Investment Valuation: Exploring the Intrinsic Value of Resort Industry in Taiwan by **Discounted Cash Flow Models**

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Abstract | In Taiwan, leisure industry is currently one of the core industries and plays an important role in economic contribution to the country. However, most investors are unfamiliar with this industry and its value, causing uncertainties in financing and its sustainable development. The aim of this research is to estimate the intrinsic value of selected company – Kentington Resort by three discounted cash flow models, i.e. dividend discount model, free cash flow to equity model and free cash flow to firm model. The research findings show that two free cash flow models are more appropriate while valuing Kentington and current market prices reflect basically its intrinsic value. In order to examine the stability of the valuation methodology, a series of sensitivity analyses are also taken in the end. By referring to this investment valuation process, managers and investors could improve the quality of their decision making and investment.

Keywords | Financial Management, Investment Valuation, Discounted Cash Flow Models, Resort Industry.

Resumo | Em Taiwan a indústria do lazer é actualmente uma das principais indústrias e desempenha um papel importante na economia do país. Porém, a maioria dos investidores não estão familiarizados com esta indústria e com o seu valor, o que causa incertezas no seu financiamento e no seu desenvolvimento sustentável. O objectivo desta pesquisa é estimar o valor intrínseco de uma empresa seleccionada – *Kentington Resort*, através de três modelos de desconto de *cash-flow*: modelo de desconto de dividendos, modelo *free cash flow to equitity* e modelo *free cash flow to firm*. Os resultados da investigação evidenciam que os dois últimos são mais apropriados quando se avalia *Kentington Resort* e os preços de mercado actuais reflectem basicamente o seu valor intrínseco. De forma a analisar a estabilidade da metodologia de avaliação foram também realizadas várias análises de sensibilidade. Recorrendo a este processo de avaliação do investimento, os gestores e investidores podem melhorar a qualidade das suas decisões e os seus investimentos.

Palavras-chave | Gestão Financeira, Avaliação do Investimento, Modelos de Desconto de *Cash Flow*, Indústria dos *Resorts*.

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1. Introduction

With the coming of 21st century, the industrial structure of Taiwan has gone through some significant changes. Tourism and leisure industry became one of the core industries and played an important role in economic contribution to the country. However, most investors are unfamiliar with this industry and its value, causing uncertainties in financing and its sustainable development. At the same time, countries across the world have gradually been going into depression, without exception, this effect has also influenced Taiwan. The competition in the business environment becomes more and more fierce. In order to survive with this change, the managers need an appropriate tool to create greater corporate value and promote the quality of decision making. A set of suitable valuation models is, therefore, essential for these enterprises to manage the change properly and achieve the desired operating performance expected by their stakeholders. Investment valuation is one of the hot topics in the field of financial management. Various valuation models have been established. The aim of this research is to select among these valuation approaches and compare the discrepancy between the intrinsic value and the market price of the chosen company.

The stock investment process is considerably different depending on the investor's belief about market efficiency. Based on the belief in the degree of market efficiency, two major investment theories emerged that separate the financial community (Proidevaux, 2004). One of them is fundamental analysis based on the idea of non-efficient markets and the other is modern portfolio theory with a strong faith in market efficiency. Fundamental analysis is an investment approach that uses existing financial information about a company to make investment decisions. It consists mainly of estimating the value of a stock and comparing it to its current market price. On the other hand, the main argument of modern portfolio theory is that all investors in the marketplace are intelligent and are trying to find mispriced stocks. The large number of informed investors will ultimately drive a stock price to its intrinsic value and hence create an efficient market. The above two different approaches of investment are based on two fundamentally different understanding of the relationship between intrinsic value and price. In our opinion, it is too simplistic to assume that markets are always efficient so that prices are equal to intrinsic value or adjust to intrinsic value automatically because it fails to capture the richness of market pricing dynamics and the complex process of price formation in the stock market, especially in Taiwan where the stock market is still immature. As such, the investment should be based on a comparison between the intrinsic value of a stock and its current market price. Investors must determine whether a stock is under- or overvalued based on the fundamentals of the business.

The measure of intrinsic value requires forecasting the future and is therefore, unavoidably subjective and various approaches are generally used. It is impossible to scientifically determine what a stock is worth at a certain point in time. The best we can do is to build a comprehensive and systematic valuation model based on the valuation theories. The idea of model development is to explicitly relate a stock's intrinsic value to currently observable fundamental variables (Damodaran, 2002). This study tries to use all relevant fundamental information available to investors to determine intrinsic values of stocks mechanically. For this we build an objective and verifiable discounted cash flow (DCF) valuation model which consists of an interactive approach combining many fundamental input factors into a flexible spreadsheet model.

2. Methodology

2.1. DCF valuation and relative valuation

During the past seven decades several models have been proposed to estimate the value of a stock or a firm. The most widely used models can be generally divided into two categories: DCF valuation and relative valuation (Damodaran, 2004). The differences in value between these two approaches come from different views of market efficiency. In DCF valuation, it is assumed that markets make mistakes and these mistakes can often occur across entire sectors or even the entire market. In relative valuation, people assume that while markets make mistakes on individual stocks, they are correct on average. As to the objective of valuation, DCF models aim to find the intrinsic value of assets, given their cash flow, growth and risk characteristics. The objective of relative valuation is to value assets based on how similar assets are currently priced in the market. The prerequisite of relative valuation is the selection of comparable firms which have similar profiles with the firm being valued in terms of cash flows, growth potential and risk. This approach becomes difficult to apply when there are relatively few firms in a sector. As mentioned earlier, the stock market of Taiwan is still immature. The number of publicly traded firms of tourist sector in Taiwan is also relatively small and the profiles of these firms are divergent. It is, therefore, suggested that DCF valuation is better than relative valuation while exploring the value of resort industry in Taiwan.

2.2. The models of DCF valuation

The underlying principle of DCF valuation is that common stock represents an ownership interest in a business and its value must be related to the returns investors expect to receive from holding it (Copeland *et al.*, 2000). Intuitively, the value of any stock or firm should be a function of three variables - how much it generates in cash flows, when these cash flows are expected to occur, and the uncertainty associated with these cash flows. DCF valuation brings all three of these variables together by computing the value of any asset to be the present value of its expected future cash flows. In Table 1, we take a closer look at the basic concepts and equations of DCF valuation and the valuation of equity and firm. According to Damodaran (2002), there are three widely used DCF models.

2.2.1. Dividend discount model (DDM)

The DDM is the fundamental model for investment valuation. When valuing equity investments in publicly traded companies, people could argue that the only cash flows investors in these investments get from the firm are dividends. Therefore, the value of the equity can be computed as the present value of expected dividend payments on the equity. The most widely known DDM is the Gordon growth model which expresses the value of a stock based on a constant growth rate of dividends. Even though DDM is the most direct and conservative way to value a stock, it has some major weaknesses related

Table 1 | Equations of DCF valuation models

DCF valuation	$\text{Value} = \sum_{t=1}^{t=n} \frac{CF_t}{(1+r)^t}$	where n = Life of the asset CF_t = Cash flow in period t r = discount rate
Equity valuation	$\text{Value of equity} = \sum_{t=1}^{t=n} \frac{\text{CF to Equity}_t}{(1+ke)^t}$	where CF to Equity_t = Expected cash flow to equity in period t K_e = Cost of equity
Firm valuation	$\text{Value of firm} = \sum_{t=1}^{t=n} \frac{\text{CF to Firm}_t}{(1+WACC)^t}$	where CF to Firm_t = Expected cash flow to firm in period t WACC = Weighted average cost of capital

to its practical application. The main problem is that observed dividends are not directly related to value creation within the company and therefore to future dividends. In most cases, it only allows us to estimate the "floor value" since many firms do not pay out all of their free cash flow as dividends. Therefore, dividends as the relevant cash flow to investors have been more and more replaced since the 1980's with free cash flows.

2.2.2. Free cash flow to equity (FCFE) model

As DDM may not capture the true capacity to generate cash flows for stockholders, a more appropriate model is the FCFE model which is based on the cash available for distribution but not necessarily distributed to shareholders. The FCFE is the residual cash flow left over after meeting interest and principal payments and providing for capital expenditures to maintain existing assets and to create new assets for future growth. Once the FCFE have been estimated, the process of estimating value parallels the DDM. The FCFE model can be viewed as an alternative to the DDM. As for which of the two values is more appropriate for evaluating the market price, the answer lies in the openness of the market for corporate control. If there is a significant probability that a firm can be taken over or its management changed, the market price will reflect that likelihood; in that case, the value from the FCFE model would be a more appropriate benchmark. As changes in corporate control become more difficult, either because of a firm's size and/or legal or market restrictions on takeovers, the value from the DDM will provide a more appropriate benchmark for comparison.

2.2.3. Free cash flow to firm (FCFF) model

The DDM and FCFE are models for valuing the equity in a firm directly. The alternative is to calculate the value of a firm using FCFF and then subtracting the value of non-common stock capital from this value. Using the FCFF model, the value of the firm is obtained by discounting expected cash flows to the firm. There are two key distinctions between FCFE model and FCFF model. The first is that the FCFE is after net debt payments, whereas the FCFF is before debt payments. The advantage of using the firm valuation approach is that cash flows related to debt do not have to be considered explicitly, while they have to be taken into account in estimating FCFE. In cases where the leverage is expected to change significantly over time, this is a significant saving since FCFF are unaffected by changes in the leverage. The firm valuation approach does, however, require information about debt ratios and interest rates to estimate the WACC. The second difference is that the value of equity is obtained by discounting expected cash flows to equity at the cost of equity, while the value of the firm is obtained by discounting expected cash flows to the firm at the weighted average cost of capital (WACC). Although the FCFE and FCFF use different definitions of cash flow and discount rates, they will yield consistent estimates of value as long as the same set of assumptions is applied for both.

2.3. Inputs estimation for DCF valuation

All DCF models ultimately boil down to estimate the following four inputs (Damodaran, 2002; Copeland *et al.*, 2000):

2.3.1. Cash flow

The value of equity or firm comes from its capacity to generate cash flows. As mentioned above, there are three choices to measure the cash flows, i.e. dividends or FCFE for equity valuation and FCFF for firm valuation. As shown in Table 2, three components go into estimating the FCFE and FCFF. The first is net income or earnings before income and tax (EBIT). The second is net capital expenditures, which is the difference between capital expenditures and depreciation. The third is investments in non--cash working capital.

Table 2 | Estimation of cash flow

DDM	DPS = dividends per share
FCFE	FCFE = Net income – (Capital expenditures–Depreciation) x (1–δ) – (Δ Working capital) x (1–δ), where δ=dbt ratio
FCFF	FCFF = EBIT (1–tax rate) – (Capital expenditures – Depreciation) – Δ Working capital

2.3.2. Discount rate

– Cost of equity (k_e): As shown in Table 3, the cost of equity is a function of three inputs: the riskless rate, the risk premium on the market portfolio and the beta (β) of the equity investments being assessed. Firstly, the riskless rate would be normally the rate on a long-term government bond. Secondly, the risk premium measures the extra return that would be demanded by investors for shifting their money from a riskless investment to an average risk investment. There are two ways to estimate the risk premium in the capital asset pricing model (CAPM). One is to look at the past and estimate the premium earned by risky investments (stocks) over riskless investments (government bonds); this is called the historical premium. The other is to use the premium extracted by looking at how markets price risky assets today; this is called an implied premium. Thirdly, there are two approaches to estimate betas. The first is the regression approach, where historical stock returns are used to compute the beta of a stock. The other is the bottom-up approach, where the beta is estimated by breaking a firm down into individual businesses, and estimating the betas of these businesses.

– Cost of debt (k_d): The cost of debt measures the current cost to the firm of borrowing funds to finance projects. In general terms, it is determined by three variables: the current level of interest rates, the default risk of the company and the tax advantage associated with debt.

– Market values of equity and debt: The market value of equity is generally the number of shares outstanding times the current stock price. The market value of debt is usually more difficult to obtain directly, since very few firms have all their debt in the form of bonds outstanding traded in the market. A simple way to convert book value debt into market value debt is to treat the entire debt on the books as one coupon bond, with a coupon set equal to the interest expenses on all the debt and the maturity set equal to the face-value weighted average maturity of the debt, and then to value this coupon bond at the current cost of debt for the company.

– Cost of capital: As shown in Table 3, the cost of capital is defined as the weighted average of capital cost (WACC), including the cost of equity and the cost of debt.

Table 3 | Estimation of discount rate

Cost of equity	k_e = Risk-free rate + β x Risk premium (CAPM)
Cost of debt	k_d = Risk-free debt + Default spread for country + Default spread for firm
Cost of capital	WACC = k_e (E/(D+E)) + K_d (D/(D+E)) where E, D = market value of equity and debt

2.3.3. Growth rate

As the value of a firm is the present value of expected future cash flows generated by the firm, the most critical input in valuation is, therefore, the growth rate to use to forecast future earnings and revenues. There are at least two ways of estimating growth for any firm. One is to look at the growth in a firm's past earnings – its historical growth rate. The second is to consider fundamentals and to estimate a growth rate based upon a firm's investment policy.

– Historical growth: The average growth rate can vary depending on whether it is an arithmetic average or a geometric average. The arithmetic average is the simple average of past growth rates, while the geometric mean takes into account the compounding that occurs from period to period. The two estimates can be very different, especially for firms with volatile earnings. Damodaran (2002) argued that the geometric average is a much more accurate measure of true growth in past earnings, especially when year-to--year growth has been erratic.

– Fundamental growth: With historical estimates, growth is an exogenous variable that affects value but is divorced from the operating details of the firm. The soundest way of incorporating growth into value is to make it endogenous, i.e., to make it a function of how much a firm reinvests for future growth and the quality of its reinvestment. As shown in Table 4, when estimating fundamental growth in the DDM, FCFE and FCFF, expected growth in earnings per share (EPS), net income and earnings before income and tax (EBIT) should be estimated respectively.

2.3.4. Growth pattern

The final choice that all discounted cash flow models have to make relates to expected growth pattern. According to Damodaran (2002), the growth patterns could be broadly classified into three categories, i.e. firms which are in stable growth already, firms which expect to maintain a constant high growth rate for a period and then drop abruptly to stable growth (two-stage growth model), and firms which will have high growth for a specified period and then grow through a transition phase to reach stable growth at a point in time in the future (three-stage growth model).

3. Research design

3.1. Fundamentals of Kentington Resort

We selected Nan Ren Lake Tourism Amusement Co., Ltd. (known as Kentington Resort), which is traded on Taiwan OTC Exchange from June 2003, as the case study organization. Financial data were collected and analyzed and the data period of the model is from 1999 to 2004, and the prediction period is from January to May of 2005. The three valuation models that this research would adopt are DDM, FCFE and FCFF discount models. By comparing the theoretical share value and actual stock value in the first season of 2005, we tried to compare the difference between the intrinsic value and market prices of Kentington Resort. Two steps were taken to test the validity of selected model. In the first step, intrinsic values are estimated using these models. After having determined the intrinsic values of the stocks in the sample, we must in the second step judge the quality of these estimates by conducting sensitivity analyses. The various relevant input factors are obtained from the website of Taiwan OTC Exchange. Table 5 summarized these fundamentals.

Table 4 | Estimation of growth rate

Historical Growth Geometric Average	$\text{Historical Growth}_{\text{Geometric}} = \left[\dfrac{\text{Earnings}_0}{\text{Earnings}_{-n}}\right]^{(1/n)} - 1$, where: Earnings_n = Earnings in year n
Fundamental Growth EPS (DDM)	$\text{Growth}_{\text{EPS}}$ = Retention ratio x Return on equity (ROE), where: Retention ratio = 1-(Dividends per share (DPS) / Earnings per share (EPS)) ROE = Net income / Book value of equity
Fundamental Growth Net Income (FCFE)	$\text{Growth}_{\text{Net Income}}$ = Equity reinvestment rate x Return on equity (ROE), where: $\text{Equity reinvestment rate} = \dfrac{\text{Capital expenditure} - \text{Depreciation} + \Delta\,\text{Working capital}}{\text{Net Income}}$
Fundamental Growth EBIT (FCFF)	$\text{Growth}_{\text{EBIT}}$ = Reinvestment rate x Return on capital (ROC), where: $\text{Capital reinvestment rate} = \dfrac{\text{Capital expenditure} - \text{Depreciation} + \Delta\,\text{Working capital}}{\text{EBIT (1 - tax rate)}}$ ROC = EBIT (1 - tax rate)/(Book value of debt + Book value of equity)

Table 5 | Fundamentals of Kentington Resort

(Million NT$)	2000	2001	2002	2003	2004	Normalized
Book value of equity	545.95	808.25	984.67	1 110.38	1 332.05	956.26
Book value of debt	972.08	801.59	730.84	759.16	816.89	816.11
Net income	89.38	146.85	177.90	127.50	203.08	148.94
EBIT (1 - tax rate)	81.79	122.50	136.11	108.08	176.69	125.03
Capital expenditure	80.64	81.74	70.79	38.45	64.22	67.17
Depreciation	45.04	46.03	47.12	45.64	43.39	45.44
Δ Working capital	-40.90	54.81	-0.34	10.35	-81.65	-11.55
DPS (NT$)	1.80	2.10	2.00	1.24	1.65	1.76
EPS (NT$)	2.02	2.45	2.45	1.46	2.13	2.10
Debt ratio	64,04%	49,79%	42,60%	40,61%	38,01%	47,01%
Retention ratio	10,89%	14,29%	18,37%	15,07%	22,54%	16,37%
ROE	16,37%	18,17%	18,07%	11,48%	15,25%	15,58%
ROC	5,39%	7,61%	7,93%	5,78%	8,22%	7,05%
Equity reinvestment rate	-5,93%	61,64%	13,11%	2,48%	-29,95%	6,83%
Capital reinvestment rate	-6,48%	73,90%	17,14%	2,92%	-34,42%	8,14%

3.2. Inputs estimation

3.2.1. Cash flows

We began by estimating a normalized FCFE and FCFF for the current year. In order to smooth out the year-to-year jumps, the average net income, EBIT, capital expenditure, depreciation and change in non-cash working capital between 2000 and 2004 were used. The normalized FCFE and FCFF were TW$ 138.46 million and TW$ 114.86 million respectively. A normalized dividends per share (DPS), as TW$ 1.76, was also estimated for the calculation of DDM.

3.2.2. Discount rate

The estimation of the discount rate was based on historical data and CAPM. First, since stock returns in Taiwan are volatile and shorter time periods can provide premiums with large standard errors, we used the yield of 10-year government bond as the riskless rate. From 1972 to 2004, we obtained a risk free rate of 5,45% as an average. Second, by the regression approach, we took month-to-month stock price percentage change data from June 2003 to December 2004 for Kentington Resort and the TAIEX index to calculate the beta of Kentington, which is 0.46. For the estimation of expected market return, since arithmetic average overstates the returns over long periods, we used the geometric average which takes into account compounding, and that it is a better predictor of the average premium in the long term. Calculating the realized stock returns from 1972 to 2004, we got an average market returns as 10,84%. Then the historical premium could be estimated as 5,39% and the cost of equity was 7,93%. As to the cost of debt, we first estimated a synthetic rating for Kentington. Based on its average interest coverage ratio of 7.42 for the latest five years, we arrived at an A+ rating and the default rate was 1%. By adopting the equation shown in Table 3, the after-tax cost of debt could be calculated as 8,88%. Finally, having estimated the costs of equity and debt, and the market value debt ratio in Table 5, we then put them together to arrive at a cost of capital for Kentington, which is 8,29%.

3.2.3. Growth rate

In order to avoid applying the growth rates to an extraordinary base year, the expected growth rate are based on the latest five years. Both historical and fundamental growths were estimated. For the historical growth, we calculated the geometric average as it is more accurate than arithmetic average while measuring the true growth in past earnings. As to the fundamental growth, the growth rates estimated should be consistent with the definition of cash flows. When forecasting cash flows to equity, we forecasted growth in EPS and net income that are measures of equity earnings. While forecasting cash flows to the firm, the growth rate that matters was the growth rate in EBIT. According to the equations shown in Table 4, we calculated the historical geometric growth rate, fundamental growth rate for EPS, net income and EBIT respectively as 1,33%, 2,57%, 1,66% and 0,79%.

3.2.4. Growth patterns

There is one rule of thumb that works well in setting a cap on the stable growth rate. The stable growth rate should generally not exceed the growth rate of the economy in which the firm operates and the risk free rate used in a valuation (Damodaran, 2002). The GNP growth rate of Taiwan through the last five years was 2,70% in average and the risk free rate adopted in this study was 5,45%. Both of them are higher than the estimated historical or fundamental growth rates. This becomes, therefore, the rationale for using the stable growth model. The valuation equations under stable growth scenario are shown in Table 6.

4. Results

4.1. Research findings

The number of shares of Kentington Resort is 95.34 million. Based on the valuation equations and input estimations illustrated above, the model prices of Kentington Resort are demonstrated in Table 7. We found that the model prices, with highest at TW$ 33.51 and lowest at TW$ 15.70 per share, vary widely depending upon whether we use different models or different assumptions of growth rates. The market prices of Kentington Resort, shown in Table 7, were highly volatile during the past five months as well, with highest at TW$ 23.0 and lowest at TW$ 16.1 per share. The estimations yielded by FCFE model, with TW$ 22.35 and TW$ 21.43, lie in between the highest market price (TW$ 23.00) and the average market price (TW$ 21.36). The estimations of FCFF model, with TW$ 17.54 and TW$ 15.70, are close to the lowest market price TW$ 16.10. The estimations of DDM differ greatly from current market prices which are TW$ 3.99 (by historical growth rate) and TW$ 10.51 (by fundamental growth rate) higher than the highest market price. Finally, it also seems that the estimations of fundamental growth set are generally higher than which of the historical growth set. From these rough figures, we cannot conclude the method with the model price closest to market price be the most suitable model for valuation. The applauding valuation model should be the one with relatively sound assumptions behind it. The DDM yielded a higher value than FCFE model. This may seem surprising since the average FCFE (TW$ 138.76 million) are higher than the dividends (TW$ 126.34 million). However, this effect is offset by the decline in growth rate, which is generated by the equity reinvestment rate (6,83%) being lower than

Table 6 | Valuation at stable growth rate

DDM	Value of equity = $\frac{DPS_1}{(k_e - g_n)}$	where DPS_1 = expected dividens next year k_e = cost of equity g_n = growth rate in dividends forever
FCFE model	Value of equity = $\frac{FCFE_1}{(k_e - g_n)}$	where $FCFE_1$ = expected FCFE next year k_e = cost of equity g_n = growth rate in FCFE forever
FCFF model	Value of firm = $\frac{FCFF_1}{(WACC - g_n)}$	where $FCFF_1$ = expected FCFF next year WACC = weighted average cost of capital g_n = growth rate in FCFF forever

Table 7 | Model and market prices of Kentington (TW$/per share)

Model prices	Market prices
1. Adopting historical growth rates (g=1,33%) – DDM: TW$26.99 – FCFE model: TW$22.35 – FCFF model: TW$17.54 2. Adopting fundamental growth rates – DDM: TW$33.51 (g=2,57%) – FCFE model: TW$21.43 (g=1,66%) – FCFF model: TW$15.70 (g=0,79%) where g is expected growth rate	(from 01 Jan to 10 Jun 2005) – Highest price: 23.00 – Lowest price: 16.10 – Average price: 21.36

the retention ratio (16,37%). The FCFE valuation is probably more realistic than the DDM because it keeps investments in cash separate from investments in operating assets. The DDM overstates the expected growth rate since it does not consider the fact that the low return earned by cash investments will bring the ROE down over time. We can, therefore, conclude that FCFE and FCFF models are more suitable for valuing Kentington Resort, and the market prices basically reflected the intrinsic value of Kentington.

4.2. Sensitivity analyses

Even though the DCF valuation model is the theoretically correct method for valuing stocks, there are some constraints while applying in practice because the input factors are difficult to forecast and very sensitive. From the discussion above, we may have found that small changes in certain inputs lead to great differences in the ultimate estimates. Consequently, any DCF valuation model needs a test of the quality of numerous input factors that go into the model. There are at least two possible sources of errors that exist in the model: model uncertainty and input uncertainty (Proidevaux, 2004). In this section, we try to reduce the uncertainty by using the spreadsheet modeling technique. In the DCF valuation model, two input factors are highly sensitive and therefore, important: growth rate and discount rate. Our approach is to test the model using different input specifications in the same valuation model. The performances of the different input specifications will then help to examine the stability of the valuation methodology. Four scenarios under different assumptions of inputs and models are summarized in Table 8. The calculations show that both expected growth rate and discount rate have a dramatic effect on the estimated intrinsic values. Take the sensitivity analysis of growth rate in the FCFE model as an example, the dynamic model shows that, by increasing or decreasing the growth rate by 2% in either direction, the model price changes to TW$ 30.8 and TW$ 16.02 respectively.

Table 8 | Sensitivity analysis of FCFE and FCFF models

Change %	Growth rate			Discount rate		
	Rate	Value (TW$)	Change %	Rate	Value (TW$)	Change %
FCFE model						
+ 2%	3,06%	30.80	+ 44%	9,93%	16.58	– 23%
+ 1%	2,06%	25.31	+ 18%	8,93%	18.69	– 13%
Current	1,06%	21.43	—	7,93%	21.43	—
– 1%	0,06%	18.50	– 14%	6,93%	25.06	+ 17%
– 2%	-1,06%	16.02	– 25%	5,93%	30.20	+ 41%
FCFF model						
+ 2%	3,06%	21.60	+ 38%	9,93%	12.47	– 21%
+ 1%	2,06%	18.21	+ 16%	8,93%	13.89	– 11%
Current	1,06%	15.70	—	7,93%	15.70	—
– 1%	0,06%	13.76	– 12%	6,93%	18.03	+ 15%
– 2%	-1,06%	12.22	– 22%	5,93%	21.18	+ 35%

5. Conclusion

Firstly, valuation requires an estimate of the present value of all expected future cash flows to shareholders. As the inputs into a valuation are estimates, the value that emerges is an estimate as well. Historical data is everything available to forecast the future so the result of valuation might have estimation error. The noise in valuation is not a reflection of the quality of the valuation model, or the analyst using it, but of the underlying real uncertainty about the future prospects of the firm. Even if a valuation is imprecise, it provides a powerful tool to answer the question of what has to occur for the current market price of a firm to be justified. Investors should adequately consider the uniqueness of current situation and then decide whether they are comfortable with these assumptions and make their investment decisions (Damodaran, 2001).

Secondly, the differences in methods and views about future prospects of a company make value individualistic. Better models and estimation techniques may reduce the degree of inaccuracy, but no valuation technique can be expected to deliver a single correct intrinsic value measure. One way to present this noise is providing a range of estimated values. The research findings show that even a small change in one variable may lead to a complete different outcome. As such, when the intrinsic value obtained from the model is significantly different from the market price, we suggest to assume first that the market is correct and to look for arguments that support this view. Only if the inputs are reasonable and the difference between actual and theoretical price is still significant should the stock be judged as under- or overvalued.

Thirdly, as the limitations shown above, we can conclude that the model is only as good as the inputs that go into it. The analysts should struggle to increase the degree of detail in DCF valuation models. Given the large input uncertainty, the benefits of small improvements in details might be rather small. On the other hand, there is a lot of uncertainty and the data should really encourage researchers to reduce this uncertainty as much as possible and, therefore, increase detail. When increasing details in future research, it is suggested to think about the accuracy of input variables, especially the estimation of discount rate. The CAPM used in this research is still too simplistic and captures only poorly the actual market process of translating risk into a return requirement. Future research should consider investment risk more broadly.

Fourthly, DCF valuation models are based on discounted future cash flows. Given these informational requirements, this approach is best used for firms whose cash flows are currently positive and can be estimated with some reliability for future periods. The further we move away from this idealized setting, the more difficult and risky DCF valuation becomes. Finally, we hope that the developed corporate valuation model can provide references and suggestions for corporate managers and investors for decision making and investment.

References

Copeland, T., Koller, T., Murin, J., 2000, *Valuation: Measuring and Managing the Value of Companies*, 3rd edition, John Wiley & Sons, Inc., New York.

Damadoran, A., 2004, *Applied Corporate Finance: A User's Manual*, 2nd Edition, John Wiley & Sons, Inc., New York.

Damadoran, A., 2001, *The Dark Side of Valuation*, Financial Times Prentice Hall, Upper Saddle River, NJ.

Damodaran, A., 2002, *Investment Valuation: Tools and Techniques for Determining the Value of Any Asset*, 2nd Edition, John Wiley & Sons, Inc., New York.

Proidevaux, P., 2004, *Fundamental Equity Valuation: Stock Selection Based on Discounted Cash Flow*, unpublished PhD thesis, University of Fribourg, Fribourg, Switzerland.

[**Submitted** 15 June 2005; **accepted** 26 July 2006]