Valuation Anchors and Premium Multiples

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Abstract

This study proposes a previously unexplored approach to the valuation of equity using accounting numbers. The valuation is carried out in two steps. First, a valuation anchor is provided by book value of equity or capitalized earnings. Second, a multiple based on a value driver of comparable firms, where the value driver might differ from the item that is used to provide the anchor, provides an estimate of the premium over the value anchor. The innovation of this approach is that it develops the widely-used multiples-based valuation approach to permit the incorporation of a company-specific anchor. We examine the valuation performance of this approach, by reference to the mean squared valuation error and bias and "explainability" components thereof. We find that, although our proposed approach outperforms most standard valuation approaches, it does not outperform the approach based on the simple price-to-forward-earnings multiple.

Valuation Anchors and Premium Multiples

1. Introduction

Equity valuation methods include simple multiples-based methods, the discounting of forecasts of cash flows or dividends, and approaches that involve the use of an accounting-based valuation anchor supplemented by discounted forecasts of accounting flows. Despite their apparent theoretical shortcomings, including their relatively limited explicit use of company-specific information, practitioners appear to favour simple multiple-based methods, where valuation multiples are derived from data for comparable firms. In this study, we propose an adaptation of the comparables-based multiple valuation approach that incorporates a company-specific valuation anchor. Our models comprise (i) a valuation anchor based on company-specific accounting information and (ii) a multiples-based measure, derived from comparable firms, of the premium over the valuation anchor. Our approach allows for the value driver used in the anchor component of the valuation model to differ from that used in the premium component. Such an approach may be attractive because it retains the relative simplicity of commonly used multiples-based approaches whilst allowing for a greater and more flexible use of company-specific information than is commonly found in such approaches.

We implement our models using three different valuation anchors: book value, capitalized current earnings and capitalized forward earnings. With each valuation anchor, we separately employ five different value drivers to arrive at the multiples-based premium: book value, current earnings, forward earnings, sales and earnings before interest, tax, depreciation and amortization (EBITDA). This gives fifteen valuation models. Since use of the same driver for the anchor and the premium is equivalent to using that driver within a standard multiples-based approach, twelve of these models are new and three are already standard. We also generate value estimates based on the stand-alone anchors of book value, capitalized current earnings and capitalized forward earnings, and from a simple implementation of the Residual Income Valuation Model. This gives a total of nineteen valuation models, twelve of which are new and seven of which are standard. We compare the valuation performance of the twelve models emanating from our proposed approach with that of the standard models. This is done both for an overall sample and for two sub-samples comprising high-technology and low-technology firms. The performance of the models is evaluated by reference to mean squared valuation errors and a decomposition thereof that encompasses both the bias and "explainability" metrics used in prior studies of the performance of valuation models.

We find that capitalized forward earnings serves as the best value anchor, followed by capitalized current earnings and book value of equity. Our proposed approach outperforms a standard multiples method based on the price to book ratio and a standard multiples method based on the price to current earnings ratio. It also outperforms stand-alone valuation anchors and the Residual Income Valuation Model. However, it does not outperform the simple price-to-forward-earnings multiple. Similar patterns hold for the sub-samples of high and low technology firms.

The remainder of the paper is organized as follows. Section 2 provides background to the study and reviews prior literature. Section 3 describes our proposed approach and our method for measuring the performance of the various valuation approaches. Section 4 describes the data and sample selection. Section 5 reports the empirical results. Section 6 concludes the paper.

2. Background

Equity valuation methods include simple multiples-based approaches, such as that based on the price-earnings (P/E) ratio, cash-based approaches, such as the Dividend Discount Model (DDM) and the Discounted Free Cash Flow Model (DFCFM), and accounting-flow-based approaches such as the Residual Income Valuation Model (RIVM) and the Abnormal Earnings Growth Model (AEGM).

Most of the recent academic research on the applicability of accounting-based valuation models has focused on RIVM. Penman and Sougiannis (1998) and Francis Olsson and Oswald (2000) have compared the valuation performance of RIVM with that of dividend or cash-flow-based approaches. Dechow, Hutton and Sloan (1999) and Choi, O'Hanlon and Pope (2006), have explored the valuation performance of formulations of RIVM based on linear information dynamics of the sort described in Ohlson (1995) and Feltham and Ohlson (1995). However, some research has focused on the valuation performance of the simpler multiples-based approaches which, according to Demirakos, Strong and Walker (2004), are favoured by analysts (Alford, 1992; Liu, Nissim and Thomas, 2002).

Firstly, researchers are interested in one of the crucial steps in applying price multiples: the selection of comparable firms. Boatsman and Baskin (1981) find that valuation errors are smaller when comparable firms are chosen based on similar historical earnings growth, relative to when they are chosen randomly. Alford (1992) suggest that industry membership or a combination of risk and earnings growth are effective criteria for selecting comparable firms. However, partitioning industries by risk or growth does not improve accuracy and selecting comparable firms solely on the basis of risk or growth is not advantageous. Liu et al (2002) conclude that selecting comparable firms from the same industry yields much better value estimates than multiples derived using all available firms. Bhojraj and Lee (2002) develop a "warranted multiple" for each firm, and identify peer firms as those having the closest warranted multiple. They conclude that comparable firms selected in this manner offer sharp improvements over comparable firms selected on the basis of other techniques. In this study, we will select comparable firms by industry membership.

Different methods are adopted by researchers in the calculation of a measure of central tendency of multiples for a set of comparable firms. Alford (1992) use the median of multiples, while Baker and Ruback (1999) prefer harmonic mean of multiples. Liu et al (2002) report that performance of valuation improves when multiples are computed using harmonic mean, relative to the mean or median ratio. In this study, we will use median to calculate the multiples in the empirical analysis.

Comparison of different multiples is the main problem for recent empirical research. Tasker (1999) examines multiples used by investment bankers, and finds that majority of multiples are constructed from one of four value drivers: Book value, net income (EPS), operating cash flow and revenue. However, she also points out that practitioners do not calculate every possible multiple for every transaction. Instead there appear to be "preferred multiples" in different industries. Baker and Ruback (1999) also report variation in the performance of different multiples across their sample industries.

Liu et al (2002) find that multiples derived from forward-looking earnings explain stock prices remarkably well. In another paper, Liu et al (2002b), the analysis suggests that multiples based on earnings perform the best, followed by dividend and cash flow multiples, and those based on sales perform the worst. Again they find that using forecasts improves performance over multiples based on reported numbers. Kim and Ritter (1999) also report that P/E multiples using earnings forecast result in much more accurate valuations than multiples using trailing earnings in valuing initial public offerings.

Interestingly, however, contrary to those reported by Tasker (1999) and Baker and Ruback (1999), Liu et al (2002) find no evidence of differential performance of different value drivers across industries. They report that, contrary to general perception, different industries are not associated with different “best multiples”.

3. Research Design

3.1 Combining valuation anchors and premia

As mentioned above, equity valuation methods include simple multiples-based approaches, such as that based on P/E ratio, cash-based approaches, such as DDM and DFCFM, and accounting-flow-based approaches such as RIVM and AEGM. Evidence in Demirakos et al (2004) suggests that a simple multiples-based approach, where multiples are derived from data for comparable firms, is favoured by valuation practitioners. This approach is likely to be attractive because of its relative simplicity.

In this study, we propose an adaptation of this approach, which retains an emphasis on multiples derived from comparable firms but introduces a firm-specific element, and explore the valuation performance of this approach. We now explain this approach.

Penman (2007, p. 20) argues that valuation models can be represented as potentially comprising a valuation anchor, derived from bottom-line accounting numbers reflecting company-specific fundamentals, and a premium. Within this structure, accounting-based equity valuation models can be classified on two dimensions: (i) with and without a valuation anchor; (ii) with and without a premium. Standard multiples-based methods have no company-specific fundamentals-based valuation anchor, and are based wholly on a comparables-based premium. DDM and DFCFM have no valuation anchor, and consist entirely of a forecast-flow-based premium derived from forecasts of dividends and free cash flows, respectively. RIVM and AEGM each have both components: a valuation anchor in the form of book value and capitalized forward earnings, respectively; a forecast-flow-based premium derived from forecasts of residual income and abnormal earnings growth, respectively. If book value is a sufficient statistic for valuation, RIVM reduces to an anchor-only book-value valuation model; if capitalized forward earnings are a sufficient statistic for valuation, AEGM reduces to an anchor-only capitalized-forward-earnings valuation model. Table 1 provides a classification of valuation models within this structure. Models are classified as being with or without an anchor, and as including or not including a premium, with a distinction being drawn between comparables-based premia and forecast-flows-based premia.

There exists an unexplored category in the matrix of valuation models given in

Table 1. The unexplored category is the combination of a valuation anchor and a premium measured by reference to comparable firms. In this paper, we explore the applicability of valuation models that can be placed in this hitherto unexplored category.

The approach that we propose can be represented more formally as a generalization of the multiples-based approach. Standard multiple-based valuation involves the calculation of a measure of the central tendency of a multiple of price to value driver for a set of comparable firms, and the application of this measure to the value driver of the firm being valued. This process can be represented as follows:

$$V_i = D_i \times cent_{j \in \phi_i} \left[\frac{P_j}{D_j} \right], \tag{1}$$

where V_i is the value estimate for firm *i*, which is the firm that is being valued, D_i is the value driver for firm *i*, $cent_{j \in \phi_i}$ denotes a measure of central tendency measured from a set of comparable firms, subscripted *j*. Provided that the subtraction of a constant amount from the data used to derive the measure of central tendency results in a subtraction of the same amount from the measure of central tendency, expression (1) can be decomposed as follows:

$$\begin{aligned} V_i &= D_i S + D_i \times cent_{j \in \phi_i} \left[\frac{P_j}{D_j} \right] - D_i S \\ &= D_i S + D_i \times cent_{j \in \phi_i} \left[\frac{P_j}{D_j} - S \right] \\ &= D_i S + D_i \times cent_{j \in \phi_i} \left[\frac{P_j - D_j S}{D_j} \right], \end{aligned} \tag{2}$$

where S denotes a scaling item applied to a value driver in measuring a valuation anchor. If book value is the valuation anchor, as in RIVM, D_i is book value at the valuation date and S is equal to 1. If forward earnings capitalized as a perpetuity is the valuation anchor, as in AEGM, D_i is forward earnings and S is equal to the reciprocal of the cost of equity. Note that this interpretation of S as the reciprocal of the cost of equity implies the assumption that the cost of equity is equal for all *j*, an assumption that is not inconsistent with the relatively simple comparables-based approach in valuation.

From (2), it can be seen that the standard multiples-base approach to valuation can be represented as comprising two components: (i) an anchor term, $D_i S$ and (ii) a multiples-based premium, calculated by applying to the value driver of the firm being valued, D_i, a multiple derived from comparable firms' ratios of premium over anchor to value driver, $(P_j - D_j S)/D_j$. Looked at in this way, it is evident that the standard approach constrains the valuation process in a number of ways. First, it restricts the value driver used in calculating the anchor to be the same as the value driver from which the comparables-based premium is calculated. Second, it implicitly restricts the scaling variable used in calculating the valuation anchor for the firm being valued and the comparable firms to be the same. It is unlikely that such restrictions are helpful, other than in simplifying the valuation task. If they could be relaxed without significantly reducing the attractive simplicity of the multiples-based approach, this would be likely to be helpful to valuation practitioners.

Relaxation of these restrictions gives the following generalized form of expression (2):

$$V_i = D_i^A S_i^A + D_i^P \times cent_{j \in \phi_i} \left[\frac{P_j - D_j^P S_j^P}{D_j^P} \right], \tag{3}$$

where D_i^A is the driver for the valuation anchor of firm *i*, S_i^A is the scaling variable applicable to D_i^A to give the valuation anchor of firm *i*, D^P is the driver for the premium of firm *i*, where the subscripts *i* and *j* relate to firm *i* and the comparable firms, respectively, and S_j^P is the scaling variable applicable to D_j^P to give the valuation anchor of the comparable firm *j*.

In implementing this approach, we consider various combinations of drivers for the valuation anchor and drivers for the premium. For the valuation anchors, we consider three drivers: book value of equity, capitalized forward earnings and capitalized current earnings. For the premium, we consider five drivers: book value of equity, forward earnings, current earnings, sales, and earnings before interest, tax, depreciation and amortization (EBITDA). The separate combination of three types of anchor and three types of premium gives fifteen models. As can be appreciated from our preceding analysis, the use of book value as the driver of both the anchor and the premium is equivalent to the use of a simple price/book-based multiples approach, and the use of forward (current) earnings as the driver of both the anchor and the premium is equivalent to the use of a simple forward (current) earnings-based multiples approach. Therefore, of these fifteen valuation models, twelve are new and three are already standard.

We also generate value estimates based on the stand-alone anchors of book value, capitalized current earnings and capitalized forward earnings. Finally, we also generate value estimates from a simple implementation of RIVM. This gives a total of nineteen valuation models, twelve of which are new and seven of which are standard.

Our implementation of RIVM is based on one year's earnings forecasts plus a terminal value estimated by capitalizing two-year-ahead residual income forecast as a perpetuity, and is written as follows (firm subscripts suppressed):[1]

$$V_0 = BV_0 + \frac{NI_1 - r_e \cdot BV_0}{1 + r_e} + \frac{NI_2 - r_e \cdot (BV_0 + b \cdot NI_1)}{(1 + r_e)(r_e - g)}, \tag{4}$$

where V_0 is the estimate of the intrinsic value of equity at time 0, BV_0 is the book value of equity at time 0, NI_1 and NI_2 are the forecasts at time 0 of the net income for times 1 and 2, r_e is the cost of equity capital, b is the earnings retention ratio equal to one minus the dividend payout ratio (winsorized to fall between 0 and 100%), and g is equal to b times the return on equity, and is the assumed rate of growth in all accounting items, including residual income. We also implement the AEGM using the same data and consistent assumptions. This gives identical value estimates to those for RIVM, and results for these are therefore not separately reported.[2]

3.2 Measuring the performance of the valuation models

In prior research, there are a number of measures of the performance of valuation models. One commonly used measure is the signed difference between the value estimate and the observed price, scaled by observed price. Another is the absolute difference between the value estimate and the observed price, scaled by observed price. A third is the R-squared statistic from a regression of observed price on the value estimate. These three measures are measures of bias, inaccuracy and "explainability", respectively. In this study, we report the mean squared error, which is itself a measure of inaccuracy, together with a decomposition of this measure which isolates bias and "explainability" components of the measure.

The mean squared error of the value estimates (denoted *V*) relative to observed price (denoted *P*) is as follows:

$$MSE = E\left[V - P\right]^2 \tag{5}$$

where $E[\cdot]$ is the expectations operator. Following Theil (1971), this measure can be decomposed as follows:[3]

$$\begin{aligned} MSE &= E[V - P]^2 \\ &= (\overline{V} - \overline{P})^2 + (s_v - s_p)^2 + 2(1 - \rho_{vp}) s_v s_p \ , \end{aligned} \tag{6}$$

where: $\overline{V}$ is the mean of the value estimates, $\overline{P}$ is the mean of the observed prices, s_v is the standard deviation of value estimates, s_p is the standard deviation of the observed prices, and ρ_{vp} is the correlation between value estimates and observed prices. Mean squared error is itself a measure of inaccuracy. The first item on the second line of (6) is the square of the bias in the value estimates. The second item is a measure of the effect of the difference between the standard deviations of the value estimates and the observed prices. The third item is a measure of the effect that is due to less than perfect correlation between value estimates and prices, and is therefore a measure of "explainability".

4. Data and Sample Selection

Our data are drawn from the period from 1975 to 2002. We collect financial statement data from COMPUSTAT, data on prices and numbers of shares from CRSP, and earnings forecasts from I/B/E/S. In order to minimize problems of inconsistency between data sources, all data are collected on an "as reported" basis, without any adjustment for subsequent stock split or other capital changes[4].

Firms with fiscal years ending in any month of the calendar year are included. Key accounting numbers, collected from COMPUSTAT, are book value of equity, earnings per share, sales and EBITDA. Price and share numbers data are for 4 months after the fiscal year end. For example, if a firm has a fiscal year end in December in year *t*, the price and share numbers data are collected for April of year *t*+1. Firms in the sample must be non-financial firms listed on either the NYSE, AMEX or NASDAQ. A large proportion of firm-year observations are excluded by this criterion due the existence of a large amount of pink sheet firms in the original dataset.[5] All accounting numbers must be non-negative. Firm-observations with key variables ranking in the top and bottom 1% are eliminated. Comparable firms are selected from the same 4-digit SIC sector, and we eliminate observations for which there are less than 5 comparable firm-year observations, as in Liu et al (2002). Panel A of Table 2 summarizes the causes of data loss.

The final sample consists of 36878 firm-year observations over the period 1975-2002.[6] Two sub-samples are also constructed as high-technology (7662) and low-technology sample (5460). Following Francis and Schipper (1999), industries are selected for these samples basing on whether firms in the industry are likely to have significant unrecorded intangible assets. Details of the partitioning are given in Panel B of Table 2. Table 3 reports the descriptive statistics for key variables, partitioned between high-technology and low-technology firms. We note that the multiples in the high-technology group are higher and more dispersed than those in the low-technology group.

5. Empirical results

Table 4 reports the decomposition of mean squared valuation error for the overall sample. Note that the t-tests (not tabulated) indicate that every pairwise difference for the variables in each column is statistically significant (at the 5% level).

Panel A gives the performance of valuation methods with book value of equity as anchor plus premium multiples based on five different accounting numbers. It could be seen that the proposed anchor plus premium multiple valuation method delivers superior performance to traditional price-to-book multiple, when the premium multiples are based on earnings or EBITDA, among which forward EPS serves as the best value drivers for the premium multiples. Sales, serving as a value driver in the premium multiple, does not provide additional information than traditional price-to-book multiple. The proportion of errors from three different sources shows that the inability of the value estimates to measure the correlation between value estimates and observed price is the one to blame.

Table 4 Panel B reports the performance of valuation methods with current EPS as value anchor, plus premium multiples based on, again, five different accounting numbers. Traditional P/E multiple is beaten by all the other four valuation methods, even when Sales is serving as the value driver in the premium multiples. The complementary effect of the other four accounting numbers to current earnings number in valuation is therefore quite significant. The noise contained in the bottom line earnings number could possibly be suppressed by the additional information from the other accounting numbers. Note that forward EPS in the premium multiple provides the most additional help the current EPS value anchor.

Table 4 Panel C shows the result of valuation performance when forward EPS serves as value anchor and with five different accounting numbers serve as value drivers in the premium multiples. In this case, the traditional price-to-forward-earnings multiple beats the proposed anchor plus premium multiple valuation method.

Table 4 Panels A to C indicate that the superiority of forward EPS as the value driver in the premium multiples is largely due to the higher correlation of the value estimates with the observed price. This gives the R-square measure used in the prior research. Note that explainability analysis is flawed. In explainability analysis, the higher the R-square of the regression the better is the valuation method. The shortcoming of this measurement of performance, is that the R-square could be very high when the value estimates are only correlated with the observed price. In other words, the value estimates are not necessarily close to observed prices when the R-square is high. It might simply be due to correlation.

Table 4 Panel D reports the performance of the stand-alone valuation methods: book value, capitalized current earnings and capitalized forward earnings serve as value estimates alone. The last method is the complicated theoretical Residual Income Valuation (RIV) model and its equivalent Abnormal Earnings Growth (AEG) model. The stand-alone anchors, not surprisingly, produce large bias, and the correlation between value estimates and observed price is low. Among the three value anchors, forward EPS gives the best performance, with lower bias and higher correlation. For the RIV (AEG) model, the Mean Squared Error is astonishingly large. The main source of error is the difference between the standard deviations of value estimates and observed price. The abnormally low correlation between value estimate and observed price also contributes to the large MSE. The bias of value estimates derived from the RIV (AEG) model is, however, surprisingly low, even comparable to the valuation bias when multiples methods are used. The poor result is most likely due to the arbitrary assumptions made in the application of the RIV (AEG) model. The justification for the simplified application of these two theoretical modes is to compare the performance of these models from practical perspective. It is to compare the performance of multiples method with that of the theoretical models on a level "practical" field.

Table 5 shows the result of MSE decomposition for firms in the high-tech sample. Following Francis and Schipper (1999), firms in the high-tech sample are those which have high likelihood of significant unrecorded intangible assets. It is obvious that the MSE has significantly increased compared to that for the general sample in the previous table. This is not surprising considering that high-tech firms are more difficult to value and higher errors are expected. Across the Panels, we can see that forward EPS still serves as the best value driver in the premium multiples and as the best value anchor. Therefore, the combination of forward EPS as value driver and value anchor, i.e. the price-to-forward-earnings multiple, delivers the best performance. The performance of the RIV (AEG) model, compared with that for the general sample, has improved. The improvement stems from the decrease in the difference of standard deviations between value estimates and observed price.

However, the bias is larger compared to the result for the general sample.

Table 6 presents the result of MSE decomposition for firms in the low-tech sample. Low-tech firms in this case are those which have low likelihood of significant unrecorded intangible assets. The performance of different valuation methods has been greatly improved for firms in this sample. This is logical because accounting numbers presumably capture more information for firms with lower unrecorded intangible assets. Comparing the results both intra- and inter-panels, it could be seen that forward EPS still serves as the best value driver in premium multiple and the best candidate for a value anchor. Apart from Sales, a different accounting number serve as value driver in the premium multiple with book value or current EPS anchor would beat the performance of benchmark P/B or P/E multiple. The valuation performance of the stand-alone value anchors has been improved as well, with capitalized forward EPS value anchor producing even better result than benchmark P/B multiple. However, as expected, the bias of value estimates derived from the stand-alone value anchor are larger. The performance of the RIV (AEG) model shows a similar pattern to that for the previous two samples. The bias is low and the error comes dominantly from the difference between the standard deviations of value estimates and observed price.

Industry Analysis

In order to further explore the possible variation of different valuation methods for different industries, an industry analysis is presented in this section.

The industry classification is based on those in Barth et al (1998) and Barth et al (1999). There are 9 industries, including food; textiles, printing and publishing; chemicals; pharmaceuticals; extractive industries; durable manufacturers; computers; retails; and services. The composition of industries is reported in Table 8

The performance of different valuation methods is ranked according to the Mean Squared Errors. There are 19 valuation methods altogether, competing in 9 industries. The results are presented in Figure 1. It could be seen from Panel C of the Figure that price-to-forward-earnings multiple is ranked as the first for 7 out of the 9 industries, and as the second for the remaining 2 industries. As shown in Panel A and B, value anchor plus premium multiple method outperforms price-to-book and price-to-current-earnings multiples. Forward EPS serves as best value driver in the premium multiples as shown in Panel A to C for all of the 9 industries. Panel D shows that forward EPS serves as the best value anchor, and the RIV/AEG model, with simplified crude assumptions, performs the worst.

Therefore, it is safe to say that the pattern of performance of different valuation methods at industry level is consistent with that at pooled sample aggregate level.

Performance of the models by year

In addition to the industry analysis presented above, we also report statistics on the performance of the measures by year. The firm-observations used in this study are from the years 1976 to 2003, i.e. 28 years. The performance of the 19 valuation methods are ranked for each of the 28 years. The top 3 ranks achieved by each method are presented in Table 9, together with the frequency of the ranks achieved.

It appears that forward EPS is the best driver for the value anchor, as shown in Panel C and D. Forward EPS is also the best candidate for the value driver in the premium multiple. Whenever the forward EPS is involved, the valuation method has the chance to be crowned as the first in ranking, apart from the case when Sales serves as the value driver the premium multiple to complement forward EPS anchor. Again, the benchmark P/B and price-to-current-earnings multiple are beaten by the anchor plus premium multiple approach. The highest rank achieved by P/B multiple is 8^{th}, and by price-to-current-earnings is 4^{th}. Price-to-forward-earnings multiple still dominates by ranking as the first for 16 out of the 28 years. The RIV/AEG model, in contrast, is ranked at bottom for all of the 28 years.

In sum, capitalized forward EPS is the best value anchor, and forward EPS also serves as the best value driver in the premium multiples. With book value of equity as value anchor, premium multiples based on earnings and EBITDA produce better results than benchmark P/B multiple. When capitalized current EPS is set to be the value anchor, premium multiples based on other accounting numbers perform better than benchmark P/E multiple. The theoretical RIV (AEG) model performance poorly, largely due the arbitrary assumptions which are intended to simplify the application to compare the methods "practically". Price-to-forward-earnings multiple, with forward EPS, the best candidate, serving as both value anchor and value driver in the premium multiple, is the winner among the different valuation methods.

6. Conclusion

In this study, we propose an adaptation of the comparables-based multiple valuation approach, in order to incorporate a company-specific valuation anchor. Under the proposed approach, valuation models comprise (i) a valuation anchor based on company-specific accounting information in the form of book value or capitalized current or forward earnings and (ii) a multiples-based measure, derived from comparable firms, of the premium over the valuation anchor. Our approach allows for the value driver used in the anchor component of the valuation model to differ from that used in the premium component. The approach is potentially attractive because it retains the relative simplicity of commonly used multiples-based approaches whilst allowing for a greater use of company-specific information than is commonly found in such approaches and greater flexibility with regard to the use of value drivers.

We implement our models using three different valuation anchors: book value, capitalized current earnings and capitalized forward earnings. With each valuation anchor, we separately employ five different value drivers to arrive at the multiples-based premium: book value, current earnings, forward earnings, sales and earnings before interest, tax, depreciation and amortization (EBITDA). Three of the special cases of the resultant fifteen valuation models are equivalent to standard multiples models based on book value, current earnings and forward earnings, respectively. We also generate value estimates based on the stand-alone anchors of book value, capitalized current earnings and capitalized forward earnings, and from a simple implementation of the Residual Income Valuation Model. This gives a total of nineteen valuation models, twelve of which are new and seven of which are standard. We compare the valuation performance of the twelve models emanating from our proposed approach with that of the standard models. This is done both for an overall sample and for two sub-samples comprising high-technology and low technology firms. The performance of the models is evaluated by reference to mean squared valuation errors and a decomposition thereof that encompasses both the bias and "explainability" metrics used in prior studies of the performance of valuation models.

We find that capitalized forward earnings serves as the best value anchor, followed by capitalized current earnings and book value of equity. Our proposed approach outperforms a standard multiples method based on the price to book ratio and a standard multiples method based on the price to current earnings ratio. It also outperforms stand-alone valuation anchors and the Residual Income Valuation Model. However, it does not outperform the simple price-to-forward-earnings multiple.

Notes

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[1] In the prior research (Dechow et al, 1997; Frankel and Lee, 1998), a longer-horizon earnings forecast of up to 10 years is used.

[2] See Isidro, O'Hanlon and Young (2006) for an account of the conditions for consistency between the two models.

[3] To control for the scale effects, we deflate both the value estimates and the observed price by assets per share.

[4] Note that the price data from these three databases are not consistent, the relationship of prices data from these three databases is: CRSP price (un-adjusted for stock split) = I/B/E/S price with adjustment factor; Compustat price (adjusted for stock split) = I/B/E/S price without adjustment factor. The equivalency of share numbers data from these three databases is: Compustat (un-adjusted) = CRSP (different decimals)(un-adjusted) = I/B/E/S share number divided by adjustment factor.

[5] Pink sheet is a daily publication compiled by the National Quotation Bureau with bid and ask prices of over-the-counter stocks, including the market makers who trade them. Unlike companies on a stock exchange, companies quoted on the pink sheets system (pink sheet firms) do not need to meet minimum requirements or file with the SEC. Pink sheets also refers to OTC trading.

[6] 1976 is the first year with complete I/B/E/S earnings forecast available, therefore, the sample period starts from 1975.

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Table 1 Classification of valuation models by reference to anchor and premium

	Without an anchor	With an anchor
Without a premium	N/A	Book value: BV_t Capitalized current earnings: $\frac{eps_t}{r_e}$ Capitalised forward earnings: $\frac{eps_{t+1}}{r_e}$
With a flow-based premium	Dividend Discount Model: $V_t^{equity} = \sum_{i=1}^{\infty} \frac{E_t(DIV_{t+i})}{(1+r_e)^i}$ Discounted Free Cash Flow Model: $V_t^{entity} = \sum_{i=1}^{\infty} \frac{E_t(FCF_{t+i})}{(1+r_{wacc})^i}$	Residual Income Valuation Model: $V_t^{equity} = BV_t^e + \sum_{i=1}^{\infty} \frac{NI_{t+i} - (r_e \cdot BV_{t+i-1}^e)}{(1+r_e)^i}$ Abnormal Earnings Growth Valuation Model: $V_t^{equity} = \frac{eps_{t+1}}{r_e} + \sum_{i=2}^{\infty} \frac{eps_{t+i} + r_e dps_{t+i-1} - (1+r_e) \cdot eps_{t+i-1}}{r_e(1+r_e)^i}$
With a comparables-based premium	Multiples-based approaches: Price/earnings Price/Book Price/Sales	As yet unexplored.

Notes:

BV_t denotes current book value

eps_t denotes current earnings

eps_{t+1} denotes forward earnings

V^{equity} denotes estimate of intrinsic value of equity
V^{entity} denotes estimate of intrinsic value of entity
DIV denotes dividend
FCF denotes free cash flow
NI denotes net income
dps denotes dividend per share
r_e denotes cost of equity
r_{wacc} denotes weighted average cost of capital

Table 2 Sample Selection Criteria and Procedure

Panel A: Sample Selection

Selection Criteria	Observations Excluded	Observations Retained	% of Observations Retained
Firm-year Observations of non-financial firms listed in NYSE+AMEX+NASDAQ from COMPUSTAT 1975-2002		209956	100.00%
Less: Firm-year Observations with key accounting numbers missing (Note 1)	106865		
Firm-year Observations with key accounting numbers non-missing		103091	49.10%
Less: Firm-year Observations without Price and Share numbers from CRSP	15763		
Firm-year Observations with Price and Share numbers data from CRSP		87328	41.59%
Less: Firm-year Observations with negative accounting numbers	21103		
Firm-year Observations with positive accounting numbers		66225	31.54%
Less: Firm-year Observations without I/B/E/S positive one-year-ahead EPS forecast	28240		
Firm-year Observations with positive I/B/E/S one-year-ahead EPS forecast		38222	18.20%
Less: Observations with per share accounts ranking top and bottom 1%	1314		
Observations without per share accounts ranking top and bottom 1%		36908	17.58%
Less: Observations from industries containing less than 5 firms	30		
Observations from industries containing at least 5 firms		**36878**	17.56%
Observations in high-technology sub-sample (Note 2)		**7662**	3.65%
Observations in low-technology sub-sample		**5460**	2.60%

Notes:
1. Data12: Sales (net); Data13: Operating income before depreciation (EBITDA); Data58: EPS(Basic); Data60: Book equity
2. See Panel B for selection of high-(low-) technology sub-samples

Table 2 Sample Selection Criteria and Procedure (continued)

Panel B: Industries Included in High- and Low-Technology Samples			
High-Technology Industries		Low-Technology Industries	
3-digit SIC	Industry Name	3-digit SIC	Industry Name
283	Drugs	020	Agricultural Products-Livestock
357	Computer and Office Equipment	160	Heavy Construction, Excluding Building
360	Electrical Machinery and Equipment, Excluding Computers	170	Construction-Special Trade
361	Electrical Transmissions and Distribution Equipment	202	Dairy Products
362	Electrical Industrial Apparatus	220	Textile Mill Products
363	Household Appliances	240	Lumber and Wood Products, Excluding Furniture
364	Electrical Lighting and Wiring Equipment	245	Wood Building, Mobile Homes
365	Household Audio, Video Equipment, Audio Receiving	260	Paper and Allied Products
366	Communication Equipment	300	Rubber and Miscellaneous Plastics Products
367	Electronic Components, Semiconductors	307	Miscellaneous Plastics Products
368	Computer Hardware	324	Cement Hydraulic
481	Telephone Communications	331	Blast Furnaces and Steel Works
737	Computer Programming, Software, Data Processing	356	General Industrial Machinery and Equipment
873	Research, Development, Testing Services	371	Motor Vehicles and Motor Vehicle Equipment
		399	Miscellaneous Manufacturing Industries
		401	Railroads
		421	Trucking, Courier Services, Excluding Air
		440	Water Transportation
		451	Scheduled Air Transportation, Air Courier
		541	Grocery Stores

Table 3 Distribution of Ratios of Price to Value Drivers

All value drivers are on per share basis. P is stock price; Sales is trailing sales per share; B is book value of equity; E is the trailing earnings; E1 is the one-year-ahead I/B/E/S consensus forecast earnings; EBITDA is the earnings before interest, tax, depreciation and amortization, which is used as a proxy for operating cash flow here.
Price data are collected from CRSP, accounting data from COMPUSTAT (1975-2002) and earnings forecasts from I/B/E/S (1976-2003).

All value drivers (accounting numbers) are restricted to be non-negative (Positive sample). Two sub-samples, high-tech and low-tech samples are set up according to the likelihood of significant unrecorded intangible assets (refer to Table 2 for details).

	Mean	St Dev	10%	25%	Median	75%	90%
Panel A Positive Sample (observations: 36878)							
P/Sales	1.502	2.310	0.231	0.438	0.854	1.693	3.233
P/B	2.732	2.923	0.820	1.245	1.939	3.184	5.264
P/E	30.858	118.300	7.628	11.012	16.204	25.227	43.805
P/E1	16.119	35.980	7.000	9.690	13.462	18.750	27.196
P/EBITDA	8.612	10.940	2.382	3.764	6.055	9.795	16.219
Panel B High-Technology Group (observations: 7662)							
P/Sales	2.713	3.944	0.426	0.810	1.563	3.033	6.094
P/B	3.800	4.108	1.039	1.590	2.656	4.566	7.607
P/E	42.027	158.429	9.722	13.668	20.594	34.130	63.750
P/E1	20.731	51.169	8.410	11.590	16.235	24.174	37.500
P/EBITDA	13.941	18.380	3.363	5.616	9.147	15.852	27.587
Panel C Low-Technology Group (observations: 5460)							
P/Sales	0.841	0.926	0.171	0.322	0.589	1.022	1.730
P/B	2.036	1.787	0.715	1.070	1.615	2.461	3.682
P/E	21.600	55.154	6.492	9.290	13.857	20.000	31.346
P/E1	13.251	31.262	6.136	8.363	11.651	15.417	20.056
P/EBITDA	5.683	4.589	1.965	3.064	4.735	7.018	10.108

Table 4 Decomposition of Mean Squared Error (Whole Sample)

This table shows the decomposition of Mean Squared Error (MSE) of different valuation methods for all the observations in the sample. The decomposition is as follows:

$$MSE = E[V - P]^2 = (\overline{V} - \overline{P})^2 + (s_v - s_p)^2 + 2(1 - \rho_{vp}) s_v s_p ,$$

where $\overline{V}$ is the mean of value estimates scaled by assets per share, $\overline{P}$ is the mean of observed intrinsic value scaled by assets per share, s_v is the standard deviation of value estimates scaled by assets per share, s_p is the standard deviation of observed intrinsic value scaled by assets per share, ρ_{vp} is the correlation between value estimates and observed intrinsic value scaled by assets per share. There are three components in the MSE. The first component (the mean component) is attributable to bias. The second is due to the differences in the standard deviation of value estimates and the observed intrinsic value. The third component is due to the less than perfect correlation between the value estimates and observed intrinsic value. To find the relative importance of each source of error, each component is divided by the MSE and the results are restated as proportions in the brackets below. The t-tests (not tabulated) indicate that every pairwise difference for the variables in each column is statistically significant at less than the 5% level.

Valuation Method	MSE	$(\overline{V} - \overline{P})^2$	$(s_v - s_p)^2$	$2(1 - \rho_{vp}) s_v s_p$	ρ_{vp}
Panel A: Book value as Anchor with Premium Multiples					
P/B	1.911	0.093	0.611	1.206	0.495
	(100%)	(4.89%)	(32.00%)	(63.11%)	
BV+EPS1	1.393	0.073	0.414	0.906	0.686
	(100%)	(5.23%)	(29.74%)	(65.02%)	
BV+EPS	1.584	0.059	0.263	1.262	0.623
	(100%)	(3.72%)	(16.59%)	(79.69%)	
BV+Sales	2.084	0.092	0.595	1.397	0.424
	(100%)	(4.44%)	(28.54%)	(67.02%)	
BV+EBITDA	1.713	0.085	0.533	1.094	0.574
	(100%)	(4.97%)	(31.14%)	(63.89%)	
Panel B: Current EPS as Anchor with Premium Multiples					
P/EPS	1.889	0.012	0.022	1.856	0.601
	(100%)	(0.63%)	(1.14%)	(98.23%)	
EPS+EPS1	1.396	0.024	0.131	1.241	0.681
	(100%)	(1.73%)	(9.38%)	(88.89%)	
EPS+BV	1.552	0.058	0.388	1.105	0.626
	(100%)	(3.73%)	(25.02%)	(71.24%)	
EPS+Sales	1.747	0.052	0.341	1.354	0.562
	(100%)	(2.98%)	(19.50%)	(77.52%)	
EPS+EBITDA	1.613	0.040	0.217	1.357	0.614
	(100%)	(2.47%)	(13.44%)	(84.09%)	

Valuation Method	MSE	$(\bar{V}-\bar{P})^2$	$(s_v - s_p)^2$	$2(1-\rho_{vp})s_v s_p$	ρ_{vp}
Panel C: Forward EPS as Anchor with Premium Multiples					
P/EPS1	1.307	0.030	0.164	1.113	0.702
	(100%)	(2.30%)	(12.53%)	(85.17%)	
EPS1+BV	1.405	0.063	0.458	0.885	0.680
	(100%)	(4.48%)	(32.56%)	(62.96%)	
EPS1+EPS	1.451	0.020	0.098	1.332	0.672
	(100%)	(1.36%)	(6.79%)	(91.85%)	
EPS1+Sales	1.579	0.058	0.408	1.113	0.616
	(100%)	(3.67%)	(25.86%)	(70.47%)	
EPS1+EBITDA	1.428	0.047	0.295	1.086	0.665
	(100%)	(3.32%)	(20.65%)	(76.04%)	
Panel D: Stand-Alone Value Anchors and RIVM					
BV anchor	2.867	0.868	1.593	0.406	0.399
	(100%)	(30.26%)	(55.56%)	(14.17%)	
EPS anchor	2.289	0.567	0.784	0.938	0.536
	(100%)	(24.78%)	(34.23%)	(40.99%)	
EPS1 anchor	2.057	0.525	0.887	0.645	0.645
	(100%)	(25.51%)	(43.14%)	(31.35%)	
RIV/AEG	957.743	0.038	848.773	108.931	0.001
	(100%)	(0.00%)	(88.62%)	(11.37%)	

Table 5 Decomposition of Mean Squared Error (High-Technology Group)

This table shows the decomposition of Mean Squared Error (MSE) of different valuation methods for the observations in the high-technology group. The decomposition is as follows:

$$MSE = E[V - P]^2 = (\bar{V} - \bar{P})^2 + (s_v - s_p)^2 + 2(1 - \rho_{vp}) s_v s_p ,$$

where $\bar{V}$ is the mean of value estimates scaled by assets per share, $\bar{P}$ is the mean of observed intrinsic value scaled by assets per share, s_v is the standard deviation of value estimates scaled by assets per share, s_p is the standard deviation of observed intrinsic value scaled by assets per share, ρ_{vp} is the correlation between value estimates and observed intrinsic value scaled by assets per share. There are three components in the MSE. The first component (the mean component) is attributable to bias. The second is due to the differences in the standard deviation of value estimates and the observed intrinsic value. The third component is due to the less than perfect correlation between the value estimates and observed intrinsic value. To find the relative importance of each source of error, each component is divided by the MSE and the results are restated as proportions in the brackets below. The t-tests (not tabulated) indicate that every pairwise difference for the variables in each column is statistically significant at less than the 5% level.

Valuation Method	MSE	$(\bar{V}-\bar{P})^2$	$(s_v - s_p)^2$	$2(1-\rho_{vp})s_v s_p$	ρ_{vp}
Panel A: Book value as Anchor with Premium Multiples					
P/B	5.656	0.387	2.533	2.736	0.364
	(100%)	(6.83%)	(44.79%)	(48.38%)	
BV+EPS1	4.447	0.327	1.769	2.350	0.593
	(100%)	(7.36%)	(39.79%)	(52.85%)	
BV+EPS	4.873	0.254	1.205	3.414	0.518
	(100%)	(5.22%)	(24.73%)	(70.05%)	
BV+Sales	6.114	0.395	2.515	3.204	0.261
	(100%)	(6.46%)	(41.13%)	(52.41%)	
BV+EBITDA	5.297	0.349	2.128	2.821	0.441
	(100%)	(6.58%)	(40.16%)	(53.26%)	
Panel B: Current EPS as Anchor with Premium Multiples					
P/EPS	5.629	0.097	0.282	5.251	0.488
	(100%)	(1.72%)	(5.01%)	(93.27%)	
EPS+EPS1	4.353	0.179	0.913	3.261	0.586
	(100%)	(4.11%)	(20.98%)	(74.91%)	
EPS+BV	4.879	0.312	1.945	2.623	0.515
	(100%)	(6.39%)	(39.86%)	(3.75%)	
EPS+Sales	5.417	0.296	1.726	3.395	0.421
	(100%)	(5.46%)	(31.86%)	(62.68%)	
EPS+EBITDA	5.082	0.221	1.146	3.715	0.486
	(100%)	(4.35%)	(22.55%)	(73.10%)	

Valuation Method	MSE	$(\bar{V}-\bar{P})^2$	$(s_v - s_p)^2$	$2(1-\rho_{vp})s_v s_p$	ρ_{vp}
Panel C: Forward EPS as Anchor with Premium Multiples					
P/EPS1	4.236	0.197	0.995	3.043	0.602
	(100%)	(4.66%)	(23.50%)	(71.84%)	
EPS1+BV	4.596	0.327	2.162	2.107	0.577
	(100%)	(7.11%)	(47.04%)	(45.84%)	
EPS1+EPS	4.616	0.132	0.672	3.813	0.559
	(100%)	(2.85%)	(14.56%)	(82.59%)	
EPS1+Sales	5.069	0.312	1.947	2.810	0.480
	(100%)	(6.15%)	(38.41%)	(55.43%)	
EPS1+EBITDA	4.681	0.255	1.441	2.985	0.541
	(100%)	(5.45%)	(30.78%)	(63.77%)	
Panel D: Stand-Alone Value Anchors and RIVM					
BV anchor	8.486	3.040	4.728	0.718	0.299
	(100%)	(35.82%)	(55.71%)	(8.46%)	
EPS anchor	7.169	2.242	2.807	2.120	0.446
	(100%)	(31.27%)	(39.16%)	(29.57%)	
EPS1 anchor	6.657	2.078	3.104	1.475	0.559
	(100%)	(31.22%)	(46.62%)	(22.16%)	
RIV/AEG	198.875	1.388	121.726	75.760	-0.006
	(100%)	(0.70%)	(61.21%)	(38.09%)	

Table 6 Decomposition of Mean Squared Error
(Low-Technology Group)

This table shows the decomposition of Mean Squared Error (MSE) of different valuation methods for the observations in the low-technology group. The decomposition is as follows:

$$MSE = E[V - P]^2 = (\bar{V} - \bar{P})^2 + (s_v - s_p)^2 + 2(1 - \rho_{vp})s_v s_p \ ,$$

where $\bar{V}$ is the mean of value estimates scaled by assets per share, $\bar{P}$ is the mean of observed intrinsic value scaled by assets per share, s_v is the standard deviation of value estimates scaled by assets per share, s_p is the standard deviation of observed intrinsic value scaled by assets per share, ρ_{vp} is the correlation between value estimates and observed intrinsic value scaled by assets per share. There are three components in the MSE. The first component (the mean component) is attributable to bias. The second is due to the differences in the standard deviation of value estimates and the observed intrinsic value. The third component is due to the less than perfect correlation between the value estimates and observed intrinsic value. To find the relative importance of each source of error, each component is divided by the MSE and the results are restated as proportions in the brackets below. The t-tests (not tabulated) indicate that every pairwise difference for the variables in each column is statistically significant at less than the 5% level.

Valuation Method	MSE	$(\bar{V}-\bar{P})^2$	$(s_v - s_p)^2$	$2(1-\rho_{vp})s_v s_p$	ρ_{vp}
Panel A: Book value as Anchor with Premium Multiples					
P/B	0.727	0.027	0.370	0.330	0.486
	(100%)	(3.71%)	(50.90%)	(45.39%)	
BV+EPS1	0.534	0.018	0.300	0.216	0.712
	(100%)	(3.43%)	(56.23%)	(40.34%)	
BV+EPS	0.539	0.016	0.271	0.253	0.684
	(100%)	(3.05%)	(50.14%)	(46.81%)	
BV+Sales	0.786	0.031	0.428	0.326	0.419
	(100%)	(4.00%)	(54.46%)	(41.54%)	
BV+EBITDA	0.659	0.026	0.380	0.253	0.598
	(100%)	(3.90%)	(57.74%)	(38.37%)	
Panel B: Current EPS as Anchor with Premium Multiples					
P/EPS	0.441	0.001	0.057	0.382	0.704
	(100%)	(0.19%)	(13.03%)	(86.78%)	
EPS+EPS1	0.397	0.002	0.094	0.302	0.743
	(100%)	(0.45%)	(23.59%)	(75.96%)	
EPS+BV	0.483	0.008	0.189	0.286	0.698
	(100%)	(1.60%)	(39.12%)	(59.28%)	
EPS+Sales	0.529	0.008	0.199	0.321	0.654
	(100%)	(1.60%)	(37.69%)	(60.72%)	
EPS+EBITDA	0.467	0.006	0.149	0.312	0.699
	(100%)	(1.30%)	(31.95%)	(66.76%)	

Valuation Method	MSE	$(\bar{V}-\bar{P})^2$	$(s_v - s_p)^2$	$2(1-\rho_{vp})s_v s_p$	ρ_{vp}
Panel C: Forward EPS as Anchor with Premium Multiples					
P/EPS1	0.365	0.004	0.125	0.237	0.783
	(100%)	(1.04%)	(34.16%)	(64.81%)	
EPS1+BV	0.439	0.010	0.222	0.207	0.766
	(100%)	(2.18%)	(50.64%)	(47.18%)	
EPS1+EPS	0.368	0.002	0.109	0.256	0.774
	(100%)	(0.65%)	(29.65%)	(69.70%)	
EPS1+Sales	0.477	0.011	0.235	0.230	0.732
	(100%)	(2.29%)	(49.35%)	(48.37%)	
EPS1+EBITDA	0.423	0.008	0.187	0.228	0.760
	(100%)	(1.91%)	(44.10%)	(53.99%)	
Panel D: Stand-Alone Value Anchors and RIVM					
BV anchor	1.053	0.243	0.648	0.162	0.453
	(100%)	(23.08%)	(61.57%)	(15.35%)	
EPS anchor	0.658	0.120	0.280	0.258	0.671
	(100%)	(18.23%)	(42.57%)	(39.20%)	
EPS1 anchor	0.590	0.106	0.309	0.174	0.763
	(100%)	(18.01%)	(52.48%)	(29.51%)	
RIV/AEG	531.070	0.071	491.115	39.885	0.022
	(100%)	(0.01%)	(92.48%)	(7.51%)	

Table 7 Industry Classification

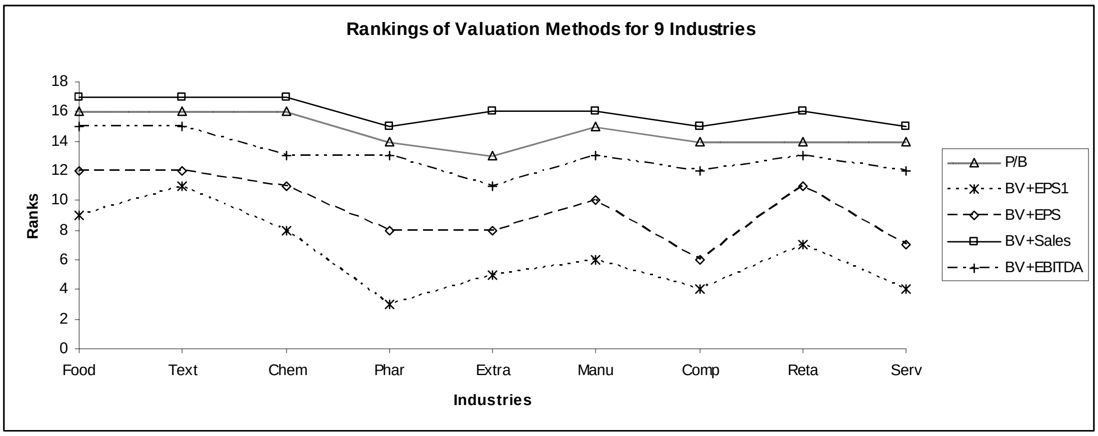
The industry classification is based on those in Barth et al (1998) and Barth et al (1999). There are 9 industries, including food; textiles, printing and publishing; chemicals; pharmaceuticals; extractive industries; durable manufacturers; computers; retails; and services. The SIC codes for each industry are presented, together with the numbers of observations and the percentage of firm-year-observations for each industry.

Industry	Primary SIC Codes	Obs	%
Food	2000-2111	1366	4.33
Textiles, printing & publishing	2200-2780	3303	10.48
Chemicals	2800-2824, 2840-2899	1581	5.02
Pharmaceuticals	2830-2836	964	3.06
Extractive industries	2900-2999,1300-1399	1549	4.92
Durable Manufacturers	3000-3669, 3680-3999	10512	33.36
Computers	7370-7379, 3570-3579, 3670-3679	4403	13.97
Retail	5000-5999	4705	14.93
Services	7000-8999, excluding 7370-7379	3128	9.93
Total		31511	100.00

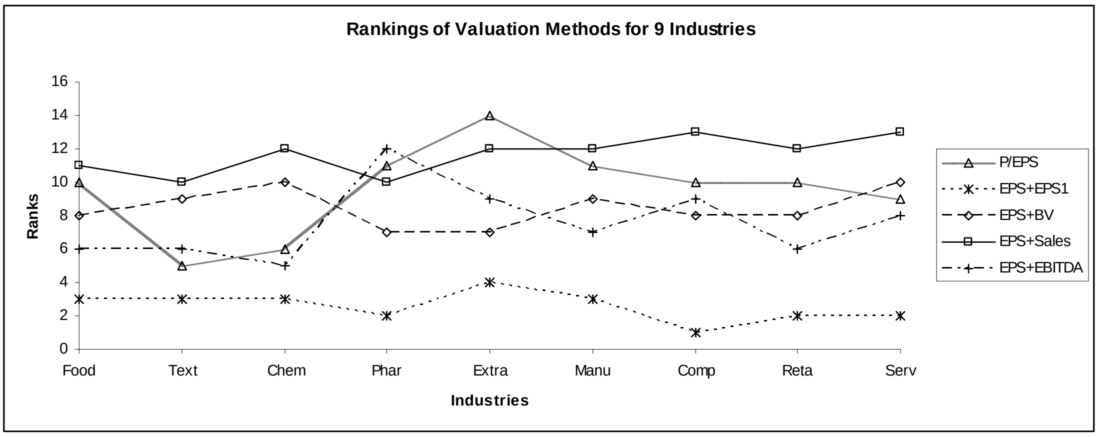
Figure 1: Rankings of Valuation Methods for 9 Industries

Graphs show the rankings of 19 valuation methods for 9 industries. Industry groups are described in Table 7. The performance of different valuation methods is ranked according to the Mean Squared Errors.

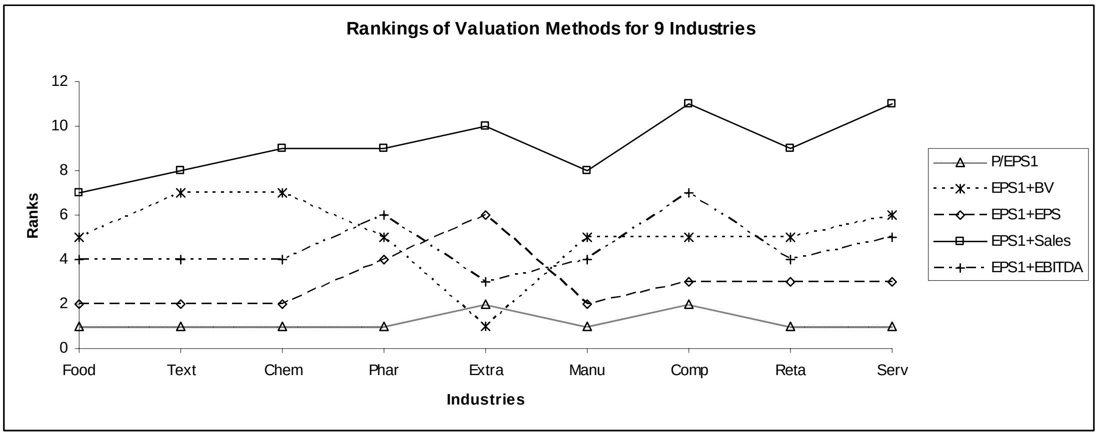
Panel A Book value as value anchor



Panel B Current EPS as value anchor



Panel C Forward EPS as value anchor



Panel D Stand-alone value anchor and RIVM

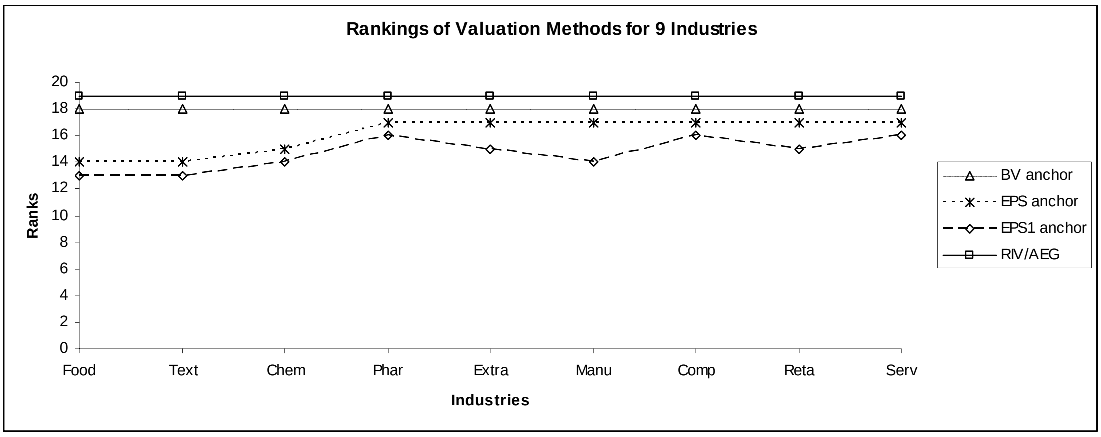


Table 8 Ranks of valuation methods for different years

The valuation performance of different valuation methods are compared for different years in the sample (1976-2003). The rankings are based on the Mean Squared Errors. The best, 2nd best and 3rd best rank for each valuation method are reported, as well as the frequencies of the ranks. The valuation method with Book value as value anchor and forward EPS as value driver in the premium multiple is ranked as the 1st among the 19 methods for 2 of the 28 years and ranked as the 2nd among the 19 methods for 3 of the 28 years.

Valuation Method	Best rank achieved	Frequency of the rank	2nd best rank achieved	Frequency of the rank	3rd best rank achieved	Frequency of the rank
Panel A: Book value as Anchor with Premium Multiples						
P/B	8th	1	9th	1	10th	2
BV+EPS1	1st	2	2nd	3	3rd	4
BV+EPS	5th	3	6th	2	7th	5
BV+Sales	10th	1	13th	1	14th	1
BV+EBITDA	6th	2	7th	1	8th	2
Panel B: Current EPS as Anchor with Premium Multiples						
P/EPS	4th	2	5th	2	6th	2
EPS+EPS1	1st	2	2nd	11	3rd	11
EPS+BV	5th	1	6th	3	7th	4
EPS+Sales	10th	1	11th	2	12th	16
EPS+EBITDA	5th	2	6th	2	7th	3
Panel C: Forward EPS as Anchor with Premium Multiples						
P/EPS1	1st	16	2nd	4	3rd	1
EPS1+BV	1st	1	2nd	3	3rd	2
EPS1+EPS	1st	1	2nd	5	3rd	12
EPS1+Sales	5th	1	6th	1	7th	1
EPS1+EBITDA	1st	2	4th	16	5th	6
Panel D: Value Anchors and RIV/AEG model						
BV anchor	15th	1	17th	4	18th	23
EPS anchor	1st	1	2nd	2	3rd	1
EPS1 anchor	1st	3	2nd	1	3rd	2
RIV/AEG	19th	28				