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An unprecedented dilemma confronts today's pension asset manager. Traditionally, most of these managers believed that the ability to select undervalued securities was the secret to earning high returns. Accordingly, fundamental securities analysis prevailed as the predominant investment management theory for use in portfolio construction.

Recently, however, another school has emerged that presents a robust challenge to the very foundation of fundamental analysis. Many academicians, backed by elaborate computer documentation, contend that securities markets have become so fiercely competitive that one no longer can find undervalued securities. This "efficient market hypothesis" (EMH), one of the main tenets held by many subscribers to modern portfolio theory (MPT), asserts that securities are priced "fairly," and thus in the long run an investor cannot make above-average profits without being exposed to a corresponding high risk of loss.[1]

Both fundamental analysis and MPT claim numerous devoted followers, and it is generally recognized that the subscription to one theory precludes the belief in the other. So where does this place the pension fund manager? Charged on the one hand with the responsibility of prudently managing fund assets and on the other confronted with the choice between two conflicting investment theories, the perplexed manager often does not know which direction to turn. If he adopts the fundamental analysis approach, he may be attempting to achieve a higher than average return while exposing his fund to higher than tolerable risk. But if he adheres to MPT, he foregoes the possibility of earning abnormally high returns since his role is confined merely to selecting the proper risk/return tradeoff and diversifying to attain that relationship.

In this article, we shall demonstrate that, unlike popular belief suggests, fundamental securities analysis and MPT are not necessarily incompatible. In fact, we introduce a hybrid action strategy that is based on a synthesis of the pertinent features of both fundamental analysis and MPT. This strategy, called Interactive Portfolio Management (IPM), gives rise to a unified management approach that relieves the manager from the difficult and limiting decision of choosing between two opposing theories, thus allowing him to concentrate on the task at hand -- optimizing the pension plan's investment performance. In order to better understand this asset management theory, it will be valuable to first trace the plight of the pension manager.

Until the 1970's, pension fund asset managers had more flexibility than virtually any other type of investor. They were unfettered by cumbersome laws and, due to tax exemption, free to switch among assets without regard to tax consequences. Their long-term investment horizon enabled them to seek higher returns in more aggressive, less liquid assets. At the same time, the stock market was experiencing one of its longest and most dramatic "bull" movements. From the end of World War II to year-end 1970, common stocks yielded an 18 percent compound annual return (cash dividends plus price appreciation), almost fourfold the rate of inflation over that same period.[2] One can easily see why many investors viewed equities as the "perfect inflation hedge."

Pension investment managers recognized the potential benefits of common stock ownership. Many managers aggressively accumulated stocks, realizing that continued high returns from these securities would reduce the amount of money the company must expend to satisfy its pension obligations. As a result, private pensions' holdings of corporate equities, which totaled less than one billion dollars in 1945, surged to over $67 billion by 1970,

representing approximately two-thirds of total pension assets.[3] Many companies, in effect, relied on the performance of their pension's equity portfolio to subsidize corporate contributions.

Most asset managers used fundamental securities analysis to select intrinsically undervalued stocks, believing that eventually these securities would be "recognized" and thus propelled to higher prices. A securities analyst prepares an estimate of intrinsic value by multiplying his estimate of the stock's earnings per share times an appropriate earnings multiplier. If a stock's market price is below its intrinsic value, it is underpriced and should be bought and held in order to reap future capital gains. In this sense, fundamental analysis concentrates primarily on the expected return of a security, sometimes devoting only cursory attention to the riskiness of the security.

As the stock market continued to prosper, an increasing number of pension managers became confident that the selection of intrinsically undervalued stocks was the most effective asset management approach. Attention continued to be focused on the generous expected return potential of equities; few bothered to consider the risk that stocks might relinquish some of their mounting price gains. Prosperity abounded among equity-oriented pension managers.

But unfortunately the environment for the pension asset manager changed. The 1970's, in particular, were significant for three reasons: (1) the Employee Retirement Income Security Act of 1974 (ERISA) was ushered in, (2) the stock market nose-dived approximately 40 percent during 1973-1974, and (3) the emergence of MPT threatened the existence of traditional securities analysis. Each of these important occurrences and its impact on the pension asset manager is initially examined. Then we present the interactive pension asset management approach -- one that incorporates the key features of traditional

securities analysis, yet is responsive to the heightened fiduciary responsibility confronting managers and the increased emphasis placed on gauging the relative riskiness of alternative investment assets.

Advent of ERISA

Pension managers, as well as other fiduciaries, for years have been required to exercise good judgment, or prudence as the legal profession labels it, in their investment decisions. As distantly as 1830, the courts defined a fiduciary's responsibility in managing funds "to observe how men of prudence, discretion and intelligence manage their own affairs, not in regard to speculation, but in regard to the permanent disposition of their funds, considering the possible income as well as the probable safety of the capital to be invested."[4] Until 1974, a fiduciary continued to be required to perform like a man of ordinary prudence in dealing with his own property.

However, the passage of ERISA in 1974 significantly changed prudence demands. A stringent new standard emerged mandating that fiduciaries act "with the care, skill, prudence and diligence under the circumstances then prevailing that a prudent man acting in like capacity and familiar with such matters would use in conducting an enterprise of like character and like aims."[5] In other words, the criterion for comparison is now not what a prudent private investor would do with his own investments, but what the professional pension manager would do under like circumstances. In essence, ERISA invokes a prudent "expert" standard, replacing the prudent man criterion. It turns the limelight on a basis of comparisons -- handling a pension fund by knowledgeable people using the highest techniques of asset management applicable to pension funds.

The implications of ERISA's new prudence requirements are striking. Since fund managers are now personally liable for losses caused by imprudent

decisions, many may elect to invest more conservatively, placing less emphasis on riskier equities and paring overall risk by subscribing to the principle of asset diversification.

Stock Market Collapse

At approximately the same time that ERISA appeared, stocks were experiencing the worst "bear" market since the days of the Great Depression. Pension managers, who had grown accustomed to the buoyant stock returns of the 'fifties and 'sixties, were heavily committed to equities -- especially those of large growth companies. Many managers theorized that no matter how much you paid for one of these elite issues, you would eventually prosper because growth would always bail you out. As a result, prices of growth stocks escalated to dizzying heights. In 1972, stocks of companies such as Avon, Disney and Polaroid, for example, sold at exorbitant prices in excess of 80 times earnings. The 1973-74 market collapse was especially cruel to these institutional favorites. By 1974, Avon, Disney and Polaroid had lost more than eighty percent of their peak market values. Even regal IBM, the epitome of a "one-decision" stock (you only buy them), had more than half of its value lopped off.

The market decline severely reduced pension fund values and significantly shook asset managers' confidence in equities. Furthermore, coming on the heels of ERISA, the stock market retreat caused many managers to reassess their attitudes toward risk. They realized that under ERISA increased risk in plan assets translated into more personal risk. However, no generally accepted measure of an asset's riskiness existed. Thus, pension managers were caught in the teeth of a very frustrating dilemma. On one hand, they desired to optimize the risk/return balance of their portfolios, but on the other

hand, they had no satisfactory way to quantify risk. Fearful that they might be challenged for exposing a plan to excessive risk, many managers took the path of least resistance -- they minimized risk by concentrating their acquisitions to low risk alternatives such as high-grade bonds and money market instruments. Others still purchased equities, but in a manner that "indexed" their portfolios to the market -- thus ensuring that they would never underperform the market (nor, for that matter, would they ever beat it).

The combination of ERISA's more stringent attitude toward risk-taking and the unsettling experience of a major stock market decline apparently caused many pension asset managers to become very risk averse -- possibly handicapping their plans' long-run productivity. A notion existed that the riskier an asset, the greater should be its return, but with no detailed specifications concerning how one ought to view risk.

Emergence of MPT

Already frustrated by cumbersome new ERISA requirements and a broad-based stock market retreat, pension asset managers were further consternated by the increasing attention that MPT was receiving. Until the arrival of MPT, most managers believed that the ability to select undervalued securities would open the door to high stock market gains. But MPT strongly challenges that fundamental belief. MPT disciples observed that stock prices seemed to follow no predictable pattern. In this manner, a blindfolded baboon throwing darts at the financial pages of the Wall Street Journal should, on average, be able to pick stocks as successfully as a professional portfolio manager. Even though this viewpoint appears very extreme, many researchers endorsed this so-called "random walk" theory, pointing out that this is really the way the securities markets should function. After all, if a stock's price reflects everything that is known about the security (past, present and future), then any new

information would come as a complete surprise. And a surprise is just as likely to be an undesirable one as it is to be a pleasant one (or vice versa). As a result, if current stock prices reflect all known information, then price behavior, which responds only to new information, should be essentially random. The implication is obvious: if stock prices follow a kind of random walk, then it would be fruitless to attempt to uncover presently undervalued stocks -- they simply do not exist because the market is too efficient to permit such an occurrence.

The new theory goes even further: since individual stock price movements are unpredictable and random, the asset manager should strive to eliminate this type of undesirable firm-specific risk through diversification. The diversification concept may be portrayed by observing the indexing technique. An investor who acquires a portfolio that exactly replicates a selected market indicator (the Standard & Poor's '500', for example) has obviously pegged or "indexed" his portfolio's performance to that of the market. Since the indexed portfolio <u>is</u> the market, individual (firm-specific) risk is nonexistent -- only market risk remains.

MPT hypothesizes that a rational, risk-averse asset manager, desiring to achieve a given expected return level, should construct the unique portfolio that possesses the lowest degree of risk for that particular return objective. This unique portfolio is known as an "efficient" portfolio because no other combination of stocks can be devised that produces the desired expected return level for as small a degree of risk. The only way to create an efficient portfolio is via diversification so that unnecessary firm-specific risk is eliminated.

It is certainly not surprising that portfolio managers found MPT to be extremely unnerving. If securities analysis is a futile practice (as market

efficiency implies), then the very profession of the securities analyst is in jeopardy. Rather than actively managing a portfolio, the asset manager should assume a relatively passive posture -- making portfolio alterations only to change a portfolio's risk/return composition. Fortunately, a new risk gauge, the beta coefficient, emerged from MPT.[6] Now the asset manager has a specific tool for quantifying portfolio risk, thus mitigating some of the concern that was previously associated with portfolio risk measurement.

How Efficient Is the Market?

It becomes readily apparent that the increasing number of subscribers to the EMH implies greater suspicion of the merits of fundamental securities analysis. If markets are completely efficient, fundamentally over- or undervalued securities do not exist. In recent years, however, an expanding contingency of researchers have questioned the validity of the EMH, asking "Are securities in all markets efficiently priced at all times?" A negative response to that query would, of course, indicate that at some point in time abnormal returns could be attained.

In particular, several academicians challenged the EMH. As a result, many empirical studies designed to test market efficiency emerged. Some researchers discovered persistent market anomalies which are inconsistent with the EMH assertions -- suggesting that abnormal returns, although very difficult to achieve, are indeed possible. One anomaly that has received considerable recent attention is the price-earnings (P/E) ratio effect. Recent studies reveal that, on average, portfolios consisting of low P/E stocks yield higher returns than justified by their underlying beta risk.[7] The empirical analysis which follows confirms this anomaly.

An Empirical Investigation

In this study a sample of 125 randomly-selected industrial companies was analyzed to determine if the P/E effect persisted during the trying 1970's. Relevant return and accounting data were retrieved from the COMPUSTAT tapes. Initially the P/E ratio for all sample firms was calculated quarterly from the beginning of 1970 to mid-year 1980. The stocks were ranked in ascending order by their respective P/E magnitudes so that the lowest quintile (Q1) includes firms with the lowest P/E ratios and the highest quintile (Q5) consists of the highest P/E's. The quarterly portfolio mean excess return for each quintile was then calculated, assuming an equal initial investment in each stock.[8] This procedure was repeated at each quarter's end, thus providing 42 consecutive quarters of return data for each of the five P/E-ranked portfolios. Thus, the composition of each portfolio was adjusted quarterly to reflect shifts in relative P/E rankings.

The systematic risk coefficients (betas) were averaged across the firms within each portfolio to estimate the portfolio's systematic risk ($\hat{B}_{pt}$) in in period t, as follows:

$$\hat{\beta}_{pt} = \frac{1}{n_{pt}} \sum_{i=1}^{n_{pt}} \hat{\beta}_{it}$$

where n_{pt} is the number of stocks in portfolio p in period t. Each quarterly excess portfolio return (r'_{pt}) was obtained by averaging cross-sectionally the excess returns of the individual stocks belonging to the particular portfolio,

$$r'_{pt} = \frac{1}{n_{pt}} \sum_{i=1}^{n_{pt}} r'_{it}$$

In this manner, the mean excess returns were computed for each of the P/E quintiles for a series of 42 consecutive quarters. Finally, the geometric mean excess return for each P/E quintile over the entire 10 1/2 year period was computed. The results are shown in Exhibit 1.

(Insert Exhibit 1 Here)

Over the entire period, a significant P/E effect was detected. As in prior studies, low P/E portfolios were found to significantly outperform the average return. In fact, excess returns decline monotonically as portfolio average P/E increases. These findings confirm that stock market anomalies continue to exist, even though the institutionally-dominated markets have no doubt become more efficient in absorbing, processing and reacting to relevant information.[9]

An Interactive Asset Management Approach

In this section, we outline an asset management approach based on the interaction and synthesis of fundamental analysis with MPT. This interactive approach resolves the basic conflict of the asset manager. Three key principles will be synthesized. From fundamental analysis we draw upon the idea of the existence of market anomalies in a nearly efficient market. From MPT we will apply two crucial notions. The first is the idea of an objective risk measure, beta. The second is the concept of eliminating individual stock risk via proper diversification. These three principles blended into an action strategy comprise Interactive Portfolio Management (IPM).

Since several empirical studies have detected market inefficiencies, it follows that the securities analyst may not be as obsolete as the EMH asserts. But these same studies also reveal that market inefficiencies are scarce and difficult to uncover. An aggressive, knowledgeable analyst may be able to discover intrinsically undervalued securities, but it certainly is not easy.

Thus, the job of today's portfolio manager becomes somewhat clearer. In a "nearly" efficient market it is prudent to rely on the advice of superior securities analysts because it is reasonable to assume that in the long run these top-notch analysts can detect securities that are intrinsically misvalued. This, in turn, indicates that the use of fundamental analysis is still a viable alternative for the asset manager -- a nearly efficient market provides enough investment opportunities to justify the securities analyst's existence.

The empirical evidence cited earlier in this article reveals that low P/E stocks provided abnormally generous rates of return during the 1970-1980 period. This anomaly is inconsistent with the notion that the securities markets are totally efficient, but are compatible with the idea of nearly efficient markets. One would thus think that the purchase of low P/E issues would be a prudent way for the asset manager to construct an attractive portfolio. Unfortunately it is not that simple because the creation of a portfolio in this manner virtually ignores the concept of risk. Whereas such a portfolio might have a very high return expectation, it could also possess a very large degree of risk -- more than the plan beneficiaries are willing to tolerate.[10] A major criticism of fundamental analysis revolves around its purportedly inadequate treatment of portfolio risk.

This is substantiated by a further look at the results of Exhibit 1. Note that for the lowest P/E stocks, the average beta levels are significantly above 1.0. This means that diversified portfolios consisting of low P/E securities could indeed expose the asset manager to high risk. The portfolio would yield expected returns above those warranted by its risk; nevertheless, the risk of the portfolio could be substantially greater than the market risk.

Exhibit 1 implies that higher than justified returns are achieved at the expense of high risk, a very serious drawback. To test the validity of this, a second empirical experiment was performed. In this experiment all low P/E stocks were classified into five beta risk categories. Quintile 1 contains the 20% least risky stocks, quintile 2 the 20% least risky stocks and so on. The same 42 quarters were used with the returns compounded over this period. All returns were then adjusted in accordance with their beta risk levels.

This experiment should reveal whether it is necessary to select high risk stocks in order to achieve excess returns. Exhibit 2 presents these findings. First note that the risk-adjusted returns are virtually the same for all beta quintiles. This confirms the risk-return tennant of MPT. After adjusting for risk, all returns should be the same. Of course, the returns of high beta stocks are larger in the absolute (non-risk-adjusted) sense.

(Insert Exhibit 2 Here)

Exhibit 2 reveals a dramatic and crucial result: every beta quintile yields substantial excess returns over the average. This means that low P/E stocks of any beta risk level produced abnormally high returns. That is, returns higher than the average of stocks at that same beta level. Therefore, it is not necessary to hold only high risk stocks in order to obtain exceptional performance.

Although fundamental analysis has recently received considerable empirical support, it nonetheless cannot be practiced in a vacuum. At this point we introduce the concept of Interactive Portfolio Management (IPM) -- a blending of fundamental analysis and MPT.

Fundamental analysis is designed to facilitate the selection of undervalued securities, but it does not thoroughly discuss how to package those individual stocks. Exhibit 3 illustrates that a fundamental approach which

analyzes stocks' P/E ratios may be employed to select specific undervalued securities. That same Exhibit shows that MPT should also enter the scene in order to enable the asset manager to package the individual securities into an efficient portfolio. This is the major departure from traditional portfolio management which primarily focuses on the selection of individual stocks, as opposed to the construction of an individual, efficient portfolio.

(Insert Exhibit 3 Here)

MPT mounts a head-on attack to the problem of risk. The theory contends that risk has two crucial components. The first component, called unsystematic or individual stock risk, can be reduced or even eliminated via diversification, but the second component, known as systematic or market risk, is non-diversifiable.[11] An investor cannot escape systematic risk, but he can regulate its intensity by effective analysis. The degree of portfolio risk is measured by the portfolio's beta which is merely a weighted average of the individual component securities' betas.[12]

Furthermore, MPT assumes that investors are risk averse, i.e., for a desired return level a rational investor always prefers the least risky (efficient) portfolio that promises that return expectation. After determining the investor's risk tolerance level, the portfolio manager's task is to select the unique portfolio possessing that risk level with the highest possible return expectation. The adherence to MPT's risk quantification technique enables the asset manager to design a portfolio that has exactly the desired amount of systematic risk (unsystematic risk is not relevant since it can be diversified away). No longer does the manager have to fear the consequences of not properly risk-designing a portfolio.

The Capital Market Line (CML) summarizes the relationship between portfolio risk and return, and in this instance is represented by the line segment $R_f MA$. Point M on the CML represents the overall market; thus, $E(R_m)$ is the expected market return and σ_m is the market's risk level.[13] If market efficiency prevails, portfolio M is the only portfolio of risky securities which should be held because it is the one portfolio which possesses zero unsystematic risk. The line segment $R_f M$ indicates the various returns available through the combination of commitments in risk-free assets and risky assets as represented by the market index. In order to achieve an expected return greater than the market, some point along that portion of the CML between M and A, the investor is assumed able to borrow at the risk-free rate, and thus "leverage" the portfolio by reinvesting the borrowed funds in the market.

(Insert Exhibit 4 Here)

In a world of efficient markets, rational investors would always strive to own portfolios falling along the CML -- all other possibilities would be inefficient. The relaxation of the EMH assumption, however, could dramatically change investors' outlook. For example, if one believes that low P/E stocks, on average, yield abnormally high returns, then that individual may prefer to move off the CML. Such a departure from the CML could be accomplished by acquiring a diversified portfolio consisting of many low P/E firms. This acquisition of undervalued securites would create a higher than normal return expectation. And, through proper diversification, unsystematic risk could be essentially negated. Market risk, of course, would still exist, but presumably only at a level approximating that of the overall market. In fact, the portfolio manager could monitor the portfolio's mean beta to ensure that an average degree of systematic risk ($\beta = 1.0$) emerges.

This is the essence of IPM. In this manner, the new diversified portfolio (denoted as point X in Exhibit 4) would replace the market index as a viable combination of risky assets.[14] In fact, the market portfolio would no longer be a relevant alternative because at the same risk level it indicates a lower return expectation than does the new, anomaly-based portfolio. The superior portfolio of risky assets could be used in combination with the risk-free asset to create a new CML (designated CML' in Exhibit 4) which would supersede the original CML. CML' is a graphic display of the results presented in Exhibit 2. Therefore, return expectations would be higher, but, due to diversification, unsystematic risk would be substantially eliminated, basically leaving only market risk exposure. The composite effect of IPM is to provide the investor a higher return expectation at each respective beta risk level.

Putting it all together, the IPM strategy can be implemented by the following action steps:

(1) Select a desired beta risk level for the portfolio.

(2) Compile a master list of low P/E stocks and their respective betas.

(3) Adjust the portfolio to obtain a broad diversification of stocks which reflects the composition of the market.

(4) Borrow or lend funds at the risk-free rate to adjust the portfolio's risk/return characteristics.

(5) Review and rebalance the portfolio at regular intervals in order to maintain the necessary P/E, beta, and diversity traits.

The procedure enables the asset manager to achieve any desired point along the CML' line of Exhibit 4 by synthesizing the key features of fundamental analysis and MPT.

Conclusion

The past decade was fraught with change for the typical pension fund asset manager. The broad-based stock market retreat, the rigid standards set forth by ERISA, and the emergence of MPT combined to threaten the practice of traditional asset management. In particular, these changes collectively led to an increased emphasis on the riskiness of assets -- no longer could return expectations be the dominant consideration. Fearful of the adverse consequences of excessive risk exposure, some managers resorted to techniques such as indexing in order to avoid being criticized for taking too much risk. In essence, the pendulum shifted from return consciousness to risk consciousness.

This article asserts that neither return nor risk should be the predominant asset management consideration. Rather the prudent manager should place equal emphasis on each factor. An approach called Interactive Portfolio Management is introduced to capture the important elements of both expected return and risk. IPM is really nothing more than a synthesis of the important features of traditional securities analysis and modern portfolio theory, and as such is designed to enable the manager to achieve the highest return expectation for a given risk level. In this manner, the skills of the superior securities analyst are still valuable for selecting undervalued securities. But at the same time the principles of MPT are meritorious -- one should employ effective asset diversification among undervalued securites in order to mitigate overall portfolio risk.

The use of IPM allows the asset manager to be responsive to the major tenets of both fundamental securities analysis and MPT. Thus, two seemingly contradictory theories are harmoniously blended to achieve a mutual objective -- optimizing a portfolio's risk/return composition.

EXHIBIT 1

ANNUAL PORTFOLIO MEAN EXCESS RETURNS AND BETAS

Portfolio Quintile	P/E Ratio Ranking	
	Excess Return	Beta
Q1	11.20	1.05
Q2	6.04	1.01
Q3	-1.88	0.97
Q4	-5.68	1.00
Q5	-9.68	1.06
F-Statistic	12.98	
Significance	.01	

EXHIBIT 2

ANNUAL MEAN EXCESS RETURNS OF LOW P/E STOCKS

Beta Quintile	Excess Return	Mean Beta
Q1	10.93	0.78
Q2	10.97	0.95
Q3	11.35	1.04
Q4	11.61	1.13
Q5	11.17	1.35

EXHIBIT 3
INTERACTIVE PORTFOLIO MANAGEMENT

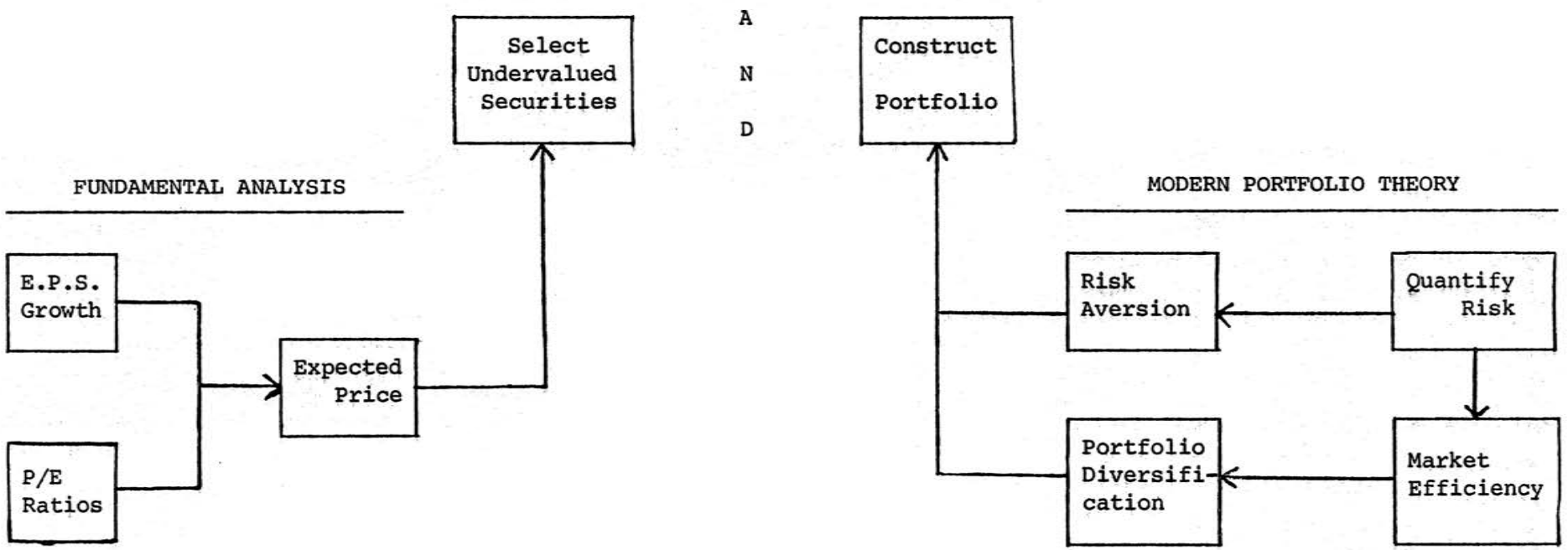
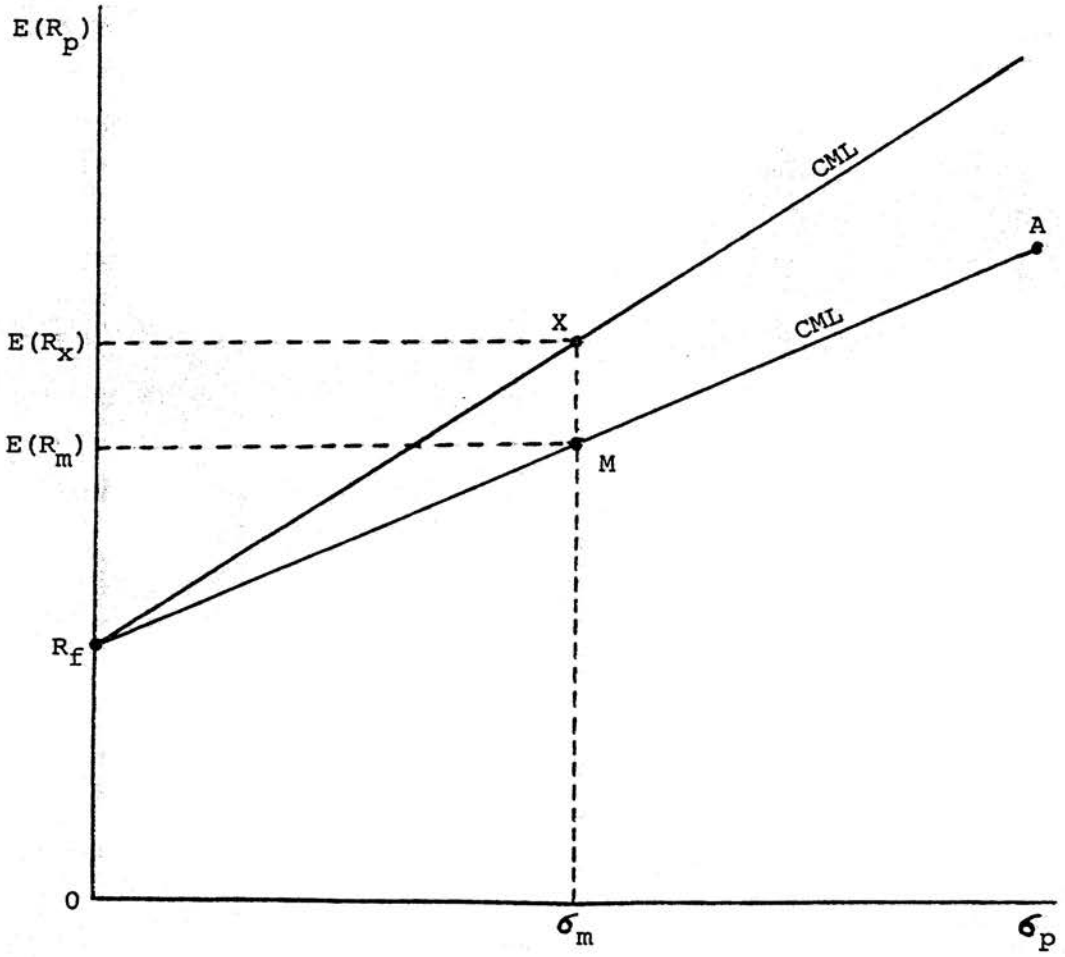


EXHIBIT 4
RISK AND RETURN RELATIONSHIPS



Footnotes

[1]An efficient market is one in which prices always fully reflect all available relevant information. Adjustment to new information is virtually instantaneous.

[2]See Roger G. Ibbotson and Rex A. Sinquefield, Stocks, Bonds, Bills, and Inflation: Historical Returns (1926-1978). Charlottesville, VA: Financial Analysts Research Foundation, 1979.

[3]Pensions and the Economy, Washington, D.C.: Employee Benefit Research Institute, 1982.

[4]Harvard College v. Amory, 26 Mass. (9 Pick.), 446, 461 (1830).

[5]See Robert W. Murphy, "Interpreting the New Prudent Man Standard Introduced by ERISA," I.C.F.A. Seminar on ERISA, January 1976.

[6]The beta coefficient measures a security's market risk, i.e., the security's risk relative to that of the overall market. A beta of 1.0 signifies a risk level comparable to the markets, whereas a $\beta > 1.0$ denotes greater-than-market risk and a $\beta < 1.0$ indicates lower-than-market risk. One should note that beta does not gauge the firm-specific risk of a stock.

[7]See S. Basu, "Investment Performance of Common Stocks in Relation to Their Price-Earnings Ratios: A Test of the Efficient Market Hypothesis," Journal of Finance, June 1977, pp. 663-682, for an analysis of the P/E effect. See Rolf W. Banz, "The Relationship Between Return and Market Value of Common Stocks," Journal of Financial Economics, March 1981, pp. 3-18 and Marc R. Reinganum, "Misspecification of Capital Asset Pricing: Empirical Anomalies Based on Earnings Yield and Market Values," Journal of Financial Economics, March 1981, pp. 27-35, for a discussion of the market capitalization anomaly.

[8]The excess return (r'_{it}) of an individual stock (i) in period t is calculated by subtracting the stock's expected return, $E(r_{it})$, from its actual return for a given period given that:

$$E(r_{it}) = r_{ft} + \beta_{it}(r_{mt} - r_{ft})$$

where r_{ft} = risk-free rate for period t;
β_{it} = systematic (beta) risk for stock i for period t; and
r_{mt} = market return for period t.

For purposes of this study excess returns were risk-adjusted by dividing each stock's or portfolio's excess return by its beta coefficient, i.e., r'_{it}/β_i.

[9]A more detailed explanation of these findings is available in John W. Peavy III and David A. Goodman, "A Further Inquiry into the Market Value and Earnings' Yield Anomalies," Institute for Quantitative Research in Finance Conference, October 1982.

[10]For example, on average, portfolios consisting of low P/E stocks possess low systematic (beta) risk, but small capitalization firms' portfolios have high beta risk. Thus, although each portfolio has produced abnormal returns, it has not done so at equal risk levels.

[11]The risk-reduction effect of diversification occurs rapidly as additional stocks are added to a portfolio. Empirical findings show that a randomly-selected 20-security portfolio is 89% correlated with the overall market, implying that specific firm risk accounts for only 11% of the portfolio's risk. See W. H. Wagner and S. Lau, "The Effect of Diversification and Risk," Financial Analysts Journal, November-December 19/1, pp. 48-53.

[12]Beta is a proxy only for systematic risk; thus it is most useful when applied to substantially diversified portfolios which have insignificant unsystematic risk exposure.

[13]The CML uses the standard deviation of returns for a portfolio (σp) as a risk gauge; however, when diversified portfolios are being evaluated, beta would be an equally acceptable risk surrogate so that $\beta_m = 1.0$.

[14]This new index would require continual updating as the P/E's of the various securites change, thus creating a more instable index than would be the case with an overall market index.

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