

THE PERFORMANCE OF THE P/B, P/E AND RIVM VALUATION MODELS FOR U.S. RATE-REGULATED COMPANIES

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Abstract

This paper studies the performance of the P/B, P/E and RIVM valuation models in finding out the intrinsic value of equity of U.S. utilities companies. Utilities are businesses whose revenues are set by regulators such as to allow only a “normal” rate of return and align market and book values. I expect that, if regulation is efficient in accomplishing this goal, the application of the sophisticated RIVM is not advantageous *vis-à-vis* the application of less complex multiples-based approaches because figures drawn from financial statements are very close to market values. U.S. manufacturing companies are used as a control group in order to maximize the comparability of the performance metrics. The performance of the valuation models is evaluated in terms of accuracy (how close to zero the valuation errors are) and bias (whether the model under or over estimates observed share price). The results show that for rate-regulated companies the RIVM generates value estimates that are neither more accurate (biggest absolute valuation errors) nor less biased (greatly over estimates the observed share price) than the ones obtained by the simple application of multiples-based approaches. This result suggests that residual income is quite low for rate-regulated companies in the United States. This can also indicate the regulation practiced in that country is relatively efficient and that the accruals measures recorded according to Regulatory Accounting Principles (RAP) perform well in terms of capturing the intrinsic value of utilities companies' shares.

1. Introduction

Accounting-based valuation models are broadly divided into accounting flow-based and multiples-based approaches. Accounting flow-based approaches are considered more sophisticated and require detailed forecasts of measures such as earnings, dividend payout ratio, growth, discount rate, etc. Multiples-based approaches, on the other hand, rely on a set of comparable firms as a proxy for the aforementioned measures in order to arrive at an estimate of the intrinsic value of a firm's equity capital.

Although theoretically all valuation models should render the same value estimates, practicalities of implementation usually result in one over-performing the other.

In this paper I use one flow-based approach, the Residual Income Valuation Model (RIVM), and two multiples-based approaches, the Price to Book (P/B) and the Price to Earnings (P/E) ratios, to find the intrinsic value of equity of utilities companies.

The utilities industry comprises companies that provide essential public services such as generation, transmission or distribution of electricity or gas, delivery of water or collection and disposal of garbage, sewage and other wastes.

Utilities are rate-regulated companies whose revenues are set such as to allow only a “normal” rate of return. A normal rate of return implies that a firm's income is equal to its cost of capital (thus the residual income is forecasted to be zero), the P/B ratio is equal to one, and the P/E ratio is equal to the inverse of the cost of capital plus one.

On the other hand, manufacturing companies, as non regulated firms, are not subject to any policies restricting profits or requiring alignment of market with book value, do not

refund abnormal profits to customers and have factors other than book value (e.g. unrestricted market entry, strikes, technological advance, etc) which affect the prediction of their future or abnormal earnings (Nwaeze, 1998).

In the large sample analysis, a study of the performance of the valuation methods for a sample of U.S. utilities and a sample of U.S. manufacturing companies is carried out. The performance is measured in terms of both accuracy (the portion of the observed share price explained by each model) and bias (whether the model under or over estimates observed share price). For utilities, measurement errors between each pair of valuation methods are also compared.

As expected, my results indicate that for utilities the RIVM provides value estimates which are neither less biased nor more accurate than those found by using the P/E and P/B ratios.

2. Literature review

2.1 Theoretical basis of accounting-based valuation models

Equity valuation using accounting numbers is the process of converting accounting forecasts into an estimate of a firm's equity value. The implementation of this process is carried out by the use of one or more valuation models.

There are two broad approaches to estimate the intrinsic value of equity: the accounting flow-based approach and the multiples-based approach.

In the accounting flow-based approach the value of equity can be determined by calculating the present value of dividends, cash flows, or earnings forecasts. Some of the best known accounting flow-based valuation models are the Dividend Discount Model (DDM), the Discounted Cash Flow Model (DCF), the Residual Income Valuation Model (RIVM) and the Abnormal Earnings Growth Model (AEGM).

The multiples-based approach obtains the value of equity of a company by examining the equity price of a set of firms which are comparable to the one that is being valued. Some of the most used multiples-based approaches are the ratios of Price to Earnings (P/E), Price to Book Value (P/B) and Price to Sales (P/S).

2.2 Accounting flow-based valuation methods

In theory, a firm's intrinsic value is estimated by discounting forecasted future accounting flows (such as dividends, net income, NOPAT or residual income) over an infinite horizon. However, in the practical implementation of such methods, accounting flows are forecasted over a finite horizon T (usually from 2 to 10 years).

In order to estimate the value that a company is expected to generate after the forecasted horizon (i.e. in perpetuity), the calculation of a terminal value based on some simplifying assumptions is carried out.

2.2.1 The Dividend Discount Model (DDM)

All valuation models derive, more or less obviously, from the Dividend Discount Model (DDM) attributed to Williams (1938). The DDM expresses the intrinsic value of a firm's equity capital as the present value of its expected future dividends. The DDM is expressed by the following formula:

$$S_t = \sum_{i=1}^{\infty} \frac{E_t[DIV_{t+i}]}{(1+r_e)^i} \quad (1)$$

where S_t is the value of equity at time t , r_e is the cost of equity, DIV_{t+i} is the dividend at time $t+i$ and $E_t[.]$ is the expectation operator based on information available at time t .

Equation 1 is related to the general approach of the DDM regardless of whether the level of expected dividends is constant or growing.

In the case of zero growth (i.e. constant dividend) the value of a share is given by:

$$S_t = \frac{DIV_1}{1+r_e} + \frac{DIV_2}{(1+r_e)^2} + \frac{DIV_3}{(1+r_e)^3} \dots = \frac{DIV}{r_e} \quad (2)$$

If future dividends are expected to grow at a constant rate g , the value of a share is expressed as follows:

$$S_t = \frac{DIV_1}{1+r_e} + \frac{DIV_2(1+g)}{(1+r_e)^2} + \frac{DIV_3(1+g)^2}{(1+r_e)^3} \dots = \frac{DIV}{r_e-g} \quad (3)$$

2.2.2 The Residual Income Valuation Model (RIVM)

Although many researchers have discovered that the present value of a stream of future cash flows can be translated into the current book value plus the present value of all future residual income (Preinreich, 1938; Edwards & Bell, 1961; Peasnell; 1982¹), the recent prominence of the RIVM is attributed to the analytical work of Ohlson (1989, 1995).

The traditional RIVM approach (used in this paper) relies on the assumptions that a firm's value is equal to the present value of expected future dividends and that both earnings and book value forecasts must be obtained in conformity with a Clean Surplus Relationship (CSR). This approach is usually referred to as the Edwards-Bell-Ohlson (EBO) valuation technique.

According to the CSR, the change in book value from one period to the other is equal to net income minus dividends, i.e., $BVE_{t+1} - BVE_t = NI_{t+1} - DIV_{t+1}$.

Algebraically, residual income is defined as:

$$RI_{t+1} = NI_{t+1} - (r_e * BVE_t), \quad (4)$$

where RI_{t+1} is the residual income at time $t+1$, BVE_t is the book value at time t , NI_{t+1} is net income for period $t+1$ and r_e is the cost of equity capital.

Residual income is also referred in the literature as "abnormal" earnings (earnings in excess of a normal return on capital employed) or economic value added (EVA)².

The DDM can be reformulated as follows in order to express a firm's equity capital value in terms of book value of equity plus the present value of expected residual income:

¹ All cited by O'Hanlon & Peasnell (2000).

² EVA® is a trademark of Stern Stewart & Co. In the United States, the United Kingdom and other countries of the world.

$$S_t = \sum_{i=1}^{\infty} \frac{E_t[DIV_{t+i}]}{(1+r_e)^i}$$

$$S_t = \frac{E_t[DIV_{t+1}]}{1+r_e} + \frac{E_t[DIV_{t+2}]}{(1+r_e)^2} + \frac{E_t[DIV_{t+3}]}{(1+r_e)^3} + \dots$$

Under the CSR assumption, $BVE_{t+1} - BVE_t = NI_{t+1} - DIV_{t+1}$.

Dividends (DIV) can be expressed as a function of net income (NI) and the book value of equity (BVE): $DIV_{t+1} = NI_{t+1} + BVE_t - BVE_{t+1}$.

From the residual income definition: $NI_{t+1} = RI_{t+1} + r_e * BVE_t$.

So, $DIV_{t+1} = [RI_{t+1} + r_e * BVE_t] - (BVE_t - BVE_{t+1}) = RI_{t+1} - BVE_{t+1} + (1+r_e) * BVE_t$.

Substituting this expression into the dividend discount model, the equity value can be expressed as follows:

$$\begin{aligned} S_t &= \frac{E_t[DIV_{t+1}]}{(1+r_e)} + \frac{E_t[DIV_{t+2}]}{(1+r_e)^2} + \frac{E_t[DIV_{t+3}]}{(1+r_e)^3} \dots \\ S_t &= \frac{E_t[RI_{t+1} - BVE_{t+1} + (1+k_e) * BVE_t]}{(1+r_e)} \\ &+ \frac{E_t[RI_{t+2} - BVE_{t+2} + (1+k_e) * BVE_{t+1}]}{(1+r_e)^2} \\ &+ \frac{E_t[RI_{t+3} - BVE_{t+3} + (1+k_e) * BVE_{t+2}]}{(1+r_e)^3} \end{aligned}$$

So, the DDM can be re-expressed as follows:

$$S_t = BVE_t + \sum_{i=1}^{\infty} \frac{E_t[RI_{t+i}]}{(1+r_e)^i}$$

Therefore, the value of equity can be expressed by the current book value plus the present value of residual income.

The recent innovation attributed to Ohlson (1995) is the creation of the Linear Information Dynamics (LID) approach, which states that future residual income obeys a mean reverting process.

Dechow *et al* (1999) find that the rate of mean reversion is decreasing in the quality of earnings, increasing in the dividend payout ratio and correlated across firms in the same industry, thereby supporting Ohlson's model. However, they also find that it provides only minor improvements over existing attempts to implement the Discount Dividend Model by capitalising short-term earnings forecasts in perpetuity.

The RIVM formula can be expressed as follows:

$$S_t = BVE_t + \sum_{i=1}^{\infty} \frac{E_t[NI_{t+i} - (r_e * BVE_t)]}{(1+r_e)^i} \quad (5a)$$

$$= BVE_t + \sum_{i=1}^{\infty} \frac{E_t[(ROE_{t+i} - r_e) * BVE_t]}{(1+r_e)^i}, \quad (5b)$$

where BVE_t is the book value at time t , $E_t[.]$ is the expectation operator based on information available at time t , NI_{t+1} = net income for period $t + 1$, r_e is the cost of equity capital, and ROE_{t+1} is the after tax return on equity for period $t + 1$.

A great advantage of the RIVM is its intuitiveness. As can be seen in equation (5a), if a firm obtains only a normal rate of return over the capital employed, its balance sheet should be sufficient for the purpose of valuation because, theoretically, the book value would be equal to the value of the company.

Similarly, according to Equation (5b), if a firm earns an ROE exactly equal to its cost of capital, its future residual income will be zero and the value of equity will be equal to book value. Therefore, firms expected to obtain ROEs higher (smaller) than their cost of capital will trade at values which are greater (smaller) than book value, i.e., will trade at a premium (discount) over book value.

The usefulness of the RIVM value estimates have been consistently attested by researchers. Penman & Sougiannis (1998) and Francis et al (2000) compare the performance of the DDM, FCF and RIVM in explaining observed prices. Whereas the former apply the models using realised attributes in a portfolio level, the latter apply the models using individual security value estimates based on forecast data. The studies also employ different performance metrics: bias in Penman & Sougiannis [(estimated price – observed price)/observed price] and accuracy in Francis et al [|estimated price – observed price|/observed price]. Despite the different research designs, similar conclusions are reached in these studies.

Penman & Sougiannis (1998) find that equity valuations based on forecasting GAAP accrual earnings and book values (RIVM) render lower errors than those based on forecasting dividends and cash flows. Nonetheless, they also find that earnings approaches do not perform well for high price-to-earnings and high price-to-book, where terminal values calculations are particularly important for valuation.

Francis et al (2000) find that the RIVM generally produces better estimates than both the DDM and the FCF. They attribute this superiority to the fact that the RIVM contains both a stock component (book value of equity) and a flow component (residual income), whereas the DDM and FCF models are pure flow-based models. Consequently, in the RIVM there is less to forecast.

Ohlson (2005), however, argues the existence of two basic problems with the RIVM valuation model. First, applying the RIVM requires clean surplus relationship on a per share basis. However, equity transactions that change the number of shares outstanding imply that $eps \neq \Delta bvps - dps$.

He points out that GAAP earnings usually violate clean surplus accounting. Second, he argues that one cannot bypass the per share issue by applying the RIVM on a total dollar value basis unless one introduces relatively subtle MM-type restrictions.

2.3. Multiples-based valuation models

2.3.1. Theoretical basis of multiples-based valuation

Multiples-based approaches differ from accounting flow-based approaches in that they do not involve multiperiod forecasts of measures such as earnings, dividend payout ratio, growth, discount rate, etc. Instead, a set of comparable firms is used as a proxy for growth and risk in order to arrive at an estimate of the intrinsic value of a firm's equity capital.

Algebraically, the multiples-based approach is defined as follows³:

$$p_{it} = \beta_t x_{it} + \varepsilon_{it}, \quad (6)$$

where p_{it} is the price for firm i (from the comparable group) in year t , x_{it} is the value driver for firm i in year t , β_t is the multiple on the value driver and ε_{it} is the pricing error.

Valuation using multiples is a three-step approach. First, a value driver is selected (earnings, book value, sales, forecast earnings, cash flows, EBITDA, etc). Second, a benchmark multiple is calculated based on a set of comparable firms. Finally, the benchmark multiple is applied to the value driver of the firm that is being analysed.

Liu *et al* (2002) state that although a multiple-based approach does not involve explicit projections and present value calculations, it relies on the same underlying principles of more comprehensive valuation approaches: value is an increasing function of future payoffs and a decreasing function of risk.

Beaver & Morse (1978) find that differences in P/E ratios persist for up to 14 years and that risk (measured by companies' specific betas) and growth (defined as observed annual growth in earnings), taken together, explain about half of this persistence. The remaining 50% is possibly attributed to differences in accounting methods. They find that firms which use conservative accounting methods like, for instance, accelerated depreciation, usually trade at higher multiples than other firms which use less conservative methods, holding constant the effects of risk and growth.

An investigation of the relationship between the P/E and the DDM provides clarification concerning the variables that multiples-based approaches are expected to reflect. The price earnings ratio (P/E) can be expressed as follows:

$$P/E = \frac{S_0}{NI_0}, \quad (7)$$

where P/E is the price/earnings ratio, S_0 is the value of equity and NI_0 is the net income.

The value of equity is:

$$S_0 = \frac{DIV_0(1+g)}{1+r_e} + \frac{DIV_0(1+g)^2}{(1+r_e)^2} + \frac{DIV_0(1+g)^3}{(1+r_e)^3} + \dots \text{ for ever, so}$$

$$S_0 = \frac{DIV_0(1+g)}{(r_e - g)}$$

$$P/E = \frac{S_0}{NI_0} = \frac{DIV_0(1+g)/(r_e - g)}{DIV_0 / \text{payout}} = \frac{(1+g) + \text{payout}}{(r_e - g)}$$

Therefore, despite its apparent simplicity, the P/E ratio, if correctly applied, is assumed to capture relatively complex variables like the growth rate in earnings, the dividend payout ratio and the cost of equity.

2.4. Links among RIVM, P/B and P/E valuation models

³ Formula extracted from Liu *et al* (2002).

If all assets and liabilities are carried at market value in a balance sheet⁴, the future residual income to be generated by those assets will be zero, the P/B ratio will be equal to one and the balance sheet is the only piece of information necessary to value the firm. A P/B ratio equal to one is called “normal” and it occurs when ROE is expected to be equal to cost of capital and, consequently, residual or abnormal income is expected to be zero, and cum-dividends book values are expected to grow at equity cost of capital.

However, in practice many assets are shown on balance sheet at values that do not reflect their market value⁵ (e.g., stock, property, plant and equipment). In this case the balance sheet is not sufficient to value a company because of the difference between the intrinsic value and book value. This difference is attributed to forecasted residual income.

If the present value of forecasted residual income is bigger (smaller) than zero, the equity must be valued at a premium (discount) from book value. This is what is called a non-normal P/B ratio, i.e., a P/B different from one.

Nonetheless, forecasted positive residual income does not necessarily mean abnormal earnings in an economic sense. Penman (2001) argues that this difference could possibly be attributed to accounting conservatism (e.g. excessive depreciation or intangible assets omission), i.e., the same possible cause for the persistent differences in P/E ratios found by Beaver & Morse (1978).

A normal P/E ratio is defined when future residual income is expected to continue at the level of current residual income. When this situation occurs, a normal P/E ratio is equal to $(1+r_e)/r_e$, i.e., the P/E ratio is just given by the cost of equity capital. For example, if a company has a cost of equity equal to 6%, a normal P/E ratio would be equal to 17.7 $(1+0.06)/0.06$. In this case, a normal P/E multiple is sufficient to find the value of equity⁶.

A P/E greater (smaller) than normal reflects the market expectation that earnings (adjusted for dividends) will grow at a rate that is higher (less) than the cost of capital, i.e., residual income is expected to increase (decline) from current levels, and the share must be valued at premium (discount) over normal P/E ratios.

Penman (1996) finds that firms with medium P/E ratios achieve growth rates in earnings that are equal to the cost of capital in subsequent years, while firms with high (low) P/E ratios, on average, usually have high (small) growth rates in earnings in subsequent years.

In summary, while the P/B is determined by the future residual income which a firm is expected to obtain, the P/E is determined by the difference between current and forecasted residual income.

3. LARGE SAMPLE EMPIRICAL ANALYSIS

3.1 Introduction

In this section, I carry out an empirical application of the P/B, P/E and RIVM for a sample of U.S. utilities and manufacturing companies in order to compare the performance of the valuation models across industries. Most of my analysis is drawn on the researches of Francis *et al* (2000) and Alford (1992).

⁴ Penman (2001) names a balance sheet in which all assets and liabilities are carried at market value as a “perfect” balance sheet.

⁵ Penman (2001) calls that an “imperfect” balance sheet.

⁶ In this case Penman (2001) calls the profit and loss account “perfect”.

The performance is evaluated both in terms of signed valuation errors (i.e. whether the value estimates are negatively biased, positively biased or unbiased) and absolute valuation errors (how accurate the value estimates are, i.e., how close to zero the valuation errors are).

The bias of the estimated price for firm i at time t is measured by the price-scaled signed valuation error, as follows:

$$SVE_{i,t} = \frac{(V_{i,t} - P_{i,t})}{P_{i,t}},$$

(8)

where $SVE_{i,t}$ is the signed valuation error for firm i at time t , $V_{i,t}$ is the estimated intrinsic value for firm i at time t and $P_{i,t}$ is the observed share price for firm i at time t .

The inaccuracy of the estimated price for firm i at time t is measured by the price-scaled absolute valuation error, as follows:

$$AVE_{i,t} = \frac{|V_{i,t} - P_{i,t}|}{P_{i,t}},$$

(9)

where $AVE_{i,t}$ is the absolute valuation error for firm i at time t , $V_{i,t}$ is the estimated intrinsic value for firm i at time t and $P_{i,t}$ is the observed share price for firm i at time t .

3.2 Sample Selection

The original sample contained 6133 firm-year observations of non-financial US listed companies with December year-end balance sheet dates from 2000 to 2003. The descriptive information and financial statements data gathered from *Compustat*. Analyst's forecasts as at April year 2004 were collected from the I/B/E/S (*Institutional Brokers' Estimation System*). The sample selection procedure is summarised in Table 1. The final sample used in this empirical application contains 64 utilities (SIC code 49: electric, gas and sanitary services). and 56 manufacturing companies (SIC code 35: industrial machinery and equipment).

Table 1
Description of the Sample

Sample Selection			
Original Sample (number of firm-year observations)			6133
(–) Companies with December year-end balance sheet dates from 2000 to 2002			4600
(=) Subtotal			1533
(–) Firms not belonging to major SIC code groups 49 (electric, gas and sanitary services) and 35 (industrial machinery and equipment)			1342
(=) Final pooled sample			191
	Utilities	Manufacturing	Pooled
	89	102	191
(–) Companies with missing or negative forecast earnings	13	20	33
(–) Companies with negative EPS	7	12	19
(–) ADR companies	2	1	3
(–) Companies without enough data for the calculation of the beta	3	13	16
(=) Final Sample	64	56	120

3.3 Research Design

The P/E and P/B multiples were calculated using the harmonic mean. These multiples were calculated by using the following value drivers:

BVPS= Common equity total (Data60) / Common shares outstanding (Data25);

EPS1= Median one-year ahead EPS forecast (mdfy1);

EPS2= Median two-year ahead EPS forecast (mdfy2);

EPS58= *Compustat* EPS = reported EPS less extraordinary items and discontinued operations;

EPSA= I/B/E/S actual EPS = reported EPS less write-offs and restructuring charges. It is regarded as a better proxy for permanent earnings.

The RIVM value estimates were calculated according to the following formula:

$$S_0 = BVE_0 + \left(\frac{E_1(EP S_1 - r_e * BVE_0)}{(1 + r_e)^1} \right) + \left(\frac{E_2(EP S_2 - r_e * BVE_1)}{(1 + r_e)^*(r_e - g)} \right) \quad (10)$$

As can be observed, there are three noteworthy terms in the formula above: the book value of equity, the calculation of the residual income expected to occur within the forecast (finite) horizon and the calculation of the terminal (infinite) value, intended to reflect the residual income expected to occur after the forecast period.

The book value of equity, BVE_1 , was calculated by assuming a clean surplus relationship, where $BVE_1 = BVE_0 + EP S_1 - DIV_1$ (ending book value equals beginning book value plus forecasted earnings less forecasted dividends). The dividend payout ratio was calculated by dividing data21 (dividends) by data172 (net income). I found dividend mean payout ratios of 64% for utilities and 26% for manufacturing firms.

The discount rate for each industry was calculated as follows:

$$r_e = r_f + \beta[E(r_m) - r_f],$$

(11) where:

r_e = industry-specific discount rate;

r_f = the average 10-year Treasury bond yield from January to December of 2003;

β = estimate of the systematic risk for the industry. Industry betas were calculated by averaging firm-specific betas. Firm-specific betas were calculated using the monthly share returns and the monthly S&P500 returns over the 60 month period comprised between January of 1999 and December of 2003;

$\beta[E(r_m) - r_f]$ = market risk premium.

I estimated the companies' specific betas using the monthly share returns and the monthly S&P500 returns over the 60 month period comprised between January of 1999 and December of 2003. I found mean betas of 0.304 for utilities and 1.329 for manufacturing.

In this paper I assume a risk premium in accordance with Dimson *et al* (2003) who estimate a risk premium of 4% for major developed markets.

Altogether, these inputs rendered a cost of equity of 6.02% for utilities firms, 10.12% for manufacturing firms and 7.91% for the pooled sample.

As far growth rates are concerned, I used a rate of 0% for utilities, because usually such companies usually have limited growth opportunities, and a rate of 4% for manufacturing (somewhat in line with developed countries GNP's growth).

3.4 Results

In order to see the industry effect in the performance of the RIVM, the value estimates obtained by application of this model were regressed against the observed share prices according to the following formula:

$$P_i = \beta_0 + \beta_1 V_i + \beta_2 V_i * IND_i + \varepsilon_i , \quad (12)$$

where P_i , the observed stock price, is explained by an intercept β_0 , a slope coefficient β_1 , the RIVM value estimate, and another slope coefficient β_2 , intended to capture the difference in the slope coefficient between the two industries and a measurement error ε_i . For the purpose of calculating β_2 , a dummy variable, IND_i (0= Utilities, 1= Manufacturing) was incorporated in the model.

Results are reported in Table 2. In Panel A one can see that the RIVM value estimates explain around 79% of the observed share prices. Panel B shows that β_2 is statistically significant (p-value = 0.0000). This means that while for utility firms the slope is β_1 , for manufacturing companies the slope coefficient is $\beta_1 + \beta_2$. Consequently, when a manufacturing, instead of a utility, is being valued, the RIVM value estimate increases by 8.8584. Finally, Panel C shows that both parametric and non-parametric tests demonstrate that the difference between the valuation errors (higher for manufacturing, as can be seen in Table 1) is significantly different from zero for the two industries at 1% of significance level.

Table 2

Performance of the RIVM across the Utilities and Manufacturing Industries

Panel A: Regression Analysis				
R Square	0.7879			
Observations	120			
Panel B: Coefficients Analysis				
	<i>Coefficients</i>	<i>Standard Error</i>	<i>T Stat</i>	<i>P-value</i>
Intercept	-1.8803	1.9575	-0.9606	0.3388
RIVM value estimate (X1)	0.8812	0.0419	21.0505	0.0000
Industry (X2) 0= Utilities 1= Manufac	14.8418	1.6691	8.8921	0.0000
Panel C: Statistical Test – Parametric T-test and Non-Parametric Wilcoxon Test^a				
Two Sample T-test	p-value	Two Sample Wilcoxon-test	Values	
Equal Variance	0.0001	Z-stats	-8.4139	
Unequal Variance	0.0001	One-sided p-value	0.0001	
		Two-sided p-value	0.0001	

^aNull: The difference between the signed valuation errors from the RIVM across the 2 industries is not statistically significant.

Alt: The difference between the signed valuation errors from the RIVM across the 2 industries is statistically significant.

Table 3
Valuation errors for utilities^a

Panel A: Absolute Prediction Errors (Accuracy) ^b				
	Value estimates			
	RIVM	EPS1	EPS2	BVPS
Absolute valuation errors ^b (mean)	0.2289	0.1151	0.1245	0.2478
Comparison against RIVM				
Parametric p-values		(0.0001)	(0.0001)	(0.4599)
Non parametric p-values		(0.0001)	(0.0001)	(0.5122)
Comparison against EPS1				
Parametric p-values			(0.0900)	(0.0001)
Non parametric p-values			(0.0665)	(0.0001)
Panel B: Signed Prediction Errors (Bias) ^c				
	Value estimates			
	RIVM	EPS1	EPS2	BVPS
Signed valuation errors ^b (mean)	0.2017	0.0003	0.0004	0.0014
Comparison against RIVM				
Parametric p-values		(0.0001)	(0.0001)	(0.0001)
Non parametric p-values		(0.0001)	(0.0001)	(0.0001)
Comparison against EPS1				
Parametric p-values			(0.9921)	(0.9765)
Non parametric p-values			(0.7013)	(0.7762)

^aThe sample shares are for December year-end utilities (DNUN2 49) and manufacturing firms (DNUN2 35) with *Compustat* descriptive information and financial statement data for 2003, share prices at April/2004, median one and two-year ahead I/B/E/S EPS forecasts.

^bMean absolute prediction errors, equal to $|\text{estimated price} - \text{observed price}| / \text{observed price}$.

Table 3 shows that for utilities the RIVM provides value estimates that are neither more accurate nor less biased than those provided by multiples-based approaches like the P/B and the P/E. These results indicate that the use of the (more complex) RIVM at the expense of (simpler) multiples-based approaches is not advantageous.

In terms of accuracy (i.e. how close to zero the valuation errors are), both the RIVM and the P/B ratio valuation errors are not statistically different from each other, while the P/E ratio is the best performer (at 1% of significance level).

In terms of bias (i.e. whether the value estimates are negatively biased, positively biased or unbiased), the three valuation models tend to over estimate the observed share price. However, the RIVM signed valuation errors are much higher (at 1% of significance level) than the ones obtained by the application of the P/E and P/B ratios, what can indicate that residual income is relatively low for rate-regulated companies in the United States.

Overall, these results can also indicate that in that country regulators are relatively efficient in setting rates such as to allow a "normal" rate of return and align book and market values thereby making utilities' financial statements very informative about the real value of such companies.

5. CONCLUSIONS AND SUGGESTIONS FOR FURTHER RESEARCH

In this paper I investigate whether the use of more complex valuation methods, like the RIVM, offer practical advantages over the use of multiples based on earnings or book values when valuing shares of utilities companies.

My results suggest that the use of the RIVM provides value estimates which are neither less biased nor more accurate than those found by using the P/E and P/B ratios thereby suggesting that accruals measures recorded according to Regulatory Accounting Principles (RAP) perform well in terms of capturing the intrinsic value of utilities' equity capital.

Further research could investigate whether the RIVM offer practical advantages over the use of multiples-based approaches in order to find the intrinsic value of share of utilities companies located in countries whose regulatory environment is not very developed.

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