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Firm Size, Book-to-Market Ratio, and Security Returns: A Holdout Sample of Financial Firms

BRAD M. BARBER and JOHN D. LYON*

ABSTRACT

Fama and French (1992) document a significant relation between firm size, book-to-market ratios, and security returns for nonfinancial firms. Because of their initial interest in leverage as an explanatory variable for security returns, Fama and French exclude from their analysis financial firms, thus creating a natural holdout sample on which to test the robustness of their results. We document that the relation between firm size, book-to-market ratios, and security returns is similar for financial and nonfinancial firms. In addition, we present evidence that survivorship bias does not significantly affect the estimated size or book-to-market premiums in returns. Our results indicate data-snooping and selection biases do not explain the size and book-to-market patterns in returns.

FAMA AND FRENCH (1992) DOCUMENT a significant relation between firm size, book-to-market ratios, and security returns for nonfinancial firms. However, some financial economists remain unconvinced about the robustness of the relation and argue that documented anomalies are simply a result of extensive data-snooping by academics (see, e.g., Black (1993) and MacKinlay (1995)). The most obvious means of evaluating the data-snooping hypothesis is to test the robustness of the results documented by Fama and French (1992) using, for example, different time periods (see Davis (1994)), different countries (see Chan, Hamao, and Lakonishok (1991)), or a holdout sample. In this research, we test the data-snooping hypothesis by analyzing the relation between firm size, book-to-market ratios, and security returns for a sizable holdout sample, which Fama and French (1992) inadvertently, but perhaps fortuitously created.

Because Fama and French (1992) were initially interested in analyzing the impact of leverage on security returns, they excluded from their analysis all financial firms. In the end, however, firm size and book-to-market ratios emerge as the strongest predictors of security returns. Unlike leverage, where the high leverage of financial firms may not have the same meaning as for nonfinancial firms, there is no reason to expect that firm size and book-to-market ratios have different meanings for financial versus nonfinancial firms. Thus, we are left with a large holdout sample of financial firms on which we

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can test the robustness of the relation between firm size, book-to-market ratios, and security returns.

We document that financial and nonfinancial firms have very similar return patterns. Both financial and nonfinancial firms exhibit a significant size and book-to-market premium. Furthermore, we are unable to reject the null hypothesis that the size or book-to-market premium differ between financial and nonfinancial firms. Aside from documenting the robustness of the relation between size, book-to-market ratios, and security returns, our results indicate that size and book-to-market ratios for financial and nonfinancial firms have similar meanings—at least as they relate to security returns.

In addition to testing the data-snooping hypothesis, we also consider the potential for data selection biases as described by Kothari, Shanken, and Sloan (1995) to lead to biases in the estimate of the size or book-to-market premium. We find little evidence that data selection biases lead to a significant overstatement of either the size or book-to-market premium, in either an economic or statistical sense.

The remainder of this article is organized as follows. In Section I we describe our data and methods. In Section II we present our main results. In Section III we describe the issue of survivorship bias. We make closing remarks in Section IV.

I. Data and Methods

We restrict our analysis to firms with available returns data on the Center for Research in Security Prices (CRSP) NYSE/AMEX/Nasdaq monthly returns files from July 1973 through December 1994. Prior to 1973, when Nasdaq data become available, there are few financial firms with available returns data. We delete from our analysis securities identified by CRSP as other than ordinary common shares (CRSP share codes 10 and 11).

Financial firms are those firms with Standard Industrial Classification (SIC) codes ranging from 6000 to 6999. The remaining firms are classified as nonfinancial firms. To define industries, we use COMPUSTAT SIC codes when available and, if not, CRSP SIC codes. This is the same procedure used by Fama and French (1992). Because we are interested in identifying a pure holdout sample, which Fama and French exclude from their analysis, this particular definition of industry is critical.

We follow the same approach as that used by Fama and French (1992) to create size decile and book-to-market decile portfolios. Using only nonfinancial firms listed on the New York Stock Exchange (NYSE), we calculate size rankings based on market value of equity in June of year t . These size rankings are used to construct size decile portfolios from July of year t through June of year $t + 1$. All Nasdaq, all AMEX, and financial firms listed on the NYSE are then placed in the appropriate size decile portfolio based on the rankings calculated from NYSE nonfinancial firms. In much of the discussion that follows, we refer to the extreme size decile portfolios as the small firms (size decile 1) and big firms (size decile 10).

Using only nonfinancial firms listed on the NYSE, we calculate book-to-market rankings based on market value of equity in December of year $t - 1$ and book value of equity (COMPUSTAT data item 60) reported on a firm's balance sheet in the same calendar year. These book-to-market rankings are used to construct book-to-market decile portfolios from July of year t through June of year $t + 1$. All Nasdaq, all AMEX, and financial firms listed on the NYSE are then placed in the appropriate book-to-market decile portfolio based on the rankings calculated from NYSE nonfinancial firms. In much of the discussion that follows, we refer to the extreme book-to-market decile portfolios as low book-to-market firms (decile 1) and high book-to-market firms (decile 10).

Table I summarizes the size and book-to-market data for nonfinancial and financial firms. The size data are based on market value of equity for June of each year. The book-to-market data are based on the calculated book-to-market ratio from the preceeding year. In this table and all of our main results, we restrict our analysis to firms with available size and book-to-market data. In Section III, we report results based on variations in this restriction to address the potential problems of data selection bias.

Three observations emerge from this analysis. First, the identified holdout sample of financial firms is quite large—ranging from 308 firms in 1973 to 1,067 firms in 1994. From 1973 to 1994, approximately 13 percent of all firms with available size and book-to-market data are financial firms.

Second, from 1973 through 1994, the average size of financial and nonfinancial firms are quite similar. In no year are we able to reject the null hypothesis that the average size of financial firms and nonfinancial firms are the same using a t -statistic assuming unequal variances. However, the distribution of size for financial and nonfinancial firms does differ. The median financial firm is larger than the median nonfinancial firm. In every year, we are able to reject the null hypothesis that the median financial firm equals the median nonfinancial firm using a Wilcoxon signed-rank test statistic.

Third, from 1976 through 1994, financial firms have significantly higher mean and median book-to-market ratios (using the previously described test statistics). In 1973 and 1975, there are no significant differences between the mean or median book-to-market ratio for financial versus nonfinancial firms. In 1974, financial firms had significantly lower mean and median book-to-market ratios than nonfinancial firms.

II. Results

Table II summarizes the percentage mean monthly returns for nonfinancial and financial firms by decile. The fourth column of this table presents t -statistics, which test the null hypothesis that the mean monthly return differs between financial and nonfinancial firms. In no size decile are we able to reject the null hypothesis of return equivalence. Furthermore, there is a significant size premium for both financial firms and nonfinancial firms. For

Table I
Size (Market Value of Equity in millions) and Book-to-Market Ratios for NYSE/AMEX/Nasdaq
Nonfinancial and Financial Firms: 1973-1994

Size is measured as price per share times shares outstanding in June of each year. Book-to-market ratio is measured as the book value of equity divided by market value of equity. Book value of equity (COMPUSTAT data item 60) is that reported on a firm's financial statement in the prior year (e.g., 1972 book value of equity is used for 1973 calculations). Market value of equity for the calculation of book-to-market ratios is based on December price and shares outstanding in the prior year.

Year	Nonfinancial Firms					Financial Firms								
	Size (\$000,000)				Book-to-Market	Size (\$000,000)				Book-to-Market				
	Obs.	Median	Mean	Std. Dev.	Mean	Obs.	Median	Mean	Std. Dev.	Mean	Std. Dev.			
1973	3,002	20	226	1,395	0.69	0.82	0.65	308	86	227	0.73	471	0.83	1.09
1974	3,038	17	185	1,075	1.26	1.54	1.43	313	56	165	1.13	356	1.39	1.33
1975	3,281	18	199	1,096	1.95	2.41	1.90	359	53	183	1.85	438	2.66	3.03
1976	3,358	19	217	1,266	1.37	1.66	1.26	344	53	181	1.65	403	2.06	2.23
1977	3,402	21	215	1,256	1.09	1.30	0.96	352	63	195	1.26	415	1.53	1.33
1978	3,347	27	218	1,196	1.05	1.25	0.92	366	70	206	1.33	405	1.41	0.81
1979	3,308	28	241	1,304	1.07	1.22	0.89	386	72	227	1.33	462	1.38	0.67
1980	3,245	30	279	1,356	0.94	1.10	0.87	410	72	223	1.28	471	1.31	0.74
1981	3,344	40	328	1,453	0.80	0.98	0.85	422	83	266	1.22	530	1.26	0.83
1982	3,556	26	256	1,294	0.82	1.02	1.02	435	71	210	1.21	450	1.25	0.77
1983	3,598	53	405	2,003	0.75	0.91	0.82	451	121	359	1.11	819	1.14	0.64
1984	3,923	36	323	1,591	0.55	0.67	0.57	489	106	290	0.87	604	0.89	0.54
1985	3,980	37	394	1,888	0.69	0.83	0.72	493	143	447	0.90	948	0.96	0.61
1986	3,913	47	508	2,343	0.60	0.73	0.69	512	178	631	0.70	1,317	0.77	0.52
1987	4,115	46	577	2,783	0.58	0.71	0.73	551	135	595	0.71	1,323	0.84	0.83
1988	4,211	35	503	2,363	0.70	0.87	0.97	573	92	513	0.94	1,135	1.31	3.55
1989	4,076	40	577	2,554	0.63	0.79	0.98	607	108	572	0.91	1,378	1.13	1.05
1990	3,992	40	654	3,035	0.59	0.79	1.12	577	115	598	0.85	1,467	1.08	1.15
1991	3,958	42	684	3,266	0.78	1.17	1.83	593	111	617	1.20	1,555	1.86	2.69
1992	3,990	58	774	3,653	0.56	0.90	3.08	602	143	812	0.83	1,942	1.23	1.93
1993	4,234	72	839	3,743	0.50	0.71	1.11	611	233	1,067	0.67	2,573	0.89	1.38
1994	4,646	71	773	3,460	0.44	0.58	0.61	1,067	84	679	0.78	2,064	0.86	0.63

Table II
Percentage Mean Monthly Returns on Equally-Weighted
NYSE/AMEX/Nasdaq Size Decile Portfolios for Financial and
Nonfinancial Firms July, 1973 to December, 1994

Size is measured as price per share times shares outstanding in June of each year. Both financial and nonfinancial firms are placed into size deciles in July based on rankings formed using only nonfinancial New York Stock Exchange (NYSE) firms with an available size measure in June of the same year. Portfolios are reformed in July of each year, 1973 to 1994.

Size Decile	Nonfinancial Firms	Financial Firms	<i>t</i> -Statistic (Difference)
1 (Small)	1.68	1.57	0.18
2	1.32	1.49	-0.30
3	1.38	1.48	-0.19
4	1.41	1.43	-0.05
5	1.51	1.40	0.22
6	1.34	1.28	0.13
7	1.30	1.27	0.08
8	1.33	1.17	0.33
9	1.15	1.20	-0.10
10 (Big)	1.03	1.04	-0.02
1-10 (Small-Big)	0.65	0.53	0.23

nonfinancial firms, this size premium is 0.65 percent per month ($t = 2.02$); for financial firms, the size premium is 0.53 percent per month ($t = 1.33$).

Table III summarizes the percentage mean monthly returns for nonfinancial and financial firms by book-to-market decile. The fourth column of this table presents *t*-statistics, which test the null hypothesis that the mean monthly return differs between financial and nonfinancial firms. Again, in no book-to-market decile are we able to reject the null hypothesis of return equivalence. Furthermore, there is a significant book-to-market premium for both nonfinancial and financial firms. For nonfinancial firms, this book-to-market premium is 1.44 percent per month ($t = 5.70$); for financial firms the book-to-market premium is 1.11 percent per month ($t = 3.06$).

Table IV summarizes the percentage mean monthly returns for nonfinancial and financial firms in the extreme deciles of size and book-to-market for two subperiods: July 1973 to June 1984, and July 1984 to December 1994. Two observations emerge from the subperiod analysis. First, in both subperiods, high book-to-market firms outperform low book-to-market firms. Thus, the holdout sample of financial firms confirms the book-to-market pattern in returns documented in Fama and French (1992).

Second, for both nonfinancial and financial firms, the size premium is only present in the earlier subperiod. Auxiliary analyses reveal that big firms outperform small firms from 1984 to 1988. For example, during this period, big nonfinancial firms earned a mean monthly return of 1.74 percent, while small nonfinancial firms earned a mean monthly return of 0.76 percent. Similarly,

Table III

**Percentage Mean Monthly Returns on Equally-Weighted
NYSE/AMEX/Nasdaq Book-to-Market Decile Portfolios for Financial
and Nonfinancial Firms July, 1973 to December, 1994**

Book-to-market ratio is measured as the book value of equity divided by market value of equity. Book value of equity (COMPUSTAT data item 60) is that reported in a firm's financial statement in the prior year (e.g., 1972 book value of equity is used for 1973 calculations). Market value of equity for the calculation of book-to-market ratios is based on December price and shares outstanding in the prior year. Both financial and nonfinancial firms are placed into book-to-market deciles in July based on rankings formed using only nonfinancial New York Stock Exchange (NYSE) firms with an available book-to-market ratio in the preceding year. Portfolios are reformed in July of each year, 1973–1994.

Book-to-Market Decile	Nonfinancial Firms	Financial Firms	t-Statistic (Difference)
1 (Low)	0.72	0.81	-0.14
2	1.30	1.69	-0.65
3	1.35	1.09	0.49
4	1.50	1.26	0.47
5	1.60	1.34	0.53
6	1.53	1.29	0.50
7	1.66	1.25	0.88
8	1.77	1.47	0.61
9	1.87	1.80	0.13
10 (High)	2.15	1.91	0.39
10-1 (High-Low)	1.44	1.11	0.74

big financial firms outperform small financial firms (1.67 percent versus 0.80 percent). However, this pattern reversed itself from 1989 to 1994, when small firms outperform big firms (1.25 percent versus 0.90 percent for nonfinancial firms, 1.34 percent versus 0.79 percent for financial firms). In short, the pattern of returns for financial and nonfinancial firms based on size decile portfolios are quite similar, though there is a five year period (1984 to 1988) when big firms significantly outperform small firms.

To further test the robustness of the size and book-to-market patterns in returns, we analyze the returns of three segments of the financial industry: banks (SIC codes 60 to 62), insurance companies (SIC codes 63 to 64), and real estate companies (SIC code 65). The results of this analysis are presented in Table V. Although we are unable to construct a portfolio of large real estate firms, small firms in both the banking and insurance industries earned larger returns than big firms in those industries. Similarly, high book-to-market firms outperformed low book-to-market firms in all three industries.

In summary, our analysis of the returns of a holdout sample of financial firms confirms the findings of Fama and French (1992). The relation between firm size and security returns is similar for financial and nonfinancial firms. With the exception of a five year period (1984–1988), small firms outperform large firms. Finally, the relation between book-to-market ratios and security

Table IV

**Percentage Mean Monthly Returns on Equally-Weighted
NYSE/AMEX/Nasdaq Size and Book-to-Market Extreme Decile
Portfolios for Financial and Nonfinancial Firms by Subperiods**

Small (large) firms are those firms in size decile 1 (10). Low (high) book-to-market firms are those firms in book-to-market decile 1 (10). Size is measured as price per share times shares outstanding in June of each year. Book-to-market ratio is measured as the book value of equity divided by market value of equity. Book value of equity (COMPUSTAT data item 60) is that reported on a firm's financial statement in the prior year (e.g., 1972 book value of equity is used for 1973 calculations). Market value of equity for the calculation of book-to-market ratios is based on December price and shares outstanding in the prior year.

	Nonfinancial Firms		Financial Firms	
	7:73-6:84	7:84-12:94	7:73-6:84	7:84-12:94
Small firms	2.30	1.02	2.03	1.09
Large firms	0.76	1.30	0.88	1.21
Low book-to-market	1.18	0.23	0.88	0.73
High book-to-market	2.62	1.67	2.51	1.29

Table V

**Percentage Mean Monthly Returns on Equally-Weighted
NYSE/AMEX/Nasdaq Size and Book-to-Market Extreme Decile
Portfolios for Banks, Insurance, and Real Estate Industries**

Banks are those firms with two-digit Standard Industrial Classification (SIC) codes 60, 61, or 62; Insurance companies, SIC codes 63 and 64; and, Real Estate companies, SIC code 65. Small (large) firms are those firms in size decile 1 (10). Low (high) book-to-market firms are those firms in book-to-market decile 1 (10). Size is measured as price per share times shares outstanding in June of each year. Book-to-market ratio is measured as the book value of equity divided by market value of equity. Book value of equity (COMPUSTAT data item 60) is that reported on a firm's financial statement in the prior year (e.g., 1972 book value of equity is used for 1973 calculations). Market value of equity for the calculation of book-to-market ratios is based on December price and shares outstanding in the prior year.

Portfolio	Banks	Insurance	Real Estate
Small firms	1.52	2.22	1.33
Large firms	1.03	1.12	n.a.
Low book-to-market	0.54	1.59	0.44
High book-to-market	1.73	2.39	1.66

n.a. = not available.

returns is similar for nonfinancial and financial firms. High book-to-market firms outperform low book-to-market firms.

III. Is Survivorship Bias Important?

Kothari, Shanken, and Sloan (1995) argue that survivorship biases in COMPUSTAT data may partially explain the relation between book-to-market

ratios and security returns. They argue that there are two sources of bias. First, prior to 1978, COMPUSTAT routinely included historical financial information of firms. Second, COMPUSTAT may back-fill the financial information of firms that delayed the reporting of their financial statements for reasons related to financial distress. The problem with this type of back-filling is that the firms which emerge from financial distress are more likely to be back-filled. Chan, Jegadeesh, and Lakonishok (1995) argue that the survivorship bias in COMPUSTAT data is small. We concur with Chan et al. for three reasons.

First, the book-to-market pattern in returns over our two subperiods of analysis (July 1973 to June 1984 and July 1984 to December 1994) is similar for nonfinancial firms. In the first subperiod, high book-to-market firms outperform low book-to-market firms by 1.44 percent; in the second subperiod, by an identical 1.44 percent. For financial firms, high book-to-market firms outperform low book-to-market firms in both subperiods, although the relation is stronger in the first subperiod of analysis. These results indicate back-filling by COMPUSTAT does not significantly affect the calculation of the book-to-market premium.

Second, we reestimate all of our results requiring five years of COMPUSTAT data prior to the ranking year. Thus, for example, for a firm to be included in the analysis in 1973, the firm must have available data from 1968 through 1972. If COMPUSTAT back-filled only five years of data, this requirement eliminates potential biases associated with back-filling. These results (not reported in a table) confirm the book-to-market pattern in returns. For example, requiring five years of book-to-market data, nonfinancial firms in the low book-to-market decile portfolio earn an average return of 0.78 percent per month, while the high book-to-market decile portfolio earn an average return of 2.11 percent. These results are very close to those reported for all nonfinancial firms in Table III. The results are similar for financial firms, where the requiring five years of COMPUSTAT data yields an average return of 1.09 percent for low book-to-market firms and an average return of 1.89 percent for high book-to-market firms.

Third, the estimate of the size premium is not significantly affected by requiring book-to-market data. The issue of survivorship bias in COMPUSTAT data is easier to address when estimating the size premium. We merely drop the requirement for book-to-market data and reestimate the mean monthly returns for small and big firms. From 1973 to 1994, the portfolio of small nonfinancial firms earn a mean monthly return of 1.59 percent, while the portfolio of big nonfinancial firms earn a mean monthly return of 1.03 percent. This translates into a size premium of 0.56 percent, less than that reported in Table II, but not significantly less (in a statistical sense). The results are similar for financial firms. The portfolio of small financial firms earn a mean monthly return of 1.50 percent, while the portfolio of big financial firms earn a mean monthly return of 1.04 percent.

In sum, we find little evidence that COMPUSTAT survivorship bias dramatically affects the estimate of the size or book-to-market premium, in either an economic or statistical sense. Our results, in combination with those of Chan, Jegadeesh, and Lakonishok (1995) and Cohen and Polk (1996) indicate that

survivorship bias in COMPUSTAT data does not dramatically affect the conclusions of Fama and French (1992).

IV. Conclusion

This research analyzes the returns for a sizable holdout sample of financial firms, which Fama and French (1992) exclude from their analysis. Our analysis reveals that the relation between size, book-to-market, and security returns is similar for financial and nonfinancial firms. In short, firm size and book-to-market ratios have similar meanings for financial and nonfinancial firms—at least as they relate to security returns. Our evidence, in combination with that of Davis (1994) for the preCOMPUSTAT period and Chan, Hamao, and Lakonishok (1991) for Japanese markets, documents the robustness of the book-to-market/return relation and allows us to reject the hypothesis that this relation is a result of collective data-snooping by academics, as some have maintained. Furthermore, we present evidence that survivorship bias in COMPUSTAT data does not significantly affect the estimate of the size or book-to-market premium for either financial or nonfinancial firms, as suggested by Kothari, Shanken, and Sloan (1995).

This research, and the accumulating evidence, indicates that firm size and book-to-market ratios explain in an economically meaningful way cross-sectional variation in security returns. At this juncture, the critical issue, which remains unresolved, is whether size and book-to-market are proxies for unidentified risk factors (as suggested by Fama and French, 1993, 1996) or security mispricing (as suggested by Lakonishok, Shleifer, and Vishny, 1994). Data-snooping and COMPUSTAT survivorship bias cannot explain the relation.

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