Equity Securities

TOPIC 7: DIVIDEND DISCOUNT VALUATION

(LECTURE EXAMPLES & SOLUTIONS ONLY)

LA TROBE UNIVERSITY

Outcome 7.2

Holding period return

- For the next 5 years the annual dividends of a stock are estimated to be \$2.00, \$2.10, \$2.20, \$3.50 and \$3.75. The stock price is expected to be \$40.00 in 5 years. The cost of equity is estimated to be 10%.
- **Calculate the value of the stock**

$$V_0 = \frac{D_1}{(1+r)} + \frac{D_2}{(1+r)^2} + \frac{D_3}{(1+r)^3} + \frac{D_4}{(1+r)^4} + \frac{D_5}{(1+r)^5} + \frac{P_5}{(1+r)^5}$$
$$= \frac{2.00}{1.1} + \frac{2.10}{1.1^2} + \frac{2.20}{1.1^3} + \frac{3.50}{1.1^4} + \frac{3.75}{1.1^5} + \frac{40.00}{1.1^5}$$
$$= \$34.76$$

Outcome 7.2

Holding period return

To	Press	Display	
Open cash flow worksheet	CF		
Enter first cash flow	0 ENTER	CFo=	0.00
Enter second cash flow	↓2 ENTER	C01=	2.00
	↓	F01=	1.00
Enter remaining cash flows	↓2.1 ENTER ↓		
	↓2.3 ENTER ↓		
	↓3.5 ENTER ↓		
	↓43.75 ENTER ↓		
Enter discount rate	NPV 10 ENTER	I=	10.00
Compute PV	↓ CPT	NPV=	34.84

Outcome 7.2

Holding period return

To	Press	Display	
Correct third cash flow	CF ↓↓↓↓↓2.2 ENTER	C03=	2.20
Recalculate NPV	NPV ↓ CPT	NPV=	34.76
Clear cash flow worksheet	CF 2nd [CLR WORK]	CF0=	0.00
Clear discount rate	NPV 2nd [CLR WORK]		

Outcome 7.2

Gordon Growth Model

- An annual dividend has just been paid equal to \$5. The expected long-term growth rate is 5% and the cost of equity is 8%.
- **Calculate the value of the stock using the GGM**

$$V_0 = \frac{D_0(1+g)}{r-g} = \frac{5(1+0.05)}{0.08-0.05} = \$175$$

Outcome 7.2

Gordon Growth Model

- The required rate of return on J.C. Penney (JCP) is estimated to be 8.8% using a CAPM model. On examination you consider that a long-term growth rate of 6% is achievable by JCP. JCP's current dividend is \$0.50.
- **Calculate the value of the JCP using the GGM and state whether you think it is undervalued or overvalued if the market price is \$25.**

$$V_0 = \frac{D_0(1+g)}{r-g} = \frac{0.50(1+0.06)}{0.088-0.06} = \$18.93$$

- As \$18.93 is less than \$25, the GGM indicates that JCP is overvalued

Outcome 7.2

Gordon Growth Model

- You wish to estimate a value for Connecticut Water Service (CTWS)
  - The company has an ROE of approximately 12.2% p.a.
  - Actual FY2001 and estimated FY2002 EPS are $1.27 and $1.33 respectively
  - The current dividend is $0.81 and estimated FY2002 dividend is $0.83
  - You forecast the payout ratio to average 70% in future
  - You anticipate a 3.7% long-term dividend growth rate, and a GDP growth rate of 4.0%
  - Its current market price is $30.00.
- **Calculate the value of CTWS using the GGM, based on an estimated cost of equity of 6.2%**
- **Justify your selection of the GGM for valuing CTWS.**

Outcome 7.2

Gordon Growth Model

- The intrinsic value based on the GGM is:

$$V_0 = \frac{D_1}{r-g} = \frac{0.83}{0.062-0.037} = \$33.20$$

- CTWS appears to be slightly undervalued as its estimated intrinsic value at $33.20 is greater than its current market price of $30.00
- The GGM is an appropriate valuation model for CTWS
  - Its ROE is stable, being based on stable demand for water and regulated prices
  - Its payout ratio is stable, indicating a stable relationship between earnings and dividends
  - Forecast earnings growth is plausible and less than the required rate of return

Outcome 7.2

Gordon Growth Model

- **CTWS's beta is -0.16. Calculate the CAPM estimate of its cost of equity, assuming an equity risk premium of 5.7% and a risk-free rate of 5.7%.**

$$\begin{aligned} E(R_i) &= R_F + \beta_i\left[E(R_M) - R_F\right] \\ &= 0.057 + (-0.16)(0.057) \\ &= 0.0479 = 4.79\% \end{aligned}$$

Outcome 7.2

Gordon Growth Model

- **Recalculate the value of CTWS based on the CAPM estimate of its cost of equity.**
- **Comment on the plausibility of your valuation assuming a P/E of 24 x FY2002 EPS is reasonable.**
- The intrinsic value using a cost of equity of 4.8% is: $V_0 = \frac{D_1}{r-g} = \frac{0.83}{0.048-0.037} = \$75.45$
- The implicit P/E ratio based on a price of $75.45 is: $P/E = \frac{P_t}{EPS_{t+1}} = \frac{75.45}{1.33} = 56.7$
- This appears to be high compared to an industry average of 24x, which reduces confidence in the previous valuation

Outcome 7.2

Gordon Growth Model

- **Recalculate the value of CTWS based on a cost of equity ranging through 5.95%, 6.20% and 6.45%, and a long-term growth estimate ranging through 3.45%, 3.70% and 3.95%.**
- **Assess the sensitivity of the valuation to changes in inputs.**

Outcome 7.2

Gordon Growth Model

	g = 3.45%	g = 3.70%	g = 3.95%
r = **5.95%**	$33.20	$36.89	$41.50
r = **6.20%**	$30.18	**$33.20**	$36.89
r = **6.45%**	$27.67	$30.18	$33.20

- Note that when the r – g spread is widest, the GGM valuation is smallest, and when the r – g spread is narrowest the GGM valuation is largest
- Only one estimate is less than the market price
- Our best estimate remains $33.20, based on the original assumptions, but it is sensitive to even small changes in inputs

Outcome 7.7

Two-stage DDM

- General Mills (GIS) is a large manufacturer and distributor of packaged consumer products. A buy-side analyst has studied GIS's growth prospects and estimates the current dividend of $1.10 will grow at 11% p.a. for the next 5 years and thereafter at 8% p.a.
- The analyst feels that his beta estimate for GIS is unreliable, so he is using the bond yield plus risk premium to estimate the required return. They YTM of GIS's long-term bond is 6.7% and he estimates a risk premium of 4%.
- **Calculate GIS's value based on a two-stage DDM.**

Outcome 7.7

Two-stage DDM

- The present value of the first cash flow is given by:

$$\frac{D_0(1+g_S)}{(1+r)} = \frac{1.10(1+0.11)}{1+0.107} = \$1.103$$

- The present value of the second cash flow is given by:

$$\frac{D_0(1+g_S)^2}{(1+r)^2} = \frac{1.10(1+0.11)^2}{(1+0.107)^2} = \$1.106$$

- This is then done for each of the first 5 years

Outcome 7.7

Two-stage DDM

- The terminal value (the value of the share at time n = 5) is given by:

$$\frac{D_0(1+g_S)^n(1+g_L)}{r-g_L} = \frac{1.10(1+0.11)^5(1+0.08)}{0.107-0.08} = \$74.143$$

- The present value of the terminal cash flow (i.e. at time 0) is given by:

$$\frac{D_0(1+g_S)^n(1+g_L)}{(1+r)^n(r-g_L)} = \frac{74.143}{(1+0.107)^5} = \$44.599$$

Outcome 7.7

Two-stage DDM

	A	B	C	I	J
1					
2		**Example 3.3.1**			
3		**Two-stage model**		v1.0: 15-3-07	
4					
5		**Inputs**			
6		Current dividend	$1.10		
7		Stage one growth rate	11%		
8		Stage two growth rate	8%		
9		Cost of equity	10.70%		
14					
15					
16		**Calculations**	**Column C Formulas**		
17		Period 1 cash flow	1.103	=(C$6*(1+C$7)^1)/(1+C$9)^1	
18		PV of period 2 cash flow	1.106	=(C$6*(1+C$7)^2)/(1+C$9)^2	
19		PV of period 3 cash flow	1.109	=(C$6*(1+C$7)^3)/(1+C$9)^3	
20		PV of period 4 cash flow	1.112	=(C$6*(1+C$7)^4)/(1+C$9)^4	
21		PV of period 5 cash flow	1.115	=(C$6*(1+C$7)^5)/(1+C$9)^5	
22		PV of terminal value	44.599	=(C6*(1+C7)^5*(1+C8)/(C9-C8))/(1+C$9)^5	
26					
27					
28		**Results**			
29		Present value of cash flows	$50.14	=SUM(C17:C22)	
38					
39					

Outcome 7.7

Two-stage DDM

To	Press	Display
Store cash flows	1.1 × 1.11 = STO 1	1.22
	× 1.11 = STO 2	1.36
	× 1.11 = STO 3	1.50
	× 1.11 = STO 4	1.67
	× 1.11 = STO 5	1.85
Enter discount rate	10.7 I/Y	I/Y= 10.70
Calculate present value of first cash flow	RCL 1 +/– FV	FV= -1.22
	1 N CPT PV STO 1	1.10

Outcome 7.7

Two-stage DDM

To	Press	Display
Calculate present value of second cash flow	RCL 2 +/– FV	FV= -1.36
	2 N CPT PV STO + 1	1.11
Repeat for remaining stage one cash flows		
Calculate present value of terminal value	1.1 × (1.11 y^x 5 = × 1.08 = ÷ (.107 – .08 = ÷ (1.107 y^x 5 =	44.60
Add values of first and second stage	+ RCL 1 =	50.15

Outcome 7.7

Two-stage DDM

- A technology company is currently paying no dividends and will not pay a dividend until 5 years from now, when it expects to pay $1.00 in dividends
- It forecasts dividends to grow at a rate of 5% thereafter
- You estimate the company's required rate of return at 11%

- **Calculate the company's value based on a two-stage DDM.**

$$V_0 = \frac{D_{n+1}}{r-g} \times \frac{1}{(1+r)^n} = \frac{1.00}{0.11-0.05} \times \frac{1}{(1+0.11)^4} = \$10.98$$

Outcome 7.7

H-model DDM

- You are valuing Siemens AG (SIE) using a H-model DDM.
- The current dividend is $1.00 and its estimated growth rate is 29.98% p.a., declining linearly over a 16-year period to a final and perpetual growth rate of 7.26% p.a.
- The risk-free rate of 5.34% and the market risk premium is 5.32% and SIE's beta, estimated against the Dax, is 1.37.

- **Calculate SIE's value based on the H-model DDM.**

- The required rate of return is as follows:

$$E(R_i) = R_F + \beta_i \left[E(R_M) - R_F \right]$$
$$= 0.0534 + (1.37)(0.0532) = 0.1263 = 12.63\%$$

Outcome 7.7

H-model DDM

- You are valuing Siemens AG (SIE) using a H-model DDM.
- The current dividend is $1.00 and its estimated growth rate is 29.98% p.a., declining linearly over a 16-year period to a final and perpetual growth rate of 7.26% p.a.
- The risk-free rate of 5.34% and the market risk premium is 5.32% and SIE's beta, estimated against the Dax, is 1.37.

- The value of the firm based on the H-model is given by:

$$V_0 = \frac{D_0(1+g_L)}{r-g_L} + \frac{D_0 H(g_S - g_L)}{r-g_L}$$
$$= \frac{1.00(1+0.0726)}{0.1263-0.0726} + \frac{1.00(8)(0.2928-0.0726)}{0.1263-0.0726} = \$52.77$$

Outcome 7.7

Three-stage DDM

- IBM currently pays a dividend of $0.55 p.a.
- We estimate the current required rate of return is 12%
- Assume that dividends will grow at 7.5% p.a. for the next two years, 13.5% p.a. for the following four years and 11.25% thereafter into perpetuity

- **Calculate IBM's value based on the three-stage DDM.**

Outcome 7.7

Three-stage DDM

$$V_0 = \sum_{t=1}^{n} \frac{D_0(1+g_1)^t}{(1+r)^t} + \sum_{t=1}^{m} \frac{D_0(1+g_1)^n(1+g_2)^t}{(1+r)^{n+t}}$$
$$+ \frac{D_0(1+g_1)^n(1+g_2)^m(1+g_3)}{(1+r)^{n+m}(r-g_3)}$$
$$= \frac{0.55(1.075)}{1.12} + \frac{0.55(1.075)^2}{1.12^2} + \frac{0.55(1.075)^2(1.135)}{1.12^3}$$
$$+ \frac{0.55(1.075)^2(1.135)^2}{1.12^4} + \frac{0.55(1.075)^2(1.135)^3}{1.12^5}$$
$$+ \frac{0.55(1.075)^2(1.135)^4}{1.12^6} + \frac{0.55(1.075)^2(1.135)^4(1.1125)}{1.12^6(0.12-0.1125)}$$
$$= \$82.40$$

Outcome 7.7

Three-stage DDM

- You are valuing HRL using a three-stage DDM model, with a linearly declining dividend growth rate in the second state
- The current DPS is $0.39
- The required rate of return on HRL is estimated to be 8.72%
- Stage one dividend growth is estimated to be 11.3% p.a. for five years
- Stage two dividend growth will decline linearly over ten years, starting at the stage one rate and ending at the stage three rate
- The equilibrium long-term dividend growth rate is estimated to be 5.7% p.a.

- **Calculate HRL's value based on the three-stage DDM.**

Outcome 7.7

Three-stage DDM

$$V_0 = \sum_{t=1}^{n} \frac{D_0(1+g_1)^t}{(1+r)^t} + \left\{ \frac{1}{(1+r)^n} \left[\frac{D_n(1+g_L)}{r-g_L} + \frac{D_n H(g_S - g_L)}{r-g_L} \right] \right\}$$

$$= \frac{0.39(1.113)}{1.0872} + \frac{0.39(1.113)^2}{1.0872^2} + \frac{0.39(1.113)^3}{1.0872^3}$$

$$+ \frac{0.39(1.113)^4}{1.0872^4} + \frac{0.39(1.113)^5}{1.0872^5} + \frac{1}{1.0872^5} \times$$

$$\left[\frac{0.39(1.113)^5(1.057)}{0.0872 - 0.057} + \frac{0.39(1.113)^5(5)(0.113 - 0.057)}{0.0872 - 0.057} \right]$$

$$= \$21.51$$

Outcome 7.6

Terminal value

- In the past year DuPont (DD) paid a $1.40 dividend that analysts expect to grow at 9.3% p.a. for next 4 years
- At the end of year 4, analysts expect the payout ratio to be 40% and the trailing P/E for DD to be 11x
- The estimated required rate of return on DD is 11.5%
- **Calculate DD's value based on a two-stage DDM, using a P/E multiple to calculate the terminal value in stage 2**

Outcome 7.6

Terminal value

$$D_4 = 1.40(1.093)^4 = \$2.00$$

$$EPS_4 = \frac{D_4}{\text{Payout ratio}} = \frac{2.00}{0.4} = \$5.00$$

$$P_4 = \text{P/E} \times EPS_4 = 11 \times 5 = \$55.00$$

$$V_0 = \sum_{t=1}^{n} \frac{D_0(1+g_1)^t}{(1+r)^t} + \frac{P_n}{(1+r)^n}$$

$$= \frac{1.40(1.093)}{1.115} + \frac{1.40(1.093)^2}{1.115^2} + \frac{1.40(1.093)^3}{1.115^3}$$

$$+ \frac{1.40(1.093)^4}{1.115^4} + \frac{55.00}{1.115^4}$$

$$= \$40.91$$

Outcome 7.7

Multi-stage DDM

- Dell Computers (DELL) is expected to grow its EPS at 25% p.a. for the next 10 years, but will reinvest all of these earnings and not pay a dividend
- After ten years you estimate Dell's ratios will revert to industry averages; i.e. a margin of 4.5%, turnover of 1.5x, and leverage of 2.0x
- You also believe that as a mature company it will need to offer a dividend pay-out ratio of 15%
- DELL's trailing EPS is $0.76 and its beta is 1.45. The risk-free rate is 5.0% and the equity risk premium is 5.7%
- **Calculate a value for DELL based on an appropriate DDM valuation model**

Outcome 7.7

Multi-stage DDM

- Long-term sustainable growth rate

  $g_{j,t} = \text{Retention Rate}_{j,t} \times \text{Profitability}_{j,t} \times \text{Efficiency}_{j,t} \times \text{Leverage}_{j,t}$

  $= 0.85 \times 0.045 \times 1.50 \times 2.00 = 11.48\%$
- Required rate of return

  $E(R_i) = R_F + \beta_i \left[E(R_M) - R_F \right] = 0.05 + (1.45)(0.057) = 13.3\%$
- Forecast year 11 dividend

  $D_{11} = \$0.76 \times (1+0.25)^{10} \times (1+0.1148) \times 0.15 = \$1.18$
- Value of Dell

  $$V_0 = \frac{1.18}{0.133 - 0.1148} \times \frac{1}{(1+0.133)^{10}} = \$18.60$$