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An Analysis of the Equity Valuation Literature as Applied to the Lodging Industry

Arun Upneja
The Pennsylvania State University
School of Hospitality Management, USA
Seoki Lee
The Pennsylvania State University
School of Hospitality Management, USA
Michael C. Dalbor
University of Nevada Las Vegas
William F. Harrah College of Hotel Administration, USA

Abstract : Very little research has been conducted regarding hospitality equity valuation. In this paper we compare three traditional models used in the empirical finance literature: dividend discount, residual income and discounted free cash flows. Research by Lundholm and O'Keefe (2001) shows that all the models will yield an identical valuation. However, others (Penman and Sougiannis, 1998; Francis, Olsson and Oswald, 2000) found differences in the model. This is most recently claimed by Penman (2001). We apply the three models to Hilton stock and find convergence between discounted dividends and residual income, but not discounted cash flows. We suspect this is because of the short horizon of our analysis and the limitations of our data source.

Key words : Lodging industry, Equity valuation, Forecast

Introduction

There are no studies that have systematically attempted to evaluate equity valuation models in the lodging industry. Most academic papers in the mainstream finance and accounting literature either exclude hospitality firms or do not examine it in detail. For example, it is very common to find academic papers that exclude all service sector firms. The lodging sector has many characteristics that differentiate it from other economic sectors in the US. For example, the lodging industry is very capital intensive; however, the performance is heavily dependent upon the quality of the service interaction with the customers. Therefore, we cannot directly conclude that the results of research that has excluded lodging firms can be extended to lodging firms. On the other hand, the same pitfalls that can cause a lack of convergence between the three models in the economic literature may also be present here with our lodging example.

The three equity valuation models used in academic research are the

discounted dividend model, residual income model, and the free cash flow valuation model. Many researchers have used these models to generate valuation for publicly traded firms, for example, Francis, Olsson and Oswald (2000) and Penman and Sougiannis (1998). The Francis et al. (2000) paper attempts to compare the relative accuracy, consistency and explainability of three kinds of models. However, Lundholm and O'Keefe (2001) show that if properly implemented all valuation models should converge to the same estimate of equity value. The main source of controversy between these researchers is the time horizon over which the valuation forecasts are made. If the horizon is assumed to be infinite, all valuation models will converge and if the horizon is assumed to be finite, different valuations will emerge from the models.

The main purposes of this paper are to explore the three major valuation models developed in the mainstream accounting and finance literature, operationalize them for the lodging industry, systematically examine and operationalize the assumptions needed for each model, and finally outline the major avenues of research in the area of valuation methods and models for the hospitality sector.

We describe and operationalize the dividend discount model and the residual income model in the paper and include a discussion on the discounted free cash flow model in the appendix. The data used in this paper is the financial data from Hilton Corporation, as reported by Value line in 2003 and is shown in table 1.

Hilton 2003 Value Line Forecasts

	2003	2004	2005	2006	2007	2008
SE(t-1)	5.46	5.73	6.1	6.77	7.74	8.71
NI(t)	0.35	0.45	0.75	1.05	1.05	1.05
D(t)	0.08	0.08	0.08	0.08	0.08	0.08
SE(t)	5.73	6.1	6.77	7.74	8.71	9.68
RI(t)	-0.196	-0.123	0.14	0.373	0.276	0.179

r_e = 10% (Cost of Equity)

g = 4% (Growth Rate)

The beginning stockholders equity for 2003 is the starting point and is the actual amount from the financial statements. Forecasted net income is shown in the second row and is forecasted to 2008. Dividends are assumed to be constant by Value line at $0.08 per share.

These two valuation models make use of a "clean surplus". Clean surplus involves using net income minus dividends to calculate stockholder's equity. This is different than using earnings. While earnings include non-recurring charges, net income does not.

The stockholders equity can now be calculated by the clean surplus relation: Net Income plus the beginning value of equity less the dividends. Finally the residual income is calculated as the Net Income less the normal return, which is calculated as the beginning value of equity multiplied by the cost of equity (we assume a rate of 10 percent).

Literature Review

A "horse race" between the different equity valuation models began in late nineties. Penman and Sougiannis (1998) investigate three different equity valuation models - dividend, free cash flow, and residual income models - to examine superiority in terms of valuation errors. To compute ex ante forecasting figures, they use portfolios utilizing ex post realized financial data instead of forecasted financial data. They particularly focus "on a practical issue: dividend, cash flow, and earnings approaches are equivalent when the respective payoffs are predicted to infinity, but in practice, forecasts are made over finite horizons" (346). They, therefore, explore different magnitudes of valuation errors of three equity valuation models forecasting over one-, two-, five-, eight-year finite horizons. They conclude that the residual income model which employs accrual accounting numbers generates better forecasting numerals with lower valuation errors than the cash flow methods - dividend and free cash flow models.

Instead of using portfolios as Penman and Sougiannis (1998) do, Francis et al. (2000) use forecasting figures for five years provided by Value Line to investigate superiority of three different equity valuation models in terms of accuracy (defined as the absolute price scaled difference between the value estimate and the current security price) and explainability (defined as the ability of value estimates to explain cross-sectional variation in current security prices). They also use growth rate of either zero or four percent after five year period. They state their main objective as "to present a pragmatic exercise comparing the reliability of these value estimates, recognizing that the forecasts underlying them may be inconsistent" (46). They conclude that the residual income model estimates are more accurate and explain more of the variation in security prices than do dividend and free cash flow models.

Courteau et al. (2000) study the equivalence of the different equity valuation models by replacing the arbitrary growth rate approach used in valuation

models by Francis et al. (2000) with a price-based terminal value calculation provided by Value Line. They state that their research objective as "to explore whether, over a five-year valuation horizon, DDM (Discounted Dividend Model), DCF (Discounted Cash Flow Model) and RIM (Residual Income Model) are empirically equivalent using Penman's (1998) theoretically "ideal" terminal value expressions in each model" (2). They find that the three models yield similar estimates. They further explore and conclude that the quality of forecasting estimates is better with using Value Line provided terminal stock price forecasts than arbitrary growth rate (zero or two percent) approach. Also, they replicate the same results of Francis et al. (2000) that residual income model is superior to cash flow models - dividend and free cash flow models.

The general consensus of the existing literature on equity valuation models is that the residual income model is considered to be a better model than the two cash flow models. Lundholm and O'Keefe (2001a), however, criticize some of the previous research for inconsistencies in their computations incorporated into the models. They claim equivalence between all three equity valuation models and state that this is consistent with the theoretical background.

Lundholm and O'Keefe (2001a) have two main purposes. First, they dispute the notion that the residual income model is superior to cash flow models. They argue that the three equity valuation models should be equivalent because they emanate from the same theoretical background. The second purpose is to identify incorrect practices in the application of the models. They spot three specific inconsistencies that analysts and researchers often mistakenly make in operating equity valuation models. The three inconsistencies described in the study are the inconsistent forecasts error, the incorrect discount rate error, and the missing cash flow error.

The inconsistent forecasts error happens due to incorrect computation practices when the perpetuity of valuation is calculated. In particular, the authors demonstrate that most previous research uses (1 + g) times the last residual income or cash flow in the finite forecasting period as a starting value for the perpetuity computation, where g is the terminal growth rate, and this value is mostly not the correct one. This incongruence is shown in equation 1.

Equation (1): $D_T \neq D_{T-1}*(1+g)$ and $RI_T \neq RI_{T-1}*(1+g)$

The incorrect discount rate error occurs when the free cash flow model is employed. The most common way to apply the free cash flow model is to value the whole firm using the weighted-average cost of capital and subtract from it the value of the debt. In the process of the computation, "the appropriate discount rate is only a weighted average of the cost of equity and the cost of debt under

certain conditions, and even then, the weights are not arbitrary. Failure to meet these conditions results in a discount rate that is inconsistent with the basic dividend discounting model, causing differences in the estimated value of the cash flow model and the residual income model" (316).

The last inconsistency, the missing cash flow error, is caused by violation of the clean surplus relation in the financial statement forecasts provided by service providers such as Value Line. As discussed previously, the clean surplus relation involves the use of net income, not earnings, to calculate the new shareholders equity. This is shown in equation (2).

Equation (2): $SE_t = SE_{t-1} + NI_t - D_t$

Penman (2001) argues against Lundholm and O'Keefe (2001a), primarily with the notion of finite horizon time period in forecasting equity value. He shows an example of a savings account with full payout and no payout situations to demonstrate that in finite setting which is considered to be more practical, different valuation models actually generate different forecast estimates. The paper concludes that even though the author agrees with some points made by Lundholm and O'Keefe (2001a), it still believes that "the empirical papers dismissed by Lundholm and O'Keefe provide evidence that GAAP accrual accounting has advantages over cash accounting" (691).

Lundholm and O'Keefe (2001b) respond to Penman (2001) by reasserting their claims about the existing literature and the errors that cause inconsistencies between the results of the equity valuation models. The paper uses the same example by Penman (2001) of a savings account to show that if all steps are taken correctly as they allege, three different equity valuation models produce the exactly same forecast estimates. They attempt to explain Penman's criticism of their original paper by concluding that "we believe that good accounting has a substantial role to play. A more accurate statement would be that we are cynical about the ability of algebra to create new information" (696).

The models

Dividend Discount Model

The theory behind the dividend discount model is that dividends are the cash flows that accrue to the stockholders, hence dividends should be priced. Therefore under this approach the theoretical market value of equity should equal the present value of all future expected dividends.

As shown in the formula below, the future stream of expected dividends are discounted by the cost of equity capital. Dividends are forecasted to some year

n and then a perpetual growth rate g is assumed. This is shown in equation (3).

$$P_e = \sum_{t=1}^{T} \frac{D_t}{(1+r_e)^t} + \frac{D_{T+1}}{(r_e - g)(1+r_e)^T}$$

Where:

P_e = Value of the equity holders' claim at time 0

$D_t = NI_t - \Delta SE_t$

NI_t = Net income for the period ending at time t; $NI_t = OI_t - I_t$.

SE_t = Shareholders' equity at time t; $OA_t - L_t = SE_t$.

OI_t = Operating income for the period ending at time t, net of tax.

OA_t = Operating asset balance at time t.

L_t = Liability balance at time t.

I_t = Interest expense for the period ending at time t, net of tax.

r_e = Cost of equity capital.

g = perpetual growth rate after the forecasting period.

Based on the data for Hilton given in table 1, the dividend discount model is operationalized below. We use the Value Line estimates that dividends will be constant for the next six years. However, in the seventh year, as pointed out by Lundholm and O'Keefe (2001a), the starting value of the dividends is found by subtracting the change in the stockholders equity between years six and seven from the net income in year seven. The reason for taking this approach is because dividends are usually decided by the board of directors and generally remain immune to the normal fluctuations in the earnings of the firm. If the dividends were either always equal to the earnings or a fraction of earnings, we would not have to artificially start the perpetual growth phase by using the change in the stockholders equity. The error committed by previous researchers is to calculate the dividends in year 7 (start of the perpetual growth phase) by taking the dividend in year 6 and multiplying by the growth rate. Using the dividend discount model, the current value of Hilton hotels is $6.98 as shown in equation (4).

$$P_e = 5.46 + \frac{-0.196}{(1+0.1)^1} + \frac{-0.123}{(1+0.1)^2} + \frac{0.14}{(1+0.1)^3} + \frac{0.373}{(1+0.1)^4} + \frac{0.276}{(1+0.1)^5} + \frac{0.179}{(1+0.1)^6} + \frac{0.124}{(0.1-0.04)\times(1+0.1)^6}$$

$$P_e = 6.979108$$

$$P_e = \frac{0.08}{(1+0.1)^1} + \frac{0.08}{(1+0.1)^2} + \frac{0.08}{(1+0.1)^3} + \frac{0.08}{(1+0.1)^4} + \frac{0.08}{(1+0.1)^5} + \frac{0.08}{(1+0.1)^6} + \frac{0.7048}{(0.1-0.04)\times(1+0.1)^6}$$

$$P_e = 6.979108$$

$$SE_7 = SE_6 \times 1.04 = 9.68 \times 1.04 = 10.0672$$

$NI_7 = NI_6 \times 1.04 = 1.05 \times 1.04 = 1.092$

$D_7 = NI_7 - (SE_7 - SE_6) = 1.092 - (10.0672 - 9.68) = 0.7048$

Residual Income Valuation Model

The residual income valuation model assumes an accounting identity to express equity values as a function of book values and residual incomes. The theoretical market value of equity is the starting value of stockholders equity plus the present value of the future stream of residual income, discounted by the cost of equity capital. The concept of residual income is the income that is earned on the stockholders equity that is above what is expected, given the level of risk in the firm's operations and capital structure. This is shown in equation (5).

$$P_e = SE_0 + \sum_{t=1}^{T} \frac{RI_t}{(1+r_e)^t} + \frac{RI_{T+1}}{(r_e - g)(1+r_e)^T} \qquad (5)$$

Where

P_e = Value of the equityholders' claim at time 0

SE_t = Shareholders' equity at time t; $OA_t - L_t = SE_t$.

RI_t = Residual income for the period ending at time t; $RI_t = NI_t - r_e SE_{t-1}$.

r_e = Cost of equity capital.

NI_t = Net income for the period ending at time t; $NI_t = OI_t - I_t$.

OI_t = Operating income for the period ending at time t, net of tax.

OA_t = Operating asset balance at time t.

L_t = Liability balance at time t.

I_t = Interest expense for the period ending at time t, net of tax.

g = perpetual growth rate after the forecasting period.

As shown in equation five, the value of the firm's equity at time t, equals the stockholders equity at time t-1 plus the present value of all future residual incomes, discounted using the equity cost of capital. We include numbers in equation five below.

$RI_t = NI_t - r_e SE_{t-1}$

$NI_7 = NI_6 \times 1.04 = 1.05 \times 1.04 = 1.092$

$RI_t = NI_t - r_e SE_{t-1} = 1.092 - 0.1 \times 9.68 = 0.124$

$RI_7 = RI_6 \times 1.04 = 0.179 \times 1.04 = 0.18616$

If we multiply the growth rate RI_6 to RI_7 to get (like several previous researchers have done), we would get,

which is not equal to 0.124.

Conclusions and suggestions for future research

Using data for Hilton Hotels Corporation from Value Line, this paper showed convergence between two of the three major equity valuation models. More importantly, this convergence was achieved within a relatively limited timeframe (seven years), implying that the theoretical convergence of the different models works in the short time frame as well. Nevertheless, as noted in previous research, more attention should be given to the inputs of each model. Improvement in the quality of inputs may potentially lead to a big improvement in our ability to properly value lodging firms. The primary variables that affect our valuation are earnings per share, retained earnings and the growth rate.

Unfortunately, our discounted free cash flow model was not consistent with the other two models as discussed in the appendix. However, we believe that this is primarily due to the definition of free cash flow in the literature may be quite different from that used by our data source. Moreover, even if free cash flow were reported consistently by Value Line, the shortened timeframe may have an influence on convergence, if a different methodology was used to generate the free cash flows (as opposed to dividends and residual earnings. Therefore, we cannot state with confidence that our research confirms the finding of Penman and Sougiannis (1998) that shows discounted cash flow models to be less accurate.

We are assuming that the cost of equity, consistent with prior research, is consistent over time. This topic is beyond the scope of this paper. However, there is scope for a stream of literature that discusses the factors that influence the equity cost of capital and how to predict it, such that the dynamic estimates can be used in the valuation models.

The current practice by academic researchers is to use analyst forecasted growth rates for the near future (three to five years) and then use arbitrary perpetual growth rates. Assuming that the consensus analyst forecast for the near term is the best available forecast, estimation of the perpetual growth rates is another fruitful area of research.

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***Note*:**

[1] The valuation is as of October 2003, when we collected the data from Value Line.

About the Author :

Arun Upneja is Associate Professor in The Pennsylvania State University School of Hospitality Management, USA
Seoki Lee is Faculty Member in The Pennsylvania State University School of Hospitality Management, USA
Michael C. Dalbor is Faculty Member in The University of Nevada Las Vegas, William F. Harrah College of Hotel Administration, USA

Appendix

Discounted Cash Flow Model

The theory behind this model is that investors place a high value on cash. Vendors, employees dividends are all paid with cash. Cash is the lifeblood of the business. Therefore, investors really don't care about accrual-based earnings. Accordingly, we use the definition of free cash flow as shown in Francis, Olsson and Oswald (2000):

Free Cash Flow= (Revenue - Operating Expense - Depreciation) x (1 - tax rate) + Depreciation + Change in Working Capital - Capital Expenditures

What is important to note here with this definition is the significant reliance upon balance sheet and/or capital budget items. Although changes in current balance sheet accounts affect earnings and net income, often these items will have a very modest net effect. With this model, there could be significant changes in working capital or a significant number of capital expenditures made with cash. This has particular important for the lodging industry, which is very fixed-assest intensive and makes significant investments in capital expenditures.

Value Line does make forecasts of capital expenditures by share. This is a line item that would typically be very difficult to forecast. Additionally, the forecasters at Value Line estimate annual depreciation expense, but not on a per share basis. Therefore, one must also be able to accurately forecast the number of common shares outstanding.

We have provided in the table below what Value Line estimates for "cash flow" are on a per share basis for Hilton in the years 2003-2005. Below that, we have provided our estimates of "free cash flow" based upon net income per share, depreciation expense and capital expenditures. It should be noted that we have not included changes in working capital as that information is not available from Value Line.

	2003	2004	2005
"Cash Flow" per share	$1.29	$1.45	$1.70
Free Cash Flow per share	$.69	$.77	$.86

As shown in the table the figures for each of the three years are quite different. More importantly, are also different from the dividends received or the residual income figures. Accordingly, we believe that the limitations of the data and the limited forecasting period make significant contributions to the lack of convergence between the models.