Constructing Intrinsic Value Estimates of Equity Using IBES and Value Line Forecasts of Fundamentals

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Abstract

The purpose of this paper is to determine how to produce best estimates of intrinsic value, as measured by 36 month abnormal returns, using IBES only forecasts, VL only forecasts, or forecasts from both services. IBES only provides earnings forecasts, while VL provides forecasts of earnings, book value, cost of capital and terminal value forecasts. We estimate 14 intrinsic value models, constructed by linking IBES and VL forecasts to the residual income model (RIM), Forward Price Earnings (FPE), and hybrid models, where hybrid models are the average of a RIM and an a FPE model.

The best “VL only” model is a RIM model which earns an abnormal return of (.0141), the best “IBES only” model is the IBES-FPE model earning (-.0169), and the best “both VL and IBES” model is a hybrid model using based on IBES earnings forecasts and VL’s terminal value forecasts, earning (.0037). None of these returns differ statistically from zero or from each other. The remaining models earn medium to large negative returns. Given the existence of acquisition costs, it is cost effective for an analyst to either purchase VL forecasts for use in a VL only RIM model, or to purchase IBES forecasts for use in the IBES-FPE model.

If the objective is maximization of raw returns, the best “VL only” model for estimating intrinsic price is a RIM model that earns a statistically significant (.1069) raw return, the best “IBES only” model is the IBES-FPE model earning (.0451), and the best “both VL and IBES” model is a RIM model based on IBES earnings forecasts and VL’s terminal value forecasts, that earns a statistically significant (.1018) raw return None of the other models earn statistically significant raw returns. Given the existence of acquisition costs, it is cost effective for an analyst to purchase VL forecasts for use in a VL only RIM model.

We expanded the analysis to consider which models are most consistent with how investors set current price. A hybrid model based on IBES earnings forecasts and VL’s terminal value forecasts is most consistent with current price. This implies that investors incorporate both IBES earnings and VL forecasts of terminal value in their estimates of intrinsic price. It’s intuitive that analysts would like to see forecasts from both IBES and VL when beginning their own intrinsic value analysis.

1. Introduction

We presume fundamental investors believe that the market is inefficient and that fundamental analysis will allow them to identify mispriced securities. Then, based on the direction and amount of mispricing, they take a position in shares in the hope of earning abnormal returns. Such investors often buy forecasts of fundamentals from investor services firms like the Institutional Brokers' Estimate System (IBES) and Value Line (VL). Such forecasts enable the investor to construct an estimate of a security's intrinsic value. Then the investor (analyst) can revise the IBES/VL forecasts using their expertise, their private knowledge, and other public knowledge, to generate their own estimate of intrinsic value.

The purpose of this paper is to determine how to produce best estimates of intrinsic value, as measured by abnormal returns, using IBES forecasts, VL forecasts, or both. This is an important question because IBES and VL provide sharply different packages with respect to forecasted fundamentals. Valuation theory (the discounted dividend model, used here in the residual income form) identifies the fundamentals as (i) forecasts of earnings to the horizon, (ii) forecasts of book value to the horizon, (iii) forecasts of price (terminal value) at the horizon, and (iv) cost of equity capital. While VL provides a forecast of all four fundamentals, IBES provides only consensus forecasts of earning to the horizon.

To implement the best strategy for earning abnormal returns, the investor must chose both the general class of the valuation model and the sources of forecasted fundamentals. Consistent with Liu et al. (2002) and Courteau et al. (2001, 2006), we limit the classes of models considered in this paper to the residual income (RIM) version of the discounted dividend model, its "special case" cousin the forward price-earning model (FPE), and the hybrid model (defined as the equally weighted average of the intrinsic values computed by the RIM and FPE models).

Regarding sources of fundamentals, we estimate the RIM, FPE and Hybrid models using only IBES fundamental forecasts, only VL forecasts, and the joint set of their forecasts. The joint use of their forecasts is potentially useful because IBES consensus forecasts of earnings to the horizon have been shown by Ramnath et al. (2004) to be more accurate than VL's. However IBES is at a disadvantage with respect to the other three fundamentals since it does not forecast them while Value Line does. Most importantly, VL supplies firm-specific estimates of terminal value.

The above papers rank particular models (defined by class of model and source of fundamentals) with respect to their ability to explain current price as measured by percentage pricing errors ((intrinsic price-current price)/current price). For external validity with respect to previous research, we report the pricing errors of the 14 models that we consider. However, our purpose is to find the model (combination of model class and source of forecasts from IBES, VL, or both) that earns the highest abnormal return. Consequently, while we report the ranking of the models on pricing error, we focus on ranking the models on risk adjusted returns.

What is known to date about the relative efficacy of models computed using the forecasts of IBES versus VL? Using IBES earnings forecasts, Liu et al. (2002) investigate RIM and FPE models and find that as measured by pricing errors, FPE is more consistent with how investor set current price than RIM. Their study does not report abnormal returns earned. Liu et al. speculate that RIM's relative lack of consistency occurs because Liu et al. estimate terminal value with a constant growth rate model, which they assume is the same for all firms. Since VL makes firm-specific estimates of terminal value, its terminal value estimates may dominate those used by Liu et al. in their study.

Courteau et al. (2001), using VL data, investigate the advantage of having a firm-specific forecast of price at the horizon, instead of using a constant growth rate across all firms. Consistent with Liu et al.'s (2002) speculation, they find that the consistency of RIM with how investors set current price is dramatically improved. Further, Courteau et al. (2006) compare VL's RIM to VL's FPE and find that RIM pricing errors are similar to those of FPE, in contrast with Liu et al.'s (2002) result that FPE dominates RIM. In addition they find that pricing errors are lowest if the hybrid model is used.

More to the point, Courteau et al. (2006), using VL forecasts, also estimate abnormal returns. They find that the model that maximizes abnormal returns (a particular RIM model) differs from the model that minimizes pricing error (i.e., the Hybrid model). Using IBES forecasts**,** Dechow et al. (1999) also estimate both abnormal returns and pricing error, though they investigate different model specifications than do Courteau et al. (2006). They too find that the model that maximizes abnormal returns differs from the model that minimizes pricing error. They investigate the cause and conclude that this difference in "best" models is inconsistent with market efficiency. Frankel and Lee (1998) estimate RIM models and provide evidence that the RIM model, using IBES forecasts to compute intrinsic value, generate risk adjusted abnormal returns. Ali et al.(2003) show that the Frankel and Lee (1998) evidence concerning abnormal returns is not explained by uncontrolled risk factors.

Jointly, the above results suggest that if an investor bought IBES to get consensus forecasts to the horizon, and VL to get terminal value estimates, then he/she might have a better RIM model as measured by abnormal returns. However, to our knowledge, no study to date has compared the abnormal return performance of the RIM, FPE, and Hybrid models using fundamentals forecasted by IBES only, VL only, and a combination of the forecasts of the two services. We do so for 14 models representing different combinations of class of model (RIM, FPE, Hybrid) and source of forecasts (VL and IBES).

Also, following the lead of Dechow et al. (1999), in addition to reporting which model maximizes abnormal returns, we report which model minimizes pricing error. The best model as measured by pricing errors can be viewed as the model-fundamental forecast combination that most closely maps how investors estimate current price. We view identification of the model minimizing pricing error as interesting in its own right. If the analyst can ascertain from VL and IBES the current beliefs of investors about the fundamentals, she can compare such beliefs to her own beliefs (based on private information and other public information) and make the appropriate revision of the IBES and/or VL forecast. Thus, acquiring both VL and IBES may be worthwhile even if the market is efficient with respect to publicly available data from both investor services, as implied by our abnormal return evidence.

Our results are derived from a sample 17,856 observations of US firms followed by both IBES and VL for at least some of the 44 quarters from 1990 through 2000. Our major findings are as follows:

Regarding accuracy of earnings forecast, as reported by Ramnath et al. (2004), IBES consensus earnings forecasts are more accurate than VL’s. The extent of the IBES advantage depends on the relative recency of the two forecasts on the date the errors are measured. However, this suggests that there may be a gain from using IBES earnings forecasts in valuation models, over those of VL.

We find that as measured by raw, 36 month, hedged, buy and hold returns, the best model using VL only fundamentals is the RIM model (.1069), the best model using IBES only forecasts is the IBES-FPE model (.0451), and the best model using both VL and IBES forecasts is a hybrid model exploiting IBES earnings forecasts and the VL terminal value forecasts (.0869). Thus if the analyst's purpose is to produce best estimates of intrinsic value, based only on raw returns, then it appears that the analyst should acquire only VL forecasts and use them to estimate intrinsic value with the RIM model.

When risk is controlled with a matched pair design based on firm size and book to market, the same VL RIM model, based entirely on VL fundamentals, is still the best model, but its 36 month risk adjusted return is only (.0141). The best IBES only model is the IBES-FPE model (-.0169) and the best model using both VL and IBES forecasts is a RIM model that uses IBES forecasts of earnings to the horizon with a VL forecast of terminal value (.0073). Statistically, the abnormal returns of each of these models do not differ from zero or from each other. Thus if the analyst's purpose is to produce best estimates of intrinsic value, as measured by abnormal returns, then it appears that the analyst should either acquire only VL forecasts and use them to estimate intrinsic value with the RIM model or acquire IBES only forecasts and use them in an IBES-FPE model. Nothing seems gained by acquiring forecasts from both VL and IBES.

However, the picture changes radically with respect to the model most consistent with how investors set current price. A hybrid model, that combines an FPE model based on IBES earnings forecasts with a RIM model which employs both IBES earnings forecasts and VL forecasts of terminal value, has the lowest pricing errors. If understanding how the market sets current price is the analyst's objective, then acquisition of both IBES's earnings forecasts and VL's terminal value forecasts is needed.

Finally because IBES does not forecast the terminal value required by RIM models, we estimate an ad hoc terminal value for IBES RIM models (described below) with a procedure called the Industry Horizon Premium terminal value, introduced by Courteau et al. (2006). In both their paper and ours, this measure is reasonably consistent with how investors set current price. However, we show RIM models using this terminal value perform badly as measured by raw or abnormal returns.

The remainder of the paper is organized as follows. In section 2 we specify, generically, the three classes of valuation models we investigate (RIM, FPE, Hybrid). We also identify our sources of forecasts of the fundamentals for the valuation models. In section 3 we discuss data and methodology. In section 4 we discuss results and section 5 is concluding remarks.

2. Model Specifications and Sources of Fundamental Forecasts

2.1 General Classes of Models

The models examined in this paper fall under three general classes: Residual Income Models (RIM), Forward Price Earnings (FPE) models, and Hybrid Models. We specify RIM as:

$$V_0^{RIM} = B_0 + \sum_{t=1}^{T} \frac{x_t - rB_{t-1}}{(1+r)^t} + \frac{P_T - B_T}{(1+r)^T}, \tag{1}$$

where V_0 is intrinsic value at point in time 0, x_t is a forecast of earnings for period t, B_t is book value at the end of period t, P_T is price at the forecast horizon T, r is the cost of equity capital, and (P_T - B_T) is premium at the horizon. RIM is mathematically equivalent to discounted dividend model and the free cash flow model. We use the RIM version of the discount model because it is earnings-based, as are the forecasts provided by both IBES and VL.

FPE models value a stock as a multiple of some function of forecasted earnings, with the multiplier being estimated using comparable firms (often on an industry basis). Liu et al. (2002) investigate several variations of FPE models and report that percentage pricing errors are lowest when the degree of earnings aggregation is highest. In general, the FPE model when earnings are aggregated over T periods is given by:

$$V_0^{FPE} = a.\sum_{t=1}^{T} x_t = \left(1 \Big/ \sum_{t=1}^{T} x_t / P_0\right) . \sum_{t=1}^{T} x_t \, , \tag{2}$$

where P_0 is the current price at time 0. The industry multiplier "a" is estimated by the following regression, where e is the error term:

$$1 = a.\left(\sum_{t=1}^{T} x_t \Big/ P_0\right) + e_t / P_0 \, . \tag{3}$$

We impose the restriction that the expectation of $(e_t/P_0) = 0$. That is, the percentage pricing error is, on average, unbiased.

Theory predicts, and Kaplan and Ruback (1996) confirm empirically, that percentage-pricing error is substantially reduced if Hybrid models are used. Following Kaplan and Ruback (1996), we derive intrinsic value for Hybrid models by equally weighting the respective intrinsic value from the RIM and FPE models:

$$V_0^{HYBRID} = \tfrac{1}{2}\left(V_0^{RIM} + V_0^{FPE}\right).. \tag{4}$$

Both FPE and hybrid models are special cases of the RIM models.

2.2 Sources of Forecasted Fundamentals

The generic RIM model (1) calculates a stock's intrinsic value as the summation of: (i) current book value, (ii) the present value of residual income over *T* periods, and (iii) the present value of the horizon premium at time *T*. For the purpose of this study, the chosen forecast horizon consists of the four years following the end of the quarter in which the forecast is made.[1] A similar four-year horizon is also adopted for the FPE model (2). While implementing the FPE model requires only earnings forecasts, the RIM models command additional fundamentals as inputs, as discussed below.

Earnings. VL provides individual earnings forecasts for Years 1, 2 and 5. Researchers using VL data usually interpolate forecasts for Years 3 and 4 based on an implicit (linear) growth rate

[1] We define the forecast report date as t = 0, which becomes the beginning of the first year of the forecast period. Our estimation methodology requires that each year of forecast period be of the same length. Thus, forecast years do not normally correspond to the firm's fiscal years. As analysts make their forecasts according to fiscal years, we use these forecasts to recompute the expected book value at each of the next four anniversary dates of the forecast.

between the Year 2 and Year 5 forecasts.[2] By comparison, IBES provides consensus earnings forecasts for Years 1 and 2, along with a long-term growth rate. A full set of IBES earnings forecasts for the 4-year horizon can be generated by applying the growth rate to the last earnings forecast available.[3]

Book Value. VL provides book value forecasts for the end of Years 1, 2 and 5. Book values for Years 3 and 4 can be interpolated using earnings and dividend forecasts. In contrast, IBES does not provide explicit book value forecasts. Researchers working with IBES data typically estimate an IBES book value forecast by applying the dividend payout ratio of the previous year computed as in Frankel and Lee (1998) to the IBES earnings forecasts to get a dividend forecast.

Cost of Equity Capital. VL provides a firm-specific beta that can be used in conjunction with the CAPM to estimate the cost of equity, whereas IBES does not. For IBES-based models, beta is normally estimated by firm-specific time-series regression of monthly CRSP returns over the five years preceding the forecast date. Regardless of the data source, the riskless rate in the CAPM is generally proxied by the 5-year treasury constant maturity rates from the Chicago Federal Reserve Bank database[4] and the historical equity premium of 6% is often adopted.

Terminal Value (P_T). VL provides a forecast of the share price at the horizon, P_T . When combined with its forecasts of book value, this allows subscribers to VL to estimate the horizon premium ($P_T - B_T$), a feature not available to users of IBES services. In the absence of an equivalent IBES forecast, we adopt the approach of Courteau et al. (2006) who suggest an industry horizon premium (IHP) approach for this purpose. The IHP approach uses the structure of the RIM model in conjunction with current prices and forecasted fundamentals to estimate a

[2] The interpolation is performed in a manner that ensures that the clean surplus relation holds during the interpolated years.
[3] All growth rates are winsorized at the level of 200%. IBES sometimes provides forecasts for as many as 5 years, instead of the long-term growth rate. For these observations, we use the specific forecasts provided in the database.
[4] We measure that at the beginning of the VL forecast month.

"premium-to-book multiple" (PBM) that minimizes percentage pricing error over the relevant industry:

$$PBM = \arg\min \sum_{k=1}^{K} \left[\frac{1}{P_{k,0}} \left(P_{k,0} - \left(B_{k,0} + \sum_{t=1}^{T} \frac{x_{k,t} - r_k B_{k,t-1}}{(1+r_k)^t} + \frac{B_{k,T}.PBM}{(1+r_k)^T} \right) \right) \right]^2, \tag{5}$$

where there are K firms in the industry. To forecast the horizon premium for a given stock, the industry PBM is multiplied by that stock's forecasted horizon book value (B_T). The appeal of the IHP approach is that it embraces the structure of a RIM model by calculating the present value of abnormal earnings to the horizon. But, like multiplier models, the IHP approach uses reverse engineering to infer the market's view of the horizon premium. This model is particularly useful if IBES earnings to the horizon are used in the RIM model, since it allows the investor to construct an industry-based terminal value consistent with his forecasts of earnings to the horizon. However, it may also interest a VL-only analyst as an alternative to VL's forecasted terminal price.

2.3 Competing Model Specifications

We consider a total of 14 model specifications based on a combination of general classes of model (RIM, FPE or Hybrid) and sources of forecasts (VL, IBES or both), as discussed below and summarized in Table 1.

Seven RIM models, computed according to Equation (1), are examined: Models 1 and 2 use VL only fundamentals, but they differ in the way terminal value is computed. Model 1 uses firm-specific horizon premium and Model 2 is based on the industry horizon premium. Model 3 uses IBES only fundamentals, by appealing to its forecasts of earnings and book value along with a derived industry horizon premium. Models 4-7 draw on a mixture of VL and IBES fundamentals.

In particular, the first two (Models 4 and 5) combine IBES forecast attributes to the horizon with each of the two versions of VL terminal value estimates, whereas Models 6-7 replace CRSP firm-specific beta used in Models 4-5 with VL firm-specific beta estimates.

Two FPE models, computed by reference to Equation (2), are considered: Model 8 uses VL four-period ahead aggregated earnings forecasts to calculate intrinsic value estimate and Model 9 employs the corresponding forecasts provided by IBES.

Five Hybrid models, computed by reference to Equation (3), are analyzed: Model 10 uses IBES fundamentals only and is calculated as a simple weighted average of Models 3 and 9; Model 11 (12) uses VL fundamentals only and combines Model 1 (2) with Model 8; and Model 13 (14) use a mixture of VL and IBES fundamentals derived from Models 6 and 8 (6 and 9). To our knowledge, Models 13 and 14 are the first attempts to mix sources of forecasted fundamentals (IBES and VL) in Hybrid models.

Alternatively stated, five of the models considered in the study use VL only fundamentals, Models 1-2 (RIM), Model 8 (FPE) and Models 11-12 (Hybrid); three models draw on IBES only fundamentals, Model 3 (RIM), Model 9 (FPE) and Model 10 (Hybrid); the remaining six use a combination of VL and IBES fundamentals, Models 4-7 (RIM) and Models 13-14 (Hybrid). For a given source of fundamentals, we compare RIM models with FPE to address a question raised by the existing literature. Liu et al. (2002), for example, find that Model 9 (the IBES FPE model) has lower percentage pricing errors than a variation of our Model 3 (the IBES only RIM model), when a constant growth rate of 2 percent is imposed on all firms for the purpose of computing terminal value. Unlike Liu et al., we use the industry horizon premium as our forecast of terminal value. Thus, our results may differ from theirs. We also extend Courteau et al. (2006), who contrast the valuation accuracy of Models 1, 8 and 12 using VL only forecasts, to the setting where IBES only forecasts are used (i.e., Models 3, 9 and 10).

3. Sample Selection and Research Methodology

3.1 Sample Selection

The initial sample consists of 72,152 firm-quarter reports published by VL from 1990 through 2000. Deleting of 12,492 firm-quarter observations whose CUSIP was changed during the sample period, 1,137 whose forecasts were made more than 61 days before or after the first forecasted year, 16,115 with missing data, 1,346 with negative value drivers, 2,466 with extreme value drivers (below or above the 1st and 99th percentile) and 709 which were not the last forecast made in the quarter leaves us with a VL sample of 37,868 firm-quarter observations.

We then match the VL sample with the corresponding coverage by IBES. Complications arise because these two investor services differ in term of the timing of forecast dates. VL publishes forecast reports each week over a cycle of 13 weeks, with forecasts for firms within a particular industry reported in the same week of each quarter. For each firm followed by VL, a maximum of four forecasts are available annually.[5] By comparison, the IBES Detailed File contains the forecasts of all analysts who choose to submit their forecasts to IBES. It is a real-time file and on any given date it can be used to create an IBES consensus forecast. The way researchers match VL forecasts with IBES's can therefore give rise to a 'recency advantage' to either investor service. Ramnath et al. (2001) show that the relative accuracy of IBES forecasts over VL depends on which forecast is more recent. We consider the following two cases: First,

[5] Note that the VL forecast is the result of the work of a single analyst.

VL is given the maximum recency advantage by estimating the models on the date VL releases its report. Specifically, each VL forecast is matched with a consensus IBES forecast computed as the median of all the individual analyst reports submitted to IBES during the immediately preceding 90 days. This approach ensures that "stale" IBES analyst reports predating the corresponding VL report by more than 90 days are not included in the calculation of the IBES consensus forecast and that VL forecasts are always relatively more recent. Second, IBES is given the maximum recency advantage by computing the IBES consensus forecast on the last day of the quarter using individual analyst reports submitted up to 90 days prior to that date, and then matching it to the most recent VL forecast. In this case, the degree of the recency advantage enjoyed by IBES over VL depends on when VL issued its last forecast. Compared to the corresponding IBES consensus forecast, VL earnings forecasts are most (least) stale for industries whose reports come out in the first (last) week of the quarter.

Applying the above matching procedures, we delete the following firm-quarter observations from the VL sample: 15,691 for which no IBES forecast was found in the 90 days preceding a VL forecast; 367 for which no IBES forecast was found in the same calendar quarter as VL; and 1,347 for which there was fewer than 5 observations per industry quarter. These filters reduce our sample to 20,463 firm-quarter observations with appropriately aligned VL and IBES forecasts.

Finally, we match the intermediate sample to CRSP database to get return data, resulting in a further loss of 1,278 firm-quarter observations due to missing CRSP returns and another 1,329 after imposing the restriction that the number of shares reported by IBES, CRSP and VL are within 10% of each other and that there are at least five observations per industry-quarter. The final sample consists of 17,856 firm-quarter observations for which RIM, FPE and Hybrid models can be estimated using either IBES only forecasts, VL only forecasts or a combination of forecasts from these two investor services.

3.2 Research Methodology

We perform two sets of analyses in this study: First, pricing-errors analysis which speaks to a model's ability to explain contemporaneous stock prices and allows us to compare our results with those reported in the prior literature. Second, returns analysis which focuses on a model's ability to identify mispriced stocks and allows fundamental analysts to formulate investment strategies that generate superior future returns. Research methodology for each of these two analyses is discussed below.

3.2.1 Pricing-Errors Analysis

Following Kaplan and Ruback (1996), Dechow et al. (1999), Liu et al. (2002) and Courteau et al. (2001, 2006), we compare percentage pricing errors, defined as (intrinsic value - current price)/ current price, across 14 valuation models to identify the one most consistent with the way investors set current prices. As mentioned in the introduction, fundamental analysts are interested in models with low pricing errors, since the analysis allows the analyst to infer whether both VL and IBES data are useful in yielding proxies for current investor beliefs about the fundamentals. This is an important step towards picking stocks, if the analyst has contrasting beliefs about the fundamentals, perhaps based on access to private information. Thus, our pricing error evidence is important to fundamental analysis even if the market is efficient with respect to published information in VL and IBES.

Several performance metrics are considered to accommodate possible differences in the investor's loss functions. They include signed percentage pricing errors (i.e., mean, median, parametric and non-parametric dispersion measures and mean squared error) and absolute percentage pricing errors (i.e., mean and median). For each metric, we interpret models with the lowest percentage pricing errors as most consistent with how current prices are set.

3.2.2 Returns Analysis

We assess the economic significance of each of the 14 valuation models by contrasting the medium-to-long horizon performance of extreme quintile portfolios formed using the following procedure: (1). For each model and every quarter, the intrinsic value to price ratio (V/P) of all available sample stocks is calculated at the end of the quarter. (2). Stocks are sorted into quintile portfolios based on V/P. Low (high) V/P quintile portfolios are regarded as over- (under-) valued. If the intuition of fundamental analysts is correct, then stocks in high V/P quintile are expected to experience a future increase in value, whereas those in low V/P quintile a decline. (3). Under the assumption that the highest quintile portfolio generally outperforms that in the lowest quintile, we form a zero-cost hedge portfolio comprising of offsetting long and short positions in the highest and lowest V/P quintiles, respectively.[6] (4). We calculate the buy-and-hold returns on the hedge portfolio over 12, 24 and 36 months subsequent to portfolio formation. (5). Steps (1)-(4) are repeated for all of our 44 sample quarters and 14 valuation models.

Ideally, forecasts used to compute the intrinsic values for portfolio formation purposes should be as close to quarter-end as possible. Thus, for the return analysis, we employ the second matching procedure by computing intrinsic value estimates at the end of each quarter. To

[6] Strictly speaking, the subsequent performance should increase monotonically with V/P quintiles.

mitigate timing advantage accorded models that use IBES forecasted fundamentals, we multiply the VL intrinsic value estimate by (1+ r), where r is the firm's expected equity return over the number days between VL forecasts and the end of the quarter (see Lundholm and Sloan 2007, p.224).[7]

We initially work with the buy-and-hold raw return, as this metric has been used as a measure of economic significance in many related studies.[8] However, the hedge portfolio is not necessarily riskless. For example, a typical stock in high (low) V/P portfolios may be a small (large) market-capitalization stock. In this case, the raw return to the hedge portfolio would simply reflect the well-known size effect. Hence, we also consider the economic significance of our valuation models based on the abnormal return to V/P portfolios. While several methods have been used to estimate a stock's abnormal return in the finance literature, Barber and Lyon (1997) find that the matched-stock approach is less vulnerable to skewness problems and hence yields relatively better-specified statistics for detecting long-run abnormal stock returns, compared to a reference (e.g., market index) portfolio approach. Under this approach, each sample stock is typically matched to a non-sample stock on the basis of firm characteristics believed to be pivotal in the risk-return relationship (e.g., market capitalization and book-to-market ratio). Following Barber and Lyon (1997), we first identify from the CRSP/Compustat merged database all stocks whose market capitalization is within 20% of each sample stock, then select the one with the closest book-to-market ratio as its control stock, and finally calculate its abnormal return as the difference between the sample stock's buy-and-hold raw return and that of the control stock.

[7] Recall from Section 3.1 that under the second matching procedure the VL forecasts can be quite stale, issued up to 90 days prior to the end of each quarter.
[8] See, for example, Frankel and Lee (1988) and Dechow et al. (1999).

4. Main Results

4.1 Descriptive Statistics

Panel A of Table 2 contains a description of the number of available firm-quarter observations used in the study, both overall and by year. Over the 44 sample quarters beginning with 1990, we have an average of 406 (i.e., 17856/44) firms in each quarter. In any given year, between 537 and 744 firms are included in the sample for at least one quarter. The overall median market capitalization of our sample is $1.38 billion, implying that firms covered by both VL and IBES tend to be large relative to the population of listed firms.

The overall mean and median book-to-market ratios are .491 and .455, respectively. Over the period 1990-2000, the median market value has nearly tripled, while book-to-market ratios have fallen steadily, reflecting the rapid transformation of the economy over this period.

Panel B of Table 2 describes the number of quarters when the minimum requirement of 5 firms per industry is met for each of the 31 Fama-French (1997) industry sectors present in the sample, along with summary statistics on market capitalization and book-to-market ratios across available sample quarters on a sector-by-sector basis. Only Utilities, Business Services, and Wholesale met the minimum size requirement every quarter. In contrast, Health Care enters the sample in only eight quarters. The mean book-to-market ratios vary across sectors with the lowest in Pharmaceutical Products (.279), and the highest in Utilities (.620).

4.2 An IBES-VL Comparison of Earnings Forecast Errors

To compare with the existing literature and provide a platform to assess subsequent findings on the relative merits of competing intrinsic value models, we begin with an examination of the accuracy of earnings forecasts provided by VL vs. IBES. For IBES earnings forecast to be useful in valuation, the IBES consensus forecasts must have less error than VL's earnings forecasts. We report earnings forecast errors in Table 3. Earnings forecasts errors per share are defined as (forecasted earnings - realized earnings)/current price.

Ramnath et al. (2001) provide evidence that the IBES mean and median absolute earnings forecast errors, scaled by price at the end of the year, do not differ from VL's for year one in the forecast horizon, but that IBES has lower earnings forecast errors four years out. This result suggests that the IBES forecasts of earnings to the horizon should be more useful than VL's forecasts to the horizon in valuation models.

For external validity, in Table 3 we compare the earnings forecast errors of the two investor services firms in our sample. The number of observations for the second year forecasts drops because of realized earnings per share which are missing from the IBES database for some firm-quarters.

Forecast error in Panel A is measured for both VL and IBES as (Forecast – Actual), deflated by stock price on the VL release date. Forecast error in Panel B is measured for both VL and IBES as (Forecast – Actual), deflated by stock price at the end of the quarter. Since VL forecasts in a quarter cannot be updated until the next quarter, but IBES forecasts can be updated until the end of the quarter, VL's forecasts in Panel B are less recent with respect to IBES forecasts than in Panel A. Thus we expect the IBES forecast errors in Panel B compared to VLs errors to be relatively lower than in Panel A. If this is not true, then contrary to the literature (Ramnath et al. (2001), the recency of forecast does not matter.

Panel A of Table 3 (where the IBES estimation is made at the VL forecast date), provides a comparison on a variety of metrics for a sample where VL forecasts of years 1 and 2 are more recent than IBES's. As reported at the bottom of the Panel A, on average the VL forecast is 37.5 days more recent than IBES forecasts which are made by 8.6 analysts, on average. Panel A shows that IBES mean squared errors are larger than VL's in both years 1 and 2. Apparently the recency advantage of VL in Panel A negates the advantage of IBES consensus forecasts. However, the reverse holds for median absolute error. However, VL can only hold this recency advantage over IBES forecasts at VL's release date each quarter, since for the next 90 days, IBES consensus forecasts are, unlike VL, updated each day.

Panel B of Table 3 reports the same comparison when the VL forecasts are less recent because the IBES estimate is made at the end of the quarter (see 3.3 above). Here, on average, we expect a zero recency advantage of VL forecasts over IBES, if both of their forecasts are uniformly spread over the quarter. In fact VL has a small recency advantage in Panel B, Table 3 (3.2 days over IBES forecasts that are made, on average, by 8.4 analysts.). We find that for all of the metrics, percentage earnings forecast error is less for the IBES consensus forecasts than for VL's. Comparison of results across Panels A and B confirms that, as Ramnath et al. (2001) found, the relative accuracy of earnings forecasts from VL and IBES depends on the relative recency of their forecasts. Thus when we investigate below which models (VL only, IBES only, or models using forecasts from both firms) are most consistent with how investors set current price, we control for relative recency of IBES to VL forecasts..

4.3 Results from Pricing-Errors Analysis

The relative consistency with current price of models using VL only, IBES only, and both VL and IBES forecasts is presented in Table 4. We continue to discuss the rankings based on three commonly used metrics, i.e., the mean absolute pricing error, median absolute pricing error, and mean squared pricing error, all as percentages of current price.

Panels A and B of Table 4 present results for each of the two matching procedures. Panel A of Table 4 presents results when VL earnings forecast are more recent than those of IBES, since all the analysts' forecasts used to compute the IBES consensus forecast are older than the VL forecast by 1-90 days. It can be seen that the best of the VL only models (1,2,8,11,12) is hybrid model 11, denoted as VL-FPE, (VL-x,B) (VL-FS Beta) (VL-FS TV), with a mean squared error of .073. Likewise, the best of the IBES only models (2,9,10) is hybrid model 10, denoted as IBES-FPE, (IBES-x,B) (CRSP-FS Beta) (IBES-IHP TV), with a mean squared error of .069. The best of the "both VL and IBES models" (4,5,6,7,13,14) is hybrid model 14, denoted as IBES-FPE, (IBES-x,B) (VL-FS Beta) (VL-FS TV), with a mean squared error of .060. Thus, using the mean squared error metric, a hybrid model using the IBES forward price earnings model with a RIM model using IBES earnings forecasts and VL's firm specific cost of capital and terminal value forecasts, is most consistent with current prices. Model 14 also has the lowest pricing errors as measured by mean and median absolute pricing error. Thus when VL has a recency advantage over IBES, hybrid model 14, which uses the IBES forecast of earnings to the horizon and VL's forecasts of cost of capital and terminal value, is most consistent with how investors set current price.

In Panel B, the IBES consensus forecasts have, on average, a similar recency compared to VL. However, the results in Panel B, Table 4 virtually mimic the results in Panel A. Most importantly, for all pricing error metrics, pricing error is the lowest when using Hybrid Model 14, which uses IBES earnings forecasts and VL's terminal values.

Regarding statistical significance, as reported in Table 4, we find the mean pricing errors for all models differ from zero at the .01 level, except for model 9. Also, the pricing errors of models 1-13 differ from those of model 14 at the .01 level.

Because of the popularity of the FPE model in practice, we compare the relative efficacy of the VL-FPE model with the IBES-FPE model, as measured by pricing error. In Panel A, the IBES FPE model (model 9) has significantly lower pricing errors than VL-FPE Model 8, for all three metrics. For example, mean squared errors for IBES-FPE and VL-FPE are .077 and .098 respectively. In Panel B, as in Panel A, the IBES-FPE model produces lower pricing error than does VL's FPE model. Using mean squared error as a metric, pricing errors for IBES and VL FPE models are .093 and .124 respectively.

In summary, the model that is most consistent with how the market sets current price is a hybrid FPE-RIM hybrid model which uses IBES forecast of earnings to the horizon and VL's forecasts of cost of capital and terminal value. Further, we find the IBES-FPE model produces lower pricing error than the VL-FPE model. Both of these results are new to the literature.

4.4 Results from Returns Analysis

From the fundamental analyst's perspective, the ultimate test of an intrinsic value model is its ability to identify mispriced stocks, thus enabling investment strategies to generate superior returns. Viewed in this light, the ability of a model to explain contemporaneous stock prices is less important than the ability to predict future returns. Accordingly, our analysis assesses the economic significance of a given intrinsic value model by documenting the medium-to-long horizon return performance of portfolios formed according to the value-to-price (V/P) ratios calculated under that model.

For each intrinsic value model, sample stocks are sorted into quintile portfolios, with low (high) intrinsic value to current price stocks representing over (under) valued securities. Table 5 reports the medium-to-long horizon buy-and-hold returns to the zero-cost hedge portfolio long on stocks with a high intrinsic value to current price ratio (high V/P) and short on low V/P stocks.

4.4.1 Raw Buy and Hold Returns

Table 5, Panel A reports the raw buy-and-hold returns to the hedge portfolio over 1-, 2-, and 3-year holding periods. Several clear patterns emerge across all models. All of the hedge portfolio cumulative returns are negative one year after portfolio formation. The conjectured correction of mispricings (high V/P stocks increase in value while low V/P stocks decrease) has not yet occurred. However, two years after portfolio formation, the buy-and-hold returns to all but one of the hedge portfolios under each model are positive, suggesting that the correction has commenced. Similarly, at the three-year horizon, all hedge returns have again increased. Focusing on 36 month, raw returns, at face value, the three-year buy-and-hold returns to hedge portfolios suggest that fundamental-based models provide useful signals of under-and over-priced stocks. As seen in Panel A, Table 5, the best of the VL only models (1,2,8,11,12) is RIM Model 1, denoted (VL-x,B) (VL-FS Beta) (VL-FS TV), with a raw return of .1069. The best of the IBES only models (2,9,10) is Model 9, denoted as IBES-FPE, with a raw return of .0451. The best of the "both VL and IBES models" (4,5,6,7,13,14) is RIM Model 6, denoted as (IBES-x,B) (VL-FS Beta) (VL-FS TV), with raw return of .1018.

Now consider statistical significance. T-statistics indicate that only the "VL only RIM Model 1": (VL-x,B) (VL-FS Beta) (VL-FS TV) and the "both VL and IBES" RIM Model 6: (IBES-x,B)

(VL-FS Beta) (VL-FS TV) differ from zero at the two-tailed .10 significance level. Further, using a t-test at the two-tailed .10 significance level, the raw returns of Models 1 and 6 do not differ from each other. Thus if the analyst seeks a model to maximize 36 month raw returns, then given the existence of acquisition costs, it is cost effective for an analyst to purchase VL forecasts for use in a VL only RIM model.

It is also worth seeing if raw returns are acting as expected. In section 3.2 we argued that if the intuition of fundamental analysts is correct, stocks in high intrinsic value to price portfolios will experience a subsequent increase in value, while stocks in low V/P portfolios will decline. Strictly speaking, the subsequent performance of V/P quintiles should increase monotonically. At the very least, the highest V/P quintiles should outperform the lowest V/P quintile. Consistent with this intuition, for RIM Model 1, the 36 month raw returns (not shown in a table) are .413, .440, .488, .511, and .520 for quintiles 1 to 5, respectively.

4.4.2 Risk Adjusted Buy and Hold Returns

Medium-to-long horizon raw returns to the hedge portfolio in Table 5 Panel A are likely to be of first-order interest to investment professionals focused on absolute returns. For several reasons, however, the raw returns to the hedge portfolio should be interpreted with caution. First, as discussed earlier, the hedge portfolio is not necessarily riskless. Second, if V/P portfolios exhibit characteristics known to influence the cross-section of equity returns, reported raw returns on the hedge portfolio may simply reflect other regularities.

To explore this possibility, note that the most successful model is Model 1: (VL – x, B) (VL – FS beta) (VL – FS TV), which relies exclusively on VL fundamentals, has a three-year raw return to the hedge portfolio of (.1069). Table 6 reports summary statistics for the quintile V/P portfolios formed according to Model 1.[9] Several features are readily apparent. The average market capitalization of stocks in V/P portfolios decreases monotonically as V/P ratio increases. Hence, the highest V/P portfolio contains the smallest stocks in the sample. In light of the well-documented size effect, V/P portfolio 5 might be expected to outperform V/P portfolio 1. Similarly, the average book-to-market ratio of stocks increases as V/P ratio increases. A positive relationship between book-to-market and average stock returns has been extensively documented.

Both (or either) of these characteristics of V/P portfolios might explain positive raw returns to the hedge portfolio.[10] Accordingly, it is useful to also examine the *risk-adjusted* performance of hedge portfolios under each intrinsic-valuation model. The approach adopted here recognizes the overwhelming empirical evidence that firm size and book-to-market ratio are strongly associated with the cross-section of stock returns (Fama and French, 1992). As described in Section 3.2, each stock in a V/P portfolio is matched to a control stock on market capitalization and book-to-market dimensions in order to control for risk factors associated with these characteristics.[11]

Table 5 Panel B reports the risk-adjusted buy-and-hold returns over 1-, 2-, and 3-year holding periods for each valuation model. It is immediately obvious that the apparent ability of intrinsic-value models to provide signals on mispriced securities is, after adjusting for risk factors, very limited. No model generates statistically significant positive abnormal returns at any horizon. The best “VL only” model is RIM Model 1, with a 36 month abnormal return of (.0141). The

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[9] Market capitalization and book-to-market summary statistics for the other models are qualitatively similar.

[10] While positive hedge portfolio returns are reported at the three-year horizon, note that hedge returns are predominantly negative over the first two post portfolio-formation years. This is inconsistent with the conjecture that Table 5 Panel A is merely capturing the size and/or book-to-market effects.

[11] Comparing the average market capitalization and book-to-market characteristics of sample and matched stocks in Table 6 shows that the matching procedure is quite precise.

best “IBES only” model is IBES FPE Model 9 with a 36 month abnormal return of (-.0169). The best “both VL and IBES” model is the hybrid Model 14: IBES-FPE, (IBES-x,B) (VL-FS Beta) (VL-FS TV), with a 36 month abnormal return of (.0037). Further, t-tests show that RIM Model 1 is not significantly different from either the IBES FPE Model 9 or Hybrid Model 14.

The policy implication of our abnormal return analysis differs from the policy implication of our raw return analysis. For maximization of raw returns, the analyst should acquire VL only. For maximizing abnormal returns the analyst is equally well served (ignoring differences in acquisition costs) by buying VL forecasts and using them in RIM Model 1 or by buying the IBES forecasts of earnings and using those forecasts in the IBES-FPE Model 9.

There are a couple of other facts worth noting. Examination of Panel B, Table 5, shows that models using use the Industry Horizon Premium Model for estimating terminal value in RIM models earn large and significantly negative abnormal returns. This implies there may be a contrarian trading strategy that would earn positive abnormal returns using these publicly available forecasts. Investigation of this counter-intuitive strategy is beyond the scope of the paper.

4.5 The Case for Acquiring both IBES and VL Forecasts

The purpose of this paper is to determine how to produce best estimates of intrinsic value, as measured by abnormal returns, using IBES forecasts, VL forecasts, or forecasts from both. If abnormal returns are to be maximized, then the analyst is equally well served (ignoring differences in acquisition costs) by buying VL forecasts and using them in RIM Model 1 or by buying the IBES forecasts of earnings and using those forecasts in the IBES-FPE Model 9. We anticipate that the analyst will treat this estimate of intrinsic value as starting point, to be revised by the analyst’s private information and access to other data sources.

However, there are advantages to the fundamental analyst of acquiring both VL and IBES. Generically, fundamental analysts can view their job as forecasting earnings and book value to the horizon, terminal value, and a cost of capital. Acquiring the best estimate of each of these is a richer starting point than just acquiring forecasts of earnings to the horizon.

Focusing on abnormal returns, a comparison of the IBES-FPE model in Table 5 Panel B to the VL-FPE model shows that, as measured by maximization of abnormal returns, IBES's earnings forecasts provide better returns than VL's. Also in Table 5 Panel B, we show that, as measured by abnormal returns, VL's terminal value estimates are better than IHP estimates of terminal value. Focusing on pricing error, we find that the way investors set current prices is most consistent with them using Model 14, Table 4, which is a hybrid model that uses IBES earnings forecasts and VL's terminal values. Thus, whether focusing on abnormal returns or pricing errors, it seems to us that the analyst would like to see the IBES's forecasts of earnings to the horizon and VL's forecasts of terminal value as a starting point of her analysis.

5. Concluding Remarks

Fundamental analysts, estimating the intrinsic value of a firm's equity using the residual income model (RIM) form of the dividend discount model, require forecasts of earnings to the horizon, book value to the horizon, price (terminal value) at the horizon, and cost of equity capital. The Institutional Brokers' Estimate System (IBES) provides consensus forecasts of earnings to the horizon and Value Line (VL) provides firm-specific forecasts of all four fundamentals.

The purpose of this paper is to determine how to produce best estimates of intrinsic value, as measured by abnormal returns, using IBES forecasts, VL forecasts, or both. Previous research suggests acquisition of the forecasts of both firms will produce the best intrinsic value forecast.

Ramnath et al. (2004) find that IBES consensus forecasts of earnings are more accurate than VL's (given conditions concerning the number of analysts in the consensus and the relative recency of IBES forecasts to VL's). Courteau et.al (2000) and Courteau et.al (2006) indicate that VL terminal value forecasts are more useful than some, non firm-specific estimates of terminal value, like constant growth rates for all firms or industry based growth rates. Thus we investigate whether combining IBES earnings forecasts and VL terminal value forecasts results in a better estimate of intrinsic value than does using IBES only or VL only forecasts. To provide a comprehensive analysis, we interact three classes of valuation models (Forward Price Earnings Models (FPE), RIM, Hybrid of FPE and RIM) with forecasts of IBES only, VL only, and from both services when estimating intrinsic value. Thus we examine 14 intrinsic value models.

If the purpose is to maximize abnormal returns, we find the analyst is equally well served (ignoring differences in acquisition costs) by buying VL forecasts and using them in a RIM model or by buying the IBES forecasts of earnings and using those forecasts in the IBES-FPE model. However each of these two models earn zero abnormal returns, and do not earn returns that differ from each other. At face value, if the purpose is to maximize raw returns, there is no reason, other than cost, to pick one service over the other, and there is clear evidence that nothing is gained by acquiring forecasts from both services.

However, if other issues are considered it may pay to acquire both services. By investigating which models produce the lowest pricing errors, we provide evidence that the way investors set current prices is most consistent with a model using IBES earning forecasts and VL's terminal values. It seems prudent for analysts to observe IBES's earning forecasts and VL's terminal value forecasts as they start their fundamental analysis.

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Table 1: Summary of Models and Source of Fundamentals

	Residual Income Models									FPE Models	
	Earnings		Book Value		Cost of Equity		Terminal Value			Earnings	
Residual Income Models (RIM)	VL	IBES	VL	IBES#	VL - FS	CRSP-FS	VL-FS	VL-IHP	IBES-IHP	VL	IBES
VL Fundamentals Only											
1: (VL-x,B) (VL-FS beta) (VL-FS TV)	✓		✓		✓		✓				
2: (VL-x,B) (VL-FS beta) (VL-IHP TV)	✓		✓		✓			✓			
IBES Fundmentals Only											
3: (IBES-x,B) (CRSP-FS beta) (IBES-IHP TV)		✓		✓		✓			✓		
Mixed VL-IBES Fundamentals											
4: (IBES-x,B) (CRSP-FS beta) (VL-IHP TV)		✓		✓		✓		✓			
5: (IBES-x,B) (CRSP-FS beta) (VL-FS TV)		✓		✓		✓	✓				
6: (IBES-x.B) (VL-FS beta) (VL-FS TV)		✓		✓	✓		✓				
7: (IBES-x.B) (VL-FS beta) (VL-IHP TV)		✓		✓	✓			✓			
Forward Price Earnings Models (FPE)											
8: VL 4-period FPE										✓	
9: IBES 4-period FPE											✓
Hybrid Models (FPE : RIM)											
IBES Fundamentals Only											
10: IBES-FPE: (IBES-x,B) (CRSP-FS beta) (IBES-IHP TV)		✓		✓		✓			✓		✓
VL Fundamentals Only											
11: VL-FPE: (VL-x,B) (VL-FS beta) (VL-FS TV)	✓		✓		✓		✓			✓	
12: VL-FPE: (VL-x,B) (VL-FS beta) (VL-IHP TV)	✓		✓		✓			✓		✓	
Mixed VL - IBES Fundamentals											
13: VL-FPE: (IBES-x,B) (VL-FS beta) (VL-FS TV)		✓		✓	✓		✓			✓	
14: IBES – FPE: (IBES –x,B) (VL – FS beta) (VL – FS TV)		✓		✓	✓		✓				✓

The sources of fundamentals are VL, the Value Line Historical Estimates and Projections database and IBES, the detailed I/B/E/S analyst forecast database. VL provides forecasts of earnings (x) and book value (B), while IBES forecasts only earnings. IBES book value forecasts are computed by applying the historical dividend payout ratios to earnings forecasts and assuming clean surplus accounting. For cost of equity, VL-FS refers to the firm-specific CAPM cost of equity computed from VL's estimation of each firm's Beta and CRSP-FS is the firm-specific CAPM cost of equity with Beta estimates computed from CRSP returns. For terminal values, VL-FS refers to VL's forecast of each firm's premium (price – book value) at the end of the forecast period, VL-IHP (IBES-IHP) is the industry horizon premium that minimises squared pricing errors computed from equation (5) with VL's (IBES's) earnings forecast

Table 2
Descriptive Statistics

Panel A: **By Year**

Sample Year	# of Firms in at Least One Quarter	# of Firm-Quarters	Market Value[a] (in millions)		Book-to-Market Ratio[b]	
			Mean	Median	Mean	Median
1990	537	1,053	1,700.9	743.2	0.604	0.587
1991	651	1,615	1,908.7	824.3	0.584	0.577
1992	656	1,629	2,282.6	1,007.5	0.535	0.513
1993	677	1,706	2,494.7	1,203.8	0.488	0.465
1994	708	1,759	2,526.7	1,232.1	0.509	0.480
1995	739	1,874	2,900.8	1,263.8	0.493	0.465
1996	727	1,874	3,584.3	1,640.2	0.465	0.423
1997	744	1,695	4,195.3	1,994.5	0.416	0.374
1998	703	1,603	4,555.3	2,225.4	0.415	0.379
1999	712	1,667	4,559.6	1,926.7	0.463	0.420
2000	605	1,381	5,127.2	1,998.7	0.475	0.409
1990-2000	1,433	17,856	3,278.4	1,381.1	0.491	0.455

Table 2 (continued)
Panel B: By Industry

Industry[c]	Number of Quarters[d]	Number of Observations	Market Value[a] (in millions)		Book-to-Market Ratio[b]	
			Mean	Median	Mean	Median
Food Production	37	414	3,239.8	1,618.9	0.389	0.354
Printing and Publishing	33	365	3,216.6	2,485.5	0.386	0.344
Consumer Goods	43	628	3,315.7	1,601.9	0.387	0.325
Apparel	36	330	1,304.2	861.6	0.518	0.461
Health Care	8	68	3,186.8	1,784.7	0.448	0.317
Medical Equipment	41	425	1,615.4	1,120.1	0.350	0.305
Pharmaceutical Products	41	311	4,056.8	2,294.8	0.279	0.246
Chemicals	42	1,047	2,631.1	1,427.5	0.436	0.390
Construction Materials	42	522	1,703.4	843.0	0.519	0.442
Steel Works, Etc.	34	292	1,314.8	496.6	0.597	0.544
Machinery	42	896	2,537.1	731.3	0.466	0.405
Electrical Equipment	34	252	3,997.5	1,083.5	0.388	0.337
Automobiles and Trucks	43	567	3,591.7	1,116.9	0.500	0.459
Aircraft	30	235	6,258.3	2,248.4	0.535	0.459
Petroleum and Natural Gas	42	770	6,602.4	2,384.0	0.454	0.436
Utilities	44	2,037	2,817.9	1,350.8	0.620	0.608
Telecommunications	29	192	11,582.6	6,406.2	0.386	0.346
Business Services	44	935	2,400.4	1,030.5	0.361	0.301
Computers	42	471	3,875.6	1,636.6	0.461	0.379
Electronic Equipment	40	540	2,284.3	1,038.5	0.478	0.425
Measuring and Control Equipment	39	317	1,542.3	755.9	0.509	0.438
Business Supplies	43	739	2,817.8	1,412.0	0.549	0.543
Shipping Containers	10	70	1,790.8	565.2	0.492	0.464
Transportation	36	518	3,299.7	1,137.7	0.545	0.497
Wholesale	44	573	1,606.3	701.8	0.539	0.455
Retail	43	1,619	2,810.3	1,049.9	0.475	0.422
Restaurants, Hotel, Motel	43	414	1,112.6	556.4	0.510	0.442
Banking	39	1,080	5,650.7	2,835.8	0.533	0.516
Insurance	43	954	4,534.9	3,039.7	0.607	0.595
Trading	32	275	5,143.5	2,623.3	0.505	0.466

N = 17,856 firm-quarter observations.

a. Market value is given by the most recent stock price per share for the firm, as published in the VL forecast report, multiplied by the number of shares outstanding at the beginning of forecast year.

b. Book-to-market ratios are computed as opening book value per share for year 0, divided by the most recent stock price per share, as published in the VL forecast report.

c. Defined in Appendix A of Fama and French (pp. 179-181, 1997).

d. Represents the number of quarters in which an industry meets the minimum 5 firms requirement.

Table 3
Earnings Forecast Errors by IBES and Value Line Analysts

Panel A: IBES forecasts precede Value Line's by 1 to 90 days

Source, Forecasted Year	Signed Forecast Errors Per Share[a]							Absolute Errors	
	Mean	Median	Standard Deviation	Non-Parametric Dispersion[b] 75%-25%	90%-10%	95%-5%	Mean Squared Errors[c]	Mean	Median
IBES, year 1	0.00411	0.00000	0.02108	0.00682	0.02435	0.04346	0.00046	0.00896	0.00302
IBES, year 2	0.01329	0.00465	0.04070	0.02541	0.06495	0.10239	0.00183	0.02309	0.01125
VL, year1	0.00329	0.00000	0.02082	0.00731	0.02468	0.04396	0.00044*	0.00911*	0.00333
VL, year 2	0.01218	0.00422	0.04065	0.02514	0.06448	0.10076	0.00180*	0.02285*	0.01133*

Mean number of analysts in IBES consensus forecast	8.6
Mean recency advantage of VL over IBES forecast[d]	37.5

Panel B: IBES forecasts follow Value Line's by more than 90 days

Source, Forecasted Year	Signed Forecast Errors Per Share[a]							Absolute Errors	
	Mean	Median	Standard Deviation	Non-Parametric Dispersion[b] 75%-25%	90%-10%	95%-5%	Mean Squared Errors[c]	Mean	Median
IBES, year 1	0.00337	0.00000	0.02010	0.00546	0.02043	0.03842	0.00042	0.00793	0.00250
IBES, year 2	0.01293	0.00407	0.04144	0.02399	0.06201	0.09998	0.00188	0.02237	0.01040
VL, year1	0.00362	0.00000	0.02180	0.00721	0.02497	0.04453	0.00049*	0.00931*	0.00330*
VL, year 2	0.01295	0.00421	0.04316	0.02517	0.06508	0.10394	0.00203*	0.02337*	0.01123*

Mean number of analysts in IBES consensus forecast	8.4
Mean recency advantage of VL over IBES forecast	3.2

N = 17,856 firm-quarter observations for year 1 forecasts and 16,344 for year 2.

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a. Forecast errors are computed as the difference between the forecast and the realized earnings per share divided by current price. Earnings forecasts are from Value Line's Historical Estimates and Projections database for the years 1990-2000 and from the IBES Detailed file from which forecasts older than 90 days have been removed to form the consensus. Each VL forecast is matched with the IBES forecasts made in the 90 days preceding the VL forecast date in Panel A, and with the IBES forecasts made during the same quarter for Panel B. Earnings forecasts are those for the first (year 1) and the second (year 2) years of the forecast period, realized earnings are taken from IBES.

b. To compute the three inter-percentile ranges in Panel A, we first rank signed forecast errors in ascending order for each model. The 75%-25% range represents the difference between the signed forecast error ranked at the 75th percentile and that ranked at the 25th percentile, the 90%-10% range and the 95%-5% range the are defined similarly.

c. Mean squared errors are calculated as the sum of the squared mean signed forecast error and the variance.

d. Average of the number of days between the date of each individual analyst forecast included in the IBES consensus and the date of the Value Line report to which it is matched.

* Mean (median) error significantly different from zero at the (two-tailed) 1% level, using a t-test (Wilcoxon signed rank test).

Table 4
Percentage Pricing Errors from IBES vs. Value Line Forecasts

Panel A: Estimation made at the VL forecast date

Sources of Fundamentals	Signed Pricing Errors Per Share[a]							Absolute Errors	
	Mean	Median	Standard Deviation	Non-Parametric Dispersion[b] 75%-25%	90%-10%	95%-5%	Mean Squared Errors[c]	Mean	Median
Residual Income Models (RIM)									
Value Line Fundamentals Only									
1: (VL-x,B) (VL-FS Beta) (VL-FS TV)	0.118‡	0.063‡	0.295	0.327	0.667	0.922	0.101*#	0.219*#	0.151*#
2: (VL-x,B) (VL-FS Beta) (VL-IHP TV)	-0.100‡	-0.117‡	0.301	0.399	0.774	0.998	0.101*#	0.257*#	0.223*#
IBES Fundamentals Only									
3: (IBES-x,B) (CRSP-FS Beta) (IBES-IHP TV)	-0.096‡	-0.114‡	0.292	0.390	0.749	0.965	0.095*	0.249*#	0.215*#
Mixed IBES_VL Fundamentals									
4: (IBES-x,B) (CRSP-FS Beta) (VL-IHP TV)	-0.112‡	-0.131‡	0.292	0.386	0.740	0.959	0.098*	0.254*#	0.220*#
5: (IBES-x,B) (CRSP-FS Beta) (VL-FS TV)	0.116‡	0.064‡	0.291	0.317	0.660	0.905	0.098*#	0.216*#	0.151*#
6: (IBES-x,B) (VL-FS Beta) (VL-FS TV)	0.115‡	0.064‡	0.286	0.319	0.651	0.890	0.095*	0.214*	0.149*
7: (IBES-x,B) (VL-FS Beta) (VL-IHP TV)	-0.112‡	-0.132‡	0.290	0.379	0.742	0.961	0.096*	0.252*#	0.219*#
Forward Price Earnings Models (FPE)									
8: Value Line 4 Period FPE	0.006‡	-0.029‡	0.313	0.358	0.750	1.014	0.098*	0.234*†	0.183*†
9: IBES 4 Period FPE	0.005‡‡	-0.018‡	0.278	0.321	0.659	0.893	0.077*	0.208*	0.162*
Hybrid Models (FPE: RIM)									
IBES Fundamentals Only									
10: IBES-FPE, (IBES-x,B)(CRSP-FS Beta) (IBES-IHP TV)	-0.046‡	-0.06‡1	0.258	0.323	0.642	0.857	0.069*	0.206*	0.170*
VL Fundamentals Only									
11: VL-FPE, (VL-x,B)(VL-FS Beta)(VL-FS TV)	0.062‡	0.020‡	0.264	0.298	0.618	0.841	0.073	0.194*	0.142*
12: VL-FPE, (VL-x,B)(VL-FS Beta)(VL-IHP TV)	-0.047‡	-0.070‡	0.285	0.354	0.717	0.942	0.084*	0.227*	0.188*
Mixed IBES-VL Fundamentals									
13: VL-FPE, (IBES-x,B)(VL-FS Beta)(VL-FS TV)	0.061‡	0.019‡	0.254	0.289	0.598	0.813	0.068*	0.188*	0.138*
14: IBES-FPE,(IBES-x,B)(VL-FS Beta)(VL-FS TV)	0.060‡	0.024‡	0.236	0.265	0.560	0.768	0.060	0.176	0.128

N = 17,856 firm-quarter observations.

Table 4 (continued)
Panel B: Estimation made at the end of the quarter

Model	Signed Pricing Errors Per Share[a]							Absolute Errors	
				Non-Parametric Dispersion[b]					
	Mean	Median	Standard Deviation	75%-25%	90%-10%	95%-5%	Mean Squared Errors[c]	Mean	Median
Residual Income Models (RIM)									
<u>Value Line Fundamentals Only</u>									
1: (VL-x,B) (VL-FS Beta) (VL-FS TV)	0.135‡	0.068‡	0.343	0.349	0.726	1.014	0.136*[#]	0.242*[#]	0.162*[#]
2: (VL-x,B) (VL-FS Beta) (VL-IHP TV)	-0.086‡	-0.116‡	0.331	0.413	0.813	1.069	0.117*	0.271*[#]	0.231*[#]
<u>IBES Fundamentals Only</u>									
3: (IBES-x,B) (CRSP-FS Beta) (IBES-IHP TV)	-0.094‡	-0.120‡	0.314	0.398	0.776	1.010	0.108*[#]	0.261*[#]	0.224*[#]
<u>Mixed IBES_VL Fundamentals</u>									
4: (IBES-x,B) (CRSP-FS Beta) (VL-IHP TV)	-0.116‡	-0.143‡	0.310	0.390	0.754	0.992	0.110*[#]	0.266*[#]	0.230*[#]
5: (IBES-x,B) (CRSP-FS Beta) (VL-FS TV)	0.113‡	0.052‡	0.329	0.333	0.699	0.973	0.121*[#]	0.230*[#]	0.156*[#]
6: (IBES-x,B) (VL-FS Beta) (VL-FS TV)	0.113v	0.051‡	0.324	0.335	0.692	0.960	0.118*	0.228*	0.156*
7: (IBES-x,B) (VL-FS Beta) (VL-IHP TV)	-0.116‡	-0.144‡	0.309	0.386	0.759	0.988	0.109*[#]	0.265*[#]	0.230*[#]
Forward Price Earnings Models (FPE)									
8: Value Line 4 Period FPE	0.022‡	-0.024‡	0.351	0.378	0.803	1.099	0.124*†	0.252*†	0.190*†
9: IBES 4 Period FPE	0.005‡‡	-0.028‡	0.305	0.330	0.692	0.968	0.093*	0.222*	0.168*
Hybrid Models (FPE: RIM)									
<u>IBES Fundamentals Only</u>									
10: IBES-FPE, (IBES-x,B)(CRSP-FS Beta) (IBES-IHP TV)	-0.044‡	-0.071‡	0.283	0.330	0.671	0.906	0.082	0.219*	0.179*
<u>VL Fundamentals Only</u>									
11: VL-FPE, (VL-x,B)(VL-FS Beta)(VL-FS TV)	0.079‡	0.024‡	0.310	0.323	0.682	0.935	0.102*	0.217*	0.152*
12: VL-FPE, (VL-x,B)(VL-FS Beta)(VL-IHP TV)	-0.032‡	-0.066‡	0.320	0.369	0.765	1.024	0.103*	0.244*	0.196*
<u>Mixed IBES-VL Fundamentals</u>									
13: VL-FPE, (IBES-x,B)(VL-FS Beta)(VL-FS TV)	0.068‡	0.017‡	0.296	0.310	0.649	0.894	0.092*	0.207*	0.148*
14: IBES-FPE,(IBES-x)(VL-FS Beta)(VL-FS TV)	0.059‡	0.015‡	0.271	0.284	0.594	0.833	0.077	0.191	0.137

N = 17,856 firm-quarter observations.

Table 4 (continued)

The sources of fundamentals are VL, the Value Line Historical Estimates and Projections database and IBES, the detailed I/B/E/S analyst forecast database. VL provides forecasts of earnings (x) and book value (B), while IBES forecasts only earnings. IBES book value forecasts are computed by applying the historical dividend payout ratios to earnings forecasts and assuming clean surplus accounting. For cost of equity, VL-FS refers to the firm-specific CAPM cost of equity computed from VL's estimation of each firm's Beta and CRSP-FS is the firm-specific CAPM cost of equity with Beta estimates computed from CRSP returns. For terminal values, VL-FS refers to VL's forecast of each firm's premium (price – book value) at the end of the forecast period, VL-IHP (IBES-IHP) is the industry horizon premium that minimises squared pricing errors computed from equation (5) with VL's (IBES's) earnings forecast

a. Percentage pricing errors are computed as the difference between the intrinsic value calculated from each of the models (as explained in Section 2) and the current share price, divided by current price. Earnings forecasts are from Value Line's Historical Estimates and Projections database for the years 1990-2000 and from the IBES Detailed file from which forecasts older than 90 days have been removed to form the consensus. Each VL forecast is matched with the IBES forecasts made in the 90 days preceding the VL forecast date in Panel A, and with the IBES forecasts made during the same quarter for Panel B. Current price is the most recent price included in the VL report in Panel A and the share price at the end of the quarter in Panel B.

b. To compute the three inter-percentile ranges in Panel A, we first rank signed pricing errors in an ascending order for each model. The 75%-25% range represents the difference between the signed pricing error ranked at the 75th percentile and that ranked at the 25th percentile, the 90%-10% range and the 95%-5% range are defined similarly.

c. Mean squared errors are calculated as the sum of (mean signed forecast errors)^2 and variance.

* Significantly different from Model 14 at the (two-tailed) 1% level, using a t-test for mean absolute and squared errors and a Wilcoxon signed rank test for median absolute errors.

#, ## Significantly different from Model 6 at the (two-tailed) 1% and 5% levels, respectively, using a t-test for mean absolute and squared errors and a Wilcoxon signed rank test for median absolute errors. Test done for RIM models only (Models 1 to 7).

† Significantly different from that of Model 9 at the (two-tailed) 1% level, using a t-test for mean absolute and squared errors and a Wilcoxon signed rank test for median absolute errors.

‡, ‡‡ Mean (median) signed error significantly different from zero at the (two-tailed) 1% and 5% levels, respectively, using a t-test (Wilcoxon signed rank test).

Table 5
Buy-and-Hold Returns to Zero-Cost Hedge Portfolios[a]

	Panel A: Raw returns to hedge portoflio			Panel B: Abnormal retuns to hedge portfolio[b]		
	1 year	2 years	3 years	1 year	2 years	3 years
Residual Income Models (RIM)						
Value Line Fundamentals Only						
1: (VL-x,B) (VL-FS Beta) (VL-FS TV)	-0.0106	0.0419	0.1069*	-0.0277	-0.0092	0.0141
2: (VL-x,B) (VL-FS Beta) (VL-IHP TV)	-0.0058	0.0120	0.0285	-0.0354*	-0.0621*	-0.1121**††
IBES Fundamentals Only						
3: (IBES-x,B) (CRSP-FS Beta) (IBES-IHP TV)	-0.0153	0.0140	0.0442	-0.0502**	-0.0729**	-0.1175***††
Mixed IBES_VL Fundamentals						
4: (IBES-x,B) (CRSP-FS Beta) (VL-IHP TV)	-0.0230	-0.0015	0.0207	-0.0505**	-0.0766**	-0.1312***††
5: (IBES-x,B) (CRSP-FS Beta) (VL-FS TV)	-0.0330	0.0175	0.0646	-0.0481**	-0.0288	-0.0182
6: (IBES-x,B) (VL-FS Beta) (VL-FS TV)	-0.0203	0.0385	0.1018*	-0.0356***	-0.0179	0.0073
7: (IBES-x,B) (VL-FS Beta) (VL-IHP TV)	-0.0235	0.0017	0.0271	-0.0537	-0.0718**	-0.1196***††
Forward Price Earnings Models (FPE)						
8: Value Line 4 Period FPE	-0.0060	0.0027	0.0107††	-0.0340	-0.0395	-0.0840**†
9: IBES 4 Period FPE	-0.0117	0.0099	0.0451	-0.0244	-0.0233	-0.0169
Hybrid Models (FPE: RIM)						
IBES Fundamentals Only						
10: IBES-FPE, (IBES-x,B)(CRSP-FS Beta) (IBES-IHP TV)	-0.0201	0.0073	0.0353	-0.0388*	-0.0469	-0.0563
VL Fundamentals Only						
11: VL-FPE, (VL-x,B)(VL-FS Beta)(VL-FS TV)	-0.0178	0.0277	0.0637	-0.0371	-0.0230	-0.0495
12: VL-FPE, (VL-x,B)(VL-FS Beta)(VL-IHP TV)	-0.0140	0.0070	0.0149†	-0.0410*	-0.0486	-0.1041**†
Mixed IBES-VL Fundamentals						
13: VL-FPE, (IBES-x,B)(VL-FS Beta)(VL-FS TV)	-0.0222	0.0189	0.0515	-0.0368*	-0.0293	-0.0523
14: IBES-FPE,(IBES-x,B)(VL-FS Beta)(VL-FS TV)	-0.0148	0.0444	0.0869	-0.0268	0.0084	0.0037

a. For each of the valuation models, quintile portfolios are formed based on each firm's ratio of intrinsic value to current market price (V/P). Intrinsic value is calculated with each of the models (as explained in Section 2) from forecasts from VL Historical Estimates and Projections database for the years 1990-2000 and from the IBES Detailed file from which forecasts older than 90 days have been removed to form the consensus. Each VL forecast is matched with the IBES forecasts made during the same quarter. Current price is the share price at the end of the quarter. For each of the three time horizons, the hedge portfolio return is defined as the difference between the returns of Portfolio 5 and Portfolio 1.

b. Difference in returns between sample firms and similar firms matched on market capitalization and book-to-market ratio.

Table 5 (continued)

*, **, *** Return significantly different from zero in a two tailed test at the 10%, 5% and 1% levels, respectively.
†,††,††† Returns significantly different from those of Model 1 in a two-tailed t-test at the 10%, 5% and 1% levels, respectively.

The sources of fundamentals are VL, the Value Line Historical Estimates and Projections database and IBES, the detailed I/B/E/S analyst forecast database. VL provides forecasts of earnings (x) and book value (B), while IBES forecasts only earnings. IBES book value forecasts are computed by applying the historical dividend payout ratios to earnings forecasts and assuming clean surplus accounting. For cost of equity, VL-FS refers to the firm-specific CAPM cost of equity computed from VL's estimation of each firm's Beta and CRSP-FS is the firm-specific CAPM cost of equity with Beta estimates computed from CRSP returns. For terminal values, VL-FS refers to VL's forecast of each firm's premium (price – book value) at the end of the forecast period, VL-IHP (IBES-IHP) is the industry horizon premium that minimizes squared pricing errors computed from equation (5) with VL's (IBES's) earnings forecast.

Table 6
Summary Statistics on V/P Portfolios Under Model 1[a]

	Sample Stocks		Matching Stocks	
V/P Portfolio	**Market Capitalization ($m)**	**Book-to-Market Ratio**	**Market Capitalization ($m)**	**Book-to-Market Ratio**
1 (low)	4,772	0.40	4,539	0.40
2	4,199	0.47	3,987	0.47
3	3,506	0.49	3,304	0.49
4	2,561	0.54	2,440	0.54
5 (high)	1,522	0.65	1,452	0.65

a. Each sample firm is matched on market capitalization and book-to-market ratio with a non-sample firm.

b. Quintile portfolios are formed based on each firm's ratio of intrinsic value to current market price (V/P). Intrinsic value is calculated with Model 1 (as explained in Section 2) from forecasts from VL Historical Estimates and Projections database for the years 1990-2000 and from the IBES Detailed file from which forecasts older than 90 days have been removed to form the consensus. Each VL forecast is matched with the IBES forecasts made during the same quarter. Current price is the share price at the end of the quarter.