Firm Size and Book-to-Market Equity as Risk Proxy in Investment Decisions

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Abstract

This study investigates the economic content of the two firm-specific characteristics, size and book-to-market equity. Size is found to be significantly related to a combination of betas on all of the macrovariables proposed in this research. Its significance persists throughout the entire sample period. This provides further evidence that size is a proxy for pervasive risk factors in the stock market. The support for book-to-market equity's role as a risk proxy is also evidenced, however to a lesser extent. Securities are then sorted into size and book-to-market equity portfolios and their effects on investment decisions are examined in the context of macrovariables. Important investment implications are drawn based on the findings.

I. Introduction

Among many firm-specific characteristics, the effects of firm size and book-to-market equity in stock returns have been documented in the literature (notably Fama and French (1992)). Fama and French include in their security pricing model (referred to as a micro model hereafter) several firm-specific characteristics along with the market beta as the explanatory variables. Two variables, firm size and book-to-market equity, are able to capture the cross-sectional variation in average stock returns. Chen, Roll, and Ross (CRR) (1986) relate several external macroeconomic variables to common factors in their model (referred to as a macro model hereafter) to value stocks and are able to show that five macrovariables are significant in explaining expected stock returns.

The effects of firm size and book-to-equity are further exemplified in a follow-up study by He and Ng (1994) which concludes that none of the five macrovariables in CRR are able to explain the cross-section of average stock returns once the two firm-specific variables, firm size and book-to-market equity, are also included in the model. Based on the study, neither does the market index play a significant role in explaining cross-sectional variation of average stock returns. It is plausible that the insignificance observation of the five macroeconomic variables and the market index in pricing securities is a reflection of a high correlation between the six macro risk parameters and the two firm-specific variables. Thus, the impact of these marcovariables on

pricing may be fully absorbed by the firm-specific variables. In other words, the results seem to imply that there is an economic rationale behind the size and book-to-market effects in average stock returns. Jegadeesh (1992) also concludes that "the size effect cannot be explained by (market) betas and a search for risk-based explanations should consider the effects of non-market risk factors, such as those used by Chan, Chen, and Hsieh (1985)."

Firms with their unique characteristics (unique in their size, book-to-market equity ratio, earnings-price ratio, financial leverage, operating leverage, dividend payout, etc.) will respond differently to expected changing events in the economy (e.g. levels of inflation, interest rate, and industrial production), which in turn leads to their specific return pattern over time. However, instead of relating firm-specific characteristics to some underlying economic fundamentals, researchers have attempted to attribute the significance of some firm-specific characteristics to market overreaction to the relative prospects of firms (Fama and French (1992) and Fant and Peterson (1995)) or to a selection bias using COMPUSTAT data (Kothari, Shanken, and Sloan (1995)).

This study intends to offer an alternative explanation to the significance phenomenon by relating firm-specific characteristics to some underlying economic fundamental variables. Given the validity of the two pricing models (the micro model vs. the macro model), a connection between the two sets of independent variables is expected on a theoretical ground. Thus, this study attempts to provide more empirical evidence in supporting the two pricing models by investigating whether historical security returns support the theoretical expectation or not. Given the above illustration, this study investigates the economic significance of firm-specific characteristics by exploring the empirical connection between the multi-betas of the macro model and the firm-specific characteristics of the micro model.

The research is significant from the point of view of both corporate decision makers and external investors. Given establishment of economic implication of firm-specific characteristics, various strategic policies (e.g. capital structure and dividend policy) can be developed by policy makers to deal with their perceived future economic conditions. With the same implication, investors can develop their investment strategies and form their portfolios by choosing stocks with the characteristics that allow them to capitalize on (hedge off) future favorable (adverse) economic states. This paper is organized into five sections. In the next section, data and methodology are described. Section 3 covers some preliminary results. In section 4, empirical results are presented. Section 5 concludes this study.

II. Data and Methodology

The sample includes firms in the intersection of the COMPUSTAT monthly return data and the merged COMPUSTAT annual industrial files of income statement and balance sheet data over the time period of 1981-2001, a time period enduring phases of various monetary polices, sustaining economic booms and busts, and being characterized by major stock market rallies and crashes. As a result of their dominating role documented in previous studies (e.g. Fama and French (1992,1993), He and Ng (1994), Davis (1994), Kothari, Shanken, and Sloan (1995), and Fant and Peterson (1995)) in determining security returns, firm size and book-to-market equity are the two firm-specific variables investigated in this study. For the purpose of the multi-beta estimates in the macro model, a firm must have 60 monthly returns preceding July of year t (1988-2002), along with the availability of the two firm-specific variables in year t-1 for it to be included in the study. Following Fama and French (1992), size and book-to-market equity are calculated by using data at the fiscal year-end of calendar year t-1 (1987-2001). Size, ln(ME), is defined as the natural log of the total market value of equity. Book value of an equity is devided by its market value to derive the book-to-market equity ratio, BE/ME.

Following Chan, Chen, and Hsieh (1985), Chen, Roll, and Ross (1986) and Chen and Jordan (1993), seven macrovariables are used in this study. They are a market index, the term structure premium, the default risk premium, the growth rate in industrial production, the growth rate in oil price, the unanticipated inflation rate, and the change in expected inflation. The market index, MP, is proxied by the total returns associated with S&P's 500 index. The term structure premium, TS, reflects the maturity premium, calculated as the difference between the long-term government bonds rate and the one-month Treasury bill rate. The default risk premium, RP, is the difference between the yields on BBB corporate bonds and the yields on AAA corporate bonds. For each year t, the growth rate in industrial production, GI, is derived by taking the natural log of the ratio of industrial production (total index) associated with month t over the same index associated with month t-1. The growth rate in oil price, GO, is similarly calculated as GI. The unanticipated inflation rate, UI, is proxied by residuals from running ARIMA model of the inflation rate. The difference between the residuals and the inflation rate is our expected inflation. The difference between two consecutive months' expected inflation is the change in expected inflation, CEI. The inflation rate is obtained from Ibbotson and Sinquefield's *Stocks, Bonds, Bills, and Inflation.* The oil price information is from the Department of Energy. The rest of the macroeconomic series are retrieved from the web site of the Federal Reserve Bank of St. Louis.

Upon the derivation of the macrovariables, 60 monthly returns preceding July of year t are regressed on concurrent macrovariables for each calendar year t to estimate the multibetas for each individual security. Two cross-sectional multiple regressions are then run, with size and book-to-market equity as the respective dependable variable and the macrovariable

betas derived earlier from running time-series regressions for each sample firm as the independent variable. The intention is to see if any of the macro-variable betas are significantly related to size and/or book-to-market equity in any given year t.

Furthermore, two sets of portfolios are constructed with each one corresponding to firm size and book-to-market equity, respectively. Each set contains five portfolios. Thus, for every year t, five "size-based" portfolios are formed by sorting securities for each calendar year t into five groups with the first one consisting of securities with smaller size than any other securities in the other four groups. Five "book-to-market-based" portfolios are similarly formed, using book-to-market equity as the sorting criterion. Each portfolio consists of roughly 20% of the sample firms in each year. For example, given a total of 969 firms for year 1987, the five constructed portfolios should contain about 194 firms each. Means of the multibetas associated with the two extreme portfolios constructed on the basis of the two firm characteristics (i.e. smallest firms vs. largest firms; lowest book-to-market equity vs. highest book-to-market equity) are then tabulated to identify any consistent sensitivity pattern for each year t.

III. Preliminaries

Table 1 displays the correlation coefficients among the relevant macrovariables. Most, but not all, of the correlations are small. The largest, .485, is between the growth rate in oil price and the unanticipated inflation (GO and UI). This probably results from the fact that an increase in oil price would also drive up the inflation, which in turn may lead to a higher unanticipated inflation if the increase in oil price is not fully expected. Besides this, the market index return (MP) is significantly correlated with default risk premium (RP), the growth rate in oil price (GO), and the unanticipated inflation (UI). This is to be expected as Chen et al. (1986) has noted that the market index should reflect information contained in the various macroeconomic series to the extent that they are important determinants of asset values. A significant correlation is also observed between the default risk premium and the term structure premium, TS. This may result from the fact that both series are based on nominal interest rates. Furthermore, the growth rate in industrial production is significantly correlated with both the term structure premium and the default risk premium. These three variables are, to some extent, related to the business cycle and are expected to be correlated. Nonetheless, Table 1 suggests that the macrovariables under consideration are far from perfectly correlated. None of them can be readily replaced with any other. However, Table 1 indicates that multicollinearity may be a potential concern in the study. Table 2 lists the time period to be studied and the number of companies investigated in each time period. As the table illustrates, this study covers 15 annual periods with sample size varying from 969 in year 1987 to 2942 in year 2001. It also shows that the more recent the sample period is, the bigger the sample size gets.

IV. Empirical Results

Cross-Sectional Regressions

Cross sectional regression results of size and book-to-market equity on the macrobetas are reported in Table 3. The table consists of two panels, panel A with size, ln(ME), as the dependent variable and Panel B with book-to-market equity, (BE/ME), as the dependent variable. As shown in Panel A of Table 3, the regression results associated with size are consistently significant at the 1% level over the entire sample periods of 15 years. This suggests that market value of equity captures the common economic risks prevailing in the stock market.

The term structure premium (TS) and the unanticipated inflation (UI) are the two most significant variables, with their significance appearing in 13 of the 15 regression equations. However, the signs of the regression coefficients are not consistent. They vary from period to period, which implies that the impact of economic fundamentals on firm size is not stable over time. The next significant ones are the market index (MP), the default risk premium (RP), and the growth rate in oil price (GO), with each one showing its significance in 9 of the 15 sample periods. While the regression sign on RP and GO again are not consistent through time, it stays positive on the market beta throughout the entire 15 time periods, suggesting a positive correlation between size and market beta. This is contradictory to the majority of previous empirical work where size and market beta are found to be negatively correlated (Jegadeesh (1992), Davis (1994), and Chan, Karceski, and Lakonishok (1998) to name a few). However, it is consistent with Fant and Peterson (1995), where, like this study, individual firms (instead of size sorted portfolios), size (instead of Fama and French (1993) size mimicking portfolio), NASDAQ stocks (in addition to New York and American stocks), and pre-ranking individual betas (in contrast to post ranking portfolio betas) are used. Furthermore, unlike general practice, neither of the two studies drops any firms with extreme size or book-to-market equity. In Fant and Peterson's study, the average correlation between size and the market beta over their sample period of 1976-1991 is 0.2201.

The regression coefficient of change in expected inflation (CEI) is significant in 8 of the 15 cases. The least significant one is the growth rate in industrial production (GI), showing its significant role in 6 of the 15 time periods. Given the well documented relationship between size and market beta (See Chan and Chen (1988) for example) and the multicollinearity concern raised earlier, Panel A of Table 4 presents the corresponding regression results by dropping the market beta as one of the independent variables. The regression results stay essentially the same. This provides further support for the size to serve as a proxy for a combination of pervasive pricing factors.

The regression results associated with book-to-market equity presented in Panel B of Table 3 is not as consistent as the results associated with

size. Nonetheless, significance is observed for 12 of the 15 time periods. As with the size regression results presented in Panel A, TS and UI once again are the two most significant variables, with their significance appearing in 9 of the 15 regression equations. The next significant ones are MP and RP, each showing their significance in 7 of the 15 time periods. Risks associated with GI and GO are linked to BE/ME in 5 of the 15 cases. Only in 4 of the 15 time periods do we observe a significant regression loading on CEI beta.

Results presented in Panel B of Table 4, derived from dropping the market beta as one of the independent variables in the cross-sectional regression of BE/ME on macro betas, are fairly consistent with its corresponding results in Panel B of Table 3, with the major change being the disappearance of significance in three more periods. Now, significant relationship between book-to-market equity and multibetas exists for 10 out of the 15 sample periods. Thus, based on the empirical results, book-to-market equity seems to capture the impact of economic pricing factors on security returns, even though the associated regression results do not provide as much strong association with the macroeconomic risk sources as size.

Properties of Size and Book-to-Market Based Portfolios

Table 5 contains seven panels, with each one covering the means of each of the seven macrovariable betas associated with the two extreme size portfolios for the 15 sample years. Results in Panel A reinforce the positive correlation revealed in the cross-sectional regression results reported in Table 3. The small ME portfolio generally has a lower beta than the large ME portfolio. This is especially true after year 1992.

In contrast, as evidenced in Panel B, the large ME portfolio (and thus large firms) is much less sensitive to the change of term structure than the small ME portfolio (and thus small firms). Alternatively, one can argue that investors are willing to pay a premium (a relatively high price) to hold stocks that are less responsive to this dimension of the interest rate volatility. The same conclusion can also be applied to the default risk. Panel C shows that large ME portfolio has a noticeably lower loading on RP than the small ME portfolio.

Panel D of Table 5 suggests that (return of) the large ME portfolio is not as sensitive to the growth (change) in industrial production as the small ME portfolio. One plausible explanation is that firms in the large ME portfolio have a larger base to absorb the impact of the volatility in industrial production than firms grouped into the small ME portfolio. The same reason probably can also be used to explain why the large ME portfolio also has a lower beta associated with GO than the small ME portfolio, as shown in Panel E.

Panels F and G cover the two inflation related beta results. The fact that the betas of UI and CEI are much lower for the large ME portfolio than

for the small ME portfolio implies that large size companies have less inflation rate risk exposure than small size firms.

In summary, investors seeking the reduction in interest rate and inflation related risks should avoid small size stocks. During the time period of surging oil price, large size stocks would also be a safer investment than small size stocks. On the other hand, Table 5 suggests that during a down turn of the economy when stock market is doing poorly, investors should try to stay away from large size stocks. Above all, the higher sensitivities of small size firms than large size firms to macroeconomic variables justify the higher returns associated with small size firms. In other words, size is a proxy for risk. The smaller the size of the firm, the more risky the investment is and the higher the required return should be.

Properties presented in Table 6, unlike Table 5, do not provide a clear cut picture for BE/ME based portfolios. Panel A shows that after 1994, market beta becomes consistently lower for the high BE/ME portfolio than for the low BE/ME portfolio. Thus, during the time period of 1994-2001, the stock market volatility had a bigger impact on low BE/ME stocks than on high BE/ME stocks. This is consistent with results covered in Panel A where small ME portfolio generally has a lower beta than the large ME portfolio (especially after year 1992). All else equal, small ME firms imply high BE/ME than large ME firms.

Panel B of Table 6 shows that stocks with high BE/ME (presumably value stocks) are better hedging vehicles against interest rate risk than stocks with low BE/ME (presumably growth stocks). This is evidenced by the fact that β_{TS} associated with the high BE/ME portfolio is positive for all but one of the 15 sample periods, while β_{TS} carries a negative sign on the low BE/ME portfolio for 11 of the 15 sample years. No definite conclusion can be drawn from the observation of betas related to RP. Both groups (low BE/ME vs. high BE/ME) seem to be equally responsive to the change of default risk premium. Thus, investors probably would not have preference toward either one when there is a major change in general risk tolerance. The same conclusion can be drawn from Panel D of the table where both low BE/ME and high BE/ME portfolios are equally responsive to the growth rate in industrial production.

Beta results evidenced in Panel E for GO indicates that the high BE/ME portfolio has definitely lower sensitivity to the change in oil price than the low BE/ME portfolio. However, neither of them is an effective hedging vehicle against an unanticipated surging oil price, as evidenced by the fact that in more than half of the 15 sample years, a negative return loading on the oil price has been observed for both high BE/ME and low BE/ME portfolios.

Panels F and G of Table 6 show that the high BE/ME portfolio is affected more by the two inflation related variables than the low BE/ME port-

folio. For the high BE/ME portfolio, 9 out of the 15 years are associated with a higher beta of UI and a higher beta of CEI. Thus, firms with high BE/ME have high inflation risk than firms with low BE/ME.

As mentioned earlier, BE/ME results do not lead to a clear implication on risk of firms associated with various level of BE/ME. High BE/ME portfolio and low BE/ME portfolio seem to have different dimensions of risk exposure. Firms with low BE/ME are more responsive to stock market volatility, fare poorly against interest rate surge, and are more sensitive to oil price change. However, firms with high BE/ME have higher inflation related risks. Thus, BE/ME as a risk proxy cannot be confirmed in the context of security return sensitivities to fundamental macroeconomic variables. This observation is in contrast to the conclusion drawn earlier on size where size is evidenced as a proxy for risk. However, the results are in line with He and Ng (1994), which asserts that "Our results imply that book-to-market equity and size do not capture similar risk characteristics important for pricing stocks." (p. 608)

Nonetheless, to investors, depending on their future risk prospect, they might prefer holding one portfolio over the other, with the factor differentiating the two portfolios being their respective BE/ME. If stock market volatility, interest rate fluctuation, or uncertain oil price movement is a concern, investors should avoid low BE/ME stocks. On the other hand, investors should stay away from high BE/ME firms, when avoiding inflation risk becomes investors' top priority.

V. Summary and Conclusions

Multiple regressions are run in this study to draw economic implications of size and book-to-market equity. A sample period of 15 years with sample size varying from 969 stocks to 2942 stocks is examined. Size is found to be significantly related to a linear combination of seven macrovariable betas in every sample year. The overwhelming evidence strongly favors the view of size as a proxy for pervasive risk parameters. This study is also able to document a strong association of book-to-market equity with the proposed macrovariables, even though the evidence is not as persuasive as that for the size.

Stocks are sorted into size and book-to-market based portfolios. An investigation of the multibetas of the constructed portfolios yields some investment implications. Investors who are concerned with interest rate and inflation related risks should avoid small size stocks. During the time period of surging oil price, large size stocks would also be a safer investment than small size stocks. Low BE/ME stocks would be a better investment instrument than high BE/ME stocks as far as inflation related risks are concerned. However, during a down turn of the economy when stock market is doing poorly, investors should try to stay away from large size stocks and low BE/ME stocks. The firms with low BE/ME should also be avoided when in-

terest rates are expected to surge or oil price uncertainty becomes a dominating factor in the economy.

Unlike most previous empirical findings, a positive correlation between the market value of equity and market beta is documented in this study. As pointed out in this study, the inconsistency may be a result of different data set and/or different methodology employed. Further research to resolve the inconsistency is warranted.

References

Chan, K.C., N. Chen, and D.A. Hsieh, September 1985, An Exploratory Investigation of the Firm Size Effect, *Journal of Financial Economics,* pp.451-471.

Chan, L.K., J. Karceski, and J. Lakonishok, June 1998, The Risk and Return from Factors, *Journal of Financial and Quantitative Analysis,* pp.159-188.

Chen, S. and B.D. Jordan, February 1993, Some Empirical Tests in the Arbitrage Pricing Theory: Macrovariables vs. Derived Factors, *Journal of Banking and Finance,* pp.65-89.

Chen, N.F., R. Roll, and S.A. Ross, July 1986, Economic Forces and the Stock Market, *Journal of Business,* pp.383-403.

Davis, J.L, December 1994, The Cross-Section of Realized Stock Returns: The Pre-COMPUSTAT Evidence, *Journal of.Finance*, pp.1579-1593.

Fama, E.F. and French K.R., June 1992, The Cross-Section of Expected Stock Returns, *Journal of Finance,* pp.427-465.

_____, March 1993, Common Risk Factors in the Returns on Bonds and Stocks, *Journal of Financial Economics,* pp.3-56.

_____, March 1996, Multifactor Explanations of Asset Pricing Anomalies, *Journal of Finance,* pp.55-84.

Fant, L.F. and D.R. Peterson, Summer 1995, The Effect of Size, Book-to-Market Equity, Prior Returns, and Beta on Stock Returns-January versus the Remainder of the Year, *Journal of Financial Research,* pp.129-142.

He, J. and Ng L.K., October 1994, Economic Forces, Fundamental Variables, and Equity Returns, *Journal of Business,* pp.599-609.

Ibbotson, R.G., and R.A. Sinquefield, 2002, *Stocks, Bonds, Bills, and Inflation (SBBI), Yearbook* (Ibbotson Associates, Chicago, IL).

Jegadeesj, N, September 1992, Does Market Risk Really Explain the Size Effect?, *Journal of Financial and Quantitative Analysis,* pp.337-351.

Kothari, S.P., J. Shariken, and R.G. Sloan, March 1995, Another Look at the Cross-Section of Expected Stock Returns, *Journal of Finance,* pp.185-224.

Reinganum, M.R., March 1981, Misspecification in Capital Asset Pricing-Empirical Anomalies based on Earnings Yields and Market Values, *Journal of Financial Economics,* pp.19-46.

Roll, R. and S.A. Ross, December 1980, An Empirical Investigation of the Arbitrage Pricing Theory, *Journal of Finance,* pp.1073-1103.

Ross, S.A., December 1976, The Arbitrage Theory of Capital Asset Pricing, *Journal of Economics,* pp.341-360.

Table 1
Correlation Matrix for Macroeconomic Variables
July 1982-June 2001 (N = 228)

Series	MP	TS	RP	GI	GO	UI	CEI
MP	1.000						
TS	-0.015	1.000					
RP	0.144*	0.240*	1.000				
GI	0.010	0.119*	-0.150*	1.000			
GO	-0.139*	-0.026	-0.081	0.115*	1.000		
UI	-0.115*	-0.031	-0.054	0.091	0.485*	1.000	
CEI	-0.043	-0.001	-0.058	-0.022	0.041	-0.045	1.000

*Indicates that the associated correlation is significantly different from zero at the 10% significance level.

Glossary:
MP = the market index,
TS = the term structure premium,
Representative = the default risk premium,
GI = the growth rate in industrial production,
GO = the change in oil prices,
UI = the unanticipated inflation rate,
CEI = the change in expected inflation.

Table 2
Sample Period and Size

Period	Size
1987	969
1988	1017
1989	1126
1990	1172
1991	1259
1992	1382
1993	1479
1994	1546
1995	1629
1996	1726
1997	1917
1998	2111
1999	2368
2000	2565
2001	2942

Table 3

Panel A: Cross-Sectional Regression Results of ln(ME) on Macrovariable Betas

Period	β_{MP}	β_{TS}	β_{RP}	β_{GI}	β_{GO}	β_{UI}	β_{CEI}	Pr>F
1987	0.852***	0.062**	-0.079***	-0.018	-0.639**	-0.019**	-0.045***	<.0001
1988	0.071	-0.082**	0.037***	-0.006	-0.732**	-0.048***	-0.018***	<.0001
1989	0.002	0.139***	0.050***	-0.009	-0.645**	-0.028***	-0.026***	<.0001
1990	0.523***	0.005	0.002	0.011	-0.386	-0.045***	-0.033***	<.0001
1991	0.270*	-0.174***	0.002	-0.035	0.458	-0.044***	-0.024***	<.0001
1992	0.037	-0.118***	-0.005	0.003	0.485*	-.000	-0.002	<.0001
1993	0.205***	-0.276***	0.013***	0.017	0.880***	0.020***	0.003	<.0001
1994	0.102	-0.146***	0.004	0.010	0.294	0.015***	0.001	<.0001
1995	0.076	0.061**	-0.006	-0.033***	-0.128	-0.001	0.006***	<.0001
1996	0.298***	0.126***	-0.011***	-0.023**	0.560***	-0.011***	-0.001	<.0001
1997	0.233***	-0.052*	-0.002	-0.052***	0.204	-0.027***	-0.006***	<.0001
1998	0.655***	-0.037	0.002**	-0.052***	-0.743***	-0.038***	-0.005***	<.0001
1999	0.630***	-0.068***	-0.007***	-0.049***	-0.358***	-0.004*	0.003	<.0001
2000	1.095***	-0.054***	0.011***	-0.026***	-0.208**	-0.013***	-0.002	<.0001
2001	0.301***	-0.154***	0.018***	0.010	0.447***	-0.022***	-0.001	<.0001

Table 3 (Continued)

Panel B: Cross-Sectional Regression Results of BE/ME on Macrovariable Betas

Period	β_{MP}	β_{TS}	β_{RP}	β_{GI}	β_{GO}	β_{UI}	β_{CEI}	Pr>F
1987	-0.043	0.021	0.034 *	-0.050*	-0.251	0.005	-0.005	.4528
1988	-0.103*	0.032***	0.000	-0.011	0.127	0.014***	-0.002	<.0001
1989	-0.016	-0.069**	-0.003	0.007	-0.347*	0.006	0.001	.0029
1990	-0.068	0.024	0.019**	0.016	0.348	0.015*	-0.008*	.0056
1991	0.143	-0.645***	-0.061**	-0.025	3.214**	0.021	-0.013	.0009
1992	0.005	-0.767***	0.011	-0.391***	-0.072	-0.042*	0.007	<.0001
1993	-0.311***	-0.070*	0.004	0.001	0.330	-0.016***	0.005**	<.0001
1994	-0.100***	-0.014	0.001	-0.007	0.215***	0.001	0.001	.0063
1995	-0.246***	0.035	-0.001	0.003	0.032	-0.010*	-0.003	.0063
1996	-0.046	0.086 ***	0.003*	0.045***	0.169*	0.005*	-0.013***	<.0001
1997	-0.110***	0.047***	0.001**	0.005**	-0.041	0.002***	0.000	<.0001
1998	-0.102***	0.028***	0.001**	0.004*	0.048	0.003***	0.000	<.0001
1999	-0.155***	0.038***	-0.010***	0.005	-0.650***	-0.020***	-0.005***	<.0001
2000	0.046	0.011	0.001	0.054	0.157	0.006	-0.009	.7593
2001	-0.049	0.063	0.001	0.007	0.009	-0.010	0.009	.9787

*, ** and *** indicate that the associated regression coefficient is significantly different from zero at the 10%, 5%, and 1% significance levels, respectively.

Glossary:
Ln(ME) = natural log of market value of equity,
BE/ME = Book value of equity divided by market value of equity,
MP = the market index,
TS = the term structure premium,
Representative = the default risk premium,
GI = the growth rate in industrial production,
GO = the change in oil prices,
UI = the unanticipated inflation rate,
CEI = the change in expected inflation.

Table 4

Panel A: Cross-Sectional Regression Results of ln(ME) on Macrovariable Betas (Without β_{MP})

Period	β_{TS}	β_{RP}	β_{GI}	β_{GO}	β_{UI}	β_{CEI}	Pr>F
1987	0.076**	-0.085***	-0.009	-0.661**	-0.027***	-0.036***	<.0001
1988	-0.078**	0.036***	-0.006	-0.730**	-0.046***	-0.018***	<.0001
1989	0.140***	0.050***	-0.009	-0.644**	-0.028***	-0.026**	<.0001
1990	0.039***	0.0010	0.008	-0.447	-0.047***	-0.032***	<.0001
1991	-0.153***	0.002	-0.034	0.435*	-0.0434***	-0.023***	<.0001
1992	-0.115***	-0.005	0.002	0.495*	-0.000	-0.002	<.0001
1993	-0.271***	0.014***	0.003	1.207***	0.020***	0.003	<.0001
1994	-0.149***	0.004	0.003	0.519***	0.018***	0.001	<.0001
1995	0.053**	-0.004	-0.036***	0.027	0.000	0.005***	<.0001
1996	0.142***	-0.006***	-0.039***	0.580***	-0.013***	-0.004***	<.0001
1997	-0.023	-0.002	-0.048***	0.178	-0.025***	-0.006***	<.0001
1998	0.040*	0.005***	-0.041***	-0.582***	-0.032***	-0.005***	<.0001
1999	-0.058***	-0.005**	-0.050***	-0.200*	-0.003	0.002	<.0001
2000	-0.049***	0.018***	-0.039***	0.298***	-0.014***	-0.003**	<.0001
2001	-0.175***	0.017**	-0.005	0.402***	-0.020***	0.003***	<.0001

Table 4 (Continued)

Panel B: Cross-Sectional Regression Results of BE/ME) on Macrovariable Betas (Without β_{MP})

Period	β_{TS}	β_{RP}	β_{GI}	β_{GO}	β_{UI}	β_{CEI}	Pr>F
1987	0.020	0.035**	-0.051*	-0.250	0.005	-0.006	.3488
1988	0.026**	0.001	-0.011	0.124	0.014***	-0.002	<.0001
1989	-0.070**	-0.003**	0.007	-0.347*	0.006	0.001	.0014
1990	0.020	0.019**	0.017	0.356	0.015*	-0.008 *	.0030
1991	-0.634***	-0.061	-0.025	3.202**	0.021	-0.013	.0004
1992	-0.766***	0.011	-0.391***	-0.070	-0.042*	0.007	<.0001
1993	-0.077*	0.002	0.022*	-0.165	-0.017***	0.006***	.0010
1994	-0.012	0.0011	0.000	-0.005	-0.001**	0.001	.5270
1995	0.060*	-0.007	0.012	-0.467**	-0.015***	-0.001	.1287
1996	0.084***	0.002	0.047***	0.166*	0.005***	-0.013***	<.0001
1997	0.033***	0.001	0.004	-0.029	0.001	0.000	<.0001
1998	0.016***	0.0004	0.002	0.023	0.002***	0.000	.0308
1999	0.036***	-0.010***	0.006	-0.688***	-0.021***	-0.005***	0001
2000	0.011	0.0024	0.054	0.178	0.006	-0.009	.6558
2001	0.0663	0.001	0.010	0.016	-0.011	0.008	.9538

*, ** and *** indicate that the associated regression coefficient is significantly different from zero at the 10%, 5%, and 1% significance levels, respectively.

Glossary:
Ln(ME) = natural log of market value of equity,
BE/ME = Book value of equity divided by market value of equity,
MP = the market index,
TS = the term structure premium,
Representative = the default risk premium,
GI = the growth rate in industrial production,
GO = the change in oil prices,
UI = the unanticipated inflation rate,
CEI = the change in expected inflation.

Table 5
Properties of Portfolios Formed on ME

Panel A: β_{MP}

Period	Small ME	Large ME
1987	0.811	1.052
1988	1.040	1.022
1989	1.022	1.026
1990	0.923	1.016
1991	1.054	1.008
1992	0.953	1.008
1993	0.535	1.013
1994	0.433	0.984
1995	0.628	1.020
1996	0.343	0.980
1997	0.936	0.942
1998	0.617	0.917
1999	0.770	0.968
2000	0.398	0.988
2001	0.670	0.991

Panel B: β_{TS}

Period	Small ME	Large ME
1987	-0.319	0.190
1988	0.170	0.199
1989	0.080	0.175
1990	-0.269	0.059
1991	0.566	0.085
1992	1.735	0.044
1993	0.978	0.158
1994	1.101	0.272
1995	-0.161	0.215
1996	-1.012	0.112

1997	0.273	0.176
1998	-0.274	0.092
1999	-1.200	0.433
2000	0.692	-0.081
2001	2.033	-0.971

Panel C: β_{RP}

Period	Small ME	Large ME
1987	4.198	-0.232
1988	-4.352	-0.571
1989	-3.162	-0.092
1990	4.822	0.602
1991	1.983	0.779
1992	-5.787	1.707
1993	1.873	1.596
1994	8.758	2.216
1995	3.123	1.980
1996	13.504	1.943
1997	5.682	5.163
1998	-3.067	4.045
1999	19.691	-0.848
2000	-5.325	1.136
2001	-1.916	-0.262

Panel D: β_{GI}

Period	Small ME	Large ME
1987	0.505	-0.232
1988	-0.576	-0.321
1989	0.322	-0.004
1990	-0.612	-0.096
1991	-0.276	-0.162
1992	1.580	-0.132

1993	1.829	-0.071
1994	3.137	0.231
1995	2.974	0.363
1996	1.922	0.203
1997	0.894	-0.105
1998	1.111	0.400
1999	0.866	-0.207
2000	1.738	0.651
2001	-0.840	-0.897

Panel E: β_{GO}

Period	Small ME	Large ME
1987	-0.405	0.003
1988	-0.076	-0.009
1989	-0.034	-0.012
1990	-0.101	-0.013
1991	-0.109	-0.022
1992	-0.071	-0.035
1993	-0.146	-0.042
1994	-0.177	-0.073
1995	-0.237	-0.073
1996	-0.105	-0.054
1997	-0.086	0.003
1998	0.014	0.016
1999	0.223	0.026
2000	0.115	0.086
2001	0.042	0.095

Panel F: β_{UI}

Period	Small ME	Large ME
1987	2.942	-1.764
1988	3.922	-1.176

1989	0.767	-0.871
1990	6.072	-0.282
1991	6.700	0.267
1992	6.978	0.617
1993	3.398	0.682
1994	2.232	1.282
1995	7.871	1.439
1996	7.469	0.092
1997	7.918	0.330
1998	8.609	-0.956
1999	29.178	-0.107
2000	7.498	-2.261
2001	19.766	-1.106

Panel G: β_{CEI}

Period	Small ME	Large ME
1987	11.295	1.086
1988	8.697	-0.388
1989	7.092	0.273
1990	10.727	0.478
1991	18.567	-0.607
1992	5.193	-2.189
1993	0.259	-1.837
1994	-2.081	-1.811
1995	-1.433	-2.444
1996	16.349	-0.032
1997	8.419	0.487
1998	12.794	3.571
1999	25.228	1.153
2000	8.857	2.879
2001	0.829	1.448

Table 6
Properties of Portfolios Formed on BE/ME

Panel A: β_{MP}

Period	Low BE/ME	High BE/ME
1987	1.062	0.912
1988	1.172	1.055
1989	1.002	1.026
1990	1.109	0.974
1991	1.184	1.070
1992	1.157	0.956
1993	0.925	1.176
1994	0.898	1.240
1995	1.032	0.684
1996	0.811	0.554
1997	1.056	0.831
1998	0.890	0.653
1999	1.143	0.758
2000	0.944	0.564
2001	1.157	0.687

Panel B: β_{TS}

Period	Low BE/ME	High BE/ME
1987	-0.216	0.134
1988	-0.012	0.409
1989	0.147	0.095
1990	-0.161	0.283
1991	-0.025	0.586
1992	0.773	0.708
1993	0.749	0.919
1994	0.846	0.834
1995	-0.067	0.287
1996	-1.367	-0.107

1997	-0.727	0.512
1998	-0.471	0.294
1999	-1.640	1.426
2000	-1.199	0.564
2001	-1.383	2.305

Panel C: β_{RP}

Period	Low BE/ME	High BE/ME
1987	1.551	3.693
1988	-1.731	-1.294
1989	-1.193	-0.605
1990	0.972	5.025
1991	1.960	4.928
1992	-0.943	3.110
1993	4.762	-0.127
1994	4.837	4.549
1995	1.697	3.171
1996	9.809	8.896
1997	16.476	6.036
1998	2.470	1.370
1999	19.123	-0.742
2000	0.003	-5.669
2001	-9.728	-1.220

Panel D: β_{GI}

Period	Low BE/ME	High BE/ME
1987	0.286	0.462
1988	-0.451	-0.183
1989	0.562	0.301
1990	-0.976	-0.771
1991	-0.572	-0.009
1992	0.737	1.450

1993	1.211	-0.507
1994	1.579	-0.642
1995	1.645	1.884
1996	0.487	1.415
1997	-0.302	0.203
1998	0.940	0.922
1999	0.184	0.510
2000	0.341	1.193
2001	-1.224	-1.817

Panel E: β_{GO}

Period	Low BE/ME	High BE/ME
1987	0.022	-0.003
1988	0.001	-0.070
1989	-0.044	0.003
1990	-0.050	-0.055
1991	-0.126	-0.093
1992	-0.137	-0.068
1993	-0.199	0.151
1994	-0.263	0.139
1995	-0.250	-0.200
1996	-0.110	-0.086
1997	0.017	-0.053
1998	0.061	0.062
1999	0.183	0.130
2000	0.289	0.059
2001	0.131	-0.027

Panel F: β_{UI}

Period	Low BE/ME	High BE/ME
1987	-1.147	2.942
1988	-0.685	2.862

1989	-0.200	0.050
1990	1.589	4.481
1991	3.729	5.563
1992	4.678	5.020
1993	3.638	-6.382
1994	5.869	-4.085
1995	7.600	6.834
1996	4.322	4.108
1997	3.385	3.674
1998	2.118	3.445
1999	23.536	1.961
2000	4.059	2.319
2001	7.925	12.501

Panel G: β_{CEI}

Period	Low BE/ME	High BE/ME
1987	5.350	7.403
1988	2.121	3.336
1989	5.806	4.286
1990	4.968	7.740
1991	10.439	14.327
1992	1.855	3.832
1993	-3.539	-6.319
1994	-3.840	-6.038
1995	-4.678	-1.996
1996	6.804	6.124
1997	3.968	8.143
1998	6.647	10.640
1999	20.409	3.796
2000	10.621	3.867
2001	8.728	0.584