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Risk, Mispricing, and Value Investing

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Abstract. We evaluate the stock return performance of a modified version of the book-to-market strategy and its implications for market efficiency. If the previously documented superior stock return of the book-to-market strategy represents mispricing, its performance should be improved by excluding fairly valued firms with extreme book-to-market ratios. To attain this, we classify stocks as value or glamour on book-to-market ratios and accounting accruals jointly. This joint classification is likely to exclude stocks with extreme book-to-market ratios due to mismeasured accounting book values reflecting limitations underlying the accounting system. Using both 12-month buy-and-hold returns and earnings announcement returns, our results show that this joint classification generates substantially higher portfolio returns in the post-portfolio-formation year than the book-to-market classification alone with no evidence of increased risk. In addition, this superior stock return performance is more pronounced among firms held primarily by small (unsophisticated) investors and followed less closely by market participants (stock price <\$10). Finally, and most importantly, financial analysts are overly optimistic (pessimistic) about earnings of glamour (value) stock, and for a subset of firms identified as overvalued by our strategy, the earnings announcement *raw* return, as well as abnormal return, is negative. These last results are particularly important because it is hard to envision a model consistent with rational investors holding risky stocks with predictable negative *raw* returns for a long period of time rather than holding T-bills and with financial analysts systematically overestimating the earnings of these stocks while underestimating earnings of stocks that outperform the stock market.

Key words: book-to-market, market efficiency, mispricing, accruals

JEL Classification: M41, G11

1. Introduction

Value investing concerns buying (selling) stocks when their price is low (high) relative to some fundamental benchmarks such as earnings, cash from operations, dividends, or accounting book value. The premise underlying this approach is that while the true value of stocks is estimable and relatively stable, their market prices fluctuate excessively due to, among other factors, overoptimism/overpessimism, and short-term speculation.

For many decades, investment professionals and market observers have claimed that value investing produces superior returns. These claims have intrigued scholars because they are inconsistent with the maintained hypothesis of market efficiency. In an effort to evaluate the validity of these claims, researchers have investigated the performance of a variety of value strategies, uncovering a number of strategies that produce superior returns over a long period of time.[1] Still, the interpretation of these studies' findings is highly controversial. For example, while a number of studies have argued that the superior returns produced by the book-to-market strategy compensate for risk (see, e.g., Fama and French, 1992; Vassalou, 2001; Doukas, Kim and Pantzalis, 2002), others (see, e.g., La Porta et al., 1997; Griffin and Lemmon, 2002; Ali, Hwang and Trombley, 2002) have asserted that there is little evidence to support this risk explanation and offer a mispricing story instead.

Given this controversy, the purpose of this study is to develop sharper and more powerful tests that will help in distinguishing between alternative explanations (risk or mispricing) for the observed superior stock-return performance of the book-to-market strategy. To attain this, we examine a modified book-to-market strategy that attempts to exclude a subset of firms for which the book-to-market signal is likely to represent noise. Specifically, we investigate the stock return performance of a strategy that combines the book-to-market strategy (see Lakonishok, Shleifer and Vishny, 1994) and the accruals anomaly (see, Sloan, 1996), that is, buying stocks with a high book-to-market and low accruals and selling stocks with a low book-to-market ratio and high accruals.[2]

The basic intuition underlying this joint strategy follows because there are two possible explanations for an extreme book-to-market ratio. One is that the book value is mismeasured, e.g., it is temporarily low due to delayed recognition of economic transactions inherent in the financial reporting system (accounting conservatism), and the market correctly bids up a firm's stock price in anticipation of the forthcoming increase in book value. In this case, an extreme book-to-market ratio does not indicate mispricing but rather a correct anticipation of future changes in the book value. A second possible explanation for an extreme book-to-market ratio is mispricing due to expectational errors, e.g., the book value number is temporarily depressed, but the market erroneously considers the book value number to be fair, perhaps due to overly pessimistic earnings expectations reflecting investors' tendency to extrapolate past earnings performance too far into the future (see La Porta et al., 1997), and thus is currently paying for each dollar of reported book value too little.[3] This expectational error will be corrected in the future as more information arrives to the market. To maximize portfolio return and thus the ability to distinguish between alternative explanations for the superior performance of value strategies, a book-to-market strategy should pick only stocks with extreme book-to-market ratios due to expectational errors.

Accounting accruals may help identify stocks with extreme book-to-market ratios due to expectational errors for two reasons. First, accruals follow a mean reversion process, i.e., unusually low (high) accruals are likely to reverse and thus to increase (decrease) future earnings and book values; evidence in Sloan (1996, p. 305, Table 5), however, indicates that investors underestimate the extent to which accruals mean reverse. Second, the level of accruals may indicate the integrity of the reported book-value number. This follows because Generally Accepted Accounting Principles (GAAP) give company managers reporting flexibility, which may be used to inflate accounting income, and thus book values, by inflating accruals (aggressive accounting), (see, e.g., Mulford and Comiskey, 2002, pp. 26–50). Thus, low (high) accruals may indicate conservative (aggressive) accounting, which means that the actual book value is higher (lower) than it appears. Consequently, a high book-to-market ratio together with low accruals imply a higher intrinsic book value than a high book-to-market and high accruals, and a low book-to-market ratio together with high accruals imply a lower intrinsic book value than a low book-to-market and low accruals. This suggests that if the superior returns produced by the book-to-market strategy represent mispricing, a strategy that considers book-to-market and accruals jointly can perform better because it will allow to pick high book-to-market firms (value stocks) and low book-to-market firms (glamour stocks) that are more likely to be mispriced.

Similar to prior research, we find that trading strategies based on either book-to-market ratios or accounting accruals generate superior returns. We also document three types of evidence not found before which supports mispricing, not risk, as the primary explanation for the superior stock return produced by value investing.

First and most important, we document negative *raw* returns in the post-portfolio-formation year for a subsample of firms identified by a mispricing story as overvalued. Furthermore, contrary to prior research (Doukas, Kim and Pantzalis, 2002), we find that financial analysts are overly optimistic (pessimistic) about earnings of glamour (value) stock in the post-portfolio-formation year. Our focus on *raw* returns and analysts' earnings expectations are particularly important, as it alleviates the standard criticism leveled against findings indicating inefficiency. This criticism is based on the belief that one can never unambiguously reject market efficiency because a test of market efficiency is a joint test of efficiency and the assumptions about the nature of market equilibrium (Fama, 1991, p. 1575). It is nearly impossible to envision a model consistent with rational investors holding risky stocks with predictable negative *raw* returns for a long period of time rather than holding T-bills, or with financial analysts overestimating systematically the earnings of these stocks while underestimating earnings of stocks that outperform the stock market.

The second type of evidence shows that the mispricing associated with the book-to-market strategy is not distributed uniformly across all firms. Rather, as may be expected, mispricing is more pronounced among firms held primarily by small (unsophisticated) investors and followed less closely by market participants (stock price $<$\$10) than among firms with considerable institutional ownership and analyst coverage (stock price $\geq$\$10). This evidence allows for the refining of the expectational error explanation for this anomaly, offered by prior research. That is, the mispricing explanation for the book-to-market anomaly applies primarily to a subset of stocks with unsophisticated ownership, as investment professionals are typically unable to invest in firms with a stock price less than \$10 due to institutional restrictions.

Finally, our evidence shows that applying the book-to-market strategy to a subset of firms for which the book-to-market ratio is more likely to indicate mispricing results in a substantial increase in the stock return abnormal performance with no evidence of increased risk. This result extends the findings in Piotroski (2000), who demonstrates that the stock return from investing in high book-to-market firms increases substantially through the selection of financially strong high book-to-market firms.

The next section describes the methodology. Section 3 reports the results of the empirical tests and the final section briefly concludes.

2. Methodology

Each year we form portfolios on the basis of book-to-market ratios, accounting accruals, and a combination thereof based on the intersection of the two independent classifications (the joint strategy). The data used to form the portfolios, accounting book values and accruals, cover the period, 1980–1998, and are thus retrieved from the 1998 Compustat annual file (including the research file). The first year is 1980 to avoid a potential survivorship bias due to a Compustat's major expansion of its database in 1978. This expansion involved an increase in the number of firms covered by the database from 2,700 to approximately 6,000. The potential bias arises because for many of the new firms data were added retroactively for as long as five years. The last year is 1998. Because of our research design 1998 is the last year for which these accounting data can be used.

Our investigation concerns forming two portfolios each year, one consisting of "genuine" value stocks and the other of "genuine" glamour stocks. Genuine value stocks are those in the highest book-to-market quintile and the lowest accruals quintile determined independently in the year prior to the portfolio formation date. Genuine glamour stocks are those in the lowest book-to-market quintile and highest accruals quintile. In addition, we form portfolios using either book-to-market ratios or accounting accruals. One reason for creating these portfolios is that their returns serve as a benchmark against which the returns to our joint strategy are evaluated.

For each portfolio formed based on information in the financial statements of year t, we compute three alternative buy-and-hold, equally-weighted, 12-month portfolio returns beginning in May of year $t+1$ and ending in April of year $t+2$: raw returns, market-adjusted returns, and size-adjusted returns. We adjust these returns for delisting bias using the method suggested by Shumway (1997).[4] The monthly stock returns used for these analyses are obtained from 2000 Center for Research in Security Prices (CRSP) monthly returns file. The portfolio-return-accumulation period commences in May of year $t+1$ to ensure that the data needed to form the portfolios (book-to-market ratios and accruals) are publicly available, and thus avoiding a potential look-ahead bias, i.e., using information unavailable to investors at the time of the portfolio formation.[5]

In year $t+1$, we also compute cumulative three-day returns around each of the four quarterly earnings announcement dates on all stocks for which data are available for that quarter. These three-day returns are then aggregated into a 12-day return by summing up the four quarterly earnings announcement returns. The quarterly earnings announcement dates required for these earnings-announcement-return tests are retrieved from the 2000 Compustat quarterly file, and the daily stock returns around the earnings announcement dates are retrieved from the 2000 CRSP daily returns file.

Like prior research, we use only stock returns on ordinary common shares and thus exclude from the sample real estate investment trusts (REITs), American Depository Receipts (ADRs), closed-end mutual funds, foreign stocks, and Americus Trust Components. We exclude financial institutions (SIC codes 6000s) because the variables to estimate accruals are not available for these firms and firm-years with a negative book value of equity because a negative book-to-market ratio is difficult to interpret. In addition, we use only firms with a December fiscal year-end to ensure that the returns of the value and glamour stocks span identical calendar periods (as opposed to event periods). This makes testing for a difference in returns between the two types of stocks interpretable. The final sample consists of 39,227 firm-year observations for the annual buy-and-hold return analyses, covering 19 return-year periods, May 1981–April 2000, and 19,742 firm-years for the earnings announcement return analyses, covering 14 return-year periods, i.e., the first quarter of 1986–first quarter of 2000.[6]

Finally, similar to prior research (e.g., Sloan, 1996), we define accounting accruals, which represents the difference between net income and cash from operation, as:

$$\text{Accruals} = (\Delta\text{CA} - \Delta\text{Cash}) - (\Delta\text{CL} - \Delta\text{STD} - \Delta\text{TP}) - \text{DEP} \quad (1)$$

Where, ΔCA is the change in current assets (Compustat data # 4), ΔCash is the change in cash and cash equivalents (Compustat data # 1), ΔCL is the change in current liabilities (Compustat data # 5), ΔSTD is the change in short-term debt (Compustat data # 34), ΔTP is the change in taxes payable (Compustat data # 71), and DEP is depreciation and amortization expense (Compustat data # 14); all variables are scaled by average total assets.[7]

3. Empirical findings

3.1. Annual buy-and-hold portfolio returns

Table 1 displays the findings on annual buy-and-hold returns for portfolios using the book-to-market classification. The results in Panel A show that while the inter-portfolio variation of the book-to-market ratio is (by construction) substantial, ranging from 0.173 for the lowest book-to-market quintile to 1.697 for the highest quintile, the inter-portfolio variation of accruals is noticeably smaller, ranging from −0.012 to −0.050. Thus, it appears that the book-to-market anomaly and the accruals anomaly only partially overlap.

The results in Panel A also show that the difference in stock return between high and low book-to-market stocks is quite similar across the three alternative stock-return measures we use: raw returns (14.1 percent), market-adjusted returns (14.2 percent), and size-adjusted returns (13.8 percent). In addition, the size-adjusted returns generate a positive return (6.0 percent) for the value stock portfolio and a negative return (−7.8 percent) to the glamour stock portfolio. These results are comparable to those in prior research (see, e.g., La Porta et al., 1997, p. 864, Table 1, panels C and D), which used a variety of sample periods and sample selection procedures, and thus increase confidence in their robustness. Somewhat surprisingly, the results in Panel A also show that while the size-adjusted return to the value stock portfolio is positive, the percentage of firms in this portfolio with a positive return is less than 50 percent (only 45.2 percent). This indicates that value investing may be riskier than it appears when only considering the first and second moments of the portfolio-return distribution, particularly for investors who are unable or unwilling to invest in a large number of firms. This also highlights the importance of our approach to improve value strategy performance by identifying a subset of firms for which book-to-market ratios are more likely to indicate mispricing.

Table 1. Average annual buy-and-hold returns for year $t+1$ on portfolios based on book-to-market ratios at the end of year t

BM quintile	*N* Firm years	Average accrual[a]	Average BM[b]	Average (median) price[c]	Average (median) trading volume[d]	Average (median) MVE ($mil)	Raw returns[e]	Market-adjusted returns[f]	Size-adjusted returns[g]	% Positive size-adjusted returns
				Panel A: Full sample						
Low 1	7839	−0.012	0.173	19.76 (12.88)	1.23 (0.74)	1785 (110)	0.060	−0.109	−0.078	35.2
2–4	23547	−0.026	0.602	19.84 (15.25)	0.95 (0.58)	1078 (130)	0.154	−0.014	0.013	42.7
High 5	7841	−0.050	1.697	9.96 (6.25)	1.02 (0.40)	235 (26)	0.201	0.033	0.060	45.2
	39227									
Mean difference 5–1							0.141	0.142	0.138	
T-stat for mean difference 5–1							3.72***	3.72***	3.43***	
				Panel B: Partitioning the sample by stock price						
Stock price ≥ $10										
Low 1	4432	0.000	0.183	31.79 (25.50)	1.50 (0.87)	3121 (396)	0.111	−0.058	−0.034	39.4
2–4	15090	−0.026	0.597	28.24 (23.50)	0.98 (0.56)	1648 (345)	0.152	−0.017	0.008	44.9
High 5	2676	−0.038	1.522	21.49 (17.25)	1.76 (0.41)	612 (127)	0.163	−0.006	0.023	49.3
	22198									
Mean difference 5–1							0.052	0.052	0.057	
T-stat for mean difference 5–1							1.09	1.09	1.14	
Stock price < $10										
Low 1	3386	−0.028	0.159	4.00 (3.50)	0.88 (0.58)	47 (22)	0.002	−0.166	−0.132	29.7
2–4	8443	−0.026	0.612	4.82 (4.75)	0.92 (0.60)	60 (24)	0.149	−0.020	0.015	38.9
High 5	5163	−0.056	1.787	3.98 (3.50)	0.63 (0.38)	39 (13)	0.209	0.040	0.072	43.1
	16992									
Mean difference 5–1							0.207	0.206	0.204	
T-stat for mean difference 5–1							5.13***	5.13***	5.04***	

The breakpoints for portfolios are determined annually by assigning all sample firms into quintiles based on the magnitude of book-to-market in year t. Equally-weighted portfolio returns are computed for each year (year $t+1$), and averaged over the 19 sample years, May 1981–April 2000. Statistical significance at the 1 percent, 5 percent, and 10 percent, two-tailed levels, are represented respectively by ***, ** and *.

[a]Accruals = (ΔCA − ΔCash) − (ΔCL − ΔSTD − ΔTP) − DEP

Where

ΔCA = change in current assets (#4)/Average Assets (#6)
ΔCash = change in cash/cash equivalents (#1)/Average Assets (#6)
ΔCL = change in current liabilities (#5)/Average Assets (#6)
ΔSTD = change in short-term debt (#34)/Average Assets (#6)
ΔTP = change in taxes payable (#71)/Average Assets (#6)
DEP = depreciation and amortization expense (#14)/Average Assets (#6)

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[b]BM: Book value of common stockholders' equity (#60)/market value of equity (#24*#199) at the end of year t.
[c]Closing price (#199).
[d]Trading volume is computed by dividing the number of shares traded (#28)/average number of shares outstanding (#25) for year t.
[e]Twelve-month buy-and-hold stock returns beginning four months after the end of year t.
[f]Market adjusted returns are computed for each stock in the portfolio by subtracting the annual buy-and-hold CRSP value-weighted returns from the annual buy-and-hold raw returns for the stock.
[g]Size-adjusted annual returns are obtained for each stock in the portfolio, by subtracting the annual buy-and-hold return on a benchmark portfolio consisting of stocks in the same size decile. The size decile breakpoints are obtained from the following website of French:

http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html

To be able to ascribe the difference in return between value and glamour portfolios to the association between book-to-market and returns, it is necessary that the book-to-market portfolios be balanced in terms of other variables shown by prior research to be important in explaining cross-sectional variation in stock returns. However, reviewing the summary statistics for three such variables, stock price, share turnover, and firm size (market capitalization) as reported in Panel A reveals differences between high and low book-to-market firms (particularly) in terms of stock price and firm size.

Can the inter-portfolio differences in these two variables explain the difference in their annual stock return performance? To shed light on this question we replicate the tests in Panel A after partitioning the sample into two subsamples: low stock-price sample (stock price <\$10) and high stock-price sample (stock price ≥\$10). We select \$10 to be the cutoff point because institutional investors (sophisticated investors) are typically reluctant or even prohibited by institutional bylaws to invest in stocks whose price is below \$10, which makes these stocks more likely to be mispriced. [8] Panel B of Table 1 reports the results of this analysis. There are two points to notice. First, within each subsample the inter-portfolio variation is reduced not only in terms of the stock price but also in terms of firm size. This is to be expected as firm size and stock price are positively correlated. Second, and more importantly, firms with stock price ≥\$10 exhibit a relatively small and statistically insignificant difference in annual return between high and low book-to-market stocks (5.2 percent using raw returns or market adjusted returns; 5.7 percent using size-adjusted returns). These returns are substantially smaller than those for the subsample of firms with stock price <\$10 displayed in Panel C−20.7 percent using raw returns, 20.6 percent using market adjusted returns, and 20.4 percent using size adjusted returns—which are highly significant.[9] These findings allow the refining of the expectational error explanation for the book-to-market anomaly, offered by prior research (La Porta et al., 1997). That is, the mispricing explanation for the book-to-market anomaly applies only to a subset of stocks with primarily unsophisticated ownership, as investment professionals are typically unable to invest in firms with a stock price less than \$10 due to institutional restrictions.[10]

Table 2 reports findings on annual buy-and-hold returns for portfolios using the accruals classification. The difference in return between the high and low accruals firms reported

Table 2. Average annual buy-and-hold returns for year $t+1$ on portfolios based on accruals at the end of year t

Accrual quintile	*N* Firm years	Average accrual[a]	Average BM[b]	Average (median) price[c]	Average (median) trading volume[d]	Average (median) MVE ($mil)	Raw returns[e]	Market-adjusted returns[f]	Size-adjusted returns[g]	% Positive size-adjusted returns
Panel A: Full sample										
Low 1	7839	−0.173	0.789	12.38 (6.75)	0.89 (0.56)	694 (42)	0.153	−0.016	0.014	41.1
2–4	23547	−0.034	0.757	20.97 (16.12)	0.95 (0.52)	1428 (146)	0.164	−0.005	0.021	44.1
High 5	7841	0.135	0.615	13.89 (9.75)	1.37 (0.73)	273 (54)	0.079	−0.089	−0.056	35.2
	39227									
Mean difference 1–5							0.074	0.073	0.070	
T-stat for mean difference 1–5							2.96***	2.95***	2.84***	
Panel B: Partitioning the sample by stock price										
Stock price ≥ $10										
Low 1	3054	−0.143	0.621	25.91 (20.25)	1.02 (0.65)	1707 (264)	0.161	−0.008	0.018	45.3
2–4	15286	−0.034	0.653	29.75 (24.50)	1.05 (0.53)	2167 (412)	0.162	−0.007	0.017	45.9
High 5	3858	0.120	0.522	23.49 (19.13)	1.81 (0.89)	516 (165)	0.085	−0.083	−0.050	37.2
	22198									
Mean difference 1–5							0.076	0.075	0.068	
T-stat for mean difference 1–5							3.73***	3.72***	3.29***	
Stock price < $10										
Low 1	4771	−0.192	0.898	3.72 (3.19)	0.81 (0.50)	45 (16)	0.143	−0.026	0.007	38.4
2–4	8245	−0.033	0.951	4.70 (4.50)	0.78 (0.51)	61 (32)	0.158	−0.011	0.023	40.8
High 5	3976	0.149	0.705	4.59 (4.38)	0.93 (0.60)	37 (19)	0.074	−0.094	−0.061	33.2
	16992									
Mean difference 1–5							0.069	0.068	0.068	
T-stat for mean difference 1–5							2.16**	2.15**	2.13**	

The breakpoints for portfolios are determined annually by assigning all sample firms into quintiles based on the magnitude of accruals in year t. Equally-weighted portfolio returns are computed for each year (year $t+1$), and averaged over the 19 sample years, May 1981–April 2000. Statistical significance at the 1 percent, 5 percent, and 10 percent, two-tailed levels, are represented respectively by ***, ** and *.

[a]Accruals = (ΔCA − ΔCash) − (ΔCL − ΔSTD − ΔTP) − DEP

Where

ΔCA = change in current assets (#4)/Average Assets (#6)
ΔCash = change in cash/cash equivalents (#1)/Average Assets (#6)
ΔCL = change in current liabilities (#5)/Average Assets (#6)
ΔSTD = change in short-term debt (#34)/Average Assets (#6)
ΔTP = change in taxes payable (#71)/Average Assets (#6)
DEP = depreciation and amortization expense (#14)/Average Assets (#6)

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[b] BM = Book value of common stockholders' equity (#60) / market value of equity (#24*#199) at the end of year t.
[c] Closing price (#199).
[d] Trading volume is computed by dividing the number of shares traded (#28)/average number of shares outstanding (#25) for year t.
[e] Twelve-month buy-and-hold stock returns beginning four months after the end of year t.
[f] Market adjusted returns are computed for each stock in the portfolio by subtracting the annual buy-and-hold CRSP value-weighted returns from the annual buy-and-hold raw returns for the stock.
[g] Size-adjusted annual returns are obtained for each stock in the portfolio, by subtracting the annual buy-and-hold return on a benchmark portfolio consisting of stocks in the same size decile. The size decile breakpoints are obtained from the following website of French:

http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html

in Panel A is remarkably similar across our three alternative return measures: 7.4 percent, 7.3 percent, and 7.0 percent using raw returns, market-adjusted returns, and size-adjusted returns, respectively. Also, the size-adjusted-return measure generates a positive return (1.4 percent) for the low accruals portfolio and a negative return (−5.6 percent) for the high accruals portfolio. These results are comparable to Sloan (1996, p. 307, Table 6), who uses a different sample period (1962–1991) and a different sample selection procedure, which increases confidence in their robustness. It is interesting to note, however, that the high accruals firms and the low accruals firms differ from other sample firms with respect to their average stock price. While the average stock price for each of the two extreme accrual portfolios is approximately $13, the average stock price for firms in the other portfolios is $21.

Given this difference in stock price and the difference in return patterns between subsamples of firms with low and high stock prices as documented above, we replicate the tests in Panel A after partitioning the sample into two subsamples: low stock-price sample (stock price <$10) and high stock-price sample (stock price ≥$10). Panel B of Table 2 reports the results for these analyses. The key finding in Panel B is that unlike the results for the book-to-market classification, the returns to the accounting accruals classification is quite similar across the two subsamples. For example, the difference in size-adjusted return between high accruals and low accruals stocks for both the subsample of firms with a stock price <$10 and the subsample of firms with a stock price ≥$10 is 6.8 percent. One way to interpret these findings is that both types of investors, sophisticated and unsophisticated, have similar difficulty in pricing accounting accruals.

Table 3 presents findings on annual buy-and-hold returns for portfolios using the two-way classification in which value stocks are the subset of high book-to-market stocks that are in the lowest accruals quintile, and glamour stocks are the subset of low book-to-market stocks that are in the highest accruals quintile. The results in Panel A for the full sample show that the difference in raw return, market-adjusted return, and size-adjusted return between the newly defined value and glamour portfolios are 20.6 percent, 20.6 percent, and 20.0 percent, respectively. These returns are thus robust to the way they are measured, and are about twice as high as the return differential between the extreme portfolios generated by either the book-to-market classification or the accruals classification alone. In addition,

Table 3. Average annual buy-and-hold returns for year $t+1$ on portfolios based on accruals and book-to-market ratios combined at the end of year t

BM/ ACC	*N* Firm years	Average accrual[a]	Average BM[b]	Average (median) Price[c]	Average (median) trading volume[d]	Average (median) MVE ($mil)	Raw returns[e]	Market-adjusted returns[f]	Size-adjusted returns[g]	% Positive size-adjusted returns
Panel A: Full sample										
High/Low 1	1981	−0.169	1.720	6.82	0.65	152	0.225	0.057	0.086	46.0
				(3.88)	(0.40)	(16)				
Low/High 2	2338	0.160	0.178	16.92	1.53	435	0.019	−0.149	−0.114	31.1
				(11.88)	(0.87)	(75)				
Mean difference 1–2							0.206	0.206	0.200	
T-stat for mean difference 1–2							5.50***	5.50***	5.12***	
Panel B: Partitioning the sample by stock price										
Stock price ≥ $10										
High/Low 1	428	−0.139	1.443	19.22	0.71	597	0.189	0.020	0.052	53.3
				(15.81)	(0.49)	(95)				
Low/High 2	1284	0.144	0.184	27.33	2.10	761	0.046	−0.122	−0.092	32.9
				(23.00)	(1.21)	(240)				
Mean difference 1–2							0.143	0.142	0.134	
T-stat for mean difference 1–2							2.94***	2.94***	2.87**	
Stock price < $10										
High/Low 1	1553	−0.177	1.80	3.40	0.63	29	0.226	0.057	0.088	44.0
				(2.75)	(0.38)	(11)				
Low/High 2	1048	0.180	0.17	4.17	1.05	42	−0.009	−0.177	−0.143	28.8
				(3.75)	(0.58)	(20)				
Mean difference 1–2							0.235	0.234	0.231	
T-stat for mean difference 1–2							4.72***	4.72***	4.65***	

The breakpoints for portfolios are determined annually by assigning all sample firms into quintiles based on the magnitude of book-to-market and accruals determined independently in year t. Equally-weighted portfolio returns are computed for each year (year $t+1$), and averaged over the 19 sample years, May 1981 – April 2000. Statistical significance at the 1 percent, 5 percent, and 10 percent, two-tailed levels, are represented respectively by ***, ** and *.

[a]Accruals = (ΔCA – ΔCash) – (ΔCL – ΔSTD – ΔTP) – DEP

Where

ΔCA = change in current assets (#4)/Average Assets (#6)
ΔCash = change in cash/cash equivalents (#1)/Average Assets (#6)
ΔCL = change in current liabilities (#5)/Average Assets (#6)
ΔSTD = change in short-term debt (#34)/Average Assets (#6)
ΔTP = change in taxes payable (#71)/Average Assets (#6)
DEP = depreciation and amortization expense (#14)/Average Assets (#6)

[b]BM: Book value of common stockholders' equity (#60) / market value of equity (#24*#199) at the end of year t.

[c]Closing price (#199).

[d]Trading volume is computed by dividing the number of shares traded (#28)/average number of shares outstanding (#25) for year t.

[e]Twelve-month buy-and-hold stock returns beginning four months after the end of year t.

[f]Market adjusted returns are computed for each stock in the portfolio by subtracting the annual buy-and-hold CRSP value-weighted returns from the annual buy-and-hold raw returns for the stock.

[g]Size-adjusted annual returns are obtained for each stock in the portfolio, by subtracting the annual buy-and-hold return on a benchmark portfolio consisting of stocks in the same size decile. The size decile breakpoints are obtained from the following website of French:

http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html the magnitudes of the size-adjusted returns generated by the joint strategy for the value stocks (8.6 percent) and the glamour stocks (−11.4 percent) are quite similar (in absolute values).

Still, the average stock price particularly for the value portfolio is low, \$6.82. Thus, we again replicate the analysis in Panel A for two subsamples, one containing stocks with a stock price <\$10 and the other containing stocks with a stock price ≥\$10. The results displayed in Panel B show that while the difference in return between the value and glamour portfolios using the subsample of firms with low stock prices (23.5 percent, 23.4 percent, and 23.1 percent using raw returns, market-adjusted returns, and size-adjusted returns, respectively) is higher than that for the portfolio of firms with high stock prices (14.3, percent, 14.2 percent, and 13.4 percent using raw returns, market-adjusted returns, and using size-adjusted returns, respectively), all differences are quite substantial and highly statistically significant.

By contrasting the results for the joint classification with those for the book-to-market classification, two salient points emerge. First, the joint classification outperforms the book-to-market classification for the full sample as well as for portfolios consisting of firms with low- and high-stock prices. Second, the joint classification yields significant abnormal returns for both the low- and the high-stock-price samples, whereas the book-to-market classification generates significant abnormal returns only for the portfolio consisting of firms with low stock prices.

There are two ways to interpret our findings. One is that the observed superior performance of the joint classification represents expectational errors on the part of investors that lead to a failure to correctly incorporate predictable changes in book values into stock prices, perhaps due to unrealistic earnings expectations reflecting investors' tendency to extrapolate past earnings performance too far into the future (see La Porta et al., 1997). A competing explanation is that this superior performance represents mismeasured abnormal returns due to a research design failure to correctly account for risk.

Can a risk story account for the totality of our findings so far? The answer seems to be no for two reasons. First, the raw returns for the portfolio consisting of low book-to-market firms with high accruals—1.9 percent for the full sample and −0.9 percent for firms with a stock price <\$10–are substantially lower than the average T-bill rate for our sample period. Why, then, do investors hold risky stocks for such a long period of time if they can obtain substantially higher return by holding T-bills? Second, while the joint strategy outperforms the book-to-market strategy by a wide margin for the entire 19-year sample period, there is no evidence that the former is riskier than the latter. In fact, it seems that the joint strategy is less risky for two reasons. First, it generates a higher percentage of winners (losers) in the value (glamour) portfolios (cf. the %-of-positive-size-adjusted-returns variable reported in Tables 1 and 3). Second, referring to figure 1—which portrays the yearly difference in stock return differentials between value and glamour stocks produced by the joint classification vis-à-vis the book-to-market classification alone—the joint strategy outperforms the book-to-market strategy in most sample years (12 out of the 19 years).

Still, skeptics may argue that these findings are suggestive of market inefficiency, nor are they conclusive. To gain additional insights into this intriguing question, we next evaluate the stock-return performance of the value strategies around earnings announcements in the

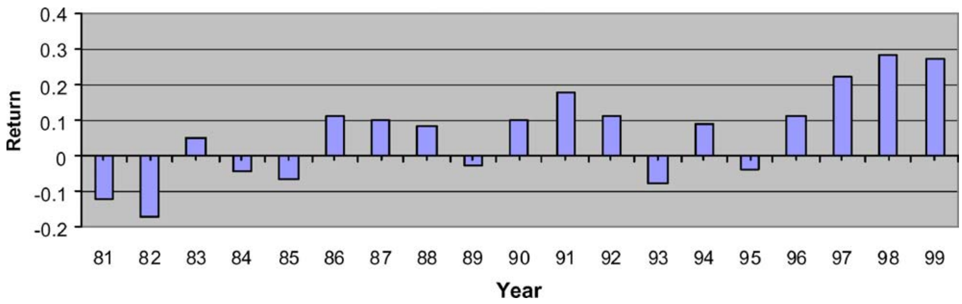

Figure 1. Annual buy-and-hold size-adjusted return difference between hedge portfolios formed on accruals and book-to-market jointly and book-to-market alone.

year following the portfolio formation. Unlike a risk story, a behavioral story has clear predictions regarding the stock price performance of both the value and glamour stocks for that rather short period of time. If the large return differential between value and glamour stocks is due to an expectational error, a disproportionally high amount of this differential will be realized around earnings announcement days vis-à-vis non-earnings announcement days. This occurs because investors update their expectations around the release of earnings announcements (see, e.g., Beaver, 1968), and because earnings announcements convey relatively large amount of information. Furthermore, since the earnings announcement period is short, the information conveyed by the earnings announcements should be the dominant price mover, which implies that stocks with low book-to-market and high accruals should generate not only negative abnormal returns but also negative raw returns in that period. While a risk story can, perhaps, explain disproportionally high positive returns around earnings announcements (for stocks with high book-to-market and low accruals), it cannot explain predictable negative raw returns, as rational investors would be expected to invest in T-bills or money market accounts instead.

3.2. Earnings announcement portfolio returns

Table 4 displays the earnings announcement returns for the high and low book-to-market portfolios using the book-to-market classification. As before, Panel A reports the results for the full sample and Panel B the results for two subsamples grouped based on stock price. Similar to the results for the annual buy-and-hold returns, the return differentials for the full sample are significant for all three return measures, ranging from 3.1 percent to 3.5 percent. Thus, more than 20 percent of the difference in annual abnormal return between the value stocks and the glamour stocks is realized over less than 5 percent of the trading days ($12/252 = 4.76$ percent). In other words, the earnings announcement return differential is five times higher than that expected if the return differential were equally spread over the year. This finding is consistent with the findings in La Porta et al. (1997, Table 1, Panels A and B), and supports that the book-to-market anomaly is (partially) due to expectational errors of earnings.

Table 4. Cumulative returns around 4 quarterly earnings announcements at year t + 1 on portfolios formed on the basis of book-to-market ratios at the end of year t.

BM quintile	N firm years	Average accrual[a]	Average BM[b]	Average (median) price[c]	Average (median) trading volume[d]	Average (median) MVE ($mil)	Raw returns[e]	Market-adjusted returns[f]	Size-adjusted returns[g]	% Positive size-adjusted returns
Panel A: Full sample										
Low 1	3801	−0.011	0.161	24.15	1.47	2857	0.000	−0.006	−0.009	48.2
				(17.63)	(0.89)	(213)				
2–4	12248	−0.026	0.586	22.08	0.98	1250	0.015	0.010	0.007	51.1
				(17.88)	(0.59)	(188)				
High 5	3693	−0.047	1.599	11.19	1.36	290	0.035	0.029	0.022	51.3
				(7.13)	(0.44)	(34)				
	19742									
Mean difference 5–1							0.035	0.035	0.031	
T-stat for mean difference 5–1							6.76***	6.06***	5.75***	
Panel B: Partitioning the sample by stock price										
Stock price ≥ $10										
Low 1	2445	−0.004	0.170	34.26	1.66	4294	0.002	−0.003	−0.003	51.20
				(28.13)	(0.95)	(554)				
2–4	8101	−0.027	0.586	29.48	0.97	1766	0.012	0.007	0.006	51.8
				(24.75)	(0.56)	(421)				
High 5	1222	−0.038	1.533	22.60	2.43	691	0.014	0.007	0.005	49.3
				(17.88)	(0.43)	(144)				
	11768									
Mean difference 5–1							0.012	0.010	0.008	
T-stat for mean difference 5–1							2.46**	2.21**	1.72	
Stock price < $10										
Low 1	1356	−0.025	0.144	4.52	1.11	67	−0.009	−0.012	−0.020	42.4
				(4.25)	(0.79)	(35)				
2–4	4143	−0.022	0.584	5.15	0.99	72	0.023	0.018	0.011	49.3
				(5.12)	(0.69)	(31)				
High 5	2470	−0.052	1.640	4.29	0.71	47	0.045	0.040	0.031	52.5
				(3.75)	(0.45)	(17)				
	7969									
Mean difference 5–1							0.054	0.052	0.051	
T-stat for mean difference 5–1							7.99***	6.95***	6.97***	

The breakpoints for portfolios are determined annually by assigning all sample firms into quintiles based on the magnitude of book-to-market ratios in year t. Equally-weighted portfolio returns are computed for each year (year $t + 1$) and averaged over 14 years from the first quarter of 1986 to the first quarter of 2000.[h] Statistical significance at the 1 percent, 5 percent, and 10 percent two-tailed levels are represented respectively by ***, ** and *.

[a]Accruals = (ΔCA – ΔCash) – (ΔCL – ΔSTD – ΔTP) – DEP

Where

ΔCA = change in current assets (#4)/Average Assets (#6)
ΔCash = change in cash/cash equivalents (#1)/Average Assets (#6)
ΔCL = change in current liabilities (#5)/Average Assets (#6)
ΔSTD = change in short-term debt (#34)/Average Assets (#6)
ΔTP = change in taxes payable (#71)/Average Assets (#6)
DEP = depreciation and amortization expense (#14)/Average Assets (#6)

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[b]BM: Book value of common stockholders' equity (#60)/market value of equity (#24*#199) at the end of year t.
[c]Closing price (#199).
[d]Trading volume is computed by dividing the number of shares traded (#28)/average number of shares outstanding (#25) for year t.
[e]Three day cumulative daily raw returns (day −1 to day +1) around quarterly earnings announcement dates following the portfolio formation date are summed over 4 consecutive quarters.
[f]Three day cumulative daily market– adjusted returns (day −1 to day +1) around quarterly earnings announcement dates following the portfolio formation date are summed over 4 consecutive quarters. The daily market adjusted returns are computed by subtracting the daily CRSP value-weighted return from the daily raw returns.
[g]Three day cumulative daily size-adjusted returns (day −1 to day +1) around quarterly earnings announcement dates following the portfolio formation date are summed over 4 consecutive quarters. Daily size-adjusted returns are obtained by subtracting the daily return on a benchmark portfolio consisting of stocks in the same size decile. The size decile breakpoints are obtained from the following website of French:

http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html

[h]Due to small number of observations in each portfolio for years before 1986, the first sample year is 1986.

The results for the two subsamples displayed in Panel B of Table 4 are again consistent with the results for the annual buy-and-hold returns. Specifically, the earnings announcement returns for the subsamples of stocks with low stock prices, ranging from 5.1 percent to 5.4 percent depending on the return measure, exceed substantially the returns for the high stock price subsample, which ranges from 0.8 percent to 1.2 percent. Moreover, while the return differentials for the low stock price subsample are highly significant for all three return measures, the return differentials for the high stock price subsample are significant for the raw returns and market-adjusted returns but insignificant for the size-adjusted returns. This further corroborates our interpretation for the results of the annual buy-and-hold returns that the book-to-market strategy applies primarily or perhaps even exclusively to a subset of firms with low stock prices, not to the whole universe of firms.

Table 5 reports the findings for the earnings announcement returns for the accruals classification. Again, the earnings announcement returns show similar patterns to those of the annual buy-and-hold returns generated by the accruals classification reported in Table 2. Specifically, the difference in return between value and glamour stocks for the full sample as well as for the two subsamples is significant, and the return differential for firms with low stock prices is higher than that for firms with high stock prices. In addition, more than 45 percent of the annual return differential produced by this strategy is realized around the 12 earnings announcement days, which span only 4.8 percent of the trading days during this period.

Table 6 displays the results for the earnings announcement returns for the joint classification. Consistent with the results for the annual buy-and-hold returns, the return differential around the earnings announcement dates using the full sample is nearly two and a half times higher than that for the market-to-book classification alone. For example, the size-adjusted return differential for the joint classification is 7.1 percent (Panel A of Table 6) vis-à-vis 3.1 percent for the corresponding differential for book-to-market classification (Panel A of Table 4). The results in Panel A of Table 6 also show that the raw return as well as the market-adjusted return and the size-adjusted return on the portfolio consisting of low book-to-market and high accruals firms are all significantly negative: raw return = −2.1

Table 5. Cumulative returns around 4 quarterly earnings announcements at year $t+1$ on portfolios formed on the basis of accruals at the end of year t

Accrual quintile	N Firm years	Average accrual[a]	Average BM[b]	Average (median) price[c]	Average (median) trading volume[d]	Average (median) MVE ($mil)	Raw returns[e]	Market-adjusted returns[f]	Size-adjusted returns[g]	% Positive size-adjusted returns
Panel A: Full sample										
Low 1	3492	−0.167	0.751	14.69	0.98	975	0.033	0.028	0.022	51.8
				(8.75)	(0.64)	(68)				
2–4	12808	−0.032	0.728	23.13	1.02	1695	0.017	0.011	0.008	51.2
				(18.50)	(0.54)	(209)				
High 5	3442	0.144	0.565	15.20	1.76	345	−0.003	−0.007	−0.012	46.9
				(11.00)	(0.87)	(72)				
	19742									
Mean difference 1–5							0.036	0.035	0.034	
T-stat for mean difference 1–5							6.99***	6.72***	6.59***	
Panel B: Partitioning the sample by stock price										
Price ≥ $10										
Low 1	1468	−0.143	0.607	27.06	1.04	2046	0.021	0.016	0.015	52.9
				(21.25)	(0.68)	(335)				
2-4	8556	−0.033	0.650	31.03	1.10	2401	0.012	0.006	0.006	51.9
				(26.00)	(0.53)	(497)				
High 5	1744	0.134	0.460	24.22	2.35	609	−0.004	−0.009	−0.010	47.2
	11768			(19.63)	(1.00)	(188)				
Mean difference 1–5							0.025	0.025	0.025	
T-stat for mean difference 1–5							5.40***	5.71***	5.46***	
Price < $10										
Low 1	2024	−0.187	0.875	4.12	0.93	59	0.042	0.037	0.029	50.9
				(3.63)	(0.61)	(23)				
2–4	4248	−0.030	0.907	5.01	0.85	72	0.025	0.020	0.013	49.4
				(5.00)	(0.58)	(29)				
High 5	1697	0.155	0.684	4.98	1.09	45	0.000	−0.004	−0.013	46.6
				(4.88)	(0.72)	(24)				
	7969									
Mean difference 1–5							0.042	0.041	0.042	
T-stat for mean difference 1–5							5.93***	5.73***	5.77***	

The breakpoints for portfolios are determined annually by assigning all sample firms into quintiles based on the magnitude of accruals in year t. Equally-weighted portfolio returns are computed for each year (year $t+1$), and averaged over 14 years from the first quarter of 1986 to the first quarter of 2000.[h] Statistical significance at the 1 percent, 5 percent, and 10 percent, two-tailed levels, are represented respectively by ***, ** and *.

[a]Accruals = (ΔCA – ΔCash) – (ΔCL – ΔSTD – ΔTP) – DEP

Where

ΔCA = change in current assets (#4)/Average Assets (#6)
ΔCash = change in cash/cash equivalents (#1)/Average Assets (#6)
ΔCL = change in current liabilities (#5)/Average Assets (#6)
ΔSTD = change in short-term debt (#34)/Average Assets (#6)
ΔTP = change in taxes payable (#71)/Average Assets (#6)
DEP = depreciation and amortization expense (# 14)/Average Assets (#6)

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[b]BM: Book value of common stockholders' equity (#60)/market value of equity (#24*#199) at the end of year t.
[c]Closing price (#199).
[d]Trading volume is computed by dividing the number of shares traded (#28)/average number of shares outstanding (#25) for year t.
[e]Three day cumulative daily raw returns (day −1 to day +1) around quarterly earnings announcement dates following the portfolio formation date are summed over 4 consecutive quarters.
[f]Three day cumulative daily market– adjusted returns (day −1 to day +1) around quarterly earnings announcement dates following the portfolio formation date are summed over 4 consecutive quarters. The daily market adjusted returns are computed by subtracting the daily CRSP value-weighted return from the daily raw returns.
[g]Three day cumulative daily size-adjusted returns (day −1 to day +1) around quarterly earnings announcement dates following the portfolio formation date are summed over 4 consecutive quarters. Daily size-adjusted returns are obtained by subtracting the daily return on a benchmark portfolio consisting of stocks in the same size decile. The size decile breakpoints are obtained from the following website of French:

http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html.

[h]Due to small number of observations in each portfolio for years before 1986, the first sample year is 1986.

percent (t-statistic = −2.10), market-adjusted return = −2.4 percent (t-statistic = −2.27), and size-adjusted return = −3.0 percent (t-statistic = −2.82).

The results for the two subsamples presented in Panel B of Table 6 offer three salient insights. First, the return differential for the joint classification in each subsample is substantially higher than that generated by the book-to-market classification alone. For example, using the subsample of firms with a stock price ≥$10, the return differential between the value and glamour portfolios for the joint classification is over four percent and is highly significant. In contrast, the corresponding differential in earnings announcement returns for the book-to-market classification alone (Panel B of Table 4) is only around one percent and is statistically insignificant for the size-adjusted returns. Second, all three alternative return measures, for both the sample of firms with a stock price ≥$10 (raw return = −2.2 percent, t-statistic = −2.03; market-adjusted return = −2.6 percent, t-statistic = −2.33; size-adjusted return = −2.3 percent, t-statistic = −2.55) and the sample of firms with a stock price <$10 (raw return = −2.5 percent, t-statistic = −2.14; market-adjusted return = −2.7 percent, t-statistic = −2.12; size-adjusted return = −3.7 percent, t-statistic = −2.89), are significantly negative. Third, for the subsample of firms with stock price <$10, the returns on the value stocks, glamour stocks, and the difference in return between the two are all substantial, particularly considering the relatively short period over which they are accumulated. For example, the size-adjusted returns for the value and glamour portfolios are 4.8 percent and −3.7 percent, respectively, and the return differential is 8.5 percent. These returns, which are accumulated over only 12 trading days (about 4.8 percent of the yearly trading days), represent nearly 37 percent of the annual buy-and-hold returns reported in Panel B of Table 3.

3.3. Analysts' earnings forecast errors

According to the behavioral explanation, the superior stock return performance of value strategies represents mispricing due to expectational errors, that is, earnings expectations

Table 6. Cumulative returns around four quarterly earnings announcements at year $t+1$ on portfolios formed on the basis of accruals and book-to-market ratios combined at the end of year

ACC/BM	*N* Firm years	Average accrual[a]	Average BM[b]	Average (median) price[c]	Average (median) trading volume[d]	Average (median) MVE ($mil)	Raw returns[e]	Market-adjusted returns[f]	Size-adjusted returns[g]	% Positive size-adjusted returns
Panel A: Full sample										
Low/High 1	843	−0.169	1.592	7.56 (4.15)	0.73 (0.47)	171 (22)	0.055	0.049	0.041	53.7
High/Low 2	937	0.169	0.161	20.33 (16.06)	2.11 (1.20)	618 (136)	−0.021	−0.024	−0.030	42.3
	1780									
Mean difference 1–2							0.076	0.073	0.071	
T-stat for mean difference 1–2							5.58***	5.36***	5.17***	
Panel B: Partitioning the sample by stock price										
Stock price ≥ $10										
Low/High 1	167	−0.138	1.390	19.80 (16.50)	0.66 (0.46)	589 (112)	0.022	0.016	0.014	55.3
High/low 2	573	0.154	0.165	29.65 (25.19)	2.75 (1.45)	949 (317)	−0.022	−0.026	−0.028	44.3
	740									
Mean difference 1–2							0.044	0.042	0.042	
T-stat for mean difference 1–2							3.72***	3.60***	3.46***	
Stock Price < $10										
Low/High 1	676	−0.179	1.657	3.62 (3.00)	0.75 (0.48)	37 (14)	0.063	0.057	0.048	53.2
High/Low 2	364	0.195	0.155	4.57 (4.47)	1.05 (0.72)	59 (31)	−0.025	−0.027	−0.037	49.3
	1040									
Mean difference 1–2							0.088	0.084	0.085	
T-stat for mean difference 1–2							6.05***	5.79***	5.88***	

The breakpoints for portfolios are determined annually by assigning all sample firms into quintiles based on the magnitude of accruals and book-to-market ratios determined independently in year t. Equally-weighted portfolio returns are computed for each year and averaged over 14 years from the first quarter of 1986 to the first quarter of 2000.[h] Statistical significance at the 1 percent, 5 percent, and 10 percent, two-tailed levels, are represented respectively by ***, ** and *.

[a]Accruals = (ΔCA − ΔCash) − (ΔCL − ΔSTD − ΔTP) − DEP

Where

ΔCA	=	change in current assets (# 4)/Average Assets (#6)
ΔCash	=	change in cash/cash equivalents (# 1)/Average Assets (#6)
ΔCL	=	change in current liabilities (# 5)/Average Assets (#6)
ΔSTD	=	change in short-term debt (# 34)/Average Assets (#6)
ΔTP	=	change in taxes payable (# 71)/Average Assets (#6)
DEP	=	depreciation and amortization expense (# 14)/Average Assets (#6)

[b]BM: Book value of common stockholders' equity (#60)/market value of equity (#24*#199) at the end of year t.

[c]Closing price (#199)

[d]Trading volume is computed by dividing the number of shares traded (#28)/average number of shares outstanding (#25) for year t.

[e]Three day cumulative daily raw returns (day −1 to day +1) around quarterly earnings announcement dates following the portfolio formation date are summed over 4 consecutive quarters.

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[f]Three day cumulative daily market–adjusted returns (day −1 to day +1) around quarterly earnings announcement dates following the portfolio formation date are summed over 4 consecutive quarters. The daily market adjusted returns are computed by subtracting the daily CRSP value-weighted return from the daily raw returns.
[g]Three day cumulative daily size-adjusted returns (day −1 to day +1) around quarterly earnings announcement dates following the portfolio formation date are summed over 4 consecutive quarters. Daily size-adjusted returns are obtained by subtracting the daily return on a benchmark portfolio consisting of stocks in the same size decile. The size decile breakpoints are obtained from the following website of French:

http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html

[h] Due to small number of observations in each portfolio for years before 1986, the first sample year is 1986.

are overly pessimistic (optimistic) for value (glamour) stocks reflecting market participants' tendency to extrapolate past earnings performance too far into the future (see La Porta et al., 1997). If this explanation is valid, we expect in the post-portfolio-formation year more optimistic earnings forecast errors for glamour firms than for value firms. Conversely, if market participants are rational and the superior return performance of value strategies represents a failure of researchers to fully account for risk, differences in earnings forecast errors between value and glamour stocks should exhibit no predictable pattern.

We define an annual earnings forecast error (FE_m(Actual EPS)) as:

$$FE_m(\text{Actual EPS}_{t+1}) = (f_m(\text{Actual EPS}_{t+1}) - \text{Actual EPS}_{t+1})/TA_{t+1} \quad (2)$$

where m is the month of the earnings forecast relative to the fiscal year end (month 0) in the post-portfolio-formation year (year $t+1$), f(Actual EPS_{t+1}) is the IBES median analysts' forecasted earnings per share (EPS), and TA_{t+1} is total assets at the beginning of year $t+1$scaled by the number of shares outstanding on that day.[11] Along the line of prior research (see, e.g., Doukas, Kim and Pantzalis, 2002), we use median earnings forecast values, not means, because mean values can be inordinately influenced by outliers. The sample period for this analysis covers 18 years, 1982–1999.

Table 7 displays ten monthly medians of analysts' forecast errors for the period, month −8 to month 1, relative to the post-formation fiscal year end (month 0) by high-priced stocks (Panel A) and low-priced stocks (Panel B). Consistent with findings of prior studies (see, e.g., O'Brien, 1988; Doukas, Kim and Pantzalis, 2002), for both the glamour subsample and the value subsample the median forecast errors are positive for nearly all forecast horizons, indicating an optimistic bias about future earnings. In addition, as the forecast horizon shortens and more information arrives to the market, the earnings forecasts for both high-priced stocks and low-priced stocks become more accurate as evidenced by declining forecast errors. For example, the median forecast error of glamour stocks with stock price <\$10 declines by approximately 90 percent from 0.1162 eight months before the fiscal year end (month −8) to 0.0176 in month 1.

Turning to testing the behavioral explanation, as predicted glamour and value stocks exhibit significantly different forecast errors. Specifically, the results for the subsample of firms with stock price ≥\$10 displayed in Panel A show that the forecast errors of glamour stocks are significantly higher (i.e., more optimistic) than those for value stocks in month −8 to month −4. As the end of the year approaches and more information arrives

Table 7. Median analysts' earnings forecast errors for year $t+1$ on portfolios based on accruals and book-to-market ratios jointly formed at the end of year t

Forecast month relative to FYE	N		Median error			
	High BM Low Acc	Low BM High Acc	High BM Low Acc (1)	Low BM High Acc (2)	Difference (2)–(1)	Wilcoxon Z-stat
			Panel A: Stock Price ≥ $10			
−8	236	830	0.0075	0.0132	0.0057	2.81***
−7	237	847	0.0064	0.0121	0.0057	3.28***
−6	238	865	0.0058	0.0099	0.0041	2.89***
−5	238	867	0.0046	0.0082	0.0037	2.58***
−4	238	874	0.0031	0.0054	0.0023	2.26**
−3	238	881	0.0027	0.0031	0.0004	1.72*
−2	238	877	0.0022	0.0023	0.0001	1.46
−1	237	877	0.0010	0.0000	−0.0010	0.80
0	238	878	0.0000	0.0000	0.0000	0.57
1	232	846	−0.0002	0.0000	0.0002	0.29
			Panel B: Stock Price < $10			
−8	426	156	0.0176	0.1162	0.0986	7.29***
−7	434	166	0.0135	0.0886	0.0751	7.28***
−6	433	180	0.0116	0.0786	0.0670	7.19***
−5	427	185	0.0107	0.0727	0.0620	7.31***
−4	422	193	0.0094	0.0560	0.0467	6.60***
−3	421	192	0.0089	0.0429	0.0340	6.01***
−2	422	196	0.0068	0.0363	0.0295	5.51***
−1	426	203	0.0053	0.0304	0.0250	4.60***
0	420	211	0.0029	0.0217	0.0188	4.04***
1	415	210	0.0023	0.0176	0.0153	4.00***

Forecast error = (IBES median analysts' forecasted EPS–Actual EPS)/Total asset per share.
The sample period covers 18 years, 1982–1999. Statistical significance at the 1 percent, 5 percent, and 10 percent, two-tailed levels, are represented respectively by ***, ** and *.

to the market, analysts update their earnings forecasts and the difference in forecast errors between value and glamour stocks vanishes. The results in Panel B for the subsample of firms with stock price <$10 also show that the forecast errors of glamour stocks are significantly higher (i.e., more optimistic) than those for value stocks. Unlike the results for the high-priced subsample, however, these differences, while decline monotonically as the forecast horizon shortens, are observed even for a forecast horizon of less than a month as evidenced by the significant forecast error differential for month 1. Furthermore, consistent with the return results, the differences in forecast error differentials between glamour and value stocks are considerably more pronounced for firms with stock price <$10 in all forecast horizons (see figure 3). One way to interpret these observed forecast error differentials is that less sophisticated ownership is associated with less sophisticated analyst coverage.

It is interesting to contrast our results with those of Doukas, Kim and Pantzalis (2002), who also test for analysts' earnings forecast error differentials between value and glamour firms. Unlike us, however, they classify stocks as value or glamour based on book-to-market ratios alone, and fail to provide evidence supporting the expectational error explanation. We replicate our forecast-error tests using the book–to-market classification alone and obtained results similar to theirs (results are not tabulated for parsimony). This further supports that our joint strategy helps identify mispriced stocks among the population of high and low book-to-market firms.

3.4. Discussion of the results

Do these findings support a behavioral story of mispricing due to expectational errors or a risk story? The answer is a behavioral story for three reasons. First, it is nearly impossible to explain within the market efficiency paradigm the significantly negative raw returns on the portfolio consisting of low book-to-market and high accruals firms (Table 6), unless one believes in ex ante negative risk premium on a large number of stocks over a long period of time. Conversely, according to the behavioral story these negative returns follow because glamour firms' earnings numbers negatively surprise the market due to overly optimistic earnings expectations. Second, it is difficult to explain why rational analysts, whose reputation is (partially) based on their predictive ability of earnings (forecast accuracy), would systematically overestimate earnings of glamour stocks and underestimate earnings of value stocks.[12] Lastly, it is difficult to explain why, in an efficient market, the joint classification yields a substantially higher earning announcement return differential than the book-to-market classification alone, as there is no evidence that the former is riskier than the latter around earnings announcements. For example, the percentage of positive size-adjusted earnings announcement returns for the full sample and the subsamples of firms with high and low stock prices for the joint classification are, respectively, 53.7 percent, 55.3 percent, and 53.2 percent, which compare favorably with those for the book-to-market classification alone, 51.3 percent, 51.2 percent, and 52.5 percent (cf. Table 4 and Table 6). And, figure 2, which depicts the yearly difference in size-adjusted earnings announcement returns between the joint classification return differential and that of the book-to-market classification, illustrates that the former consistently outperforms the latter 79 percent of the time.

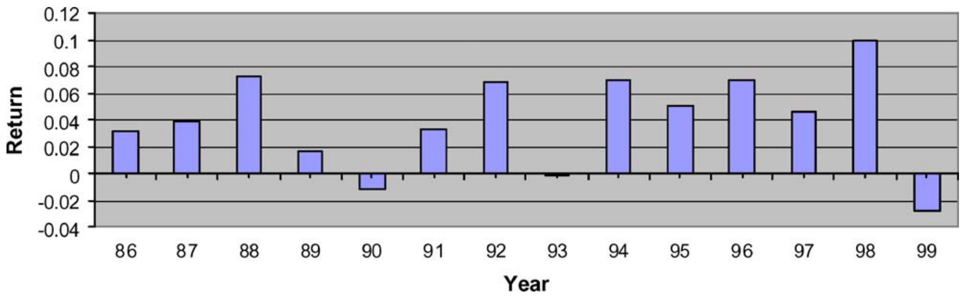

Figure 2. Difference in size-adjusted returns around four quarterly earnings announcements between hedge portfolios on accruals and book-to-market jointly and book-to-market alone.

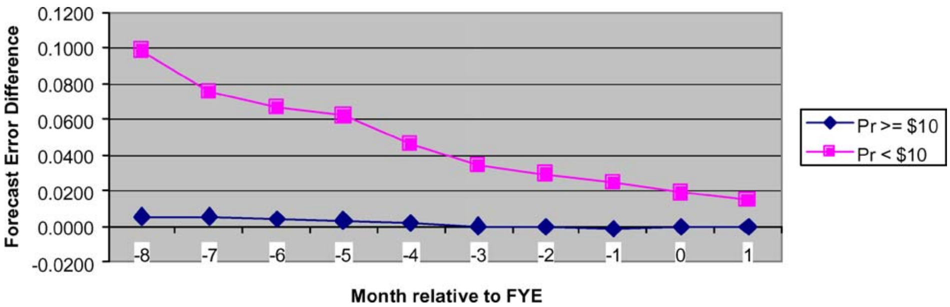

Figure 3. Differences in median analysts' forecast errors by subsamples partitioned on stock price: Median forecast error of glamour stocks (low BM/high Acc) minus median forecast error of value stocks (high BM/Low Acc). Forecast error = (IBES median analysts' forecasted EPS − Actual EPS) / Total asset per share Median difference in forecast error = Median forecast error (Low BM/High Accruals) – Median Forecast Error (High BM/Low Accruals).

4. Conclusion

In this article we evaluate the stock return performance of an improved version of the book-to-market strategy, and its implications for market efficiency. The idea underlying our improved strategy is simple. Cross-sectional differences in book-to-market ratios may indicate either mispricing ("wrong" denominator) or mismeasured accounting book values due to limitations underlying the accounting system of fairly priced stocks ("wrong" numerator). Thus, if mispricing exists the performance of the book-to-market strategy can be improved by excluding the latter. To obtain this, we classify stocks as value or glamour on book-to-market ratios and accruals jointly. Specifically, value stocks are those with high book-to-market ratios and low accruals and glamour stocks are those with low book-to-market ratios and high accruals.

The findings show that the annual returns on the joint classification outperform those on either the book-to-market classification or the accruals classification alone, with no evidence of increased risk. When the sample is partitioned into firms with stock prices above and below $10, firms with low stock prices exhibit substantially larger return differential between value and glamour stocks than firms with high stock prices. Furthermore, for the book-to-market classification the differential is only significant for stocks with low stock prices. These findings allow the refining of the expectational error explanation for this anomaly, offered by prior research. That is, the mispricing explanation for the book-to-market anomaly applies only to a subset of stocks with unsophisticated ownership, as investment professionals are typically unable to invest in firms with a stock price less than $10 due to institutional restrictions. However, this refined explanation cannot account for the results from the joint strategy, as the return differentials generate by this strategy are significant for both levels of stock prices.

To gain additional insights into the book-to-market anomaly, we investigated earnings announcement returns and analysts' earnings forecast errors in the post-portfolio-formation year. One intriguing finding is that for the joint strategy, the raw return, the market-adjusted return, and the size-adjusted return on glamour stocks are all negative. While the expectational error explanation predicts this result, it cannot be explained within the market efficiency paradigm unless one believes that the risk premium is negative for a large number of stocks for a long period of time. The results from the earnings announcement return tests also show that disproportionally large percentage of the annual abnormal return to the joint strategy realized around earnings announcement, and that the joint strategy returns outperform those of either the book-to-market or the accruals strategy. The return results are corroborated by findings from testing analysts' earnings forecast errors, which indicate that analysts are overly optimistic (pessimistic) about earnings of glamour (value) stock in the post-formation year.

The question whether a risk story can explain the superior performance of the book-to-market strategy seems to be highly controversial. While some argue that these returns compensate for risk (see, e.g., Fama and French, 1992; Vassalou, 2001; Doukas, Kim and Pantzalis 2002), others (see, e.g., La Porta et al., 1997; Griffin and Lemmon, 2002; Ali, Hwang and Trombley, 2002) assert that there is little evidence to support this risk explanation and offer a mispricing story instead. Our evidence supports a mispricing story.

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Notes

1. These strategies include the book-to-market anomaly (Rosenberg, Reid and Lanstein, 1984), the earnings-to-price anomaly (Basu, 1977), the cash flow-to-price anomaly (Chan, Hamao and Lakonishok, 1991; Lakonishok, Shleifer and Vishny, 1994), and fundamental analysis applied to a portfolio of high book-to-market firms (Piotroski, 2000).
2. Accounting accruals are the non-cash component of accounting net income; see next section for more details.
3. Note that accounting book values and earnings are closely related: computing end of current year book value involves adding up net income for the current year and the book value at the end of the previous year.
4. For a stock that disappears from CRSP during the 12-month return accumulation period, a delisting return is included if available in CRSP. A missing delisting return is replaced with a -30 percent return if the delisting is performance related (delisting code = 500 or 520 <delisting code <584), and with a zero otherwise. These assumptions, which turn out to be unimportant to our results, are based on Shumway's (1997) findings, and have been used by prior research (see, e.g., Griffin and Lemmon, 2002).
5. U.S. publicly traded companies must file 10Ks (i.e., annual reports) with the SEC within 90 days from their fiscal year end.
6. The number of observations for the earnings-announcement-return tests is substantially smaller than that for the annual return tests due to the additional data restriction that earnings announcement dates be available from the Compustat quarterly file. Also, due to small number of observations in each portfolio for years before 1986, the first sample year for the earnings announcement return tests is 1986.
7. This definition of accruals is standard in the earnings management literature. The rationale for excluding ΔTP is that this literature typically focuses on income from continuing operations, which excludes income-tax expense (for more details see Sloan, 1996, p. 293).
8. For example, *The Wall Street Journal* (2002) explains that AT&T is taking the highly unusual step of asking shareholders to approve a one-for-five reverse stock split because "The New York-based concern is looking to

attract big investors who don't like to invest in companies with a single-digit stock price." Another example, according to *The New York Times* (1978), "Some believe that stocks trading below $10 may well be one of the better hunting grounds for unexploited values because few Institutions will venture to buy such shares. There is a kind of convention in institutional circles that shares below that level are taboo because they don't represent 'quality'." In addition, we replicate all return tests that follow by using 10 percent of institutional ownership as the cutoff point instead of the stock price and obtained similar results, albeit a 30 percent reduction in sample size due to the requirement that institutional ownership data be available from the CDA Spectrum database.

9. There is a slight discrepancy between the number of observations in Panel A, 39,227, and the sum of the numbers of observations in Panel B and Panel C, 39,190. This slight difference follows because the market value of equity was directly retrieved from CRSP, whereas stock prices were retrieved from Compustat.
10. Another possible explanation for the superior performance of the subsample of firms with low stock prices is that the returns are distorted due to the inclusion of firms with low liquidity. To assess this possibility, we replicate all the tests after excluding from the sample stocks with a share price <$1, and obtain very similar results.
11. The use of Analysts' forecasts as a proxy for investors' earnings expectations is standard in the literature (see, e.g., Doukas, Kim and Pantzalis, 2002), and is supported by evidence that analysts' earnings forecasts are a proxy for market expectations (see, e.g., Brown and Rozeff, 1978; Brown et al., 1987).
12. The accuracy of earnings forecasts is one of the four criteria by which security analysts are ranked in the annual "All-American Research Team" selected by *Institutional Investors*. (The other criteria are picking stocks, writings reports, and overall client service.)

References

Ali, A., L. S. Hwang and M. A. Trombley, "Arbitrage Risk and the Book-to-Market Anomaly." *Journal of Financial Economics* (2002) (forthcoming).

Basu, S., "Investment Performance of Common Stocks in Relation to Their Price to Earnings Ratios: A Test of The Efficient Market Hypothesis." *The Journal of Finance* 32, 663–682 (1977).

Beaver, W., "The Information Content of Annual Earnings Announcements." *Journal of Accounting Research* 6, 67–92 (1968).

Brown, L. D. and M. S. Rozeff. "The Superiority of Analyst Forecasts as Measures of Expectations: Evidence from Earnings." *The Journal of Finance* 33, 1–16 (1978).

Brown, L. D., P. A. Griffin, R. L. Hagerman and M. E. Zmijewski. "Security Analyst Superiority Relative to Univariate Time Series Models in Forecasting Quarterly Earnings." *Journal of Accounting and Economics* 9, 61–88 (1987).

Chan, K., Y. Hamao and J. Lakonishok. "Fundamentals and Stock Returns in Japan." *The Journal of Finance* 46, 1739–1764 (1991).

Doukas, J. A., C. F. Kim and C. Pantzalis. "A Test of the Error-Expectations Explanation of the Value/Glamour Stock Returns Performance: Evidence from Analysts' Forecasts." *The Journal of Finance* 57, 2143–2166 (2002).

Fama, E. F. "Efficient Capital Markets: II." *The Journal of Finance* 46, 1575–1617 (1991).

Fama, E. F. and K. R. French, "The Cross-Section of Expected Stock Returns." *The Journal of Finance* 47, 427–465 (1992).

Griffin, J. and M. Lemmon. "Book-to-Market Equity, Distress Risk, and Stock Returns." *The Journal of Finance* 57, 2317–2336 (2002).

La Porta, R., J. Lakonishok, A. Shleifer and R. Vishny. "Good News for Value Stocks: Further Evidence on Market Efficiency." *The Journal of Finance* 52, 859–874 (1997).

Lakonishok, J., A. Shleifer and R. Vishny, "Contrarian Investment, Extrapolation, and Risk." *The Journal of Finance* 49, 1541–1578 (1994).

Mulford C. W. and E. E. Comiskey, *The Financial Numbers Game: Detecting Creative Accounting Practices*. New York: John Wiley & Sons, Inc. 2002.

The New York Times. Cheap Stocks: Undervalued? June 8 (1978).

O'Brien P. C. "Analysts' Forecasts as Earnings Expectations." *Journal of Accounting and Economics* 10, 53–83 (1988).

Piotroski, J. D., "Value Investing: The Use of Historical Financial Statement Information to Separate Winners from Losers." *Journal of Accounting Research* 38, 1–41 (2000).

Rosenberg, B., K. Reid and L. Ronald, "Persuasive Evidence of Market Inefficiency." *Journal of Portfolio Management* 11, 9–17 (1985).

Shumway, T., "The Delisting Return Bias in CRSP Data." *The Journal of Finance* 52, 327–340 (1997).

Sloan, R. G. "Do Stock Prices Fully Reflect Information in Accruals and Cash Flows About Future Earnings?" *The Accounting Review* 71, 289–316 (1996).

Vassalou, M., "Default Risk in Equity Returns." Working Paper. Columbia University (2001).

The Wall Street Journal, Leading the News: AT&T Corp. Resorts To Unusual Motion: Reverse Stock Split—Market Capitalization Stays Constant, but Measure Would Boost Share Price. April 11 (2002).