

**PERFORMANCE OF THE EQUITY PRICE TO BOOK RATIO
AS A SUBSTITUTE FOR TOBIN'S Q**

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ABSTRACT: "q", the ratio of market value to current replacement cost, has increasingly displaced the traditional accounting rate of return ("ARR") as a measure of economic performance in studies of industrial organization and corporate control. The q ratio incorporates financial market information about economic performance that is more comprehensive than the information contained in the ARR. Nonetheless, q ratios are not always available or computable for the desired firms or frequency. This study tests whether the q ratio can be proxied by an alternative and more readily available measure: the equity price to book ratio ("PB"). The PB ratio has been used in one form or another by Fama and French (1991), Hirschey (1985), Fruhan (1979), Sullivan (1977), and Thomadakis (1977). The hypothesis that PB is a good substitute for q, even in complex empirical analyses, is supported.

The "q" ratio attributed to Tobin (1969) and Brainard and Tobin (1968) is widely accepted as a theoretically proper measure of corporate economic performance. The many important issues involved in the empirical estimation of q were addressed by Lindenberg and Ross (1981), who presented a methodology and application to a sample of 246 corporations over an 18 year period. Following their methodology, many studies have employed q estimates in research analyses. In addition, Hall, Cummins, Laderman, and Mundy, have developed a database (R&D MasterFile, 1985) on 2,601 corporations for the years 1958-84 which readily permit the estimation of the q ratio for a large sample of firms.

The widespread use of q estimates has been driven in large part by the recognition of the many theoretical and empirical deficiencies of accounting measures in traditional tests about the relationship between profitability and underlying economic variables.¹ For example, Smirlock, Gilligan, and Marshall ("SGM", 1984) have suggested that the q ratio is a superior alternative to accounting rates of return in empirical tests determining the source of excess profitability.

Nonetheless, estimates of q ratios are not always available or computable at the desired frequency, for the desired firms, at the desired timeliness. For such cases, it would

¹ Fisher and McGowan (1983, page 8), for example, have asserted that the use of "accounting rates of return to make inferences about monopoly profits is a baseless procedure". Notable examples of accounting-based studies are Bain (1956), Shepherd (1972), and Sullivan (1977). Weiss (1974) presents a review of other earlier studies and Benston (1985) summarizes more recent work.

be extremely useful to use other, readily available proxies to serve as substitutes for q . Toward that end, this paper examines whether the simply constructed equity price to book ratio (PB) serves as a useful proxy for q in complex econometric tests.

The q estimates we use are from two sources: Lindenberg and Ross (1981) and the R&D MasterFile (1985). We construct PB ratios with MasterFile data for an overlapping set of firms and time period, and three analyses are carried out. First, the simple cross-sectional correlation coefficients between q and PB ratios are computed. In thirteen of fifteen years during the period (1963-77), as well as in all five-year subperiods, the correlation coefficient between the Lindenberg-Ross q ratio and the traditional PB ratio exceeds 0.950 for a sample of 168 common firms. For the entire 15-year period, the average correlation is 0.977. Second, the Smirlock, Gilligan, and Marshall study of the structure-conduct-performance relationship is replicated, except that the q and PB ratios are interchanged. The results are qualitatively invariant to the substitution; each variable significantly related to q is also significantly related to PB , and vice-versa. Third, the use of q and PB as alternative proxies for the economic rate of return is explored through a replication of a study by Salamon (1985). Again, the results are qualitatively equivalent in that the significance of coefficients is the same when either the q ratio or the PB ratio are used as proxies for the economic rate of return.

In summary, the evidence is compelling that the easily estimated equity price to book ratio is a reliable, robust proxy for carefully estimated q ratios.

1. Context of the Research

The use of accounting rate of return measures as indicators of economic performance has a long history of controversy [for example, see Harcourt (1965), Brozen (1970), Stigler (1963), Solomon (1966), Fisher and McGowan (1983), and Benston (1985)]. Nonetheless, their use has persisted primarily due to the absence of a better practical alternative. The absence of a measure which is both theoretically superior and empirically

practical creates the irony that while the theoretical weaknesses of accounting measures can be demonstrated, their empirical validity can only be guessed (as, for example, through simulation or hypothetical illustrations).²

The innovation of q , the ratio of market value of the firm to the current replacement cost of its assets, has presented researchers with a measure of performance that increasingly is being viewed as a superior alternative to accounting rate of return measures.³ Its practical importance was heightened by the work of Lindenberg and Ross ("LR" 1981), who showed how q ratios for firms could be empirically estimated. The ratios constructed by LR have played an important role in analyses employing firm level q ratios. Their ratios have been used in subsequent studies on a variety of topics by, among others, Salinger (1984), Bernier (1987), Nguyen and Bernier (1988), and Montgomery and Wernerfelt (1988a and 1988b). Likewise, the methodology introduced by LR for estimating firm level q ratios is used by a number of authors for generating their own q estimates, such as Hirschey and Wichern (1984), Hirschey (1985), Chappel and Cheng (1982 and 1984), Smirlock, Gilligan, and Marshall (1984), Chen, Cheng, and Hite (1986 and 1989), and Lang, Stulz, and Walkling (1989). A recent alternative source of estimates for firm level q ratios is the R&D MasterFile (Hall *et al*, 1985). Studies employing q ratios from the MasterFile include, among others, Morck, Vishny, and Shleifer (1988, 1989, and 1990), and Holderness and Sheehan (1988).⁴

A few studies examine the association between q and alternative financial ratios. Hirschey and Wichern (1984), for example, report a cross-sectional correlation of 0.937 between q and EV/S (excess value, i.e., market minus book equity, over sales) for a sample of 386 firms in 1977. Hirschey (1985) examines determinants of corporate profitability in

² This point is advanced by Long and Ravenscraft (1984).

³ Ijiri (1979) and Salamon (1982 and 1985) assert that the conditional internal rate of return on expected profit streams is theoretically superior to the accounting rate of return.

⁴ Other studies using q ratios at the firm level of analysis include, among others, Barclay and Litzenberger (1988) and Hayashi and Inoue (1989). These authors devise their own methodology for constructing q ratios.

1977. His empirical tests yield similar results regardless of whether q or EV/S serves as the profitability measure, leading him to conjecture that these two variables might be close substitutes. No study, however, directly examines the association over an extended time period between q and a more readily available financial ratio. The question addressed by our study is the extent to which the equity price to book ratio (PB), calculated as the ratio of stock price to stockholder's equity per share, is a substitute for q .

A number of surrogate instruments for the q ratio could have been explored. The PB ratio, however, is the most desirable proxy of q for many reasons:

- (i) The PB ratio is widely studied. For example, Fama and French (1991) conclude that the PB ratio explains a significant proportion of the variation in average stock returns. Similarly, studies exploring the link between PB and economic rents have been conducted by Hirschey (1985), Fruhan (1979), Sullivan (1977), and Thomadakis (1977).
- (ii) PB , like q , is a stock measure, or capitalized ratio, rather than a flow measure such as return on equity or profit margin.⁵
- (iii) PB , like q , reflects the existence of economic rents and risk premia. This attributes undoubtedly play a role in determining profitability differentials among firms.
- (iv) PB has a theoretical basis virtually identical to q . Of course, q includes the total market value of the firm whereas PB focuses only on the equity portion. *A priori*, this might reduce the correspondence between the two measures and suggest that PB is more sensitive than q to fluctuations in economic rents.
- (v) All it takes to construct PB is a balance sheet and common stock share price.

This latter point is of great practical importance.

⁵ Under some conditions, q equals the ratio of the economic profit rate to the capitalization rate, plus the ratio of the present value of growth opportunities to the capital stock. This approach is alluded to by Brainard and Tobin (1968) and is used by Holland and Myers (1980). Likewise, under those same conditions PB is a function of the ratio of the economic profit rate to the capitalization rate and the earnings retention ratio.

2. Data, Empirical Tests, and Results

In examining the relationship of PB with q , it is important to consider how q is constructed. This is especially true since q estimates, at times, have been the subject of professional criticism. For example, there are difficulties in the estimation of the market value of the firm, the numerator of the q ratio. There are many non-traded or thinly-traded securities such as preferred stock or debt for which valuation by the researcher is exceedingly complex. Assumptions must be made about "the maturity distribution of the firm's bonds, their coupon rates, and the current yield to maturity" (LR, 1981, p. 11). Klock, Thies, and Baum (1991) show that imputed market values may contain significant measurement error. Likewise, there is mounting evidence that current replacement cost estimates, the denominator of q ratios, are biased due to business cycle or tax effects (Downs, 1992).

In order to strengthen confidence about the inferences from our analyses of PB and q , we obtain q ratios from two different sources. Lindenberg-Ross (1981) generously provided their annual q ratio estimates for 246 firms throughout 1960-77, and the R&D MasterFile accumulated by Hall, Cummins, Laderman, and Mundy (1985) under the auspices of the National Bureau of Economic Research provides information on q ratios for 2,601 manufacturing firms throughout 1958-84. These are perhaps the two most widely used and respected sources of q ratios utilized by researchers in finance and economics.

An overlapping sample of firms appearing in both LR and MasterFile is developed. Of the 246 firms for which Lindenberg and Ross calculate q ratios, 168 firms could be identified on the MasterFile with complete information for each year 1963-77.⁶ Some summary statistics for the 168 firms are presented in Table 1. For each firm, a q ratio in each year is constructed as the total market value of the firm (the variable VAL on the MasterFile) divided by the inflation adjusted net capital stock ($NETCAP$). Average q

⁶ The number of overlapping firms was reduced to only 123 when the entire LR sample period of 1960-77 was used. Consequently, the shorter interval 1963-77 was selected because it yielded significantly more firms.

ratios for each of the 168 firms are computed with MasterFile data and subsequently they are correlated with the LR q ratios. The simple cross-sectional correlation coefficient equals 0.956 when the firm average is computed for the entire 1963-77 sample period. When firm averages are based on five-year subsamples, the correlation coefficients for the 168 firms are 0.941 for 1963-67, 0.970 for 1968-72, and 0.964 for 1973-77. Annually, the correlation coefficients between the 168 LR and MasterFile q ratios exceed ninety-five percent in 11 of 15 years. These statistics indicate that even though there are differences in the algorithms used by LR and MasterFile for computing q , the resulting ratios are very similar.

PB ratios were calculated for each firm for each year with balance sheet data (and common stock prices) from the MasterFile. Table 2 presents information about the correlation between the PB ratios and the analogous q ratios from LR or from the MasterFile. Simple correlation coefficients are computed for the cross-sectional comparison between a given year's q ratios and that year's PB ratios. Correlation coefficients also are shown for the comparison between 5-year average q and 5-year average PB ratios and, likewise, correlation coefficients are shown for the 15-year averages (1963-77). In thirteen of fifteen years the annual correlations between PB and the LR q ratios exceed ninety-five percent, and the lowest value of 0.936 in 1975 still indicates a significant degree of correlation. For each 5-year subperiod, the correlation coefficient between a firm's average q (from LR) and its average PB also exceeds ninety-five percent. Similarly, the 15-year average q (from LR) and PB ratios across the 168 firms are correlated with a coefficient of 0.977. The correlation between PB and the q ratios from the MasterFile are qualitatively similar. From almost any perspective, the q and PB ratios are significantly correlated.

High correlation among two series does not necessarily imply that they behave similarly in empirical analyses. To examine whether q and PB behave similarly, a second mode of analysis is conducted in which these two ratios are interchanged. One of the

significant studies in the extant literature on the structure-conduct performance relationship is replicated.

The study by Smirlock, Gilligan, and Marshall (SGM, 1984) employs q at the firm level of analysis in order to ascertain the source of the excess profitability that is earned by leading firms in an industry. Competing theories are that, on the one hand, superior performance occurs because leading firms have an efficient structure that leads to diminished costs. On the other hand, it is argued that perhaps leading firms conduct business so as to capitalize monopoly profits. SGM present new evidence about whether structure or conduct is the most important determinant of excess profitability by empirically estimating the equation

$$R = a_0 + \sum_{i=1}^n a_i X_i + e, \quad (1)$$

where R is a measure of firm rents, X is a vector of control variables frequently employed in the literature, and e are the residual errors from the ordinary least squares regression (e denotes residuals throughout the remainder of this study).⁷ SGM explain that acceptance or rejection of one or another of the competing theories depends on the significance of the estimated coefficients in equation 1. Our interest here is not to discriminate between competing theories, but rather to examine the substitutability of PB for q .

The data employed by SGM to estimate the coefficients in equation 1 include q ratios as measures of firm rents (a methodology similar to LR is used by SGM to construct q), and right-hand-side variables are obtained from Shepherd (1986). The results from SGM are replicated herein with the purpose of deducing the effects of interchanging the q and PB ratios. Permission to use the same right-hand-side data was granted by Shepherd, and the data was generously supplied to us by Sullivan (1977).⁸ The left-hand-side variable

⁷ The control variables, subsequently employed in the estimates presented in Table 4, are discussed in detail by Shepherd (1986). In brief, though, the variables are: market share (MS), four-firm concentration ratio (CR), market share growth (MSG), barriers to entry dummies (moderate, $MBTE$, or high, $HBTE$), and a concentration ratio dummy (CR^*).

⁸ Our request to SGM for their q data was unsuccessful and consequently an identical replication of their study is not possible. The SGM sample consisted of 132 of the Shepherd firms over the period 1961-70. The sample

is proxied by the q ratios generously supplied by Lindenberg and Ross (results obtained by using the MasterFile q ratios are also computed but they are qualitatively similar and are not shown).

Table 3 presents summary information about the firms in the SGM study and in our replication with the LR data. The average q for our sample is 2.33 compared to 2.30 for SGM; our market share variable (MS) has a mean of 25.56 compared to 24.35 for SGM, etc. The data used in our replication closely approximates the data used by SGM.

SGM estimate four variants of equation 1. The results from their study are presented in Table 4 in the rows labeled 4.1-SGM, 4.2-SGM, 4.3-SGM, and 4.4-SGM. Results from our replication are presented in the rows labeled 4.1- q , 4.2- q , 4.3- q , and 4.4- q . Substantial discussion on the interpretation of the coefficients is presented in SGM and is not repeated here. The main insight from the regression results is that the influence of concentration is dominated by the market share effect.

The important point for the current study is that the replication is successful because the variables they find significant (in rows 4.1-SGM, 4.2-SGM, etc.) also are significant herein (in rows 4.1- q , 4.2- q , etc.) In order to determine whether the PB ratio may be substituted for the q ratio without loss of information, all equations are re-estimated with PB as the dependent variable instead of q . Those results are presented in the rows labeled 4.1-PB, 4.2-PB, 4.3-PB, and 4.4-PB. The results are qualitatively the same as with q . The variables that are significant in, say, equation 4.4- q also are significant in 4.4-PB and vice versa. Qualitatively, and to a lesser extent quantitatively, the q and PB ratios behave similarly.⁹

herein consists of the Shepherd firms for which LR q ratios are available and equals 74 firms over the 1963-70 sample period.

⁹ The significance of the incremental information content in q is inferred by obtaining fitted values for PB (denoted $PBHAT$) from equation 4.4-PB. Next, q is regressed on $PBHAT$. The resulting equation has a sum-of-squared residuals (SSR) equal to 91.74. This latter regression is a restricted version of equation 4.4- q , whose SSR equals 89.76. The stability of the coefficients across these two equations is evidence that " PB contains the same information as q ". The F-statistic for that hypothesis is $(\Delta SSR/4)/(89.76/68)$, or 0.375, and the hypothesis is not rejected.

A third mode of analysis for assessing the substitutability of *PB* for *q* is to assess the relative performance of *PB* as an instrument for the economic rate of return. Part of the profitability controversy has focused on the role of accounting rate of return measures (*ARR*). Fisher and McGowan (1983) theorize that *ARR* contain systematic biases about true economic profit rates. Salamon (1985) devises a methodology for testing this conjecture. The methodology herein follows Salamon, but a different dataset and model is used.

The firms studied in this analysis include the 168 firms in the overlapping LR and MasterFile sample sets for the 1973-77 sample period. Salamon examines a five year sample period for the years 1974-78. His sample period could not be matched exactly because the LR *q* series ends in 1977. Salamon analyzes firms from *Compustat* for which there is complete data and ends up with 197 firms. All data in our analysis, with the exception of the LR *q* ratios, is taken from the MasterFile. The *ARR* for each firm in each of the five years is proxied by the *GRATE* variable on the MasterFile; *GRATE* is defined as the ratio of gross cash flows to the gross capital stock adjusted for inflation, with gross cash flows equaling Income before Extraordinary Items, Depreciation, and Interest Income less an inventory valuation adjustment and an imputed income from short-term assets. The simple average of a firm's five annual *ARR*'s is taken as the *ARR* of the firm for the period 1973-77.

Our study, like Salamon's, examines the relationship between *ARR* and firm size. The *SIZE* variable for each firm is equal to the firm's five-year average of total book assets. Total book assets is computed as the net book value of the firm's physical plant (variable *BKPLANT*) plus total current assets (variable *CURRASST*). The following equation is estimated for the 168 firms in the sample,

$$ARR = a_0 + a_1 SIZE + e. \quad (3)$$

Those results, listed in row 5.1 of Table 5, show that there is a positive and significant relationship between the *ARR* and *SIZE*. This may reflect either superior economic

performance by large firms or a systematic bias in the accounting conventions adopted by large relative to small firms.

To deduce whether there is a systematic bias, the *ARR* is regressed on the proxy for the economic profit rate, *P*, as in

$$ARR = b_0 + b_1 P + RES. \quad (4)$$

The residuals from this regression, denoted *RES*, are subsequently regressed on *SIZE*:

$$RES = c_0 + c_1 SIZE + e, \quad (5)$$

Regression equation 4 partitions the *ARR* into two components. One component ($b_1 P$) carries information about the economic profit rate. The other (*RES*) conveys "other information" and can be thought of as a biasing component of the *ARR*. If the estimated coefficient c_1 is statistically significant, and if *P* is not significantly related to *SIZE*, it can be concluded that the biasing component (*RES*) is responsible for the significant relationship between the *ARR* and *SIZE*.

Salamon measures *P* by constructing a conditional internal rate of return variable (*CIRR*). The *CIRR* is estimated within the theoretical framework set up in Ijiri (1979) and Salamon (1982) and requires estimating from the firm's financial statements measures of (i) the constant growth rate in the firm's gross investment, (ii) the useful life of a composite investment, (iii) the internal rate of return on the composite investment, and (iv) the pattern of cash flows produced by the composite investment. Salamon (1985) finds that the residuals in equation 5 are significantly related to firm size (i.e., the coefficient c_1 is significantly positive) and concludes that the *ARR* is a systematically biased measure of the economic rate of return.

The complexity of the computation involved in estimating the *CIRR* and the important role of this proxy in the subsequent steps in the analysis, leads one to question the importance of the proxy selection in determining the conclusions of the study. Herein, that conclusion is re-examined by using the same methodology as Salamon, except the true

economic profit rate is proxied by the LR q and PB ratios instead of the $CIRR$ (the MasterFile q ratios yield equivalent results).

Equation 4 is estimated by employing q as a proxy for P , the economic profit rate. Those results are presented in row 5.2-q of Table 5. There is a highly significant positive relationship between the ARR and q . The t-statistic is 17.52 and the corrected R^2 , at 0.65, indicates that a substantial proportion of the variation in the ARR is explained by variation in q . The residuals from this equation are regressed on $SIZE$, with the results of that estimation listed in row 5.3-q. The residuals are significantly and positively related to $SIZE$, with a t-statistic equal to 2.89. Importantly, the regression of q on $SIZE$, listed in row 5.4-q, indicates the economic profit rate is not significantly related to firm size, even though ARR and $SIZE$ are related.

While the results herein are consistent with those reported by Salamon, the primary concern is the relative performance of the q and PB ratios as instruments for the true economic profit rate. The results obtained in rows 5.2-q through 5.4-q are re-estimated for the case when the proxy for the true economic profit rate is the PB ratio. Those estimates are listed in rows 5.2-PB through 5.4-PB, respectively. The estimates are qualitatively the same and further demonstrate that the PB and q ratios are interchangeable substitutes, even in complex analyses.

3. Conclusion

Perhaps it is because accounting measures are widely criticized as biased estimates of profitability that many researchers have preferred to employ Tobin's q in their analyses. Obtaining q ratios at the firm level of analysis for the desired frequency or timeliness, however, is not always possible due to data limitations. In such instances, more readily available proxies for q are desirable. In this study, we examine the performance of the equity price to book ratio (PB) as such a proxy.

Three analyses are carried out. First, the simple correlation coefficients between q and PB ratios are computed. Second, the study by Smirlock, Gilligan, and Marshall (1984) is replicated, except that the q and PB ratios are interchanged. Third, the methodology devised by Salamon (1985) is used with the q and PB ratios in order to determine whether accounting rates of return contain systematic biases. In all three analyses the hypothesis of this study is supported. Tobin's q ratio and the equity price to book ratio are interchangeable empirical proxies.

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TABLE 1: Comparison of summary statistics for data from two sources for 168 firms of Tobin's q and equity price to book ratios

	Average	Std Error	Minimum	Maximum
<i>Lindenberg-Ross q ratio</i>				
1963-77	1.54	1.09	0.45	8.47
1963-67	1.90	1.52	0.52	10.73
1968-72	1.71	1.40	0.43	11.66
1973-77	1.00	0.57	0.33	4.08
<i>NBER MasterFile q ratio</i>				
1963-77	1.70	1.96	0.41	14.68
1963-67	2.32	3.13	0.47	22.73
1968-72	1.87	2.33	0.38	18.98
1973-77	0.91	0.82	0.25	5.76
<i>Equity price/book ratio</i>				
1963-77	1.95	1.73	0.45	13.75
1963-67	2.39	2.37	0.42	16.94
1968-72	2.22	2.21	0.49	19.35
1973-77	1.23	0.94	0.25	5.00
<i>Average sales (millions dollars)</i>				
1963-77	1549.2	3266.7	88.9	28279.0
<i>Average total assets (millions dollars)</i>				
1963-77	1196.6	2357.5	66.5	20160.0

Notes:

Lindenberg and Ross (LR, 1981) generously supplied their annual q ratios.

NBER q ratios are constructed for the matched LR firms with data from the R&D MasterFile (Hall, Cummins, Laderman, and Mundy, 1985).

Equity price to book ratios are constructed for the matched LR firms with data from the R&D MasterFile.

TABLE 2: Correlation coefficients for 168 firms between equity price to book ratios and q ratios

Cross-Sectional Correlation Coefficient		
	q ratio from LR	q ratio from MasterFile
<i>Annual</i>		
1963	.978	.905
1964	.971	.884
1965	.957	.869
1966	.969	.939
1967	.977	.949
1968	.971	.949
1969	.981	.930
1970	.974	.957
1971	.974	.964
1972	.978	.966
1973	.966	.953
1974	.949	.953
1975	.936	.936
1976	.954	.932
1977	.955	.944
<i>Five-year averages</i>		
1963-67	.973	.911
1968-72	.978	.956
1973-77	.959	.948
<i>Fifteen-year average</i>		
1963-77	.977	.977

Notes:

q ratios are obtained from Lindenberg and Ross (LR, 1981) and from the R&D Masterfile (Hall, Cummins, Laderman, and Mundy, 1985).

Equity price to book ratio ratios are constructed for the matched LR firms with data from the R&D MasterFile.

TABLE 3: Summary statistics for data in Smirlock, Gilligan, and Marshall (SGM, 1984) and for the replication herein

Variable	Mean	<i>For the replication</i>		Max	<i>For SGM</i>	
		Std Dev	Min		Mean	Std Dev
<i>q</i>	2.33	1.87	.49	10.59	2.30	1.62
<i>PB</i>	3.03	3.00	.56	17.79	--	--
<i>MS</i>	25.56	15.07	5.00	68.00	24.35	14.09
<i>CR</i>	67.91	17.36	25.00	95.00	65.92	17.39
<i>SIZE</i>	6.18	1.19	4.27	9.71	6.35	1.18
<i>MSG</i>	1.02	.21	.85	2.33	1.01	.19

Notes:

In the replication and in SGM the variables MS (average Market Share) and CR (Concentration Ratio) are obtained from Shepherd (1986). SIZE denotes log of SALES, and MSG denotes market share growth.

SGM analyze 132 firms, 1961-70, employing q ratios that they construct.

The replication analyzes 74 firms, 1963-70, employing q ratios obtained from Lindenberg-Ross (1981).

TABLE 4: Regression results from Smirlock, Gilligan and Marshall (SGM, 1984), and from the replications with the q and PB ratios

Eq.	Intercept	MS	CR	MBTE	HBTE	MSG	CR*	Adj R ²	SSR
4.1-SGM	-2.33* (-3.35)	.061* (7.45)		.352 (1.27)	.571 (1.60)	2.79* (4.77)			208.75
4.1-q	-2.86* (-3.03)	.073* (6.61)		.279 (.62)	.291 (.53)	3.01* (3.92)		.48	126.41
4.1-PB	-5.51* (-3.85)	.126* (7.46)		.014 (.20)	-.190 (-.23)	5.24* (4.51)		.53	290.06
4.2-SGM	-2.44* (-2.96)		.037* (4.49)	.104 (.32)	.215 (.48)	2.16* (3.30)			258.72
4.2-q	-4.00* (-3.42)		.053* (4.24)	.156 (.29)	-.084 (-.12)	2.62* (2.94)		.32	163.82
4.2-PB	-7.14* (-3.81)		.082* (4.12)	-.115 (-.14)	-.608 (-.56)	4.710* (3.30)		.32	450.54
4.3-SGM	-2.60* (-3.51)	.055* (3.61)	.009 (1.05)	.261 (.90)	.380 (.95)	2.67* (4.50)			206.91
4.3-q	-3.44* (-3.34)	.063* (4.75)	.018 (1.37)	.156 (.34)	-.053 (-.09)	2.79* (3.57)		.48	123.01
4.3-PB	-6.12* (-3.90)	.115* (5.65)	.019 (.95)	-.116 (-.17)	-.553 (-.61)	5.01* (4.21)		.53	286.27
4.4-SGM	-2.31* (-3.49)	.052* (6.29)		.308 (.88)	.353 (1.33)	2.88* (5.14)	1.23* (3.57)		189.47
4.4-q	-2.50* (-3.10)	.054* (5.36)		.164 (.43)	-.329 (-.69)	3.02* (4.63)	2.39* (5.27)	.62	89.76
4.4-PB	-4.99* (-3.99)	.098* (6.26)		-.149 (-.25)	-1.07 (-1.44)	5.25* (5.20)	3.39* (4.82)	.64	216.25

Notes:

Independent variables are constructed and discussed by Shepherd (1986) and are identified in footnote 7.

Equations labeled -SGM are results obtained in Smirlock, Gilligan, and Marshall and use the SGM q ratio as the dependent variable. SGM do not report adjusted R^2 .

Equations labeled -q are results obtained from the replication herein and use the Lindenberg-Ross q ratio as the dependent variable.

Equations labeled -PB are results obtained herein and use the equity price to book ratio as the dependent variable.

T-statistics are in parentheses, the * indicates significance at the five percent level, and SSR denotes sum-of-squared residuals. There are 74 firms in each of our regressions.

TABLE 5: Regression results for determining whether the accounting rate of return contains a systematic bias

row	<i>variables</i>		intercept	slope	R ²	SSR
	dependent	independent				
5.1	<i>ARR</i>	<i>SIZE</i>	.0692 (26.70)	1.6×10^{-6} (2.46)	.0294	.1489
5.2-q	<i>ARR</i>	<i>q</i>	.0290 (10.25)	.0431 (17.52)	.6469	.0542
5.3-q	<i>RES^q</i>	<i>SIZE</i>	-.0020 (-1.31)	1.1×10^{-6} (2.89)	.0420	.0516
5.4-q	<i>q</i>	<i>SIZE</i>	.9800 (19.91)	1.2×10^{-5} (.93)	.0001	53.64
5.2-PB	<i>ARR</i>	<i>PB</i>	.0387 (18.37)	.0272 (19.97)	.7042	.0454
5.3-PB	<i>RES^{PB}</i>	<i>SIZE</i>	-.0017 (-1.21)	9.5×10^{-7} (2.67)	.0354	.0435
5.4-PB	<i>PB</i>	<i>SIZE</i>	1.902 (12.68)	3.7×10^{-5} (.66)	.0001	166.67

Notes

The sample set includes 168 firms over the 1973-77 sample period.

ARR is the firm's average accounting rate of return.

q is the firm's average q ratio as estimated by Lindenberg and Ross (1981).

PB is the firm's average equity price to book ratio.

SIZE is the firm's average total assets (net).

T-statistics are shown in parentheses and SSR denotes sum-of-squared residuals.