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A Comparative Analysis of ROE and Value-to-Price based Trading Rules: Do Conventional Risk Factors Matter?

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Abstract

This paper examines the profitability of ROE and value to price (VP) based trading rules. We find that the ROE based trading rule generates significant hedge portfolio return over 12-month period after portfolio formation. In addition, we find that the ROE-based trading rule significantly under-performs trading rules based on VP ratio, especially over longer horizon. However, the result indicates that the profitability of the ROE trading rule is by and large subsumed by the conventional risk factors.

I. Introduction

Return on equity (ROE) has been one of the most popular profitability measures among investors. It measures how the stockholders fared during the year. In an accounting sense, ROE is a true bottom-line performance measure to the stockholders since it measures how much profit is earned during the year for every dollar in equity. To the extent that investors form their expectations about firms' future profitability based on this measure, the investors will purchase (sell) stocks that performed well (poorly) in the previous year. In such cases, the ROE will predict future stock returns. Nevertheless, the ability of ROE to predict future stock returns has not been fully exploited in the literature. This study attempts to provide a preliminary analysis of this unexplored link.

In the literature the importance of investors' expectation about future ROE is highlighted in the residual income valuation model (Frankel and Lee 1998). Under this model, the market's expectation about future ROE determines stock price. In the accounting literature, identifying mis-priced stocks using financial statement information such as ROE is consistent with the goal of fundamental analysis (Penman 1992). Given that ROE is closely related to intrinsic value-to-price (VP hereafter) ratio under the model, we adopt the VP ratio as a benchmark in our analysis.

This study extends prior literature on the residual income valuation model by exploring the return predictability of an accounting ratio, i.e., ROE. Specifically, this study examines the direct link between current ROE and future stock returns that has not yet been examined in the literature. Although the return predictability of ROE is to some extent implied in Frankel and Lee (1998)'s analysis, their approach is indirect in that they use current ROE to first predict future ROE, which is in turn used to predict future stock returns. In contrast, the approach we take in this study is a one-step procedure since it does not involve predicting future ROE.

Our analyses show that ROE trading rule generates statistically significant hedge portfolio returns up to one year after portfolio formation. However, the result suggests that the profitability of ROE investment strategy is for the most part subsumed by the conventional risk factors, i.e., the market, size, and book-to-market. Further, the evidence indicates that ROE clearly under-performs VP beyond one year after portfolio formation.

This paper is organized as follows. In the next section, we summarize the theory. In section III, we discuss the portfolio test procedures of ROE and VP strategy. Section IV contains a description of data and sample. In section V, we report the empirical results. We conclude in section VI.

II. Theory

This research is mainly linked to two streams of research in accounting and finance. First, this study is closely related to the fundamental analysis line of literature in accounting (Ou and Penman 1989, Holthausen and Larker 1992, Stober 1992, Lev and Thiagarajan 1993, Abarbanell and Bushee 1998). Ou and Penman (1987) document abnormal return to a single summary measure, called *Pr* that predicts future earnings. They devise a LOGIT model for predicting changes in annual EPS one-year ahead, using 28 financial statement variables chosen from a wide set of 68 variables. They report over 8% abnormal return in the first year after EPS predictions are made.

Holthausen and Larker (1992) and Stober (1992) extend Ou and Penman (1989). Holthausen and Larker (1992) find that a trading rule that exploits the correlation between current period financial statement data and future returns (without any hypothesis about future earnings) dominates Ou and Penman (1989)'s strategy. In contrast, Stober (1992) finds that the abnormal returns documented in Ou and Penman's study (1989) persist for over six years beyond the earning prediction date. He thus concludes that the financial statement variables used by Ou and Penman (1989) can be seen as proxies for expected returns.

Lev and Thiagarajan (1993) and Abarbanell and Bushee (1998) explore the ability of "fundamental signals" to explain and predict firm performance. The "fundamental signals" represent the core set of information frequently employed by professional financial analysts for fundamental analyses. The signals, first introduced to the literature by Lev and Thiagarajan (1993), include contemporaneous changes in accounts receivables, inventories, gross margins, selling expenses, capital expenditures, effective tax rates, inventory methods, audit qualifications, and labor force sales productivity. Lev and Thiagarajan (1993) find that these fundamental signals explain contemporaneous stock returns. Extending their study, Abarbanell and Bushee (1998) find that the fundamental signals can be used to generate abnormal returns. Their result suggests that the fundamental signals contain information about future returns that is associated with future earnings news. Their trading rule based on the fundamental signals earns an average 12-month cumulative size-adjusted abnormal return of 13.2 percent.

Second, this study is related to prior studies that examine the ability of financial ratios to predict returns. These ratios include book-to-market (Kothari and Shanken 1997, Rosenberg, Reid, and Lanstein 1985), earnings-to-price (Basu 1977), dividend yield (Campbell and Shiller 1988, Fama and French 1998), and intrinsic value-to-price (Frankel and Lee 1998) ratio. Basu (1977) finds that earnings-to-price (EP hereafter) ratio predicts stock returns. Rosengerg, Reid, and Lanstein (1985), Fama and French (1992), and Kothari and Shanken (1997) find that the ratios of book-to-market value of equity predict stock returns. Campbell and Shiller (1988) and Fama and French (1988) find that dividend yield predicts stock returns since they reflect information about expected returns. Frankel and Lee (1998) document that intrinsic value-to-price (VP) ratio outperforms BP in predicting returns.[1)]

The theoretical cornerstone of this study is the following dividend discounting model that shows firm value should equal the discounted present value of expected future dividend at equilibrium.

$$P_t = \sum_{\tau=1}^{\infty} \frac{E_t[\tilde{D}_{t+\tau}]}{\rho^{\tau}} \tag{1}$$

where P is value (or the "true" price), ρ is discount rate and D is dividend

The dividend discount model is mathematically equivalent to the following residual income valuation model often referred to as the Edwards-Bell-Ohlson (EBO) model under some restrictive assumptions (clean surplus and convergence conditions):

1) In contrast, Francis, Olsson, and Oswald (2000) find that the profitability of VP strategy is subsumed by the conventional risk factors - the market, size, and book-to-market.

$$P_t = B_t + \sum_{\tau=1}^{\infty} \frac{E_t[\tilde{X}_{t+\tau} - (\rho - 1)\tilde{B}_{t+\tau-1}]}{\rho^{\tau}} \tag{2}$$

where P is value (or the "true" price), B is book value, ρ is discount rate[2], and X is net income

The above residual income model shows that price can be expressed as book value in time $t(B_t)$ plus the market's expectation about future residual income, which is the second term on the right hand side of the equation. Manipulating this term using book value at time t-1 yields the following equation, which shows that the expectation about future ROE determines the price (Penman 1996, Frankel and Lee 1998):

$$P_t = B_t + \sum_{\tau=1}^{\infty} \frac{E_t[(R\tilde{O}E_{t+\tau} - (\rho - 1))\tilde{B}_{t+\tau-1}]}{\rho^{\tau}} \tag{3}$$

where $ROE_t = X_t/B_{t-1}$

Due to various reasons, however, the observed market price P_t^o may deviate from the "true" price P_t.[3] Lee, Myers, and Swaminathan (1999) give a good summary of why the observed price may deviate from the true price. They note that the observed price may diverge from the true price due to (1) noise trading (Schiller 1988, Delong, Shleifer, Summers, and Waldmann 1990); (2) uninformed trading (Wang 1993); or (3) difficulties associated with measuring the true price. They argue that the magnitude and the duration of the deviations depend on the costs of arbitrage. In such cases, the process by which price adjusts to intrinsic value requires time, and observed price does not always perfectly reflect true price. In such a world, as they claim, a more realistic depiction of the relation between observed price and true price is one of continuous convergence rather than static equality. This is because in the long run, arbitrage forces cause price to converge to value, but in the short run, the existence of nontrivial arbitrage costs may prevent observed price from converging to true price. A typical example of such arbitrage cost is trading cost, which can take the form of bid-ask

2) $\rho = 1 + r$, where r is long-term return on equity

3) Or alternatively, the "intrinsic" value (Lee, Myers, and Swaminathan 1999)

spread, commissions, the cost of selling short, or the opportunity costs associated with implementing the strategy (Bernard and Thomas 1989). Stoll and Whaley (1983) estimate average trading costs for small and large firm stocks at approximately four to two percents on an annual basis. Thus, if the potential arbitrage profit is below this threshold, then a rational investor would not decide to engage in trading, and observed price may deviate from true price.

Given that P_t^o may be different from P_t at times but should converge over time, investors may be interested in finding P_t. This is because if they have a better idea of P_t, they can take investment positions based on this knowledge to generate arbitrage profit. Let's consider the following example. If there is a stock that will have high (low) *ROE* in the future but the market does not fully impound this information, it will be mis-priced, i.e., $P_t \neq P_t^o$. This discrepancy between P_t and P_t^o will give rise to arbitrage opportunities to the investors. If $P_t < P_t^o$ ($P_t > P_t^o$), the investors are likely to profit by shorting (longing) the stock. To the extent that *ROE* is informative about *P*, trading rule based on *ROE* becomes an interesting research question.

III. Test Procedures

Equation (2), (3) represent procedures for estimating a firm's true value (P_t). The four main parameters needed for both *ROE* and *VP* test are: return on equity (ROE_t), book value (B_t), forecasted future net income (FNI_{t+1}), and cost of capital (ρ).

Consistent with previous literature (Bernard 1994, Beaver and Ryan 2000) ROE_t is defined as NI_t/BV_{t-1}, where *NI* and *BV* are net income (annual Compustat #18) and book value (annual Compustat #60) measured at per-share level, respectively. The number of shares is Compustat item #25, adjusted for stock splits and dividends.

The *VP* is calculated as in equation (4), similar to Frankel and Lee (1998).[4] The model is kept rather simple based on Liu, Nissim, and Thomas (2000)'s findings that more complicated

4) The main difference is that they used I/B/E/S forecasts to derive future ROE estimates. Instead, we directly use the median I/B/E/S consensus earnings forecasts. See appendix A in Frankle and Lee (1998) for more details.

specification of intrinsic value estimate provides only trivial improvement over more parsimonious ones.

$$\hat{P}_t = B_t + \frac{E_t[\tilde{FNI}_{t+1} - (\rho - 1)B_t]}{\rho} + \frac{E_t[\tilde{FNI}_{t+2} - (\rho - 1)\tilde{B}_{t+1}]}{\rho(\rho - 1)} \quad (4)$$

where *FNI* is forecasted future net income

The above specification forecasts abnormal earnings for two periods and takes the last period in perpetuity. For FNI_{t+1} and FNI_{t+2}, we use the median I/B/E/S consensus analysts' forecasts issued at each fiscal year end.[5] For the dividend payout ratio that is necessary to forecast future dividend, we calculate firm-specific payout ratio by dividing the common stock dividends paid in the most recent year (Compustat Item #21) by net income before extraordinary items (Compustat Item #237). Similar to Frankel and Lee (1998), we divide dividends by ten percent of book value to compute an estimated payout ratio for firms with negative earnings. Finally, we adopt two types of cost-of-capital estimates.

$$R_{j,m} = RF_m + RP_j \quad (5)$$

where $R_{j,m}$ is an annual cost-of-capital estimate of firm j, RF_m is risk-free rate,[6] and RP_j is the industry-specific risk premium for firm j

The first is firm-specific rate using the capital asset pricing model and the second one is industry specific cost-of-capital (Fama and French 1997). Since Lee, Myers, and Swaminathan (1999) show that the estimation of intrinsic value is improved when time-varying component of cost-of-capital is used, we report results based on the industry and time-specific cost-of-capital estimates (Fama and French 1997). However, results are comparable when the firm-specific rates are used.

In order to investigate the ability of current ROE to predict future ROE, we rank firms based on ROEs at each fiscal year end and track future ROEs up to three years. The mean ROEs in

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5) In order to avoid the situation where the asymmetric distribution of forecasted earnings affects the results, we use the median forecasts.

6) RF_m is an annualized rate of one-month T-bill rate obtained from Ibbotson and Associate's 1999 Year Book

each decile are reported in Panel A of Table 2, and they are plotted in Panel B. To examine the return implications, we first compute future buy-and-hold returns. These buy-and-hold returns are computed by compounding monthly returns obtained from CRSP monthly tape. To ensure that financial statement information necessary to compute ROE has reached the investors, we start calculating returns four months after the fiscal year end.[7] Thus, year '*t*' return period for a firm with December fiscal year end starts in April of year *t*+1 and ends in March of year *t*+2. An advantage of examining buy-and-hold (both raw and market-adjusted) return is that it captures long-term investor experience relatively well compared to other methods of calculating long-term returns. In this vein, Barber and Lyon (1997) recommend the use of buy-and-hold return to measure long-term stock return performance. We compute both raw (BHR) and market-adjusted (BHAR) buy-and-hold returns in the following manner:

$$BHR_{i,j} = \prod_{j}(1 + r_{i,j}) \qquad BHAR_{i,j} = \left[\prod_{j}(1 + r_{i,j}) - \prod_{j}(1 + R_j)\right] \tag{6}$$

where $r_{i,j}$ = raw stock return for firm i in the portfolio in month j, R_j = market return (S&P 500 Composite Index) in month j

To compute the market-adjusted buy-and-hold returns for individual securities, we subtract the market return from the return of a security during the corresponding period. Using these individual returns, we compute BHAR at the portfolio level by equally weighting the individual returns. With these, we compute hedge portfolio return, which is the difference between the return for portfolio 10 and the return for portfolio 1. This return summarizes the predictive ability of each ratio with respect to future returns.

To adjust for risk, we estimate the following two models. The first adjustment procedure involves Jensen alphas (Ibbotson

7) This holding period has been frequently examined in the accounting literature, but is different than the ones commonly examined in the finance literature. A typical holding period in the finance literature (i.e. Fama and French 1993) starts from July of year *t*+1, regardless of the fiscal-year-end month in year *t*, where as that in the accounting literature starts three to four months after each fiscal year end.

1975). This procedure uses the following time-series regression for each portfolio.

$$(R_{j,t} - RF_t) = \alpha_j + \beta_j(RM_t - RF_t) + \varepsilon_{j,t} \tag{7}$$

where $R_{j,t}$ is average raw monthly returns of the portfolio in calendar-month t, RF_t is risk free rate in month t (Ibbottson Associate's one-month T-bill rate), and RM_t is market return for month j (value-weighted CRSP market return)

The β_j measures the relative risk of each portfolio, and α_j, Jensen alpha, captures the excess return with respect to beta. Under this specification, the intercept, by construction, measures the monthly average excess return with respect to the beta. Thus, for instance, the intercept of .01 means that the monthly average abnormal returns to the trading strategy under examination is 1% after controlling for the market premium. This specification assumes that investors use the Sharpe-Lintner version of the capital asset pricing model in forming expectations about future returns.

The second adjustment procedure is regarding firm size and book-to-market ratio (Fama and French 1993). Since these two variables are well-documented predictors of future stock returns, we include these variables to the previous specification and estimate the following three-factor model:

$$(R_{j,t} - RF_t) = \alpha_j + \beta_j(RM_t - RF_t) + \gamma_j SMB_t + \varphi_j HML_t + \varepsilon_{j,t} \tag{8}$$

where SMB_t is the difference between the return of portfolios of "small" stocks and "big" stocks in month t, HML_t is the difference between the return of portfolios of "high" book-to-market stocks and "low" book-to market stocks in month t

Similar to the previous specification, i.e. equation (7), the intercept α_j in this equation measures the average monthly abnormal returns of a portfolio with respect to the three factors. If the profitability of ROE trading rule is a result of its correlation with some of these risk factors, then the intercept α_j should not be significantly different from zero. A value of β_j greater (less) than one means that firms in portfolio j are, on average, riskier (less risky) than the market. A value of γ_j greater (less) than zero indicates the influence of small (large) stocks in the portfolio on the portfolio return. A value of φ_j greater (less) than zero indicates the influence of high (low) book-to-market stocks in the portfolio on the portfolio return. Fama (1998), among others, notes that this methodology has an advantage (over other methods of measuring long-term stock performance) of being able to account for the cross-sectional correlations across securities through the time-series variation of the monthly abnormal stock returns.

IV. Data and Descriptive Statistics

The evidence presented in this paper is based on a sample of 29,140 firm-year observations during 1982 to 1995 with (1) non-missing earnings and book value data on 1999 Compustat Annual Primary, Secondary, and Tertiary, Full Coverage, and Merged Research Files; (2) necessary price and return data in 1999 CRSP files; (3) one and two-year-ahead consensus analysts' forecasts available on 1999 I/B/E/S files. The number of yearly observations ranges between 1,598 (in 1982) and 2,763 (in 1995) during the sample period. To control for survivorship bias, we do not exclude observations that do not have ROE or return data in the years subsequent to portfolio formation. Thus, an observation in the sample can have missing future return data in one or all of the five subsequent years.

Descriptive statistics and correlations are shown in Panel A of Table 1. Pearson (Spearman) correlation is reported above (below) the diagonal. As expected, ROE is positively related to VP but negatively related to BP. The correlation between current ROE and other financial ratios are generally significant at 99% confidence level. Panel B of Table1 reports a summary statistics of the selected variables during the sample period. The mean and the median ROE during the sample period approximate .10 and .13 respectively.[8] The mean of VP and BP are .7159 and .7346. These figures are comparable to the ones reported in the previous studies (Bernard 1994, Frankel and Lee 1998, and Fama and French 1992). On average, there are 2,081

8) Similarly, Bernard (1994) had the mean ROE of .11 in his sample.

Table 1. Correlations and Summary Statistics of Selected Variables[a]

Panel A: Correlation among Selected Variables[b]

	ROE	VP	BP	SIZE
ROE		0.0247 (.0001)	-0.1997 (.0001)	0.2107 (.0001)
VP	0.0506 (.0001)		0.3227 (.0001)	-0.0462 (.0001)
BP	-0.3618 (.0001)	0.3980 (.0001)		-0.1946 (.0001)
SIZE	0.2590 (.0001)	-0.0236 (.0283)	-0.1896 (.0001)	

Panel B: Summary Statistics

Variables	Mean	Median	Std. Dev.	Maximum	Minimum
ROE	0.1002	0.1279	0.2126	1.7906	-1.8332
VP	0.7159	0.6683	0.3384	2.9835	0.0159
BP	0.7346	0.6538	0.4369	3.4069	0.0545
SIZE	7.0639	5.3655	8.4094	12.7179	-4.5099
3mo Ret	0.0466	0.0331	0.2087	3.0000	-0.9185
6mo Ret	0.0739	0.0489	0.3138	4.4545	-0.9549
Yr1 Ret	0.1576	0.1058	0.4859	16.3333	-0.9848
Yr2 Ret	0.1748	0.1235	0.4802	9.7895	-0.9848
Yr3 Ret	0.1595	0.1042	0.4893	9.7895	-0.9779

a This table is based on 29,104 observations during 1981-1996. ROE, VP, and BP refer to book-return on equity, intrinsic value-to-price, and book-to-price ratio, respectively. Firm size is measured as the log of total market capitalization at the beginning of the period

b The correlation reported above (below) the diagonal is Pearson (Spearman) correlation. Reported in parentheses are p-values.

observations each year during the sample period.[9] The mean and the median beta in the sample are approximately 1.71 and 1.88. They are estimated using at least 24 monthly returns. The market risk premium of 8.4%, the mean of historical premium

9) Firms can have missing data in future years.

during 1929-1998 period (Ibbotson and Associates 1999), is used. The mean and the median of the resulting firm-specific cost-of-capital estimates are 14.33% and 15.83%. The corresponding figures for the industry cost-of-capital estimates are 12.39% and 12.33%, respectively.

V. Results and Discussions

Table 2 reports the evolution of future ROE in ROE portfolios. The mean-reversion in ROEs over the years is consistent with previous studies (Bernard 1994, Beaver and Ryan 2000). The hedge portfolio ROE (the top decile portfolio ROE less the bottom decile portfolio ROE) decreases from about 73% in year zero to 24% by the end of year three. The mean reversion is stronger for the extreme portfolios, consistent with competitive forces driving out abnormally high profitability while dislocation costs "trap" some firms with abnormally low profits (Bernard 1994).

Table 3 and Table 4 show the future return performance of ROE and VP portfolio. The evidence indicates that although the ROE hedge portfolio returns are significant up to one year after portfolio formation, it under-performs the benchmark portfolio thereafter. Over one year after portfolio formation, the ROE portfolio generates hedge return of about 2.8%, while the VP portfolio generates 5.0%. The VP portfolio return is comparable to the ones reported in previous studies. For instance, the first year VP portfolio hedge return is approximately 4-5%, about the same as Dechow, Hutton, and Sloan (1999) who report about 6% in their sample.[10]

Beyond one year, the VP portfolio dominates the ROE portfolio, and the ROE hedge portfolio return becomes less significant. The superior return predictability of VP over longer horizon is consistent with Frankel and Lee (1998). The VP portfolio generates close to 9% for two years after the portfolio formation, and about 7% for three years. Table 5 shows the results from

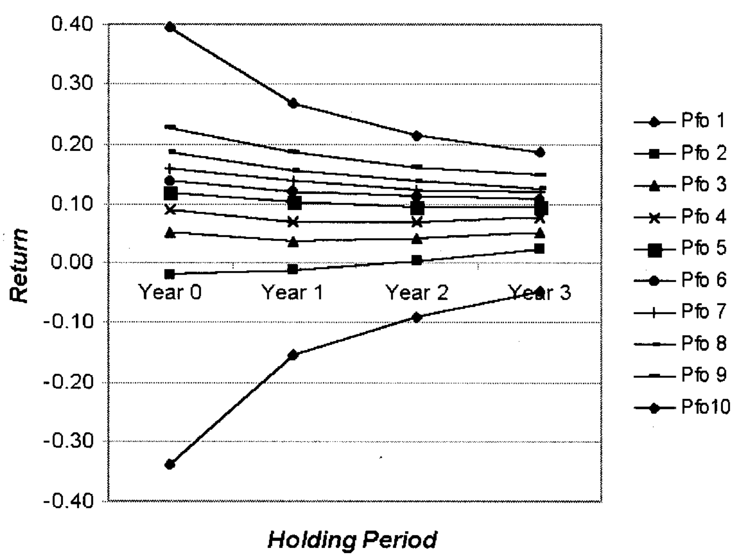
10) Frankel and Lee (1998) obtain similar level of return (about 3-4%) in the first year. If Fama and French (1993) holding period is applied to my sample, the VP hedge portfolio return increases across years, and it exceed 5% in the first year.

Table 2. The Evolution of Future ROE in ROE Portfolios[c]

Panel A: The Evolution of Future ROE in ROE Portfolio

Portfolio	Yr0 ROE	Yr1 ROE	Yr2 ROE	Yr3 ROE
1	-0.3386	-0.1559	-0.0913	-0.0488
2	-0.0198	-0.0117	0.0018	0.0239
3	0.0509	0.0347	0.0405	0.0506
4	0.0887	0.0684	0.0693	0.0775
5	0.1164	0.1019	0.0953	0.0934
6	0.1384	0.1194	0.1126	0.1058
7	0.1591	0.1373	0.1223	0.1192
8	0.1849	0.1553	0.1370	0.1247
9	0.2264	0.1864	0.1611	0.1473
10	0.3955	0.2664	0.2140	0.1868

Panel B: The Evolution of Future ROE in ROE Portfolio (Panel A Plotted)[d]



c ROE is book return-on-equity. Decile 1 (10) refers to low (high) ROE portfolios, respectively. Yr0 ROE, Yr1 ROE, Yr2 ROE, Yr3 ROE refer to ROE at Year 0, one-year, two-year, and three-year subsequent to portfolio formation, respectively.

d In the graph, Pfo 1, Pfo 2, ..., Pfo 10 refer to decile 1 (lowest ROE) to decile 10 (highest ROE) portfolio, respectively.

Table 3. Future Return Performance of ROE Portfolios[e,f]

Panel A: ROE Portfolio Future Raw Return

Portfolio	mnROE	3moRET	6moRET	Yr1RET	Yr2RET	Yr3RET
1	-0.3386	0.0397	0.0624	0.1355	0.1497	0.1487
2	-0.0198	0.0488	0.0583	0.1531	0.1759	0.1680
3	0.0509	0.0444	0.0725	0.1514	0.1785	0.1679
4	0.0887	0.0394	0.0718	0.1496	0.1900	0.1601
5	0.1164	0.0445	0.0745	0.1667	0.1788	0.1622
6	0.1384	0.0430	0.0743	0.1553	0.1798	0.1491
7	0.1591	0.0500	0.0837	0.1711	0.1709	0.1563
8	0.1849	0.0488	0.0853	0.1722	0.1804	0.1554
9	0.2264	0.0511	0.0757	0.1606	0.1722	0.1504
10	0.3955	0.0570	0.0829	0.1636	0.1715	0.1755
Hedge		0.0173	0.0205	0.0281	0.0217	0.0268
(t-stat)		(2.3926)***	(1.8953)**	(1.6545)**	(1.3424)*	(1.6788)**

Panel B: ROE Portfolio Future Market-Adjusted Return

Portfolio	mnROE	3moRET	6moRET	Yr1RET	Yr2RET	Yr3RET
1	-0.3386	0.0067	0.0066	0.0076	-0.0103	-0.0177
2	-0.0198	0.0136	0.0024	0.0223	0.0229	0.0046
3	0.0509	0.0080	0.0122	0.0176	0.0234	0.0083
4	0.0887	0.0033	0.0116	0.0171	0.0348	0.0004
5	0.1164	0.0084	0.0157	0.0347	0.0248	0.0005
6	0.1384	0.0070	0.0168	0.0240	0.0260	-0.0108
7	0.1591	0.0137	0.0243	0.0376	0.0160	-0.0052
8	0.1849	0.0145	0.0258	0.0393	0.0230	-0.0029
9	0.2264	0.0148	0.0134	0.0268	0.0157	-0.0102
10	0.3955	0.0199	0.0191	0.0273	0.0126	0.0151
Hedge		0.0132	0.0124	0.0196	0.0229	0.0329
(t-stat)		(1.8333)**	(3.3514)***	(4.3946)***	(1.4313)*	(2.1087)**

e ROE indicates book return-on-equity. *Mn*ROE refers to the mean ROE in the decile. *6moRet, 1YrRet, 2YrRet,3YrRet* refer to returns six-month, one-year, two-year, and three-year subsequent to portfolio formation, respectively. The portfolios are formed four-months after each fiscal year end in order to ensure that financial statement information has reached the investors.

f ***, ** and * signify one-tailed statistical significance at the 1%, 5% and 10% levels, respectively.

Table 4. Future Return Performance of Value-to-Price (VP) Portfolios[g,h]

Panel A: VP Portfolio Future Raw Return

Portfolio	mnVP	3moRET	6moRET	Yr1RET	Yr2RET	Yr3RET
1	0.2647	0.0440	0.0700	0.1224	0.1160	0.1328
2	0.4185	0.0386	0.0558	0.1304	0.1610	0.1361
3	0.4997	0.0413	0.0597	0.1262	0.1688	0.1345
4	0.5700	0.0453	0.0684	0.1496	0.1706	0.1523
5	0.6390	0.0407	0.0592	0.1383	0.1655	0.1396
6	0.7081	0.0434	0.0712	0.1587	0.1734	0.1577
7	0.7800	0.0476	0.0780	0.1734	0.1900	0.1706
8	0.8650	0.0474	0.0828	0.1758	0.1909	0.1643
9	0.9960	0.0412	0.0729	0.1658	0.1990	0.1857
10	1.4184	0.0519	0.0790	0.1721	0.2037	0.1917
Hedge		0.0078	0.0089	0.0497	0.0876	0.0589
(t-stat)		(2.1814)**	(0.9993)	(3.5981)***	(6.0057)***	(4.0659)***

Panel B: VP Portfolio Future Market-Adjusted Return

Portfolio	mnVP	3moRET	6moRET	Yr1RET	Yr2RET	Yr3RET
1	0.2647	0.0131	0.0158	-0.0052	-0.0432	-0.0353
2	0.4185	0.0065	-0.0013	0.0011	0.0037	-0.0234
3	0.4997	0.0085	0.0030	-0.0065	0.0136	-0.0254
4	0.5700	0.0106	0.0089	0.0189	0.0134	-0.0056
5	0.6390	0.0058	0.0031	0.0078	0.0089	-0.0176
6	0.7081	0:0071	0.0140	0.0242	0.0186	-0.0010
7	0.7800	0.0106	0.0188	0.0390	0.0339	0.0117
8	0.8650	0.0088	0.0213	0.0408	0.0379	0.0056
9	0.9960	0.0029	0.0125	0.0297	0.0456	0.0245
10	1.4184	0.0122	0.0145	0.0386	0.0500	0.0337
Hedge		-0.0008	-0.0013	0.0438	0.0932	0.0690
(t-stat)		(-0.8008)	(-0.5910)	(3.2444)***	(6.3856)***	(4.6000)***

g MnVP refers to the mean VP in the decile. 6moRet, 1YrRet, 2YrRet, 3YrRet refer to returns six-month, one-year, two-year, and three-year subsequent to portfolio formation, respectively. The portfolios are formed four-months after each fiscal year end in order to ensure that financial statement information has reached the investors.

h ***, ** and * signify one-tailed statistical significance at the 1%, 5% and 10% levels, respectively.

Table 5. Time Series Regressions of Monthly Excess Returns[i,j]

- *1-Factor Model:* $(R_{j,t} - RF_t) = \alpha_j + \beta_j (RM_t - RF_t) + \varepsilon_{j,t}$ (7)
- *3-Factor Model:* $(R_{j,t} - RF_t) = \alpha_j + \beta_j (RM_t - RF_t) + \gamma_j SMB_t + \varphi_j HML_t + \varepsilon_{j,t}$ (8)

Panel A: ROE Portfolio Regressions

Portfolio	Model	α_j	β_j	γ_j	φ_j	Adj.R^2
High ROE	1-factor	-0.002	1.20			0.860
	(t-stat)	(-1.02)	(32.09)***			
	3-factor	0.001	1.08	0.61	-0.22	0.956
	(t-stat)	(1.55)	(44.98)***	(16.29)***	(-5.39)***	
Low ROE	1-factor	-0.002	1.27			0.507
	(t-stat)	(-0.559)	(13.60)***			
	3-factor	-0.002	1.26	1.65	0.45	0.768
	(t-stat)	(-0.669)	(17.26)***	(14.25)***	(3.54)***	

Panel B: VP Portfolio Regressions

Portfolio	Model	α_j	β_j	γ_j	φ_j	Adj.R^2
High VP	1-factor	0.001	1.09			0.670
	(t-stat)	(0.34)	(18.84)***			
	3-factor	-0.001	1.15	1.01	0.57	0.864
	(t-stat)	(-.312)	(27.14)***	(15.19)***	(7.92)***	
Low VP	1-factor	0.003	1.08			0.507
	(t-stat)	(1.13)	(16.12)***			
	3-factor	0.003	1.08	1.15	0.40	0.768
	(t-stat)	(1.58)	(20.60)***	(14.16)***	(4.55)***	

i The results are based on 180 monthly stock returns of the market, size, and book-to-market factors from May 1982 to April 1997. The results are based on 12-month holding investment strategy. $R_{j,t}$ is equally-weighted monthly stock returns of the portfolio in calendar-month t, RF_t is risk free rate in month t (Ibbottson Associate's one-month T-bill rate), RM_t is market return for month j (value-weighted CRSP market return), SMB_t is the difference between the return of portfolios of "small" stocks and "big" stocks in month t, and HML_t is the difference between the return of portfolios of "high" and "low" book-to market stocks in month t. High (low) ROE indicates top (bottom) decile ROE portfolio.

j ***, ** and * signify two-tailed statistical significance at the 1%, 5% and 10% levels, respectively.

Table 6. Time Series Regressions of Monthly Excess Returns on ROE Portfolios: Sub-Sample Period Analysis[k,l,m]

- *1-Factor Model:* $(R_{j,t} - RF_t) = \alpha_j + \beta_j (RM_t - RF_t) + \varepsilon_{j,t}$ (7)
- *3-Factor Model:* $(R_{j,t} - RF_t) = \alpha_j + \beta_j (RM_t - RF_t) + \gamma_j SMB_t + \varphi_j HML_t + \varepsilon_{j,t}$ (8)

Panel A: Pre-1990 Period

Portfolio	Model	α_j	β_j	γ_j	φ_j	Adj.R^2
High ROE	1-factor	-0.003	1.26			0.877
	(t-stat)	(-1.23)	(24.37)***			
	3-factor	0.000	1.10	0.75	-0.37	0.968
	(t-stat)	(0.17)	(32.60)***	(11.80)***	(-4.67)***	
Low ROE	1-factor	-0.007	1.29			0.629
	(t-stat)	(-1.31)	(11.90)***			
	3-factor	-0.001	1.23	1.50	0.34	0.770
	(t-stat)	(-0.34)	(12.90)***	(8.36)***	(1.52)	

Panel B: Post-1990 Period

Portfolio	Model	α_j	β_j	γ_j	φ_j	Adj.R^2
High VP	1-factor	-0.003	1.27			0.639
	(t-stat)	(-0.79)	(10.52)***			
	3-factor	-0.000	1.12	0.81	-0.20	0.930
	(t-stat)	(-0.04)	(19.04)***	(13.80)***	(-3.31)***	
Low VP	1-factor	0.000	1.45			0.300
	(t-stat)	(0.01)	(0.28)			
	3-factor	-0.004	1.50	1.89	0.48	0.740
	(t-stat)	(-0.88)	(8.09)***	(10.25)***	(2.47)**	

k The results are based on 180 monthly stock returns of the market, size, and book-to-market factors from May 1982 to April 1997. The results are based on 12-month holding investment strategy. $R_{j,t}$ is equally-weighted monthly stock returns of the portfolio in calendar-month *t*, RF_t is risk free rate in month *t* (Ibbottson Associate's one-month T-bill rate), RM_t is market return for month *j* (value-weighted CRSP market return), SMB_t is the difference between the return of portfolios of "small" stocks and "big" stocks in month *t*, and HML_t is the difference between the return of portfolios of "high" and "low" book-to market stocks in month *t*. High (low) ROE indicates top (bottom) decile ROE portfolio.

l ***, ** and * signify two-tailed statistical significance at the 1%, 5% and 10% levels, respectively.

m Pre-1990 (Post-1990) period covers 1985-1991 (1992-1997).

estimating equation (7) and (8). The results indicate that the profitability of ROE trading rule is by and large subsumed by the conventional risk factors. The intercepts in both specifications (Jensen alpha and the three-factor model alpha) are insignificant in both top and bottom decile ROE portfolio.

More importantly, Table 5 shows interesting beta estimates for the ROE portfolios. Looking down the beta column of ROE portfolios in Panel A, we can see that low ROE portfolio has higher betas than high ROE portfolio in both models. Given the unexpected result for betas, we turn to additional analysis of sub-sample period. Table 6 also shows that even in the sub-sample period the high ROE portfolio betas are consistently smaller than those of the low ROE portfolio. This result suggests that the differences of returns among ROE based portfolios are not due to differences in the conventional risk factors.

VI. Conclusion

Motivated by the residual income valuation model, this study explores the return predictability of ROE and VP based trading rules. Although the ROE based hedge portfolio return is significant up to one year after portfolio formation, our evidence indicates that the profitability of ROE trading rule is largely explained by the conventional risk factors. Both Jensen's alpha and the three-factor model alpha for 12-month holding period are insignificant, suggesting that the profitability of ROE trading rule is subsumed by the conventional risk factors. Beyond one year after portfolio formation, the profitability of ROE trading rule dissipates quickly, and the VP portfolio dominates ROE portfolio up to three years. However, the profitability of VP based trading rule is also subsumed by the conventional risk factors.

One finding, which raises interesting questions about market efficiency, is that unlike betas in VP portfolio, betas in high ROE portfolio are smaller than those in low ROE portfolio. This result is difficult to reconcile with the risk hypothesis that all the difference in returns are due to the difference in risks. There may be another factor that affect the differences of returns other than conventional risk factors. We leave this issue to future research.

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