columbia Pictures	General Motors
Commonwealth Edison	General Signal
Federated Dept. Stores	International Paper
General Foods	Joy Manufacturing
I.B.M.	Kennecott Copper
R.H. Macy's	McGraw Hill
Munsingwear	Phelps Dodge
Pacific Gas & Electric	Pullman
Pan American Air Lines	Revere Copper & Brass
Safeway Stores	U.S. Steel
Standard Brands	United Technology
J.P. Stevens	
Twentieth Century Fox	
Union Oil of CA	

Sample Time Period and Data Format

The sample time period selected is from January, 1955 to December, 1975 for a total of 21 years. This time period covers four (4) expansions and four (4) contractions of the general economy.

The data set originally consisted of monthly and quarterly measurements. Initial testing is done for both measures in percentage change form. I decided to use quarterly data as the explanatory power of the monthly observations was significantly smaller than the quarterly results. All monthly data was transformed to quarterly data.

Scale Free and Conclusion

The original data is tested using single independent economic variable equations with market returns as the dependent variable. All selected economic variables are transformed to scale free variables (standardized values) when indexes are formed. The reason for standardization is that when variables have substantially different magnitudes it subjects the results to bias and statistical errors in calculation. Transformation of the variables does not effect the relationship between variables since the correlation between variables does not change.

The study consists of four (4) parts. The first part consists of testing the relationship between market returns and a set of 39 economic leading indicators, and

then forming economic indexes representing the different processes of the economy that best explain investor expectations of market returns.

The second part consists of testing if security returns are significantly related to market returns using the traditional single index capital asset pricing model.

The third part substitutes and tests if the set of economic indicators investors' use to form their expectations are similar for market returns and security returns as well as being similar between individual securities.

The fourth, and final, part consists of regressing individual securities with market returns and the economic indicators to see if the traditionally used market model is ex-ante efficient and can possibly be improved by using a multi-index model.

(1) The selection of economic variables was restricted to the leading economic indicators of the NBER. This restricted selection process was judged appropriate since it satisfied Turnbull's hypothesis and model. Turnbull's model shows that values and returns are dependent upon investor expectations given a set of current information of future economic outcomes. Since leading economic indicators are assumed by NBER to supply the necessary information to forecast future economic outcomes, then this set satisfies Turnbull's model's assumptions.

CHAPTER 3.
STATISTICAL METHODS

This chapter describes the methods and results of testing the relationship between market returns as measured by the returns of the Standard & Poor's 500 Common Stock Index and the 39 leading economic variables. Given these regression results, economic process indexes were formed using various weighting methods.

This index formation methodology initially uses only economic variables that are measured quarterly. The two (2) preliminary tested indexes are revised to include an additional two (2) economic process indexes as well as additional quarterly economic variables (transformed from monthly observations).

A total of five (5) indexes are selected. A profitability index, a narrow investment index that includes only quarterly measured economic variables, a broad investment index that includes both originally measured monthly and quarterly economic variables, an employment index, and a money and credit index.

Market Returns and Economic Variable Regressions

Individual regressions were used to test for relationships between market returns as measured by percentage change in the Standard & Poor's 500 Common Stock Index and the percentage change for each economic variable. This was done for all economic variables using

quarterly data. Statistical tests for significance, studentized range test for normality, Durbin-Watson statistic for serial correlation, and Spearman's "t" test for heteroscedasticity were calculated for each regression where necessary.

Further, the economic data was lead and lagged for three (3) time periods relative to market returns to explore the expectational relationship.

From the examination of the above testing, the best set of economic variables will be selected. If no one individual economic variable has high explanatory power, a coefficient of determination greater than, or equal to, 30 percent, then indexes of economic processes will be formed.

Results of Testing

A total of 39 economic variables were tested with 273 regressions run. Results are reported in the Appendix.

A total of 27 variables had correlations equal to or greater than .30. Nineteen economic series are represented with eight (8) series being represented twice. Six (6) series are identical in terms of the economic process they measure, only differing in terms of real or constant dollars. The results are reported on Table 4.

Of the 29 variables and market returns only two (Series 17 and Series 3) could be rejected as not normally distributed at the .01 level of significance using the

TABLE 4

SIGNIFICANT ECONOMIC VARIABLES WITH MARKET RETURNS GREATER THAN OR EQUAL TO .30

$R_{mt} = b_o + b_1 Var_{j, t+m}$

t = 82 Observations

m = 0, 1, 2

SERIES NUMBER	ECONOMIC VARIABLE SERIES TITLE	TIME PERIOD	ECONOMIC PROCESS	CORRELATION WITH MARKET RETURNS
1	Average Work Week of Production Workers	t + 1	Employment	.4616
3	Layoff Rate, Manufacturing	t + 1	Employment	-.4616
6	Value of Manufacturer's New Orders, Durable Goods Industries, Current Dollars	t + 1	Investment	.3930
7	Value of Manufacturer's New Orders, Durable Goods Industries, 1972 Dollars	t + 1	Investment	.4196
8	Value of Manufacturer's New Orders for Consumer Goods, Materials, 1972 Dollars	t + 1	Investment	.4645
12	Index of Net Business Formation	t + 1	Investment	.5395
13	Number of New Business Incorporations	t + 1	Investment	.3478
15	Profits After Taxes per Dollar of Sales, All Manufacturing Corporations	t + 1	Profitability	.3997
15	Profits After Taxes per Dollar of Sales, All Manufacturing Corporations	t + 2	Profitability	.4012
16	Corporate Profits After Taxes, Current Dollars	t + 1	Profitability	.3177

TABLE 4 (CONT.)

SERIES NUMBER	ECONOMIC VARIABLE SERIES TITLE	TIME PERIOD	ECONOMIC PROCESS	CORRELATION WITH MARKET RETURNS
16	Corporate Profits After Taxes, Current Dollars	t + 2	Profitability	.4948
17	Ratio Price to Unit Labor Cost, Non-Farm Business	t + 2	Profitability	.3137
18	Corporate Profits After Taxes, 1972 Dollars	t + 1	Profitability	.3359
18	Corporate Profits After Taxes, 1972 Dollars	t + 2	Profitability	.5085
28	New Private Housing Units, Started Total	t + 1	Investment	.3411
32	Vendor Performance, % of Companies Receiving Slow Deliveries	t + 2	Profitability	.4034
34	Net Cash Flow, Corporate, Current Dollars	t + 1	Profitability	.3034
34	Net Cash Flow, Corporate, Current Dollars	t + 2	Profitability	.4336
35	Net Cash Flow, Corporate, 1972 Dollars	t + 1	Profitability	.3215
35	Net Cash Flow, Corporate, 1972 Dollars	t + 2	Profitability	.4593
89	Gross Private Domestic Fixed Investment, Total Residential, 1972 Dollars	t + 1	Investment	.4760
89	Gross Private Domestic Fixed Investment, Total Residential, 1972 Dollars	t + 2	Investment	.3986

TABLE 4 (CONT.)

SERIES NUMBER	ECONOMIC VARIABLE SERIES TITLE	TIME PERIOD	ECONOMIC PROCESS	CORRELATION WITH MARKET RETURNS
105	Money Supply M1-B, 1972 Dollars	t + 0	Money/Credit	.4010
105	Money Supply M1-B, 1972 Dollars	t + 1	Money/Credit	.4428
106	Money Supply M2, 1972 Dollars	t + 0	Money/Credit	.3931
106	Money Supply M2, 1972 Dollars	t + 1	Money/Credit	.4011
110	Total Funds Raised, Private Non-Financial Borrowers Credit Market	t + 1	Investment	.3862

Studentized Range Test for Normality. None could be rejected at the .01 level of significance for serial correlation using the Durbin-Watson test or heteroscedasticity using Spearman's rank correlation "t" test. One can conclude from the results the statistical testing for significance of coefficients is not in error.

Examination of the results show that Turnbull's theory is proven correct. Investor expectations of market returns is a function of their expectations of future outcomes of economic variables. Investors seem to have a future expectational horizon of as much as six (6) months for profitability and three (3) months for other economic processes.

The use of economic indexes is needed since no one variable has a coefficient of determination greater than .30.

Criteria was formed to reduce the orginal set to eliminate redundancies in measurements (Series 6 and 7, Series 16 and 18, and Series 34 and 35) and differences in time periods (Series 15, 18, 35, 89, 105, and 106). The criteria was simply taking the series with the highest correlation. Further, it should be noted that all of the better significant redundant series were inflation adjusted.

Using the above criteria, 16 series were selected to be used in the formation of indexes (see Table 5). A total of four (4) economic processes are to be represented; Profitability with a lag of two (2) periods, Investment

TABLE 5

SELECTED ECONOMIC VARIABLES

$R_{mt} = a + b\ Var_{i,\ t+m}$ $\quad t = 1,\ldots,81$, $m = 3,2,\ldots,-3$

Criteria

a) Correlation with market returns greater than .30.
b) For each economic variable, given (a), select time period with highest value.
c) If selected economic variables differ by adjustment for prices, select highest value.

SERIES NUMBER	ECONOMIC VARIABLE SERIES TITLE	TIME PERIOD	ECONOMIC PROCESS	CORRELATION VALUE
1	Average Work Week of Production Workers	t + 1	Employment	.4616
3	Layoff Rate	t + 1	Employment	-.4616
7	Value of Manufacturer's New Orders, Durable Goods, 1972 Dollars	t + 1	Investment	.4196
8	Value of Manufacturer's New Orders, Consumer Goods & Materials in 1972 Dollars	t + 1	Investment	.4645
12	Index of Net Business Formation	t + 1	Investment	.5395
13	Number of New Business Incorporations	t + 1	Investment	.3478
15	Profits After Taxes per Dollar of Sales, All Manufacturing Corporations	t + 2	Profitability	.4012
17	Ratio Price to Unit Labor Cost, Non-Farm Business	t + 2	Profitability	.3137
18	Corporate Profits After Taxes, 1972 Dollars	t + 2	Profitability	.5085
28	New Private Housing	t + 1	Investment	.3411

TABLE 5 (CONT.)

SERIES NUMBER	ECONOMIC VARIABLE SERIES TITLE	TIME PERIOD	ECONOMIC PROCESS	CORRELATION VALUE
32	Vendor Performance, % of Companies Receiving Slow Deliveries	t + 2	Profitability	.4043
35	Net Cash Flow, Corporate, 1972 Dollars	t + 2	Profitability	.4593
89	Gross Private Domestic Fixed Investment, Total Residential, 1972 Dollars	t + 1	Investment	.4760
105	Money Supply M1-B, 1972 Dollars	t + 1	Money/Credit	.4428
106	Money Supply M2, 1972 Dollars	t + 1	Money/Credit	.4011
110	Total Funds Raised, Private Non-Financial Borrowers Credit Market	t + 1	Investment	.3860

(narrow and broad) lagged one (1) period, Employment lagged one (1) period, and Money and Credit lagged one (1) period. This was needed to reduce the size of the set of economic variables and to minimize the high collinearity between individual economic variables for each process.

Five (5) possible indexation methods were initially proposed. They were the National Bureau of Economic Research's methodology, a naive equal weighting method, a correlation weighting method, a coefficient of determination method, and a factor analysis method. All methods were sample tested.

The National Bureau of Economic Research's method entails computation of symmetric percentage change for each variable; then a standardized absolute value for each variable is computed; a weighted average for each variable using the Bureau's scoring method is calculated; and finally, a summation of the individual values for each time period. This was done for a small sample. The results showed insignificant differences than if a single variable was used and the method was abandoned.

Each of the four (4) other methods gave promising results as discussed below in the preliminary index testing section and were used.

The naive or equal weighting method was formed by summing the values of each economic variable of an

economic process and dividing the sum by the number of summed economic variables.

The correlation weighted index was formed in a two (2) step procedure. The first step was to calculate the wieght for each economic variable. This was done by dividing the correlation of the economic variable by the sum of the correlations of the economic variables for that economic process. The index was then calculated for each observation by summing the products of the correlation weight and the actual operation value for each economic variable.

The coefficient of determination method is identical to the correlation method except that the coefficient of determination is substituted.

The factor analysis method is also a two (2) step method. For each economic process, a single factor analysis is computed for the processes set of economic variables. Using the calculated factor weights, a weighted average is calculated by summing the products of the factor weights and the observation value for each economic variable. The Appendix gives the notational methodology for the index calculations.

Preliminary Index Testing

Using only quarterly reported data, two (2) indexes were formed using each of the weighting methods. The two (2) indexes were Investment (Narrow) consisting of Series

89 and 110 lagged one period, and Profitability (used only in preliminary tests) consisting of Series 15, 18, and 35 lagged two (2) periods. Weightings using each method are shown on Table 6.

Regressions were run regressing market returns and the two (2) index models for each weighting method.

The results of this testing are found on Table 7. The results showed that Profitability and Investment (Narrow) were both significantly related to market returns using each of the weighting methods. The best weighting method was the coefficient of determination weightings. The worst method was when factor weights were used. This probably occurs because the weights generated are dependent upon the common relationship between the economic variables rather than the other methods which rely on the relationship between the economic variables and market returns(1).

The results of the preliminary tests show that market returns are a function of investor expectations of future economic outcomes. Future investment and future profitability measure these expectations.

The coefficient of determination weighting method seems to be best. Further testing using all quarterly data will bear this out.

Revision of Indexes and Results

Revised indexes for the profitability and investment

TABLE 6
PRELIMINARY WEIGHTINGS FOR INDEXES

SERIES NUMBER	NAIVE METHOD WEIGHTS	CORRELATION METHOD WEIGHTS	COEFFICIENT OF DETERMINANTS METHOD WEIGHTS	FACTOR ANALYSIS METHOD WEIGHTS
Profitability				
15_{t+2}	.333	.294	.255	-.138
18_{t+2}	.333	.371	.410	-.529
35_{t+2}	.333	.335	.335	-.343
Investment				
89_{t+1}	.5	.552	.603	.5
110_{t+1}	.5	.448	.397	-.5

TABLE 7

PRELIMINARY INDEX REGRESSION RESULTS

$$R_{mt} = b_o + b_1 I_{ot} + b_2 P_{ot}$$

METHOD	b_1	$t(b_1)$	b_2	$t(b_2)$	r	F	DURBIN WATSON
Naive (1 = 1)	.43	3.98	.37	3.73	.597	21.92	2.09
Correlation (1 = 2)	.43	3.97	.37	3.70	.599	22.12	2.08
Coefficient of Determination (1 = 3)	.43	3.94	.37	3.68	.600	22.22	2.06
Factor Analysis (1 = 4)	.04	.22	-.50	-4.92	.491	12.57	1.96

processes as well as the formation of an employment index and a money and credit index were formed when both quarterly data and quarterly transformed monthly measured variables are included.

Both a narrow investment index (using only quarterly measured data) and a broad investment index (using all data) were decided to be used in the testing even though the correlation with market returns was improved from .5005 to .6005. I decided to include both forms of the investment index because the collinearity between the two indexes (correlation was .7429) was significantly less when compared to the collinearity between the old and new profitability index which was .967. In all further tests the narrow and broad investment indexes are used individually, but not at the same time. A list of the five (5) indexes and their economic variables can be found in Table 8.

Testing of two (2) and four (4) revised index models was done for each weighting method. The weights and correlations between each index and market return can be found on Tables 9 and 10.

The results using the revised indexes (found in Table 11) were similar to the prior weighting method conclusions. The coefficient of determination had the highest explanatory power as measured by the adjusted R^2s. The worst performing weighting method again was the factor

TABLE 8
LIST OF INDEXES AND THEIR ECONOMIC VARIABLES

SERIES NUMBER	SERIES TITLE
	PROFITABILITY INDEX - TIME PERIOD t + 2
15	Profits After Taxes per Dollar of Sales, All Manufacturing
17	Ratio Price to Unit Labor Cost, Non-Farm Business
18	Corporate Profits After Taxes, 1972 Dollars
32	Vendor Performance, % of Companies Receiving Slow Deliveries
35	Net Cash Flow, Corporate, 1972 Dollars
	BROAD INVESTMENT INDEX - TIME PERIOD t + 1
7	Value of Manufacturer's New Orders, Durable Goods, 1972 Dollars
8	Value of Manufacturer's New Orders, Consumer Goods & Materials, 1972 Dollars
12	Index of Net Business Formation
13	Number of New Business Incorporations
28	New Private Housing
89	Gross Private Domestic Fix Investment, Total Residential, 1972 Dollars
110	Total Funds Raised, Private Non-Financial Borrowers Credit Market
	NARROW INVESTMENT INDEX - TIME PERIOD t + 1
89	Gross Private Domestic Fix Investment, Total Residential, 1972 Dollars
110	Total Funds Raised, Private Non-Financial Borrowers Credit Market
	EMPLOYMENT INDEX - TIME PERIOD t + 1
1	Average Work Week of Production Workers
3	Layoff Rate
	MONEY AND CREDIT INDEX - TIME PERIOD t + 1
105	Money Supply M1-B, 1972 Dollars
106	Money Supply M2, 1972 Dollars

TABLE 9
LIST OF INDEXES AND THEIR ECONOMIC VARIABLES AND WEIGHTS

SERIES NUMBER	SERIES TITLE	SERIES WEIGHT
	PROFITABILITY INDEX (t+2)	
15	Profits After Taxes per Dollar of Sales, All Manufacturing Corporations	.181
17	Ratio Price to Unit Labor Cost, Non-Farm Business	.110
18	Corporate Profits After Taxes, 1972 Dollars	.290
32	Vendor Performance, % of Companies Receiving Slow Deliveries	.182
35	Net Cash Flow, Corporate, 1972 Dollars	.237
	BROAD INVESTMENT INDEX (t+1)	
7	Value of Manufacturer's New Orders, Durable Goods, 1972 Dollars	.136
8	Value of Manufacturer's New Orders, Consumer Goods & Materials, 1972 Dollars	.167
12	Index of Net Business Formation	.225
13	Number of New Business Incorporations	.093
28	New Private Housing	.089
89	Gross Private Domestic Fix Investment, Total Residential, 1972 Dollars	.175
110	Total Funds Raised, Private Non-Financial Borrowers Credit Market	.115
	NARROW INVESTMENT INDEX (t+1)	
89	Gross Private Domestic Fix Investment, Total Residential, 1972 Dollars	.603
110	Total Funds Raised, Private Non-Financial Borrowers Credit Market	.397
	EMPLOYMENT INDEX (t+1)	
1	Average Work Week of Production Workers	.5
3	Layoff Rate	-.5
	MONEY AND CREDIT INDEX (t+1)	
105	Money Supply M1-B, 1972 Dollars	.549
106	Money Supply M2, 1972 Dollars	.451

TABLE 10
CORRELATION WITH MARKET RETURNS FOR
EACH INDEX AND WEIGHTING METHOD

	WEIGHTING METHOD			
ECONOMIC INDEX	NAIVE	CORRELATION	COEFFICIENT OF DETERMINATION	FACTOR
Profitability	.517	.522	.525	-.495
Narrow Investment	.493	.497	.501	.092
Broad Investment	.591	.597	.601	-.577
Employment	.521	.521	.521	.004
Money and Credit	.435	.436	.437	.087

TABLE 11
MARKET RETURNS AND SINGLE ECONOMIC INDEX RESULTS
USING COEFFICIENT OF DETERMINATION WEIGHTS

$$R_{mt} = b_o + b_1 I_{jt}$$

ECONOMIC INDEX	b_1	$t(b_1)$	$\bar{R}^2$	D.W.	S.R.	SPEARMAN'S t
I_n	0.601	6.718	0.353	2.038	5.332	-1.204
P	0.525	5.511	0.266	1.992	6.035	-0.697
E	0.521	5.456	0.262	2.034	6.027	-0.776
M	0.437	4.341	0.181	1.957	4.802	-0.314
I_o	0.501	5.172	0.241	2.036	5.021	-1.458

method. Given this result it was decided that the coefficient of determination weighting method would be used in further testing.

Regressions were run using the coefficient of determinating weighting methodology for a two (2), three (3), and four (4) index model. The three (3) index models always included the investment index and the profitability index with the employment index or the money and credit index added. The results show the best test model included the old investment index, revised profitability index, and the employment index and can be found in Table 12. This index model had an $\bar{R}^2$ of .3865 which was only marginally better than the two (2) index models of the old investment index and revised profitability that had an $\bar{R}^2$ of .384. The results show investment and profitability was significant at all levels of testing while employment was only significant at the .10 level. Since the results between each of the different models were so small it was decided to use all four (4) types of indexes in the individual security testing.

The reason for this decision was to allow for broader testing of the hypothesis whether or not individual securities are related to similar economic processes.

Statistical testing of the indexes shows that one could not reject the hypothesis that they are normally distributed; observations for each series are independently distributed and have constant variance.

TABLE 12
MARKET RETURNS AND MULTI ECONOMIC INDEX RESULTS
USING COEFFICIENT OF DETERMINATION WEIGHTS

$$R_{mt} = b_o + b_1 I_{nt} + b_2 P_t + b_3 E_t + b_4 M_t$$

	$b_1 I_n$	$t(b_1)$	b_2	$t(b_2)$	b_3	$t(b_3)$	b_4	$t(b_4)$	$\bar{R}^2$
Two Index	0.604	3.918	0.283	2.055	--	--	--	--	0.378
Three Index	0.527	2.763	0.256	1.790	0.155	0.693	00	00	0.374
Three Index	0.533	3.088	0.269	1.946	--	--	0.103	0.914	0.376
Four Index	0.443	2.113	0.239	1.658	0.120	0.767	0.114	0.969	0.373

$$R_{mt} = b_o + b_1 I_{ot} + b_2 P_t + b_3 E_t + b_4 M_t$$

	$b_1 I_o$	$t(b_1)$	b_2	$t(b_2)$	b_3	$t(b_3)$	b_4	$t(b_4)$	$\bar{R}^2$
Two Index	0.401	3.695	0.470	4.099	--	--	--	--	0.384
Three Index	0.342	3.072	0.331	2.466	0.247	1.898	--	--	0.387
Three Index	0.347	2.845	0.433	3.589	--	--	0.112	0.980	0.366
Four Index	0.299	2.430	0.306	2.217	0.237	1.811	0.093	0.825	0.366

Conclusions

The results of this chapter prove that market returns are a function of investor expectations of future economic outcomes. A coefficient of determination weighting method is shown to perform best when economic process indexes are formed. The two (2) best performing indexes represent the investment (narrow and broad) and profitability processes.

Given the results of this chapter, the next step is to prove that market returns are significantly related to security returns as the capital market asset pricing model shows. Significance of this testing will allow the substitution of economic indexes for market returns to test if security returns are significantly related to the same set of economic indexes that investors' use to form their expectations of future economic outcomes.

(1) The risk-free rate was included in the preliminary testing. This was done to see if the explanatory power of investors expectations of short-term interest rates increases the explanatory power of the test equations. Data was obtained from the Ibbotson and Sinquefield (1976) study.

The test results using the risk-free rate in a single index were as expected. The risk-free rate was significantly negatively related to market returns. This supports the Capital Asset Pricing Model since as interest rates rise the expected value of future cash flows fall and market values must adjust downwards. The coefficient correlation between the risk-free rate and market returns was -.29753 with a "t" value of -2.78749 and a Durbin-Watson statistic of 1.79708. When the risk-free rate was included in the two (2) index regressions, the test results were insignificant at the .05 level for each weighting method. The risk-free rate reduced the "t" values for each index though all remained highly significant.

One can conclude that investors expectations of interest rates is also partially explained by expectations of future economic outcomes. As for its use as an explanatory variable of market returns, the economic indexes dominate. Given these results further testing with the risk-free rate was omitted.

CHAPTER 4.
SECURITY RETURNS AND MARKET RETURNS

The purpose of this chapter is to test the validity of the capital asset pricing model, that is, are security returns significantly related to market returns. The importance of this testing is that it will allow the substitution of economic indexes for market returns and to test if security returns are significantly related to the same set of economic indexes as market returns as well as between individual securities.

Security and Market Return Results

Regressions were run using the single index capital asset pricing model for each security in the sample. Results can be found on Table 13.

The results of the tests of significance for the security regressions show 41 securities were significantly related to market returns at the .01 level of significance. Two additional securities (American Stores and Burroughs) are significant at the .05 level of significance, but Kennecott Copper and Phelps Dodge were not significant at either level. This result raises the question if the traditionally used single index capital asset pricing model is ex-ante efficient for all securities or can a multi-index model improve statistical testing.

TABLE 13

MARKET MODEL RESULTS - NONDURABLE GOODS GROUP

$$R_{it} = b_o + b_1 R_{mt}$$

COMPANY NAME	b_1	$t(b_1)$	$\bar{R}^2$	D.W.	F	SPEARMAN'S t TEST	STUDENTIZED RANGE TEST
American Air Lines	0.467	4.718	0.208	1.701	22.260	0.041	6.634
American Home Products	0.454	4.558	0.196	2.276	20.775	0.812	6.823
American Stores	0.246	2.271	0.049	1.653	5.157	1.376	7.114
AT&T	0.499	6.167	0.240	2.187	26.595	0.497	5.344
Bristol Myers	0.412	4.040	0.159	1.677	16.322	1.441	6.587
Burlington Industries	0.348	3.325	0.110	1.830	11.056	0.951	5.273
Burroughs	0.244	2.254	0.048	2.321	5.081	-0.374	5.431
Celanese	0.277	2.578	0.065	1.981	6.646	1.340	4.574
Chessie Systems	0.364	3.495	0.122	1.761	12.215	0.349	7.623
Cluett Peabody	0.493	5.068	0.234	1.889	25.685	0.957	4.827
Columbia Pictures	0.302	2.836	0.080	2.054	8.043	1.040	6.884
Commonwealth Edison	0.385	3.731	0.138	2.003	13.920	0.992	6.197
Federated Dept. Stores	0.417	4.105	0.164	2.054	16.851	0.533	5.941
General Foods	0.308	2.890	0.083	2.185	8.352	-0.731	6.621
I.B.M.	0.477	4.847	0.217	2.100	23.493	-0.532	5.363
R.H. Macy's	0.468	4.740	0.210	2.373	22.468	0.370	6.306
Munsingwear	0.333	3.158	0.100	2.033	9.973	0.507	7.177
Pacific Gas & Electric	0.298	2.797	0.079	2.082	7.823	-0.145	5.495
Pan American Airlines	0.487	4.985	0.227	1.814	24.850	2.254	6.866
Safeway Stores	0.313	2.948	0.087	1.737	8.691	-1.275	5.467
Standard Brands	0.379	3.667	0.133	1.770	13.447	0.987	5.539
J.P. Stevens	0.446	4.455	0.189	1.567	19.847	1.736	5.554
Twentieth Century Fox	0.382	3.690	0.135	2.080	13.616	1.867	5.336
Union Oil of CA	0.285	2.656	0.070	1.825	7.054	1.658	5.336

TABLE 13 (CONT.)

MARKET MODEL RESULTS - DURABLE GOODS GROUP

$R_{it} = b_o + b_1 R_{mt}$

COMPANY NAME	b_1	$t(b_1)$	$\bar{R}^2$	D.W.	F	SPEARMAN'S t TEST	STUDENTIZED RANGE TEST
Allied Chemical	0.332	3.143	0.099	1.975	9.878	-0.268	6.049
Armco Steel	0.435	4.321	0.179	1.681	18.071	-1.584	5.000
Boeing	0.323	3.058	0.093	1.889	9.356	0.029	4.927
Caterpiller Tractor	0.507	5.257	0.247	1.758	27.635	1.071	5.348
Chicago Pneumatic	0.429	4.242	0.173	1.878	17.994	-0.543	4.749
Chrysler	0.463	4.674	0.205	2.606	21.849	1.808	7.012
Clark Equipment	0.365	3.603	0.122	1.787	12.268	0.091	4.653
Crown Zellerbach	0.363	3.490	0.121	1.741	12.178	-0.061	4.929
Dupont	0.419	4.123	0.165	1.669	17.003	0.247	6.495
General Cable	0.314	2.954	0.087	1.777	8.726	-0.212	5.309
General Motors	0.561	6.061	0.306	2.174	36.739	1.249	5.578
General Signal	0.442	4.402	0.185	1.772	19.378	1.228	5.160
International Paper	0.472	4.794	0.213	2.050	22.986	0.332	5.000
Joy Manufacturing	0.423	4.174	0.169	1.637	17.425	-0.051	4.900
Kennecott Copper	0.103	0.922	-0.002	1.775	0.850	-0.074	5.833
McGraw Hill	0.501	5.173	0.241	1.842	26.765	-0.652	5.412
Phelps Dodge	0.193	1.760	0.025	1.486	3.010	-0.773	5.727
Pullman	0.257	2.377	0.654	1.366	5.651	1.229	4.473
Revere Copper & Brass	0.260	2.404	0.056	1.724	5.777	0.400	6.655
U.S. Steel	0.401	3.910	0.150	1.631	15.284	0.761	5.616
United Technology	0.396	3.859	0.146	1.785	14.894	0.017	4.672

Results of the Durbin-Watson test of significance for serial correlation show only one (1) security (Chrysler) could be said to have a problem of serial correlation. The hypothesis of homoscedasticity could be accepted at the .01 level for all securities using Spearman's "t" test. The hypothesis that returns are normally distributed is rejected for 12 firms using the Studentized Range test.

The results for both groupings are similar for all statistical test results except for the test of normality. Of the 12 securities that reject the null hypothesis that their returns are normally distributed, nine (9) are from the non-durable group.

Conclusions

The security sample using the capital asset pricing model is reported and analyzed. The results show that 41 securities are significantly related to market returns, and there are not any statistical testing problems present. Given the above results, the next step is to substitute economic indexes for market returns and test if security returns are significantly related to the same economic indexes that investors' use to form their expectations of future economic outcomes. In addition, the question of ex-ante efficiency of market returns will be further examined.

CHAPTER 5.
TESTING SECURITY RETURNS AND ECONOMIC INDEXES

This chapter concerns itself with testing the relationship between individual securities' returns and the economic indexes. Tests are run using security returns with each index individually and then with various combinations. Results are analyzed to see if individual security returns are a function of investor expectations of future economic outcomes as well as compared to the results obtained in the previous chapter.

The 45 companies security returns were regressed with the five (5) economic indexes. The following equation was run:

$$R_{it} = b_o + \sum_{j=1}^{5} b_j I_{jt}$$

where:

R_{it} = security i's return in period t

I_{jt} = index j's percentage change in period t

t = 1, ..., 82

j = 1 for Narrow Investment Index

= 2 for Broad Investment Index

= 3 for Profitability Index

= 4 for Employment Index

= 5 for Money and Credit Index

for:

a) each j individually

b) j = 1 and 3

c) j = 1, 3, 4

d) j = 1, 3, 5

e) j = 1, 3, 4, 5

f) j = 2, 3

g) j = 2, 3, 4

h) j = 2, 3, 5

i) j = 2, 3, 4, 5

The statistical results for the testing is reported on Tables 14a and 14b.

Single Index Test Findings

The individual results showed that only six (6) firms were not significantly related to at least one (1) of the indexes at the .10 level of significance. These firms were Allied Chemical, Burroughs, Clark Equipment, Kennecott Copper, and Phelps Dodge. At the .05 level of significance one additional firm (Joy Manufacturing) can be included in this group. The best explanatory economic index was profitability which was significant for 36 firms at the .05 level and 25 firms at the .01 level.

When the groups were examined there was some divergence. At the .05 level of significance only two (2) firms (Burroughs and Union Oil of CA) of the seven (7) companies not significantly related to at least one (1) economic index comes from the non-durable goods group.

TABLE 14a

SINGLE ECONOMIC INDEX RESULTS

DURABLE GOODS GROUP

t AND r VALUES

COMPANY NAME	t_{In}	t_{Io}	t_P	t_E	t_M	r_{In}	r_{Io}	r_P	r_E	r_M
Allied Chemical	0.843	0.509	1.624	0.054	-0.637	0.094	0.057	0.179	0.006	0.071
Armco Steel	2.303	1.930	2.895	1.491	0.324	0.249	0.211	0.308	0.164	0.036
Boeing	2.296	1.920	3.005	1.115	1.879	0.249	0.210	0.318	0.128	0.206
Caterpiller Tractor	3.134	2.416	4.077	2.077	0.872	0.331	0.261	0.415	0.226	0.203
Chicago Pneumatic	3.508	2.584	3.843	1.444	0.773	0.365	0.278	0.395	0.159	0.086
Chrysler	3.034	2.394	3.045	1.580	2.017	0.321	0.259	0.322	0.174	0.220
Clark Equipment	1.232	0.759	0.916	-0.470	0.872	0.136	0.085	0.102	-0.052	0.097
Crown Zellerbach	1.597	1.080	2.759	1.089	-0.398	0.176	0.120	0.295	0.121	-0.044
Dupont	4.041	3.286	2.230	2.805	0.965	0.412	0.345	0.242	0.299	0.107
General Cable	1.774	1.043	2.527	1.294	0.172	0.195	0.116	0.272	0.143	0.019
General Motors	4.233	2.673	3.184	2.896	2.112	0.428	0.286	0.335	0.308	0.230
General Signal	3.038	1.492	4.163	2.702	2.779	0.322	0.165	0.422	0.289	0.297
International Paper	2.610	2.174	3.158	1.944	0.783	0.280	0.236	0.333	0.212	0.087
Joy Manufacturing	1.145	0.688	1.828	1.063	0.993	0.127	0.077	0.200	0.118	0.110
Kennecott Copper	-1.022	-0.980	-0.581	-0.954	-1.053	0.114	0.109	-0.065	-0.106	-0.117
McGraw Hill	2.029	1.332	2.778	1.210	1.181	0.221	0.147	0.297	0.134	0.131
Phelps Dodge	0.098	-0.312	0.713	-0.469	-0.085	0.011	-0.035	0.079	-0.052	-0.009
Pullman	0.740	0.680	2.754	1.014	0.046	0.082	0.076	0.294	0.113	0.046
Revere Copper & Brass	1.686	1.076	2.168	0.808	0.258	0.185	0.119	0.236	0.090	0.029
U.S. Steel	2.246	1.360	1.966	1.179	-0.001	0.244	0.150	0.215	0.131	0.000
United Technology	2.668	1.910	3.228	1.742	1.029	0.225	0.209	0.339	0.191	0.114

TABLE 14a (CONT.)
SINGLE ECONOMIC INDEX RESULTS
NONDURABLE GOODS GROUP
t AND r VALUES

COMPANY NAME	t_{In}	t_P	t_{Io}	t_E	t_M	r_{In}	r_P	r_{Io}	r_E	r_M
American Air Lines	2.908	4.052	1.897	2.179	1.305	0.309	0.413	0.208	0.236	0.144
American Home Products	1.199	2.177	0.712	1.040	1.858	0.133	0.236	0.079	0.115	0.203
American Stores	-0.045	2.550	-1.618	0.087	-0.736	-0.005	0.274	-0.178	0.010	-0.082
AT&T	1.959	3.475	1.078	1.785	1.441	0.214	0.362	0.120	0.196	0.150
Bristol Myers	0.082	3.011	0.105	0.526	1.099	0.089	0.319	0.012	0.059	0.122
Burlington Industries	1.508	2.145	-0.170	1.861	0.884	0.166	0.233	-0.019	0.204	-0.006
Burroughs	0.388	0.624	0.082	0.328	0.714	0.043	0.070	0.009	0.037	0.080
Celanese	3.850	2.970	2.055	2.108	1.787	0.395	0.315	0.224	0.229	0.196
Chessie Systems	0.546	2.782	-0.191	0.495	0.391	0.061	0.297	-0.021	0.055	0.044
Cluett Peabody	4.175	2.931	2.992	3.027	1.908	0.423	0.311	0.317	0.321	0.209
Columbia Pictures	2.226	2.769	-0.092	1.381	0.420	0.246	0.296	-0.010	0.153	-0.047
Commonwealth Edison	1.335	3.296	1.002	1.615	1.283	0.147	0.346	0.111	0.178	0.142
Federated Dept. Stores	1.636	2.761	0.702	1.030	-0.224	0.180	0.295	0.078	0.114	-0.025
General Foods	0.865	2.857	-0.429	0.988	-0.005	0.096	0.304	-0.048	0.110	-0.001
I.B.M.	0.973	2.172	0.058	0.755	1.854	0.108	0.236	0.006	0.084	0.203
R.H. Macy's	2.569	1.877	1.362	1.285	1.735	0.276	0.205	0.150	0.142	0.190
Munsingwear	2.526	1.331	1.577	1.569	-0.144	0.272	0.147	0.174	0.173	-0.016
Pacific Gas & Electric	0.704	2.044	0.043	0.724	0.990	0.079	0.223	0.005	0.081	0.110
Pan American Air Lines	1.954	3.564	0.867	1.934	1.492	0.213	0.370	0.097	0.211	0.165
Safeway Stores	0.545	2.411	-1.061	0.731	-0.827	0.061	0.260	-0.118	0.081	-0.092
Standard Brands	1.207	2.372	0.070	0.847	0.000	0.134	0.256	0.008	0.094	0.000
J.P. Stevens	4.025	3.671	2.828	3.081	0.884	0.410	0.380	0.301	0.326	0.098
Twentieth Century Fox	1.582	2.973	0.464	1.192	1.119	0.174	0.315	0.052	0.132	0.124
Union Oil of CA	0.136	1.284	0.130	0.102	1.784	0.015	0.142	0.015	0.011	0.196

TABLE 14b
MULTI INDEX REGRESSION RESULTS
NONDURABLE GOODS GROUP

$$R_{it} = b_o + b_1 I_{nt} + b_2 P_t$$

COMPANY NAME	b_1	$t(b_1)$	b_2	$t(b_2)$	$\bar{R}^2$	D.W.	F
American Air Lines	0.074	0.555	0.365	2.729	0.153	1.859	8.293
American Home Products	-0.033	-0.231	0.258	1.805	0.033	2.314	2.368
American Stores	-0.310	-2.264	0.474	3.458	0.110	1.791	5.981
AT&T	-0.033	-0.241	0.383	2.798	0.110	2.035	5.995
Bristol Myers	-0.198	-1.442	0.447	3.247	0.103	2.038	5.633
Burlington Industries	0.027	0.192	0.216	1.508	0.031	1.866	2.292
Burroughs	-0.003	-0.017	0.071	0.486	-0.020	2.445	0.193
Celanese	0.329	2.443	0.103	0.768	0.141	2.050	7.670
Chessie Systems	-0.223	-1.612	0.440	3.188	0.095	1.889	5.267
Cluett Peabody	0.380	2.856	0.067	0.501	0.151	1.852	8.757
Columbia Pictures	0.094	0.672	0.235	1.678	0.070	2.015	4.033
Commonwealth Edison	-0.128	-0.934	0.428	3.121	0.107	1.950	5.858
Federated Dept. Stores	-0.017	-0.122	0.306	2.178	0.064	2.147	3.772
General Foods	-0.170	-1.228	0.414	2.983	0.087	2.140	4.860
I.B.M.	-0.075	-0.525	0.284	1.992	0.035	2.188	2.475
R.H. Macy's	0.246	1.740	0.047	0.334	0.054	2.347	3.320
Munsingwear	0.302	2.139	-0.048	-0.336	0.075	2.043	3.213
Pacific Gas & Electric	-0.111	-0.777	0.294	2.061	0.033	2.042	2.381
Pan American Air Lines	-0.043	-0.312	0.398	2.912	0.116	1.933	6.329
Safeway Stores	-0.183	-1.299	0.378	2.689	0.064	1.919	3.776
Standard Brands	-0.054	-0.377	0.291	2.047	0.044	1.759	2.853
J.P. Stevens	0.283	2.142	0.197	1.491	0.171	1.796	9.334
Twentieth Century Fox	-0.049	-0.355	0.347	2.490	0.078	2.117	4.433
Union Oil of CA	-0.130	-0.901	0.226	1.561	0.006	1.945	1.227

TABLE 14b (CONT.)

MULTI INDEX REGRESSION RESULTS

DURABLE GOODS GROUP

$$R_{it} = b_o + b_1 I_{nt} + b_2 P_t$$

COMPANY NAME	b_1	$t(b_1)$	b_2	$t(b_2)$	$\bar{R}^2$	D.W.	F
Allied Chemical	-0.036	-0.261	0.202	1.396	0.008	2.090	1.334
Armco Steel	0.087	0.624	0.252	1.804	0.076	1.626	4.354
Boeing	0.074	0.535	0.270	1.944	0.082	1.943	4.617
Caterpiller Tractor	0.109	0.815	0.345	2.590	0.158	1.786	8.608
Chicago Pneumatic	0.189	1.420	0.273	2.044	0.156	1.945	8.486
Chrysler	0.194	1.412	0.197	1.435	0.104	2.568	5.691
Clark Equipment	0.121	0.831	0.024	0.164	-0.006	1.724	0.763
Crown Zellerbach	-0.024	-0.171	0.310	2.208	0.064	1.746	3.773
Dupont	0.437	3.264	-0.040	-0.297	0.149	1.724	8.114
General Cable	0.033	0.234	0.250	1.771	0.051	1.839	3.183
General Motors	0.361	2.733	0.102	0.771	0.169	2.031	9.214
General Signal	0.085	0.641	0.367	2.760	0.162	1.902	8.807
International Paper	0.112	0.813	0.261	1.887	0.096	2.041	5.295
Joy Manufacturing	-0.003	-0.024	0.202	1.405	0.016	1.631	1.651
Kennecott Copper	-0.123	-0.840	0.014	0.097	-0.012	1.845	0.521
McGraw Hill	0.052	0.367	0.263	1.877	0.066	1.792	3.885
Phelps Dodge	-0.069	-0.470	0.124	0.846	-0.016	1.545	0.362
Pullman	-0.183	-1.317	0.412	2.965	0.084	1.481	4.695
Revere Copper & Brass	0.057	0.401	0.199	1.391	0.034	1.629	2.406
U.S. Steel	0.180	1.265	0.099	0.695	0.041	1.612	2.748
United Technology	0.011	0.082	0.332	2.401	0.093	1.871	5.148

TABLE 14b (CONT.)
MULTI INDEX REGRESSION RESULTS
NONDURABLE GOODS GROUP

$$R_{it} = b_o + b_1 I_{ot} + b_2 P_t$$

COMPANY NAME	b_1	$t(b_1)$	b_2	$t(b_2)$	$\bar{R}^2$	D.W.	F
American Air Lines	0.390	3.530	0.060	0.547	0.153	1.862	8.288
American Home Products	0.241	2.040	-0.012	-0.098	0.032	2.318	2.345
American Stores	0.397	3.590	-0.328	-2.960	0.146	1.792	7.946
AT&T	0.370	3.264	-0.020	-0.174	0.109	2.038	5.980
Bristol Myers	0.367	3.210	-0.127	1.109	0.093	2.075	5.159
Burlington Industries	0.280	2.390	-0.125	-1.063	0.044	1.849	2.871
Burroughs	0.077	0.636	-0.020	-0.164	-0.020	2.446	0.206
Celanese	0.269	2.350	0.122	1.069	0.090	1.993	4.991
Chessie Systems	0.356	3.101	-0.155	-1.356	0.086	1.887	4.829
Cluett Peabody	0.224	1.988	0.233	2.071	0.122	1.802	6.616
Columbia Pictures	0.349	3.039	-0.142	-1.236	0.082	2.056	4.623
Commonwealth Edison	0.354	3.108	-0.122	-0.196	0.098	1.932	5.385
Federated Dept. Stores	0.309	2.668	-0.039	-0.332	0.065	2.154	3.824
General Foods	0.376	3.304	-0.190	-1.667	0.101	2.190	5.560
I.B.M.	0.272	2.316	-0.096	-0.819	0.040	2.200	2.684
R.H. Macy's	0.173	1.462	0.085	0.718	0.024	2.302	2.009
Munsingwear	0.095	0.800	0.138	1.156	0.014	2.050	1.558
Pacific Gas & Electric	0.258	2.184	-0.092	-0.783	0.033	2.063	2.386
Pan American Air Lines	0.389	3.453	-0.050	-0.446	0.117	1.933	6.387
Safeway Stores	0.355	3.121	-0.252	-2.212	0.100	1.893	5.494
Standard Brands	0.295	2.528	-0.103	-0.887	0.051	1.794	3.198
J.P. Stevens	0.310	2.807	0.184	1.670	0.152	1.785	8.284
Twentieth Century Fox	0.345	3.001	-0.078	-0.682	0.082	2.125	4.621
Union Oil of CA	0.159	1.325	-0.046	-0.379	-0.003	1.953	0.887

TABLE 14b (CONT.)
MULTI INDEX REGRESSION RESULTS
DURABLE GOODS GROUP

$$R_{it} = b_o + b_1 I_{ot} + b_2 P_t$$

COMPANY NAME	b_1	$t(b_1)$	b_2	$t(b_2)$	$\bar{R}^2$	D.W.	F
Allied Chemical	0.183	1.533	-0.012	-0.103	0.008	2.083	1.307
Armco Steel	0.266	2.317	0.110	0.961	0.083	1.591	4.649
Boeing	0.279	2.435	0.105	0.914	0.088	1.923	4.922
Caterpiller Tractor	0.369	3.363	0.122	1.108	0.164	1.759	8.948
Chicago Pneumatic	0.338	3.065	0.150	1.360	0.154	1.939	8.387
Chrysler	0.262	2.307	0.160	1.406	0.104	2.584	5.683
Clark Equipment	0.082	0.676	0.054	0.446	-0.012	1.720	0.515
Crown Zellerbach	0.291	2.506	0.010	0.087	0.064	1.733	3.762
Dupont	0.130	1.152	0.295	2.614	0.112	1.776	6.085
General Cable	0.266	2.276	0.015	0.132	0.051	1.844	3.163
General Motors	0.265	2.356	0.186	1.657	0.121	2.070	6.551
General Signal	0.420	3.810	0.057	0.006	0.157	1.884	8.559
International Paper	0.284	2.502	0.129	1.135	0.103	2.017	5.647
Joy Manufacturing	0.199	1.678	0.001	0.011	0.016	1.630	1.650
Kennecott Copper	-0.028	-0.230	-0.098	-0.816	-0.012	1.848	0.501
McGraw Hill	0.281	2.424	0.041	0.356	0.066	1.795	3.880
Phelps Dodge	0.108	0.894	-0.076	-0.626	-0.014	1.557	0.448
Pullman	0.310	2.670	-0.041	-0.353	0.065	1.467	3.814
Revere Copper & Brass	0.222	1.882	0.036	0.302	0.033	1.620	2.369
U.S. Steel	0.184	1.557	0.081	0.683	0.028	1.626	2.153
United Technology	0.034	2.671	0.094	0.828	0.101	1.856	5.531

TABLE 14b (CONT.)
MULTI INDEX REGRESSION RESULTS
NONDURABLE GOODS GROUP

$$R_{it} = b_o + b_1 I_{nt} + b_2 P_t + b_3 E_t + b_4 M_t$$

COMPANY NAME	b_1	$t(b_1)$	b_2	$t(b_2)$	b_3	$t(b_3)$	b_4	$t(b_4)$	$\bar{R}^2$	D.W.	F
American Air Lines	0.202	1.107	0.404	2.875	-0.119	-0.373	-0.106	-0.823	0.143	1.900	4.384
American Home Products	-0.103	-0.529	0.246	1.646	-0.030	-0.174	0.167	1.212	0.027	2.304	1.563
American Stores	-0.131	-0.706	0.526	3.685	-0.142	-0.862	-0.180	-1.373	0.115	1.937	3.622
AT&T	-0.014	-0.074	0.392	2.700	-0.039	-0.236	0.009	0.065	0.087	2.046	2.940
Bristol Myers	-0.128	-0.683	0.479	3.311	-0.163	-0.980	0.053	0.396	0.093	2.022	3.084
Burlington Industries	0.058	0.302	0.211	1.414	0.105	0.613	-0.180	-1.311	0.034	1.931	1.707
Burroughs	-0.039	-0.195	0.064	0.414	-0.006	-0.033	0.077	0.538	-0.043	2.443	0.168
Celanese	0.498	2.732	0.160	1.140	-0.207	-1.279	-0.085	-0.658	0.141	2.118	4.320
Chessie Systems	-0.125	-0.666	0.474	3.253	-0.126	-0.753	-0.041	-0.303	0.079	1.941	2.734
Cluett Peabody	0.432	2.372	0.080	0.567	-0.021	-0.128	-0.075	-0.584	0.143	1.860	4.374
Columbia Pictures	0.384	2.098	0.316	2.231	-0.189	-1.158	-0.338	-2.598	0.132	2.116	4.078
Commonwealth Edison	-0.167	-0.889	0.417	2.874	0.027	0.162	0.043	0.325	0.085	1.941	2.891
Federated Dept. Stores	0.219	1.168	0.374	2.583	-0.176	-1.056	-0.249	-1.870	0.091	2.208	3.024
General Foods	-0.064	-0.341	0.442	3.031	-0.058	-0.345	-0.136	-1.012	0.076	2.241	2.676
I.B.M.	-0.130	-0.675	0.279	1.877	-0.069	-0.399	0.184	1.314	0.036	1.157	1.755
R.H. Macy's	0.336	1.746	0.084	0.566	-0.172	-1.007	0.025	0.186	0.043	2.346	1.912
Munsingwear	0.502	2.660	0.003	0.022	-0.088	-0.523	-0.279	-2.088	0.081	2.008	2.780
Pacific Gas & Electric	-0.124	0.633	0.296	1.958	-0.037	-0.215	0.067	0.485	0.012	2.072	1.240
Pan American Air Lines	-0.050	-0.267	0.396	2.743	-0.004	-0.023	0.019	0.140	0.094	1.929	3.090
Safeway Stores	-0.018	-0.100	0.419	2.874	-0.061	-0.363	-0.243	-1.813	0.080	2.020	2.754
Standard Brands	0.108	0.559	0.338	2.273	-0.127	-0.742	-0.162	-1.185	0.042	1.852	1.880
J.P. Stevens	0.442	2.501	0.235	1.723	-0.046	-0.290	-0.251	-2.001	0.191	1.832	5.792
Twentieth Century Fox	0.023	0.121	0.374	2.541	-0.112	-0.662	-0.010	-0.073	0.060	2.122	2.282
Union Oil of CA	-0.241	-1.243	0.208	1.391	-0.048	-0.282	0.266	1.939	0.030	2.057	1.616

TABLE 14b (CONT.)

MULTI INDEX REGRESSION RESULTS

DURABLE GOODS GROUP

$$R_{it} = b_o + b_1 I_{nt} + b_2 P_t + b_3 E_t + b_4 M_t$$

COMPANY NAME	b_1	$t(b_1)$	b_2	$t(b_2)$	b_3	$t(b_3)$	b_4	$t(b_4)$	$\bar{R}^2$	D.W.	F
Allied Chemical	0.236	1.223	0.285	1.915	-0.248	-1.448	-0.234	-1.717	0.041	2.225	1.860
Armco Steel	0.293	1.565	0.312	2.153	-0.159	-0.956	-0.211	-1.586	0.090	1.774	3.013
Boeing	0.186	0.987	0.318	2.185	-0.228	-1.360	0.049	0.365	0.083	1.853	2.732
Caterpiller Tractor	0.230	1.266	0.388	2.770	-0.171	-1.060	-0.035	-0.272	0.149	1.824	4.548
Chicago Pneumatic	0.563	3.277	0.392	2.960	-0.396	-2.699	-0.258	-2.115	0.237	1.958	7.303
Chrysler	0.325	1.748	0.249	1.730	-0.228	-1.379	0.011	0.083	0.103	2.506	3.329
Clark Equipment	0.355	1.837	0.114	0.760	-0.388	-2.259	-0.002	-0.014	0.032	1.750	1.679
Crown Zellerbach	0.214	1.144	0.376	2.609	-0.157	-0.943	-0.274	-2.070	0.097	1.828	3.181
Dupont	0.568	3.146	-0.009	-0.066	-0.031	-0.193	-0.214	-1.669	0.158	1.821	4.794
General Cable	0.194	1.012	0.295	1.999	-0.107	-0.632	-0.183	-1.348	0.052	1.852	2.118
General Motors	0.432	2.384	0.124	0.888	-0.070	-0.435	-0.053	-0.415	0.151	2.028	4.594
General Signal	0.012	0.067	0.351	2.508	0.009	0.058	0.129	1.000	0.151	1.876	4.598
International Paper	0.252	1.344	0.300	2.072	-0.096	-0.574	-0.157	-1.178	0.092	2.096	3.040
Joy Manufacturing	-0.016	-0.084	0.201	1.315	-0.007	-0.043	0.034	0.240	-0.008	1.625	0.820
Kennecott Copper	-0.041	-0.204	0.038	0.246	-0.064	-0.362	-0.083	-0.583	-0.032	1.836	0.365
McGraw Hill	0.173	0.906	0.307	2.077	-0.169	-0.995	-0.038	-0.282	0.055	1.794	2.176
Phelps Dodge	0.074	0.373	0.174	1.132	-0.195	-1.101	-0.050	-0.352	-0.025	1.532	0.500
Pullman	-0.149	-0.781	0.421	2.863	-0.016	-0.096	-0.046	-0.347	0.061	1.503	2.323
Revere Copper & Brass	0.262	1.361	0.263	1.766	-0.201	-1.177	-0.160	-1.171	0.040	1.697	1.850
U.S. Steel	0.421	2.220	0.169	1.151	-0.185	-1.096	-0.249	-1.848	0.069	1.799	2.495
United Technology	0.084	0.444	0.354	2.421	-0.061	-0.366	-0.068	-0.508	0.074	1.853	2.612

TABLE 14b (CONT.)

MULTI INDEX REGRESSION RESULTS

NONDURABLE GOODS GROUP

$$R_{it} = b_o + b_1 I_{ot} + b_2 P_t + b_3 E_t + b_4 M_t$$

COMPANY NAME	b_1	$t(b_1)$	b_2	$t(b_2)$	b_3	$t(b_3)$	b_4	$t(b_4)$	$\bar{R}^2$	D.W.	F
American Air Lines	0.440	3.236	0.113	0.882	-0.044	-0.324	-0.095	-0.735	0.138	1.884	4.249
American Home Products	0.228	1.580	-0.069	-0.505	-0.065	-0.449	0.166	1.202	0.027	2.309	1.556
American Stores	0.510	3.774	-0.242	-1.899	-0.151	-1.110	-0.115	-0.889	0.149	1.904	4.539
AT&T	0.389	2.781	-0.014	-0.108	-0.043	-0.305	0.011	0.080	0.087	2.048	2.942
Bristol Myers	0.457	3.279	-0.105	-0.797	-0.203	-1.444	0.060	0.449	0.095	2.048	3.132
Brulington Industries	0.228	1.588	-0.113	-0.837	0.160	1.109	-0.114	-0.832	0.041	1.888	1.873
Burroughs	0.059	0.392	-0.056	-0.398	-0.013	-0.083	0.089	0.624	-0.041	2.447	0.198
Celanese	0.257	1.816	0.113	0.849	0.016	0.111	0.012	0.092	0.066	1.989	2.439
Chessie Systems	0.453	3.222	-0.101	-0.764	-0.165	-1.170	-0.034	-0.254	0.081	1.949	2.774
Cluett Peabody	0.158	1.147	0.216	1.665	0.146	1.045	-0.041	-0.314	0.112	1.867	3.557
Columbia Pictures	0.396	2.828	-0.059	-0.445	0.017	0.122	-0.200	-1.490	0.085	2.109	2.873
Commonwealth Edison	0.384	2.723	-0.008	-0.063	-0.055	-0.384	-0.002	-0.016	0.076	1.951	2.667
Federated Dept. Stores	0.415	2.952	0.077	0.581	-0.084	-0.593	-0.217	-1.617	0.079	2.204	2.732
General Foods	0.435	3.105	-0.133	-1.006	-0.060	-0.422	-0.098	-0.730	0.087	2.258	2.931
I.B.M.	0.261	1.824	-0.170	-1.260	-0.094	-0.657	0.219	1.601	0.050	2.163	2.063
R.H. Macy's	0.151	1.031	0.042	0.305	-0.014	-0.093	0.106	0.758	0.006	2.309	1.131
Munsingwear	0.097	0.668	0.207	1.521	0.116	0.792	-0.221	-1.597	0.026	2.033	1.531
Pacific Gas & Electric	0.275	1.890	-0.109	-0.794	-0.074	-0.506	0.077	0.557	0.015	2.105	1.300
Pan American Air Lines	0.389	2.789	-0.060	-0.454	-0.015	-0.108	0.029	0.221	0.095	1.929	3.129
Safeway Stores	0.422	3.032	-0.167	-1.270	-0.032	-0.227	-0.176	-1.328	0.099	1.998	3.214
Standard Brands	0.361	2.515	-0.038	-0.284	-0.065	-0.444	-0.114	-0.828	0.039	1.831	1.817
J.P. Stevens	0.314	2.356	0.258	2.061	0.116	0.863	-0.232	-1.821	0.171	1.799	5.188
Twentieth Century Fox	0.382	2.692	-0.070	-0.525	-0.084	-0.590	0.027	0.199	0.063	2.111	2.355
Union Oil of CA	0.164	1.131	-0.120	-0.882	-0.141	-0.966	0.247	1.784	0.020	2.065	1.412

TABLE 14b (CONT.)

MULTI INDEX REGRESSION RESULTS

DURABLE GOODS GROUP

$$R_{it} = b_o + b_1 I_{ot} + b_2 P_t + b_3 E_t + b_4 M_t$$

COMPANY NAME	b_1	$t(b_1)$	b_2	$t(b_2)$	b_3	$t(b_3)$	b_4	$t(b_4)$	$\bar{R}^2$	D.W.	F
Allied Chemical	0.120	0.888	0.328	2.272	-0.158	-1.084	-0.217	-1.575	0.032	2.216	1.670
Armco Steel	0.222	1.693	0.362	2.596	-0.064	-0.452	-0.220	-1.652	0.095	1.733	3.130
Boeing	0.121	0.915	0.350	2.494	-0.163	-1.150	0.051	0.383	0.081	1.852	2.793
Caterpiller Tractor	0.159	1.253	0.428	3.165	-0.093	-0.679	-0.036	-0.279	0.149	1.780	4.538
Chicago Pneumatic	0.288	2.316	0.495	3.745	-0.181	-1.361	-0.216	-1.711	0.188	1.989	5.677
Chrysler	0.170	1.289	0.308	2.198	-0.104	-0.739	0.034	0.252	0.087	2.563	2.936
Clark Equipment	0.078	0.564	0.182	1.242	-0.228	-1.540	0.068	0.490	-0.006	1.721	0.883
Crown Zellerbach	0.151	1.157	0.413	2.970	-0.084	-0.602	-0.277	-2.079	0.098	1.809	3.189
Dupont	0.338	2.625	0.092	0.672	0.175	1.270	-0.192	-1.467	0.128	1.805	3.962
General Cable	0.097	0.719	0.331	2.311	-0.033	-0.228	-0.168	-1.227	0.046	1.866	1.979
General Motors	0.158	1.209	0.205	1.482	0.109	0.785	0.006	0.043	0.105	2.076	3.376
General Signal	-0.073	-0.576	0.356	2.645	0.032	0.237	0.164	1.270	0.154	1.876	4.699
International Paper	0.209	1.596	0.342	2.461	-0.018	-0.126	-0.172	-1.296	0.100	2.059	3.250
Joy Manufacturing	-0.010	-0.072	0.198	1.342	-0.014	-0.090	0.033	0.234	-0.009	1.626	0.820
Kennecott Copper	-0.049	-0.347	0.032	0.214	-0.073	-0.489	-0.074	-0.518	-0.031	1.844	0.386
McGraw Hill	0.073	0.545	0.339	2.369	-0.099	-0.688	-0.019	-0.138	0.048	1.806	2.032
Phelps Dodge	-0.034	-0.245	0.191	1.285	-0.150	-1.000	-0.013	-0.093	-0.026	1.549	0.480
Pullman	0.027	0.200	0.390	2.734	-0.097	-0.675	-0.102	-0.749	0.054	1.505	2.165
Revere Copper & Brass	0.117	0.862	0.311	2.151	-0.097	-0.667	-0.133	-0.965	0.027	1.649	1.553
U.S. Steel	0.171	1.259	0.247	1.712	-0.013	-0.091	-0.198	-1.438	0.029	1.749	1.607
United Technology	0.156	1.183	0.365	2.602	-0.055	-0.392	-0.110	-0.825	0.088	1.831	2.952

The R.A. Fisher Z Transformation test of correlation differences was used to test if the explanatory power of market returns and the explanatory power of a single economic index are similar in explaining security returns. The test assumes the samples are independent and bivariate normally distributed. The purpose of this test is to show the substitution of an economic index that investors use to form their expectations for market returns is appropriate. The statistical results are reported in the Appendix.

The results of the R.A. Fisher correlation test using a null hypothesis $r_{i,\,m} = r_{i,\,j}$ shows that the profitability index is accepted as similar to market returns for all firms at all levels of significance. The results for the other indexes show the broad investment index was accepted for 37 firms at the .05 level, the narrow investment index for 28 firms at the .05 level, the employment index for 30 firms at the .05 level, and the money and credit index for 18 firms at the .05 level.

We can conclude from the single index results that the profitability index has the greatest similarity to market returns and can be substituted for all firms when using a single index model. Further, we can conclude given the strong results using the other indexes that a multi-index model will most likely improve the results.

Multi-Economic Index Findings

The purpose of this testing was to see if: (1) a security return is a function of more than one economic process, and (2) are the expectations of economic processes that determine security returns the same as the expectations used to determine market returns.

As the results on Table 15 show, 28 of the firms adjusted R^2's were improved by including at least one (1) or more indexes. The most included index was the profitability index (36 firms), followed by the investment indexes (25 firms, 17 for the broad investment index and 8 for the narrow investment index), the money and credit index (19 firms), and the employment index (10 firms).

The explanatory power of the economic indexes varied across all securities as well as individually. This verifies Turnbull's theory that the relationships between a security's expected cash flows and expected economic outcomes does not have to be the same. It should be noted that the composition of the economic indexes were determined and weighted by maximizing their explanatory power of market returns rather than security returns. This was done under the assumption that market returns, as measured by the Standard & Poor's 500 Stock Price Index, are an adequate measure of the ideal efficient capital asset portfolio.

TABLE 15

BEST SET OF ECONOMIC INDEXES FOR SECURITY i

NON-DURABLE GOODS

COMPANY NAME	P	I_n	I_o	E	M	$\bar{R}^2_I$	$\bar{R}^2_m$	$\bar{R}^2_I / \bar{R}^2_m$
American Air Lines	*					.160	.208	.769
American Home Products	*				*	.044	.196	.224
American Stores	*		*	*		.151	.049	3.082
AT&T	*					.120	.240	.500
Bristol Myers	*			*		.111	.159	.698
Burlington Industries	*				*	.046	.110	.418
Burroughs						0	.048	0
Celanese	*	*		*		.147	.065	2.262
Chessie Systems	*	*				.095	.122	.779
Cluett Peabody		*				.169	.234	.722
Columbia Pictures	*	*		*	*	.132	.080	1.650
Commonwealth Edison	*					.109	.138	.790
Federated Dept. Stores	*				*	.095	.164	.579
General Foods	*		*			.101	.083	1.217
I.B.M.	*		*		*	.057	.217	.263
R.H. Macy's		*				.065	.210	.310
Munsingwear		*			*	.101	.100	1.010
Pacific Gas & Electric	*					.038	.078	.487
Pan American Air Lines	*					.126	.227	.555
Safeway Stores	*		*		*	.110	.087	1.264
Standard Brands	*					.054	.133	.406
J.P. Stevens	*	*			*	.201	.189	1.063
Twentieth Century Fox	*					.088	.135	.652
Union Oil of CA	*	*			*	.041	.070	.586

*Included in best explanatory index regression

TABLE 15 (CONT.)
BEST SET OF ECONOMIC INDEXES FOR SECURITY i
DURABLE GOODS

COMPANY NAME	P	I_n	I_o	E	M	$\bar{R}_I^2$	$\bar{R}_m^2$	$\bar{R}_I^2/\bar{R}_m^2$
Allied Chemical	*	*		*	*	.041	.099	.414
Armco Steel	*		*		*	.104	.179	.581
Boeing	*	*		*		.093	.093	1.000
Caterpiller Tractor	*		*			.164	.247	.664
Chicago Pneumatic	*	*		*	*	.237	.173	1.370
Chrysler	*	*		*		.115	.205	.561
Clark Equipment		*		*		.050	.122	.410
Crown Zellerbach	*		*		*	.105	.121	.868
Dupont		*			*	.179	.165	1.085
General Cable	*				*	.064	.087	.736
General Motors		*				.173	.306	.565
General Signal	*				*	.172	.185	.930
International Paper	*		*		*	.111	.213	.521
Joy Manufacturing	*					.028	.169	.167
Kennecott Copper					*	.001	0	≈1
McGraw Hill	*					.077	.241	.320
Phelps Dodge						0	.025	0
Pullman	*	*				.084	.054	1.555
Revere Copper & Brass	*					.044	.056	.786
U.S. Steel	*	*		*	*	.069	.150	.460
United Technology	*					.104	.146	.712

*Included in best explanatory index regression

When comparing the average explanatory power of the economic indexes to the average explanatory power of the market returns index, the market's adjusted R^2 was higher. The market's was .1473 while the indexes was .0972. The difference between the sub-groups was extremely small. The non-durable goods group had an adjusted R^2 of .0984 while the durable goods group had an adjusted R^2 of .0960. This result was as expected since we are substituting economic indexes that were formed to maximize the explanatory power of market returns and not of an individual security's return.

When the individual securities are examined for the explanatory power of the economic indexes and of the market returns index, a different conclusion is found. A total of ten (10) securities had higher adjusted R^2's than the market index and two (2) were equal to the market index. For this group of ten (10) securities the adjusted R^2 for the economic indexes was .1443 and the market was .1045. Of these ten (10) securities, seven (7) of the firms (American Stores, Celanese, Columbia Pictures, General Foods, Munsingwear, Safeway Stores, and J.P. Stevens) were classified in the non-durable goods group (29% of the firms), and only three (3) of the firms (Chicago Pneumatic, Dupont, and Pullman) were from the durable goods group (14% of the firms), though the two (2) firms (Boeing and Kennecott Copper) that were equal were also from this group.

This result further answers the question of ex-ante efficiency of market returns. Either the Standard & Poor's index of market returns is not a good surrogate measure to be used in the capital asset pricing model or a security's unique risk which is assumed to be diversified away is being measured by the economic indexes. Most probably, the Standard & Poor's index is not truly ex-ante efficient. This implies that multi-indexes can be used to improve the explanatory power of individual securities.

Conclusions of Multi-Economic Index Findings

Security returns are found to be a function of investor expectations of future economic outcomes. For many firms (62%) their security returns are related to more than one (1) economic process. The economic indexes formed to measure investor expectations were found to be as good as, or better than, the explanatory power of market returns for a large number of firms (12 or 26.7% of the sample). This is further evidence of ex-ante inefficiency of a traditional measure of the ideal market portfolio. The next chapter will examine this conclusion.

CHAPTER 6.
TESTING SECURITY RETURNS AND ALL COMBINATIONS OF MARKET RETURNS AND ECONOMIC INDEXES

The previous chapter's results imply the currently used single index capital asset pricing model is not ex-ante efficient. The purpose of this chapter is to see if the explanatory power of the single index market model can be improved by including different combinations of economic indexes with the market returns index. If the explanatory power is improved for a security's returns then ex-ante efficiency would be rejected.

The testing of the above hypothesis was done using the following equation:

$$R_{it} = b_o + b_1 R_{mt} + \sum_{j=1}^{5} b_j I_{jt}$$

where:

R_{it} = security i's return in period t

R_{mt} = market return in period t

I_{jt} = index j's percentage change in period t

t = 1, ..., 82

j = 1 for Narrow Investment Index

j = 2 for Broad Investment Index

j = 3 for Profitability Index

j = 4 for Employment Index

j = 5 for Money and Credit Index

for market returns, and:

a) each j individually

b) j = 1, 3

c) j = 1, 3, 4

d) j = 1, 3, 5

e) j = 1, 3, 4, 5

f) j = 2, 3

g) j = 2, 3, 4

h) j = 2, 3, 5

i) j = 2, 3, 4, 5

The statistical results for the above regressions are reported on the tables in the Appendix.

Discussion of Tests and Results

Security Returns, Market Returns and a Single Economic Index

The regression results of the market model and a single economic index showed that the explanatory power of the market model was improved for all firms. The statistical measure used was the coefficient of determination which measures the proportion of the explained variance.

Given the above result statistical significance was measured and tested by calculating the partial correlations between the securities and each economic index holding market returns constant. The importance of this was to see if the market model is ex-ante efficient for each security since partial correlations measure the improved explanatory power when an additional variable is included in a regression. A significant partial correlation would clearly imply that the traditionally used market model

is ex-ante inefficient.

The results of the partial correlation testing showed a total of 27 firms (60% of the sample) had at least one significant partial correlation at the .10 level of significance ($r^2_{i,j.m} \geq .035$) and 13 firms (28.9% of the sample) were still significant at the .05 level of significance ($r^2_{i,j.m} \geq .051$). The narrow investment index performed best. A total of eight (8) firms were significant at the .05 level and three (3) additional firms were added at the .10 level of significance. Table 16 gives a summary of the results.

Inspection of the sub-grouping results show that the non-durable goods group would be improved the most by including an additional index. A total of 16 (66.7%) of the firms were significantly improved at the .10 level and nine (9) (37.5%) were significantly improved at the .05 level. The index that improves the largest number of non-durable goods was the narrow investment index. This index was significant for eight (8) (33.3%) firms at the .05 level and 10 (41.7%) firms at the .10 level.

A total of 11 (52.4%) firms of the durable goods group were improved by including a single economic index at the ,10 level while four (4) (19%) were significantly improved at the .05 level of significance. The best performing index was the profitability index. The index significantly improved results of the market model for

TABLE 16

PARTIAL COEFFICIENTS OF DETERMINATION

NONDURABLE GOODS GROUP

COMPANY NAME	$r^2_{iIn.m}$	$r^2_{i\ P.m}$	$r^2_{iIo.m}$	$r^2_{i\ E.m}$	$r^2_{i\ M.m}$
American Air Lines	0.001	0.050	0.001	0.000	0.005
American Home Products	0.039	0.000	0.038	0.021	0.000
American Stores	0.038	0.031	0.129	0.020	0.047
AT&T	0.016	0.019	0.031	0.007	0.006
Bristol Myers	0.047	0.018	0.061	0.041	0.006
Burlington Industries	0.004	0.006	0.057	0.002	0.035
Burroughs	0.017	0.004	0.018	0.012	0.002
Celanese	0.089	0.043	0.009	0.011	0.008
Chessie Systems	0.045	0.018	0.065	0.029	0.018
Cluett Peabody	0.033	0.005	0.009	0.007	0.000
Columbia Pictures	0.008	0.029	0.039	0.000	0.044
Commonwealth Edison	0.013	0.034	0.010	0.002	0.002
Federated Dept. Stores	0.010	0.010	0.030	0.016	0.064
General Foods	0.013	0.030	0.060	0.004	0.024
I.B.M.	0.057	0.000	0.082	0.048	0.000
R.H. Macy's	0.000	0.004	0.013	0.016	0.002
Munsingwear	0.009	0.000	0.000	0.000	0.036
Pacific Gas & Electric	0.018	0.008	0.031	0.010	0.002
Pan American Air Lines	0.013	0.024	0.034	0.003	0.004
Safeway Stores	0.028	0.014	0.112	0.010	0.072
Standard Brands	0.016	0.005	0.051	0.017	0.040
J.P. Stevens	0.040	0.037	0.010	0.013	0.012
Twentieth Century Fox	0.006	0.021	0.033	0.007	0.003
Union Oil of CA	0.041	0.000	0.026	0.028	0.007

TABLE 16 (CONT.)
PARTIAL COEFFICIENTS OF DETERMINATION
DURABLE GOODS GROUP

COMPANY NAME	$r^2_{iIn.m}$	$r^2_{i\ P.m}$	$r^2_{iIo.m}$	$r^2_{i\ E.m}$	$r^2_{i\ M.m}$
Allied Chemical	0.019	0.000	0.018	0.043	0.064
Armco Steel	0.000	0.011	0.000	0.007	0.036
Boeing	0.018	0.046	0.017	0.015	0.019
Caterpiller Tractor	0.002	0.040	0.000	0.003	0.000
Chicago Pneumatic	0.022	0.048	0.006	0.006	0.013
Chrysler	0.004	0.010	0.000	0.007	0.000
Clark Equipment	0.012	0.012	0.015	0.114	0.026
Crown Zellerbach	0.004	0.017	0.008	0.008	0.059
Dupont	0.048	0.000	0.030	0.010	0.008
General Cable	0.000	0.018	0.004	0.002	0.019
General Motors	0.019	0.003	0.000	0.000	0.000
General Signal	0.006	0.062	0.005	0.006	0.014
International Paper	0.000	0.013	0.000	0.003	0.020
Joy Manufacturing	0.030	0.001	0.029	0.015	0.008
Kennecott Copper	0.048	0.019	0.034	0.034	0.032
McGraw Hill	0.013	0.002	0.019	0.029	0.010
Phelps Dodge	0.019	0.002	0.024	0.033	0.011
Pullman	0.009	0.037	0.005	0.001	0.006
Revere Copper & Brass	0.003	0.015	0.000	0.004	0.010
U.S. Steel	0.000	0.000	0.005	0.010	0.045
United Technology	0.000	0.028	0.000	0.000	0.005

five (5) (23.8%) of the firms at the .10 level. A statistical summary of the results can be found on Table 17 and Table 18.

We can conclude from the above results that the market model as traditionally measured by using the Standard & Poor's stock index of returns does not include all the expectations of future economic outcomes that investors use to determine the returns of many firms. The cuase of this inefficiency is probably due to the fact the Standard & Poor's index is not a good surrogate measure of the ideal market portfolio and could possibly be improved by including additional indexes to help explain unique characteristics of individual firms.

Security Returns, Market Returns and Multi-Economic Indexes

The objective of this testing was to see (1) if the expectations of economic processes used by investors to determine security returns is fully measured by the single index capital asset model, and (2) what economic processes' expectations can be used to improve the market model.

The results on Table 19 clearly show that every firm in the sample is improved by including at least one (1) economic index in the market model.

The average improvement in the adjusted R^2 of the single index market model was .0494, that is, the adjusted R^2 improved from .1473 to .1914. This is a

TABLE 17
SUMMARY OF PARTIAL COEFFICIENT OF DETERMINATION
RESULTS FOR ALL SECURITIES

INDEX	NUMBER OF FIRMS SIGNIFICANT .10 LEVEL	.05 LEVEL
Profitability	3	0
Investment Narrow	10	8
Investment Broad	8	2
Employment	2	0
Money and Credit	7	2

TABLE 18
SUMMARY OF PARTIAL COEFFICIENT OF DETERMINATION
RESULTS BY GROUP

GROUP	NUMBER OF FIRMS SIGNIFICANT .10 LEVEL	.05 LEVEL	TOTAL
Non Durable Goods	7	9	16
Durable Goods	7	4	11
Total	14	13	27

TABLE 19

BEST SET OF ECONOMIC INDEXES AND MARKET PORTFOLIO FOR SECURITY i

NON-DURABLE GOODS

COMPANY NAME	m	P	I_n	I_o	E	M	$\bar{R}^2_{Im}$	$\bar{R}^2_m$	$\bar{R}^2_{Im}/\bar{R}^2_m$	$\bar{R}^2_{Im}-\bar{R}^2_m$
American Air Lines	*	*				*	.245	.208	1.178	.037
American Home Products	*		*				.217	.196	1.107	.021
American Stores	*	*		*	*	*	.233	.049	4.755	.184
AT&T	*	*	*				.272	.240	1.133	.032
Bristol Myers	*	*		*	*	*	.251	.159	1.579	.092
Burlington Industries	*			*			.150	.110	1.364	.040
Burroughs	*			*			.053	.048	1.104	.005
Celanese		*	*		*		.147	.065	2.262	.082
Chessie Systems	*	*		*	*	*	.209	.122	1.713	.087
Cluett Peabody	*		*				.250	.234	1.068	.016
Columbia Pictures	*	*	*		*	*	.162	.080	2.025	.082
Commonwealth Edison	*	*	*				.192	.138	1.391	.054
Federated Dept. Stores	*	*			*	*	.238	.164	1.451	.074
General Foods	*	*		*	*	*	.163	.083	1.964	.080
I.B.M.	*	*		*	*	*	.298	.217	1.373	.081
R.H. Macy's	*				*		.214	.210	1.019	.004
Munsingwear	*	*	*		*	*	.138	.100	1.380	.038
Pacific Gas & Electric	*	*	*				.097	.078	1.244	.019
Pan American Air Lines	*	*		*			.265	.227	1.167	.038
Safeway Stores	*	*		*	*	*	.218	.087	2.506	.131
Standard Brands	*	*		*	*	*	.181	.133	1.361	.048
J.P. Stevens	*	*	*		*	*	.245	.189	1.296	.056
Twentieth Century Fox	*	*		*			.167	.135	1.237	.032
Union Oil of CA	*	*	*		*	*	.111	.070	1.586	.041

Average Increase of $\bar{R}^2$ .05725

*Included in best explanatory index regression

TABLE 19 (CONT.)

BEST SET OF ECONOMIC INDEXES AND MARKET PORTFOLIO FOR SECURITY i

DURABLE GOODS

COMPANY NAME	m	P	I_n	I_o	E	M	$\bar{R}^2_{Im}$	$\bar{R}^2_m$	$\bar{R}^2_{Im}/\bar{R}^2_m$	$\bar{R}^2_{Im}-\bar{R}^2_m$
Allied Chemical	*	*		*	*	*	.210	.099	2.121	.111
Armco Steel	*	*			*	*	.213	.179	1.190	.034
Boeing	*	*			*		.125	.093	1.344	.032
Caterpiller Tractor	*	*			*		.282	.247	1.142	.035
Chicago Pneumatic	*	*	*		*	*	.301	.173	1.740	.128
Chrysler	*	*			*		.211	.205	1.029	.006
Clark Equipment	*				*		.194	.122	1.590	.072
Crown Zellerbach	*	*			*	*	.196	.121	1.620	.075
Dupont	*		*		*	*	.227	.165	1.291	.062
General Cable	*	*				*	.112	.087	1.287	.035
General Motors	*		*				.311	.306	1.016	.005
General Signal	*	*		*			.227	.185	1.227	.042
International Paper	*	*				*	.233	.213	1.094	.020
Joy Manufacturing	*		*				.184	.169	1.089	.015
Kennecott Copper	*		*				.035	0	∞	.035
McGraw Hill	*	*			*		.261	.241	1.083	.020
Phelps Dodge	*			*	*		.047	.025	1.840	.022
Pullman	*	*	*				.111	.054	2.055	.057
Revere Copper & Brass	*	*				*	.064	.056	1.143	.008
U.S. Steel	*		*		*	*	.188	.150	1.207	.038
United Technology	*	*				*	.163	.146	1.116	.017

Average Increase of $\bar{R}^2$ .0403

*Included in best explanatory index regression

percentage increase of 33.53% in explanatory power.

The economic index included most often in the best set of indexes for a firm was the profitability index (33 or 73.3% of the firms), followed by the investment index (31 or 68.9% of the firms where the broad investment index was selected for 17 or 37.8% of the firms, and the narrow investment index for 14 or 31.1% of the firms), the employment index (26 or 57.8% of the firms), and the money and credit index (23 or 51.1% of the firms).

When indexes are clustered by type with their respective firms on Table 20 and industry groups are listed with indexes on Table 21, it can be observed that the best set of explanatory indexes varies across firms and industries. This result implies that different variables are used by investors to form their expectations for various securities, and this information seems to vary within industries as well as between industries. Further research in this area is needed due to the small number of firms within each industry grouping.

The results of the sub-groupings showed some differences. The non-durable goods group adjusted R^2 was increased by .05725 while the durable goods group adjusted R^2 was increased by .0494. The number of indexes included with the market model was slightly more for the non-durable goods group (2.79 indexes per security) as compared to the durable goods group (2.19 indexes per security). This

TABLE 20

COMPANIES CLUSTERED BY INDEX

INDEXES	COMPANY NAME	INDUSTRY
P	American Air Lines	Transportation - Air
P	AT&T	Utilities (Electric)
P	Commonwealth Edison	Utilities (Electric)
P	Joy Manufacturing	Machinery (Specialty)
P	McGraw Hill	Publishing
P	Pacific Gas & Electric	Utilities (Electric)
P	Pan American Air Lines	Transportation - Air
P	Revere Copper & Brass	Metal Fabricating
P	Standard Brands	Foods (Processed)
P	Twentieth Century Fox	Entertainment
P	United Technologies	Aerospace
I_n	Cluett Peabody	Textile (Apparel Manufacturer)
I^n	General Motors	Automobiles
I^n_n	Macy's (R.H.)	Retail Stores (Department)
PI_o	Caterpiller Tractor	Machinery (Construction & Materials Handling)
PI_o	General Foods	Foods (Processed)
PI_n	Chessie Systems	Transportation (Rail)
PI^n_n	Pullman, Inc.	Railroad Equipment
PM	American Home Products	Drugs
PM	Burlington Industries	Textiles Products
PM	Federated Dept. Stores	Retail Stores (Department)
PM	General Cable	Metal Fabricating
PM	General Signal	Railroad Equipment
PE	Bristol Myers	Drugs
PI_nE	Boeing	Aerospace
PI^nE	Celanese	Textile Synthetics
PI^n_nE	Chrysler	Automobile
PI_nM	Stevens (J.P.)	Textile Products
PI^n_nM	Union Oil of CA	Oil-Integrated Domestic
PI_oE	American Stores	Retail Stores (Food)

TABLE 20 (CONT.)

INDEXES	COMPANY NAME	INDUSTRY
$PI_{n}M$	Armco Steel	Steel
$PI^{o}M$	Crown Zellerbach	Paper
$PI^{o}M$	I.B.M.	Office & Business Equipment
$PI^{o}M$	International Paper	Paper
$PI^{o}_{o}M$	Safeway Stores	Retail Stores (Food)
$PI_{n}EM$	Allied Chemical	Chemicals
$PI^{n}EM$	Chicago Pneumatic	Machinery (Industrial)
$PI^{n}EM$	Columbia Pictures	Entertainment
$PI^{n}_{n}EM$	U.S. Steel	Steel
$I_{n}E$	Clark Equipment	Machinery (Construction & Materials Handling)
$I_{n}M$	Dupont	Chemicals
$I^{n}_{n}M$	Munsingwear	Textile (Manufacturing)
NONE	Burroughs	Office & Business Equipment
NONE	Kennecott Copper	Copper
NONE	Phelps Dodge	Copper

TABLE 21
INDUSTRY GROUPINGS

INDUSTRY	COMPANY NAME	INDEXES
Aerospace	Boeing	P, I_n, E
	United Technologies	P
Automobiles	Chrysler	P, I_n, E
	General Motors	I_n
Chemicals	Allied Chemical	P, I_n, E, M
	Dupont	I_n, M
Copper	Kennecott Copper	NONE
	Phelps Dodge	NONE
Drugs	American Home Products	P, M
	Bristol Myers	P, E
Entertainment	Columbia Pictures	P, I_n, E, M
	Twentieth Century Fox	P
Foods (Processed)	General Foods	P, I_o
	Standard Brands	P
Machinery (Construction & Materials Handling)	Caterpiller Tractor	P, I_o
	Clark Equipment	I_n, E
Machinery (Industrial)	Chicago Pneumatic	P, I_n, E, M
Machinery (Specialty)	Joy Manufacturing	P
Metal Fabricating	General Cable	P, M
	Revere Copper & Brass	P

TABLE 21 (CONT.)

INDUSTRY	COMPANY NAME	INDEXES
Office & Business Equipment	Burroughs	NONE
	I.B.M.	P, I_o, M
Oil Integrated Domestic	Union Oil of CA	P, I_n, M
Paper	Crown Zellerbach	P, I_o, M
	International Paper	P, I_o, M
Publishing	McGraw Hill	P
Railroad Equipment	General Signal	P, M
	Pullman, Inc.	P, I_n
Retail Stores (Department)	Federated Dept. Stores	P, M
	R.H. Macy's	I_n
Retail Stores (Food)	American Stores	P, I_o, E
	Safeway Stores	P, I_o, M
Steel	Armco Steel	P, I_o, M
	U.S. Steel	P, I_n, E, M
Textile (Apparel Manufacturer)	Cluett Peabody	I_n
	Munsingwear	I_n, M
Textile Products	Burlington Industries	P, M
	J.P. Stevens	P, I_n, M
Transportation (Air)	American Air Lines	P
	Pan American Air Lines	P
Transportation (Rail)	Chessie Systems	P, I_n

TABLE 21 (CONT.)

INDUSTRY	COMPANY NAME	INDEXES
Utilities (Electric)	Commonwealth Edison	P
	Pacific Gas & Electric	P
Utilities (Telephone)	AT&T	P

seems to imply the market model is less representative of the non-durable goods sector of the economy than the durable goods sector.

The results of this section imply that the single index market model that is currently used to measure a firm's systematic risk is not an ex-ante efficient portfolio, and therefore does not fully measure investor expectations of an individual firm's systematic risk. We can conclude that either an improved single index be found or a multi-index model be used.

CHAPTER 7.
SUMMARY AND IMPLICATIONS

I have shown in this study that Turnbull's model is correct as borne out by the empirical results. It was proven that market and security returns are a function of investor expectations of future economic outcomes, that expectations of economic outcomes used by investors vary across firms and industries, and that currently used market returns indexes, as measured by the Standard & Poor's Index and indexes employed in the capital asset pricing model, are either ex-ante inefficient or a multi-index model must be used.

Specifically, I tested Turnbull's model using 39 cyclical leading economic variables as defined by the National Bureau of Economic Research, the Standard & Poor's 500 Stock Index, and a security sample of 45 security returns selected from 26 industries for a test period of January, 1955 to December, 1975. The empirical data was in a percentage change format on a quarterly basis. Further, the economic variables were lead and lagged three (3) periods when tested versus market returns.

I showed that market returns are significantly related to 16 economic series which represented four (4) general economic processes: profits, investment, employment, and money and credit. Because no single economic series had a high explanatory value, indexes were formed to represent

the four (4) economic processes. Five (5) methods of index formation were tested during this process. The best index formation method was the coefficient of determination method which explained 38.65% of the market's return.

I then proceeded to test if individual firm's security returns are a function of the same set of economic indexes used for market returns. The results showed that 42 of the 45 securities in the sample were significantly related to the economic indexes. The three (3) firms were Burroughs, Kennecott Copper, and Phelps Dodge. Additionally, Kennecott Copper and Phelps Dodge were found not to be significantly related to market returns at the .05 level of significance. Further research in this area is required to find out what risk characteristics these firms have that are unique from other firms.

The best explanatory economic index was profitability followed by both forms of investment index, money and credit, and employment. The explanatory power of each specific index varied across securities as well as across industries. The average explanatory power of the economic indexes was less than the explanatory power of market returns, but for 12 firms, the explanatory power was better than, or equal to, that of market returns. In fact, when I tested for correlation differences using Fisher's Z transformation test, the hypothesis that a

single economic index's correlation with security returns is the same as the market's correlation could not be rejected at all levels of significance. This result clearly shows that returns are a function of investor expectations of future economic outcomes.

I then tested to see if investor expectations of security returns are fully measured by market returns as the single index capital asset pricing model states. When I added economic indexes to the model the explanatory power was increased for every single security in the sample. These empirical results reject the use of the generally used measure of market returns in testing the single index capital asset pricing mode. The currently used measures are not ex-ante efficient and either an improved index needs to be formed or multi-indexes should be used. My results clearly support Roll's paper critiquing the methodologies used to test the single index model.

Implications for Further Research

This study focused on empirically testing Turnbull's multi-period model. The paper successfully showed that market returns of a firm's assets are determined by investor expectations of future economic outcomes. The research raised many questions which were not answered.

Since the economic variable selection criteria did restrict the sample to 39 variables, can the inclusion of the other remaining variables (coincidental and lagging)

improve the test results? The methodology restricted each economic process to a single time period. The use of multiple time periods by applying distributed-lag models can possibly improve the explanatory power of the indexes. Further, if multiple time periods are found significant, the regression coefficients could possibly give us insight into the values investors assign to certainty equivalent coefficients. In addition, tests need to be done to see if the coefficients are stable over time.

The paper showed security returns were a function of various indexes and the best set of indexes varied across firms. Further research is needed to test if the best set of indexes differ by economic environment. Does the best set differ between an expansion period and a recession period, or different periods where governmental policy has changed?

The security sample represented 26 industries, but no more than two (2) securities from any one (1) industry. This study showed economic indexes varied across securities. A study is necessary to test if the economic indexes vary within an industry.

My results showed that investor expectations of future economic outcomes are incorporated within security returns. Econometric model builders can possibly use this measure of future expectations to improve their forecasts of future economic movements. Corporate planners can also use these results to improve their forecasts.

With the inclusion of my study, empirical papers have shown that ex-post accounting returns are significantly related to ex-ante market returns; security market returns are significantly related to market portfolio returns though additional research is needed to understand why two (2) of the firms in my sample were not significant in their relationship to markets returns; and market returns are significantly related to future economic outcomes. To complete the analysis, accounting returns should be tested in the correctly specified form. Accounting variables should lag market returns. Further, these accounting returns should be examined to test their relationship with economic outcomes. The set of economic variables that are related to accounting returns should be the same as for security returns. This would test Myer's hypotheses.

Another area of future research that needs to be explored is the classification methods of NBER. They classify economic variables relative to the business cycle. Would their classifications be the same if they were tested relative to market returns? The validity of NBER's index methodology was questioned in this paper. Can an improved index methodology be found that will increase its explanatory power?

The last area of further research that I wish to comment on is the better performance of inflation adjusted measures of economic performance. During the

selection process all significant inflation adjusted measures were preferred to their unadjusted measures. Inflation during my sample period was not extremely high as it has been recently. This raises the question whether investors use inflation adjusted economic variables to form their expectations during periods of high inflation.

I have discussed many areas of future research. These research suggestions need to be explored to improve our understanding of the relationship between accounting returns, market returns, and economic movements.

APPENDIX

LIST OF SYMBOLS

SYMBOL	DEFINITION
P	Profitability Index
I_o	Investment (Narrow)
I_n	Investment (Broad)
M	Money and Credit Index
E	Employment Index
D.W.	Durbin Watson Statistic
S.R.	Studentized Range Statistic
$\bar{R}^2$	Adjusted R^2 Statistic
t	Time
R_{mt}	Return of Market Index in Time Period t
r	Correlation
R_{it}	Return of Security i in Time Period t
r^2	Coefficient of Determination
P_o	Preliminary Profitability Index

TABLE 22

MARKET RETURNS AND ECONOMIC VARIABLE REGRESSION RESULTS

$R_{mt} = b_o + b_1 Var_{i,\ t+Q}$ — 84 Observations

SERIES NUMBER	ECONOMIC VARIABLE SERIES TITLE	b_1 COEFFICIENT	t_{b1} VALUE	CORRELATION VALUE	DURBIN WATSON	STANDARD ERROR OF ESTIMATE
1	Average Work Week of Production Workers	.49573	.51461	.25673	1.69291	.08276
2	Accession Rate	.22335	2.26221	.24237	1.76541	.08042
3	Layoff Rate	-.04014	-.78487	.08635	1.70755	.08258
6	Value of Manufacturer's New Orders, Durable Goods, Current Dollars	-.11108	-.68094	-.07498	1.63574	.07498
7	Value of Manufacturer's New Orders, Durable Goods, 1972 Dollars	-.01246	-.07658	-.00848	1.66691	.08289
8	Value of Manufacturer's New Orders, Consumer Goods & Materials in 1972 Dollars	.22242	1.26391	.13823	1.73910	.08209
10	Contracts and Orders for Plant and Equipment, Current Dollars	-.08047	-.97222	-.10675	1.60315	.08242
12	Index of Net Business Formation	.93427	2.21672	.23777	1.78158	.08051
13	Number of New Business Incorporations	.26663	1.37208	.14981	1.74967	.08196
14	Current Liabilities of Business Failures	-.01093	-.45744	-.05045	1.69308	.08279
15	Profits After Taxes per Dollar of Sales, All Manufacturing Corporations	-.14500	-1.19477	.08131	1.69394	.07335
16	Corporate Profits After Taxes, Current Dollars	-.10513	-.79956	-.13080	1.74091	.06802
17	Ratio Price to Unit Labor Cost, Non-Farm Business	-1.10861	-2.27243	-.24340	1.66062	.08040
18	Corporate Profits After Taxes, 1972 Dollars	-.06754	-.51170	-.08795	1.75482	.06792
20	Contracts, Orders, Plant Equipment, 1972 Dollars	-.05357	-.57471	-.06333	1.62443	.08272

TABLE 22 (CONT.)

SERIES NUMBER	ECONOMIC VARIABLE SERIES TITLE	b_1 COEFFICIENT	t_{b1} VALUE	CORRELATION VALUE	DURBIN WATSON	STANDARD ERROR OF ESTIMATE
23	Index of Spot Market Prices, Raw Industrial Material	-.01216	-.06605	-.00729	1.67320	.08289
24	Value of Manufacturer's New Orders, Capital Goods Non-Defense, Current Dollars	-.11545	-1.46866	-.16009	1.58162	.08182
25	Change in Manufacturer's Unfilled Orders, Durable Goods Industries	.00016	.13548	.01496	1.66547	.08288
27	Value of Manufacturer's New Orders, Capital Goods Non-Defense, 1972 Dollars	-.10077	-1.11705	-.12242	1.59113	.08227
28	New Private Housing	.27522	3.26038	.28876	1.79829	.07799
29	Index of New Private Housing Authorized by Local Building Permits	.20802	2.53524	.26960	1.84109	.07982
30	Gross Private Domestic Investment, Change in Business Inventories, All Industries, 1972 Dollars	.00030	.10621	.01172	1.78897	3.15396
31	Change in Book Value Manufacturing Trade Inventories	-.00098	-.39770	-.04387	1.68210	.08281
32	Vendor Performance, % of Companies Receiving Slow Deliveries	-.01944	-.48484	-.05346	1.65954	.08277
34	Net Cash Flow, Corporate, Current Dollars	-.12933	-.64092	-.07060	1.75936	.41079
35	Net Cash Flow, Corporate, 1972 Dollars	-.08742	-.44534	-.049121	1.76350	.04568
36	Net Change in Inventories On Hand, On Order, 1972 Dollars	.00397	1.30099	.14221	1.69847	.08205
36a	Smoothed	.00014	1.00992	.11084	1.64380	.08238

TABLE 22 (CONT.)

SERIES NUMBER	ECONOMIC VARIABLE SERIES TITLE	b_1 COEFFICIENT	t_{b1} VALUE	CORRELATION VALUE	DURBIN WATSON	STANDARD ERROR OF ESTIMATE
54	Sales Retail Stores, Current Dollars	-.05428	-.10849	-.01198	1.67117	.08288
89	Gross Private Domestic Fix Investment, Total Residential, 1972 Dollars	.25909	1.50319	.16375	1.91811	.05139
92a	Change in Sensitive Crude Material Prices (Smoothed)	.00455	1.51282	.16478	1.68699	.08176
93	Free Reserves	-.00046	-.69514	-.07654	1.67865	.08265
104	Change in Total Liquid Assets	.00701	1.75634	.19040	1.70967	.08137
104a	Smoothed	.02989	1.43719	.15674	1.76139	.08187
105	Money Supply M1-B, 1972 Dollars	3.84194	4.22130	.42251	2.02160	.07513
106	Money Supply M2, 1972 Dollars	3.32204	4.05947	.40906	1.96332	.07564
110	Total Funds Raised, Private Non-Financial Borrowers Credit Market	.03201	.49418	.05449	1.81589	.13841
112	Net Change in Bank Loans to Businesses	-.00012	-.20362	-.02248	1.67628	.08287
113	Net Change in Consumer Credit	-.00080	-.29911	-.03301	1.66972	.08285

TABLE 23

MARKET RETURNS AND ECONOMIC VARIABLE REGRESSION RESULTS

$R_{mt} = b_o + b_1 Var_{i, t+1}$ 83 Observations

SERIES NUMBER	ECONOMIC VARIABLE SERIES TITLE	b_1 COEFFICIENT	t_{b1} VALUE	CORRELATION VALUE	DURBIN WATSON	STANDARD ERROR OF ESTIMATE
1	Average Work Week of Production Workers	3.61805	4.07131	.41215	1.99503	.07476
2	Accession Rate	.26124	2.68895	.28626	1.94661	.07861
3	Layoff Rate	-.19368	-4.17520	-.42087	1.95477	.07443
6	Value of Manufacturer's New Orders, Durable Goods, Current Dollars	.54449	3.38171	.35173	1.74386	.07681
7	Value of Manufacturer's New Orders, Durable Goods, 1972 Dollars	.58108	3.68190	.37864	1.30082	.07594
8	Value of Manufacturer's New Orders, Consumer Goods & Materials in 1972 Dollars	.68497	4.18096	.42130	1.93126	.07441
10	Contracts and Orders for Plant and Equipment, Current Dollars	.16119	1.91304	.20791	1.75285	.08026
12	Index of Net Business Formation	1.99318	5.27253	.50548	2.12193	.07079
13	Number of New Business Incorporations	.51294	2.75716	.29291	1.88327	.07845
14	Current Liabilities of Business Failures	-.01438	-.60840	-.06744	1.73515	.08186
15	Profits After Taxes per Dollar of Sales, All Manufacturing Corporations	.043369	3.78600	.38775	1.87040	.07291
16	Corporate Profits After Taxes, Current Dollars	.37550	2.91933	.30854	1.91458	.06700
17	Ratio Price to Unit Labor Cost, Non-Farm Business	.99205	2.02582	.21959	1.72004	.08005
18	Corporate Profits After Taxes, 1972 Dollars	.40102	3.12132	.32766	1.95529	.06663
20	Contracts, Orders, Plant Equipment, 1972 Dollars	.23614	2.50255	.26789	1.80239	.07905

TABLE 23 (CONT.)

SERIES NUMBER	ECONOMIC VARIABLE SERIES TITLE	b_1 COEFFICIENT	t_{b1} VALUE	CORRELATION VALUE	DURBIN WATSON	STANDARD ERROR OF ESTIMATE
23	Index of Spot Market Prices, Raw Industrial Material	.32530	1.81925	.19813	1.75394	.08042
24	Value of Manufacturer's New Orders, Capital Goods Non-Defense, Current Dollars	.15204	1.87571	.20402	1.75373	.08032
25	Change in Manufacturer's Unfilled Orders, Durable Goods Industries	-.00135	-1.11369	-.12280	1.74692	.08143
27	Value of Manufacturer's New Orders, Capital Goods Non-Defense, 1972 Dollars	.22925	2.48018	.26567	1.80211	.07910
28	New Private Housing	.23896	2.81047	.30007	1.92619	.07832
29	Index of New Private Housing Authorized by Local Building Permits	.17930	2.18699	.23612	1.90038	.07973
30	Gross Private Domestic Investment, Change in Business Inventories, All Industries, 1972 Dollars	.00217	.75975	.08411	1.73954	3.15577
31	Change in Book Value Manufacturing Trade Inventories	.00645	1.66675	.18209	1.71691	.08068
32	Vendor Performance, % of Companies Receiving Slow Deliveries	.09916	2.56829	.27441	1.86591	.07890
34	Net Cash Flow, Corporate, Current Dollars	.55391	2.77801	.29493	1.89254	.04342
35	Net Cash Flow, Corporate, 1972 Dollars	.57804	2.98952	.31523	1.92797	.04447
36	Net Change in Inventories On Hand, On Order, 1972 Dollars	.00616	2.04919	.22200	1.84374	.08000
36a	Smoothed	-.00003	-.24663	-.02739	1.71719	.08202

TABLE 23 (CONT.)

SERIES NUMBER	ECONOMIC VARIABLE SERIES TITLE	b_1 COEFFICIENT	t_{b1} VALUE	CORRELATION VALUE	DURBIN WATSON	STANDARD ERROR OF ESTIMATE
54	Sales Retail Stores, Current Dollars	1.15540	2.41248	.25891	1.77681	.07925
89	Gross Private Domestic Fix Investment, Total Residential, 1972 Dollars	.69546	4.35684	.43572	1.94149	.05109
92a	Change in Sensitive Crude Material Prices (Smoothed)	.00229	.76306	.08448	1.75152	.08176
93	Free Reserves	.00018	.27620	.03067	1.72713	.08201
104	Change in Total Liquid Assets	-.00001	-.00439	.00048	1.72734	.08205
104a	Smoothed	.02702	1.30897	.14396	1.71626	.08119
105	Money Supply M1-B, 1972 Dollars	4.06679	4.56794	.45259	2.14842	.07316
106	Money Supply M2, 1972 Dollars	3.26759	4.03301	.40893	1.95337	.07487
110	Total Funds Raised, Private Non-Financial Borrowers Credit Market	.21006	3.44246	.35725	1.95659	.13869
112	Net Change in Bank Loans to Businesses	-.00016	-.25509	-.02833	1.72628	.08202
113	Net Change in Consumer Credit	-.00090	-.33771	-.03749	1.71717	.08199

TABLE 24

MARKET RETURNS AND ECONOMIC VARIABLE REGRESSION RESULTS

$R_{mt} = b_o + b_1 Var_{i,\ t+2}$ — 82 Observations

SERIES NUMBER	ECONOMIC VARIABLE SERIES TITLE	b_1 COEFFICIENT	t_{b1} VALUE	CORRELATION VALUE	DURBIN WATSON	STANDARD ERROR OF ESTIMATE
1	Average Work Week of Production Workers	2.42930	2.62347	.28145	1.97761	.07786
2	Accession Rate	.09316	.93084	.10351	1.70176	.08071
3	Layoff Rate	-.10995	-2.23479	-.24240	1.89569	.07872
6	Value of Manufacturer's New Orders, Durable Goods, Current Dollars	.32402	1.94708	.21270	1.86327	.07929
7	Value of Manufacturer's New Orders, Durable Goods, 1972 Dollars	.34935	2.12623	.23127	1.89523	.07894
8	Value of Manufacturer's New Orders, Consumer Goods & Materials in 1972 Dollars	.32606	1.86207	.20381	1.83354	.07944
10	Contracts and Orders for Plant and Equipment, Current Dollars	.10723	1.26765	.14032	1.67811	.08034
12	Index of Net Business Formation	1.08462	2.60644	.27977	1.84020	.07790
13	Number of New Business Incorporations	.34084	1.80489	.19780	1.77140	.07954
14	Current Liabilities of Business Failures	.00179	.07627	.00852	1.65575	.08114
15	Profits After Taxes per Dollar of Sales, All Manufacturing Corporations	.44170	3.91771	.40121	1.91420	.07325
16	Corporate Profits After Taxes, Current Dollars	.59193	5.09378	.49487	1.90325	.06742
17	Ratio Price to Unit Labor Cost, Non-Farm Business	1.39484	2.95590	.31378	1.79065	.07704
18	Corporate Profits After Taxes, 1972 Dollars	.61166	5.28213	.50850	1.94948	.06704
20	Contracts, Orders, Plant Equipment, 1972 Dollars	.14151	1.47552	.16276	1.70674	.08006

TABLE 24 (CONT.)

SERIES NUMBER	ECONOMIC VARIABLE SERIES TITLE	b_1 COEFFICIENT	t_{b1} VALUE	CORRELATION VALUE	DURBIN WATSON	STANDARD ERROR OF ESTIMATE
23	Index of Spot Market Prices, Raw Industrial Material	.31788	1.79700	.19697	1.76711	.07955
24	Value of Manufacturer's New Orders, Capital Goods Non-Defense, Current Dollars	.15646	1.94906	.21291	1.77238	.07928
25	Change in Manufacturer's Unfilled Orders, Durable Goods Industries	-.00122	-1.02113	-.11342	1.71876	.08062
27	Value of Manufacturer's New Orders, Capital Goods Non-Defense, 1972 Dollars	.21146	2.29348	.24838	1.83722	.07860
28	New Private Housing	.03823	.43453	.04852	1.68427	.08105
29	Index of New Private Housing Authorized by Local Building Permits	.12036	1.46113	.16122	1.68204	.08008
30	Gross Private Domestic Investment, Change in Business Inventories, All Industries, 1972 Dollars	.00097	.34344	.03837	1.66309	3.17480
31	Change in Book Value Manufacturing Trade Inventories	.00259	.66747	.07441	1.66104	.08092
32	Vendor Performance, % of Companies Receiving Slow Deliveries	.14331	3.94359	.40343	1.89478	.07425
34	Net Cash Flow, Corporate, Current Dollars	.80060	4.30494	.43368	1.88457	.04368
35	Net Cash Flow, Corporate, 1972 Dollars	.82810	4.62541	.45834	1.93652	.04473
36	Net Change in Inventories On Hand, On Order, 1972 Dollars	.00371	1.22803	.13602	1.65399	.08039
36a	Smoothed	.00008	.63821	.07117	1.65982	.08094

TABLE 24 (CONT.)

SERIES NUMBER	ECONOMIC VARIABLE SERIES TITLE	b_1 COEFFICIENT	t_{b1} VALUE	CORRELATION VALUE	DURBIN WATSON	STANDARD ERROR OF ESTIMATE
54	Sales Retail Stores, Current Dollars	.84055	1.74487	.19147	1.76326	.07964
89	Gross Private Domestic Fix Investment, Total Residential, 1972 Dollars	.62553	3.88789	.39864	1.99529	.05139
92a	Change in Sensitive Crude Material Prices (Smoothed)	-.00039	-.13291	-.01485	1.65344	.08113
93	Free Reserves	.00046	.69999	.07802	1.65018	.08090
104	Change in Total Liquid Assets	-.01935	-2.16809	-.23557	1.74856	.07886
104a	Smoothed	-.03940	-1.94627	-.21262	1.63245	.07929
105	Money Supply M1-B, 1972 Dollars	1.88072	1.94030	.21200	1.78504	.07930
106	Money Supply M2, 1972 Dollars	.89102	1.02096	.11341	1.69250	.08062
110	Total Funds Raised, Private Non-Financial Borrowers Credit Market	.17323	2.80651	.29938	1.98044	.13936
112	Net Change in Bank Loans to Businesses	.00022	.35329	.03946	1.65027	.08108
113	Net Change in Consumer Credit	.00395	1.51480	.16698	1.69607	.08000

TABLE 25

MARKET RETURNS AND ECONOMIC VARIABLE REGRESSION RESULTS

$R_{mt} = b_o + b_1 \, Var_{i,\, t+3}$ — 81 Observations

SERIES NUMBER	ECONOMIC VARIABLE SERIES TITLE	b_1 COEFFICIENT	t_{b1} VALUE	CORRELATION VALUE	DURBIN WATSON	STANDARD ERROR OF ESTIMATE
1	Average Work Week of Production Workers	1.05258	1.10893	.12380	1.74194	.07978
2	Accession Rate	-.06590	-.66187	.07424	1.66230	.08017
3	Layoff Rate	-.02400	-.47508	.05337	1.73312	.08028
6	Value of Manufacturer's New Orders, Durable Goods, Current Dollars	.1869	1.11118	.12405	1.77199	.07978
7	Value of Manufacturer's New Orders, Durable Goods, 1972 Dollars	.20788	1.25281	.13957	1.78859	.07961
8	Value of Manufacturer's New Orders, Consumer Goods & Materials in 1972 Dollars	.00996	.05603	.00630	1.69947	.08039
10	Contracts and Orders for Plant and Equipment, Current Dollars	-.08445	-.99917	-.11171	1.61742	.07989
12	Index of Net Business Formation	-.45036	-1.05379	-.11773	1.63190	.07984
13	Number of New Business Incorporations	-.03885	-.20334	-.02287	1.69394	.08038
14	Current Liabilities of Business Failures	-.00070	-.03014	-.00339	1.69603	.08040
15	Profits After Taxes per Dollar of Sales, All Manufacturing Corporations	-.02409	-.19756	-.02222	1.68145	.07368
16	Corporate Profits After Taxes, Current Dollars	.08628	.65284	.07325	1.74735	.06783
17	Ratio Price to Unit Labor Cost, Non-Farm Business	.04446	.09030	.01015	1.70079	.08039
18	Corporate Profits After Taxes, 1972 Dollars	.11067	.83416	.09344	1.76640	.06745
20	Contracts, Orders, Plant Equipment, 1972 Dollars	-.08271	-.85948	-.09625	1.62371	.08002

TABLE 25 (CONT.)

SERIES NUMBER	ECONOMIC VARIABLE SERIES TITLE	b_1 COEFFICIENT	t_{b1} VALUE	CORRELATION VALUE	DURBIN WATSON	STANDARD ERROR OF ESTIMATE
23	Index of Spot Market Prices, Raw Industrial Material	.25049	1.4079	.15645	1.76033	.07941
24	Value of Manufacturer's New Orders, Capital Goods Non-Defense, Current Dollars	.01637	.20122	.02263	1.71362	.08038
25	Change in Manufacturer's Unfilled Orders, Durable Goods Industries	-.00183	-1.55574	-.17241	1.63816	.07919
27	Value of Manufacturer's New Orders, Capital Goods Non-Defense, 1972 Dollars	.03812	.40466	.04548	1.73269	.08031
28	New Private Housing	-.05328	-.60982	-.06844	1.71067	.08021
29	Index of New Private Housing Authorized by Local Building Permits	-.10824	-1.32153	-.14706	1.70206	.07952
30	Gross Private Domestic Investment, Change in Business Inventories, All Industries, 1972 Dollars	.00114	.40589	.04561	1.68189	3.19458
31	Change in Book Value Manufacturing Trade Inventories	-.00308	-.30178	-.08984	1.66475	.08007
32	Vendor Performance, % of Companies Receiving Slow Deliveries	.00834	.21194	.02383	1.70968	.08037
34	Net Cash Flow, Corporate, Current Dollars	.11013	.53901	.06053	1.73208	.04391
35	Net Cash Flow, Corporate, 1972 Dollars	.17817	.89670	.10037	1.76598	.04501
36	Net Change in Inventories On Hand, On Order, 1972 Dollars	-.00552	-1.86691	-.20556	1.63866	.07868
36a	Smoothed	.00007	.50403	.05661	1.69242	.08027

TABLE 25 (CONT.)

SERIES NUMBER	ECONOMIC VARIABLE SERIES TITLE	b_1 COEFFICIENT	t_{b1} VALUE	CORRELATION VALUE	DURBIN WATSON	STANDARD ERROR OF ESTIMATE
54	Sales Retail Stores, Current Dollars	.19846	.40512	.04553	1.71011	.08031
89	Gross Private Domestic Fix Investment, Total Residential, 1972 Dollars	.26632	1.55296	.17211	1.73590	.05163
92a	Change in Sensitive Crude Material Prices (Smoothed)	.00071	.21982	.02472	1.69633	.08037
93	Free Reserves	-.00030	-.46803	-.05258	1.68642	.08029
104	Change in Total Liquid Assets	-.01082	-1.19952	-.13374	1.78092	.07967
104a	Smoothed	-.01468	-.71763	-.08047	1.77015	.08014
105	Money Supply M1-B, 1972 Dollars	-.01563	-.01590	-.00178	1.69563	.08040
106	Money Supply M2, 1972 Dollars	-1.12447	-1.30324	-.14507	1.64813	.07955
110	Total Funds Raised, Private Non-Financial Borrowers Credit Market	.07674	1.20650	.13450	1.72184	.14002
112	Net Change in Bank Loans to Businesses	-.00026	-.43688	-.04909	1.70535	.08030
113	Net Change in Consumer Credit	.00382	1.47822	.16405	1.71817	.07931

TABLE 26

MARKET RETURNS AND ECONOMIC VARIABLE REGRESSION RESULTS

$R_{mt} = b_o + b_1 \, Var_{i,\, t-1}$ — 83 Observations

SERIES NUMBER	ECONOMIC VARIABLE SERIES TITLE	b_1 COEFFICIENT	t_{b1} VALUE	CORRELATION VALUE	DURBIN WATSON	STANDARD ERROR OF ESTIMATE
1	Average Work Week of Production Workers	-1.47877	-1.52035	-.16656	1.63886	.08224
2	Accession Rate	-.08725	-.085599	-.09468	1.61286	.08303
3	Layoff Rate	.07465	1.44756	.15879	1.63882	.08234
6	Value of Manufacturer's New Orders, Durable Goods, Current Dollars	-.13074	-.78870	-.08729	1.64250	.08308
7	Value of Manufacturer's New Orders, Durable Goods, 1972 Dollars	-.05449	-.33064	-.03671	1.63979	.08334
8	Value of Manufacturer's New Orders, Consumer Goods & Materials in 1972 Dollars	-.14145	-.78491	-.08688	1.62677	.08309
10	Contracts and Orders for Plant and Equipment, Current Dollars	.08505	1.01413	.11197	1.64083	.08288
12	Index of Net Business Formation	-.52596	-1.20806	-.13303	1.60487	.08266
13	Number of New Business Incorporations	.11477	.056727	.06290	1.64640	.08324
14	Current Liabilities of Business Failures	-.02805	-1.17415	-.12936	1.62159	.08270
15	Profits After Taxes per Dollar of Sales, All Manufacturing Corporations	-.07844	-.63831	-.07074	1.77391	.07377
16	Corporate Profits After Taxes, Current Dollars	-.09840	-.74328	-.08230	1.75041	.06842
17	Ratio Price to Unit Labor Cost, Non-Farm Business	-1.17693	-2.35242	-.25288	1.76555	.08065
18	Corporate Profits After Taxes, 1972 Dollars	-.08253	-.62191	-.06893	1.74763	.06832
20	Contracts, Orders, Plant Equipment, 1972 Dollars	.09133	.96985	.10714	1.64899	.08292

TABLE 26 (CONT.)

SERIES NUMBER	ECONOMIC VARIABLE SERIES TITLE	b_1 COEFFICIENT	t_{b1} VALUE	CORRELATION VALUE	DURBIN WATSON	STANDARD ERROR OF ESTIMATE
23	Index of Spot Market Prices, Raw Industrial Material	-.45672	-2.54138	-.27174	1.74061	.08026
24	Value of Manufacturer's New Orders, Capital Goods Non-Defense, Current Dollars	.06905	.86550	.09572	1.63269	.08302
25	Change in Manufacturer's Unfilled Orders, Durable Goods Industries	-.00098	-.83086	-.09192	1.65593	.08305
27	Value of Manufacturer's New Orders, Capital Goods Non-Defense, 1972 Dollars	.06984	.76603	.08480	1.63934	.08310
28	New Private Housing	.01256	.13706	.01522	1.65359	.08339
29	Index of New Private Housing Authorized by Local Building Permits	.14738	1.73668	.18947	1.69482	.08189
30	Gross Private Domestic Investment, Change in Business Inventories, All Industries, 1972 Dollars	.00193	.67100	.07435	1.77289	3.15024
31	Change in Book Value Manufacturing Trade Inventories	-.00598	-2.47658	-.26531	1.71171	.08041
32	Vendor Performance, % of Companies Receiving Slow Deliveries	-.04774	-1.12722	-.12427	1.67029	.08275
34	Net Cash Flow, Corporate, Current Dollars	-.22747	-1.12620	-.12416	1.73416	.04465
35	Net Cash Flow, Corporate, 1972 Dollars	-.17359	-.88201	-.09753	1.73495	.04596
36	Net Change in Inventories On Hand, On Order, 1972 Dollars	-.00295	-.95580	-.10560	1.61842	.08293
36a	Smoothed	-.00010	-.70805	-.07843	1.59645	.08314

TABLE 26 (CONT.)

SERIES NUMBER	ECONOMIC VARIABLE SERIES TITLE	b_1 COEFFICIENT	t_{b1} VALUE	CORRELATION VALUE	DURBIN WATSON	STANDARD ERROR OF ESTIMATE
54	Sales Retail Stores, Current Dollars	-.97342	-1.97072	-.21390	1.71950	.08147
89	Gross Private Domestic Fix Investment, Total Residential, 1972 Dollars	.11239	.63435	.07030	1.79003	.05117
92a	Change in Sensitive Crude Material Prices (Smoothed)	-.00030	.09805	-.01089	1.64125	.08340
93	Free Reserves	-.00055	-.81505	.09019	1.68494	.08306
104	Change in Total Liquid Assets	-.00365	.89772	.09925	1.69136	.08299
104a	Smoothed	.02415	1.14932	.12667	1.65626	.08273
105	Money Supply M1-B, 1972 Dollars	1.30727	1.29961	.14291	1.73722	.08254
106	Money Supply M2, 1972 Dollars	1.53392	1.72416	.18815	1.76299	.08191
110	Total Funds Raised, Private Non-Financial Borrowers Credit Market	-.04774	-.72960	-.08080	1.75316	.13845
112	Net Change in Bank Loans to Businesses	-.00042	-.66179	-.07333	1.65435	.08318
113	Net Change in Consumer Credit	.00183	.67558	.07469	1.62548	.08317

TABLE 27

MARKET RETURNS AND ECONOMIC VARIABLE REGRESSION RESULTS

$R_{mt} = b_o + b_1 Var_{i, t-2}$ 82 Observations

SERIES NUMBER	ECONOMIC VARIABLE SERIES TITLE	b_1 COEFFICIENT	t_{b1} VALUE	CORRELATION VALUE	DURBIN WATSON	STANDARD ERROR OF ESTIMATE
1	Average Work Week of Production Workers	-1.12948	-1.14428	-.12690	1.70737	.08206
2	Accession Rate	-.09150	-.90555	-.10072	1.72117	.08230
3	Layoff Rate	.06295	1.21202	.13428	1.72359	.08198
6	Value of Manufacturer's New Orders, Durable Goods, Current Dollars	-.00143	-.00857	-.00095	1.68562	.08272
7	Value of Manufacturer's New Orders, Durable Goods, 1972 Dollars	-.00092	-.00561	.05559	1.68545	.08272
8	Value of Manufacturer's New Orders, Consumer Goods & Materials in 1972 Dollars	-.18422	-1.02064	-.11337	1.71288	.08219
10	Contracts and Orders for Plant and Equipment, Current Dollars	.02540	.30128	.03366	1.68376	.08268
12	Index of Net Business Formation	-.77437	-1.80132	-.19743	1.70030	.08110
13	Number of New Business Incorporations	.21820	-1.06381	-.11810	1.64307	.08215
14	Current Liabilities of Business Failures	.03502	1.48506	.16379	1.66850	.08221
15	Profits After Taxes per Dollar of Sales, All Manufacturing Corporations	-.05207	-.41785	-.04666	1.82953	.07273
16	Corporate Profits After Taxes, Current Dollars	.04947	.35712	.03989	1.77993	.06543
17	Ratio Price to Unit Labor Cost, Non-Farm Business	-.42719	-.81721	-.09098	1.71089	.08238
18	Corporate Profits After Taxes, 1972 Dollars	.04877	.35432	.03958	1.78131	.06585
20	Contracts, Orders, Plant Equipment, 1972 Dollars	.02053	.21688	.02424	1.68304	.08270

TABLE 27 (CONT.)

SERIES NUMBER	ECONOMIC VARIABLE SERIES TITLE	b_1 COEFFICIENT	t_{b1} VALUE	CORRELATION VALUE	DURBIN WATSON	STANDARD ERROR OF ESTIMATE
23	Index of Spot Market Prices, Raw Industrial Material	-.57657	-3.29138	-.24534	1.87653	.07763
24	Value of Manufacturer's New Orders, Capital Goods Non-Defense, Current Dollars	.03312	.41703	.04657	1.68304	.08263
25	Change in Manufacturer's Unfilled Orders, Durable Goods Industries	-.00055	-.47112	-.05260	1.70026	.08261
27	Value of Manufacturer's New Orders, Capital Goods Non-Defense, 1972 Dollars	.03090	.34061	.03805	1.68089	.08266
28	New Private Housing	-.02007	-.21725	-.02428	1.68297	.08270
29	Index of New Private Housing Authorized by Local Building Permits	-.05102	-.59150	-.06598	1.66146	.08254
30	Gross Private Domestic Investment, Change in Business Inventories, All Industries, 1972 Dollars	.00197	.68989	.07690	1.80889	3.16717
31	Change in Book Value Manufacturing Trade Inventories	-.00165	-.66663	-.07432	1.71251	.08250
32	Vendor Performance, % of Companies Receiving Slow Deliveries	-.05054	-1.12932	-.12526	1.68825	.08207
34	Net Cash Flow, Corporate, Current Dollars	.11919	.57311	.06394	1.76689	.04353
35	Net Cash Flow, Corporate, 1972 Dollars	.12205	.60967	.06800	1.76765	.04521
36	Net Change in Inventories On Hand, On Order, 1972 Dollars	-.00172	-.55961	-.06244	1.70170	.08256
36a	Smoothed	.00020	1.45442	.16050	1.68390	.08165

TABLE 27 (CONT.)

SERIES NUMBER	ECONOMIC VARIABLE SERIES TITLE	b_1 COEFFICIENT	t_{b1} VALUE	CORRELATION VALUE	DURBIN WATSON	STANDARD ERROR OF ESTIMATE
54	Sales Retail Stores, Current Dollars	-1.11252	-2.27888	-.24689	1.77762	.08016
89	Gross Private Domestic Fix Investment, Total Residential, 1972 Dollars	.14759	.83303	.09273	1.79626	.05098
92a	Change in Sensitive Crude Material Prices (Smoothed)	-.00087	-.28644	-.03200	1.69548	.08268
93	Free Reserves	-.00096	-1.45312	-.16036	1.69400	.08165
104	Change in Total Liquid Assets	.00227	.56089	.06258	1.69688	.08256
104a	Smoothed	-.02077	-.99229	-.11048	1.62647	.08222
105	Money Supply M1-B, 1972 Dollars	-.29073	-.28678	-.03204	1.68116	.08268
106	Money Supply M2, 1972 Dollars	.28648	.31777	.03550	1.69377	.08267
110	Total Funds Raised, Private Non-Financial Borrowers Credit Market	-.04832	-.70158	-.07819	1.81960	.13130
112	Net Change in Bank Loans to Businesses	-.00034	-.55136	-.06152	1.69157	.08257
113	Net Change in Consumer Credit	-.00204	-.75960	-.08462	1.71555	.08243

TABLE 28

MARKET RETURNS AND ECONOMIC VARIABLE REGRESSION RESULTS

$R_{mt} = b_o + b_1 Var_{i,\ t-3}$ — 81 Observations

SERIES NUMBER	ECONOMIC VARIABLE SERIES TITLE	b_1 COEFFICIENT	t_{b1} VALUE	CORRELATION VALUE	DURBIN WATSON	STANDARD ERROR OF ESTIMATE
1	Average Work Week of Production Workers	.57283	.57079	.06408	1.67530	.08275
2	Accession Rate	-.03244	-.31047	-.03491	1.70479	.08287
3	Layoff Rate	.00114	.02159	.00242	1.69706	.08292
6	Value of Manufacturer's New Orders, Durable Goods, Current Dollars	-.16445	-.98675	-.11034	1.66735	.08241
7	Value of Manufacturer's New Orders, Durable Goods, 1972 Dollars	-.19773	-1.20117	-.13392	1.66036	.08217
8	Value of Manufacturer's New Orders, Consumer Goods & Materials in 1972 Dollars	-.08346	-.45331	-.05093	1.70211	.08281
10	Contracts and Orders for Plant and Equipment, Current Dollars	-.08302	-.62299	-.06992	1.69147	.08272
12	Index of Net Business Formation	.25395	.54436	.06113	1.68690	.08276
13	Number of New Business Incorporations	.09413	.45275	.05087	1.68055	.08281
14	Current Liabilities of Business Failures	.00396	.16322	.01836	1.70024	.08291
15	Profits After Taxes per Dollar of Sales, All Manufacturing Corporations	-.27829	-2.22698	-.24304	1.84464	.07104
16	Corporate Profits After Taxes, Current Dollars	-.15684	-1.12719	-.12581	1.80504	.06525
17	Ratio Price to Unit Labor Cost, Non-Farm Business	.57002	1.05381	.11773	1.70450	.08234
18	Corporate Profits After Taxes, 1972 Dollars	-.15131	-1.09781	-.12258	1.80447	.06590
20	Contracts, Orders, Plant Equipment, 1972 Dollars	-.06960	-.22836	-.08167	1.69046	.08264

TABLE 28 (CONT.)

SERIES NUMBER	ECONOMIC VARIABLE SERIES TITLE	b_1 COEFFICIENT	t_{b1} VALUE	CORRELATION VALUE	DURBIN WATSON	STANDARD ERROR OF ESTIMATE
23	Index of Spot Market Prices, Raw Industrial Material	-.36604	-2.17675	-.23787	1.85658	.08054
24	Value of Manufacturer's New Orders, Capital Goods Non-Defense, Current Dollars	-.07528	-.94960	-.10623	1.68908	.08245
25	Change in Manufacturer's Unfilled Orders, Durable Goods Industries	-.00086	-.73095	-.08196	1.69828	.08264
27	Value of Manufacturer's New Orders, Capital Goods Non-Defense, 1972 Dollars	-.10080	-1.11589	-.12456	1.68634	.08227
28	New Private Housing	.00301	.03237	.00364	1.69702	.08292
29	Index of New Private Housing Authorized by Local Building Permits	-.00321	-.03472	-.00390	1.69657	.08292
30	Gross Private Domestic Investment, Change in Business Inventories, All Industries, 1972 Dollars	-.00027	-.09658	-.01086	1.81163	3.18686
31	Change in Book Value Manufacturing Trade Inventories	.00004	.01724	.00194	1.69667	.08292
32	Vendor Performance, % of Companies Receiving Slow Deliveries	.04012	.85506	.09575	1.67123	.08254
34	Net Cash Flow, Corporate, Current Dollars	-.15857	-.75539	-.08468	1.80330	.04347
35	Net Cash Flow, Corporate, 1972 Dollars	-.14805	-.73732	-.08267	1.80125	.04542
36	Net Change in Inventories On Hand, On Order, 1972 Dollars	-.00055	-.17935	-.02017	1.69984	.08290
36a	Smoothed	.00014	.99343	.11117	1.71620	.08241

TABLE 28 (CONT.)

SERIES NUMBER	ECONOMIC VARIABLE SERIES TITLE	b_1 COEFFICIENT	t_{b1} VALUE	CORRELATION VALUE	DURBIN WATSON	STANDARD ERROR OF ESTIMATE
54	Sales Retail Stores, Current Dollars	-.06842	-.13135	-.01477	1.70014	.08291
89	Gross Private Domestic Fix Investment, Total Residential, 1972 Dollars	-.01555	-.08716	-.00980	1.81111	.05127
92a	Change in Sensitive Crude Material Prices (Smoothed)	-.00435	-1.44619	-.16059	1.75721	.08184
93	Free Reserves	.00026	.39766	.04469	1.69750	.08284
104	Change in Total Liquid Assets	.00008	.02031	.00228	1.69724	.08292
104a	Smoothed	.02970	1.42052	.15781	1.66257	.08188
105	Money Supply M1-B, 1972 Dollars	-.59724	-.53797	-.06600	1.70229	.08274
106	Money Supply M2, 1972 Dollars	-.12744	-.13934	-.01567	1.69698	.08291
110	Total Funds Raised, Private Non-Financial Borrowers Credit Market	.00395	.05679	.00638	1.81009	.13136
112	Net Change in Bank Loans to Businesses	.00007	.12174	.01369	1.69434	.08291
113	Net Change in Consumer Credit	-.00712	-2.73917	-.29451	1.70149	.07924

TABLE 29
NOTATIONAL METHODOLOGY FOR FORMATION OF INDEXES

$$I_{jlt} = \sum_{t=1}^{82} W_{Kl} Var_{Kt} \quad \text{for } j = 1, 2, 3, 4$$

Where:

I_{jt} = Value of Index j in period t for method l

W_K = Weight of variable K in index j for method l

Var_{Kt} = Value of economic variable K in period t

l = 1 Naive method

l = 2 Correlation method

l = 3 Coefficient of determination method

l = 4 Factor analysis method

TABLE 30
TEST OF SIGNIFICANCE FOR FISHER'S Z TRANSFORMATION VALUES FOR SINGLE INDEXES
NONDURABLE GOODS GROUP

COMPANY NAME	I_n	I_o	P	E	M
American Air Lines	0	1	0	1	2
American Home Products	2	2	0	2	1
American Stores	0	2	0	0	2
AT&T	2	2	0	2	2
Bristol Myers	2	2	0	2	2
Burlington Industries	0	2	0	0	2
Burroughs	0	0	0	0	0
Celanese	0	0	0	0	0
Chessie Systems	2	2	0	2	2
Cluett Peabody	0	0	0	0	2
Columbia Pictures	0	2	0	0	2
Commonwealth Edison	0	1	0	0	1
Federated Dept. Stores	1	2	0	2	2
General Foods	0	2	0	0	2
I.B.M.	2	2	1	2	2
R.H. Macy's	0	2	1	2	2
Munsingwear	0	0	0	0	2
Pacific Gas & Electric	0	1	0	0	0
Pan American Air Lines	2	2	0	2	2
Safeway Stores	1	0	0	0	2
Standard Brands	1	2	0	1	2
J.P. Stevens	0	0	0	0	2
Twentieth Century Fox	0	2	0	1	1
Union Oil of CA	1	1	0	1	0

Legend:

0 = Not significant at .10 level ($d \leq .262$)
1 = Not significant at .05 level ($d \leq .312$)
2 = Significant difference at .05 level.

TABLE 30 (CONT.)
TEST FOR SIGNIFICANCE FOR FISHER'S Z TRANSFORMATION VALUES FOR SINGLE INDEXES
DURABLE GOODS GROUP

COMPANY NAME	I_n	I_o	P	E	M
Allied Chemical	0	1	0	2	1
Armco Steel	0	0	0	1	2
Boeing	0	0	0	0	0
Caterpiller Tractor	0	1	0	2	2
Chicago Pneumatic	0	1	0	1	2
Chrysler	0	0	0	2	1
Clark Equipment	0	1	1	2	1
Crown Zellerbach	0	0	0	0	2
Dupont	0	0	0	0	2
General Cable	0	0	0	0	1
General Motors	0	2	1	2	2
General Signal	0	1	0	0	0
International Paper	0	1	0	1	2
Joy Manufacturing	2	2	0	2	2
Kennecott Copper	0	0	0	0	0
McGraw Hill	2	2	0	2	2
Phelps Dodge	0	0	0	0	0
Pullman	0	0	0	0	0
Revere Copper & Brass	0	0	0	0	0
U.S. Steel	0	1	0	1	2
United Technology	0	0	0	0	0

Legend:

0 = Not significant at .10 level ($d \leq .262$)
1 = Not significant at .05 level ($d \leq .312$)
2 = Significant difference at .05 level

TABLE 31

FISHER'S Z TRANSFORMATION VALUES
FOR SINGLE INDEX REGRESSIONS
NON-DURABLE GOODS GROUP

COMPANY NAME	Z_m	Z_{In}	d_{In}	Z_p	d_p	Z_{Io}	d_{Io}	Z_E	d_E	Z_M	d_M
American Air Lines	0.503	0.319	0.184	0.439	0.064	0.211	0.292	0.241	0.262	0.145	0.358
American Home Products	0.490	0.134	0.346	0.241	0.249	0.079	0.411	0.115	0.375	0.205	0.285
American Stores	0.251	-0.005	0.256	0.281	-0.030	-0.178	0.429	0.010	0.241	-0.082	0.333
AT&T	0.548	0.217	0.331	0.379	0.169	0.121	0.327	0.199	0.349	0.151	0.397
Bristol Myers	0.438	0.089	0.349	0.323	0.115	0.012	0.426	0.059	0.379	0.123	0.315
Burlington Industries	0.363	0.168	0.195	0.237	0.126	-0.019	0.382	0.207	0.156	-0.006	0.369
Burroughs	0.249	0.043	0.206	0.070	0.179	0.009	0.240	0.037	0.202	0.080	0.189
Celanese	0.231	0.418	-0.187	0.326	-0.095	0.228	0.003	0.233	-0.002	0.199	0.032
Chessie Systems	0.382	0.061	0.321	0.306	0.076	-0.021	0.403	0.055	0.347	0.044	0.338
Cluett Peabody	0.540	0.451	0.089	0.321	0.219	0.328	0.212	0.332	0.208	0.212	0.328
Columbia Pictures	0.312	0.251	0.061	0.305	0.007	-0.010	0.322	0.154	0.158	-0.047	0.359
Commonwealth Edison	0.406	0.148	0.258	0.361	0.045	0.111	0.295	0.181	0.225	0.143	0.262
Federated Dept. Stores	0.444	0.182	0.262	0.304	0.140	0.078	0.366	0.115	0.329	-0.025	0.469
General Foods	0.318	0.096	0.222	0.314	0.004	-0.048	0.366	0.110	0.208	-0.001	0.319
I.B.M.	0.518	0.108	0.410	0.241	0.277	0.006	0.512	0.084	0.434	0.205	0.313
R.H. Macy's	0.508	0.283	0.225	0.208	0.300	0.151	0.357	0.143	0.365	0.192	0.316
Munsingwear	0.346	0.279	0.067	0.148	0.198	0.176	0.170	0.175	0.171	-0.016	0.362
Pacific Gas & Electric	0.307	0.079	0.228	0.226	0.081	0.005	0.302	0.081	0.226	0.110	0.197
Pan American Air Lines	0.532	0.216	0.316	0.388	0.144	0.097	0.435	0.214	0.318	0.166	0.366
Safeway Stores	0.324	0.061	0.263	0.266	0.058	-0.119	0.205	0.081	0.243	-0.092	0.416
Standard Brands	0.400	0.135	0.265	0.262	0.138	0.008	0.392	0.094	0.306	0.000	0.400
J.P. Stevens	0.480	0.436	0.044	0.400	0.080	0.310	0.170	0.338	0.142	0.098	0.372
Twentieth Century Fox	0.402	0.176	0.226	0.326	0.076	0.052	0.350	0.133	0.269	0.125	0.277
Union Oil of CA	0.293	0.015	0.278	0.143	0.150	0.015	0.278	0.011	0.282	0.199	0.094

TABLE 31 (CONT.)
FISHER'S Z TRANSFORMATION VALUES
FOR SINGLE INDEX REGRESSIONS
DURABLE GOODS GROUP

COMPANY NAME	Z_m	Z_{In}	d_{In}	Z_p	d_p	Z_{Io}	d_{Io}	Z_E	d_E	Z_M	d_M
Allied Chemical	0.345	0.094	.0251	0.057	0.288	0.190	0.155	0.006	0.339	0.071	0.274
Armco Steel	0.466	0.254	0.212	0.214	0.252	0.318	0.148	0.166	0.300	0.036	0.430
Boeing	0.335	0.254	0.081	0.213	0.122	0.329	0.006	0.129	0.206	0.209	0.126
Caterpiller Tractor	0.559	0.344	0.215	0.267	0.292	0.441	0.118	0.230	0.329	0.206	0.353
Chicago Pneumatic	0.458	0.382	0.076	0.286	0.172	0.418	0.040	0.160	0.298	0.086	0.372
Chrysler	0.501	0.332	0.169	0.265	0.236	0.334	0.167	0.176	0.325	0.224	0.277
Clark Equipment	0.382	0.137	0.245	0.085	0.297	0.102	0.280	-0.052	0.434	0.097	0.285
Crown Zellerbach	0.380	0.178	0.202	0.121	0.259	0.304	0.076	0.121	0.259	-0.044	0.336
Dupont	0.446	0.438	0.008	0.359	0.087	0.247	0.199	0.308	0.138	0.107	0.339
General Cable	0.325	0.198	0.127	0.117	0.208	0.279	0.046	0.144	0.181	0.019	0.306
General Motors	0.634	0.457	0.177	0.294	0.340	0.348	0.286	0.318	0.316	0.234	0.400
General Signal	0.475	0.334	0.141	0.166	0.309	0.450	0.025	0.299	0.176	0.306	0.169
International Paper	0.513	0.288	0.225	0.241	0.272	0.346	0.167	0.215	0.298	0.087	0.426
Joy Manufacturing	0.451	0.127	0.324	0.077	0.374	0.202	0.249	0.119	0.332	0.110	0.341
Kennecott Copper	0.103	0.115	-0.012	0.109	-0.006	-0.065	0.168	-0.106	0.209	-0.117	0.220
McGraw Hill	0.551	0.224	0.327	0.148	0.403	0.306	0.245	0.135	0.416	0.131	0.420
Phelps Dodge	0.195	0.011	0.184	-0.035	0.230	0.079	0.116	-0.052	0.247	-0.009	0.204
Pullman	0.263	0.082	0.181	0.076	0.187	0.303	-0.050	0.113	0.150	0.046	0.217
Revere Copper & Brass	0.266	0.187	0.079	0.119	0.147	0.241	0.015	0.090	0.176	0.029	0.237
U.S. Steel	0.425	0.249	0.176	0.151	0.274	0.218	0.207	0.131	0.294	0.000	0.425
United Technology	0.419	0.229	0.190	0.212	0.207	0.352	0.067	0.193	0.226	0.115	0.204

TABLE 32
RESULTS OF FISHER'S Z TRANSFORMATION TESTS

ECONOMIC INDEX	NUMBER OF SECURITIES SIGNIFICANT AT .10	.05
45 SECURITY SAMPLE RESULTS		
P	4	0
I_n	12	8
I_o	28	17
E	23	15
M	34	17
NON-DURABLE GOODS GROUP		
P	2	0
I_n	10	6
I_o	18	14
E	12	8
M	20	17
DURABLE GOODS GROUP		
P	2	0
I_n	2	2
I_o	10	3
E	11	7
M	14	10

TABLE 33
COEFFICIENT OF DETERMINATION SUMMARY FOR MULTI ECONOMIC INDEX AND MARKET RETURNS REGRESSIONS
NON-DURABLE GOODS

COMPANY NAME	$R^2_{\tilde{m}}$	$R^2_{\tilde{m}IN}$	$R^2_{\tilde{m}P}$	$R^2_{\tilde{m}Io}$	$R^2_{\tilde{m}E}$	$R^2_{\tilde{m}M}$
American Air Lines	0.218	0.219	0.257	0.219	0.218	0.222
American Home Products	0.206	0.237	0.206	0.235	0.226	0.206
American Stores	0.061	0.097	0.090	0.182	0.080	0.105
AT&T	0.249	0.261	0.263	0.272	0.255	0.254
Bristol Myers	0.169	0.208	0.184	0.220	0.203	0.174
Burlington Industries	0.121	0.124	0.125	0.171	0.122	0.152
Burroughs	0.060	0.076	0.064	0.077	0.071	0.061
Celanese	0.077	0.159	0.117	0.086	0.087	0.084
Chessie Systems	0.132	0.171	0.148	0.188	0.157	0.149
Cluett Peabody	0.243	0.268	0.247	0.250	0.249	0.243
Columbia Pictures	0.091	0.098	0.117	0.126	0.091	0.131
Commonwealth Edison	0.148	0.159	0.177	0.157	0.149	0.149
Federated Dept. Stores	0.174	0.182	0.182	0.197	0.188	0.227
General Foods	0.095	0.107	0.122	0.149	0.098	0.117
I.B.M.	0.227	0.277	0.227	0.299	0.264	0.227
R.H. Macy's	0.219	0.219	0.222	0.229	0.233	0.220
Munsingwear	0.111	0.119	0.112	0.111	0.111	0.143
Pacific Gas & Electric	0.089	0.105	0.095	0.117	0.097	0.090
Pan American Air Lines	0.237	0.247	0.255	0.266	0.239	0.240
Safeway Stores	0.098	0.123	0.111	0.199	0.107	0.163
Standard Brands	0.144	0.158	0.148	0.188	0.159	0.178
J.P. Stevens	0.199	0.231	0.228	0.207	0.211	0.210
Twentieth Century Fox	0.146	0.151	0.164	0.172	0.152	0.148
Union Oil of CA	0.081	0.119	0.081	0.103	0.107	0.087

TABLE 33 (CONT.)
COEFFICIENT OF DETERMINATION SUMMARY FOR MULTI ECONOMIC INDEX AND MARKET RETURNS REGRESSIONS
DURABLE GOODS

COMPANY NAME	R_{Rm}^2	R_{RmIN}^2	R_{RmP}^2	R_{RmIo}^2	R_{RmE}^2	R_{RmM}^2
Allied Chemical	0.110	0.127	0.110	0.126	0.148	0.167
Armco Steel	0.189	0.189	0.198	0.189	0.195	0.218
Boeing	0.093	0.109	0.135	0.108	0.107	0.110
Caterpiller Tractor	0.257	0.258	0.287	0.257	0.259	0.257
Chicago Pneumatic	0.184	0.202	0.223	0.189	0.189	0.196
Chrysler	0.215	0.217	0.223	0.215	0.221	0.215
Clark Equipment	0.113	0.144	0.144	0.146	0.214	0.138
Crown Zellerbach	0.132	0.135	0.147	0.137	0.139	0.183
Dupont	0.175	0.215	0.176	0.200	0.184	0.182
General Cable	0.098	0.098	0.114	0.101	0.099	0.115
General Motors	0.315	0.328	0.317	0.315	0.315	0.315
General Signal	0.195	0.200	0.245	0.199	0.200	0.208
International Paper	0.223	0.223	0.233	0.223	0.225	0.241
Joy Manufacturing	0.179	0.204	0.180	0.203	0.193	0.186
Kennecott Copper	0.011	0.058	0.030	0.045	0.045	0.043
McGraw Hill	0.251	0.261	0.252	0.265	0.273	0.260
Phelps Dodge	0.037	0.055	0.038	0.060	0.069	0.048
Pullman	0.066	0.074	0.101	0.070	0.067	0.071
Revere Copper & Brass	0.067	0.069	0.081	0.067	0.070	0.076
U.S. Steel	0.160	0.160	0.160	0.164	0.169	0.198
United Technology	0.157	0.157	0.181	0.157	0.157	0.161

TABLE 34

ADJUSTED R^2 SUMMARY FOR MULTI INDEX REGRESSIONS

NONDURABLE GOODS GROUP

COMPANY NAME	$\bar{R}^2_{Mm}$	$\bar{R}^2_{IoPm}$	$\bar{R}^2_{IoPEm}$	$\bar{R}^2_{IoPMm}$	$\bar{R}^2_{IoPEMm}$	$\bar{R}^2_{InPm}$	$\bar{R}^2_{InPEm}$	$\bar{R}^2_{InPMm}$	$\bar{R}^2_{InPEMm}$
American Air Lines	0.208	0.153	0.143	0.148	0.138	0.153	0.147	0.148	0.143
American Home Products	0.196	0.032	0.021	0.037	0.027	0.033	0.021	0.039	0.027
American Stores	0.049	0.146	0.151	0.146	0.149	0.110	0.105	0.118	0.115
AT&T	0.240	0.109	0.099	0.098	0.087	0.110	0.099	0.098	0.087
Bristol Myers	0.159	0.093	0.105	0.083	0.095	0.103	0.103	0.094	0.093
Burlington Industries	0.110	0.044	0.045	0.039	0.041	0.031	0.025	0.041	0.034
Burroughs	0.048	-0.020	-0.033	-0.028	-0.041	-0.020	-0.033	-0.029	-0.043
Celanese	0.065	0.090	0.078	0.078	0.066	0.141	0.147	0.133	0.141
Chessie Systems	0.122	0.086	0.092	0.076	0.081	0.095	0.090	0.084	0.079
Cluett Peabody	0.234	0.122	0.122	0.111	0.112	0.161	0.150	0.154	0.143
Columbia Pictures	0.080	0.082	0.070	0.096	0.085	0.070	0.068	0.128	0.132
Commonwealth Edison	0.138	0.098	0.088	0.086	0.076	0.107	0.096	0.097	0.085
Federated Dept. Stores	0.164	0.065	0.060	0.086	0.079	0.064	0.062	0.089	0.091
General Foods	0.083	0.101	0.092	0.097	0.087	0.087	0.076	0.087	0.076
I.B.M.	0.217	0.040	0.031	0.057	0.050	0.035	0.025	0.046	0.036
R.H. Macy's	0.210	0.024	0.012	0.019	0.006	0.054	0.055	0.043	0.043
Munsingwear	0.100	0.014	0.006	0.030	0.026	0.075	0.041	0.089	0.081
Pacific Gas & Electric	0.078	0.033	0.023	0.024	0.015	0.033	0.021	0.024	0.012
Pan American Air Lines	0.277	0.117	0.106	0.107	0.095	0.116	0.105	0.105	0.094
Safeway Stores	0.087	0.100	0.090	0.110	0.099	0.064	0.053	0.090	0.080
Stnadard Brands	0.133	0.051	0.042	0.049	0.039	0.044	0.037	0.047	0.042
J.P. Stevens	0.189	0.152	0.147	0.174	0.171	0.171	0.160	0.201	0.191
Twentieth Century Fox	0.135	0.082	0.074	0.071	0.063	0.078	0.072	0.066	0.060
Union Oil of CA	0.070	-0.003	-0.007	0.021	0.020	0.006	-0.005	0.041	0.030

TABLE 34 (CONT.)

ADJUSTED R^2 SUMMARY FOR MULTI INDEX REGRESSIONS

DURABLE GOODS GROUP

COMPANY NAME	$\bar{R}^2_{Mm}$	$\bar{R}^2_{IoPm}$	$\bar{R}^2_{IoPEm}$	$\bar{R}^2_{IoPMm}$	$\bar{R}^2_{IoPEMm}$	$\bar{R}^2_{InPm}$	$\bar{R}^2_{InPEm}$	$\bar{R}^2_{InPMm}$	$\bar{R}^2_{InPEMm}$
Allied Chemical	0.099	0.008	0.014	0.030	0.032	0.008	0.017	0.027	0.041
Armco Steel	0.179	0.083	0.075	0.104	0.095	0.076	0.073	0.091	0.090
Boeing	0.093	0.088	0.091	0.078	0.081	0.082	0.093	0.073	0.083
Caterpiller Tractor	0.247	0.164	0.159	0.155	0.149	0.158	0.159	0.148	0.149
Chicago Pneumatic	0.173	0.154	0.168	0.179	0.188	0.156	0.203	0.181	0.237
Chrysler	0.205	0.104	0.098	0.093	0.087	0.104	0.115	0.093	0.103
Clark Equipment	0.122	-0.012	0.004	-0.024	-0.006	-0.006	0.045	-0.018	0.032
Crown Zellerbach	0.121	0.064	0.059	0.105	0.098	0.064	0.059	0.098	0.097
Dupont	0.165	0.112	0.115	0.121	0.128	0.149	0.139	0.168	0.158
General Cable	0.087	0.051	0.040	0.058	0.046	0.051	0.042	0.060	0.052
General Motors	0.306	0.121	0.116	0.109	0.105	0.169	0.160	0.160	0.151
General Signal	0.185	0.157	0.148	0.165	0.154	0.162	0.151	0.162	0.151
International Paper	0.213	0.103	0.092	0.111	0.100	0.096	0.087	0.099	0.092
Joy Manufacturing	0.169	0.016	0.003	0.004	-0.009	0.016	0.003	0.004	-0.008
Kennecott Copper	-0.002	-0.012	-0.022	-0.021	-0.031	-0.012	-0.024	-0.021	-0.032
McGraw Hill	0.241	0.066	0.060	0.055	0.048	0.066	0.066	0.055	0.055
Phelps Dodge	0.025	-0.014	-0.013	-0.026	-0.026	-0.016	-0.014	-0.028	-0.025
Pullman	0.054	0.065	0.060	0.061	0.054	0.084	0.072	0.073	0.061
Revere Copper & Brass	0.056	0.033	0.027	0.034	0.027	0.034	0.036	0.036	0.040
U.S. Steel	0.150	0.028	0.016	0.041	0.029	0.041	0.040	0.066	0.069
United Technology	0.146	0.101	0.092	0.098	0.088	0.093	0.083	0.084	0.074

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