

Equity Valuation¹ In-Class Problem²

The subject firm in this problem set is Leshkal Industries, Inc., a fictional firm for which hypothetical values have been presented. The Income Statement, Balance Sheet, and Other Financial Information used herein are also used in other In-Class Problems in support of building a body of Corporate Finance In-Class Problems.

As an individual investor you've become interested in Leshkal Industries³, a leader in energy storage and renewable energy integration, and are considering making a meaningful investment in the firm. As the firm is privately held and has no established market value you need to decide how much to offer the firm's current owners for a stake in the firm. You've studied the firm, its financial statements, and have reviewed a revenue and expense forecast provided by an independent consulting firm. You anticipate that this, together with your superior understanding of business finance and valuation modeling, will lead you to assign a value to the firm as an operating asset.

Additional Financial Information						
Stock Value ¹	2009	2010	2011	2012	2013	2014
Shares Outstanding (thousands)	500	500	500	500	500	550
12/31 Price per Share	1.00	1.8	7.48	12.6	13.51	15.84
P/E Multiple	NA	60.0	34.0	28.0	22.0	24.0
EPS	--	0.03	0.22	0.45	0.614	0.66
Market Cap (\$ thousands)		900	3740	6300	6755	8712
Dividends Paid	0.00	0.00	0.05	0.15	0.191	0.218
Book Value / Liabilities	NA	NA	NA	NA	562	476

¹ Firm incorporated in 2009 with 500,000 shares each issued at \$1.00 per share

In your research you've noted the value the firm assigned its shares as of the end of each year and have been informed that the firm expects to keep dividends constant for the next 5 years and then expects to allow them to increase to 10% each year for the following 5 years and finally to stabilize them at the then current percentage of net earnings from that point forward, based on the expectation that the firm's net earnings will grow from that point at 3% annually. The firm is forecasting net income growth of 10% per year for the next 10 years after which net income expectations are in line with dividend growth expectations for years 11+. You've chosen to consider all of these metrics for your valuation calculations, though you wonder whether these are in fact the same metrics the firm used to assign its own year-end share value.

¹ This problem and solution set is intended to present an abbreviated discussion of the included finance concepts and is not intended to be a full or complete representation of them or the underlying foundations from which they are built.

² This problem set was developed by Richard Haskell, PhD (rhaskell@westminstercollege.edu), Gore School of Business, Westminster College, Salt Lake City, Utah (2015).

³ Leshkal Industries, Inc. is a purely fictionalized firm. Any similarity to an actual firm is simply coincidental and unintended. The values presented are likewise completely hypothetical and are not intended to represent values for any actual firm or operation.

1. If your discount rate is equal to 6%, what value might you place on the firm's shares using a DCF/DG model given the information above?

$$P_0 = \text{DCF}_{1-5} + \text{DCF}_{6-10} + \text{PV}_{\text{CV}}$$

$$\text{DCF}_{1-5} = \sum \frac{CF_t}{(1+r)^t} = \frac{.218}{(1.06)^1} + \frac{.218}{(1.06)^2} + \frac{.218}{(1.06)^3} + \frac{.218}{(1.06)^4} + \frac{.218}{(1.06)^5} = 0.9183$$

$$\text{DCF}_{6-10} = \sum \frac{CF_t}{(1+r)^t} = \frac{.218(1.10^1)}{(1.06)^6} + \frac{.218(1.10^2)}{(1.06)^7} + \frac{.218(1.10^3)}{(1.06)^8} + \frac{.218(1.10^4)}{(1.06)^9} + \frac{.218(1.10^5)}{(1.06)^{10}} = 0.9115$$

$$\text{CV} = \frac{D_{11}}{r-g} = \frac{.218(1.10^5)(1.03)}{.06-.03} = 12.054$$

$$\text{PV}_{\text{CV}} = \frac{\text{CV}}{(1+r)^{10}} = \frac{12.05}{1.06^{10}} = 6.7309$$

$$P_0 = \text{DCF}_{1-5} + \text{DCF}_{6-10} + \text{PV}_{\text{CV}} = 0.9183 + 0.9115 + 6.7309 = 8.5608$$

2. How does the value you calculated in (1) compare to the value the firm assigned to their stock at the end of 2014, and how might you explain any possible differences in value?

The value assigned by the firm at the end of 2014 is \$15.84 per share, substantially higher than the \$8.5608 value we calculated above. This is, in part, the result of using the Dividend Growth formula to value a stock when only part of the stock's TRS (total return to shareholders) is obtained through the receipt of the dividend.

We might reasonably expect the value to be significantly greater were we to use the firm's net income or NOPLAT instead of the dividend.

3. Rather than seeking to assess a value for this firm based on the strength of the dividend alone, calculate a value for the firm based on the firm's EPS using the same model form and the information provided. You'll also use the same r .

$$P_0 = \text{DCF}_{1-10} + \text{PV}_{\text{CV}}$$

$$\begin{aligned} \text{DCF}_{1-10} &= \sum \frac{CF_t}{(1+r)^t} = \frac{.66(1.10^1)}{(1.06)^1} + \frac{.66(1.10^2)}{(1.06)^2} + \frac{.66(1.10^3)}{(1.06)^3} + \frac{.66(1.10^4)}{(1.06)^4} + \frac{.66(1.10^5)}{(1.06)^5} \\ &= \frac{.66(1.10^6)}{(1.06)^6} + \frac{.66(1.10^7)}{(1.06)^7} + \frac{.66(1.10^8)}{(1.06)^8} + \frac{.66(1.10^9)}{(1.06)^9} + \frac{.66(1.10^{10})}{(1.06)^{10}} \\ &= 8.137 \end{aligned}$$

A modified form of the Dividend Growth model for our purposes can be expressed as

$$CV = \frac{EPS_{11}}{r-g} = \frac{.66(1.10^{10})(1.03)}{.06-.03} = 58.74$$

$$PV_{cv} = \frac{CV}{(1+r)^{10}} = \frac{58.74}{1.06^{10}} = 32.8192$$

$$P_0 = DCF_{1-10} + PV_{cv} = 8.137 + 32.8192 = 40.9564$$

4. **How does the value you calculated in (3) compare to the value the firm assigned to their stock at the end of 2014, and how might you explain any possible differences in value?**

The value assigned by the firm at the end of 2014 is \$15.84 per share, substantially lower than the \$40.96 value we calculated above. This is most likely the result of the firm having included a much higher r in their own calculations. A higher r would result in a lower value and be reflective of some level of risk beyond that which we've expected based on our $r = 10\%$.

5. **Given the information noted for 2011 – 2014, calculate the r the firm might have used to assign the year-end share value using the Dividend Growth formula and taking the growth rate in the EPS as g , the respective EPS as the CF_i , and solving for r . Do this to find the r for each year from 2012 – 2014.**

The Dividend Growth formula is $P_0 = \frac{D_1}{r-g}$, we can modify this as $P_0 = \frac{EPS_1}{r-g}$, and to solve for r must rearrange the formula as follows:

$$P_0 = \frac{EPS_1}{r-g}$$

$$(P_0)(r - g) = EPS_1$$

$$r - g = \frac{EPS_1}{P_0}$$

$$r = \frac{EPS_1}{P_0} + g$$

We know each EPS_i and P_0 as the EPS for Price per share for each particular year as follows:

	2011	2012	2013	2014
EPS	0.22	0.45	0.614	0.66
Share Price	7.48	12.6	13.51	15.84

Now let's first calculate the growth rate of EPS for each year from 2012 – 2014:

$$g_{2012} = \frac{EPS_{2012} - EPS_{2011}}{EPS_{2011}} = \frac{.45 - .22}{.22} = 1.0455 = 104.55\%$$

$$g_{2013} = \frac{EPS_{2013} - EPS_{2012}}{EPS_{2012}} = \frac{.614 - .45}{.45} = 0.3644 = 36.44\%$$

$$g_{2014} = \frac{EPS_{2014} - EPS_{2013}}{EPS_{2013}} = \frac{.66 - .614}{.614} = 0.0749 = 7.49\%$$

With these values we can calculate the r for each year 2012 – 2014 as follows using $r = \frac{EPS_1}{P_0} + g$

$$r_{2012} = \frac{0.45}{7.48} + 1.0455 = 1.1056 \text{ or } 110.56\%$$

$$r_{2013} = \frac{0.614}{12.60} + 0.3644 = 0.4132 \text{ or } 41.32\%$$

$$r_{2014} = \frac{0.66}{13.51} + .0749 = 0.1238 \text{ or } 12.38\%$$

6. What patterns do you observe in the firm's r and g in the analysis above and how might these be considered in your assignment of value for the firm?

There appears to be a direct and positive correlation between the firm's r and g . In 2012, when $g_{2012} = 104.55\%$, the derived r was 110.56% and as the firm's g declined to 36.44% in 2013 and 7.49% in 2014, r also declined to 41.32% and 12.38%, respectively. It's also instructive that for each year observed g is less than r , possibly suggesting the firm used an r foretelling something of the firm's future g .

That the firm used such high values for r , much higher than that used in assigning value under either our dividend or EPS based approach, may also tell us that the firm was yet more confident about its prospects for future growth and aware of its possible risks than might be considered by those looking at it from the outside. Were we to use the firm's r_{2014} as the r in our EPS based valuation the firm's valuation would be calculated at \$11.7289 (see calculation below), which is much closer to the \$15.84 value the firm assigned itself.

The spread between this value and that assigned by the firm may be the result of some expected EPS increase not captured by the $g_{1-10} = 10\%$ and $g_{11+} = 5\%$ used in our model. Were we to use a $g_{1-10} = 20\%$ and $g_{11+} = 5\%$ we would assign a value of \$15.67, nearly identical to that assigned by the firm. With this we might conclude the firm's declared forecasting of $g_{1-10} = 10\%$ and $g_{11+} = 3\%$ to be a cautious estimate to avoid the damaging effects of disappointing market expectations.

Valuation using $r = 12.38\%$, $g_{1-10} = 10\%$, and $g_{11+} = 5\%$

$$P_0 = \text{DCF}_{1-10} + \text{PV}_{\text{CV}}$$

$$\begin{aligned}\text{DCF}_{1-10} &= \sum \frac{CF_t}{(1+r)^t} = \frac{.66(1.10^1)}{(1.1238)^1} + \frac{.66(1.10^2)}{(1.1238)^2} + \frac{.66(1.10^3)}{(1.1238)^3} + \frac{.66(1.10^4)}{(1.1238)^4} + \frac{.66(1.10^5)}{(1.1238)^5} \\ &= \frac{.66(1.10^6)}{(1.1238)^6} + \frac{.66(1.10^7)}{(1.1238)^7} + \frac{.66(1.10^8)}{(1.1238)^8} + \frac{.66(1.10^9)}{(1.1238)^9} + \frac{.66(1.10^{10})}{(1.1238)^{10}} \\ &= 5.8781\end{aligned}$$

A modified form of the Dividend Growth model for our purposes can be expressed as

$$\text{CV} = \frac{\text{EPS}_{11}}{r-g} = \frac{.66(1.10^{10})(1.03)}{.1238 - .03} = 18.7977$$

$$\text{PV}_{\text{CV}} = \frac{\text{CV}}{(1+r)^{10}} = \frac{58.74}{1.1238^{10}} = 5.8508$$

$$P_0 = \text{DCF}_{1-10} + \text{PV}_{\text{CV}} = 5.8781 + 5.8508 = 11.7289$$

Valuation using $r = 12.38\%$, $g_{1-10} = 20\%$, and $g_{11+} = 5\%$

$$P_0 = \text{DCF}_{1-10} + \text{PV}_{\text{CV}}$$

$$\begin{aligned}\text{DCF}_{1-10} &= \sum \frac{CF_t}{(1+r)^t} = \frac{.66(1.20^1)}{(1.1238)^1} + \frac{.66(1.20^2)}{(1.1238)^2} + \frac{.66(1.20^3)}{(1.1238)^3} + \frac{.66(1.20^4)}{(1.1238)^4} + \frac{.66(1.20^5)}{(1.1238)^5} \\ &= \frac{.66(1.20^6)}{(1.1238)^6} + \frac{.66(1.20^7)}{(1.1238)^7} + \frac{.66(1.20^8)}{(1.1238)^8} + \frac{.66(1.20^9)}{(1.1238)^9} + \frac{.66(1.20^{10})}{(1.1238)^{10}} \\ &= 6.817\end{aligned}$$

A modified form of the Dividend Growth model for our purposes can be expressed as

$$\text{CV} = \frac{\text{EPS}_{11}}{r-g} = \frac{.66(1.20^{10})(1.05)}{.1238 - .05} = 28.4417$$

$$\text{PV}_{\text{CV}} = \frac{\text{CV}}{(1+r)^{10}} = \frac{58.74}{1.1238^{10}} = 8.8525$$

$$P_0 = \text{DCF}_{1-10} + \text{PV}_{\text{CV}} = 6.817 + 8.8525 = 15.6695$$

Leshkal Industries, Inc.					
Balance Sheet (\$ thousands)					
Year Ending December 31					
	2013	2014		2013	2014
Current Assets			Liabilities		
Cash & Securities	84	98	Accounts Payable	312	344
Accounts Receivable	165	188	Credit Line	231	196
Inventory	393	422	Total	543	540
Total	642	708			
			Long Term Debt		
Fixed Assets			Mortgages	200	177
Buildings	1,579	1,668	Bonds	331	280
Equipment	819	864	Total	531	457
Technology	148	163			
Total	2,546	2,695	Owner's Equity		
			Common Stock	500	550
Other Assets			Preferred Stock	-	-
Patents Held	125	125	Accumulated Retained Earnings	1,799	2,041
Rental Property	60	60	Total	2,299	2,591
Total Assets	3,373	3,588	Total Liabilities and Owner's Equity	3,373	3,588

Leshkal Industries, Inc.		
Income Statement (\$ thousands)		
January 1 - December 31		
	2013	2014
Income		
Product Sales	1452	1,664
Services	568	617
Royalties	20	20
Rent (net)	9	10
Total Income	2,049	2,311
Expenses		
COGS	716	807
Sales & Marketing	240	270
Administration	236	267
Depreciation	242	276
Total Expenses	1,434	1,620
Interest Paid		--
General Interest	107	109
Bond Interest	43	32
Total Interest Paid	150	141
Taxable Income	465	550
Tax (34%)	158	187
Net Income	307	363
Distribution of Earnings		
Dividends (Common)	95.6	121
Addition to Retained Earnings	211	242

Additional Financial Information							
	2009	2010	2011	2012	2013	2014	
Stock Value ¹							
Shares Outstanding (thousands)	500	500	500	500	500	550	
12/31 Price per Share	1.00	1.80	7.48	12.60	13.51	15.84	
P/E Multiple	NA	60	34	28	22	24	
EPS	--	0.03	0.22	0.45	0.614	0.66	
Market Cap (\$ thousands)		900	3,740	6,300	6754	8712	
Dividends Paid	0	0.00	0.00	0.15	0.191	0.218	
Book Value / Liabilities	NA	NA	NA	NA	562	476	

¹ Firm incorporated in 2009 with 500,000 shares each issued at \$1.00 per share