Size, Value and Financial Distress Risk Premiums: Cross-Section of Expected Returns

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FORWARDING SHEET

The thesis titled "Size, Value and Financial Distress Risk Premiums: Cross-Section of Expected Returns" submitted by Ms. Quratulain Itrat Baig in partial fulfillment of MS degree in Management Sciences with specialization in Finance, has been completed under my guidance and supervision. I am satisfied with the quality of student's research work and allow her to submit this thesis for further process as per IIU rules & regulations.

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IN THE NAME OF ALLAH
The Most Beneficent and Merciful

"Dedicated to my Mother"

ABSTRACT

This research attempts to provide an evidence for the existence of a systematic relation between the financial distress risk and average return along with the effort to find out whether or not HML premium proxies for the risk of financial distress. Following the methodology used by Fama and French (1993), ordinary least squares technique is used after sorting the sample in twelve sub-portfolios. Altman (1968) model is been used to rank the firms according to their distress risk. The results thus produced show that HML and DMS make provisions for the same effect hence concluding that HML proxies for the distress risk factor. Three factor models prove to be of great help to capture much of the market variation, however, consequent to the fact that HML and DMS could be used interchangeably, they should not be used at the same time to arrive at the appropriate discount rate that could be used in valuing projects and decisions pertaining to financing, mergers and acquisitions.

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DECLARATION

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No portion of the work, presented in this thesis, has been submitted in support of any application for any degree or qualification of this or any other university or institute of learning.

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ABREVIATIONS

CAPM:	Capital Asset Pricing Model
APT:	Arbitrage Pricing Theory
R_i - R_f:	Excess Return on Portfolio
R_m - R_f:	Market Premium
SMB:	Small minus Big
HML:	High minus Low
DMS:	Distressed minus Solvent
VIF:	Variance Inflation Factor

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Chapter 1

INTRODUCTION

1.1 Background

A significant number of research studies in finance have made efforts in improving the understanding of investor's valuation of risky cash flows. It is generally believed that a higher return on investments while investing in riskier securities or projects is expected by investors. Literature suggests several asset pricing models that illustrate investor's assessment of risk and valuation of risky cash flows. Capital Asset Pricing Model (CAPM) proposed by Sharpe-Lintner-Black is the most commonly used model that facilitates in assessing the risk of project cash flows and in arriving at the apt most discount rate to be used in valuing the project.

Capital Asset Pricing Model (CAPM) initially developed by Treynor (1961) and Sharpe (1963, 1964) is undoubtedly the first model used to work out the market price for risk. Later on, it was further developed by Lintner (1965, 1969), Mossin (1966) and Black (1972). The theory is based on the interaction of rational optimizing investors where beta of the cash flows is used to measure the risk of a project where there is a linear relation between beta and the required expected return.

Ross (1976) formulated another important equilibrium pricing model, called Arbitrage Pricing Theory (APT). It is believed to be a testable substitute to the Capital Asset pricing Model. CAPM forecasts that linear relation of the rates of return on securities to a single common factor whereas APT assumes that the asset returns are affected by a combination of several common factors which are linearly related to the return on any risky asset. It has a broader spectrum than CAPM since it considers several factors for the explanation of optimum return on a risky asset. However, it has the same spirit as that of CAPM, in fact, CAPM can be shown to be a special case of APT.

Though CAPM has been widely accepted due to its simple formation but, its empirical validity has been questioned a number of times. Relation of return with firm specific characteristic such as size, book-to-market equity and Price-to-earnings has been studied. Nicholson (1960) articulates that low P/E stocks while Banz (1981) shows that low market capitalization firms have high average returns. These patterns in cross-section of stock returns are not explained by CAPM, therefore they are called anomalies.

Fama and French (1992, 1993) developed two models that performed better than CAPM in describing the cross-section of returns. A characteristic model incorporating both firm size and B/M ratio was proposed by Fama and French (1992). Later on Fama and French (1993) came up with a three-factor model where market, size and B/M factors have been incorporated so as to confine a great deal of variation in stock returns in a single model. Using the time series regression approach, they validate that size, and book-to-market ratios amplify the explanation of expected stock returns provided by market beta.

1.2 Research Problem

Financial distress risk premium is hypothesized to be the explanation for premiums related to both, size effect (Chan and Chen (1991)) and B/M ratio (Fama and French (1993, 1995, 1996)). Contrary to that, Lakonishok et al (1994), LaPorta (1996), LaPorta et al (1997) and Mun et al (2000) show that the irrational investor behavior causes the observed relation which is further supported by Daniel and Titman (1997) that relates the impact of HML factor on returns to B/M characteristic. Dichev (1998) argues that firms with high distress risk earn low returns and have low B/M ratios and concludes that HML premium does not characterize as a return for the exposure to financial distress risk. More to the point, Hong and Stien (1999) and Daniel et al (2001) developed behavioral models that are consistent with the empirically observed return patterns.

The argument by Fama and French that HML premium is related to distress-risk is based on the findings that high B/M firms have low profitability. Contrary to that, Dichev (1998) argues that when financial distress is measured by using bankruptcy prediction models, no monotonic positive relation is exhibited between distress-risk and B/M. According to Dichev (1998), HML premium does not represent a return for the exposure to financial-distress risk. Therefore, he concludes that the distress-risk characteristic is imperative in describing the cross-section of returns but does not subsume the role of B/M.

The methodology used by Dichev (1998) was quite different from the one used by Fama and French (1993, 1995). Contrary to Fama and French (1993, 1995), he used Fama and French (1992) characteristic model while excluding the firms with negative book-equity, however he reported separately for the firms trading on three stock exchanges and equal weighted portfolio characteristics and returns. Literature shows that univariate measure of distress-risk such as profitability is a weaker measure of financial distress event as compared to bankruptcy prediction models used by Dichev (1998).

1.3 Research Questions

This thesis sets out to explore the relations between three anomalies, size, B/M, financial distress and average returns. Furthermore it determines whether or not the market prices distress risk. Following hypothesis are tested to provide evidence regarding these issues.

1. Does any relationship exist between size of the firm and cross-section of equity return?

2. Does any relationship exist between book-to-market ratio and cross-section of equity return?

3. Does any relationship exist between financial distress and cross-section of equity return?

4. Do the proposed two-factor models have greater explanatory power than the conventional Capital Asset Pricing Model?

5. Do the proposed three-factor models have greater explanatory power than the two-factor models and conventional Capital Asset Pricing Model?

6. Does the proposed four-factor model has greater explanatory power than the conventional Capital Asset Pricing Model?

7. Does the proposed four-factor model has greater explanatory power than Fama and French three-factor model?

1.4 Importance of the Research

The research is important both in theoretical as well as practical perspective. It is meant to provide an evidence for the existence of a systematic relation between the risk of financial distress and average return. Furthermore, an evidence supporting the importance of distress-risk in describing return, in the context of Fama and French (1993) model, would support the view that the HML premium does not proxies for the risk of financial distress.

Once the evidence is collected that whether or not financial distress risk carries a premium and the role of financial distress risk premium in arriving at the appropriate discount rate is assessed, it would be helpful in valuing projects which is critical in merger & acquisition activities.

1.5 Outline of Methodology

Following the methodology used by Fama and French (1993), ordinary least squares technique is used after sorting the sample in twelve sub-portfolios, for that purpose a sorting formation of 2×3×2 has been applied. Firms are first sorted into size portfolios which are then splitted into B/M portfolios. The firms in portfolios thus formed are again sorted as per their ranking on distress risk. Altman (1968) model is being used to rank the firms according to distress risk and to ascertain the distress risk premium for three-factor and four-factor models.

1.6 Limitations

The main limitations of the study relate to the time span of data period, exclusion of finance firms and to the measure of distress-risk. Since bankruptcy prediction models are the common tools used to identify the high-level distress risk firms, therefore, one of the models i.e. Altman (1968) is used in the study. However, it is likely for all models to measure the distress-risk with some error. Since these models are developed to predict bankruptcy for industrial and manufacturing firms only, therefore, financial firms are removed from the sample. Moreover, Altman model was developed for manufacturing firms whereas as it has been used for manufacturing as well as industrial firms which is again a limitation of this study. Limited time period chosen for the collection of data adds up to the limitation of the study. Stability of the results could be determined if the data collection period is stretched over a longer time span and sub-periods are used in a future research.

1.7 Outline of Thesis

The thesis proceeds as the literature relevant to the determinants of asset returns is presented in chapter 2. Financial distress prediction models are reviewed and testable research hypotheses are developed in the same chapter. Chapter 3 explains the methodology used to test the hypotheses developed earlier. Chapter 4 presents and discusses the results for each tested hypothesis. Chapter 5 discusses the implication of these results and suggestions for future research.

Chapter 2

LITERATURE REVIEW

Cross-section of stock returns has been explained in a variety of ways which could broadly be categorized as risk and behavioral based. Risk-based explanations include models such as CAPM of Sharpe (1964), Lintner (1965) and Black (1972), ICAMP of Merton (1973), and APT by Ross's (1976). These models are based on the hypothesis that investors need to be compensated for exposing their investment to various sources of systematic risk. These models differ in assumptions regarding the source of systematic risk and the market mechanics driving the risk-return relation. Behavioral based explanations take account of investor's irrationality such as over/under-reaction, market inefficiency and models such as those proposed by Hong and Stien (1999) and Daniel et al (2001).

Later on, Fama and French (1993) took a step forward to CAPM by developing a three-factor model incorporating return premiums of firm-specific characteristics such as size and book-to-market ratio (B/M) in addition to market risk premium. However, Fama and French (1995) argued that B/M return premium is interconnected with the financial distress risk.

2.1 Asset Pricing Models

2.1.1 Mean-Variance Efficient Portfolio

The foundation of asset pricing models was laid down by Markowitz (1952). He assumed that all investors are rational and risk-averse as they ask for additional compensation for exposure to additional risk (variability of return). He observed that a) a combination of two risky assets that are not perfectly positively correlated, will not add up their standard deviations of return (risk) and b) the standard deviation of a portfolio of risky assets is less than the sum of individual standard deviations of its components. To create optimal risk-return trade-off, investors are likely to hold a portfolio of assets that may depict their risk aversion level. This strategy helps them to avoid firm specific risk and their portfolio is exposed only to the risk that cannot be eliminated through diversification. This *optimal efficient portfolio* is a combination of a risk-free asset and a number of risky assets where investors keep on adjusting the proportions of the risky assets and the risk-free asset in order to create the optimal risk-return trade off. Markowitz model develops the efficient frontier of portfolios using expected returns and standard deviation of returns which helps the investors to choose the one that suits them the most.

2.1.2 Capital Asset Pricing Model

Total risk that investors face can be splitted into two types i) non-diversifiable (systematic) and ii) diversifiable (unsystematic), while CAPM relates the expected return of a stock to a measure of its non-diversifiable (systematic) risk. Diversifiable risk is security specific and can be exterminated by increasing the number of securities in a portfolio (through diversification) whereas risk associated to economic movements is called non-diversifiable therefore cannot be eliminated through diversification.

Based on the theory of mean-variance efficiency and optimum portfolio selection laid down by Markowitz (1952), Sharp (1964) developed the Capital Asset Pricing Model where return on a single stock is related to the return on an index. The same model was further clarified and extended by Lintner (1965) and Mossin (1966). The cross-section regression tests on the improved model are focused on predicting the slope and the intercept which determines the relation between expected return and market beta, where risk-free rate is the intercept and the expected market return in excess to the risk-free rate is the coefficient of slope. There arise two major problems with these tests, first, the beta estimates for individual securities are not precise enough and secondly the regression residuals have similar sources of variation which leads to positive correlation among them, resultantly the standard errors show up a downward bias.

Blume (1970), Friend and Blume (1973) and Black, Jensen and Scholes (1972) apply the model on portfolios instead of individual securities since the beta estimates are more precise for diversified portfolios as compared to individual securities. Therefore, on the basis of the rationale that weighted average of the expected returns on individual stocks is the expected return on a portfolio, the same model can be used for a portfolio of assets. Fama and MacBeth (1973) estimate month-by-month cross-section regressions of monthly returns on betas instead of estimating a single cross-section regression of average monthly returns on betas.

CAPM is a hypothetical model based on the assumptions that i) investors are reluctant to take risk and desire to maximize their utility ii) they expect homogeneously about returns on assets iii) they can borrow and lend any amount at a risk-free rate iv) the quantity of marketable and perfectly divisible assets is fixed v) information is available to all at no cost vi) perfect competition exists in the market. Although not all these assumptions conform to reality, but these generalizations pave the path for the development of CAPM. Later studies on quantification and pricing of the risk relaxed many of the very strict assumptions.

Based on these assumptions, investors hold a risk- free asset and a combination of risky assets, which forms an optimal portfolio called the market portfolio. This mean-variance efficient portfolio is formed of all traded risky assets weighted according to their market value. The linear relationship between risk and return on efficient portfolios is called Capital Market Line (CML) and can be written as:

$$E(R_p) = R_f + \sigma_p \left[\frac{E(R_m) - R_f}{\sigma_m}\right] \qquad (2.1)$$

where; $E(R_p)$ is the expected return on portfolio p,

R_f is the return on risk-free asset,

$E(R_m)$ is the return on market portfolio,

σ_p is the standard deviation of portfolio returns,

σ_m is the standard deviation of market portfolio returns.

While holding a combination of risk-free asset and market portfolio, the risk called beta (β) is contributed by an asset to the market portfolio, and is relevant to all the investors. Beta is a measure of systematic risk and a straight line known as Security Market Line (SML) depicts the relation between the expected rate of return and beta. The SML equation is:

$$E(R_i) = R_f + \beta_i\left(E(R_m) - R_f\right) \qquad (2.2)$$

where; $E(R_i)$ is the expected return on asset i,

R_f is the return on risk-free asset,

$E(R_m)$ is the return on market portfolio,

β_i is the beta of asset i, and

$$\beta_i = \left[\frac{\sigma_i r_{im}}{\sigma_m}\right] = \frac{Cov(R_i, R_m)}{\sigma^2_m} \quad (2.3)$$

where; r_{im} is the correlation between asset return R_i and market portfolio return R_m.

σ^2_m is the variance of market portfolio.

Since $(E(R_m) - R_f)$ and σ^2_m are the same for all assets, thus $Cov(R_i, R_m)$ determines a unique beta for each asset and therefore its risk premium. Hence, beta of an asset determines its equilibrium price through SML equation.

2.1.3 Arbitrage Pricing Theory

Arbitrage Pricing Theory (APT) presented by Ross (1976) determines the relation between risk and expected return based on the Law of One Price, rather relying on mean-variance efficiency that differentiates APT from CAPM and its extensions. According to APT, assets (or portfolio of assets) that are sensitive to identical risk factors will bear the same price and thus will offer equivalent returns. APT assumes k systematic factors that are common to all assets and are primarily responsible for the movements in all asset prices. The linear relationship of expected return on asset i with k number of risk factors is as below:

$$E(r_i) = \lambda_0 + \beta_{i1}\lambda_1 + \beta_{i2}\lambda_2 + \cdots .. + \beta_{ik}\lambda_k \quad (2.4)$$

2.2 Anomalies to the Capital Asset Pricing Model (CAPM)

Early empirical studies of CAPM are not found supportive for the hypothesis that the cross section of returns is fully captured by the sensitivity to market risk. Such empirical failure of CAPM stimulated the need to investigate the return patterns that are not captured by the sensitivity to market risk which resulted in the studies of relation between returns and firm characteristics such as size, book-to-market (B/M) and price-to-earnings (P/E). Patterns in returns such as return reversals and momentum have also been explored.

Above discussed relations exemplify few potential anomalies to CAPM. Since it is suggested that any publicly available information such as information regarding past prices can be used to predict returns, therefore, violations of the weak or semi-strong form of Efficient Market Hypothesis is also represented through these relations. However, there is some likelihood that empirical issues such as statistical problems or inability to correctly identify the market portfolio may have caused these relations. Moreover, it is rational to believe that some of the effects count for others such as Ball (1978) illustrated that variables like P/E, size and B/M are all scaled versions of a firm's stock price.

2.2.1 Price/Earnings Effect

Earlier empirical work along with the study conducted by Nicholson (1960) concluded that high P/E stocks underperform as compared to low P/E stocks. This hypothesis was based on the studies that had a few statistical limitations such as look-ahead bias, selection bias and no adjustment for risk (Basu (1977), Banz and Breen (1986)). Later on these statistical issues were corrected as Basu (1977) re-examined the hypothesis using estimation procedures where the sample of NYSE firms collected for the period 1956 to 1971 was sorted into 6 portfolios based on their P/E ratio, while one out of those six was comprised of firms with negative P/E ratio.

Using CAPM and zero-beta CAPM, Basu (1977) determined that high P/E portfolios earned 2.5% to 3% less whereas low P/E portfolios earned 2% to 4.5% more than that implied by their level of risk. He further added that a series of good (bad) news make the investors excessively optimistic (pessimistic) and they temporarily overvalue (undervalue) the stocks which cause an increase (decrease) in their P/E ratios. Later on, if the actual earnings turn out to be worse (better) than expected, the prices were re-adjusted accordingly.

2.2.2 Size Effect

Banz (1981) and Reinganum (1981b) were the first to document the relation between company size and asset returns where market value of shareholder's equity was used as a proxy to firm size. These studies formed 25 portfolios by sorting firms first into size quintiles and then by beta. A non-linear relation between market value and equity returns was determined by Banz (1981). Using Time Series Regression, he found a negative coefficient for the size variable whereas its magnitude and significance varied across sub-periods. Further, he concluded that large firms had significantly smaller risk adjusted returns than small firms during the period 1936 to 1975. The smallest firms in the sample had the most prominent effect where the true size effect for very small firms was underestimated by the linear relation.

2.2.3 Price Effect

Stoll and Whaley (1983), Blume and Stambaugh (1983) and Jaffe, Keim and Westerfield (1989) showed that the inverse of price per share is significantly positively related to mean excess returns and is known as Price Effect. Since many small firms have low prices, therefore Stoll and Whaley (1983) and Bhardwaj and Brooks (1992) hypothesized that the size effect and price effect replicate each other. Stoll and Whaley (1983) found a similar magnitude and pattern over time in price effect as that of size effect. Conversely, Jaffe, Keim and Westerfield (1989) for price as compared to size when used in regressions, thus concluded that both had separate influences on expected returns.

2.2.4 Book-Equity / Market-Equity Effect

Keim (1980) and Stattman (1980) were the first to document the relation between book-to-market (B/M) and asset returns where they found a significantly negative relation between them. These studies reported that the B/M effect proxies for the size effect. Penman (1991) reports that after five years of portfolio formation, high B/M firms are less profitable than low B/M firms.

2.2.5 Momentum Effect

Asset pricing models are based on the assumption that investors behave rationally which means that as soon as any new information is available to the investors, they appropriately rework their beliefs regarding probability of future returns. In contrast, behavioral evidence shows that on receiving any new information individuals tend to underweight prior data while overweighing recent information (DeBondt and Thaler (1985)). This behavior shows that stocks with favorable news (winners) are likely to be overvalued whereas stocks with bad news (losers) are likely to be undervalued. An investment strategy of selling winners and buying losers is called contrarian strategy. An investment made while undertaking contrarian strategy pays off when stock prices fall back to their fundamental prices (Chan (1988)).

Based on the hypothesis that temporary mispricing of securities may result in P/E effect along with the behavioral evidence that investors overweight recent information, De Bondt and Thaler (1985, 1987) investigated that whether stock returns could be predicted using the principle of overreaction. They sorted the sample firms based on three years of past performance where 35 stocks with worst (best) performance were allocated to the loser (winner) portfolio. The beta of winner portfolio was consistently greater than the beta of loser portfolio while the later outperformed the earlier by an average cumulative return of 24.6%. Therefore it was concluded that losers earn higher returns while taking lesser risk than winners.

De Bondt and Thaler (1987) used B/M as a measure of over/undervaluation and found that the returns of portfolios based on B/M produces the same reversal pattern as the winner-loser portfolios. Chopra, Lakonishok and Ritter (1992) found significant overreaction effect even after controlling for size and adjusting for test period betas. Same methodology as of Ball and Kothari (1989) was employed with a difference of incorporating empirically determined price of market risk instead of using the price of risk implied by the CAPM. Consequently, the differences in returns generated by differences in betas of winners and losers were not as big as that assumed by CAPM.

2.3 Fama and French Characteristic Model

Fama and French (1992) developed a cross-sectional model by incorporating beta and firm characteristics of a sample of non-financial firms trading on NASDAQ, AMEX and NYSE during the period 1963 to 1990. The two-stage methodology of Fama and MacBeth (1973) was used for the estimation of the model where Ri is the excess return for asset i:

$$R_i = \beta_1 \ln(\text{market value})_i + \beta_2 \ln(B/M)_i \tag{2.5}$$

For the development of the model, firms with negative book-equity were excluded from the sample, however, a comparison of negative and positive book-equity firms was made and it was observed that both high B/M firms and negative book-equity firms had high returns.

2.4 Fama and French Three-Factor Model

To find out whether size and B/M capture the cross-section of excess returns earned by bonds and stocks, Fama and French (1993) developed a three-factor model by extending their 1992 study. The three factor model applies the time-series regression approach of Black, Jensen and Scholes (1972) that helps to capture most of the cross-sectional variation in average stock returns and describes the return on portfolios formed on size and B/M ratio. Monthly returns on stocks and bonds are regressed on the returns to the mimicking portfolios of size, BE/ME and term-structure risk factors in addition to returns on a market portfolio of stocks (Fama and French (1993)).

Fama and French (1995, 1996) tests the ability of three factor model to capture other return anomalies by extending their research to portfolios formed on the basis of E/P, D/P and sales growth. High (low) E/P and D/P stocks show high (low) average returns similar to high (low) B/M stocks while the return predicted by the model was too big for zero D/P and negative E/P portfolios. Moreover, the zero dividend portfolio loaded considerably on the size factor whereas the negative E/P portfolio loaded heavily on both B/M and size factors. In addition, Fama and French (1996) and Jegadesh and Titman (2001) reported that long-term reversal of returns has also been captured by the three-factor model.

Chan and Chen (1991) reported that size effect is related to financial distress. However, while further investigating the argument that high (low) B/M stocks are distressed (growth) stocks, Fama and French (1995) argued that B/M and distress have got a stronger connection as compared to the previously reported size and distress linkage. Since, firms persistent with high (low) profitability showed low (high) B/M, therefore, it was concluded that these firms were growth (distressed) firms.

Relation of size and B/M to shocks in expected earnings is examined by Fama and French (1995). Though the relations reported for earnings was not as strong and consistent as for returns but the regression results showed that the variation in the earnings of market index, B/M portfolios and size portfolios is related to the cross-section of changes in the earnings of firms in the same way as the marker premium, size factor and B/M factor is related to returns. It is suggested that noisy measures of shocks to reported earnings might be a reason for the lack of strength in the earnings relation. Fama and French (1997) used a conditional three-factor model to investigate the relation between B/M and financial distress for industry portfolios which showed an increased HML coefficient for an industry when it is distressed. It is argued than an increase in factor loadings would increase the discount rate and negative abnormal returns.

2.5 Financial Distress Prediction Models

Financial Distress Prediction Models are used to forecast bankruptcies while academics use them in studies on financial distress. Literature suggests four basic frameworks to assess bankruptcy a) based on accounting measures, b) based on stock prices, c) based on interest rates and d) full information analysis, out of which accounting measures are the most commonly used means to measure the credit risk. Such methods vary from simple univariate analysis to complex multivariate credit scoring models like Altman's Z-score (Altman, 1968) or Ohlson's O-score (Ohlson, 1980).

Earlier, size and value effects have also been related to financial distress. Chan and Chen (1991) found that small firms had high financial leverage and cash flow problems, therefore assuming reductions in dividend and high leverage as two proxies for financial distress, they explored their relationship with returns using time series regression tests, and concluded that small firms are riskier than the bigger ones. Later on, Fama and French (1995) showed that the relation between B/M and financial distress is stronger than the relation between size and financial distress. They established that low (high) profitability firms had high (low) B/M and were found to be distressed (growth) firms.

Profitability has been used as a univariate measure of financial distress. However, it is being argued by Altman (1968) and Taffler (1983) that the use of a univariate measure may ignore other aspects and therefore is potentially misleading. Altman (1968) used a sample of manufacturing firms to develop a distress prediction model whereas Ohlson (1980) used industrial firms for the same purpose. The pattern of financial ratios such as profitability, liquidity and leverage, vary from industry to industry as the patterns of capital structure, revenue and expense vary across industries (Edmister (1972), Izan (1984), Platt and Platt (1990)). Hence, same model cannot be appropriate to classify financially distressed firms from two different industries. Various studies from the past have concluded that accounting measures of unsuccessful firms are poles apart from that of going concerns (Altman (1968)). Many researchers including Beaver (1966), Altman (1968), Deakin (1976), Simnett and Trotman (1992) and Altman (1993) found a significant decline in the accounting ratios of financially distressed firms even a couple of years prior to their bankruptcy.

Altman's (1968) Z-score and Ohlson's (1980) O-score have been widely used in research work and in practice (Altman (1993), Dichev (1998)). A number of studies have tried to improve these models but the past empirical work has used the original models as a standard practice. Coats and Fant (1993) suggested that Altman's model is helpful in predicting the "going concern" status of a firm. Classification accuracy of Ohlson (1980) model is greater that Altman (1968) model, with an accuracy of 81.3% vs. 78.2%, respectively. Both the models are found to be good measures of bankruptcy and various other indicators of financial distress (Dichev (1998)). The models are briefly discussed below:

2.5.1 Altman's Z-Score

Z–Score = 1.2(WC/TA) + 1.4(RE/TA) + 3.3(EBIT/TA) + 0.6(MVE/TL) + 1.0(Sales/TA)

where *WC* – working capital, *TA* – total assets, *RE* – retained earnings, *EBIT* – earnings before

interest and taxes, MV*E* – market value of equity, *TL* – total liabilities.

2.5.2 Ohlson's O-Score

O-score = -1:32 - 0:407 (SIZE) + 6:03 (TL/TA) - 1:43 (WC/TA) + 0:076 (CL/CA)

-1:72 (OENEG) - 2:37 (NI/TA) - 1:83 (FU/TL) + 0:285 (INTWO)

-0:521(CHIN)

where SIZE is the log of the ratio of total assets to the GNP price-level index, TL/TA is the ratio of total liabilities to total assets, WC/TA is the ratio of working capital to total assets, CL/CA is the ratio of current liabilities to current assets, a dummy variable OENEG is used which is equal to one if total liabilities exceeds total assets and zero otherwise, NI/TA is the ratio of net income to total assets, FU/TL is the ratio of funds from operations to total liabilities, INTWO is again a dummy variable equal to one if there was negative net income for the last two years and zero otherwise, and CHIN represents a measure of the change in net income.

2.5.3 CHS Bankruptcy Prediction Model

Recently, Campbell, Hilcher and Szilagyi (2005) developed a model to predict bankruptcy by implementing reduced-form econometric model as hereunder:

CHS = - 9:164 - 20:264 (*NIMTAAV G*) + 1:416 (*TL/MTA*) - 7:129 (*EXRETAV G*)

+ 1:411 (*SIGMA*) - 0:045 (*RSIZE*) - 2:132 (*CASH/MTA*) + 0:075 (*MB*)

- 0:058 (*PRICE*)

where *NIMTAAV G* is a declining geometric average of past values of the ratio of net income to the market value of total assets, *TL/MTA* represents the ratio of total liabilities to the market value of total assets, *EXRETAV G* is a declining geometric average of monthly log excess stock returns relative to the market index, *SIGMA* stands for the standard deviation of daily stock returns over the preceding three months, *RSIZE* is the log ratio of market capitalization to the market value of the market index, *CASH/MTA* is the ratio of cash to the market value of total assets, *MB* is the market-to-book ratio, *PRICE* is the log price per share.

It is suggested by rational asset pricing that while investors undertake additional un-diversifiable risk, they dèmand additional return to compensate. Literature shows that cross-section of returns can be described by using market factor along with a range of economic and firm specific factors. Fama and French three-factor model is an exemplary effort towards capturing many of the anomalies to the CAPM. Research questions and hypotheses are developed to extend the available evidence regarding the relation between size, B/M, distress-risk and return. Moreover, the study will determine whether distress-risk is systematically priced. The methodology used to examine the research hypotheses is presented in chapter 3.

Chapter 3

METHODOLOGY

This thesis extends the study of Fama and French (1995) by further investigating the relation of financial distress risk and return. For that, distress factor premium is calculated and time series regression is used to analyze whether or not market prices financial distress risk. Literature review related to the prediction of financial distress strongly carries the view that multivariate prediction models of bankruptcy are better measures of distress risk as compared to univariate measures. Therefore, following Dichev (1998), multivariate measure of predicting bankruptcy is used as a proxy for the financial distress risk.

Chapter 3 outlines and justifies the methodology used to answer the research questions developed in Chapter 2. First, the sample selection criteria and data requirements are detailed. Second, the alternative methods considered to measure financial distress are reviewed and the measure used is justified. Finally, regression methodology and models are discussed.

3.1 Sample Selection Criteria

The sample consists of the firms that are listed on Karachi Stock Exchange (KSE) and have been traded for at least eight consecutive months. Since Altman's (1968) model is used to measure financial distress which is not considered to be an appropriate measure to indicate the distress level for financial firms Dichev (1998). Therefore all financial firms including banking, insurance and securities firms are excluded from the sample. Such non-financial firms that were

Table 3.1: Distribution of Firms in Each of The Sorted Sets

	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
Total	120	143	143	186	185	143
Size (B)	60	71	71	93	92	71
Size (S)	60	72	72	93	93	72
Value (S/L)	20	22	22	29	29	22
Value (S/M)	20	27	27	35	34	27
Value (S/H)	20	22	22	29	29	22
Value (B/L)	20	22	22	29	29	22
Value (B/M)	20	28	28	35	35	28
Value (B/H)	20	22	22	29	29	22
Distress (S/L/S)	6	7	7	8	9	7
Distress (S/L/D)	6	7	7	8	9	7
Distress (S/M/S)	6	8	8	11	11	8
Distress (S/M/D)	6	8	8	11	11	8
Distress (S/H/S)	6	7	7	9	9	7
Distress (S/H/D)	6	7	7	9	9	7
Distress (B/L/S)	6	7	7	9	9	7
Distress (B/L/D)	6	7	7	9	9	7
Distress (B/M/S)	6	8	8	11	11	9
Distress (B/M/D)	6	8	8	11	11	9
Distress (B/H/S)	6	7	6	9	9	7
Distress (B/H/D)	6	7	6	9	9	7

Table 3.1 shows the number of firms in each group after every independent sort, where the number of firms after the third and last sort is not less than 5 in each of the twelve sub-portfolios.

fulfilling the basic criteria for the period 2001 through 2007 were selected for further analysis. Each year the number of firms fulfilling the selection criteria varied as shown in Table 3.1.

3.2 Construction of Explanatory Variables:

3.2.1 Firm Size and Book-to-Market Ratio

Firm size and book-to-market ratio (B/M) are calculated using the same methodology as used by Fama and French (1993). Market Value (MV) at June (t) is used to define firm size, where MV is defined as the number of shares outstanding at June (t) multiplied by share price at June (t), expressed in rupees millions. Firm's book-to-market is calculated at June (t), where book value of equity at the beginning of financial year is divided by the market value of equity at the same point in time. Book value of Shareholder's Equity is, the book value of shares outstanding, plus deferred taxes and investment tax credits, minus the book value of preferred stock.

Literature has supported Market Value (Market Capitalization) as the standard proxy to determine the size of a firm, therefore making it an obvious choice. On the other hand, some ambiguity is found in the choice of measure for value of a firm, however, use of book-to-market ratio has been supported by three strong reasons. First, a comparison of results from the use of book-to-market ratio with those from the use of dividend yield, price-earnings ratio and cash flow-to- price ratio, conclude that portfolios formed using book-to-market ratio have higher explanatory power than ones formed on the basis of alternative ratios Lakonishok, Shleifer, and Vishny (1994), Fama and French (1998), Bauman, Conover, and Miller (1998) and Chan, Karceski, and Lakonishok (1998). Second, there is a possibility of zero dividends, negative earnings and cash flows or there might have a strong impact of one-time effects on these ratios whereas book-to-market ratio is available for most of the companies. Third, book-to-market ratio is used by the majority of researchers, including Fama and French (1993), Carhart (1995) and Ammann and Steiner (2008). These reasons drive the decision to apply book-to-market ratio as a proxy of firm value.

3.2.2 Financial Distress Risk

In most of the research studies on financial distress, legal bankruptcy is used as the operational definition for financial distress (Ward and Foster (1997)), while it is very narrow definition and is not sufficient to describe the phenomenon (Scott (1981)), (Pastena and Ruland (1986)). There are events other than bankruptcy that affect the shareholders and thus formulate the risk of financial distress (Coats and Fant (1993)). Therefore, investors are concerned about both the bankruptcy and other distress events while pricing the financial distress risk.

Altman's (1968) Z-score and Ohlson's (1980) O-score have been widely used in research work and in practice (Altman(1993), Dichev (1998)). A number of studies have tried to improve these models but the past empirical work has used the original models as a standard practice.

3.2.2.1 Altman's Z-Score

$$\text{Z–Score} = 1.2(WC/TA) + 1.4(RE/TA) + 3.3(EBIT/TA) + 0.6(MVE/TL) + 1.0(Sales/TA)$$

where *WC* – working capital, *TA* – total assets, *RE* – retained earnings, *EBIT* – earnings before interest and taxes, *MVE* – market value of equity, *TL* – total liabilities.

3.3 Construction of Factor Mimicking Portfolios:

Fama and French (1993) formed six sub-portfolios (S/L, S/M, S/H, B/L, B/M, B/H) by breaking down the sample in to two size groups and subsequently each divided into three value groups. Whereas, Liew and Vassalou (2000) break down the sample into three groups at each stage, resulting in twenty-seven sub-portfolios. It is more consistent to divide the sample into either two (2×2×2) or three (3×3×3) sub-portfolios according to each characteristic but a slightly different formation of twelve sub-portfolios (2×3×2) is used here. In order to make more than eight portfolios, (2×2×2) formation is not used while (3×3×3) formation is rejected for the reason that it was to make sure that there are at least five securities in each portfolio Vaihekoski (2004).

To form the characteristic-balanced portfolios, for June of each year (t) at first the firms in the sample are sorted out in ascending order according to the market value forming two groups, one of "small firms" (S) and other of "big firms" (B) where the median of the sample as on June (t) is used as the split point. Monthly returns of each firm falling in each of the sorted group are calculated which are further used to calculate an average return to represent each month. Thereafter, the two groups S and B are independently sorted out in ascending order of book-to-market ratio where three groups of the firms with the breakpoint at 30^{th} and 70^{th} percentile are formed, namely low (S/L & B/L), med-level (S/M & B/M) and high (S/H & B/H) respectively. Subsequently, these six groups are further sorted out according to the Z-score forming "distressed" firms (D) and "solvent" firms (S) making a sum of twelve sub-portfolios (S/L/S, S/L/D, S/M/S, S/M/D, S/H/S, S/H/D, B/L/S, B/L/D, B/M/S, B/M/D, B/H/S, B/H/D). The formation of twelve intersecting size, B/M and distress-risk portfolios is described in Table 3.2.

These intersecting size-B/M-distress portfolios are formed to calculate the size, B/M and distress premiums, for which, monthly returns of each stock in these twelve sub-portfolios are used to calculate equally-weighted monthly returns for each set. Though the approach of value-weighted portfolios is more practical as it is used for portfolio investments but the argument favoring equally-weighted approach is that the portfolios then formed are less affected by large stocks therefore enunciates more the factor characteristics themselves (Ammann and Steiner (2008)).

Table 3.2: Intersecting Size, B/M and Distress Risk Portfolios

Risk of Financial Distress	Size	Book to Market Ratio	Financial Distress risk	Portfolio Title
HIGH	Small	Low	Distressed	S/L/D
	Small	Medium	Distressed	S/M/D
	Small	High	Distressed	S/H/D
	Big	Low	Distressed	B/L/D
	Big	Medium	Distressed	B/M/D
	Big	High	Distressed	B/H/D
LOW	Small	Low	Solvent	S/L/S
	Small	Medium	Solvent	S/M/S
	Small	High	Solvent	S/H/S
	Big	Low	Solvent	B/L/S
	Big	Medium	Solvent	B/M/S
	Big	High	Solvent	B/H/S

The premiums of three factors SMB, HML and DMS are then calculated using three formulae, where SMB (small minus big), is the simple mean of the differences between monthly average returns of small and big stocks and it is meant to mimic the risk factor in portfolio returns related to size of the constituent firms. as shown below:

SMB = 1/6*[(S/L/S- B/L/S) + (S/L/D- B/L/D) + (S/M/S- B/M/S) + (S/M/D- B/M/D) + (S/H/S- B/H/S) + (S/H/D- B/H/D)]

The above stated formula shows that the portfolios which are similar in other two characteristics i.e. book-to-market ratio and financial distress-risk, but are differentiated as big and small stocks, the difference of their monthly average returns is calculated. Out of twelve sub-portfolios there are six small and six big portfolios hence the average of six differences gives out the SMB premium.

The portfolio HML (high minus low) is the simple mean of the differences between monthly average returns of high B/M and low B/M stocks and it is meant to mimic the risk factor in portfolio returns related to value of the constituent firms, as shown below:

HML = 1/4*[(S/H/S- S/L/S) + (S/H/D- S/L/D) + (B/H/S- B/L/S) + (B/H/D- B/L/D)]

The formula stated above shows that the portfolios which are similar in other two characteristics i.e. size and financial distress-risk, but are differentiated as High B/M and Low B/M stocks, the difference of their monthly average returns is calculated. Out of twelve, four sub-portfolios having mid-level book-to-market ratio are not used here to calculate HML premium as hence the difference of average monthly returns on four high B/M and four low B/M sub-portfolios is considered where the average of these differences presents the HML premium.

The portfolio DMS (distressed minus solvent) is the simple mean of the differences between monthly average returns of distressed and successful stocks and it is meant to mimic the risk factor in portfolio returns related to financial distress of the constituent firms, as shown below:

$$DMS = 1/6*[(S/L/D - S/L/S) + (S/M/D - S/M/S) + (S/H/D - S/H/S) + (B/L/D - B/L/S) + (B/M/D - B/M/S) + (B/H/D - B/H/S)]$$

Similar to what has been done to calculate SMB and HML, the portfolios which are similar in other two characteristics i.e. size and book-to-market ratio, but are differentiated as distressed and solvent stocks, the difference of their monthly average returns is calculated. Six out of twelve sub-portfolios are classified as solvent and other six are classified as distressed stocks portfolios, thus the average of six differences renders the DMS premium.

3.4 Regression Models:

With the purpose to examine whether the market systematically prices the return premium related to the three factors, ordinary least squares technique is used. Various combinations of three factor premia: SMB, HML and DMS are used to run a number of regressions where market factor is made part of every regression since it is essentially required to describe stock returns (Fama and French (1993)), (Chan and Chen (1991)). To calculate the monthly portfolio excess return, monthly risk-free rate is being subtracted from the monthly returns of each portfolio. At first, CAPM regressions are run using excess return on each portfolio as the dependent variable:

$$Ri_t - Rf_t = \alpha_i + \beta_i (RM_t - Rf_t) + \varepsilon i_t \quad (3.1)$$

Later on following regressions using each factor separately in combination with the market factor are run:

$$Ri_t - Rf_t = \alpha_i + \beta_i (RM_t - Rf_t) + s_i SMB_t + \varepsilon i_t \quad (3.2)$$

$$Ri_t - Rf_t = \alpha_i + \beta_i (RM_t - Rf_t) + h_i HML_t + \varepsilon i_t \quad (3.3)$$

$$Ri_t - Rf_t = \alpha_i + \beta_i (RM_t - Rf_t) + d_i DMS_t + \varepsilon i_t \quad (3.4)$$

Afterwards, Fama and French (1993) three factor model is being tested on each portfolio, as given below:

$$Ri_t - Rf_t = \alpha_i + \beta_i (RM_t - Rf_t) + s_i \, SMB_t + h_i \, HML_t + \varepsilon i_t \quad (3.5)$$

$$Ri_t - Rf_t = \alpha_i + \beta_i (RM_t - Rf_t) + s_i \, SMB_t + d_i \, DMS_t + \varepsilon i_t \quad (3.6)$$

$$Ri_t - Rf_t = \alpha_i + \beta_i (RM_t - Rf_t) + h_i \, HML_t + d_i \, DMS_t + \varepsilon i_t \quad (3.7)$$

In the end, the proposed four factor model including SMB, HML and DMS along with the market factor is being tested, as given below:

$$Ri_t - Rf_t = \alpha_i + \beta_i (RM_t - Rf_t) + s_i \, SMB_t + h_i \, HML_t + d_i \, DMS_t + \varepsilon i_t \quad (3.8)$$

Where;

R_{it} is the equally-weighted return on portfolio i during month t

R_{Ft} is the rate of return on 1-month Treasury bill at the beginning of month t

R_{Mt} is the value-weighted return on all stocks listed on the Karachi Stock Exchange (KSE) during the month t

SMBt is the return on the size factor mimicking portfolio for the month t

HMLt is the return on the B/M factor mimicking portfolio for the month t

DMSt is the return on the distress risk factor mimicking portfolio for the month t

and

ε_{it} is a mean-zero stochastic error term.

A well specified asset pricing model, with excess market return and returns earned by zero-investment portfolios used as explanatory variables, produces intercepts that are almost equal to zero (Fama and French (1993)), and will also exhibit higher adjusted R^2 values. The expected factor loadings, either significantly positive or significantly negative are shown in table 3.3.

Table 3.3: Expected Signs for Factor Loadings

	SMB		HML		DMS	
Firm Characteristic	**Small**	**Big**	**High**	**Low**	**Distressed**	**Solvent**
Expected Sign	+ive	-ive	+ive	-ive	+ive	-ive

Chapter 3 has provided the hypotheses and the methodology that is employed to test the hypotheses in order to answer the research questions developed in chapter 2. The results of these tests are presented in the next chapter.

Chapter 4

RESULTS AND INTERPRETATIONS

This chapter studies the premiums of risk factors RMRF, SMB. HML and DMS resulting from the construction approach presented in the previous chapter. First, descriptive statistics of twelve sub-portfolios and four factors are presented. Second, the regression results of CAPM, two-factor, three-factor and four-factor models are discussed and finally the explanatory powers of these models are compared with each other.

It is believed that small size firms earn higher average returns than big size firms, accordingly high book-to-market ratio firms and distressed firms have higher average returns as compared to low book-to-market ratio and successful firms respectively. Therefore, among the twelve factor mimicking portfolios, S-H-D ought to be the highest return producing portfolio while the case is not true for KSE. Table 4.1 shows that S-M-D is the lowest while B-H-D is the highest average return producing portfolio that is contrary to the evidence found in literature. This inconsistency is attributable to the fact that these factors generate country specific results (Fama and French (1993)).

Table 4.1: Descriptive Statistics of Twelve Factor Mimicking Portfolios

	S-H-S	S-H-D	S-M-S	S-M-D	S-L-S	S-L-D	B-H-S	B-H-D	B-M-S	B-M-D	B-L-S	B-L-D
Mean	0.0221	0.0229	0.0188	0.0076	0.0192	0.0132	0.0246	0.0266	0.0204	0.0168	0.0126	0.0135
SD	0.0895	0.2178	0.0744	0.0915	0.0663	0.0889	0.0668	0.1674	0.0729	0.0914	0.0614	0.0905
Min	-0.2077	-0.8939	-0.1672	-0.2458	-0.1348	-0.1499	-0.1379	-0.7487	-0.1660	-0.1644	-0.1417	-0.1813
Max	0.3748	0.8920	0.2232	0.2779	0.1962	0.3451	0.1477	0.7331	0.1836	0.2752	0.1443	0.2838

Moving ahead to the risk associated with these portfolios, S-H-D is the riskiest of all with a standard deviation of 21.78% whereas B-L-S is the least risky portfolio with a standard deviation of 6.14%. Since S-H-D is the riskiest one, therefore, has the widest range of possible returns as it shows the lowest minimum return and highest maximum return at the same time.

To calculate market risk premium, risk free rate is being deducted from monthly returns on KSE-100 Index while the monthly returns on twelve sub-portfolios are used to construct premiums for the variables SMB, HML and DMS. Table 4.2 shows the imperative statistics of these premiums for the period July' 2001 to June' 2007. The table shows that risk factors R_m-R_f and HML have gained positive returns during the sample period while the other two factors SMB and DMS have ended up in negative average premiums. This shows that big firms have higher average returns on KSE therefore the average premium for SMB (small minus big) is negative in the market. Similarly, negative average premium for DMS shows that the 'solvent' firms earn higher returns than the 'distressed' firms. It is evident from the table below that the volatility of premiums on all the risk factors is greater than 5% however with the standard deviation of 8.05%, the premium on R_m-R_f is the most volatile of all.

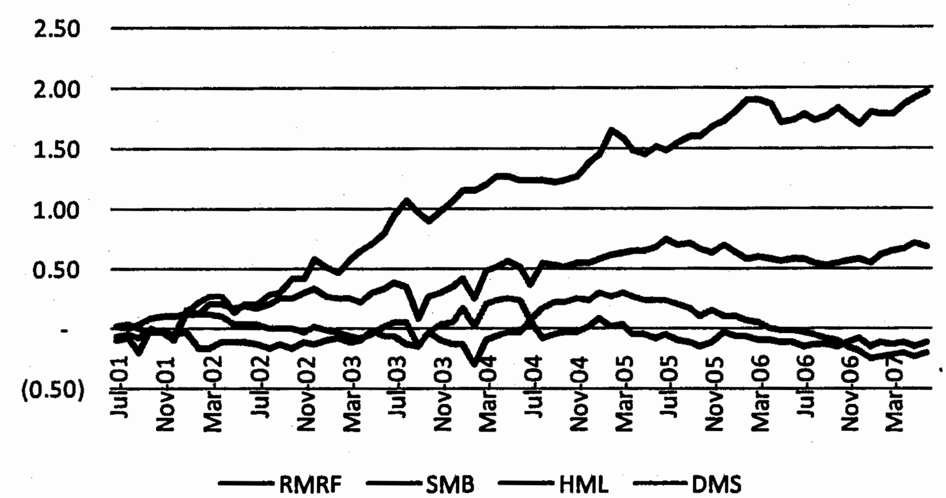
Table 4.2: Premiums of the Risk Factors for Different Portfolios

	Rm-Rf	*SMB*	*HML*	*DMS*
Average Premium	2.75%	-0.18%	0.94%	-0.28%
Standard Deviation	8.05%	5.45%	6.88%	6.37%
Minimum	-15.30%	-16.37%	-25.65%	-20.00%
Maximum	23.61%	20.23%	23.28%	20.81%

Graph 4.1 shows the trend of cumulative continuously compounded premiums on four risk-factors R_m-R_f, SMB, HML and DMS. The behavior of factor premiums discussed above is depicted by the cumulative trend of four factor premiums as well. Graph shows that the trend line for SMB is occasionally above the "zero level" showing that KSE pays out no

premium for the risk of investing in small firms. DMS is meagerly positive over the period but HML has a profusely strong impact during the same period.

Graph 4.1: Cumulative Premiums of Four Risk Factors



An insightful look at the trend of these factors shows that all the factor premiums except that of HML premium have faced a dip after the March' 2005 market crash. This shows that the trend of premium for distressed firms is covered in HML premium. Since the same premium cannot be depicted in two trends, therefore DMS has a downward slope after the market crash therefore we can say that HML proxies for distress risk.

Table 4.3: Correlation of Monthly Premiums of Four Factors

	Rm-Rf	SMB	HML	DMS
Rm-Rf	1.00			
SMB	-0.13	1.00		
HML	0.18	0.27	1.00	
DMS	0.40	0.27	0.73	1.00

The correlation among the factors is of critical importance while running multifactor regressions. Low correlations exhibit the lack of multicolinearity thus showing the high quality of the model. Table 4.3 shows the correlations among the four factors and the results thereof validate the formation methodology of these factors as most of the cross-correlations except that of the one among HML and DMS, are close to zero. The correlation results show that the size and market factor can be appropriately detached from other factors by the construction of twelve sub-portfolios. However, the cross-correlation of 0.73 among HML and DMS factors shows that they are strongly connected to each other, which is mainly because of the inclusion of negative book equity firms since such firms have high distress risk.

Further, to examine the explanatory power of two, three and four factor models, excess return on whole of the sample and on sub-portfolios formed at three subsequent sorts is regressed on premiums obtained by market, size, value and distress factors. The portfolios thus formed are best fit for testing since they are adequately diversified with respect to the characteristics under discussion. The approach used here is in accordance with that of Fama and French (1993), Griffin (2002) and others. Eight time series regression models are thus tested and the results of each are discussed in detail.

Table 4.4 shows the results of regressions run on all portfolios using CAPM equation, whereby it is found that R_m-R_f is significantly positively related to all portfolios returns and these results are consistent across stylized portfolios. Moreover, intercepts for all portfolio returns are on the verge of threshold 'zero' which again indicates that the model is a good fit. It is shown that loadings on market factor for big firms is greater than small firms which indicate the fact that the return on big firms is heavily driven by market factor. Moreover, the model is found to be best fit for the portfolio of Big stocks having Mid-level B/M Ratio (B/M) as it reports the highest adjusted R^2 of 0.77, whereas it is equal or greater than 0.4 for almost all the portfolios except that of Small stocks having High-level B/M Ratio (S/H).

Table 4.4: Capital Asset Pricing Model

$$R_{it} - RF_t = \alpha_i + \beta_i (RM_t - RF_t) + \varepsilon_{it} \qquad (3.1)$$

		Intercept	Rm-Rf	Significance F	Adj. R^2
P	*Coefficients*	-0.0052	0.6625	0.0000	0.62
	t Stat	-1.0154	10.8463		
	P-value	0.3134	0.0000		
S	*Coefficients*	-0.0044	0.5849	0.0000	0.42
	t Stat	-0.6472	7.2090		
	P-value	0.5196	0.0000		
B	*Coefficients*	-0.0050	0.7082	0.0000	0.65
	t Stat	-0.9530	11.5067		
	P-value	0.3439	0.0000		
S/H	*Coefficients*	-0.0019	0.6747	0.0000	0.26
	t Stat	-0.1725	5.0979		
	P-value	0.8635	0.0000		
S/M	*Coefficients*	-0.0060	0.5588	0.0000	0.44
	t Stat	-0.9630	7.5562		
	P-value	0.3388	0.0000		
S/L	*Coefficients*	-0.0063	0.5432	0.0000	0.40
	t Stat	-0.9478	6.8598		
	P-value	0.3465	0.0000		
B/H	*Coefficients*	-0.0019	0.7299	0.0000	0.44
	t Stat	-0.2349	7.5919		
	P-value	0.8150	0.0000		
B/M	*Coefficients*	-0.0081	0.8277	0.0000	0.77
	t Stat	-1.8049	15.5730		
	P-value	0.0754	0.0000		
B/L	*Coefficients*	-0.0072	0.6399	0.0000	0.66
	t Stat	-1.5794	11.8553		
	P-value	0.1187	0.0000		

Table 4.4 shows the results of regressions run using Capital Asset Pricing Model where R_m-R_f .shows a significantly positive relation to all portfolio returns.

Results of regression equation 3.2 are exhibited in Table 4.5, where impact of size premium on portfolio returns is revealed by incorporating SMB in the CAPM.. Table 4.5 shows that the coefficient signs for SMB factor loadings are in line with the literature since they are positive for the small firms and negative for the big firms. The results show that the size effect is explained for the small firm portfolios only while it is rejected for the big firms. Moreover, the intercept is nearly zero and the explanatory power or each of the small portfolios is greater than 0.5. Though in few of the cases the size effect is not priced by the market but in some of the cases it is priced as well, therefore, the premise that the size factor is priced by the market cannot be rejected.

Table 4.6 presents the results of regression equation 3.3, where HML factor has been added to the CAPM. As the literature tells that lower the HML factor negative the loading on it, and higher the HML factor, positive the loadings on it. Half of the theory is exhibited in table 4.6 since the loadings are positive for high HML portfolios, though they are positive for medium and low HML portfolios as well but as the results are insignificant for these portfolios therefore it is out of consideration. However, on the basis of these results, the premise that HML factor is priced by the market cannot be simply ruled out. In addition to that the intercepts for all the portfolios are near to zero and the explanatory power for HML significant portfolios is greater than 0.56.

Moving onwards, DMS factor has been added to CAPM as shown in equation 3.4 and results presented in Table 4.7. In order to study the impact of DMS factor premium on distressed and solvent stocks, portfolios sorted on the basis of Z-score are presented here as well. According to the literature DMS factor loadings are negative for solvent stocks and positive for distressed stocks. The same theory is exhibited in the results below where the

Table 4.5: Two Factor Model: Combination of Market Factor and SMB

$$Rit - RFt = \alpha i + \beta i\ (RMt - RFt) + si\ SMBt + \varepsilon it \quad (3.2)$$

		Intercept	Rm-Rf	SMB	Significance F	Adj. R^2
P	*Coefficients*	-0.0054	0.6826	0.2333	0.0000	0.65
	t Stat	-1.0860	11.5626	2.6771		
	P-value	0.2813	0.0000	0.0093		
S	*Coefficients*	-0.0048	0.6330	0.5577	0.0000	0.59
	t Stat	-0.8257	9.2126	5.4983		
	P-value	0.4118	0.0000	0.0000		
B	*Coefficients*	-0.0049	0.7026	-0.0644	0.0000	0.65
	t Stat	-0.9424	11.2827	-0.7003		
	P-value	0.3493	0.0000	0.4861		
S/H	*Coefficients*	-0.0025	0.7671	1.0721	0.0000	0.57
	t Stat	-0.2970	7.5151	7.1156		
	P-value	0.7674	0.0000	0.0000		
S/M	*Coefficients*	-0.0062	0.5889	0.3500	0.0000	0.52
	t Stat	-1.0679	8.4791	3.4139		
	P-value	0.2893	0.0000	0.0011		
S/L	*Coefficients*	-0.0065	0.5726	0.3405	0.0000	0.46
	t Stat	-1.0333	7.5865	3.0559		
	P-value	0.3051	0.0000	0.0032		
B/H	*Coefficients*	-0.0018	0.7115	-0.2135	0.0000	0.45
	t Stat	-0.2219	7.4067	-1.5058		
	P-value	0.8251	0.0000	0.1367		
B/M	*Coefficients*	-0.0081	0.8253	-0.0278	0.0000	0.77
	t Stat	-1.7899	15.3051	-0.3486		
	P-value	0.0778	0.0000	0.7284		
B/L	*Coefficients*	-0.0072	0.6351	-0.0551	0.0000	0.66
	t Stat	-1.5665	11.6274	-0.6835		
	P-value	0.1218	0.0000	0.4966		

Table 4.5 shows the impact of size premium on portfolio returns where the premium on small minus big firms (SMB) is incorporated in the CAPM.

Table 4.6: Two Factor Model: Combination of Market Factor and HML

$$Rit - RFt = \alpha i + \beta i\,(RMt - RFt) + hi\,HMLt + \varepsilon it \qquad (3.3)$$

		Intercept	Rm-Rf	HML	Significance F	Adj. R^2
P	*Coefficients*	-0.0066	0.6237	0.2518	0.0000	0.68
	t Stat	-1.3835	10.9572	3.7807		
	P-value	0.1710	0.0000	0.0003		
S	*Coefficients*	-0.0063	0.5297	0.3592	0.0000	0.53
	t Stat	-1.0198	7.1178	4.1254		
	P-value	0.3114	0.0000	0.0001		
B	*Coefficients*	-0.0059	0.6796	0.1855	0.0000	0.68
	t Stat	-1.1847	11.3157	2.6388		
	P-value	0.2402	0.0000	0.0103		
S/H	*Coefficients*	-0.0069	0.5293	0.9450	0.0000	0.64
	t Stat	-0.8762	5.6057	8.5529		
	P-value	0.3840	0.0000	0.0000		
S/M	*Coefficients*	-0.0066	0.5408	0.1169	0.0000	0.45
	t Stat	-1.0644	7.2336	1.3364		
	P-value	0.2909	0.0000	0.1858		
S/L	*Coefficients*	-0.0066	0.5352	0.0523	0.0000	0.40
	t Stat	-0.9813	6.6145	0.5527		
	P-value	0.3299	0.0000	0.5823		
B/H	*Coefficients*	-0.0043	0.6595	0.4573	0.0000	0.56
	t Stat	-0.5982	7.6267	4.5193		
	P-value	0.5517	0.0000	0.0000		
B/M	*Coefficients*	-0.0082	0.8247	0.0198	0.0000	0.77
	t Stat	-1.8112	15.1633	0.3107		
	P-value	0.0745	0.0000	0.7570		
B/L	*Coefficients*	-0.0072	0.6393	0.0039	0.0000	0.66
	t Stat	-1.5683	11.5674	0.0600		
	P-value	0.1214	0.0000	0.9523		

Table 4.6 shows the impact of value premium on portfolio returns where the premium on high minus low B/M firms (HML) is incorporated in the CAPM.

DMS coefficients for distressed stocks are positive. Though the regression results show negative loadings on solvent stocks as expected but at the same time these results are found insignificant for the same portfolios. Hence these results show that market prices the DMS factor. Besides the intercept coefficients for all the portfolios are close to zero and the explanatory power for DMS significant portfolios is greater than 0.45.

After running regressions on all possible two factor combinations, three factor models including Fama and French (1993) model have been tested and results are presented in Table 4.8 through Table 4.10. Table 4.8 shows the results of regression equation 3.5 where the impact of SMB and HML is found significant for most of the portfolios. Coefficient signs for factor loadings have followed the same pattern as expected since there are positive SMB and HML loads for small firm and high B/M portfolios while they are negative for big firm and low B/M portfolios respectively. Since the results for B/L portfolio are insignificant, therefore, positive coefficient sign for the same does not matter. Thus the table concludes that market prices three factors proposed by Fama and French (1993). Along with this it is apparent that all the portfolios have somewhat more or less zero intercept however the explanatory power of the model has not increased significantly by using HML and SMB together as compared to the explanatory power of the models when these factors were used separately.

Regression equation 3.6 gives out another three factor model using SMB and DMS along with the Market Factor and the results thus obtained are presented in Table 4.9. The table was extended to third-level sorting since the model includes distress factor. The behavior of factor loadings is consistent with the behavior found in literature since there is positive load on Small and High B/M stock portfolios whereas negative load on Big and Low B/M stock portfolios. The results stand significant in most of the cases for SMB, however,

Table 4.7: Two Factor Model: Combination of Market Factor and DMS

$$Rit - RFt = \alpha i + \beta i (RMt - RFt) + di\,DMSt + \varepsilon it \quad (3.4)$$

		Intercept	Rm-Rf	DMS	Significance F	Adj. R²
P	*Coefficients*	-0.0016	0.5631	0.3141	0.0000	0.69
	t Stat	-0.3461	9.3776	4.1426		
	P-value	0.7303	0.0000	0.0001		
S	*Coefficients*	0.0008	0.4405	0.4567	0.0000	0.55
	t Stat	0.1307	5.6627	4.6505		
	P-value	0.8964	0.0000	0.0000		
B	*Coefficients*	-0.0023	0.6341	0.2342	0.0000	0.68
	t Stat	-0.4512	9.9354	2.9063		
	P-value	0.6532	0.0000	0.0049		
S/H	*Coefficients*	0.0094	0.3610	0.9918	0.0000	0.57
	t Stat	1.0850	3.2682	7.1107		
	P-value	0.2817	0.0017	0.0000		
S/M	*Coefficients*	-0.0037	0.4950	0.2016	0.0000	0.47
	t Stat	-0.5955	6.2708	2.0233		
	P-value	0.5534	0.0000	0.0469		
S/L	*Coefficients*	-0.0040	0.4799	0.2002	0.0000	0.41
	t Stat	-0.6048	5.6536	1.8683		
	P-value	0.5473	0.0000	0.0660		
B/H	*Coefficients*	0.0033	0.5874	0.4504	0.0000	0.53
	t Stat	0.4284	6.0873	3.6967		
	P-value	0.6697	0.0000	0.0004		
B/M	*Coefficients*	-0.0071	0.7995	0.0892	0.0000	0.77
	t Stat	-1.5557	13.8391	1.2231		
	P-value	0.1244	0.0000	0.2255		
B/L	*Coefficients*	-0.0066	0.6235	0.0518	0.0000	0.66
	t Stat	-1.4192	10.5512	0.6942		
	P-value	0.1603	0.0000	0.4899		

Table 4.7 shows the impact of distress risk factor premium on portfolio returns where the premium on distressed minus solvent firms (DMS) is incorporated in the CAPM.

Table 4.7: Two Factor Model: Combination of Market Factor and DMS (contd...)

$$R_{it} - RF_t = \alpha_i + \beta_i (RM_t - RF_t) + d_i DMS_t + \varepsilon_{it} \quad (3.4)$$

		Intercept	Rm-Rf	DMS	Significance F	Adj. R^2
S/H/D	*Coefficients*	0.0227	0.1104	2.6952	0.0000	0.64
	t Stat	1.3676	0.5230	10.1113		
	P-value	0.1759	0.6026	0.0000		
S/M/D	*Coefficients*	-0.0112	0.5588	0.4191	0.0000	0.42
	t Stat	-1.2605	4.9367	2.9325		
	P-value	0.2117	0.0000	0.0046		
S/L/D	*Coefficients*	-0.0052	0.5542	0.5314	0.0000	0.53
	t Stat	-0.6677	5.6111	4.2613		
	P-value	0.5066	0.0000	0.0001		
S/H/S	*Coefficients*	-0.0006	0.6642	0.0791	0.0000	0.37
	t Stat	-0.0636	5.7800	0.5450		
	P-value	0.9495	0.0000	0.5875		
S/M/S	*Coefficients*	0.0000	0.5062	-0.0788	0.0000	0.25
	t Stat	-0.0034	4.8697	-0.6003		
	P-value	0.9973	0.0000	0.5503		
S/L/S	*Coefficients*	0.0029	0.4137	-0.0365	0.0001	0.21
	t Stat	0.3919	4.3392	-0.3035		
	P-value	0.6963	0.0000	0.7624		
B/H/D	*Coefficients*	0.0118	0.5150	1.4329	0.0000	0.45
	t Stat	0.7502	2.5719	5.6682		
	P-value	0.4557	0.0123	0.0000		
B/M/D	*Coefficients*	-0.0112	0.8814	0.2783	0.0000	0.74
	t Stat	-1.9037	11.7524	2.9389		
	P-value	0.0611	0.0000	0.0045		
B/L/D	*Coefficients*	-0.0113	0.7579	0.2669	0.0000	0.57
	t Stat	-1.4970	7.9407	2.2148		
	P-value	0.1390	0.0000	0.0301		
B/H/S	*Coefficients*	0.0045	0.5491	-0.0897	0.0000	0.38
	t Stat	0.6790	6.4681	-0.8369		
	P-value	0.4994	0.0000	0.4055		
B/M/S	*Coefficients*	-0.0033	0.6723	-0.2084	0.0000	0.46
	t Stat	-0.4860	7.7410	-1.9008		
	P-value	0.6285	0.0000	0.0615		
B/L/S	*Coefficients*	-0.0079	0.5721	-0.0419	0.0000	0.52
	t Stat	-1.4560	8.2912	-0.4813		
	P-value	0.1499	0.0000	0.6318		

Table 4.8: Three Factor Model: Combination of Market Factor, SMB and HML

$$R_{it} - RF_t = \alpha_i + \beta_i (RM_t - RF_t) + s_i SMB_t + h_i HML_t + \varepsilon_{it} \quad (3.5)$$

		Intercept	Rm-Rf	SMB	HML	Significance F	Adj. R^2
P	*Coefficients*	-0.0065	0.6425	0.1528	0.2153		
	t Stat	-1.3824	11.2637	1.7768	3.1329	0.0000	0.69
	P-value	0.1714	0.0000	0.0801	0.0026		
S	*Coefficients*	-0.0060	0.5868	0.4649	0.2482		
	t Stat	-1.1030	8.8262	4.6385	3.0979	0.0000	0.63
	P-value	0.2739	0.0000	0.0000	0.0028		
B	*Coefficients*	-0.0060	0.6616	-0.1468	0.2205		
	t Stat	-1.2186	10.9492	-1.6120	3.0289	0.0000	0.68
	P-value	0.2272	0.0000	0.1116	0.0035		
S/H	*Coefficients*	-0.0063	0.6263	0.7893	0.7565		
	t Stat	-1.0620	8.5737	7.1680	8.5937	0.0000	0.79
	P-value	0.2920	0.0000	0.0000	0.0000		
S/M	*Coefficients*	-0.0064	0.5821	0.3363	0.0366		
	t Stat	-1.0900	8.1190	3.1119	0.4232	0.0000	0.51
	P-value	0.2795	0.0000	0.0027	0.6735		
S/L	*Coefficients*	-0.0064	0.5785	0.3524	-0.0318		
	t Stat	-0.9987	7.4218	2.9989	-0.3391	0.0000	0.45
	P-value	0.3215	0.0000	0.0038	0.7356		
B/H	*Coefficients*	-0.0046	0.6076	-0.4222	0.5582		
	t Stat	-0.6860	7.4212	-3.4207	5.6574	0.0000	0.62
	P-value	0.4951	0.0000	0.0011	0.0000		
B/M	*Coefficients*	-0.0082	0.8199	-0.0386	0.0290		
	t Stat	-1.8065	14.7302	-0.4599	0.4322	0.0000	0.77
	P-value	0.0753	0.0000	0.6471	0.6670		
B/L	*Coefficients*	-0.0073	0.6317	-0.0621	0.0187		
	t Stat	-1.5721	11.1934	-0.7301	0.2753	0.0000	0.66
	P-value	0.1206	0.0000	0.4678	0.7839		

Table 4.8 shows the results of Fama and French (1993) three-factor model where the premiums on small minus big firms (SMB) and high minus low B/M firms are used in addition to market premium.

DMS results are insignificant for the portfolios with solvent firms. Again all the intercepts are nearly zero and explanatory power of the model has increased in most of the cases as compared to when these factors were separately used.

The regression equation 3.7 shows that the third and last combination of three-factors mingles HML and DMS along with Market Factor, while the results of regressions are shown in Table 4.10. Though the trend of factor loadings is the same as expected from literature since HML and DMS have a positive load on high B/M and distressed stocks and a negative load on low B/M and solvent stocks but almost all the portfolios have insignificant results for these factors. This shows that HML and DMS cater for the same effect and when they are used together they offset the effect of each other thus following insignificant results. In view of the fact that the findings end up insignificantly, the discussion regarding the upward glide of explanatory power and the origin of intercept loses its worth. Therefore, it is concluded that HML proxies for the distress factor and the proposition of Fama and French (1995) is fully supported.

Finally equation 3.8 presents the proposed four factor model and the regression results for twenty one portfolios are exhibited in Table 4.11. The table shows that the trend of loading on all the factors is in sync with the behavior found in literature. However, to interpret the final results of Table 4.11, it should be looked into simultaneously with Table 4.8 and Table 4.9. It is apparent from these tables that the portfolios for which HML and DMS both were significant when used separately from each other in Table 4.8 and Table 4.9 respectively, they are found significant for either one of them in Table 4.11. This shows that HML and DMS make provisions for the same effect therefore, when both are used concurrently, results cannot be significant for both at the same time.

Table 4.9: Three Factor Model: Combination of Market Factor, SMB and DMS

$$Rit - RFt = \alpha i + \beta i\,(RMt - RFt) + si\,SMBt + di\,DMSt + \varepsilon it \quad (3.6)$$

		Intercept	Rm-Rf	SMB	DMS	Significance F	Adj. R^2
P	*Coefficients*	-0.0022	0.5877	0.1291	0.2717	0.0000	0.70
	t Stat	-0.4669	9.5120	1.4853	3.3791		
	P-value	0.6420	0.0000	0.1421	0.0012		
S	*Coefficients*	-0.0011	0.5236	0.4376	0.3130	0.0000	0.64
	t Stat	-0.1999	7.2699	4.3198	3.3385		
	P-value	0.8421	0.0000	0.0001	0.0014		
B	*Coefficients*	-0.0015	0.6006	-0.1765	0.2922	0.0000	0.70
	t Stat	-0.3039	9.2452	-1.9317	3.4560		
	P-value	0.7621	0.0000	0.0576	0.0009		
S/H	*Coefficients*	0.0060	0.5114	0.7914	0.7317	0.0000	0.71
	t Stat	0.8472	5.4901	6.0406	6.0356		
	P-value	0.3999	0.0000	0.0000	0.0000		
S/M	*Coefficients*	-0.0051	0.5543	0.3120	0.0991	0.0000	0.51
	t Stat	-0.8511	7.1054	2.8436	0.9766		
	P-value	0.3977	0.0000	0.0059	0.3322		
S/L	*Coefficients*	-0.0054	0.5372	0.3017	0.1011	0.0000	0.46
	t Stat	-0.8285	6.3326	2.5283	0.9159		
	P-value	0.4103	0.0000	0.0138	0.3629		
B/H	*Coefficients*	0.0052	0.5034	-0.4421	0.5957	0.0000	0.59
	t Stat	0.7274	5.3899	-3.3654	4.9003		
	P-value	0.4695	0.0000	0.0013	0.0000		
B/M	*Coefficients*	-0.0068	0.7860	-0.0709	0.1125	0.0000	0.77
	t Stat	-1.4801	13.0826	-0.8393	1.4389		
	P-value	0.1435	0.0000	0.4042	0.1548		
B/L	*Coefficients*	-0.0062	0.6072	-0.0858	0.0800	0.0000	0.66
	t Stat	-1.3349	9.9007	-0.9948	1.0021		
	P-value	0.1864	0.0000	0.3234	0.3198		

Table 4.9 shows the results of a proposed three-factor model where the premiums on small minus big firms (SMB) and distressed minus solvent firms (DMS) are used in addition to market premium.

Table 4.9: Three Factor Model: Combination of Market Factor, SMB and DMS (contd...)

$$Rit - RFt = \alpha i + \beta i\,(RMt - RFt) + si\,SMBt + di\,DMSt + \varepsilon it \quad (3.6)$$

		Intercept	Rm-Rf	SMB	DMS	Significance F	Adj. R^2
	Coefficients	0.0158	0.4164	1.6100	2.1662		
S/H/D	*t Stat*	1.2065	2.4273	6.6731	9.7023	0.0000	0.78
	P-value	0.2318	0.0179	0.0000	0.0000		
	Coefficients	-0.0130	0.6367	0.4101	0.2843		
S/M/D	*t Stat*	-1.5139	5.6390	2.5827	1.9349	0.0000	0.46
	P-value	0.1347	0.0000	0.0120	0.0572		
	Coefficients	-0.0070	0.6343	0.4214	0.3929		
S/L/D	*t Stat*	-0.9542	6.5636	3.1012	3.1241	0.0000	0.58
	P-value	0.3434	0.0000	0.0028	0.0026		
	Coefficients	-0.0032	0.7775	0.5961	-0.1168		
S/H/S	*t Stat*	-0.3823	7.1612	3.9042	-0.8266	0.0000	0.47
	P-value	0.7034	0.0000	0.0002	0.4114		
	Coefficients	-0.0011	0.5542	0.2526	-0.1618		
S/M/S	*t Stat*	-0.1386	5.2059	1.6874	-1.1678	0.0000	0.27
	P-value	0.8902	0.0000	0.0961	0.2470		
	Coefficients	0.0018	0.4642	0.2657	-0.1238		
S/L/S	*t Stat*	0.2425	4.7860	1.9482	-0.9812	0.0001	0.24
	P-value	0.8092	0.0000	0.0555	0.3300		
	Coefficients	0.0187	0.2133	-1.5869	1.9543		
B/H/D	*t Stat*	1.5515	1.3470	-7.1246	9.4813	0.0000	0.68
	P-value	0.1254	0.1824	0.0000	0.0000		
	Coefficients	-0.0114	0.8878	0.0337	0.2672		
B/M/D	*t Stat*	-1.9095	11.3319	0.3059	2.6207	0.0000	0.74
	P-value	0.0604	0.0000	0.7606	0.0108		
	Coefficients	-0.0098	0.6947	-0.3323	0.3761		
B/L/D	*t Stat*	-1.3485	7.2693	-2.4724	3.0236	0.0000	0.60
	P-value	0.1820	0.0000	0.0159	0.0035		
	Coefficients	0.0052	0.5222	-0.1418	-0.0431		
B/H/S	*t Stat*	0.7702	5.9405	-1.1469	-0.3770	0.0000	0.38
	P-value	0.4438	0.0000	0.2555	0.7073		
	Coefficients	-0.0019	0.6115	-0.3197	-0.1034		
B/M/S	*t Stat*	-0.2942	7.0696	-2.6279	-0.9185	0.0000	0.50
	P-value	0.7695	0.0000	0.0106	0.3616		
	Coefficients	-0.0075	0.5537	-0.0970	-0.0101		
B/L/S	*t Stat*	-1.3735	7.7280	-0.9626	-0.1080	0.0000	0.52
	P-value	0.1741	0.0000	0.3392	0.9143		

Table 4.10: Three Factor Model: Combination of Market Factor, HML and DMS

$$R_{it} - RF_t = \alpha_i + \beta_i (RM_t - RF_t) + h_i HML_t + d_i DMS_t + \varepsilon_{it} \quad (3.7)$$

		Intercept	Rm-Rf	HML	DMS	Significance F	Adj. R^2
P	*Coefficients*	-0.0033	0.5762	0.1143	0.2170	0.0000	0.69
	t Stat	-0.6794	9.4655	1.1893	1.9505		
	P-value	0.4992	0.0000	0.2384	0.0552		
S	*Coefficients*	-0.0015	0.4578	0.1511	0.3284	0.0000	0.55
	t Stat	-0.2293	5.8081	1.2144	2.2796		
	P-value	0.8193	0.0000	0.2288	0.0258		
B	*Coefficients*	-0.0035	0.6433	0.0802	0.1661	0.0000	0.68
	t Stat	-0.6584	9.8847	0.7808	1.3962		
	P-value	0.5125	0.0000	0.4376	0.1672		
S/H	*Coefficients*	-0.0008	0.4397	0.6855	0.4095	0.0000	0.66
	t Stat	-0.1028	4.3906	4.3358	2.2375		
	P-value	0.9184	0.0000	0.0000	0.0285		
S/M	*Coefficients*	-0.0033	0.4923	-0.0236	0.2217	0.0000	0.46
	t Stat	-0.5116	6.0902	-0.1848	1.5007		
	P-value	0.6106	0.0000	0.8539	0.1381		
S/L	*Coefficients*	-0.0016	0.4614	-0.1616	0.3375	0.0000	0.42
	t Stat	-0.2327	5.3612	-1.1893	2.1458		
	P-value	0.8167	0.0000	0.2385	0.0355		
B/H	*Coefficients*	-0.0023	0.6302	0.3723	0.1342	0.0000	0.56
	t Stat	-0.3032	6.6601	2.4923	0.7762		
	P-value	0.7627	0.0000	0.0151	0.4403		
B/M	*Coefficients*	-0.0059	0.7903	-0.0797	0.1569	0.0000	0.77
	t Stat	-1.2345	13.4285	-0.8573	1.4585		
	P-value	0.2213	0.0000	0.3943	0.1493		
B/L	*Coefficients*	-0.0057	0.6163	-0.0627	0.1051	0.0000	0.66
	t Stat	-1.1594	10.2146	-0.6583	0.9527		
	P-value	0.2503	0.0000	0.5126	0.3441		

Table 4.10 shows the results of a proposed three-factor model where the premiums on high minus low B/M firms (HML) and distressed minus solvent firms (DMS) are used in addition to market premium.

Table 4.10: Three Factor Model: Combination of Market Factor, HML and DMS (contd…)

$$Rit - RFt = \alpha i + \beta i\,(RMt - RFt) + hi\,HMLt + di\,DMSt + \varepsilon it \quad (3.7)$$

		Intercept	Rm-Rf	HML	DMS	Significance F	Adj. R^2
	Coefficients	0.0000	0.2847	1.5186	1.4052		
S/H/D	*t Stat*	-0.0014	1.5638	5.2836	4.2233	0.0000	0.74
	P-value	0.9989	0.1225	0.0000	0.0001		
	Coefficients	-0.0067	0.5237	-0.3052	0.6783		
S/M/D	*t Stat*	-0.7246	4.6128	-1.7026	3.2689	0.0000	0.43
	P-value	0.4712	0.0000	0.0932	0.0017		
	Coefficients	0.0006	0.5101	-0.3839	0.8575		
S/L/D	*t Stat*	0.0716	5.2715	-2.5134	4.8490	0.0000	0.56
	P-value	0.9432	0.0000	0.0143	0.0000		
	Coefficients	-0.0075	0.7176	0.4650	-0.3159		
S/H/S	*t Stat*	-0.8307	6.3983	2.6267	-1.5415	0.0000	0.42
	P-value	0.4090	0.0000	0.0106	0.1278		
	Coefficients	-0.0016	0.5185	0.1074	-0.1700		
S/M/S	*t Stat*	-0.1906	4.8848	0.6412	-0.8766	0.0001	0.25
	P-value	0.8494	0.0000	0.5235	0.3838		
	Coefficients	0.0048	0.3996	-0.1224	0.0674		
S/L/S	*t Stat*	0.6069	4.1116	-0.7978	0.3796	0.0003	0.21
	P-value	0.5460	0.0001	0.4278	0.7054		
	Coefficients	0.0019	0.5910	0.6629	0.8698		
B/H/D	*t Stat*	0.1177	2.9751	2.1138	2.3959	0.0000	0.48
	P-value	0.9066	0.0041	0.0382	0.0193		
	Coefficients	-0.0108	0.8783	-0.0267	0.3010		
B/M/D	*t Stat*	-1.7436	11.4379	-0.2204	2.1447	0.0000	0.74
	P-value	0.0857	0.0000	0.8262	0.0356		
	Coefficients	-0.0055	0.7136	-0.3853	0.5942		
B/L/D	*t Stat*	-0.7260	7.6595	-2.6197	3.4896	0.0000	0.61
	P-value	0.4703	0.0000	0.0108	0.0009		
	Coefficients	-0.0042	0.6158	0.5813	-0.5835		
B/H/S	*t Stat*	-0.6906	8.2539	4.9358	-4.2794	0.0000	0.54
	P-value	0.4922	0.0000	0.0000	0.0001		
	Coefficients	-0.0023	0.6642	-0.0705	-0.1485		
B/M/S	*t Stat*	-0.3153	7.4804	-0.5029	-0.9155	0.0000	0.45
	P-value	0.7535	0.0000	0.6166	0.3632		
	Coefficients	-0.0097	0.5859	0.1195	-0.1434		
B/L/S	*t Stat*	-1.7097	8.3595	1.0800	-1.1199	0.0000	0.52
	P-value	0.0919	0.0000	0.2839	0.2667		

A complete summary of adjusted R^2 of each portfolio for all models is given below in Table 4.12. The table clearly shows that the explanatory power of each of the two-factor models is greater than the Capital Asset Pricing Model. The same effect is could be seen in each portfolio when another factor is added to the two-factor models with few exceptions where it remains almost the same even after the factor addition. However, addition of the fourth factor does not help on to increase the explanatory power as compared to the three-factor models, since for each portfolio it matches to the explanatory power of any of the three-factor models. Therefore, using SMB, HML and DMS altogether does not add something as compared to when either two of them are used together.

A complete summary of Variance Inflation Factors (VIF) of each portfolio for all models is given in Table 4.13. Variance inflation factors are a measure of the multi-colinearity among the independent variables in an ordinary least square regression analysis. A common rule of thumb is that if VIFj is greater than 5, then multicollinearity is high. Since the multicolieartiy index VIF is less than 5 in each case, therefore it shows that multicolinearity exists within the tolerance limit. The formula for calculating the multicolinearity measure is given below:

$$VIF_j = \frac{1}{1 - R_j^2}$$

where R_j is the multiple correlation coefficient.

If the variance inflation factor of an independent variable is 5.27 ($\sqrt{5.27} = 2.3$) this means that the standard error for the coefficient of that independent variable is 2.3 times as large as it would be if that independent variable was uncorrelated with the other independent variables.

Table 4.11: Four Factor Model: Combination of Market Factor, SMB, HML and DMS

$$Rit - RFt = \alpha i + \beta i\,(RMt - RFt) + si\,SMBt + hi\,HMLt + di\,DMSt + \varepsilon it \quad (3.8)$$

		Intercept	Rm-Rf	SMB	HML	DMS	Significance F	Adj. R^2
P	*Coefficients*	-0.0038	0.5987	0.1232	0.1061	0.1835	0.0000	0.70
	t Stat	-0.7672	9.5834	1.4181	1.1104	1.6244		
	P-value	0.4456	0.0000	0.1608	0.2708	0.1090		
S	*Coefficients*	-0.0029	0.5364	0.4309	0.1225	0.2111	0.0000	0.64
	t Stat	-0.5078	7.3631	4.2521	1.0992	1.6030		
	P-value	0.6133	0.0000	0.0001	0.2756	0.1136		
B	*Coefficients*	-0.0029	0.6102	-0.1815	0.0923	0.2155	0.0000	0.69
	t Stat	-0.5540	9.2620	-1.9812	0.9156	1.8091		
	P-value	0.5814	0.0000	0.0517	0.3632	0.0749		
S/H	*Coefficients*	-0.0034	0.5777	0.7565	0.6352	0.2036	0.0000	0.79
	t Stat	-0.5327	7.1857	6.7652	5.1649	1.4010		
	P-value	0.5960	0.0000	0.0000	0.0000	0.1658		
S/M	*Coefficients*	-0.0044	0.5496	0.3144	-0.0445	0.1361	0.0000	0.51
	t Stat	-0.7049	6.9111	2.8424	-0.3655	0.9467		
	P-value	0.4833	0.0000	0.0059	0.7159	0.3472		
S/L	*Coefficients*	-0.0027	0.5182	0.3117	-0.1823	0.2526	0.0000	0.46
	t Stat	-0.3976	6.0720	2.6255	-1.3960	1.6376		
	P-value	0.6922	0.0000	0.0107	0.1673	0.1062		
B/H	*Coefficients*	-0.0008	0.5455	-0.4642	0.4031	0.2605	0.0000	0.63
	t Stat	-0.1097	6.0800	-3.7199	2.9370	1.6065		
	P-value	0.9129	0.0000	0.0004	0.0045	0.1129		
B/M	*Coefficients*	-0.0057	0.7781	-0.0668	-0.0752	0.1750	0.0000	0.77
	t Stat	-1.1823	12.7529	-0.7870	-0.8058	1.5869		
	P-value	0.2413	0.0000	0.4341	0.4232	0.1172		
B/L	*Coefficients*	-0.0054	0.6012	-0.0827	-0.0572	0.1275	0.0000	0.66
	t Stat	-1.1002	9.6319	-0.9521	-0.5991	1.1303		
	P-value	0.2752	0.0000	0.3445	0.5511	0.2624		

Table 4.11 shows the results of the proposed four-factor model where the premiums of on small minus big firms (SMB), high minus low B/M firms (HML) and distressed minus solvent firms (DMS) are simultaneously used in addition to market premium.

Table 4.11: Four Factor Model: Combination of Market Factor, SMB, HML and DMS (cont...)

$$Rit - RFt = \alpha i + \beta i\,(RMt - RFt) + si\,SMBt + hi\,HMLt + di\,DMSt + \varepsilon it \quad (3.8)$$

		Intercept	Rm-Rf	SMB	HML	DMS	Significance F	Adj. R^2
S/H/D	*Coefficients*	-0.0051	0.5643	1.5322	1.4169	0.9882	0.0000	0.87
	t Stat	-0.4902	4.2238	8.2463	6.9332	4.0921		
	P-value	0.6256	0.0001	0.0000	0.0000	0.0001		
S/M/D	*Coefficients*	-0.0081	0.6019	0.4284	-0.3336	0.5617	0.0000	0.48
	t Stat	-0.9201	5.3689	2.7477	-1.9453	2.7715		
	P-value	0.3608	0.0000	0.0077	0.0559	0.0072		
S/L/D	*Coefficients*	-0.0009	0.5911	0.4441	-0.4134	0.7366	0.0000	0.62
	t Stat	-0.1266	6.3613	3.4365	-2.9083	4.3849		
	P-value	0.8997	0.0000	0.0010	0.0049	0.0000		
S/H/S	*Coefficients*	-0.0095	0.8221	0.5727	0.4270	-0.4718	0.0000	0.52
	t Stat	-1.1433	7.7979	3.9058	2.6479	-2.4756		
	P-value	0.2570	0.0000	0.0002	0.0101	0.0158		
S/M/S	*Coefficients*	-0.0025	0.5637	0.2476	0.0910	-0.2374	0.0001	0.26
	t Stat	-0.2898	5.2003	1.6425	0.5488	-1.2118		
	P-value	0.7728	0.0000	0.1052	0.5849	0.2299		
S/L/S	*Coefficients*	0.0039	0.4495	0.2734	-0.1405	-0.0070	0.0001	0.24
	t Stat	0.5006	4.5710	1.9993	-0.9344	-0.0393		
	P-value	0.6183	0.0000	0.0496	0.3535	0.9688		
B/H/D	*Coefficients*	0.0073	0.2938	-1.6292	0.7711	1.3132	0.0000	0.72
	t Stat	0.6256	1.9661	-7.8387	3.3731	4.8612		
	P-value	0.5337	0.0534	0.0000	0.0012	0.0000		
B/M/D	*Coefficients*	-0.0110	0.8848	0.0353	-0.0291	0.2914	0.0000	0.74
	t Stat	-1.7478	11.0707	0.3176	-0.2377	2.0168		
	P-value	0.0851	0.0000	0.7518	0.8128	0.0477		
B/L/D	*Coefficients*	-0.0044	0.6567	-0.3123	-0.3646	0.6792	0.0000	0.63
	t Stat	-0.6072	7.0547	-2.4122	-2.5603	4.0361		
	P-value	0.5458	0.0000	0.0186	0.0127	0.0001		
B/H/S	*Coefficients*	-0.0036	0.5840	-0.1743	0.5929	-0.5361	0.0000	0.55
	t Stat	-0.6006	7.6659	-1.6451	5.0875	-3.8923		
	P-value	0.5502	0.0000	0.1046	0.0000	0.0002		
B/M/S	*Coefficients*	-0.0012	0.6063	-0.3170	-0.0494	-0.0623	0.0000	0.49
	t Stat	-0.1746	6.8758	-2.5843	-0.3665	-0.3907		
	P-value	0.8619	0.0000	0.0119	0.7151	0.6973		
B/L/S	*Coefficients*	-0.0094	0.5669	-0.1039	0.1264	-0.1151	0.0000	0.52
	t Stat	-1.6464	7.8279	-1.0318	1.1409	-0.8795		
	P-value	0.1044	0.0000	0.3059	0.2580	0.3823		

This chapter concludes that there exists a premium for all three risk factors i.e. size, value and distress risk and the relationship between these variables and equity returns is the same as found in literature and exhibited in Table 3.3. The proposed two-factor and three-factor models have greater explanatory power than the conventional Capital Asset Pricing Model. Moreover, the proposed three-factor models have generally greater explanatory power as compared to the two-factor models, however, the proposed four-factor model was not able to increase the explanatory power as compared to any of the three-factor models significantly. This chapter has discussed the results and their interpretations in detail. Implication of these results and suggestions for future research are discussed in the next chapter.

Table 4.12: Adjusted R Square

	CAPM	2 Factor with SMB	2 Factor with HML	2 Factor with DMS	3 Factor SMB + HML	3 Factor SMB + DMS	3 Factor HML + DMS	4 Factor
	Adj. R^2	Adj. R^2	Adj. R^2	Adj. R^2	Adj. R^2	Adj. R^2	Adj. R^2	Adj. R^2
P	0.62	0.65	0.68	0.69	0.69	0.70	0.69	0.70
S	0.42	0.59	0.53	0.55	0.63	0.64	0.55	0.64
B	0.65	0.65	0.68	0.68	0.68	0.70	0.68	0.69
S/H	0.26	0.57	0.64	0.57	0.79	0.71	0.66	0.79
S/M	0.44	0.52	0.45	0.47	0.51	0.51	0.46	0.51
S/L	0.40	0.46	0.40	0.41	0.45	0.46	0.42	0.46
B/H	0.44	0.45	0.56	0.53	0.62	0.59	0.56	0.63
B/M	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77
B/L	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66

Table 4.12 gives a complete summary of adjusted R^2 of each portfolio for all models. The table clearly shows that the explanatory power of each model increases with the addition of another factor with few exceptions where it remains almost the same even after the factor addition.

Table 4.13: Variance Inflation Factor

	CAPM	2 Factor with SMB	2 Factor with HML	2 Factor with DMS	3 Factor SMB + HML	3 Factor SMB + DMS	3 Factor HML + DMS	4 Factor
	Vif	Vif	Vif	Vif	Vif	Vif	Vif	Vif
P	2.64	2.88	3.14	3.25	3.24	3.31	3.27	3.32
S	1.72	2.44	2.11	2.22	2.74	2.79	2.24	2.80
B	2.85	2.83	3.09	3.15	3.17	3.28	3.14	3.27
S/H	1.35	2.31	2.75	2.31	4.75	3.50	2.90	4.82
S/M	1.79	2.06	1.81	1.87	2.04	2.06	1.84	2.03
S/L	1.67	1.85	1.66	1.71	1.82	1.84	1.72	1.87
B/H	1.80	1.83	2.30	2.12	2.65	2.44	2.28	2.71
B/M	4.40	4.35	4.34	4.43	4.30	4.41	4.42	4.39
B/L	2.97	2.94	2.92	2.94	2.90	2.94	2.92	2.92

Table 4.13 gives a complete summary of Variance Inflation Factor (VIF) of each portfolio for all models where VIF is less than 5 in each case. This shows that multicolinearity exists within the tolerance limit.

Chapter 5

IMPLICATIONS AND CONCLUSION

The discussion in previous chapter shows that book-to-market ratio and z-score capture the same variation in portfolio returns since both report the distress or solvency of the firms. The firms that are distressed, at the same time have high book-to-market ratio as advocated by Fama and French (1995). Hence, the factors HML and DMS are highly positively correlated showing cross-correlation up to 0.73. Market factor is found to be the most pronounced factor with the annualized average premium of 32.76% while HML too pays out a positive return of 11.28% p.a..

This research suggests that CAPM should be used with caution since it is not capable to capture the market variations completely. Three factor models are of great help to capture much of the market variation, however, the fact that HML and DMS could be used interchangeably, therefore they should not be used at the same time. Market responds very differently to small firms as compared to big firms, same goes with high book-to-market and distressed stocks or low book-to-market and solvent stocks, hence all these facts should be kept in mind while formulating investing strategies. This would help to arrive at the appropriate discount rate that may be used in valuing projects and decisions pertaining to financing, mergers and acquisitions.

This research could be extended by studying the determinants of all the risk factors separately. Additionally, the same models could be applied on industry wise sorted portfolios which could help to identify the most vibrant factor for individual business sectors. Another research may add macroeconomic variables in these models to check the variation in market returns caused by those variables.

BIBLIOGRAPHY

Altman, E.I., 1968, Financial ratios, discriminant analysis and the predictive power of corporate bankruptcy, *Journal of Finance*, **23**, 589-609.

Altman, E.I., 1993, Corporate financial distress and bankruptcy: A complete guide to predicting and avoiding distress and profiting from bankruptcy, Wiley, N.Y.

Ball, R., 1978, Anomalies in relationships between securities' yields and yield surrogates, *Journal of Financial Economics,* **6,** pp. 103-126.

Ball, R. and Kothari, S. P., 1989, Non-stationery expected returns: Implications for the tests of market efficiency and serial correlation in returns, *Journal of Financial Economics,* **25**, 51-74.

Bauman, S. W., Conover, M. C. and Miller, R. E., 1998, "Growth versus Value and Large Cap versus Small-Cap Stocks in International Markets", *Financial Analysts Journal*, **54**, pp. 75−89.

Banz, R. W., 1981, The relationship between return and market value of common stocks, *Journal of Financial Economics,* **9**, 3-18.

Banz, R. W. and Breen, W. J., 1986, Sample-dependent results using accounting and market data: Some evidence, *Journal of Finance,* **41,** 779-773.

Basu, S., 1977, Investment performance of common stocks in relation to their price-earnings ratios: A test of the efficient market hypothesis, *Journal of Finance,* **32**, 663-682.

Black, F., 1972, Capital market equilibrium with restricted borrowing, *Journal of Business,* **45**, 444-455.

Black, F., Jensen, M. and Scholes, M., 1972, The Capital Asset Pricing Model: Some empirical tests, *Studies in the theory of Capital Markets,* (Ed, Jensen, M. C.) Praeger, NY, pp. 79 - 122.

Bhardawaj, R. K. and Brooks, L. D., 1992, The January anomaly: Effects of low share price, transaction costs and bid-ask bias, *Journal of Finance,* **47**, 553-575.

Blume, M. E., 1970, Portfolio Theory, A step towards its practical application, *Journal of Business,* **43**, 152-173.

Blume, M. E. and Friend, I., 1973, A new look at the Capital Asset pricing Model, *Journal of Finance,* **28**, 19-33.

Blume, M. E. and Stambaugh, R., 1983, Biases in computed returns, an application to the size effect, *Journal of Financial Economics,* **13**, 387-404.

Campbell, J. Y., Hilcher, J. and Szilagyi, J., 2005, In search of Distress Risk, *Discussion Paper*, Harvard University Cambridge, Massachusetts.

Carhart, M., 1995, "Survivor Bias and Persistence in Mutual Fund Performance", *Unpublished Ph.D. dissertation,* Graduate School of Business, University of Chicago.

Chan, K. C., 1988, On the contrarian investment strategy, *Journal of Business,* **61**, 147-163.

Chan, K.C. and Chen, N.F., 1991, Structural and return characteristics of small and large firms, *Journal of Finance*, 46, 1467-1484.

Chan, K. C., Karceski, J. and Lakonishok, J., 1998, "The Risk and Return from Factors" , *The Journal of Financial and Quantitative Analysis,* **33**, pp. 159−188.

Chopra, N., Lakonishok, J. and Ritter, J. R., 1992, Measuring abnormal performance. Do stocks overreact? *Journal of Financial Economics,* **31**, 235-268.

Coats, P. K. and Fant, F. L., 1993, Recognizing financial distress patterns using a neural network tool, *Financial Management,* **22**, 142-155.

Daniel, K. and Titman, S., 1997, Evidence on the cross sectional variation in stock returns, *Journal of Finance*, **52**, 1-33.

Deakin, E. B., 1976, Distributions of financial accounting ratios: Some empirical evidence, *The Accounting Review,* **51**, 90-96.

DeBondt, W. F. M. and Thaler, R., 1985, Does the stock market overreact? *Journal of Finance,* **40**, 793-805.

DeBondt, W. F. M. and Thaler, R., 1987, Further evidence on investor overreaction and stock marker seasonality, *Journal of Finance,* **42,** 557-581.

Dichev, I. D., 1998, Is the risk of bankruptcy a systematic risk? *Journal of Finance,* **53,** 1131 - 1147.

Daniel, K., Titman, S. and Wei, K. C. J., 2001, Explaining the cross-section of stock returns in Japan, Factors or characteristics?, *Journal of Finance,* **56,** 743-766.

Edmister, R. O., 1972, An empirical test of financial ratio analysis for small business failure prediction, *Journal of Financial and Quantitative Analysis,* **7**, 1477-1493.

Fama, E. F. and MacBeth, J. D., 1973, Risk, return and equilibrium: Empirical Tests, *Journal of Political Economy,* pp. 607-636.

Fama, E. F., and French, K. R., 1992, "The cross section of expected stock returns", *Journal of Finance*, **47**, 427-465.

Fama, E. F. and French, K. R., 1993, "Common risk factors in the returns on stocks and bonds", *Journal of Financial Economics,* **33**, 3-56.

Fama, E. F., and French, K. R., 1995, "Size and book-to-market factors in earnings and returns", *Journal of Finance*, **50**, 131-155.

Fama, E. F., and French, K. R., 1996, "Multifactor explanations of asset pricing anomalies", *Journal of Finance,* **51**, 55-83.

Fama, E. F. and French, K. R., (1998), "Value versus Growth: The International Evidence" , Journal of Finance, 53, pp. 1975–1998.

Hong, H. and Stein, J. C., 1999, A unified theory of underreaction, momentum trading and overreaction in asset markets, *Journal of Finance,* **54**, 2143-2184.

Izan, H. Y., 1984, Corporate distress in Australia, *Journal of Banking and Finance,* **8**, 303 - 320.

Jaffe, J., Keim, D. B. and Westerfield, R., 1989, Earnings yields, market values and stock returns, *Journal of Finance*, **44**, 135-148.

Jegadesh, N. and Titman, S., 2001, Profitability of momentum strategies: An evaluation of alternative explanations, *Journal of Finance,* **56**, 699-720.

Keim, D. B., 1980, Asset pricing anomalies and capital market seasonality. Empirical evidence, Unpublished manuscript, University of Chicago, Chicago, IL .

Lakonishok, J., Shleifer, A. and Vishny, R. W., (1994), "Contrarian Investment, extrapolation and risk" , *The Journal of Finance*, **49**, pp. 1541−1578.

LaPorta, R., 1996, Expectations and the cross-section of stock returns, *Journal of Finance,* 51, 1715-1739.

LaPorta, R., Lakonishok, J., Shleifer, A., and Vishny, R., 1997, Good news for value stocks: Further evidence on market efficiency, *Journal of Finance*, 52, 859-874.

Linter, J., 1965a, Security prices, risk and maximal gains from diversification, *Journal of Finance,* 20, 587-615.

Linter, J., 1965b, The valuation of risky investments in stock portfolios and capital budgets, *Review of Economics and Statistics,* **47**, 13-37.

Liew, J. and Maria V., 2000, "Can Book-to-Market, Size and Momentum be Risk Factors that Predict Economic Growth?", *Journal of Financial Economics*, 57, pp. 221−245.

Markowitz, H. M., 1952, Portfolio Selection, *Journal of Finance,* **7**, 77-91.

Merton, R. C., 1973, An intertemporal capital asset pricing model, *Econometrica,* **41**, 867 -887.

Mossin, J., 1966, Equilibrium in Capital Asset Market, *Econometrica,* **34,** 768-783.

Mun, J.C., Vasconcellos, G.M., and Kish, R., 2000, The contrarian/overreaction hypothesis. An analysis of the US and Canadian stock markets, *Global Finance Journal*, **11**, 53 - 72.

Nicholson, S. F., 1960, Price-earnings ratios, *Financial Analyst Journal,* July – August.

Ohlson, J. A., 1980, Financial ratios and the probabilistic prediction of bankruptcy, *Journal of Accounting Research,* **18,** 109-131.

Pastena, V. and Ruland, W., 1986, The merger/bankruptcy alternative, *The Accounting Review,* **61,** 288-301.

Penman, S. H., 1991, "An evaluation of accounting rate of return", *Journal of Accounting, Auditing and Finance,* **6,** 233-255.

Platt, H. D., and Platt, M. B., 1990, "Development of a class of stable predicable variables: The case of bankruptcy prediction", *Journal of Business Finance and Accounting,* **17,** 31-51.

Reinganum, M. R., 1981b, "Misspecification of capital asset pricing: Empirical anomalies based on earnings yield and market values", *Journal of Financial Economics,* **9,** 19 - 46.

Ross, S. A., 1976, "The Arbitrage theory of capital asset pricing", *Journal of Economic Theory,* **13,** 341-360.

Scott, J., 1981, "The probability of Bankruptcy", *Journal of Banking and Finance,* **5,** 317 -344.

Sharpe, W.F., 1964, "Capital Asset Prices: A theory of market equilibrium under conditions of risk", *Journal of Finance,* 19, 425-442.

Simnet, R. and Trotman, K., 1992, "Identification of key financial ratios for going concern decisions", *Charter*, 39-41.

Stattman, D., 1980, "Book-values and expected stock-returns", University of Chicago, Chicago, I11.

Stoll, H.R. and Whaley, R.E., 1983, "Transaction costs and the small firm effect, *Journal of Financial Economics",* **12,** 57-79.

Taffler, R. J., 1983, "The assessment of company solvency and performance using a statistical model", *Journal of Business Research,* **3,** 295-307.

Treyner, J. L., 1961, "Toward a theory of market value of risky assets", *Unpublished manuscript.*

Ward, T. J. and Foster, B. P., 1997, "A note on selecting a response measure for financial distress",*Journal of Business Finance and Accounting,* **24**, 869-879.