Forecasting Valuation[1]
In-Class Problem[2]

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.

This In-Class Problem relies on values calculated in Reorganizing Financial Statements: NOPLAT, IC, and FCF[3] and Forecasting ROIC: Organic Growth[4]

As a hedge fund manager interested in securing a major stake in domestic manufacturing firms with exposure to renewable energies, you've become interested in Leshkal Industries, Inc.[5], a leader in energy storage and renewable energy integration. You've studied the firm and its financial statements and now want to forecast future revenues and expenses to determine how interested you are in recommending a significant investment in this firm by your fund.

To help focus your analysis, you've chosen to forecast the firm's revenues based on your best judgement, data available from an independent market analysis and the recommended liquidation of the firm's non-operating assets. This has supported the following forecast of NOPLAT, Invested Capital and ROIC[6]:

Year	Revenue	Labor Expense	Non-Labor COGS	S & A Expense	Dep	Invested Capital	NOPLAT	ROIC
2014	2281	589	218	537	276	3059	436	0.1426
2015	2509	648	240	591	304	3059	480	0.1569
2016	2760	713	264	650	334	3059	528	0.1726
2017	3036	784	290	715	367	3059	581	0.1898
2018	3340	862	319	786	404	3059	639	0.2088
2019	3674	949	351	865	445	3059	703	0.2297
2020	4041	1043	386	951	489	3059	773	0.2527
2021	4445	1148	425	1046	538	3059	850	0.2779
2022	4890	1263	467	1151	592	3059	935	0.3057
2023	5378	1389	514	1266	651	3059	1029	0.3363
2024	5916	1528	565	1393	716	3059	1132	0.3699
2025	6508	1680	622	1532	787	3059	1245	0.4069

[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] *Reorganizing Financial Statements: NOPLAT, IC, and FCF* is available through the following URL: www.richardhaskell.net/resources/Reorganizing+Fin+Stmt+-+NOPLAT$2C+IC$2C+FCF+-+solution.pdf

[4] *Forecasting ROIC: Organic Growth* is available through the following URL: www.richardhaskell.net/resources/Forecasting+ROIC+Organic+Growth+-+solution.pdf

[5] 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.

[6] Values for NPLAT, IC, and ROIC taken from the In-Class Problem *Forecasting ROIC: Organic Growth*

Finally, you've chosen to forecast valuation through use of a simple Discounted Cash Flow, Adjusted Present Value (APV), Key Value Driver (KVD), and Economic Profit Models and have accepted the following assumptions: g = rate of growth of revenues = 10%; WACC = current cost of debt capital = 18.5%

1. **Based on the Discounted Cash Flow/Key Value Driver Model, what value would you assign Leshkal based on our 10 year projection?**

   This breaks into two parts: the use of a DCF Model to assign value during the explicit period and a KVD Model to assign value beyond that point. In order to assign value based on a DCF model, we'll use the NOPLAT values from our table of values for the explicit period, but we need to think about what we'll use for the *r* in this model, and based on the values available to us I think we need to use WACC. It's high, but it's the only credible proxy we have barring making some assumptions for which we have little or no foundation.

   The DCF/KVD Models is calculated in two parts: Part One is a simple DCF Model based on projected NOPLAT and assigns value during the explicit forecast period; Part Two is the Key Driver Model and assigns a continuing value before the explicit period. Part Two creates a future value and needs to be discounted back to a present value to be relevant to us – we most often see this discounting value as WACC, which is some opportunity cost of capital, so we'll u se WACC for this value throughout this entire problem set.

   $\text{Value}_{\text{DCF/KVD}} = \sum \frac{NOPLAT_t}{(1+WACC)^t} + PV_{2024}$

   $PV_{2024} = \frac{NOPLAT_{2025}\left(1-\frac{g}{ROIC_{2025}}\right)}{WACC-g} = \frac{1245\left(1-\frac{0.10}{0,4069}\right)}{0.185-0.1} = 11{,}047.39$

   $PV_0 = \frac{PV_{2024}}{(1+WACC)^t} = \frac{11047.39}{1.185^{10}} = 2023.38$ This is the present value of PV_{2024}

   Now you can think about the DCF/KVD equation as follows:

   $\text{Value}_{\text{DCF/KVD}} = \frac{480}{1.185^1} + \frac{528}{1.185^2} + \frac{581}{1.185^3} + \frac{639}{1.185^4} + \frac{703}{1.185^5} + \frac{773}{1.185^6} + \frac{850}{1.185^7} + \frac{935}{1.185^8} + \frac{1029}{1.185^9} + \frac{1132}{1.185^{10}} + 2023.38$

   = 404.95 + 375.89 + 348.92 + 323.88 + 300.64 + 279.06 + 259.04 + 240.45 + 223.2 + 207.18

   = 2963.21 + 2023.38

   = 4986.59

2. **Based on a Discounted Cash Flow/Dividend Growth Model (modified), or DCF/DG Model, what value would you assign Leshkal based on our 10 year projection?**

In order to assign value based on a DCF model, we'll use the NOPLAT values from our table of values for the explicit period just as we did for the DCF/KVD Model. Again, this is a model in two parts in which Part One is a simple Discounted Cash Flow Models assigning a value for the explicit forecast period, and Part Two uses a modified version of the Dividend Growth Model and assigns a continuing value beyond the explicit period. Just as in the DCF/KVD Model we need to recall that the valuation assigned in Part Two is a future value and must be time discounted back to a present value – we'll use WACC for this discounting.

$DCF_{EXT} = \sum \frac{NOPLAT_t}{(1+WACC)^t} + PV_{2024}$

$PV_{2024} = \frac{NOPLAT_{2025}}{WACC-g} = \frac{1245}{0.185-0.1} = 14{,}647.06$

$PV_0 = \frac{14647.06}{1.185^{10}} = 2682.67$ This is the present value of PV_{2024}

Now you can think about the DCF equation as follows:

$DCF_{EXT} = \frac{480}{1.185^1} + \frac{528}{1.185^2} + \frac{581}{1.185^3} + \frac{639}{1.185^4} + \frac{703}{1.185^5} + \frac{773}{1.185^6} + \frac{850}{1.185^7} + \frac{935}{1.185^8} + \frac{1029}{1.185^9} + \frac{1132}{1.185^{10}} + 2682.67$

= 404.95 + 375.89 + 348.92 + 323.88 + 300.64 + 279.06 + 259.04 + 240.45 + 223.2 + 207.18 + 10898.79

= 2963.21 + 2682.67

= 5645.88

3. **Based on the Economic Profit Model, what value would you assign Leshkal?**

To capture both the explicit and continuing periods Economic Profit Model in it's complete form can be thought of as follows:

$Value_{ECON\pi}$ = Invested Capital at beginning of Forecast period + Present Value of Forecast Economic Profit During Explicit Period + Present Value of Forecast Economic Profit After Explicit Period (Continuing Value period

We'll think of these as **$Value_{ECON\pi}$** = IC_t + PV Econ $\pi_{EXPLICIT}$ + PV Econ π_{CV}

= IC_{2014} + PV Econ $\pi_{2015\text{-}2024}$ + PV Econ $\pi_{2025\text{-}\infty}$

Where in IC_t is simply obtained through our table of values. IC_{2014} = 3059

We don't have express values for economic profit for the explicit period, but since we know that ***Economic Profit = invested capital x (ROIC-WACC)***, we can calculate these values in to present value summation:

$$\text{PV Econ } \pi_{2014-2024} = \sum \frac{IC_t(ROIC_t - WACC_t)}{(1+WACC_t)^t}$$

$$= \frac{(3059)(0.1569-0.185)}{1.185^1} + \frac{(3059)(0.1726-0.185)}{1.185^2} + \frac{(3059)(0.1898-0.185)}{1.185^3} + \frac{(3059)(0.2088-0.185)}{1.185^4} + \frac{(3059)(0.2297-0.185)}{1.185^5} + \frac{(3059)(0.2527-0.185)}{1.185^6} + \frac{(3059)(0.2779-0.185)}{1.185^7} + \frac{(3059)(0.3057-0.185)}{1.185^8} + \frac{(3059)(0.3363-0.185)}{1.185^9} + \frac{(3059)(0.3699-0.185)}{1.185^{10}}$$

= -72.70 – 27.17 +8.79 + 36.86 + 58.44 + 74.68 + 86.57 + 94.91 + 100.38 + 103.54

= 464.30

We can now focus on the last value, which is the present value of the forecasted profit after the explicit forecast period. Recall that this will result in a value in the future, which will then need to be discounted back to the present once it has been calculated.

$$\text{PV Econ } \pi_{2025-\infty} = \frac{Econ\pi_{2025-\infty}}{(1+WACC)^{10}}$$

$$Econ\pi_{2025-\infty} = \frac{Invested\ Capital_{2024}\ x\ (ROIC_{2024} - WACC)}{WACC - g}$$

$$= \frac{3059\ x\ (0..3699 - 0.1850)}{0.185 - 0.10}$$

= 6,654.225

$$\text{PV Econ } \pi_{2024-\infty} = \frac{Econ\pi_{2025-\infty}}{(1+WACC)^{10}} = \frac{6654.225}{1.185^{10}} = 1{,}218.748$$

$\textbf{Value}_{ECON\pi}$ = IC_{2014} + PV Econ $\pi_{2015-2024}$ + PV Econ $\pi_{2025-\infty}$

= 3059 + 464.30 + 1218.748

= 4742.05

4. What is Leshkal's valuation based on the APV Model?

There are a few things to consider if we're going to think about the APV Model.

a. The model only projects a valuation based on the explicit period, so we'll need to add to it a component to extend the valuation beyond that. We can credibly use a variation on the Dividend Growth Model here such that an extended APV Model may be as follows:

$$APV_{EXTENDED} = \sum_{t=1}^{\infty} \frac{FCF}{(1+k_u)^t} + \sum_{t=1}^{\infty} \frac{(T_m)Interest}{(1+k_{tax})^t} + PV_{2024}$$

We'll break this into its component parts which we'll call V_{FCF}, V_{tax} PV_{2024} such that

$$V_{FCF} = \sum_{t=1}^{\infty} \frac{FCF}{(1+k_u)^t}$$

$$V_{tax} = \sum_{t=1}^{\infty} \frac{(T_m)Interest}{(1+k_{tax})^t}.$$

$$PV_{2024} = \frac{NOPLAT_{2025}}{WACC-g}$$

b. Since we don't observe K_U, we need to make an assumption of its value. We're already forecasting a constant D/E ratio, so it's a short step to assume that $K_U = K_D$ and that $K_U = K_{TAX}$. Further, we've observed that $K_D = 0.185$, so we'll assume $K_D = K_U = K_{TAX} = 0.185$ or 18.5%.

c. We haven't projected Free Cash Flow (FCF) so we need to think about this.

   i. In our reorganized GAAP Cash Flow Statement focused on determining Free Cash Flow we noted that FCF = NOPLAT + Depreciation + Δ NWC (increase) + Δ NCS (increase).

   ii. Though we haven't expressly forecast changes in NCS, we see from our table of values that depreciation is increasing at 10% along with sales, so it's credible to assume that net fixed investment is also increasing at 10%. Recall that NCS = Δ Net Fixed Investment + Depreciation.

   iii. We can further forecast changes in NWC of the same amount.

So FCF can be forecast as follows:

Year	Interest	NOPLAT	Depreciation	Δ NWC	NCS	FCF
2014	141	436	276	34	425	253
2015	121	480	304	37	468	279
2016	121	528	334	41	514	306
2017	121	581	367	45	566	337
2018	121	639	404	50	622	371
2019	121	703	445	55	684	408
2020	121	773	489	60	753	449
2021	121	850	538	66	828	494
2022	121	935	592	73	911	543
2023	121	1029	651	80	1002	597
2024	121	1132	716	88	1102	657
2025	121	1245	787	97	1213	723

$V_{FCF} = \frac{279}{1.185^1} + \frac{306}{1.185^2} + \frac{337}{1.185^3} + \frac{371}{1.185^4} + \frac{408}{1.185^5} + \frac{449}{1.185^6} + \frac{494}{1.185^7} + \frac{543}{1.185^8} + \frac{597}{1.185^9} + \frac{657}{1.185^{10}}$

= 235.09 + 218.23 + 202.58 + 188.05 + 174.56 + 162.04 + 150.41 + 139.62 + 129.61 + 120.31

= 1720.5

$V_{TAX} = \frac{(121)(0.34)}{1.185^1} + \frac{(121)(0.34)}{1.185^2} + \frac{(121)(0.34)}{1.185^3} + \frac{(121)(0.34)}{1.185^4} + \frac{(121)(0.34)}{1.185^5} + \frac{(121)(0.34)}{1.185^6} + \frac{(121)(0.34)}{1.185^7} + \frac{(121)(0.34)}{1.185^8} + \frac{(121)(0.34)}{1.185^9} + \frac{(121)(0.34)}{1.185^{10}}$

= 34.67 + 29.26 + 24.69 + 20.83 + 17.58 + 14.84 + 12.52 + 10.57 + 8.92 + 7.52

= 181.39

$PV_{2024} = \frac{1245}{0.185-0.1} = 14{,}647.06$

But recall that this is a value 10 years in the future so we need to adjust it for its present value:

$PV_0 = \frac{14647.06}{1.185^{10}} = 2682.67$

Adding these values together we get $APV_{EXTENDED}$ = 1720.50 + 181.39 + 2682.67 = 4584.56

AND NOW YOU SEE WHY WE COMPUTED THIS VALUE LAST!!!

5. Given the various values you've calculated (DCF/KVD, DCF/DG, Economic Profit, and APV), what value would you place on this firm and why?

The valuation models provided the following outcomes:

Model	Value	Components
DCF/KVD	4,986.59	NOPLAT, ROIC, WACC, g
DCF/DG	5,645.88	NOPLAT, WACC, g
APV	4,584.56	FCF, Interest, NOPLAT, WACC, g
Econ Profit	4,742.05	IC, NOPLAT, ROIC, WACC, g

McKinsey prefers to use the DCF/KVD Model and it may now be obvious as to why: of the two most straight forward models (DCF/KVD and DCF/DG) it provides the most conservative valuation. The other models (APV and Econ Profit) are interesting, but their foci on Free Cash Flow (APV) and Invested Capital (Econ Profit) takes us somewhat outside of what we're really trying to assess.

So, I'll simply side with McKinsey and use the DCF/KVD Model and assign a value of 4,986.59 to Leshkal.

Leshkal Industries, Inc.
Balance Sheet
Year Ending December 31

	2013	2014
Current Assets		
Cash & Securities	84	98
Accounts Receivable	165	188
Inventory	393	422
Total	642	708
Fixed Assets		
Buildings	1,579	1,668
Equipment	819	864
Technology	148	163
Total	2,546	2,695
Other Assets		
Patents Held	125	125
Rental Property	60	60
Total Assets	3,373	3,588

	2013	2014
Liabilitites		
Accounts Payable	312	344
Credit Line	231	196
Total	543	540
Long Term Debt		
Mortgages	200	177
Bonds	331	280
Total	531	457
Owner's Equity		
Common Stock	500	550
Preferred Stock	-	-
Accumulated Retained Earnings	1,799	2,041
Total	2,299	2,591
Total Liabilities and Owner's Equity	3,373	3,588

Additional Financial Information

Stock Value		
Shares Outstanding	500	550
12/31 Price per Share	13.51	15.84
P/E Multiple	22.00	24.00
EPS	0.614	0.66
Market Value (Market Cap)	6,754	8,712
Book Value / Liabilities	1,074	997

Leshkal Industries, Inc.
Income Statement
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