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RATIO AS A RISK PROXY

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**THE RELIABILITY OF THE BOOK-TO-MARKET
RATIO AS A RISK PROXY**

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ABSTRACT

THE RELIABILITY OF THE BOOK-TO-MARKET RATIO AS A RISK PROXY

By

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There is a strong empirical correlation between common stock returns and the book-to-market ratio (BE/ME). The higher the ratio the higher the observed returns. Two competing explanations of the BE/ME effect are advanced in the literature. The first asserts that BE/ME is a proxy for risk. The second provides evidence that contrarian strategies are successful because of investor overreaction. This study reexamines the Fama and French (1992) research in light of this debate. Careful examination exposes the BE/ME variable as an unreliable predictor during certain periods of time. The results reveal that BE/ME is positively and significantly related to return in only 42% of the monthly regressions. When compared to "Cash Flow" yields, "Sales Growth," and "Size"; BE/ME is more consistent with the characteristics of a risk proxy than these competing variables. This research also shows that the inclusion of deferred tax liabilities in the definition of book equity adds nothing to the predictive power of the ratio.

I dedicate this dissertation to the most important person in my life, my wife Virginia. This dissertation has been possible because she has aspired to the greater responsibility, the character development of Andrew, Alexander, Ross, and Zachary.

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CHAPTER 1

INTRODUCTION

There is an empirical link between common stock returns and firms' book-to-market (BE/ME) ratios. The nature of this link has generated debate and a difference of opinion among academics in recent years. The following study explores the issues and provides new, useful information for assessing the validity of several extant interpretations of the positive BE/ME-return relationship. The paper analyzes the reliability and interrelationships between "champion" variables put forth on either side of the debate. The paper also examines the use of deferred tax liabilities in the BE/ME variable formulation.

1.1 The BE/ME Effect - Interpretations

Fama and French (1992, 1993, 1995) discovered that BE/ME is a useful variable for predicting stock returns. The strength of the variable allows it to act as the central factor in their asset pricing model, despite interactions with other explanatory variables. Other authors who have

found a significant positive correlation between BE/ME ratios and the cross section of stock returns include Stattman (1980), Rosenberg, Reid, and Lanstein (1985), Chan, Hamao and Lakonishok (1991, 1993), Capaul, Rowley, and Sharpe (1993), Lakonishok, Shleifer, and Vishny (1994) and Davis (1994).

One major interpretation of the BE/ME effect is that BE/ME is a proxy for risk, as proposed by Fama and French (1992). Competing explanations include: 1) the relationship is caused by inefficient markets and investor overreaction, Haugen (1995), Lakonishok, Shleifer, and Vishny (1994); 2) the strength of the variable is due to selection bias in COMPUSTAT data, Kothari, Shanken, and Sloan (1995), and 3) the BE/ME ratio contains a factor that is non-risk based, Beaver and Ryan (1993), and Harris and Marston (1994).

The current debate centers on the second panel of Table 1 below. The first panel is not under dispute. High BE/ME firms have high returns and low BE/ME firms have low returns. Disagreement persists over the risk attributes of high and low BE/ME firms.

Fama and French (1992) believe that high BE/ME firms have high risk levels and thus the market is behaving efficiently. Lakonishok, Shleifer, and Vishny (1994)

Table 1

**Book to Market Effect
Risk Proxy or Investor Overreaction**

	Low BE/ME - Growth Firm	High BE/ME - Value Firm
High Return		Fama and French Risk Proxy Theory Lakonishok, Shleifer, and Vishny / Haugen and Baker Inefficient Market Theory
Low Return	Fama and French Risk Proxy Theory Lakonishok, Shleifer, and Vishny / Haugen and Baker Inefficient Market Theory	

	Low BE/ME - Growth Firm	High BE/ME - Value Firm
High Risk	Lakonishok, Shleifer, and Vishny / Haugen and Baker Inefficient Market Theory Investor Overreaction	Fama and French Risk Proxy Theory
Low Risk	Fama and French Risk Proxy Theory	Lakonishok, Shleifer, and Vishny / Haugen and Baker Inefficient Market Theory Investor Overreaction

present an alternative scenario. They establish investor overreaction at work in the market. Investors bid "growth" firm prices up too far, causing high market values and extremely low BE/ME ratios to result. Conversely, investors bid the price of slow growth firms or "value" firms down too low causing high BE/ME ratios to occur.

For nearly two decades research has focused on anomalies or apparent violations of the Capital Asset Pricing Model (CAPM). Fama and French (1992) summarize and validate this research. Their main findings are that individual variables (size, BE/ME, leverage, and earnings yield) all predict the cross-section of returns. Multivariate analysis leads to interaction effects that eliminate the statistical significance of all these factors except size and BE/ME.

Fama and French (1992) claim that the factors used in their model proxy for underlying risk, thus providing a useful alternative to other existing asset pricing models. Specifically, they state:

**If our results are more than chance,
they have practical implications for
portfolio formation and performance
evaluation by investors whose primary
concern is long-term average returns.
If asset-pricing is rational, size and
BE/ME must proxy for risk. Our results
then imply that the performance of**

managed portfolios (e.g., pension funds and mutual funds) can be evaluated by comparing their average returns with the average returns of benchmark portfolios with similar size and BE/ME characteristics. Likewise, the expected returns for different portfolio strategies can be estimated from the historical average returns of portfolios with matching size and BE/ME properties. (Fama and French (1992) p. 452)

There are at least two other possible explanations to which Fama and French (1992) allude. One such explanation is an irrational asset-pricing story. Another possibility is that the relationship between size, BE/ME, and return is simply a statistical artifact that transpires by chance. Fama and French argue that if the statistical significance of BE/ME and size were a mere coincidence, then the relationship with return would not persist over long time periods. In their words, "we put little weight on this possibility especially for book-to-market equity" (p. 451).

In contrast to the risk proxy theory, Lakonishok, Shleifer, and Vishny (1994), and Haugen (1995) give evidence in favor of a market that overprices "growth" stocks and underprices "value" stocks. Low BE/ME, low cash flow yield, and high sales growth are characteristics considered normal for "growth" stocks while high BE/ME, high cash flow yield, and low sales growth are indicative of stocks falling in the

"value" category. Furthermore, they show that value based investment strategies do not have notably higher risk levels than growth based strategies.

1.2 Book to Market Effect - Major Results

There are a number of consequential distinctions between time horizons, data sets, and methodologies used by proponents of the opposing points of view. For now it should be noted that Fama and French (1992) look at monthly returns for one year following portfolio formation. Lakonishok, Shleifer and Vishny (1994) use annual holding periods extended for a five-year post-formation period. In reviewing the following summary findings of this study, one should keep in mind that the methodology used here is comparable to the Fama and French study.

Several important findings from this study reveal additional information beyond the findings disclosed in the extant literature. These new findings shed light on the apparent contradiction between the two points of view outlined above. The findings suggest that the BE/ME effect is more stable over time than the competing "growth/value" variables recommended by Lakonishok, Shleifer, and Vishny (1994). Even so, BE/ME is a statistically reliable predictor of return in less than half the monthly

regressions. Only by assuming a long term investment horizon is it safe to presume that the effect will be reliable. Of the variables analyzed, only BE/ME and one form of the cash flow variable are significant for each ten year period examined. Over five year periods, no variable is always significant.

Unlike the findings in Lakonishok, Shleifer and Vishny (1994), "sales growth" does not displace the importance of BE/ME in multivariate cross-sectional monthly regressions. Lakonishok, Shleifer and Vishny establish that sales growth is a powerful multivariate predictor of returns using five year holding periods. As a risk proxy, any variable should invite a more rapid reaction in returns. High risk firms should exhibit high returns within a relatively short period of time, perhaps a year, rather than reacting to risk characteristics gradually over five year periods. For a one year test period, returns are more reliably correlated to BE/ME than growth in sales.

In support of the overreaction theory, cash flow and sales growth variables do perform very well in some periods. Cash flow yield overpowers BE/ME under some formulations, and not in others. Multivariate results are presented that challenge the dominant BE/ME predictive effectiveness and significance found in Fama and French (1992).

1.3 Risk Proxy - Risk Measurement

Not only should a risk proxy have reliable predictive power over time, but the proxy should demonstrate some correlation with known risk measurements. Lakonishok, Shleifer and Vishny (1994) report the risk characteristics of growth and value firms. Value firms have no more risk and probably less than growth firms. A possible caveat centers on their very restrictive sample technique and methodology. All NASDAQ firms in their study are excluded from the sample along with any firm that did not have a complete five-year sales history. They also examined postformation returns over five years rather than the single year used by Fama and French (1992). Tabulation of risk characteristics in BE/ME deciles using a complete spectrum of firms in the market proves to be an issue worth reexamining in this study.

Of specific interest is the existence of segments in the common stock population that consistently behave contrary to the Fama and French (1992) risk proxy theory. That is, there are at least some groups of securities that consistently fall in the northwest and southeast quadrants of one or both of the above panels of Table 1. A violation of the risk proxy theory occurs when there are groups of firms that consistently exhibit:

- 1) high BE/ME ratios and low risk,
- 2) high BE/ME and low return,
- 3) low BE/ME and high return,
- 4) low BE/ME and high risk.

Though there is need for more effort in this area, the study casts some light on this issue. Risk is measured using several traditional measurements such as beta, standard deviations, and standard errors of the residuals. Other potential risk measurements examined include the percentage of firms disappearing from the sample in any given year and the average bond rating for each decile portfolio. Stocks sorted into BE/ME deciles have a risk pattern similar to a horseshoe. In general BE/ME follows a risk proxy pattern if analysis ignores the bottom half of the distribution. High BE/ME deciles have higher risk measurements than those in the middle. On the low end of the spectrum the analysis is reversed. Low BE/ME portfolios have higher risk measurements than the middle portfolios.

If the Fama and French (1992) model is to become the new standard or one of the new standards for asset pricing, then categories one through four above should not consistently exist. On this front the model seems to be lacking. This study does find a robust monotonically increasing relationship between BE/ME and return as other

preceding authors have done. Unlike many competing variables, BE/ME requires no portfolio aggregation techniques. The OLS regressions work best when individual firm BE/ME ratios are regressed against return. This leaves the analyst in a quandary. If an attempt at rational asset pricing is to be made, a relatively reliable predictor is at hand. Are the violations in risk characteristics worth ignoring? The actual reliability levels and risk proxy violations are supported in later chapters.

1.4 Deferred Tax Liabilities in BE/ME Formulations

Another focus of this study is on firm characteristics or factors that contribute to high (low) BE/ME ratios regardless of risk level. The author believes that the strength of the correlation between BE/ME and return could be caused by a non-risk based factor. This factor may appear in either of two ways. The first way is through the formulation of the BE/ME variable. Fama and French include deferred tax liabilities (DTL) in book equity thus enlarging the ratio for a key group of firms. The second way is environmental. A non-risk based factor in BE/ME may exist due to cross-sectional accounting, growth, and asset differences among firms in the data set.

It seems hard to believe that BE/ME cannot be explained by factors other than risk, given the accounting components of book equity and underlying asset differences among firms. One portion of this paper is framed with special consideration given to the deferred tax liability (DTL) as a potential non-risk based factor. The findings are consistent with the notion that DTL is unrelated to return. On the other hand, high DTL firms appear to have less risk than the average firm in the sample population. Including DTL in BE/ME ratios distorts the risk signal, if one exists. Fortunately or unfortunately, depending on one's research perspective, the simple BE/ME ratio is as good a predictor of return as the Fama and French (1992) model which includes DTL as a component of book equity.

1.5 Outline

The following chapter outlines the Fama & French (1992) study in some detail. Chapter 3 elaborates on the controversy between the risk proxy theory and the investor overreaction story. Chapter 4 describes the data and some empirical design considerations. Chapter 5 presents results and explanations of the book-to-market effect and the reliability of competing variables. Chapter 6 reviews the use of deferred tax liability in various empirical studies

and explains the possible impact on BE/ME ratio formulations. Chapter 7 displays findings on the role of deferred tax liability. Chapter 8 summarizes this study and draws the major conclusions.

CHAPTER 2

THE METHODOLOGY AND RESULTS OF THE (1992) FAMA AND FRENCH MODEL

In this section of the paper the quality of the Fama and French (1992) characterizations about the BE/ME risk proxy are contested. First, their methodology is outlined and the results of their study are presented. Next, the motivation for the replication and extension of the Fama and French BE/ME study is presented. Methodological issues and conceptual problems with the model are introduced.

2.1 Methodology and Results

The Fama and French (1992) study looks at a number of variables such as earnings/price, size, BE/ME, and leverage that have been analyzed in preceding years. From this list of variables they arrive at two that show the strongest statistical relationship with return: size and BE/ME. The following is their final cross-sectional model after discarding highly correlated and non-significant independent variables.

The model: $R_{it} = a_i + b_{1i}(\ln ME) + b_{2i}(\ln BE/ME) + e_{it} \quad (2.1)$

R_{it} = the monthly return for stock i at time t , where t equals 1 to 12 starting in July and ending in June of the following year.

$\ln(ME)$ = the natural log of market equity in June of year t .

$\ln(BE/ME)$ = the natural log of the BE/ME ratio in December of year $t-1$.

e_{it} = random disturbance term.

b_i = the time series average slope of the monthly regression slopes for July 1963 to December 1990.

Alternative forms of the model include the following variables:

$\ln(A/ME)$ = fiscal year end total book assets divided by market equity in year $t-1$.

$\ln(A/BE)$ = fiscal year end total book assets divided by book equity in year $t-1$.

E/P dummy = takes a value of 1 when the earnings price ratio is negative. (E = income before extraordinary items, plus income-statement deferred taxes, minus preferred dividends)

$E(+)/P$ = the positive ratio of earnings to price

A detailed description of the data is analyzed in Chapter 4. Each variable is estimated using accounting and price data available to the public before the return estimation period. Regressions are then performed on

portfolios or individual securities depending on the focus. For purposes of illustration, BE/ME is estimated as of December of year $t-1$. This variable is then regressed against returns in each month starting in July of year t to June of year $t+1$. The procedure starts in December 1962 with the formation of independent variables. Then the independent variable is regressed against return from July 1963 to June of 1964. Each year the procedure is repeated.

The generous six-month interval between the formation of the BE/ME ratio and when returns are calculated insures that accounting data is available to the investing public. Other studies assume that year-end accounting data is available after a shorter three-month interval, e.g., Lakonishok, Shleifer, and Vishny (1994).

Leverage variables and E/P variables are discussed in detail in Fama and French (1992). Since these variables are not robust predictors of return in the multivariate setting, they are not discussed further at this point.

Interactions between size and beta are thoroughly investigated in the first part of the Fama and French (1992) study. Results indicate that beta is unrelated to return when the effect of size is accounted for. These findings (documented in Fama and French Table I and II) are interesting but not the main focus of this study.

Single and multivariate regression results are tabulated in Fama and French (1992) Table III. T-statistics indicate that BE/ME and size are the main variables that are significant, positive and negative respectively. A single variable post ranking beta model has no statistical significance. Book and market leverage variables show strong relationships with return. The effect of these leverage variables is captured by BE/ME. An E/P dummy variable is constructed for firms with negative earnings. The positive earnings/price ratio (E/P) and E/P dummy variable each explain return. When other variables are included with E/P and E/P dummy, these variables lose statistical significance.

Fama and French (1992) Table IV reaffirms the BE/ME results displayed in their Table III. A reliable positive relationship between BE/ME and return is displayed. Firms are ranked on BE/ME ratios and then divided into ten equally proportioned deciles. The top and bottom decile are cut in half (1A,1B,10A,10B) creating twelve portfolios in all. Portfolio average BE/ME is compared to the portfolio average monthly returns in the year following the June formation date. The results indicate a strong positive monotonically increasing relationship between BE/ME and return. The results presented for E/P ratios are also strong but not

smoothly increasing from portfolio to portfolio.

Fama and French (1992) Table V tabulates the ranked returns on portfolios formed on size and BE/ME. The relative importance and interaction of these two variables are revealed in this setting. Ten size portfolios are formed using NYSE breakpoints. Then, in each size portfolio, ten BE/ME portfolios are formed. In support of the regression results from their Table III, each size portfolio displays a strong linear relation between BE/ME and return. In each BE/ME portfolio a size component also appears to exist.

In Fama and French (1992) a correlation of -0.26 is reported between $\ln(\text{ME})$ and $\ln(\text{BE/ME})$ for individual stocks. A similar result occurs for portfolios. Their explanation is that small firms are likely to have high BE/ME ratios and that high BE/ME firms partially exhibit a size effect. Both variables are detecting joint distress ("poor prospects"). But both variables have individual explanatory power.

The important findings of the Fama and French (1992) study include the display of a negative size effect, a positive BE/ME effect, and zero explanatory power from beta. The projection of risk characteristics from their results appears reasonable on the surface, but bears a more detailed inquiry.

2.2 Methodological issues

Other authors have raised several important methodological issues regarding the type of research undertaken by Fama and French. As with any study, some of these issues prove incidental, while others prove essential for further study.

Kothari, Shanken and Sloan (1995) have raised the specter of data bias in COMPUSTAT data. Ball, Kothari, and Shanken (1995) have documented problems with December year end portfolio formation procedures when dealing with contrarian strategies. Harris and Marston (1994), and Lakonishok, Shleifer, and Vishny (1994) form their BE/ME portfolios differently than Fama and French with differing results. In this study analysis is done with and without NASDAQ firms in order to mitigate data bias problems. Portfolio formation occurs in June, though accounting data is drawn from December year ends. The differences in portfolio formation are addressed in more detail in Chapter 4.

A significant methodological issue deals with the mechanism for forming the BE/ME variable. Fama and French (1992, 1993, 1995) use a deferred tax liability (DTL) component in their BE/ME construction that may not be tied to increasing risk. They specifically add DTL to BE to

provide a BE/ME ratio: $(BE + DTL)/ME$. Rosenberg, Reid, and Lanstein (1985) add "intangibles" to the book equity before they calculate their BE/ME ratios. Stattman (1980), Lakonishok, Shleifer, and Vishny (1994), and Chan, Hamao and Lakonishok (1991) do not appear to include the DTL as part of BE. The latter study concerns the Japanese market where accelerated depreciation is used for both book and tax purposes. Consequently, this source of DTL does not occur.

Other studies do not include the DTL in their estimate of BE/ME. There is the possibility that the strength of Fama and French's result is due to the construction of their BE/ME variable. For example, the strength of the BE/ME variable is compromised in the multivariate setting outlined by Lakonishok, Shleifer, and Vishny (1994).

The risk component of the BE/ME variable appears to be concentrated in the denominator of the ratio. As the ME is depressed in relation to BE, the ratio rises. If the numerator has adjustments that affect the ratio, the risk signal may be distorted. Thus anything that significantly increases the BE for a firm has the effect of signalling higher risk whether the risk characteristics of the firm have changed or not. The strength of the BE/ME variable in the Fama and French model may be attributed to the concentration of firms with high DTL balances in the high

BE/ME portfolios. Fama and French form ten ranked portfolios based on BE/ME and then compare these to return. There is no question that the DTL substantially inflates the numerator of the BE/ME ratio for some firms, but not all.

Firms with a large portion of their book assets financed by DTL are not insignificant in number. There is a need to address the risk characteristics of these firms. As outlined in Chapter 6, there is no reason to suspect that return is highly correlated with the size of the DTL account, or correlated with changes in the account. Thus it would appear that some firms with high $(BE+DTL)/ME$ are included in a "high risk" portfolio by accident rather than by logical design. If these misplaced (lower risk) companies happen to have high returns as suggested by Haugen (1995), then they would be a driving force in the Fama and French results.

A synopsis of methodological issues reveals that the major concern is the formulation of BE/ME. Including DTL in book equity has no important impact on aggregate regression results. But, as shown in Chapter 7, including DTL distorts the risk signal for a group of high DTL firms. These firms have relatively low levels of risk, while exhibiting high BE/ME ratios if BE/ME is formed using the Fama and French formulation. Sample selection concerns while worthy of

examination turn out to be incidental in nature. Data bias is not a driving force in the BE/ME effect. Inferences remain the same whether NASDAQ firms are included in the sample or not.

2.3 Conceptual issues

Even if methodological abnormalities cause no serious problems, conceptually there is a problem with using BE/ME ratios as a risk proxy. Until testing has occurred, one cannot expect that BE/ME ratios are comparable between vastly different firms. Any mechanism that causes BE or ME to vary cross-sectionally is likely to distort the relationship between BE and ME, i.e., the risk signal.

The recorded book assets represent the value of the assets in place as of the date of acquisition, less depreciation expense. From book assets one can subtract the legal claims from creditors to arrive at book equity. Market value on the other hand not only includes the current market value of the assets in place, but contains the present value of future growth prospects as well.

By comparing the difference between the BE and ME of each firm, Fama and French (1992) have found an apparent way to assess the riskiness of the firm. If there is a large difference between the two measures, the firm is supposedly

less risky, and thus commands a lower return. If the market is efficient, then high risk firms will always have depressed market values in relation to other firms and in relation to their own BE. The assumption inherent in this argument is that BE's are relatively stable, constant, and comparable across firms.

Fama and French's risk proxy theory would be correct if each firm's BE/ME ratio meant the same thing. If for example there were two companies that were the same for all practical purposes, (i.e., same accounting methods, asset base, and technology), then comparison would be valid. For illustration purposes assume that one company has poor management and follows an erratic work schedule. While the other company is diligent and maintains a steady schedule. Subsequent earnings results for the two firms will reveal differences. The disciplined firm will exhibit higher earnings over time. Thus, the market price will rise above the book value. The earnings for the erratic firm will suffer. The market value will not rise as far above book value as for the diligent firm. Truly the firm with the higher BE/ME will be the riskier firm.

As Haugen (1995) and Lakonishok, Shleifer, and Vishny (1994) argue, firms with high BE/ME are not riskier, but safer using several risk measures. Risk measures examined

include beta, standard deviation, performance during down markets, and performance during up markets.

Capaul, Rowley, and Sharpe (1993) and Harris and Marston (1994) also find that high BE/ME firms have lower beta risk. (The latter study controls for growth, to return beta to a significant explanatory role.) Whether the inefficient market theory or Fama and French's risk proxy theory is correct depends on the reliability of the BE/ME ratio as a risk measure. Not only do BE/ME ratios have to pick up risk components that are not captured in more traditional measures such as estimated betas; but BE/ME must also be a consistent ranking mechanism across firms and industries.

There are many reasons for differences in recorded equity value and market equity value. It is possible that in the aggregate these ratios have explanatory power, but there are definite drawbacks to allow for. As an example, consider two firms that buy identical buildings. Firm A purchases its building in 1960 for \$100, Firm B purchases its building in 1980 for \$200. In 1990 both buildings are worth \$250. Both buildings are depreciated for 40 years on a straight-line basis for both book and tax purposes. The relative BE/ME ratios are:

	Firm A	Firm B
	-----	-----
BE/ME	25/250 = .2	150/250 = .6

Firm A has a much lower book equity because the asset has been depreciated over three fourths (3/4) of its life, rather than for one fourth (1/4) as in Firm B. Inflation also has affected the relative positions on the balance sheet. The higher BE/ME ratio cannot represent distress in this case since both firms are in a similar economic position. Other than depreciation tax shields, the two firms are identical and thus of equal risk. But these firms have substantially different BE/ME ratios. Fama and French (1992) do not take differences such as this into consideration.

There are several other examples of accounting procedures that can change the BE/ME ratio for a firm without necessarily changing the risk level. A recent example would be the introduction of the Statement of Financial Accounting Standards No. 106, Employers' Accounting for Postretirement Benefits Other Than Pensions.

Before SFAS No. 106, firms would record retirees' health benefits on a "pay as you go" basis. Now a firm must record the future benefits as a liability. The recorded asset

levels are the same as before, so it is likely that book equity value is reduced. Of course this causes some firm's BE/ME ratios to change dramatically. The actual cash outflows and risks involved have not changed.

Another example of cross-sectional differences in reported financial statements would be the act of recording goodwill for mergers and acquisitions. Two methods of accounting are allowed under GAAP - purchase or pooling. Under the purchase method the current value of the assets are recorded on the financial statements. Under the pooling method only the recorded book value is used. Whether a firm uses one method or another depends on the terms of the merger. Comparable book values are changed under one method of accounting and not the other. Two identical mergers that pool and purchase respectively would end up having different BE/ME ratios after the merger. Differing ratios result, although the assets and risks to the firm are primarily the same.

Book equity differences may be insignificant in cross-sectional averages. Realizing that cross-sectional differences in reported BE may be an important consideration; the author recommends examination of one general case. This case involves the creation of a relatively high (low) BE/ME ratio, without necessarily

demonstrating the corresponding high level of risk. It seems worthwhile to choose cases where the BE/ME distortions are likely to affect large numbers of firms. Though there are many possible avenues for investigation this paper focuses on a case dealing with DTL. This topic has already been motivated above, and is investigated in more detail in Chapter 6 and 7.

In Chapter 7 aggregate results are not affected by DTL distortions of book equity values. A strong relationship between BE/ME and return exists cross-sectionally. Clearly the risk signal is distorted for some firms that have high DTL values. When DTL is removed from BE, the performance of BE/ME improves marginally. Further study is needed to determine whether other book equity distortions are present among the sample population. Given the large percentage of monthly regressions that do not have statistically significant BE/ME coefficients, it is possible that the BE/ME risk signal can be sharpened.

CHAPTER 3

BE/ME EFFECT: RISK PROXY OR INVESTOR OVERREACTION?

Explanations of the BE/ME effect are reviewed in this section. The risk proxy theory and the investor overreaction explanation are presented. These rival positions are used to articulate why there is a correlation between stock return and the "growth/value" firm continuum. Growth expectations can be measured using BE/ME or several other variables. High BE/ME firms are considered "value" firms while low BE/ME firms are labeled "growth" firms or "glamour" firms. The literature is mixed regarding the level of risk and return attributable to high growth firms and/or low growth (value) firms.

3.1 Book to Market Effect: Risk Proxy

Many studies, including this one, demonstrate a strong BE/ME effect and size effect. Two basic approaches explain this effect: rational asset pricing, or irrational asset pricing.

Fama and French (1992) consistently support a role for BE/ME and size in a rational asset pricing framework. Their study documents the economically powerful results of the BE/ME - size model. They theorize that rational asset pricing explains their results. They suggest that BE/ME and size are risk factors much like the relative distress factors discussed by Chan and Chen (1991). In this setting, relatively distressed firms are considered firms with high BE/ME, and/or low market equity positions. These firms are categorized as firms with relatively poor prospects.

Firms with poor prospects (rationally identified in the market) have their prices bid down, leading to a relatively small dollar value for market equity and relatively high BE/ME ratios. Under this scenario the market rationally creates the disparity between the ratios for firms in the population. If this in fact occurs, it provides a nice explanation for the monotonically increasing relationship between return and BE/ME. In an irrational asset pricing scenario one would not expect a monotonic relationship, but rather results driven by the extreme positions of the highest and lowest portfolios.

Fama and French (1993) test the consistency of the BE/ME and size effect under different modeling assumptions. Unlike the model used in their earlier paper, here they use

a five-factor model. The five factors in this new model consist of three stock market related factors and two bond market or term structure factors. Specifically, a general market factor is used ($R_m - R_f$) along with size, BE/ME, and the two term structure variables (maturity risk premium and default risk premium). Fama and French also use time series regressions rather than cross-sectional regressions. Major differences in the modeling procedure not only include more explanatory variables, but also use of an excess return process.

A rational asset pricing model needs to behave effectively not only for stock returns, but for other security classes as well. The Fama and French (1993) five factor model attempts to span the stock and bond markets with factors used to explain returns in both sectors. The success of the model provides support in favor of the continued use of the size and BE/ME variables suggested in the (1992) cross-sectional study. These variables stand up to variations in the modeling process, demonstrating a robust nature and lending credence to the idea of a consistent risk proxy.

In an even more recent paper Fama and French (1995) demonstrate the poor prospects scenario to which they allude in earlier works. Their starting premise is that rationally

priced securities must demonstrate systematic differences in returns because of differences in risk. Namely, **"size and BE/ME must proxy for sensitivity to common risk factors in returns."** p. 131. They then go on to demonstrate that the source of this risk is poor earnings prospects. Their position, though supported, may be considered unreasonable if one looks at the findings on risk presented by Lakonishok, Shleifer, and Vishny (1994), and Haugen (1995). These findings are discussed below in Subsection **3.6. Growth and Risk.**

As shown by Fama and French (1995), the link between earnings and BE/ME provides support for the risk proxy theory. Firms with high (low) BE/ME ratios manifest sustained levels of depressed (high) earnings for four years before and five years after portfolio formation. Thus, it is possible to classify these firms as relatively distressed. The market evidently makes unbiased expectations about earnings growth potential. The market price for high BE/ME firms is bid down due to poor future earnings prospects. Unlike the BE/ME effect, the size effect in earnings is not consistent over time.

Fama and French (1995) do find a degree of mean reversion in earnings. Firms with low levels of earnings before portfolio formation exhibit modest increases in

earnings afterward, and vice versa. Mean reversion is not as pronounced as what may be expected in an overreaction story. Firms with high BE/ME consistently have earnings levels below those firms with low BE/ME ratios over time.

If a risk proxy is deemed reliable, it must stand the test of time. In contrast the market overreaction story has no such requirement, unless, of course, investors are expected always to overreact in the same way. Davis (1994) presents evidence in favor of the risk proxy concept. BE/ME and size continue their robust ways in a study using data from a pre-COMPUSTAT period.

Davis (1994) supports the risk proxy theory by showing time consistency for the strategy. He also presents information in contradiction to the overreaction findings of Lakonishok, Shleifer, and Vishny (1994). Sales growth does not perform in a statistically significant fashion during the period and sample of his study.

Total explanatory power as presented by adjusted R squared is relatively small in the Davis (1994) model. Adjusted R squared has a maximum explanatory effect of 4%. This is consistent with the best regressions found in this study as well. Fama and French do not present these findings for their 1992 study. The R squared coefficients in their (1993) time series study are very strong, with over

90% of most regression variation explained. The difference in the R squared coefficients is undoubtedly due to inclusion of the market factor, and use of excess return methodology rather than the raw return measurements used here.

3.2 Book to Market Effect: Investor Overreaction

The poor earnings prospects story presented by Fama and French (1995) does not preclude investors from bidding the prices of securities down too far or up too far, i.e., overreaction. Firms with high BE/ME do show a degree of risk via poor earnings prospects. This type of risk may not translate into more normal risk measurements such as volatility measures or relative market risk measures.

Haugen and Baker (1993), Lakonishok, Shleifer, and Vishny (1994), and Haugen (1995) agree with Fama and French (1992) that the BE/ME ratio is reliably related to return. However they disagree about the risk proxy relationship of BE/ME and return. They argue that high BE/ME firms are "value" firms while low BE/ME firms are "growth" firms. As outlined in the introduction above, these authors believe that value firms are less risky or at least no more risky than growth firms.

The inefficient market or overreaction argument states that the market underprices value firms and overprices growth firms. This mispricing occurs because the average investor is unable to forecast future growth prospects properly. Growth rates for extreme firms on either pole revert to the mean faster than investors anticipate. Haugan (1995), and Fuller, Huberts, and Levinson (1993) support the notion that current growth stocks grow more slowly in the future and current value stocks grow faster on average.

Though the evidence in favor of the overreaction story seems overpowering at first, there are several issues that need to be addressed and resolved. The first issue deals with the uniformity of predictive power for contrarian variables. Another way of framing the same question is to focus on the consistency of mispricing using the various value/growth variables suggested. If one were to perform piecewise regressions, would these regressions show explanatory power for extreme portfolios only? Or would the regressions show explanatory power for the average firm as well? If the former were the case, one would lean toward overreaction theories.

One may expect that firms on the fringe (high growth and extreme value) would be mispriced in a valid overreaction setting. One would not expect that the degree

of mispricing would be uniform across firms or across time. An overreaction story seems hard to explain when the over/under reaction is so smooth across the entire stock population as is found with the BE/ME ratio. In Chapter 7 firms are sorted on BE/ME, formed into decile portfolios and then average returns are tabulated. Even decile portfolios in the middle of the sample population have higher average returns than portfolios of lower rank. Also when piecewise regressions are run as explained in Chapter 5, firms in the middle of the distribution still have a statistically significant positive BE/ME - return effect.

A most interesting proposition of the overreaction story is the explanation for why the value strategy consistently outperforms the glamour investment strategy. Lakonishok, Shleifer, and Vishny (1994) posit several explanations for this phenomenon. One possible explanation is the fact that analytical tools and techniques were not available until recently, thus precluding investors from finding this persistent contrarian result.

Another possibility proposed by Lo and MacKinlay (1990) is that data specific results have been unearthed. Lakonishok, Shleifer, and Vishny point to the Davis (1994) study as evidence that the value strategy consistently outperforms glamour over time. One should note that the

Davis study also provides evidence (found in this study as well) that sales growth is much more time specific in its results. Perhaps some value/growth strategies are time specific while other variables such as BE/ME are true proxies for risk.

Other explanations center on why institutional and individual investors would shun a value strategy in favor of a growth strategy given the documented superior returns. As Haugen (1995), and Lakonishok, Shleifer, and Vishny (1994) discuss, investors may consistently rely on recent history to their detriment. They may invest in well run companies whatever the price. They may screen out financially distressed firms from their investment horizon. Or they may simply have too short of an investment horizon to take proper advantage of the anomaly. Whatever the cause, the anomaly apparently persists.

In this study the reliability of variable persistence is analyzed in Chapter 5. The conclusion reached is that some so-called overreaction strategies are much more persistent than others. This poses the possibility that some variables in question are risk proxies while others are time specific market overreaction events.

3.3 The Results of the Lakonishok, Shleifer, and Vishny Model

Lakonishok, Shleifer and Vishny (1994) find that value strategies as depicted by high BE/ME, high cash flow yield, high earnings yield, and low sales growth, all dramatically outperform the opposite glamour strategies over time. They suggest that these variables are ways of assessing the market's expectations for future growth. Value firms are projected to have low growth by investors, while glamour firms are expected to have high growth rates in the future. Of the variables suggested, Lakonishok, Shleifer, and Vishny intimate that BE/ME has the least interpretable growth characteristics. They argue that too many scenarios unrelated to growth can affect the ratio.

Not only do Lakonishok, Shleifer, and Vishny (1994) demonstrate the superior performance of various value strategies, they also recommend a preferred set of investment strategies. When Lakonishok, Shleifer, and Vishny perform multiple sorts, they show that dual strategies perform better than single strategies. In multiple regressions, BE/ME is displaced as an important variable if sales growth and cash flow yield are introduced. In a univariate setting, cash flow yield not BE/ME is the most important variable. The successes of these univariate and

combined strategies are attributed to naive investors extrapolating recent firm growth performance much too far into the future.

The contrarian "value" strategy performance premium needs to be analyzed in more detail. Disagreement about why the effect persists mandates further analysis. This study answers the need for analysis of competing variables that overpower BE/ME. An important question is the possibility that these variables are interchangeable risk proxies revealing the same risk factors. Are investors overreacting to the same factor, namely "growth," measured differently by different variables?

3.4 Comparison of Methodology and Results

Comparison of methodology and results from Fama and French (1992) and Lakonishok, Shleifer, and Vishny (1994) reveal some important differences. These differences may help explain why the authors come to their respective conclusions. In Chapter 4 below the data and empirical design differences between the studies are outlined in detail. Here some differences are sketched as a suggestion for additional study.

The introduction of alternate "value/growth" variables occurs after the original Fama and French (1992) study.

Since these variables supersede BE/ME in importance in the Lakonishok, Shleifer, and Vishny (1994) findings, they add prominence to the investor overreaction hypothesis. The original BE/ME effect is thus labeled as another contrarian strategy, though not as clear and precise in predicting future growth expectations.

This study proposes to reexamine the BE/ME effect and several other "growth/value" variables in the context of the Fama and French (1992) monthly regression analysis. The biggest and most significant difference between the two studies appears to be the postformation periods during which returns are calculated. Independent variables are regressed against these returns. The long term results of Lakonishok, Shleifer, and Vishny support the investor overreaction hypothesis, while the relatively short one-year monthly regressions reveal that BE/ME is much more consistent and stable than these other variables. Thus, as a risk proxy BE/ME is superior, even if it does not refute the possibility of investor overreaction.

As the Fama and French (1992) study is replicated, it is easier to pinpoint which methodologies are sensitive causing conflicting results. Table 2 outlines the most important differences. These differences include sample composition, sample time period, return calculation periods,

Table 2**Comparison of Methodolgy and Results**

	Fama and French	Lakonishok, Shleifer, and Vishny
Data	NYSE, AMEX, NASDAQ	NYSE, AMEX
Date Portfolios Formed	June 1962 to June 1989	April 1968 to April 1990
Returns	Monthly - July of Year(t) to June of Year(t+1)	Annual Buy and Hold for Years +1 to +5
Estimation Period	At Least 24 Monthly Returns Prior to July of Year t	At Least Five Years of Accounting Data
Best Variables	LN(BE+DTL)/ME LN(ME)	Weighted Growth in Sales Positive Cashflow/ME
Points of Interest	Much Less Restrictive Methodology More Suitable Methodology for a Risk Proxy	BE/ME and Size are Not Significant Over Successive One Year Multiple Regressions When GS and C/P are Included

and estimation period restrictions. These differences are addressed more completely in Chapter 4 and Chapter 5.

3.5 Growth, BE/ME, and Return - More Literature

Harris and Marston (1994) show a theoretical model that supports a link between BE/ME, growth, and beta.

$$BE/ME = r_f/r + [(r_m - r_f)/r]\beta - (1/r)g \quad (3.1)$$

In this model r_f is the risk-free rate, r_m is the return on the market, g is the cash flow growth rate, and r is the rate of return on book value per share. Beta and growth are positively and negatively related to BE/ME respectively. Thus the model suggests that risk and BE/ME should be positively linked as in the main risk proxy theory. The model also shows that growth is normally negatively related to BE/ME.

The Harris and Marston (1994) empirical results confirm the expectations of the model. Using the five-year mean analyst forecasts of earnings per share as a proxy for growth, growth and beta turn out to be significant components of BE/ME. High BE/ME ratios continue to play an empirically dominant return role, even when controlling for growth. Thus, a role for beta is revived and the BE/ME

effect is documented as partially a growth effect. The persistence of BE/ME upon controlling for growth shows that mispricing of growth firms can only be part of the story, not the entire explanation. Thus, the Harris and Marston results fall somewhere between those of the main risk proxy theory and the inefficient market theory.

The robust BE/ME variable in Harris and Marston (1994) is in opposition to the findings of Lakonishok, Shleifer, and Vishny (1994). The latter use growth in sales as their growth variable rather than analysts forecasts.

If BE/ME ratios are capturing the difference between the value of the net assets in place (BE), and the future growth opportunities of the firm (ME-BE), then a growth proxy in isolation should be an important part of return explanation. If markets are efficient, then expected growth prospects should be correctly capitalized in the stock price leaving periodic returns just sufficient to compensate for risk. Contrary to Lakonishok, Shleifer, and Vishny (1994), Harris and Marston (1994) document that there is no "consistent return advantage" to investing in low growth instead of high growth stocks. Yet, they model a strong negative relationship between growth and BE/ME. Their evidence provides support for a possible continued risk proxy role for BE/ME. Their evidence also reveals that

there is likely a non-risk component in the BE/ME effect.

The trick appears to be the ability to untangle the three-way relationship between return, BE/ME, and growth. To date, Harris and Marston (1994) examine ex ante growth expectations using analyst EPS forecasts. Haugen (1995) uses the DeMarch Associates indexes and results to document ex post growth in EPS and its negative relation to return. Lakonishok, Shleifer, and Vishny (1994) use growth in sales as an ex post measurement and E/P ratios and cash flow/price ratios to demonstrate a negative ex ante growth and return relationship. The evidence provides strong support for a negative connection between BE/ME and growth. Since BE/ME and return are positively related, it is natural to connect low growth stocks with a high level of return as in Lakonishok, Shleifer, and Vishny (1994), Haugen (1995) and also as in this study.

3.6 Growth and Risk

If high BE/ME firms are value firms and low BE/ME firms are growth firms, then the risk characteristics of these firms become a very important piece of information in the quest to disentangle the competing theories on BE/ME relevance. Haugen (1995) uses the Fama and French data to show that growth firms have higher betas than value firms.

Thus he argues that the BE/ME effect cannot exist in an efficient market.

Lakonishok, Shleifer, and Vishny (1994) also examine this issue in several ways. First they examine the behavior of the cross-section of firm returns in the most severe recent recessions. They find that a value investment strategy outperforms a growth strategy during most recessions. Next they examine the performance of growth firms and value firms during the best and worst stock market months. If value firms are more risky, they should have larger downside potential. Again they find that value outperforms growth during down markets. They also find that value outperforms growth in up markets. In their words, **"value stocks could be described as having higher up-market betas and lower down-market betas than glamour stocks with respect to economic conditions."** p. 1569.

The difference in risk levels between the two strategies shrinks when more traditional measures of risk are used. Lakonishok, Shleifer, and Vishny (1994) estimate betas and standard deviations for growth and value strategies. They indicate that value strategies have slightly higher risk levels. But, after controlling for size effects, they find the two groups to be quite similar in risk attributes. The returns on a value strategy are

much too high to be labeled risk induced.

3.7 Summary and Hypotheses

The risk proxy theory and the overreaction explanation are two quite different ways of explaining the BE/ME effect. Both theories are able to predict high levels of return for value firms and low levels of return for growth firms. These two theories come to substantially different positions on risk attributes for value and growth firms. It is possible that one explanation is more accurate than the other. But, it may be possible that both theories have elements of truth that need synthesizing into one eclectic position. The differences found in results and methodology between the Fama and French (1992) study, and the Lakonishok, Shleifer, and Vishny (1994) study, may be of significant magnitude to alter the validity of explanations about the common phenomenon.

Jegadeesh and Titman (1993) find that the difference between winner and loser portfolio performance over the short run is opposite the performance found in longer periods. In this study evidence hints at a similar shift in significance for contrarian strategies. The performance of contrarian strategies may be postformation period specific. A particular variable such as sales growth may reliably

predict return over five-year postformation periods, but fail to do so in one-year postformation periods.

The general hypotheses upon which most recent BE/ME literature builds, are:

HO: There is a linear relationship between BE/ME and return.

HO: There is a reliably accurate relationship between BE/ME and risk.

More specific and focused hypotheses addressed in this study include:

HO: Each univariate contrarian variable is a statistically significant predictor of return over the entire sample period.

HO: Each univariate contrarian variable is a statistically significant predictor over all subperiods of the sample period.

HO: Piecewise regressions support the contrarian strategy overreaction story.

HO: Multivariate regressions support investor overreaction.

The first of these focused hypotheses concentrate on the reliability of each variable over the entire research time frame. If a variable has been touted as a risk proxy, rejection of the hypothesis damages the credibility of the risk proxy theory. If the variable is viewed as a

contrarian strategy, rejection simply negates the overreaction specified elsewhere in the literature. Rejection for any variable also raises the possibility that there is a data specific or formulation specific explanation for its original inclusion in the literature. At least one formulation of each of the major variables used in this study (BE/ME, size, sales growth, and cash flow) are significant in univariate regressions.

The second focused hypothesis addresses the reliability of each variable during subperiods. A risk proxy is expected to be significant during most periods. Rejection of the hypothesis damages the credibility of the risk proxy unless risk is cyclical. If certain risk factors are cyclical, there remains a need for a general proxy that measures risk in all periods. The ability to differentiate between risk proxies and contrarian overreaction variables may prove useful. It is possible that a risk proxy works much of the time, but investors overreact periodically as well. The main variables in the literature may be composed of risk proxies, variables with anomalous return relationships, or both.

Focused hypothesis number three is used to evaluate the reliability of predictive power across the sample of firms. A risk proxy should smoothly predict return for all segments

of the sample population including firms farthest from the extremes. An investor overreaction concept is better supported if only firms toward the tails of the distribution are driving returns. Piecewise regressions are used to examine this issue with some support for the risk proxy theory and other support for the investor overreaction concept.

The last hypothesis is used to examine the interaction of the various variables proposed by Fama and French (1992) and by Lakonishok, Shleifer, and Vishny (1994). Investor overreaction is supported if variables that are uncorrelated or negatively correlated with risk perform best in multivariate regressions.

These specific hypotheses are addressed systematically in Chapter 5. The resulting findings support investor overreaction on some fronts, while supporting a possible risk proxy - return relationship in others.

CHAPTER 4

DATA AND EMPIRICAL DESIGN

A portion of the Fama and French (1992) methodology is replicated using primarily the same data set and the same techniques. The starting point for the analysis (1962) is the same as that used by Fama and French. The analysis is extended two years beyond the period of their study so that a complete thirty-year period is covered. Use of the same techniques facilitates comparison between the results of this study and the Fama and French (1992) study. As an example, the relationship between BE/ME and return is tested with and without deferred tax liabilities (DTL). What is more important, similar methodology allows for interpretation of differences between Fama and French (1992) and Lakonishok, Shleifer, and Vishny (1994). Differences in procedural methodology are discussed and used where appropriate.

4.1 Data

All firms on NYSE, AMEX, and NASDAQ are initially included in this study if they reside on both the CRSP tapes and the COMPUSTAT annual industrial files of income-statement and balance-sheet data. The original Fama and French study excludes financial firms because of leverage variables used in their tests. Leverage is not directly analyzed in this study. So, financial firms are included in the data set if all other screening criteria are met.

Any reliable risk proxy should work for a wide range of securities. For this reason financial firms are included in the study. The statistics found using this more inclusive data set are so close to those found by Fama and French that it was not deemed necessary to exclude them at this time. Further study is needed to ascertain if the BE/ME effect is consistent in each industrial category, including the financial services category. Fama and French (1994) deliver some results in this area.

Ordinary least squares regressions are run with and without NASDAQ firms. Lakonishok, Shleifer, and Vishny (1994) exclude NASDAQ firms to avoid potential data bias. Fama and French (1992) include them. It is thus necessary to compare the results with and without including NASDAQ firms.

Banz and Breen (1986) document selection bias in COMPUSTAT data. Kothari, Shanken, and Sloan (1995) test the Fama and French results using data taken from the S & P Analysts Handbook. They find a weaker BE/ME effect than that found in the COMPUSTAT data. Davis (1994) creates a database that is free from survivorship bias and still finds a positive BE/ME effect. Breen and Korajczyk (1995) find no existence of selection bias for a restricted COMPUSTAT sample of NYSE/AMEX firms. Some differences occur when NASDAQ data are included in their study. As pointed out by Breen and Korajczyk, the reason for these differences may be data bias, or simply a stronger BE/ME effect for these firms.

Data bias concerns notwithstanding, elimination of NASDAQ companies results in potential risk bias. The most useful risk proxy would have the ability to explain returns for a large segment of firms, preferably the whole market. Including only NYSE and AMEX firms in a study avoids NASDAQ survivorship bias. But NYSE and AMEX firms are the ultimate survivors. They have been listed only because they were able to withstand the test of time and grow into listing eligibility.

By including only NYSE and AMEX in a study, one is more apt to dilute the unique risk characteristics of small firms

and overweight the risk characteristics of portfolios predominately composed of large companies. Also as Fama, French, Booth, and Sinquefeld (1993) have shown, NYSE and NASD stocks of similar size have quite different risk characteristics. NYSE stocks have higher distress factors than NASD firms. Unfortunately, the distress factor used by Fama et. al. is BE/ME. Thus the argument that the risks are different is circular, given that BE/ME is suspect as a risk proxy.

Thirty portfolio formation years are analyzed in this study. Accounting data for BE/ME is gathered starting with December 1962 and ending with December 1991. Postformation period return data run from July 1963 to June 1993. This provides a thirty-year period and allows for even five and ten year divisions. The original Fama and French (1992) study covers the years 1962-1989. To calculate beta and the sales growth variable, data is drawn from 1957 on.

Lakonishok, Shleifer, and Vishny (1994) start the analysis of their portfolios in 1968 and run through 1990. Since their portfolio techniques require five years of accounting data, they gather data from 1963 on. This time period does not seem unreasonable given the restricted sample sizes available in the 1960's. It should be pointed out, however, that prior to 1968, one of their most powerful

variables, (sales growth) behaves in an opposite fashion to the results found during the period of their study.

4.2 Formation and Postformation Periods

In studies such as this one, the usual procedure is to use accounting variables gathered during a formation period. These variables are then regressed against returns generated during the postformation period. The formation period for some variables is very short, e.g., year-end financial statement data gathered in year $t-1$. Other variables require substantial calculation periods, e.g., sales growth and beta. Accounting variables for use in this study are formed at fiscal year-end in calendar year $t-1$. Market value of equity is formed at the end of June in year t . Beta's are formed using returns calculated for up to five years preceding June of year t . Sales growth is calculated using up to six fiscal year ends to provide five annual sales growth rates.

The postformation period starting point and duration differ depending on the study. In this study, as in Fama and French (1992), the accounting data is formed in year $t-1$ to explain returns for each month starting in July of year t to June of year $t+1$. The lag between the year-end and the start of the postformation period varies. The lag is

incorporated to allow the dissemination of information concerning these variables to the public. Many studies use December accounting data and start examining returns in April of the following year, e.g., Lakonishok, Shleifer, and Vishny (1994). I will follow the more conservative approach of Fama and French and analyze returns from July of year t to June of $t+1$.

A major difference between the Fama and French (1992) methodology and that used by Lakonishok, Shleifer, and Vishny (1994) focuses on the length of the postformation period. The former, as already discussed, runs for one and a half years past the calendar year end, or one year past the formation period ending in June of year t . The results presented by Lakonishok, Shleifer, and Vishny on the other hand, come from an extensive five-year postformation period. Results derive from five annual return holding periods, rather than twelve monthly return holding periods.

Both postformation time periods are legitimate and useful. The conclusions drawn from these time periods may be naturally quite different, even though they attempt to explain the same phenomenon. It would not be unreasonable to find different explanations for the different time frames. For example Jegedeesh and Titman (1993) find that securities determined to be past winners substantially

outperform past losers for the next three to twelve months after formation. But, past losers and past winners perform in an opposite fashion for the following time period (thirteen to thirty-six months). The advantageous additional returns found in the earlier period are lost. So, their interpretation that past winners continue to be winners is not in opposition to the findings of De Bondt and Thaler (1985, 1987). They find that past losers are winners and past winners are losers. The results and inferences are postformation time period sensitive.

Likewise, it is not surprising to find differing results for Fama and French (1992) methodology that focuses on the relatively near term, and Lakonishok, Shleifer, and Vishny (1994) methodology which focus on a longer time horizon. Lakonishok, Shleifer, and Vishny find that sales growth over five-year postformation time periods is one of the most powerful variables. Davis (1994) does not find a statistically significant sales growth variable when using Fama and French techniques in a pre-COMPUSTAT study. In this study sales growth is significant when tested in isolation, but, fails to maintain significance in the presence of BE/ME.

Return calculation differences are not at the heart of this study. It should be noted, however, that Fama and

French (1992) use monthly returns in their regressions. Unlike Fama and French the author of this study did not have access to the entire CRSP master file subscription. It was thus necessary to use daily return data in order to analyze NASDAQ firms. Two daily return files were used, which provide daily return data for NYSE and AMEX, and NASDAQ respectively. These daily returns were then compounded into monthly returns. $[(1 + \text{daily return in day 1}) * (1 + \text{daily return in day 2}) * \dots * (1 + \text{daily return in day } n) - 1.0]$. These returns were then checked against those from the file that presents monthly returns calculated for NYSE firms. The returns are identical, except where a dividend is paid part way through the month. The monthly return file assumes the dividend is paid at the end of the month. The daily return compounding method thus provides a return that is slightly larger in every third month for stocks that pay a dividend.

Though the daily compounding methodology may be more accurate, there appears to be no measurable difference in outcomes. The results in this study confirm those found in the Fama and French study in every regard. The average monthly return for the entire sample is 1.25% in the Fama and French study and 1.29% in this study.

4.3 Sample Selection Criteria

To be included in the study a company must have a CRSP stock price for December of year $t-1$ and June of year t . The stock must have at least one monthly return during the postformation period, July of year t to June of year $t+1$. The company also must have monthly returns for at least 24 of the 60 months preceding July of year t . Each company must have book equity for its fiscal year (ending in any month) of calendar year $t-1$. These restrictions imposed by Fama and French are followed in this study as well.

An additional restriction is added for convenience in comparing studies. The additional restriction is the requirement that a firm have sales in at least two adjacent years during the five years preceding year t . Other accounting variables used in this study such as earnings and depreciation are present when sales for a firm are recorded.

The requirement for a stock to exhibit a return in the postformation period effectively means that a company may not cease trading in June of year t and still be included in the sample. Firms that cease trading during the postformation period (July of year t to June of year $t+1$) are included in the study. To exclude them would be to introduce survivorship bias. Many of the firms that

disappear have large negative final month returns. An individual investing in a portfolio formed at the end of June would be unlikely to predict which firms were to cease trading the following February, for example.

Lakonishok, Shleifer, and Vishny (1994) are not dealing with monthly returns but rather yearly holding periods. When a firm disappears from the CRSP tapes, they substitute the average return from the appropriate size decile portfolio in the missing return's position until the end of the year.

Lakonishok, Shleifer, and Vishny (1994) are more restrictive in their data screening criteria. They require a full five years of accounting data and restrict their study to NYSE and AMEX firms. These restrictions effectively exclude the vast majority of firms in the lower market equity categories of the overall market. In order to make it possible to say something about the relationship between sales growth and return, or cash flow and return, for the Fama and French (1992) sample, these restrictive screening criteria were not adopted.

An attempt was made to stay as close to the Fama and French (1992) methods and sample size as possible without compromising the value of having a complete data set from which to draw inferences. Thus, a firm that meets all of

the Fama and French criteria, but has only two years of sales data, would be included in this study and excluded in the Lakonishok, Shleifer, and Vishny (1994) study. A firm that does not have an adequate sales history, but meets all other Fama and French criteria, is necessarily excluded.

Exclusion of firms lacking sales data does not dramatically lower the average annual sample size, but does decrease sample size by an average of 128 firms. Average sample size decreases by only 48 firms if the year 1974 is excluded. In 1974 alone, 2432 firms are excluded from the study because these firms do not have a two-year COMPUSTAT sales history. Returns are recorded for NASDAQ firms starting in December of 1972, and accounting data for many of these firms begins in 1973. This precludes a June 1974 formation date, since only one year of accounting data is available.

The average number of firms included in the monthly regressions total 2347. Fama and French average sample size is 2267. The reason for the overall larger sample size in this study is two fold. Two more years of data are included. Each of these additional years has over four thousand firms thus increasing the average from that found in Fama and French (1992). The other reason for the larger sample size is the inclusion of financial firms. Leaving

out the years that extend beyond the period of the Fama and French study effectively lowers the average sample size so that it is slightly less than theirs. The lower sample size for years ending in 1989 results because of the missing sales growth firms.

An issue dealing with data reliability needs to be addressed. Do the sample size differences between Fama and French (1992) and Lakonishok, Shleifer, and Vishny (1994) make comparisons between the two studies invalid? The complete sample in this study allows for sales growth and cash flow comparisons on a sample nearly the same as that used by Fama and French. The author felt that rerunning the data with only NYSE and AMEX firms was a sufficient test of reliability for inferences about the Lakonishok, Shleifer, and Vishny results. Most firms on AMEX and NYSE have a complete five-year accounting history.

Several other data issues complicate the data gathering process when using a limited subscription to the CRSP tapes. Once accounted for these issues should have no bearing on the results. One problem is a group of firms with multiple security classes. In this study only one security class per company was included. If multiple security classes are used, some companies would be double counted, i.e., showing up twice or three times in a particular BE/ME decile. When

there are multiple security classes the ordinary voting common shares are the class chosen if possible. Matching of security class in CRSP with COMPUSTAT data is made possible by published security descriptions and codes in the COMPUSTAT manual. The appropriate security class will change over time for some companies.

Another issue involves firms that move from one exchange to another. If not duly accounted for, exchange hopping results in missing data. Under the new CRSP Master File subscription, an entire firm return history is available on the tape. In contrast the old subscription presents data for all firms on a particular exchange. Thus under the old subscription one needs to generate a list of all firms identified on both the NYSE/AMEX tape and on the NASDAQ tape. Then any analysis using or counting returns must check to see that the returns from both tapes are properly being used. For example, when doing inclusion tests for firms with at least 24 months of return data, a firm that just switches from NASDAQ to NYSE will be excluded if using only the NYSE/AMEX file. Only by counting the returns from both tapes is it evident that the firm has been actively trading for a substantial period of time. Of course this missing data effect has to be accounted for when making beta calculations as well.

4.4 Variable Descriptions

Listed below in Table 3 are variable descriptions and brief explanations as needed. Some additional variable formation features are also discussed in this section.

Market equity (ME) for use in the BE/ME variable, is reported on the last trade date in December and consists of COMPUSTAT item #24*#25 (Shares outstanding * price). Market equity (ME) for the "size" variable is taken from the CRSP data tapes. The most recent reported shares outstanding are multiplied with the price reported on the last trade date of June in year t .

Book equity (BE) for use in the BE/ME variable is constructed in two ways. (1) COMPUSTAT data item # 60 that includes common stock outstanding, capital surplus, and retained earnings. (2) COMPUSTAT data item # 60 plus item # 35. COMPUSTAT item # 35 (DTL) is deferred taxes and investment tax credits if any.

One major dilemma deals with firms that exhibit negative cash flows. For most of this study, negative cash flow firms are assumed to be most similar to growth firms and assigned a rank of 1 in the cash flow decile variable described in Table 3 below. Negative cash flow firms are included so as to maintain as large a data set as possible for comparative inferences. Including negative cash flow

Table 3

Variable Descriptions

Variable Name	Variable Description
Ln(DTL/BE)1	Deferred tax liability (COMPUSTAT data item #35) divided by book equity (item # 60) - All firms without DTL are assigned a value equal to the natural log of a firm with DTL = to 0.00001 (-11.5129) this allows all firms to be used in the regressions.
Ln(DTL/BE)2	The same as above, except only firms with a DTL balance are used.
Ln(DTL/BE)3	Only firms with a DTL balance equal to or greater than 10% of book equity are used.
Ln(DTL/BE)4	Only firms with a DTL balance equal to or greater than 20% of book equity are used.
Ln(DTL/BE)5	Only firms with a DTL balance equal to or greater than 30% of book equity are used.
Ln((BE+DTL)/ME)	Fama and French's book to market ratio including deferred tax liabilities.
Ln(BE/ME)	The plain book to market ratio.
Cash Flow	Earnings before extraordinary items (data item # 18) plus depreciation (item # 14) all divided by market value.
Cash Flow Dec	The raw cash flows above are sorted into deciles and assigned a 1.0 for the lowest cash flow firms, a 2.0 for the next lowest decile, and so on up to a 10 for the highest cash flow firms.
Ln(Cashfl Dec)	The natural log of the cash flow deciles above.
MGS	Median sales growth over the last five years if available. $\text{Sales Growth} = [(\text{Sales}_t - \text{Salest-1}) / \text{Salest-1}]$. Sales in each year t is taken from COMPUSTAT item #12.
MGS Deciles	Firms are sorted into decile portfolios based on MGS. Firms are assigned a rank from 1 to 10; 1 for the lowest growth firms and 10 for the highest growth firms. This has the effect of reducing noise and increasing predictive power.
Ln(MGS Dec)	The natural log of the MGS deciles.

Table 3 (cont'd)

Variable Name	Variable Description
WGS	Weighted growth in sales over the last five years if available. (30% weighting to the most recent year, 25% for the next most recent year down to 10% for the fifth year). If there are less than five years the weights are adjusted to add up to 100%.
WGS Deciles	WGS sorted into decile portfolios and assigned a rank from 1 to 10 from lowest to highest growth firms.
Ln(WGS Dec)	The natural log of WGS deciles.
Ln(ME)	The natural log of June ending market value denominated in millions of dollars.
EBETA	The equally weighted market model beta, using 24 to 60 months of returns as in Fama and French. The index used is the NYSE index.
VBETA	The value weighted market model beta.

firms creates the strongest and most significant results. Alternate regressions were also run using only positive cash flow firms and a negative cash flow dummy. Another test was conducted assuming negative cash flow firms to be most like "value firms." It should be noted that negative BE firms are not included in the regressions. So negative cash flow firms used are more apt to be temporarily depressed, or very rapid growth firms using more resources than are generated internally.

Another issue addressed in this study deals with the form of the sales growth variable that is most effective.

The median sales growth (MSG) variable has been demonstrated as a significant predictor in the life cycle model used by Anthony and Ramesh (1992). They use the model to test the stock market response to accounting performance measures. Lakonishok, Shleifer, and Vishny (1994) use a different sales growth procedure. They rank firms on sales growth in each of five years prior to portfolio formation. They then weight the sales rank for the most recent years more heavily than the more distant years. In contrast, the MSG variable is a median number.

Median sale growth has the advantage of being stable, but may suffer when firms undergo rapid sales growth. Rapid sales growth would result in an understated sales growth trend for cross-sectional data. Likewise, firms that exhibit a recent decline in sales growth will overstate the sales growth trend if the median growth rate is used.

A concern is that MSG does not capture the volatility in sales growth from year to year. In answer to this problem Lakonishok, Shleifer, and Vishny (1994) conducted tests that use an equal weighting procedure as well as their weighted average procedure. They report that the results are similar. It does not appear that MSG will be very sensitive to alternate construction procedures. As can be seen in Table 3 several sales growth variables are tested in

this study.

In a multivariate life cycle approach such as the one used by Anthony and Ramesh (1992), MSG should work well. In a univariate regression there may be additional information captured by weighting recent sales growth more heavily. In addition to the median sales growth approach, an increasing weighted scale for sales growth is used in each year. The following hypothetical example is constructed to illustrate the benefits of using a weighted sales growth procedure. Year five is the most recent year.

Table 4

Weighted Sales Growth Example

Year	Sales Growth	Weight	Total
1	0.10	0.10	0.0100
2	0.09	0.15	0.0135
3	-0.08	0.20	-0.0160
4	0.14	0.25	0.0350
5	-0.04	0.30	-0.0120
Totals		1.00	0.0305

Using the median sales growth procedure would yield a sales growth rate of 9% in the above example rather than the 3.05% found in Table 4. Using the weighted sales growth procedure proposed here places 55% of the weight on the last two years. Both procedures may prove to be useful.

CHAPTER 5

EMPIRICAL RESULTS AND EXPLANATIONS: VARIABLE RELIABILITY

Several rhetorical questions are presented here as a means of introducing the empirical investigation. Major results are suggested as a prelude to the more detailed analysis presented in the tables below.

Are "value/growth" variables significant using the Fama and French (1992) methodology? Lakonishok, Shleifer, and Vishny (1994) find cash flow yield and sales growth are stronger variables than BE/ME. Davis (1994) on the other hand does not find a significant sales growth variable. The results found in this study confirm the significance of each of the major variable categories on a univariate basis. Using multivariate models presents mixed results.

Another question centers upon variable reliability. Several variables are introduced from both sides of the efficient markets aisle. Are these variables reliable through time? From the findings, one may infer that $\ln(\text{BE/ME})$ is the most reliable variable through time with the cash flow deciles variable a very close second. Sales

growth and size have considerable fluctuations in the thirty-year period of this study.

Do some variables such as $\ln(\text{WGS})$ (weighted sales growth) perform well over the extended five-year time frame found in Lakonishok, Shleifer, and Vishny (1994), while falling short in the one-year postformation period of Fama and French (1992)? In multivariate models using the Fama and French methodology, $\ln(\text{WGS})$ does not maintain statistical significance in the presence of $\ln(\text{BE/ME})$. These and other questions are addressed in detail below.

5.1 Competing Univariate Variables

Fama and French (1992) and Lakonishok, Shleifer, and Vishny (1994) have demonstrated models that are statistically significant predictors of stock return. Lakonishok, Shleifer, and Vishny cast doubt upon the superiority and strength of the Fama and French model, and the interpretation of its results. The following tests set out to illuminate the interaction of variables used by the two competing schools of thought. Lakonishok, Shleifer, and Vishny analyze BE/ME with their sample and methodological restrictions imposed. Here the competing variables are analyzed using the Fama and French methodology as outlined in Chapter 4.

Table 5 summarizes monthly regression results for variables used in the Fama and French (1992) model and also several variations of growth/value variables suggested by Lakonishok, Shleifer, and Vishny (1994). Each variable is formed as described in the Chapter 4. The coefficient mean (or average slope) is the average regression coefficient taken from 360 monthly regressions that start in July 1963 and proceed to June 1993. The T-statistics and P values are taken from single sample t-tests in which the time series of the regression coefficient is tested for the hypothesis that the mean is not different than zero. Asterisks found next to individual P values highlight significance levels at 5% or lower. In addition, the number of significant positive and negative (5% level) monthly regression coefficients are recorded.

Of the variables analyzed, each is a significant predictor of return over the thirty-year study period except for the equally and value weighted beta's and the raw median sales growth and raw weighted sales growth variables. All significant variables have signs that correspond with the results from earlier studies. $\text{LN}(\text{BE}/\text{ME})$ and cash flow variables are positively related to return while size and sales growth variables are negatively correlated with

Table 5

**Average Slopes From Month-By-Month
Regressions of Stock Returns on Variables of Interest
July 1963 to June 1993**

Each variable is formed as described in Chapter 4. The coefficient mean (or average slope) is the average regression coefficient taken from 360 monthly regressions that start in July 1963 and proceed to June 1993. The T-statistics and P values are taken from single sample t-tests in which the time series of the regression coefficient is tested for the hypothesis that the mean is not different than zero. Asterisks found next to individual P values highlight significance levels at 5% or lower. In addition, the number of significant positive and negative (5% level) monthly regression coefficients are recorded.

Variable	Coefficient Mean	T Stat	P Value	Number Sign Pos Months	Number Sign Neg Months
LN(BE/ME)	0.0047	5.31	0.000 *	152	69
CASHFLOW	0.0235	4.19	0.000 *	116	55
CASHFLOW DEC	0.0011	5.36	0.000 *	144	60
LN(CASHF DEC)	0.0035	3.93	0.000 *	136	64
MGS	-0.0043	-1.86	0.064	45	77
MGS DECILES	-0.0004	-2.59	0.010 *	67	120
LN(MGS DEC)	-0.0019	-3.16	0.002 *	54	107
WGS	-0.0026	-1.38	0.168	38	63
WGS DECILES	-0.0005	-2.70	0.007 *	67	120
LN(WGS DEC)	-0.0020	-3.27	0.001 *	58	109
LN(ME)	-0.0015	-3.03	0.003 *	109	144
EBETA	0.0013	0.63	0.526	124	146
VBETA	-0.0003	-0.17	0.867	106	147

return. The strongest variables are $\ln(\text{BE/ME})$ and cash flow deciles. The next strongest variables are the natural log of weighted sales growth deciles, and size. Of all the variables analyzed in a univariate fashion, cash flow deciles has the highest significance level, but only fractionally higher than $\ln(\text{BE/ME})$.

When looking at each individual monthly regression, we find that $\ln(\text{BE/ME})$ has more significant monthly regressions of the appropriate sign than any other variable in the study. Out of a universe of 360 monthly regressions, 42% of them are significantly positive while only 19% of them work in the opposite direction. Thirty-nine percent (39%) of the monthly regression coefficients cannot be established as different from zero.

The cash flow decile variable has fewer statistically positive monthly regression coefficients than $\ln(\text{BE/ME})$, but also has fewer months where the results move in the wrong direction (40% positive, 17% negative, and 43% inconclusive). For $\ln(\text{WGS Deciles})$ 30% have significant negative monthly coefficients, while 16% of the months perform contrary to expectations. Over half the monthly regressions coefficients (54%) are insignificant. For $\ln(\text{ME})$ similar percentages are 40% significantly negative, 30% significantly positive, and 30% inconclusive.

On the univariate level the results indicate that $\ln(\text{BE/ME})$ would probably be the most effective predictor of return over time due to its more consistent relationship with return.

All three variations of the cash flow variable are significant. Sorting cash flows in ascending order and forming ten ranked portfolios (ranks from 1 to 10) appears to create the best performing cash flow variable. Cash flow portfolios work better than individual cash flow data. This is in contrast to regressions run using $\ln(\text{BE/ME})$ as the independent variable. The decile portfolio ranking procedure employed for cash flow deciles does not have as much explanatory power for $\ln(\text{BE/ME})$ as the individual firm cross-sectional regressions. The coefficient mean drops from 0.0047 to 0.0045, and the attending T statistic drops from 5.31 to 4.91. This leads the author to believe that $\ln(\text{BE/ME})$ is a better risk proxy, providing more information from each individual firm. Cash flow deciles and other variables provide general information about market returns if enough company specific variation is eliminated.

Of the sales growth variables, weighting more recent sales growth more heavily seems to produce marginally better forecasts of return. Much like the cash flow variable procedure, forming deciles eliminates much of the noise

associated with individual securities within each decile. In recent years much of this noise has been introduced by companies that catapult from relatively small regional or niche players into huge companies with national exposure. For example, many software companies move from revenue levels in the hundreds of thousands of dollars, to revenues in the millions, within a year or two. This, of course, causes tremendous outlier problems (sales growth of 80-500% a year) for a small group of firms. The outlier problem is cured when deciles are formed and rankings are assigned to each firm.

This study does not concentrate on the relationship between beta and return. It should be noted, however, that regressions run here are based on individual firm beta's. Fama and French (1992) aggregate their beta's by portfolio. They have adequately demonstrated the lack of power for portfolio assigned beta's when size is introduced into the relationship.

5.2 Comparison to Fama and French Results

Comparison of results between this study and the Fama and French (1992) study proves worthwhile. Table 6 demonstrates the similarity in results. Beta, $\ln((BE+DTL)/ME)$, and $\ln(ME)$ each have average coefficients

and T statistics taken from this study that are of the same sign and virtually the same magnitude as those found in Fama and French. $\ln((BE+DTL)/ME)$ is used here rather than $\ln(BE/ME)$ for comparison purposes. Chapter 7 examines the difference between these two ratios in detail. Later findings that have an impact on the Fama and French (1992) inferences should be viewed with confidence. This confidence is inspired by the assurance found here that data and technique are not introducing significant differences into the results of the study.

Table 6

**COMPARISON OF RESULTS
BETWEEN THIS STUDY AND FAMA AND FRENCH**

Each variable is formed as described in Chapter 4. The coefficient mean (or average slope) is the average regression coefficient taken from 360 monthly regressions that start in July 1963 and proceed to June 1993. The T-statistics are taken from single sample t-tests in which the time series of the regression coefficient is tested for the hypothesis that the mean is not different than zero.

This Study			Fama and French	
Variable	Coef- ficient	T Stat	Coef- ficient	T Stat
Beta	0.13%	0.63	0.15%	0.46
$\ln(BE+DTL/ME)$	0.46%	5.28	0.50%	5.71
$\ln(ME)$	-0.15%	3.03	-0.15%	-2.58

5.3 Subperiod Results - Time Consistency

An unanswered question arises when consideration is given to the behavior of each variable during subperiods of the overall study. Do the large average returns garnered from contrarian or risk proxy strategies, derive from consistent common stock return behavior? Or are the results due to a few exceptional months or years? Table 7 casts light on the issue by dividing the data into ten-year subperiods.

In Table 7 the 360-month period is divided into three 120 month intervals. The Fama and French (1992) methodology and procedures are used as they were in Table 5 above. In addition to the coefficient means, t statistics and p values; the percentage of significant positive and negative (5% level) monthly regression coefficients for each period are recorded.

The results shown for $\ln(\text{BE/ME})$ and size are consistent with subperiod results presented by Fama and French (1992). BE/ME is a significant variable in the ten-year subperiods used here, or the 13 and 14 year subperiods of Fama and French. $\ln(\text{ME})$ shows statistical rigor in only one ten-year period here and lacks power in both the Fama and French subperiods as well.

Table 7

**Average Slopes From Month-By-Month
Regressions of Stock Return on Variables of Interest
Ten Year Subperiod Results**

Each variable is formed as described in Chapter 4. The coefficient mean (or average slope) is the average regression coefficient taken from the 120 monthly regressions for each ten year period. The T-statistics and P values are taken from single sample t-tests in which the time series of the regression coefficient is tested for the hypothesis that the mean is not different than zero. In addition, the percentage of significant positive and negative (5% level) monthly regression coefficients are recorded.

LN(BE/ME)	July 1963 to June 1973	July 1973 to June 1983	July 1983 to June 1993
Coef. Mean	0.0034	0.0052	0.0054
T Statistic	2.29	2.69	5.44
P Value	0.024 *	0.008 *	0.000 *
% Sign Pos	31%	46%	50%
% Sign Neg	19%	25%	13%
CASHFLOW DEC			
Coef. Mean	0.0010	0.0009	0.0012
T Statistic	3.26	2.48	3.59
P Value	0.001 *	0.015 *	0.000 *
% Sign Pos	31%	41%	48%
% Sign Neg	15%	17%	18%
LN(WGS DEC)			
Coef. Mean	-0.0001	-0.0036	-0.0024
T Statistic	-0.10	-3.28	-2.36
P Value	0.918	0.001 *	0.020 *
% Sign Pos	12%	20%	18%
% Sign Neg	18%	38%	35%
LN(ME)			
Coef. Mean	-0.0012	-0.0032	-0.0001
T Statistic	-1.43	-3.39	-0.10
P Value	0.157	0.001 *	0.923
% Sign Pos	27%	28%	37%
% Sign Neg	29%	53%	38%

Lakonishok, Shleifer, and Vishny (1994) approach the subperiod problem in a different fashion. They look at postformation period returns for each formation year. Postformation periods extend for one, three, and five-year lengths in their subperiod analysis. The one-year periods are most similar to results shown in Figure 1 through 4 below. They find that 23% of the years in their 22-year period have negative returns for a high minus low cash flow portfolio. BE/ME exhibits negative returns in 27% of the years. A combined cashflow/sales growth portfolio exhibits negative returns in 14% of the years, contrary to expectations. It should be noted that every five-year postformation period exhibits returns in line with contrarian predictions.

In subperiod analysis Lakonishok, Shleifer, and Vishny (1994) do not present findings for sales growth except as it is combined with the cash flow variable. This omission is important since as found in Table 7 above, and Table 8, and Figure 3 below, $\ln(\text{WGS})$ does not reliably predict return in some time periods.

There are differences in subperiod analysis between this study and the Lakonishok, Shleifer, and Vishny (1994) study. In this study regression coefficients based on a complete data set are used to calculate the subperiod T

statistics. In contrast, Lakonishok, Shleifer, and Vishny look at the difference between; the two highest and lowest cash flow portfolios; the one highest and one lowest BE/ME ratio portfolio; and the lowest and highest two variable portfolios combining high (low) cash flow firms and low (high) sales growth firms. This procedure is adequate if one expects to find overreaction variables rather than risk proxies. As has been discussed already, BE/ME is a monotonic predictor of return over the entire market continuum, not just extreme portfolios.

The results found in subperiod analyses reveals that patience is a key attribute when using any of these strategies as an investment rule. Only BE/ME and cash flow deciles are significant over ten-year periods, and then over half the monthly returns do not respond to the strategy.

5.4 Subperiod Results - Rolling 120 Month Periods

The ten-year period results tabulated in the above table, use arbitrary beginning and ending dates that fit into the sample period in three even intervals. Rolling 120 period T tests were performed on the monthly regression coefficients for each variable. It is possible to establish which variables have strength without concern for the particular ten-year batch of data used. Each consecutive T

test drops the oldest month and adds a new month to maintain 120 monthly coefficients. There is a total of 240 ten-year periods in the 360 months of this study.

Using the rolling average procedure for ten-year periods masks shorter term volatility in the regression coefficients. Cash flow deciles show tremendous coefficient strength with 97% of the ten-year periods significantly above zero at the 5% level. As can be seen below, in five-year periods cash flow decile coefficients are significantly different from zero only about half the time.

$\ln(\text{BE/ME})$ is a significant predictor in 90% of the ten year rolling periods. $\ln(\text{WGS})$ is significant 78% of the time. $\ln(\text{ME})$ is only significant during 30% of the ten-year periods. $\ln(\text{ME})$, and to some extent $\ln(\text{WGS})$, are opportunistic variables. At times they are significant during periods when other variables are not. Thus in multivariate regressions they add to the explanatory power of the model in use.

5.5 Subperiod Results - Five Year Periods

In five-year periods the results are more sketchy. Results indicate that even the powerful (BE/ME) variable is reliably related to return for more than 50% of the months, during only one five-year period. Of course it could be

argued that BE/ME does a nice job of predicting return and adequately proxies for risk, except for periods when unforeseen shocks such as oil crises send the market reeling out of equilibrium. An example of such a shock appears during the period of July 1979 to June of 1980 as seen in Figure 1. It also could be argued that investors overreact in cycles or follow investing fads. What is clear, is that the BE/ME effect is a strong recurring theme.

Firm market value is not a good univariate predictor of return for many time periods. But, as will be demonstrated below, size does very well as a complimentary variable in multivariate regressions. This may be because small firm return achievement outpaces large firm return performance during some time periods when the other strategies of interest are not performing in a statistically significant fashion. It may be that size is randomly unrelated to the other investment strategies and thus provides a degree of diversification benefit. Or it may be that the results are simply time period specific. If this is the case, then there is no assurance that size will continue to perform well in the future.

Five-year results are outlined in Table 8 below. The procedures and layout for the table are identical to those

Table 8

Average Slopes From Month-by-Month Regressions of Stock Returns on Variables of Interest - Five Year Subperiods

Each variable is formed as described in Chapter 4. The coefficient mean (or average slope) is the average regression coefficient taken from the 60 monthly regressions for each five year period. The T-statistics and P values are taken from single sample t-tests in which the time series of the regression coefficient is tested for the hypothesis that the mean is not different than zero. In addition, the percentage of significant positive and negative (5% level) monthly regression coefficients are recorded.

	7/63 to 6/68	7/68 to 6/73	7/73 to 6/78	7/78 to 6/83	7/83 to 6/88	7/88 to 6/93
LN(BE/ME)						
Coef. Mean	0.0062	0.0006	0.0079	0.0026	0.0067	0.0040
T Statistic	2.71	0.32	2.42	1.23	4.71	2.97
P Value	0.009 *	0.749	0.019 *	0.225	0.000 *	0.004 *
% Sign Pos	33%	28%	47%	45%	60%	40%
% Sign Neg	12%	27%	18%	32%	12%	15%
CASHFLOW DEC						
Coef. Mean	0.0015	0.0006	0.0013	0.0006	0.0023	0.0002
T Statistic	3.39	1.28	2.14	1.28	5.42	0.37
P Value	0.001 *	0.206	0.036 *	0.207	0.000 *	0.713
% Sign Pos	35%	27%	42%	40%	58%	38%
% Sign Neg	7%	23%	10%	23%	12%	25%
LN(WGS DEC)						
Coef. Mean	0.0011	-0.0013	-0.0053	-0.0019	-0.0033	-0.0014
T Statistic	0.68	-0.91	-3.49	-1.21	-2.59	-0.92
P Value	0.499	0.367	0.001 *	0.232	0.012 *	0.364
% Sign Pos	8%	12%	13%	27%	15%	22%
% Sign Neg	12%	23%	40%	37%	40%	30%
LN(ME)						
Coef. Mean	-0.0039	0.0014	-0.0038	-0.0026	0.0013	-0.0015
T Statistic	-3.29	1.25	-2.38	-2.57	1.60	-1.27
P Value	0.002 *	0.216	0.021 *	0.013 *	0.115	0.210
% Sign Pos	12%	42%	25%	30%	45%	0.28
% Sign Neg	40%	18%	53%	52%	28%	48%

used for Table 7. The only difference is the use of five year or 60 month periods rather than ten-year periods.

Cash flow deciles appear to behave in a fashion similar to BE/ME. Both variables are significant during the same five-year time spans, except for the last time period July 1988 to June 1993. During this period cash flow deciles are not significantly related to return, while the BE/ME variable continues to foretell the best and worst investments.

Sales growth variables are quite unreliable in short time spans but, like size, appear to add diversification benefits in multivariate strategies. It may be that the Fama and French (1992) monthly regression procedure and one year postformation time interval is capturing two sales growth effects that offset each other. Lakonishok, Shleifer, and Vishny (1994) demonstrate that a contrarian approach, in which one invests in low sales growth firms, outperforms the bandwagon approach of investing in high sales growth firms. High sales growth firms may follow a relative strength pattern in which at least some of these firms outperform the average for the near term, while later an underperforming reversal in returns occurs. This effect, while not proven for sales growth, is found in the positive twelve month serial correlations of return, and negative

longer period returns of Jegadeesh (1990), and Jegadeesh and Titman (1993). If sales growth performance is postformation time period specific, a tendency toward dilution of results will occur in contrarian strategies over the short run. This could explain why the findings from the two different methodologies reveal differing results.

5.6 Monthly Regression Coefficients Averaged on a Yearly Basis

One key insight stands out for portfolio managers. In any prolonged period when the contrarian strategy really flops; it is precisely then that the strategy becomes most effective for the ensuing time period. The following few years tend to have extremely large regression coefficients. When the contrarian strategy is rebounding from dismal failure, probably many portfolio managers abandon the strategy, and rush toward the average returns of the S & P 500. In this sense all of the strategies, whether proxys for risk or not, result in excellent contrarian opportunities.

Figures 1 through 4 that follow depict the monthly regression coefficients for each of the major variables averaged on a yearly basis. The years on the x-axis represent the variable formation period from which

accounting data is drawn. The data points represent the average monthly regression coefficients regressed against stock return during the period July of year $t+1$ to June of year $t+2$. The numbers in parentheses represent the number of significant positive coefficients for the year followed by the number of significant negative coefficients.

From these figures it is easy to see when the variable in question has had periods of failure. Failure entails falling into negative territory for $\ln(\text{BE/ME})$ and cash flow deciles, and rising into positive territory for $\ln(\text{WGS})$ and $\ln(\text{ME})$. $\ln(\text{BE/ME})$ and cash flow deciles are both very strong variables over time. They follow a similar pattern in returns until recent years when they diverge. $\ln(\text{BE/ME})$ is more reliable than any of the other variables with only four years in which the coefficient drops into negative territory. Cash flow deciles become negative in five years. $\ln(\text{WGS})$ is positive in eight out of thirty years, with several more years very close to zero. Clearly $\ln(\text{WGS})$ performs opposite to contrarian strategy predictions during the period before that in which Lakonishok, Shleifer, and Vishny (1994) analyze their results. $\ln(\text{ME})$ has positive coefficients in about one-third of the years. $\ln(\text{ME})$ does not perform well during the mid-eighties.

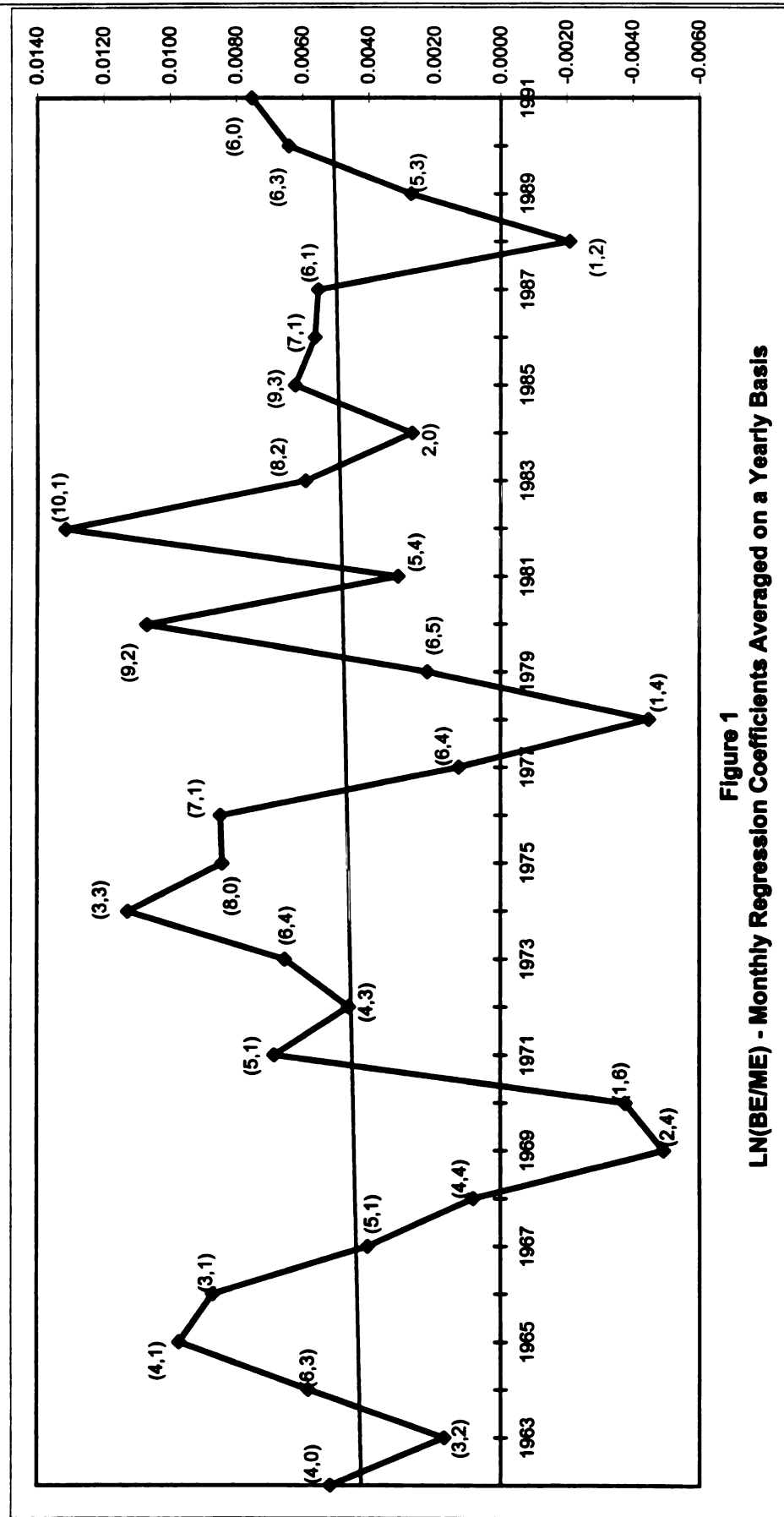
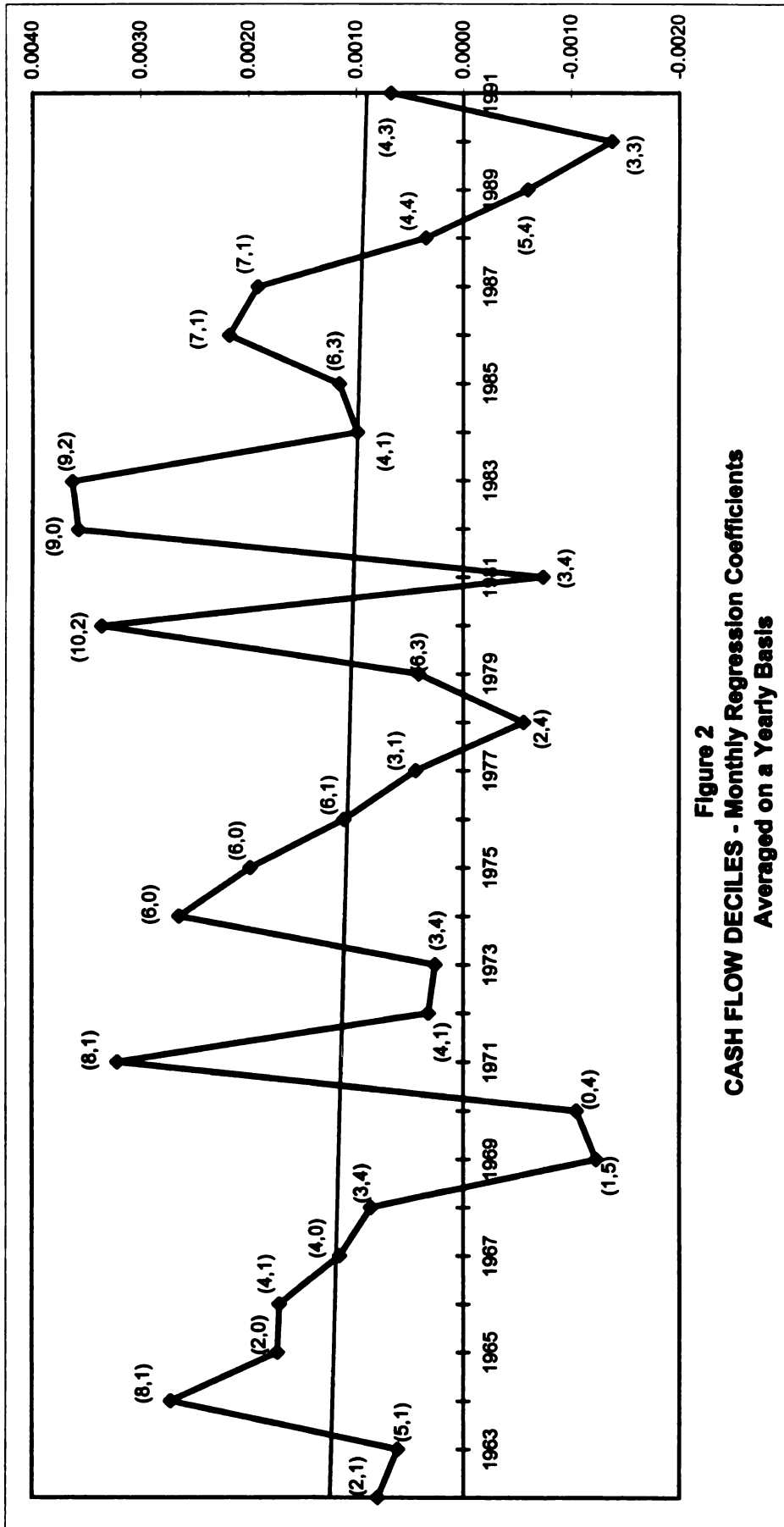
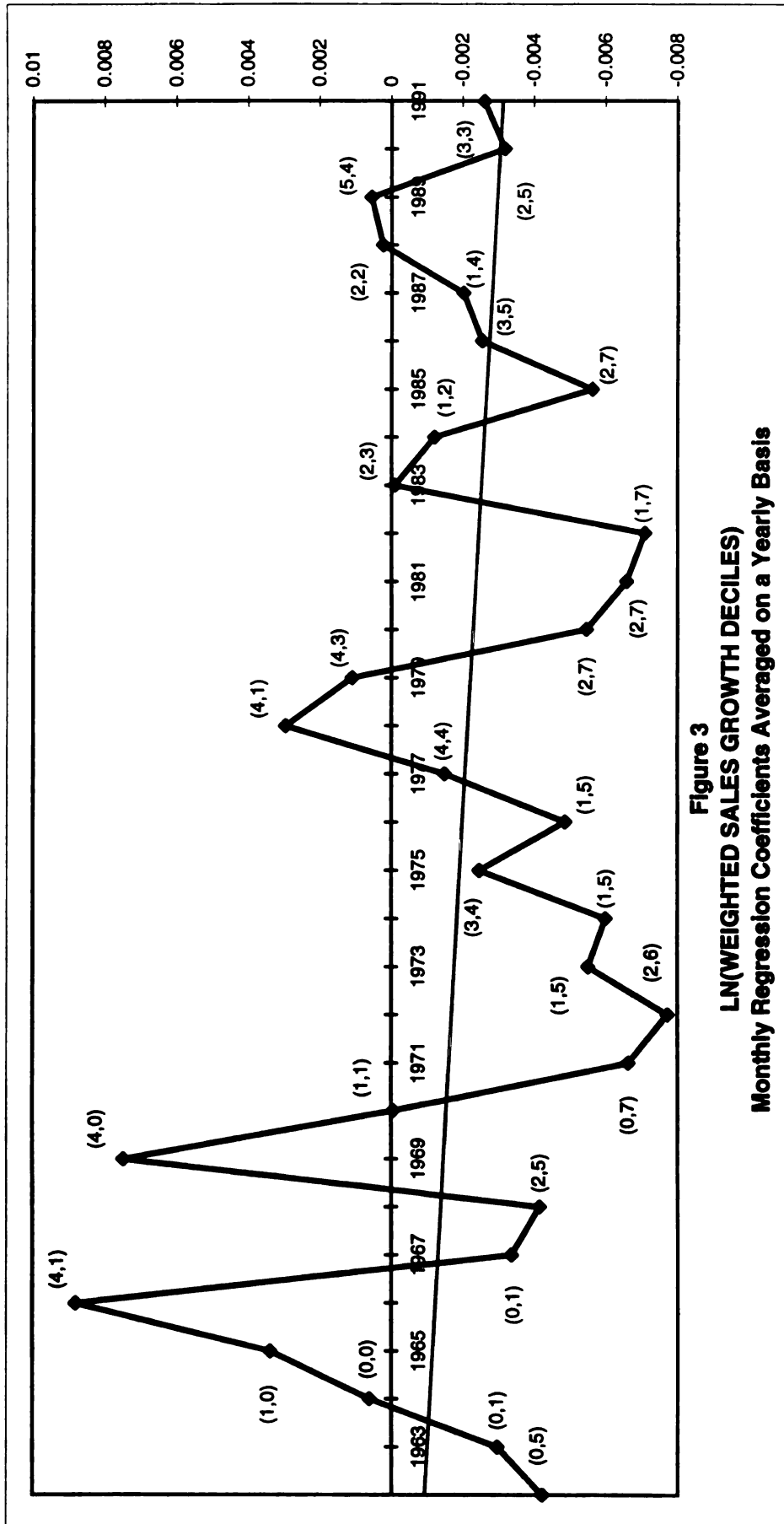


Figure 1
LN(BE/ME) - Monthly Regression Coefficients Averaged on a Yearly Basis

The years on the x-axis represent the "variable" formation period from which accounting data is drawn. The data points represent the average monthly regression coefficients of the variable regressed against stock return, during the period July of year $t+1$ to June of year $t+2$. For example, the negative regression coefficient for 1978 is for the return period July 79 to June 80. The numbers in parentheses represent the number of significant positive coefficients for the year followed by the number of significant negative coefficients.



The years on the x-axis represent the "variable" formation period from which accounting data is drawn. The data points represent the average monthly regression coefficients of the variable regressed against stock return, during the period July of year $t+1$ to June of year $t+2$. The numbers in parentheses represent the number of significant positive coefficients for the year followed by the number of significant negative coefficients.



The years on the x-axis represent the "variable" formation period from which accounting data is drawn. The data points represent the average monthly regression coefficients of the variable regressed against stock return, during the period July of year $t+1$ to June of year $t+2$. The numbers in parentheses represent the number of significant positive coefficients for the year followed by the number of significant negative coefficients.

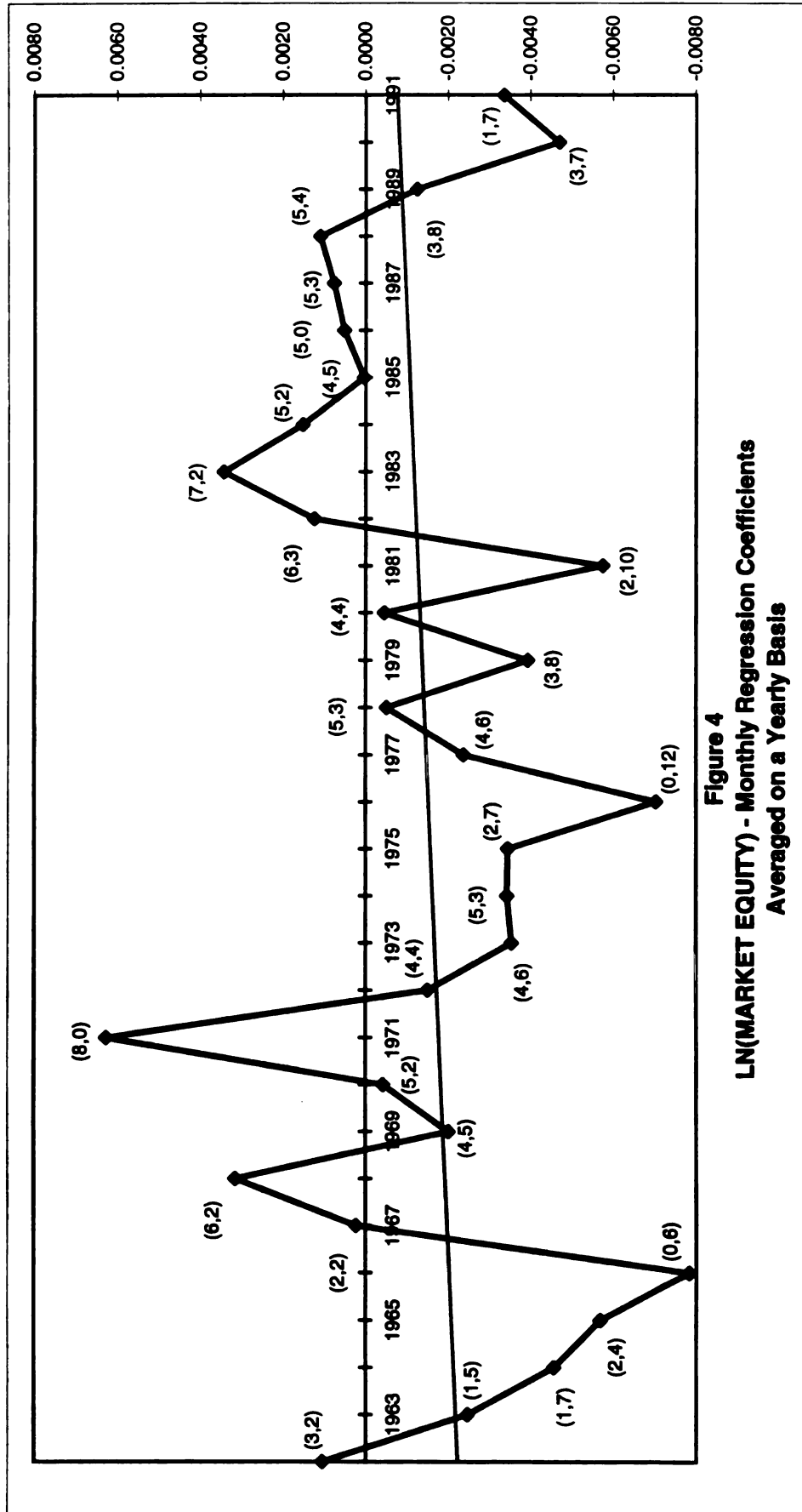


Figure 4
LN(MARKET EQUITY) - Monthly Regression Coefficients
Averaged on a Yearly Basis

The years on the x-axis represent the "variable" formation period from which accounting data is drawn. The data points represent the average monthly regression coefficients of the variable regressed against stock return, during the period July of year $t+1$ to June of year $t+2$. The numbers in parentheses represent the number of significant positive coefficients for the year followed by the number of significant negative coefficients.

5.7 Piecewise Regressions

The investigation to this point has primarily revolved around four variables and their reliability as risk proxies, or in contrast as contrarian investment vehicles. Another way to analyze these variables is to determine whether the entire sample of firms respond to the independent variable, or whether isolated segments of the sample are driving return results. If the variable is to be a reliable risk proxy, all segments of the population should respond in a similar fashion to the regressions.

Piecewise regressions are used to test the relation between each variable and return at each of three levels. Each variable is sorted in ascending order and then divided into three equal groups, with each group labeled 1, 2 or 3 corresponding to cases in the lowest, middle, and highest variable category. Each group becomes a separate variable with zeros assigned to cases from other groups. This procedure allows for the determination of variable reliability across the continuum of firms. For example firms with low, medium, and high BE/ME variables are regressed against return to ascertain if particular levels of the variable are significant predictors of return in their own right. Table 9 below illustrates these piecewise regressions.

Table 9

Piecewise Regressions
Average Slopes From Month-by-Month
Regressions of Stock Returns on Variables of Interest
July 1963 to June 1993

Each variable is formed as described in Chapter 4. The coefficient mean (or average slope) is the average regression coefficient taken from 360 monthly regressions that start in July 1963 and proceed to June 1993. The T-statistics and P values are taken from single sample t-tests in which the time series of the regression coefficient is tested for the hypothesis that the mean is not different than zero. Asterisks found next to individual P values highlight significance levels at 5% or lower. Each variable is divided into three equal groups after sorting in ascending order. The lowest variable cases are assigned to group 1, those in the middle are assigned to group 2, and the highest variable group is labeled as group three. Each group becomes a separate variable with zeros assigned to cases from other groups.

Variable	Coefficient Mean	T Statistic	P Value
LN(BE/ME) 1	0.0040	4.42	0.000 *
LN(BE/ME) 2	0.0049	2.94	0.004 *
LN(BE/ME) 3	0.0062	3.32	0.001 *
CASHFLOW DEC1	-0.0006	-0.98	0.328
CASHFLOW DEC2	0.0002	0.57	0.568
CASHFLOW DEC3	0.0008	3.13	0.002 *
LN(WGS) 1	-0.0042	-3.41	0.001 *
LN(WGS) 2	-0.0025	-3.10	0.002 *
LN(WGS) 3	-0.0024	-3.84	0.000 *
LN(ME) 1	-0.0043	-5.89	0.000 *
LN(ME) 2	-0.0031	-4.75	0.000 *
LN(ME) 3	-0.0021	-4.06	0.000 *

Each of the three $\ln(\text{BE/ME})$ piecewise variables are significant predictors of return. Those firms with the highest BE/ME ratios have a steeper slope coefficient. However a surprise result appears when analyzing the cash flow decile variables. Only firms with the highest ratios seem to be driving the results. Though cash flow decile is one of the strongest variables in the complete sample regressions, here it is demonstrated that as a risk proxy $\ln(\text{BE/ME})$ does a better job. It may be said that firms with the highest cash flow are good contrarian investment plays. The statistical power of the cash flow regressions from Table 5 may derive from the difference in return between the highest and lowest cash flow firms. With the segmentation approach of piecewise regressions, much of this power is lost.

Another surprise is the strength of the $\ln(\text{WGS})$ variable across each segment of the sample population. The firms with the lowest sales growth have the steepest slope, but all of the three subsegments reveal significant slope coefficients which are higher than the slope found in combined regressions. Could it be that sales growth becomes a stronger predictor when segments of the population are analyzed rather than the entire sample population?

The same phenomenon as found in $\ln(\text{WGS})$ occurs for $\ln(\text{ME})$ as well. All three of the piecewise regression coefficients are highly significant, of the proper sign, and substantially higher than the complete sample coefficient found above (-0.0015).

Conclusions are hard to draw for $\ln(\text{WGS})$ and $\ln(\text{ME})$ because of the increased coefficient size under piecewise regression analysis. It appears that $\ln(\text{BE}/\text{ME})$ and $\ln(\text{ME})$ make the best risk proxys, with $\ln(\text{ME})$ exhibiting more power when samples are segmented or other variables are included in the regressions. Cash flow is a powerful contrarian variable, but unreliable as a risk proxy. $\ln(\text{WGS})$ is an enigma in that it does not hold up well over some periods but exhibits remarkable strength when sample populations are segmented, or when used in multiple regressions.

5.8 Multiple Regression Results

The conclusions drawn from the multiple regression analysis provide support for the results found by Fama and French (1992), and also those found by Lakonishok, Shleifer and Vishny (1994). $\ln(\text{BE}/\text{ME})$ and $\ln(\text{ME})$ are both significant predictors of return when included in a two-factor model. Cash flow deciles and $\ln(\text{WGS})$ are also strong multivariate predictors of return. The following tables,

Table 10 and Table 11 introduce a few striking results, along with a few subtle particulars.

As can be seen from Table 10, the familiar Fama and French two factor model of $\ln(\text{BE/ME})$ and $\ln(\text{ME})$ is displayed first, and is statistically significant. The second set of regression results confirms the earlier contention that $\ln(\text{WGS})$ is not as robust under the Fama and French (1992) sample and methodology as under the Lakonishok, Shleifer, and Vishny (1994) procedures. $\ln(\text{BE/ME})$ and $\ln(\text{ME})$ maintain statistical significance while $\ln(\text{WGS})$ falls short of this mark.

The third regression amplifies the power of the cash flow deciles variable to predict return in the presence of other substantial univariate predictors. $\ln(\text{BE/ME})$ appears to be a casualty in this war, missing significance at the 5% level by 1.1%. The evidence is mixed on this accord though. When negative cash flow firms are purged from the cash flow variable and relegated to a dummy variable, $\ln(\text{BE/ME})$ retains its significance, along with $\ln(\text{ME})$ and positive cash flow firms. The cash flow dummy variable is not significant in this regression. It is also not significant when it is run in isolation with positive cash flow firms only.

Table 10

Multiple Regressions
Average Slopes From Month-by-Month
Regressions of Stock Returns on Variables of Interest
July 1963 to June 1993

Each variable is formed as described in Chapter 4. The coefficient mean (or average slope) is the average regression coefficient taken from 360 monthly regressions that start in July 1963 and proceed to June 1993. The T-statistics and P values are taken from single sample t-tests in which the time series of the regression coefficient is tested for the hypothesis that the mean is not different than zero. Asterisks found next to individual P values highlight significance levels at 5% or lower.

VARIABLE	COEFFICIENT	T STATISTIC	P VALUE
LN (BE/ME)	0.0030	3.87	0.000 *
LN (ME)	-0.0011	-2.32	0.021 *
LN (BE/ME)	0.0027	3.59	0.000 *
LN (ME)	-0.0011	-2.30	0.022 *
LN (WGS)	-0.0006	-1.13	0.259
LN (BE/ME)	0.0017	1.88	0.061
LN (ME)	-0.0013	-2.67	0.008 *
CASHFLOW DEC	0.0006	3.52	0.000 *
LN (BE/ME)	0.0017	2.05	0.041 *
LN (ME)	-0.0012	-2.58	0.010 *
CASHFLOW (+)	0.0221	3.48	0.001 *
CFLOW DUMMY	-0.0001	-0.04	0.971
LN (BE/ME)	0.0012	1.40	0.163
LN (ME)	-0.0012	-2.65	0.008 *
CASHFLOW DEC	0.0007	3.66	0.000 *
LN (WGS)	-0.0009	-1.61	0.109

Evidently there is some overlap in explanatory factors. This overlap is captured by both the cash flow variable and $\ln(\text{BE/ME})$. This common factor appears to be at least partially centered on firms with negative cash flow. The possibility of multicollinearity is discussed below. The last regression result emphasizes the weakness of both $\ln(\text{BE/ME})$ and $\ln(\text{WGS})$ in some multivariate settings.

Each of the above multiple regressions was tested for collinearity tolerance levels. The regressions in the next table were also tested in the same fashion. None of the regressions had variance inflation factors above 4.0, with most below 2.0. A standard safety cutoff range extends upward to 10.0.

Table 11 proffers the best and most comprehensive regression models in the study. Each variable is significant. Average coefficient means, t statistics and p values are given. The combination of variables that remain significant is the most interesting aspect of the table. Cash flow deciles and $\ln(\text{WGS})$ work well together. $\ln(\text{BE/ME})$ and $\ln(\text{ME})$ are solid as already illustrated. $\ln(\text{ME})$ has explanatory power in addition to that given by the cash flow deciles variable. In fact, cash flow deciles, $\ln(\text{ME})$ and $\ln(\text{WGS})$ in combination have significant roles in return.

Table 11

Multiple Regressions
Average Slopes From Month-by-Month
Regressions of Stock Returns on Variables of Interest
July 1963 to June 1993

Each variable is formed as described in Chapter 4. The coefficient mean (or average slope) is the average regression coefficient taken from 360 monthly regressions that start in July 1963 and proceed to June 1993. The T-statistics and P values are taken from single sample t-tests in which the time series of the regression coefficient is tested for the hypothesis that the mean is not different than zero. Asterisks found next to individual P values highlight significance levels at 5% or lower.

VARIABLE	COEFFICIENT	T STATISTIC	P VALUE
CONSTANT	0.0098	3.24	0.001 *
LN (WGS)	-0.0019	-3.07	0.002 *
CASHFLOW DECILES	0.0010	5.28	0.000 *
CONSTANT	0.0187	4.43	0.000 *
LN (BE/ME)	0.0030	3.87	0.000 *
LN (ME)	-0.0011	-2.32	0.021 *
CONSTANT	0.0144	3.05	0.002 *
LN (ME)	-0.0015	-3.08	0.002 *
CASHFLOW DECILES	0.0009	4.79	0.000 *
CONSTANT	0.0161	3.63	0.000 *
LN (WGS)	-0.0013	-2.31	0.022 *
LN (ME)	-0.0014	-2.86	0.004 *
CASHFLOW DECILES	0.0008	4.72	0.000 *

Each table summarizes 360 monthly regressions per model. Thus, it is difficult to present meaningful comparison statistics for choosing the best models. Below Table 12 tabulates the mean and median R-squared for each of the important models. Also shown are the mean and median adjusted R-squared, and F statistic. The number of significant positive and negative monthly coefficients is presented at the bottom of the table.

Each equation has comparable explanatory power. The combination of $\ln(\text{WGS})$, $\ln(\text{ME})$, and cash flow deciles demonstrate the highest average R squared and adjusted R squared. This combination of variables has a fraction more explanatory power than alternate models, but, the F statistic is larger for the $\ln(\text{BE/ME})$ and $\ln(\text{ME})$ model.

Probably the most important conclusion is that significant returns can be obtained by using any one of these four models as an investment strategy. Large amounts of company specific noise drive down the R squared results in these monthly regressions. Only a few percentage points of total return are explained by the model. One must remember that actual tabulation of average returns by decile portfolio shows substantial differences in return between portfolios. Also, results from time-series

Table 12

**Multiple Regression Comparisons
Average Statistics From Month-by-Month
Regressions of Stock Returns on Variables of Interest
July 1963 to June 1993**

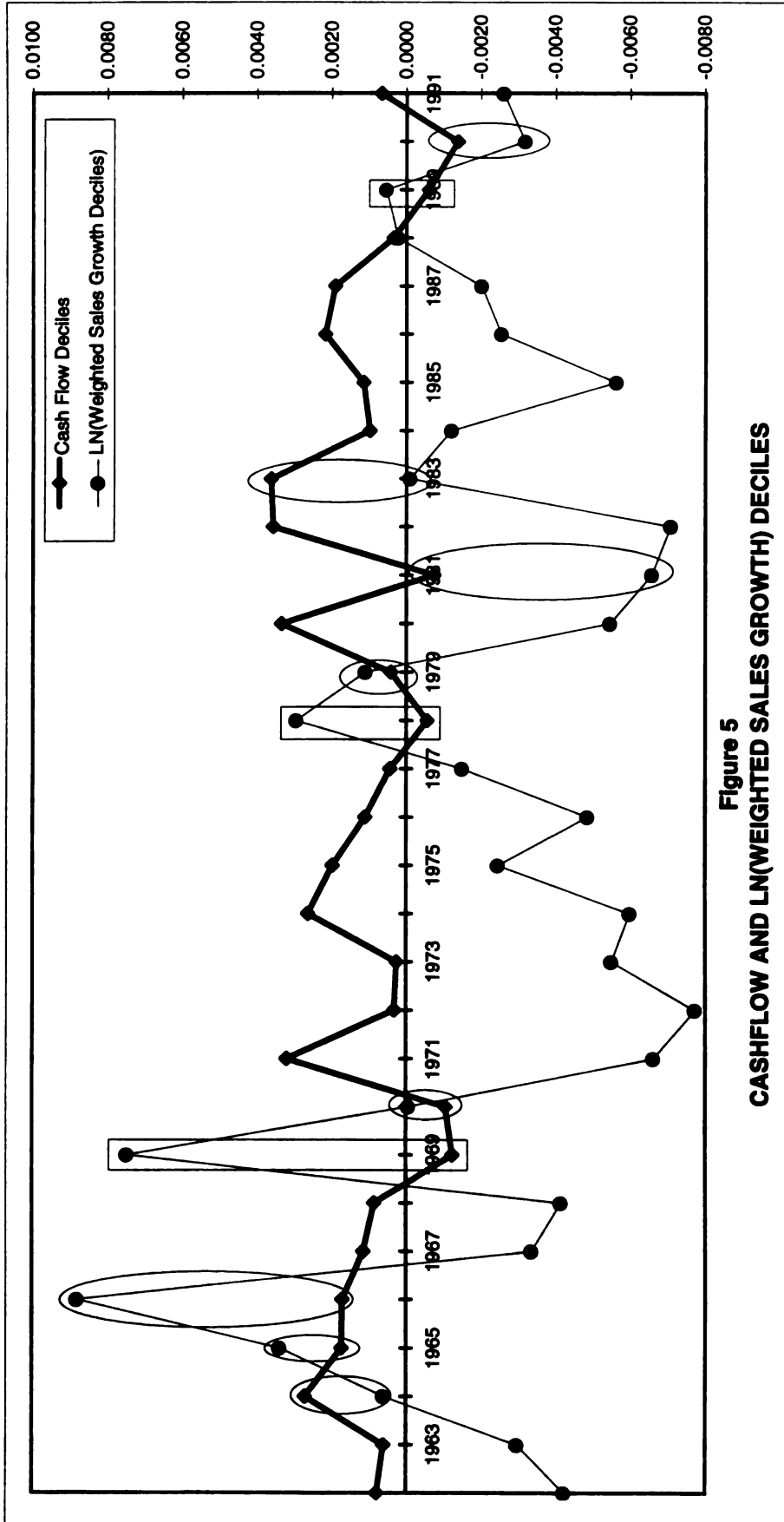
Each variable is formed as described in Chapter 4. Each row below tabulates the average (mean or median) explanatory or comparative statistic taken from the 360 monthly regressions that start in July 1963 and proceed to June 1993.

VARIABLES IN REGRESSION	LN (ME) LN (BE/ME)	LN (WGS) LN (ME) CASHFDE	LN (ME) CASHFDE	LN (WGS) CASHFDE
Mean R Squared	0.0305	0.0350	0.0300	0.0163
Median R Squared	0.0152	0.0192	0.0140	0.0074
Mean Adj. R Squared	0.0281	0.0311	0.0275	0.0144
Median Adj. R Squared	0.0131	0.0159	0.0122	0.0061
Mean F Statistic	22.9330	16.3491	21.0922	11.3403
Median F Statistic	11.1804	9.3353	10.5476	6.0320
Number Months Significant Positive (NEG)	110 (125) 122 (66)	66 (95) 106 (129) 132 (53)	104 (137) 132 (53)	61 (99) 142 (59)

regressions exhibit very strong R squared results in Fama and French (1993). The data provided here does not resolve the debate between the risk proxy theory or the investor overreaction story. Only by referring to earlier portions of this study can one come to a conclusion on this topic.

An inspection of the model that includes cash flow deciles and $\ln(\text{WGS})$ allows for visualization of the diversification benefits of multiple strategies. Figure 5 plots the year by year average regression coefficients for the two variables in question.

The cash flow decile coefficients are usually positive and the $\ln(\text{WGS})$ coefficients are usually negative. When this result persists, the combined model displays the typical "growth" versus "value" phenomenon in which value wins. There are eight years where one variable predicts returns as normal but the other variable crosses over into territory that violates the direction of the overreaction principle. The plot of the average regression coefficients in these years are circled. Because of the diversification benefits of multiple strategies, the combined variable model works substantially better than the individual security model. There are three years in which both variables violate the overreaction theory. The average regression coefficients for these years are surrounded by square boxes.



The years on the x-axis represent the "variable" formation period from which accounting data is drawn. The data points represent the average monthly regression coefficients of the variable regressed against stock return, during the period July of year $t+1$ to June of year $t+2$. The numbers in parentheses represent the number of significant positive coefficients for the year followed by the number of significant negative coefficients.

5.9 Reliability Check: NYSE and AMEX Results Only

One would expect questions to arise concerning NASDAQ data bias and its impact on the results shown in the tables above. The typical argument should go something like this: the reason some contrarian variables are not as robust in this study as in Lakonishok, Shleifer, and Vishny (1994) is because of the undue influence of NASDAQ firms. The analysis done above is repeated using only NYSE and AMEX firms. Table 13 replicates Table 5 in every respect except the inclusion of NASDAQ firms.

The inferences from univariate regressions are identical under both data sets. Reducing the size of the sample reduces each average coefficient slightly, and reduces the significance level a bit. Of all the major variables each one has the identical sign found in the complete data set, and continues to be significant in the NYSE and AMEX data set. The only unique and different result concerns $\ln(\text{ME})$, which has a larger coefficient and is significant at a lower p value.

Multiple regressions are also run using only NYSE and AMEX data. Four models are presented in Table 14. The findings from these multiple regressions produce similar inferences to those found using NASDAQ firms as part of the data set. $\ln(\text{BE/ME})$ and $\ln(\text{ME})$ continue to be a viable and

Table 13

**Average Slopes From Month-by-Month
Regressions of Stock Returns on Variables of
Interest
NYSE and AMEX Firms Only
July 1963 to June 1993**

Each variable is formed as described in Chapter 4. The coefficient mean (or average slope) is the average regression coefficient taken from 360 monthly regressions that start in July 1963 and proceed to June 1993. The T-statistics and P values are taken from single sample t-tests in which the time series of the regression coefficient is tested for the hypothesis that the mean is not different than zero. Asterisks found next to individual P values highlight significance levels at 5% or lower.

VARIABLE	COEFFICIENT	T STAT	P VALUE
LN(BE/ME)	0.0041	4.43	0.000 *
CASHFLOW	0.0232	4.06	0.000 *
CASHFLOW DEC	0.0009	4.79	0.000 *
LN(CASHF DEC)	0.0028	3.58	0.000 *
MGS	-0.0044	-1.79	0.075
MGS DECILES	-0.0003	-1.94	0.053
LN(MGS DEC)	-0.0017	-2.89	0.004 *
WGS	-0.0022	-1.15	0.250
WGS DECILES	-0.0003	-1.91	0.057
LN(WGS DEC)	-0.0017	-2.82	0.005 *
LN(ME)	-0.0018	-3.57	0.000 *
EBETA	0.0027	1.25	0.211
VBETA	0.0007	0.40	0.690

Table 14

Multiple Regressions
Average Slopes From Month-by-Month
Regressions of Stock Returns on Variables of Interest
NYSE and AMEX Firms Only
July 1963 to June 1993

Each variable is formed as described in Chapter 4. The coefficient mean (or average slope) is the average regression coefficient taken from 360 monthly regressions that start in July 1963 and proceed to June 1993. The T-statistics and P values are taken from single sample t-tests in which the time series of the regression coefficient is tested for the hypothesis that the mean is not different than zero. Asterisks found next to individual P values highlight significance levels at 5% or lower.

VARIABLE	COEFFICIENT	T STAT	P VALUE
LN (BE/ME)	0.0022	2.68	0.008 *
LN (ME)	-0.0015	2.97	0.003 *
LN (BE/ME)	0.0019	2.45	0.015 *
LN (ME)	-0.0015	-2.97	0.003 *
LN (WGS)	-0.0004	-0.84	0.399
LN (BE/ME)	0.0008	0.90	0.370
LN (ME)	-0.0015	-3.19	0.002 *
CASHFLOW DEC	0.0005	2.96	0.003 *
LN (BE/ME)	0.0005	0.50	0.616
LN (ME)	-0.0015	-3.18	0.002 *
CASHFLOW DEC	0.0005	3.07	0.002 *
LN (WGS)	-0.0007	-1.32	0.188

significant combination, even in the presence of $\ln(\text{WGS})$. Only when cash flow deciles are used does $\ln(\text{BE/ME})$ lose significance, just as it did in regressions using the complete data set.

5.10 Summary and Interpretation of Findings

The preceding discussion concentrates on the use of four main variables to predict stock returns: $\ln(\text{BE/ME})$, $\ln(\text{ME})$, $\ln(\text{WGS})$, and cash flow deciles. The first two variables make up the heart of the Fama and French (1992) two factor model. The latter two variables are introduced because of the Lakonishok, Shleifer, and Vishny (1994) overreaction findings. After testing these variables (and many variants) in 360 monthly univariate regressions, it is clear that each is statistically significant with the correct sign.

The author hoped to find incontrovertible evidence in favor of either the risk proxy theory or the investor overreaction story. Here, answers are not black and white, they are a muddled gray. Some evidence supports one theory; other evidence weakens the same supposition and supports the opposing point of view.

$\ln(\text{BE/ME})$ turns out to be the most reliable variable in univariate monthly regressions over five, ten, and thirty

year periods. It is also the variable that is most likely to have average regression coefficients of the correct sign for one year periods as well. Unlike other variables, $\ln(\text{BE/ME})$ has the most explanatory power when no portfolio aggregation techniques are used. Cash flow deciles and $\ln(\text{WGS})$ each require the elimination of company specific noise in order for the variable to have explanatory power. When piecewise regressions are performed, each group of firms on the sorted BE/ME continuum is able to predict return.

The strengths of $\ln(\text{BE/ME})$ have been extolled. Weaknesses also abound. In monthly regressions, less than half the monthly returns have a statistically positive relationship with return. In five-year subperiods, the variable is not always significant. In 240 rolling ten-year periods, $\ln(\text{BE/ME})$ ranks second behind cash flow deciles with 90% of the periods significant. Multiple regressions reveal a strong $\ln(\text{BE/ME})$ variable even in the presence of sales growth, in contrast to the findings of Lakonishok, Shleifer, and Vishny (1994). But, when cash flow deciles are thrown into the mix, $\ln(\text{BE/ME})$ becomes marginalized.

Cash flow deciles do stand out in many respects. But, they overpower $\ln(\text{BE/ME})$ only if negative cash flow firms are included in the sample population. Cash flow deciles

are highly significant in monthly univariate and multivariate regressions when averaged over thirty years. In 240 ten-year rolling average periods, cash flow is significant 97% of the time. When subperiod analysis is restricted to five-year periods, a different picture appears. Cash flow deciles become less reliable than $\ln(\text{BE}/\text{ME})$ with significant performance in only three out of six five-year periods. Furthermore, unlike $\ln(\text{BE}/\text{ME})$ which is uniformly predictive of return across the entire sample population of firms, cash flow deciles appear to be driven by firms in the highest portfolios only.

Sales growth as measured by $\ln(\text{WGS})$ exhibits very little reliability in subperiods and in multiple regressions that include $\ln(\text{BE}/\text{ME})$. This is in opposition to the very strong variable found by Lakonishok, Shleifer, and Vishny (1994). Since sales growth is very strong over five-year postformation periods, and much weaker in the one-year postformation return methodology of Fama and French (1992), it is possible that sales growth results are postformation time period specific. In multiple regressions, long period average univariate regressions, and in piecewise regressions $\ln(\text{ME})$ performs admirably as an addition to return predictions. When analyzed over shorter subperiods, $\ln(\text{ME})$ is a most unreliable predictor of return. During 240

ten-year rolling average periods, $\ln(\text{ME})$ is significantly different from zero in only 30% of the years. Though the inferences are not altered, it is worth noting that $\ln(\text{ME})$ has stronger coefficients when NASDAQ firms are excluded, and when piecewise regressions are performed.

In summary $\ln(\text{BE}/\text{ME})$ is a reasonably reliable risk proxy, much more so than competing variables. A good deal of investor overreaction does exist, especially over the long run. This overreaction serves to distort the risk signal rather than completely obliterating it. BE/ME is a very imperfect risk proxy, but rather uniform across all firms and time. It is hard to believe that investors overreact in such a uniform fashion. Overreaction is much more plausible when viewing the results taken from extreme portfolios on either end of the value/growth rankings.

CHAPTER 6

USE OF DTL IN BE/ME

6.1 Review of DTL Treatment in Selected Studies

Fama and French (1992, 1993, 1995) argue that BE/ME ratios are a proxy for some underlying risk factor. They assert that high BE/ME firms are poor performers (i.e., low ROA). Investors drive down the market value for these firms and the BE/ME ratios rise. Because of the added risk, investors in these firms require higher returns.

Fama and French (1992) use a deferred tax liability (DTL) component in their BE/ME construction that may not be tied to increasing risk. If the inclusion of DTL in the numerator of the BE/ME ratio distorts the risk signal then an alternative explanation may be needed. The visible risk-return association exhibited by Fama and French's (BE+DTL)/ME ratio, may provide evidence in favor of a non-risk based explanation, such as an inefficient market.

Since other studies listed in Chapter 1 do not include the DTL in their estimate of BE/ME, there is the possibility

that the strength of Fama and French (1992) results are due to the construction of their BE/ME variable. The strength of the BE/ME variable may be attributed to the concentration of firms with high DTL balances in the high BE/ME portfolios. Fama and French form ten ranked portfolios based on BE/ME and then compare these to return. The DTL substantially inflates the numerator of the BE/ME ratio for some firms, but not all.

Incidentally, DTL is often used in the construction of variables other than BE/ME ratios. Bhandari (1988) finds that a debt/equity ratio is positively related to return. His debt equity ratio includes book debt (BD) + DTL divided by market equity.

$$(BD + DTL)/ME \quad (6.1)$$

In Bhandari's study the long term debt/equity ratio (excluding DTL) does not perform as well as equation (6.1). Chan and Chen (1991) do not include DTL in their definition of financial leverage.

Barclay and Smith (1992) probe management choice as to the optimal maturity structure of debt. They include DTL in their estimate of the market value of assets. They use a market-asset-to-book-asset ratio (MA/BA) to proxy for the

growth options in a firm's investment opportunity set.

Specifically:

$$MA = BA - BE + ME \quad (6.2)$$

Rearranging this equation illustrates a logical but perhaps erroneous conclusion. One's conclusion depends upon an assumption as to the correct valuation of DTL. The definition of the book value of assets is:

$$BA = BD + BE + DTL \quad (6.3)$$

A substitution in the Barclay and Smith equation can be performed that results in:

$$MA = BD + DTL + ME \quad (6.4)$$

If the market value of DTL is considered 100% of book value then (6.4) is the correct formulation for the market value of assets. Givoly and Hayn (1992) reveal that DTL values are approximately \$0.56 on the dollar. As Simonds (1991) has shown, it is not proper to include DTL in an estimate of the market value of assets at all. To do so results in double counting since the effect of future taxes

paid is already impounded in the market value of equity. Whether one assigns a discounted value to the DTL account or assigns a 100% value, the MA in (6.4) is overstated.

Badrinath and Kini (1990, 1991) perform a study similar to Fama and French except Tobin's q ratio is used instead of BE/ME ratios. Stocks with low Tobin's q ratios have higher returns than stocks with high q 's. When size and E/P ratios are also included in the regressions, the significance of Tobin's q is lost. There is a high degree of correlation between E/P and q , but this correlation is not symmetric across portfolios. It should be noted that the construction of q ratios is suspect in their study because of the misapplication of DTL in the formula similar to the application in Barclay and Smith (1992).

6.2 Is There a Proper Role for DTL?

It appears that Fama and French (1992, 1993, 1995) are attempting to use $(BE + DTL)/ME$ as a proxy for net (BA/MA) . If $MA > BA$, either asset inflation has occurred or some positive NPV activities have arisen. By using a historical cost approach Fama and French adjust down to net assets by eliminating creditors claims.

Several simple equations are used to develop support for mutually exclusive positions. Then the comparability of these equations will be examined using Table 15 and Table 16.

$$\text{Total Book Assets} = \text{BE} + \text{BD} + \text{DTL} \quad (6.5)$$

$$\text{Total Market Assets} = \text{ME} + \text{BD} + \text{MDTL} \quad (6.6)$$

BD = Book debt

MDTL = Market value of the deferred tax liability

To achieve net assets first subtract debt from each equation.

$$\text{Net Book Assets} = \text{BE} + \text{DTL} \quad (6.7)$$

$$\text{Net Market Assets} = \text{ME} + \text{MDTL} \quad (6.8)$$

$$\text{Book to Market Ratio} = (\text{BE} + \text{DTL}) / (\text{ME} + \text{MDTL}) \quad (6.9)$$

One could also say that true net assets available to common stockholders would best be represented by also subtracting DTL and MDTL from the equations as well; after

all, MDTL is unobservable. This of course would provide the simple formulation used by Stattman (1980).

If one believes DTL has value then the Fama and French methodology is inaccurate. A necessary adjustment would be to include some discounted fraction of book DTL in the denominator of the net market asset equation. (Givoly and Hayn (1992) claim that the value of the DTL on average is about \$0.56 per dollar of book DTL balance.) Alternately one could subtract DTL from the net book asset equation thus arriving at a BE/ME ratio identical to Stattman (1980). This would have the effect of decreasing the size of the BE/ME variable for firms with large DTL balances. Another approach is to conclude that DTLs have no market value as in Simonds (1991); i.e., the future tax payments are impounded in the current equity market value.

Caution must be used in assuming BE/ME is comparable across firms whatever the method of formulation. If the significance of the BE/ME ratio is driven by the method of formulation, or if firms ranked on DTL balance size do not exhibit a linear relationship between BE/ME and return then rejection of the risk proxy theory may be warranted.

6.3 A Nonregulated Firm Example

If a world with complete knowledge can be constructed, then the pure theoretical relationship between DTL, BE/ME ratios, and returns can be examined. Specifically does adding DTL to BE aid in predicting return? The next two tables have been taken from Simonds (1991) and adapted to examine these relationships. The details of the example are repeated here.

Suppose a new firm originates with the purchase of a single asset with a three-year life acquired with funds obtained through a common stock issuance. No additional assets will be purchased and all free cash flow (FCF) will be distributed to shareholders. The firm has a 15% discount rate or required rate of return on equity and the net present value (NPV) of this investment project is positive. Assume that the asset value is depreciated using straightline depreciation for both financial and tax accounting purposes. The corporate income tax rate is taken to be 35%. The earnings level before taxes and depreciation from the service potential of the asset is \$50 in each year. The Table 15 represents these assumed facts.

When Table 15 and Table 16 are compared one can view the DTL generating process and make comparisons between two firms that use different depreciation methods. Table 16

Table 15

**Valuation of Equity for a Nonregulated Firm
Straightline Depreciation for
Financial and Tax Accounting**

<u>Balance Sheet</u>	<u>Year 0</u>	<u>Year 1</u>	<u>Year 2</u>	<u>Year 3</u>
<u>Assets</u>				
Gross Investments	\$90.00	\$90.00	\$90.00	\$90.00
Accumulated Depreciation	\$0.00	\$30.00	\$60.00	\$90.00
Net Assets	\$90.00	\$60.00	\$30.00	\$0.00
<u>Liabilities and Owners' Equity</u>				
Deferred Taxes (DTL)				
Owners' Equity	\$90.00	\$60.00	\$30.00	\$0.00
Total Liabilities and Owners Equity	\$90.00	\$60.00	\$30.00	\$0.00
<u>Income Statement - Tax Return</u>				
Earnings Before Depr. and Taxes		\$50.00	\$50.00	\$50.00
Straightline Depreciation		\$30.00	\$30.00	\$30.00
Earnings Before Tax		\$20.00	\$20.00	\$20.00
Tax Expense $t = .35$		\$7.00	\$7.00	\$7.00
After Tax Earnings		\$13.00	\$13.00	\$13.00
<u>Income Statement - Financial Report</u>				
Earnings Before Depr. and Taxes		\$50.00	\$50.00	\$50.00
Straightline Depreciation		\$30.00	\$30.00	\$30.00
Earnings Before Tax		\$20.00	\$20.00	\$20.00
Tax Expense $t = .35$		\$7.00	\$7.00	\$7.00
Net Income		\$13.00	\$13.00	\$13.00
<u>Financial Statement Income Tax Reconciliation</u>				
Income Tax Current		\$7.00	\$7.00	\$7.00
Income Tax Deferred		\$0.00	\$0.00	\$0.00
Income Tax Expense (Book)		\$7.00	\$7.00	\$7.00
<u>Other Financial & Market Information</u>				
	<u>0</u>	<u>1</u>	<u>2</u>	<u>3</u>
Free Cash Flow (a)	(\$90.00)	\$43.00	\$43.00	\$43.00
Equity Market Value (b)	\$98.18	\$69.91	\$37.39	\$0.00
Equity Book to Market Ratio (c)	\$0.92	\$0.86	\$0.80	
Price Earnings Ratio (d)	\$7.55	\$5.38	\$2.88	
ROE (e)	\$0.14	\$0.22	\$0.43	
IRR (f)	\$0.20			
(a) Net income + depreciation from tax return (or) (b) Present value of remaining free cash flow discounted at 15% (c) Owners' equity/Equity market value (d) Equity market value(beg of year)/ Net income (e) Net income/Owners' equity(beg of year) (f) Internal Rate of Return from Free Cash Flow				

Table 16

**Valuation of Equity for a Nonregulated Firm
Straightline Depreciation for Financial Accounting
Accelerated Depreciation for Tax Reporting**

<u>Balance Sheet</u>	<u>Year 0</u>	<u>Year 1</u>	<u>Year 2</u>	<u>Year 3</u>
<u>Assets</u>				
Gross Investments	\$90.00	\$90.00	\$90.00	\$90.00
Accumulated Depreciation	\$0.00	\$30.00	\$60.00	\$90.00
Net Assets	\$90.00	\$60.00	\$30.00	\$0.00
<u>Liabilities and Owners' Equity</u>				
Deferred Taxes (DTL)	\$0.00	\$7.00	\$7.00	\$0.00
Owners' Equity	\$90.00	\$53.00	\$23.00	\$0.00
Total Liabilities and Owners Equity	\$90.00	\$60.00	\$30.00	\$0.00
<u>Income Statement - Tax Return</u>				
Earnings Before Depr. and Taxes		\$50.00	\$50.00	\$50.00
Straightline Depreciation		\$50.00	\$30.00	\$10.00
Earnings Before Tax		\$0.00	\$20.00	\$40.00
Tax Expense $t = .35$		\$0.00	\$7.00	\$14.00
After Tax Earnings		\$0.00	\$13.00	\$26.00
<u>Income Statement - Financial Report</u>				
Earnings Before Depr. and Taxes		\$50.00	\$50.00	\$50.00
Straightline Depreciation		\$30.00	\$30.00	\$30.00
Earnings Before Tax		\$20.00	\$20.00	\$20.00
Tax Expense $t = .35$		\$7.00	\$7.00	\$7.00
Net Income		\$13.00	\$13.00	\$13.00
<u>Financial Statement Income Tax Reconciliation</u>				
Income Tax Current		\$0.00	\$7.00	\$14.00
Income Tax Deferred		\$7.00	\$0.00	(\$7.00)
Income Tax Expense (Book)		\$7.00	\$7.00	\$7.00
<u>Other Financial & Market Information</u>				
	<u>0</u>	<u>1</u>	<u>2</u>	<u>3</u>
Free Cash Flow (a)	(\$90.00)	\$50.00	\$43.00	\$36.00
Equity Market Value (b)	\$99.66	\$64.61	\$31.30	\$0.00
Book Equity + DTL to Market Value (c)	0.90	0.93	0.96	
Book Equity to Market Value	0.90	0.82	0.73	
Price Earnings Ratio (d)	7.67	4.97	2.41	
ROE (e) IRR (f)	0.22	0.14	0.25	0.57
(a) Net income + depreciation from tax return (or) (b) Present value of remaining free cash flow discounted at 15% (c) Owners' equity/Equity market value (d) Equity market value(beg of year)/ Net income (e) Net income/Owners' equity(beg of year) (f) Internal Rate of Return from Free Cash Flow				

assumes that an accelerated depreciation schedule is used for tax accounting purposes while straightline depreciation is retained for financial reporting. The following accelerated depreciation schedule is used for year one, two and three respectively: \$50, \$30, and \$10.

Several general results are worth noting when comparing the above firms. First, under accelerated depreciation as in the Table 16, instead of paying taxes in three equal annual installments of \$7 each, the tax payment stream is rearranged into payments of \$0, \$7, \$14. Viewed from the beginning of year one, the tax payments are delayed but in total amount are equal to those under straightline depreciation. By the following year, however, future remaining tax payments are greater under accelerated depreciation than for straightline. A DTL is recorded as a result of this timing difference.

Second, by comparing the results in Table 15 and Table 16 for year one, we see that postponing the tax payment creates an additional market value of \$1.48. Third, in year two and three the firm that uses accelerated depreciation will have a lower market value (See Table 17). Of course this is simply the result of paying out free cash flow to investors. Fourth, adding DTL to BE does make the book values of the accelerated and straightline depreciation

firms comparable. But as Simonds (1991) maintains, "two identical physical assets with different tax depreciation histories are not of equal value to their equity owners."

Fifth, the BE + DTL approach may predict the "level" of ME, i.e., the higher the ratio the lower the equity value (see the tabulation below). The straight BE/ME ratio has the opposite effect, i.e., the lower the ratio, the lower the ME.

Table 17

Selected Numbers Condensed From Table 14 and Table 15

Year	0	1	2
Table 15 BE/ME	0.92	0.86	0.80
Table 15 ME	98.18	69.91	37.39
Table 16 (BE+DTL)/ME	0.90	0.93	0.96
Table 16 BE/ME	0.90	0.82	0.73
Table 16 ME	99.66	64.61	31.30

As the Table 18 shows, the size of the $(BE + DTL)/ME$ ratio does not accurately predict the ranked magnitude of the return variable. The higher return is not linked to higher BE/ME ratios; at least not in this perfect knowledge scenario. See column #1. Also, look at ratios and returns across rows. Ratios and returns are uncorrelated if the first column is excluded.

Table 18

BE/ME - Return Comparisons From Table 14 and Table 15

Year	0	1	2
Table 14 BE/ME	0.92	0.86	0.80
Table 14 Return	0.26	0.15	0.15
Table 15 (BE+DTL)/ME	0.90	0.93	0.96
Table 15 BE/ME	0.90	0.82	0.73
Table 15 Return	0.27	0.15	0.15

McConnell and Muscarella (1985) have shown that stock prices immediately adjust to the announcement of new capital expenditure increases for nonutility manufacturing firms. In our example we have illustrated this immediate

adjustment. Once the expected tax consequences are anticipated, there is no relation between a change in DTL and return. It does not matter whether straightline or accelerated depreciation is used; the stock price adjusts to all future expected after tax cash flows. The resulting change in DTL balances resulting from the use and reversal of accelerated depreciation is not highly correlated with return.

6.4 Summary and Hypotheses

There are differences in BE/ME construction in the empirical literature. There also is a potential lack of correlation between DTL and return. In Chapter 7 of the paper an examination of three points is proposed. First, BE/ME formulations with and without DTL will be tested against return for sensitivity to differences in variable construction. A test of statistical difference in means will be undertaken for each Fama and French (1992) portfolio.

Ranked portfolios are formed on each formulation of BE/ME. The average ratios are reported from each portfolio. A paired t-test is then conducted. Perhaps there is no economic difference between the two formulations, but there is definitely a statistical difference. It seems likely

that the slope of the relationship between BE/ME and return is altered to some extent. The actual results do not find any benefit in using the more complex Fama and French (1992) $((BE + DTL)/ME)$ variable. To the contrary the simple BE/ME effect shows slightly higher slope coefficients and t statistics.

The second point of investigation will go one step further and examine the linearity of the BE/ME and return relationship. Ranked portfolios formed on DTL balance size will be used to compare BE/ME to return. If high BE/ME portfolios are continually dominated by capital intensive firms that generate large DTL balances, then the BE/ME effect will be called into question. The BE/ME effect is supposed to pick up risk characteristics rather than structural differences between various firms' asset portfolios.

The author assumes those firms with high levels of DTL have fundamentally different asset structures than firms without substantial levels of DTL. When aggregating return data for firms of very different structural characteristics, it is possible that the BE portion of the BE/ME ratio is distorted. This distortion may cause certain groups of firms to fall on the regression line in a way that appears to support the risk/return relationship. Thus if the risk

proxy theory is to hold, then BE/ME should be linear in return even when portfolios are sorted by DTL size first. This point is examined in Chapter 7 and found unimportant.

Third, the empirical relationship between risk, return, and DTL levels will be considered. A crucial unanswered issue is whether the size of the DTL balance is positively correlated with the risk of the firm. By including DTL in the BE/ME ratio the size of the risk proxy is increased, but the degree of risk may not be. Based on a firm's past capital investment announcements; the directional change in the DTL balance can be predicted with relative certainty. If the market is informationally efficient then the level of change can be predicted as well. If DTL changes are known in advance, and they have an element of certainty established by tax law, then changes in the $(BE+DTL)/ME$ ratio cannot be attributed solely to changing risk levels.

Given these three related research questions the following three hypotheses are proposed. From these hypotheses an empirical design is executed in Chapter 7.

H0: The size of the DTL account is not statistically linked to the size of the Fama and French BE/ME variable.

If this hypothesis is not rejected then there is little need to pursue additional tests of the DTL/Risk/Return nature. Without a connection between DTL and BE/ME there is no need to compare alternative formulations of BE/ME. If instead there is a link between DTL and BE/ME, then the following hypotheses become important. As documented in Chapter 7 there is a statistical difference between BE/ME with and without DTL.

HO: DTL level is highly correlated with return.

DTL level is part of the Fama and French (1992) BE/ME ratio. If DTL is not highly correlated to return then noise is being needlessly introduced into their analysis. If the hypothesis is rejected, the risk proxy inference made by Fama and French will merit examination. DTL is not correlated with return as is shown in Chapter 7.

HO: DTL level is highly correlated to the risk of the firm.

Rejection of this statement calls for alteration of the construction of the risk proxy. If several above hypotheses are rejected, the risk proxy theory may be judged inadequate or in need of adjustment. A discussion about risk and DTL

is documented in Chapter 7 below.

H0: Risk and return attributes for $(BE+DTL)/ME$ are no different from BE/ME .

Of course this last hypothesis is the most important. If the first three hypotheses are rejected and this one is not, then nothing conclusive will have been determined. If on the other hand, this hypothesis is rejected, then the risk proxy theory will have suffered a major blow. The blow has not fallen. Except for marginal improvements by using $\ln(BE/ME)$, there is no vital difference between the two formulations of book-to-market ratios.

CHAPTER 7

EMPIRICAL RESULTS AND EXPLANATIONS: DEFERRED TAX LIABILITIES IN BOOK TO MARKET RATIOS

Fama and French (1992) create a book to market variable which includes deferred tax liabilities as part of the definition of book equity. As market equity is suppressed for risky and financially distressed firms, the difference between book equity and market equity becomes smaller, i.e., a risk signal. In this section of the study the formulation of the variable is contested. Deferred tax liabilities (DTL) do not have a relationship with return, and thus should not be included in the BE/ME ratio. On the other hand, high DTL/BE firms have lower average levels of risk. Inclusion of DTL in book equity is apt to distort any risk signal for these firms. Risk indicators are also analyzed in relation to BE/ME deciles.

7.1 Empirical Tests of the Role of DTL in BE/ME ratios.

Table 19 shows the actual number of firms falling in each DTL/BE category and the alternate forms of book-to-market equity: $(BE+DTL)/ME$ and BE/ME . The intent is to

document the potential importance of high (DTL) firms by examining their numbers. If there are large numbers of high DTL firms, and there is a substantial difference between the BE/ME variables for these firms, then the rest of the DTL study is worthy of pursuit. The hypothesis of interest is repeated here from Chapter 6.

HO: The size of the DTL account is not statistically linked to the size of the Fama and French BE/ME variable.

It is evident from Table 19 that there is a substantial number of firms with high deferred tax liability levels. On average there are almost five-hundred fifty firms with DTL levels greater than or equal to 10% of book equity. The average total number of firms in the sample population is over two-thousand five-hundred. Negative book equity firms are examined, and then set aside. Without including negative book equity firms there are on average 2433.9 firms over the thirty-year period of the study. Firms with high DTL levels make up about 23% of the sample population used in statistical tests.

The two book-to-market formation procedures are placed side by side for comparison. It is evident that firms with high DTL levels have substantially inflated BE/ME ratios if

Table 19

**BE/ME and (BE+DTL)/ME Differences
for Firms Sorted on Deferred Tax Liability
December 1962 - 1991**

All firms from the merged CRSP - COMPUSTAT NYSE/AMEX/NASDAQ data base are ranked yearly on (DTL/BE). DTL is COMPUSTAT fiscal year end data item #35, while BE is data item #60. For each DTL/BE group the number of firms is listed (N), as well as two alternative constructions of the (BE/ME) variable. ME is calendar year end share price times shares outstanding; data items #24*#25. All averages use the number of years for which a positive number of firms exist. For example there are only 24 years with negative BE firms; thus the denominator used in the first row is 24 rather than 30.

DTL/BE	N	(BE +DTL) /ME	BE/ME
Negative BE	67.1	-2.1914	-2.2386
Negative DTL Positive BE	2.9	0.8373	0.8494
0%-9.99%	1881.7	0.9854	0.9342
10%-19.99%	275.1	1.0349	0.9078
20%-29.99%	110.1	1.0631	0.8549
30%-39.99%	60.2	1.1353	0.8321
40%-49.99%	39.8	1.2967	0.8949
50%-59.99%	29.5	1.5379	0.9990
60%-69.99%	15.2	1.6548	1.0089
70%+	19.4	1.2010	0.6361
Average Including Negatives	(Total) 2501.0	0.9297	0.8384
Average Not Including Negatives	(Total) 2433.9	1.0157	0.9232

DTL is included. For example, those firms that have DTL/BE ratios above 70% have Fama and French (1992) $(BE + DTL)/ME$ ratios that are almost twice as high as the plain BE/ME ratio.

Table 20 forms portfolios similar to the Fama and French deciles. The question of interest is the same as in Table 19, but now framed in the Fama and French (1992) setting. Does it matter whether the DTL is included in the BE/ME variable, or not? Panel A forms portfolio deciles ranked on the Fama and French $(BE+DTL)/ME$ variable.

The BE/ME ratio is slightly smaller than the $((BE + DTL)/ME)$ ratio. The interesting part, is the spread of average DTL/BE levels between portfolios. Except for the smallest half decile portfolio, DTL levels are generally higher, the higher the decile portfolio rank. This is expected since DTL is included in the ratio. Including DTL in the ratio, helps to push high DTL firms up in the rankings.

Table 20, Panel B uses the same ranking procedures and the same portfolio size. The only difference is that the portfolios are formed on BE/ME without DTL. Deferred tax liability levels are presented by decile, without shifting high DTL firms into higher portfolios. This makes it feasible to address the possibility that high DTL firms fall

naturally in higher BE/ME decile ranks. DTL/BE averages are shifted substantially toward the low deciles in Panel B, when compared with the Fama and French (1992) variable formulation procedure shown in Panel A.

In Table 20, Panel C the average results from the two ranking mechanisms displayed in Panel A and Panel B are put side by side. Also shown is the average difference between the two methods. A difference in means test is conducted and a T-Statistic is listed. The table very clearly shows that statistically there is a substantial difference between the two formulations. But, it appears that the ratio values continue to be close enough, that the economic impact on regressions will not be noticeable.

Fama and French (1992) show that there is some interaction between size and BE/ME ratios. Small firms are more apt to have high BE/ME ratios. The interaction is not of a large enough magnitude to negate the importance of either variable in combined regressions. Table 21 looks at DTL/BE when firms are sorted on size and then BE/ME. All firms from the merged CRSP-COMPUSTAT NYSE/AMEX/NASDAQ database are ranked yearly on size, and then on one of the book-to-market ratio formulations. Portfolios are formed by dividing firms into two groups based on the NYSE 50th size percentile. All firms bigger than the 50th% are included in

Table 20

**BE/ME and (BE+DTL)/ME Differences
for Firms Sorted on Fama and French BE/ME Deciles
December 1962 - 1991**

All firms from the merged CRSP - COMPUSTAT NYSE/AMEX/NASDAQ data base are ranked yearly on one of the (BE/ME) formulations. DTL is COMPUSTAT fiscal year end data item #35, while BE is data item #60. For each decile portfolio two alternative constructions of the BE/ME variable are listed. The lowest and highest portfolios have been split in half. ME is calendar year end share price times shares outstanding; data items #24*#25. (DTL/BE) is a structural variable that shows the degree of DTL in the capital structure. The simple average is the sum of the values in each cell for each year, divided by 30.

Panel A - Portfolios Formed on [(BE+DTL)/ME]

PORTFOLIO	(BE+DTL) /ME	BE/ME	DTL/BE
1A	0.1367	0.1334	0.0842
1B	0.2556	0.2464	0.0428
2	0.3872	0.3698	0.0540
3	0.5359	0.5101	0.0566
4	0.6735	0.6377	0.0637
5	0.8064	0.7614	0.0668
6	0.9442	0.8882	0.0739
7	1.1058	1.0399	0.0726
8	1.3132	1.2322	0.0778
9	1.6449	1.5481	0.0727
10A	2.1224	2.0102	0.0655
10B	3.5838	3.4045	0.0617

Table 20 (cont'd)

Panel B - Portfolios Formed on [BE/ME]

PORTFOLIO	BE/ME	(BE+DTL)/ME	DTL/BE
1A	0.1322	0.1386	0.1172
1B	0.2445	0.2577	0.0525
2	0.3671	0.3913	0.0648
3	0.5064	0.5407	0.0658
4	0.6324	0.6806	0.0759
5	0.7547	0.8139	0.0795
6	0.8836	0.9509	0.0772
7	1.0355	1.1074	0.0699
8	1.2340	1.3081	0.0595
9	1.5579	1.6326	0.0468
10A	2.0212	2.1143	0.0440
10B	3.4285	3.5591	0.0379

Table 20 (cont'd)

Panel C - Summary of Differences in BE/ME Construction

PORTFOLIO	N	(BE+DTL)/ME	BE/ME	DIFFERENCE	T-STAT
(NEG BE)	54.9	-1.7281	-1.7615	0.0275	1.4118
1A	132.7	0.1367	0.1322	0.0045	15.7301
1B	132.7	0.2556	0.2445	0.0111	42.3620
2	265.3	0.3872	0.3671	0.0202	71.7035
3	265.3	0.5359	0.5064	0.0295	123.0542
4	265.3	0.6735	0.6324	0.0412	146.7335
5	265.1	0.8064	0.7547	0.0516	163.4529
6	265.3	0.9442	0.8836	0.0607	187.9250
7	265.3	1.1058	1.0355	0.0702	207.1028
8	265.3	1.3132	1.2340	0.0792	190.3777
9	265.3	1.6449	1.5579	0.0871	143.1559
10A	132.7	2.1224	2.0212	0.1012	81.5698
10B	132.7	3.5838	3.4285	0.1553	13.7717

Table 21

**BE/ME and (BE+DTL)/ME Differences
December 1962 - 1991
Comparisons for Portfolios Sorted
on Size and Then BE/ME**

All firms from the merged CRSP-COMPUSTAT NYSE/AMEX/NASDAQ database are ranked yearly on size and then on one of the book-to-market ratio formulations. Portfolios are formed by dividing firms into two groups based on the NYSE 50th size percentile. All firms bigger than the 50th% are included in the big group (B), and the rest of the firms in the small group (S). Then, within each size group, three portfolios are formed based on BE/ME ranking for all firms: Low (L), Medium (M), and High (H). DTL is COMPUSTAT fiscal year end data item #35, while BE is data item #60. ME is calendar year end share price multiplied by shares outstanding; data items #24*#25. The simple average is the sum of the values in each cell for each year, divided by 30.

Port- folio	N	Portfolio Formation Procedure (BE+DTL)/ME	DTL/BE	N	Portfolio Formation Procedure BE/ME	DTL/BE
S/L	557	0.4032	0.0553	544	0.3788	0.0676
S/M	581	0.8626	0.0568	572	0.8044	0.0628
S/H	674	1.8302	0.0581	696	1.7282	0.0447
B/L	245	0.3878	0.0706	249	0.3697	0.0879
B/M	226	0.8451	0.1099	231	0.7851	0.1204
B/H	130	1.4805	0.1513	112	1.3667	0.0972

the big group (B), and the rest of the firms in the small group (S). Then, within each size group, three portfolios are formed based on BE/ME ranking for all firms: Low (L), Medium (M), and High (H).

The results presented in Table 21 are useful and necessary documentation of the interaction between BE/ME, size, and DTL/BE. Nothing dramatically new is revealed. Differences in the magnitude of the BE/ME ratio under alternate formulations are clear. The average DTL/BE balance is higher in large stocks than small stocks. As in Table 20 Panel A and B, the method of BE/ME formulation determines whether DTL/BE is shifted toward the high BE/ME portfolios, or towards the low portfolios.

7.2 Return and Risk Characteristics of DTL

Table 22 addresses the issue of the correlation between DTL and return, and DTL and risk. Portfolios are formed on the percentage of DTL in the capital structure (DTL/BE) as in Table 19 above. The relevant average portfolio statistics can then be examined. In trying to measure the relationship between DTL and risk, a number of possible risk measurements such as bond ratings are shown. Fama and French claim that BE/ME is a relative distress variable. Relative distress can mean poor future prospects, financial

stress or both.

In building the DTL/BE portfolios, all firms from the merged CRSP-COMPUSTAT database are ranked at calendar year end $(t-1)$. Each portfolio is used to calculate monthly equal-weighted returns for July of year (t) to June of year $(t+1)$. The average return is the time-series average of the monthly equal-weighted portfolio returns. All firms have a return in July of year (t) ; but some firms cease active trading for one reason or another. The percentage of firms in each portfolio that cease trading, is given, and the percentage of firms with a STANDARD & POOR's senior debt rating. The average bond code is the average code for those firms that have a rating. The lowest code (2) is for AAA rated bonds, while the highest code (27) is for D rated bonds. Bond codes are only presented by COMPUSTAT since the mid 1980's, so the information shown is anecdotal at best. The relevant hypotheses from Chapter 6 are repeated here.

H0: DTL level is highly correlated with return.

H0: DTL level is highly correlated to the risk of the firm.

If DTL is not highly correlated with return, then there is no point in including DTL in the BE/ME ratio as in Fama

and French (1992). If DTL level is not highly correlated with risk, then including it in BE/ME is likely to distort the risk signal if such a signal exists.

As illustrated in Table 22 Panel A below, there is no systematic relationship between return and DTL level. Firms with low DTL levels (0%-9.99%) have returns that exceed all but two of the higher DTL portfolio average returns. As shown in earlier studies, firms with negative book equity have returns that are larger than average - clearly a risk/return relationship.

Negative book equity firms exhibit high risk levels using several risk indicators. These firms have a much higher average annual drop out rate than any other portfolio of firms in the sample population. Negative book equity firms disappear from the CRSP tape return files at an average annual rate of 19.97%. The average drop out rate for the entire sample population stands at 3.8%. Negative book equity firms, have fewer firms that have a published bond rating, and of those that do, they have a rating that is higher by far (19.68) than other firms in the sample population (11.04).

Firms with high levels of DTL are less risky according to risk indicators tabulated in Table 22 Panel A. Except for the DTL/BE 70% plus category, high DTL firms have lower

Table 22

**Risk and Return Characteristics for
Firms Sorted on Deferred Tax Liability
December 1962 - 1991**

All Firms from the merged CRSP-COMPUSTAT NYSE/AMEX/NASDAQ database are ranked at calendar year end (t-1) on (DTL/BE). DTL is COMPUSTAT fiscal year end data item #35, while BE is data item #60. Each (DTL/BE) portfolio is used to calculate monthly equal-weighted returns for July of year (t) to June of year (t+1). The average return is the time-series average of the monthly equal-weighted portfolio returns. All firms have a return in July of year (t); but some firms cease active trading for one reason or another. The percentage of firms in each portfolio that cease trading, is given as well as the percentage of firms with a STANDARD & POOR'S Senior Debt Rating. The average bond code (data item #280) is the average code for those firms which have a rating. The lowest code (2) is for AAA rated bonds, while the highest code (27) is for D rated bonds. Cash Flow is the average of earnings before extraordinary items (data item #18) plus depreciation (item #14), all divided by market value. June market value is denominated in millions of dollars. MGS is the five year median growth in sales (sales in taken from data item #12) WGS; weights the sales growth for recent years more heavily (30% for the most recent year, 25% for the second most recent year...10% for the fifth year). Standard Deviations measure total risk. EBeta and VBeta are the average of equally weighted and value weighted beta's respectively taken from the market model. (24 months - 60 months of returns are used as in Fama & French). EESE and VESE are the average of the portfolio standard error of the residuals on an equally weighted and value weighted basis. The index used is the CRSP-NYSE index. The averages at the bottom of the table cover the average value of all firms on a given variable; with and without including firms that exhibit negative BE. All averages use the number of years for which a positive number of firms exist. For example there are only 24 years with negative BE firms; thus the denominator used in the first row is 24 rather than 30.

Panel A

DTL/BE	Average Return	% of Firms Disappear	% W Bond Code	Average Bond Code
Negative BE	0.0148	0.1997	0.2092	19.6856
Negative DTL	0.0225	0.0192	0.5214	8.2619
0%-9.99%	0.0130	0.0360	0.1421	11.0924
10%-19.99%	0.0116	0.0253	0.3325	10.1260
20%-29.99%	0.0119	0.0224	0.4627	9.8887
30%-39.99%	0.0132	0.0267	0.4559	9.1065
40%-49.99%	0.0113	0.0163	0.4439	8.8075
50%-59.99%	0.0153	0.0148	0.5025	8.6721
60%-69.99%	0.0286	0.0109	0.4274	9.3937
70%+	0.0125	0.0786	0.5274	11.3878
Avg w/negatives	0.0129	0.0380	0.2008	11.0397
Avg w/o negatives	0.0129	0.0335	0.2005	10.8013

Table 22 (cont'd)

Panel B

DTL/BE	Cash Flow	MGS	WGS	June Market Value (\$M)
Negative BE	-1.7468	0.4480	1.5051	47.483
Negative DTL	0.1589	0.1229	0.1379	909.970
0%-9.99%	0.1048	0.3089	0.5376	533.870
10%-19.99%	0.1755	0.1373	0.1681	815.188
20%-29.99%	0.1952	0.1515	0.2039	855.354
30%-39.99%	0.1868	0.1354	0.1817	935.076
40%-49.99%	0.2145	0.1462	0.1925	984.565
50%-59.99%	0.2506	0.1241	0.1481	1121.999
60%-69.99%	0.3488	0.1195	0.1478	1214.087
70%+	0.1422	0.1943	0.2790	627.240
Avg w/negatives	0.0741	0.2756	0.4847	594.978
Avg w/o negatives	0.1243	0.2709	0.4566	610.071

Panel C

DTL/BE	STD DEV	EBETA	EESE	VBETA	VESE
Negative BE	0.2185	1.3481	0.2000	1.4127	0.2054
Negative DTL	0.1231	1.2376	0.1010	1.2681	0.1048
0%-9.99%	0.1213	1.0206	0.1053	1.1315	0.1080
10%-19.99%	0.0985	0.9034	0.0837	1.0531	0.0849
20%-29.99%	0.0957	0.8309	0.0820	1.0151	0.0828
30%-39.99%	0.0957	0.8505	0.0813	1.0369	0.0822
40%-49.99%	0.1062	1.0173	0.0887	1.1960	0.0908
50%-59.99%	0.0958	0.7963	0.0814	0.9398	0.0826
60%-69.99%	0.1127	0.8023	0.1009	0.9207	0.1011
70%+	0.1340	1.0132	0.1179	1.1127	0.1204
Avg w/negatives	0.1191	1.0002	0.1033	1.1205	0.1058
Avg w/o negatives	0.1164	0.9906	0.1007	1.1125	0.1031

drop out rate percentages than average firms. High DTL firms also have higher percentages of firms with bond ratings, and lower average bond codes.

Lakonishok, Shleifer, and Vishny (1994) suggest several contrarian variables which when regressed against return, indicate that investors overreact to projected growth opportunities. Table 22 Panel B representatives of these "growth/value" variables are listed. June market value denominated in millions of dollars is also shown.

Negative book equity firms demonstrate negative average cash flow yields, and high median sales growth and weighted sales growth rates. Negative book equity firms on average have very low market capitalizations as well.

High DTL firms have higher cash flow yields than firms with low DTL/BE ratios. High DTL firms also tend to have low sales growth rates and large market capitalizations.

Table 22 Panel C records some more traditional risk measures. Average standard deviations, betas, and standard error of the residuals are shown. Negative book equity firms have average standard deviations approximately twice as high as the average firm. Equally weighted and value weighted betas average 1.34 and 1.41 respectively for these negative book equity firms. These firms also average twice as much company specific risk as measured by the standard

errors of the residuals. High DTL/BE firms have lower risk levels than average on each of these measures.

7.3 Properties of Book to Market Portfolios

If DTL is established as an important part of the Fama and French methodology, then its actual impact on the slope of the BE/ME - return regression becomes important. The following hypothesis is the motivation behind the construction of Table 23 and the Table 24.

H0: Risk and return attributes for portfolios formed on (BE+DTL)/ME are no different than portfolios formed on BE/ME.

If this hypothesis is rejected then variable formulation procedures become crucial. As is found in Table 23 below, there are some differences between the two formulations. Table 24 reveals that the differences do not dramatically alter the slope coefficients in the regressions displayed.

Although the above hypothesis cannot be rejected, Table 23 is useful for another reason. The table may be used to show the relationship between BE/ME and risk. There is evidence on both sides of the debate between the risk proxy theory and the investor overreaction theory. Any new

evidence on the nature of risk in BE/ME portfolios is a useful addition to the current body of knowledge. It is hoped that new evidence will sharpen the distinction between the two theories.

Table 23 organizes BE/ME and $((BE + DTL)/ME)$ deciles with the corresponding average returns, and various risk measurements. At the end of each year $t-1$, twelve portfolios are formed on the basis of ranked values of $((BE+DTL)/ME)$ and (BE/ME) . Portfolios cover deciles of the ranking variables with the bottom and top two portfolios split in half (1A,1B,10A and 10B). All firms from the merged CRSP - COMPUSTAT NYSE/AMEX/NASDAQ data base are included. As in Fama and French (1992), return is the time-series average of the monthly equal-weighted portfolio returns.

Average return is monotonically increasing across decile portfolios in Table 23 Panel A1, except for portfolio three. The average monthly return in portfolio three, (0.99%) is slightly smaller than the return in portfolio two (1.0%). In Panel B1 this problem is not encountered. Firms sorted on BE/ME without the inclusion of DTL never decrease from a lower ranking decile to a higher ranking decile. This smooth BE/ME - return relationship is unlike what one would expect if investor overreaction were driving returns.

Table 23

**Risk and Return Characteristics for Decile Portfolios Formed
on (BE+DTL)/ME and BE/ME
December 1962 - 1991**

At the end of each year (t-1), ten portfolios are formed on the basis of ranked values of (BE+DTL)/ME and BE/ME. Portfolios cover deciles of the ranking variables with the top and bottom portfolio split in half (1A, 1B, 10A, 10B). DTL is COMPUSTAT fiscal year end data item #35, while BE is data item #60. ME for use in BE/ME is data item #24*#25 for December of year t-1. The average return is the time-series average of the monthly equal-weighted portfolio returns. All firms have a return in July of year (t); but some firms cease active trading for one reason or another. The percentage of firms in each portfolio that cease trading, is given as well as the percentage of firms with a STANDARD & POOR'S Senior Debt Rating. The average bond code (data item #280) is the average code for those firms which have a rating. The lowest code (2) is for AAA rated bonds, while the highest code (27) is for D rated bonds. Cash Flow is the average of earnings before extraordinary items (data item #18) plus depreciation (item #14), all divided by market value. June market value is denominated in millions of dollars. MGS is the five year median growth in sales (sales is taken from data item #12) WGS; weights the sales growth for recent years more heavily (30% for the most recent year, 25% for the second most recent year...10% for the fifth year). Standard Deviations measure total risk. EBeta and VBeta are the average of equally weighted and value weighted beta's respectively taken from the market model. (24 months - 60 months of returns are used as in Fama & French). EESE and VESE are the average of the portfolio standard error of the residuals on an equally weighted and value weighted basis. The index used is the CRSP-NYSE index.

Panel A1 - Portfolios Formed on (BE+DTL)/ME

	Avg Return	% of Firms Disappear	% w/Bond Code	Avg Bond Code	Cash Flow	June Market Value
1A	0.0073	0.0496	0.0472	11.7814	0.0021	1549.289
1B	0.0088	0.0312	0.1062	10.1843	0.0443	1194.434
2	0.0100	0.0291	0.1581	9.8014	0.0721	958.676
3	0.0099	0.0316	0.2125	10.0835	0.0998	679.983
4	0.0106	0.0321	0.2319	10.1742	0.1184	595.995
5	0.0115	0.0289	0.2402	9.7682	0.1385	528.993
6	0.0122	0.0273	0.2660	9.8327	0.1519	546.036
7	0.0134	0.0305	0.2518	10.0181	0.1640	462.822
8	0.0163	0.0312	0.2360	10.6939	0.1754	420.440
9	0.0171	0.0336	0.1816	11.7303	0.1920	351.921
10A	0.0191	0.0409	0.1327	13.5772	0.1792	190.141
10B	0.0216	0.0507	0.1059	16.7240	-0.0008	80.079

Table 23 (cont'd)

Panel A2 - Portfolios Formed on (BE+DTL)/ME

	MGS	WGS	STD DEV	EBETA	EESE	VBETA	VESE
1A	0.7138	1.6207	0.1565	1.1208	0.1413	1.2835	0.1416
1B	0.6607	1.0028	0.1348	1.1002	0.1184	1.2781	0.1190
2	0.4544	0.6402	0.1252	1.0773	0.1085	1.2475	0.1097
3	0.2119	0.3842	0.1171	1.0308	0.1006	1.1831	0.1023
4	0.4477	0.7235	0.1130	1.0061	0.0971	1.1369	0.0989
5	0.1658	0.2320	0.1047	0.9287	0.0896	1.0530	0.0915
6	0.1606	0.2637	0.1025	0.9216	0.0874	1.0388	0.0896
7	0.1353	0.3100	0.1012	0.8875	0.0867	0.9932	0.0892
8	0.1218	0.1598	0.1051	0.9291	0.0900	1.0236	0.0929
9	0.1405	0.2058	0.1121	0.9646	0.0965	1.0468	0.1000
10A	0.1009	0.1452	0.1231	1.0165	0.1071	1.0849	0.1112
10B	0.2624	0.5094	0.1393	1.0466	0.1233	1.0767	0.1281

Table 23 (cont'd)

Panel B1 - Portfolios Formed on BE/ME

	Avg Return	% of Firms Disappear	% w/Bond Code	Avg Bond Code	Cash Flow	June Market Value
1A	0.0072	0.0488	0.0603	12.4868	-0.0001	1555.246
1B	0.0090	0.0319	0.1222	10.2063	0.0428	1209.845
2	0.0095	0.0287	0.1792	9.4867	0.0744	953.056
3	0.0098	0.0314	0.2218	9.9484	0.1022	768.669
4	0.0110	0.0300	0.2465	9.6487	0.1233	613.773
5	0.0110	0.0284	0.2709	9.8149	0.1426	575.654
6	0.0129	0.0274	0.2666	9.6917	0.1580	549.710
7	0.0140	0.0292	0.2405	10.6249	0.1646	421.166
8	0.0156	0.0316	0.2059	11.2838	0.1766	372.085
9	0.0164	0.0364	0.1495	12.0582	0.1788	281.126
10A	0.0183	0.0438	0.1083	14.4234	0.1687	202.268
10B	0.0217	0.0545	0.0959	16.9951	-0.0104	68.324

Panel B2 - Portfolios Formed on BE/ME

	MGS	WGS	STD DEV	EBETA	RESR	VBETA	VRESR
1A	0.7119	1.6276	0.1551	1.1161	0.1398	1.2824	0.1401
1B	0.6422	0.9333	0.1347	1.1002	0.1183	1.2730	0.1190
2	0.4559	0.6375	0.1236	1.0713	0.1069	1.2456	0.1080
3	0.2183	0.4098	0.1155	1.0183	0.0993	1.1754	0.1007
4	0.4437	0.6038	0.1107	0.9763	0.0951	1.1108	0.0970
5	0.1614	0.3333	0.1035	0.9293	0.0883	1.0568	0.0903
6	0.1437	0.1938	0.1027	0.9247	0.0876	1.0411	0.0899
7	0.1544	0.3952	0.1022	0.9050	0.0874	1.0079	0.0900
8	0.1305	0.1657	0.1072	0.9413	0.0918	1.0355	0.0948
9	0.1278	0.1969	0.1148	0.9815	0.0990	1.0569	0.1027
10A	0.1226	0.1718	0.1249	1.0258	0.1088	1.0885	0.1130
10B	0.2664	0.5170	0.1407	1.0456	0.1249	1.0734	0.1298

The difference in returns between the top and bottom portfolios is not the only story. Firms not included in the extreme portfolios, still uniformly contribute much to the predictability of return. Though the difference is minor, Panel B1 exhibits a slightly larger spread in average returns between the highest and lowest portfolio. The difference in average returns between these two portfolios is 1.45%.

Firms cease trading and disappear from the CRSP return files for many reasons, including the onslaught of severe financial difficulty. If the average percent of firms that disappear from a portfolio in any given year are viewed as a type of risk measurement, then a new indication of BE/ME decile risk is available. A mild saucer shaped curve illustrates the risk pattern. Firms on either extreme (high and low BE/ME ranked portfolios) have higher percentages of firms that drop from the recorded trading records. Both portfolio 1A and 10B have an average drop out rate of close to 5%. The curve is quite smooth, with portfolio five and six demonstrating the lowest levels of firm drop out at under 3%. Of course this evidence by itself does not make or break the risk proxy theory. Higher ranking portfolios do have more firms disappearing than firms in the middle of the pack. This is in line with risk proxy expectations.

The higher drop out rates for low BE/ME deciles does not support the theory. Future research may find that the reasons for drop out are different between the bottom and top deciles. It may very well be that firms in the low ranking portfolios are accounted for by mergers, or takeovers that are not negative events for the shareholders involved.

Standard & Poors senior debt ratings, are not available for the majority of the years in this study. The percentage of firms that have a bond rating, and the average bond code for these firms, become interesting risk indicators for the last seven years of the study. A horseshoe or U - shaped risk pattern is evident by examining Table 23 Panel A1 and Panel B1. Panel B1 is much more uniform suggesting the proper method for forming the BE/ME variable does not include DTL. Firms on either end of the BE/ME ranking scheme have fewer firms with bond ratings, and higher average bond codes. Though this evidence is anecdotal, it indicates that risk is related to BE/ME deciles, but not in a linear fashion across the entire spectrum of firms.

Cash flow, market equity, and sales growth are tabulated for each BE/ME decile in Table 23. These variables may or may not be risk proxies, but are worthy of examination because of the nature of the BE/ME debate.

High BE/ME deciles have high cash flows. The relation between cash flow and BE/ME is uniform until the highest BE/ME portfolios are reached. Portfolio 10B has an average negative cashflow in both Panel A1 and B1. A negative cash flow might be considered a risk indicator. The negative cashflow in portfolio 10B is caused by one extreme outlier. If this outlier is removed from Panel B1, the average cash flow for portfolio 10B is positive 4.16%. This level of cash flow is still substantially below 16.87% found in portfolio 10A.

As Fama and French (1992) have shown earlier, market equity is negatively correlated with BE/ME. Firms in portfolio 10B are on average very small indeed. Sales growth variables tend to become smaller for the higher BE/ME deciles. This relationship is hardly uniform. There may be some industry specific influences at the third and fourth deciles. Decile 10B again reverses the normal trend with a much higher average sales growth than decile 10A.

All of the traditional risk measurements shown demonstrate a U - shape profile, with the lowest and highest deciles revealing higher risk levels than deciles more toward the middle of the sample population. The highest BE/ME portfolios have somewhat higher average standard deviations, betas, and standard error of the residual

measurements than those found in the average firm. This is evidence in favor of the risk proxy theory. A major blow to the risk proxy explanation comes when examining the lowest BE/ME deciles. These deciles also have higher risk than the average firm. Decile 1A, in all risk categories registers higher average risk indicators than decile 10B.

7.4 Regression Comparisons Between $((BE + DTL)/ME)$ and BE/ME

Table 24 is similar to Fama and French (1992) Table III. Variables are as described in Chapter 4. Rather than using portfolios of securities, individual securities are regressed against return. The statistical significance of the alternate BE/ME formulations can be observed. These regressions also provide another mechanism for viewing the relationship between DTL and return.

Return is not related to DTL/BE at any level. Whether a firm has a 10% DTL/BE level, or a 50% DTL/BE level is of no consequence. These regressions are run by systematically excluding more low DTL firms as the regressions move from $\ln(DTL/BE1)$ to $\ln(DTL/BE5)$. Piecewise regressions also find no correlation between DTL and return.

The last two univariate regressions show that there is little economic or statistical difference between the two

formulations. $\ln(\text{BE/ME})$ is fractionally better in the number of statistically significant positive and negative monthly coefficients. Also, the slope and time series t statistic are marginally higher. The author recommends $\ln(\text{BE/ME})$ for simplicity. This formulation smooths the returns and risk measures more evenly across the distribution of sample firms.

Multiple regression comparisons that use the alternate BE/ME variable formulations also display only marginal differences at best. Other variables used in the regressions do not interact differently between the two formulations.

Since the Financial Accounting Standards Board has come out with the liability method of accounting for DTL, there may be differences in the meaning of this account after 1987. Statement of Financial Accounting Standards No. 96 Accounting for Income Taxes was never officially required, leading to non-uniform treatment of DTL for several years. Some firms adopted SFAS No. 96 early, while others waited until the fiscal year beginning after December 15, 1992 when SFAS No. 109 Accounting for Income Taxes was implemented. The only possible effect on this study would come if there were large changes in a firm's financial statements from early adoption of SFAS No. 96. To guard against mixing data

Table 24

**Average Slopes From Month-by-Month
Regressions of Stock Returns on Variables of Interest
July 1963 to June 1993**

Each variable is formed as described in Chapter 4. The coefficient mean (or average slope) is the average regression coefficient taken from the 360 monthly regressions starting in July 1963 to June 1993. The T-statistics and P values are taken from single sample t-tests in which the time series of the regression coefficient is tested for the hypothesis that the mean is not different than zero. In addition, the number of significant positive and negative (5% level) monthly regression coefficients is recorded.

Variable	Coef- ficient Mean	T Stat	P Value	Number Sign Pos Months	Number Sign Neg Months
LN (DTL/BE) 1	-0.0001	-1.30	0.196	89	80
LN (DTL/BE) 2	-0.0003	-0.77	0.443	81	66
LN (DTL/BE) 3	0.0008	0.51	0.612	45	43
LN (DTL/BE) 4	0.0014	0.38	0.706	26	29
LN (DTL/BE) 5	-0.0037	-0.73	0.466	10	20
LN ((BE+DTL) /ME)	0.0046	5.28	0.000 *	146	64
LN (BE/ME)	0.0047	5.31	0.000 *	152	69

with different meanings, careful examination of monthly regressions after 1987 were undertaken. The conclusions of this study are not altered. Return is not related to DTL/BE before or after SFAS No. 96.

7.5 Summary of Findings

There is no large economic or statistical difference between the findings of this study when choosing between BE/ME and $((BE + DTL)/ME)$. Including DTL in the definition of book equity distorts the ratio for a small group of firms. In cross-sectional regressions, the statistical differences are only slightly in favor of the simple BE/ME ratio that does not include DTL.

Monthly returns are not related to DTL/BE in any fashion. High DTL/BE firms in general have less risk than the average low DTL/BE firm. Thus, including DTL in BE/ME for these firms is apt to distort the BE/ME risk signal.

Book to market ratios are related to various risk indicators, but not in the linear fashion expected. The risk curve is horseshoe or U-shaped, with the highest and lowest BE/ME deciles carrying more risk than firms in the middle of the sample population.

Future research may explain why the highest and lowest BE/ME deciles have the highest CRSP drop out rates. Are companies disappearing from both portfolios for similar reasons?

CHAPTER 8

CONCLUSION AND REMARKS

The goal of this study is to test the reliability of the BE/ME ratio as a risk proxy. The Fama and French (1992) methodology is used to reexamine the strong empirical correlation between common stock returns and the BE/ME variable. Important additions to the extant literature provided in this study reaffirm many of the findings of Fama and French (1992), but also reaffirms portions of the conflicting market overreaction view presented by Lakonishok, Shleifer, and Vishny (1994). It appears not to be a matter that one theory is right and the other theory is wrong. Empirical support for a somewhat reliable BE/ME risk proxy is found. Evidence in support of investor overreaction is also found during portions of the thirty-year period on which this study is based. Both views provide useful insights into the behavior of common stock returns.

The Fama and French (1992) study brought the BE/ME effect to the forefront in the literature and crystallized

the risk proxy theory. Lakonishok, Shleifer, and Vishny (1994) recast the BE/ME effect as one of several contrarian strategies that are not based on the risk/return relationship but rather caused by inefficient markets and investor overreaction. This study answers several questions regarding these theories in an attempt to reconcile and explain the differing positions. The existing explanations need to be augmented and assimilated into a more complete understanding of the stock return generating process.

8.1 BE/ME Reliability

A major question answered in this study is whether the BE/ME variable is a reliable predictor of return. $\ln(\text{BE/ME})$ is significantly and positively related to return in univariate monthly regressions more often than other value/growth variables. In comparison to other variables, $\ln(\text{BE/ME})$ performs quite well. Nonetheless it is significant in only 42% of the monthly regressions, hardly an ideal risk proxy.

Some formulations of the cash flow, sales growth, and size variables are also significant predictors of return for the thirty-year period starting in July 1963 and concluding in June 1993. These variables exhibit varying degrees of reliability for shorter periods. Only the BE/ME and cash

flow variables are significant in each of three ten-year subperiods. None of the variables is always significant in five-year subperiods, though $\ln(\text{BE/ME})$ is significant more often than the others. $\ln(\text{BE/ME})$ is also the variable that is most likely to have average regression coefficients of the correct sign for one-year periods.

Only by using long investment horizons can reliability be attributed to any of the value/growth variables including the BE/ME variable. As a risk proxy, $\ln(\text{BE/ME})$ does a better job of predicting common stock returns than other variables (though the actual relationship to risk is suspect because of low risk levels for some high BE/ME firms). Also, unlike other variables, $\ln(\text{BE/ME})$ has the most explanatory power when no portfolio aggregation technique is used. The cash flow and sales growth variables each require the elimination of company specific noise in order for the variable to have significant explanatory power. Noise reduction is accomplished by assigning the decile portfolio rank to each individual firm rather than using the raw cash flow and sales growth numbers in the analysis.

8.2 Dominant Variables

Lakonishok, Shleifer, and Vishny (1994) suggest that BE/ME, sales growth and cash flow variables are examples of

contrarian variables that predict return because of investor overreaction. Sales growth and cash flow are the most powerful predictors of return in their study. An important consideration in this paper is the analysis of these contrarian variables using the Fama and French (1992) methodology. Careful attention is given to potential dominant independent variables. From this observation, clues are gathered as to which theory is supported by the empirical findings.

In the univariate setting, the BE/ME variable is the most reliable variable among those analyzed. When the nature of the analysis changes, the results reveal mixed evidence, sometimes in favor of other dominant variables. In 240 rolling ten-year periods, $\ln(\text{BE/ME})$ ranks second behind cash flow deciles with 90% of the periods significant versus 97%. Multiple regressions reveal a strong significant $\ln(\text{BE/ME})$ variable in all cases except in the presence of one form of the cash flow variable.

A cash flow decile variable is dominant in many respects. But, the dominant cash flow variable overpowers $\ln(\text{BE/ME})$ only if negative cash flow firms are included in the sample population. Cash flow deciles are highly significant in monthly univariate and multivariate regressions when averaged over 30 years. When subperiod

analysis is restricted to five-year periods, a different picture emerges. Cash flow deciles become less reliable than $\ln(\text{BE/ME})$, with significant performance in only three out of six five-year periods. Furthermore, unlike $\ln(\text{BE/ME})$ which is uniformly predictive of return across the entire sample population of firms, the cash flow decile variable is driven by firms in the highest portfolios only.

$\ln(\text{BE/ME})$ maintains its dominance even in the presence of sales growth, in contrast to the findings of Lakonishok, Shleifer, and Vishny (1994). Sales growth exhibits very little reliability in subperiods and in multiple regressions that include $\ln(\text{BE/ME})$. Since sales growth is very strong over five-year postformation periods, and much weaker in the one-year postformation return methodology of Fama and French (1992), it is possible that sales growth results are postformation period specific.

The least reliable variable is the size variable used by Fama and French (1992). In multiple regressions, long period average univariate regressions, and in piecewise regressions, $\ln(\text{ME})$ performs admirably if used as an addition to return predictions. When analyzed over shorter subperiods, $\ln(\text{ME})$ is a most unreliable predictor of return. During 240 ten-year rolling average periods, $\ln(\text{ME})$ is significantly different from zero in only 30% of the

periods. Though the inferences are not altered, $\ln(\text{ME})$ has stronger coefficients when NASDAQ firms are excluded and when piecewise regressions are performed.

In this study conflicting evidence is presented which points toward some investor overreaction while maintaining BE/ME as a risk proxy variable, albeit a flawed one. BE/ME has similarities to the other value/growth variables but demonstrates more consistency over time and more explanatory power across all firms. Overreaction in security prices serves to distort the risk signal rather than to obliterate it completely. Overreaction is much more plausible when viewing the results taken from extreme portfolios on either end of the value/growth rankings. Differences in the behavioral character of the BE/ME variable allow it to continue to play a role as a risk proxy. Of course an alternate view may conclude that investor overreaction is uniform across all firms with the magnitude of the overreaction following a smooth orderly function. Piecewise regressions show that all segments of the market demonstrate a BE/ME - return relationship, not just the extreme portfolios.

Both investor overreaction and security pricing based on risk may be at work through time. It is quite plausible that firms in the extreme value growth portfolios exhibit a

good deal of investor overreaction. At the same time it is very likely that firms in the less extreme portfolios follow some sort of risk-based asset pricing. A segmented equity market would explain these dual stock return processes.

8.3 BE/ME Formulation - Sensitivity Analysis

Fama and French (1992) use the difference between book equity and market equity (BE/ME) as a risk signal. In their theory, the farther the market value is depressed, the larger the size of the BE/ME ratio and the higher the risk level. Thus, the ratio works as a risk signal or proxy for risk.

On the surface, a comparison of book equity with market equity seems questionable given all the possible variations in asset structure, accounting conventions, and industry specific elements that affect a company's report of book value. These elements make it hard to compare the meaning of book equity between firms. Using BE/ME in a cross-sectional study seems to be asking for distortions in the risk signal. Fama and French (1992) find such a powerful relationship between BE/ME and return that comparability issues have been set aside.

A major portion of this study is allocated to a sensitivity analysis of the unique Fama and French (1992)

book-to-market ratio. They include DTL in the numerator of the ratio providing a potential distortion to the risk signal. The sensitivity analysis is carried out to determine whether the alternate formulations of the BE/ME variable have any impact on the inferences found in Fama and French (1992).

There is no large economic or statistical difference between the empirical findings of this study when choosing between BE/ME and $((BE + DTL)/ME)$. Including DTL in the definition of book equity distorts the ratio for a small group of firms. In cross-sectional regressions, the statistical differences are only slightly in favor of the simple BE/ME ratio that does not include DTL.

Distortion of the risk signal for firms with high levels of DTL is evident. Monthly returns are not related to DTL/BE in any fashion. High DTL/BE firms in general have less risk than the average low DTL/BE firm. Thus, including DTL in BE/ME for these firms is apt to distort the BE/ME risk signal although it has little impact on general market results.

8.4 The BE/ME Effect - Risk Based or Anomaly Driven

Fama and French (1992) conjecture that the strong relationship between BE/ME and return must be driven by risk

differences among firms. Fama and French (1995) show evidence that the earnings of high BE/ME firms are substantially depressed compared to low BE/ME firms, thus supporting the risk proxy theory. Lakonishok, Shleifer, and Vishny (1994) using different methodologies, find that the BE/ME effect is not risk based but caused by investors inability to project future firm growth rates properly.

In this study, BE/ME is related to various risk indicators, but not in the linear fashion expected. The risk curve is horseshoe or U-shaped with the highest and lowest BE/ME deciles carrying more risk than firms in the middle of the sample population. This risk curve persists with several different risk measurements. Risk measurements analyzed include: standard deviations, beta's, standard error of the residuals, average bond codes, and the percentage of firms that cease trading on an organized exchange.

Future research may explain why the highest and lowest BE/ME deciles have the highest CRSP drop out rates. This research could detect whether the reasons for drop out are similar for both extreme portfolios.

8.5 How the Two Theories can be Integrated

The examination of variable reliability issues, variable dominance issues, and risk issues allow for partial integration of the risk proxy theory and the overreaction hypothesis. Although the analysis does not cover many possible avenues of investigation, it does provide empirical results that provide a better understanding of the observed cross-sectional common stock returns. These results should assist in the formulation of a comprehensive explanation of the BE/ME effect and other value/growth investment strategies.

The overreaction hypothesis seems best suited to the extreme portfolios. Champion variables used to support the overreaction hypothesis are also time period sensitive. This temporal sensitivity should fit well with overreaction proponents since investors should not always be expected to behave in a uniform or rational fashion.

The strong sales growth variable in the Lakonishok, Shleifer, and Vishny (1994) study, coupled with the weaker sales growth performance using the Fama and French methodology, appears to provide conflicting evidence. Conflicting evidence can be attributed to the disparate methodologies used. This apparent contradiction may simply result because of variation in postformation return behavior

between short and long term horizons. In this study, twelve monthly returns are examined in which the BE/ME variable is dominant. In the Lakonishok, Shleifer, and Vishny study, sales growth is dominant over the longer five-year period. The evidence suggests that the sales growth variable is capturing some long term investor overreaction, at least for the extreme portfolios. This does not preclude security returns from adjusting to the process captured by the BE/ME variable (risk or overreaction depending on ones preference) during shorter one year period.

The risk proxy theory should not be totally discounted at this time, given the consistent behavior of the BE/ME variable across the entire spectrum of firms. Neither risk characteristics nor return characteristics of the BE/ME variable fit perfectly with the risk proxy theory, but no other variable has surfaced to replace it when analyzing the entire market range of firms.

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