

## Forecasting Value: Economic Profit<sup>1</sup> Case Study<sup>2</sup>

*The subject firm for the problems represented in this case is The Farm Hill Group, Ltd., 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 support of building a body of Corporate Finance In-Class Problems and Case Studies.*

You've been assigned to review the financial statements of The Farm Hill Group, Ltd. preparatory to making a recommendation to your client regarding a possible investment in the firm. Farm Hill is a legacy manufacturer of a line of residential and commercial overhead doors and has historically generated strong profits for its stakeholders. Its current rate of growth ( $\Delta$  NOPLAT) is equal to its historical and expected future rate of growth for the next five years. The firm's outstanding bonds have a coupon rate of 14%, pay interest twice a year, and at the end of 2014 there are 15 years remaining to maturity in a market in which current yield for the firm's debt is 6%. Your client considers all of Farm Hill's assets and revenues to be pertinent to the firm's operations. You've been given the firm's abbreviated financial statement (attached) and the following forecasted values with respect to the common stock:  $R_F = 0.04$ ,  $R_M = 0.07$ ,  $\beta = 0.96$

Year	Debt	EBIT	Dep	Int Exp	IC	NOPLAT	$\Delta$ NWC	NCS	FCF	ROIC
2014	31.544	8.65	3.890	4.360	109.842	5.882	2.472	7.930	-0.63	0.0535
2015	31.544	9.394	4.225	5.161	121.139	6.388	2.685	8.612	-0.684	0.0527
2016	33.575	10.202	4.588	5.691	133.407	6.937	2.915	9.353	-0.743	0.0520
2017	35.780	11.079	4.982	6.268	146.730	7.534	3.166	10.157	-0.807	0.0513
2018	38.176	12.032	5.411	6.894	161.199	8.182	3.438	11.030	-0.876	0.0508
2019	40.777	13.067	5.876	7.573	176.912	8.885	3.734	11.979	-0.952	0.0502
2020	43.602	13.5894	6.111	8.312	193.977	9.24076	4.055	13.009	-1.713	0.0476

Notice I've changed the firm's level of debt and IC in this projection. I've supposed the firm retains a constant debt/IC ratio, IC is changing as NWC, and NCS are changing. I've projected changes in NWC and NCS equal to changes in revenue or 8.6%, and I've increased IC as a result of this, which in turn increases debt due to the constant debt/invested capital ratio I imposed. Recall that  $NCS = \Delta FA = FA_1 - FA_0 + Depreciation$  and  $IC = FA + NWC$ , we then take  $\Delta IC = NCS + \Delta NWC$  such that  $IC_1 = IC_0 + \Delta IC = IC_0 + NCS + \Delta NWC$ .

<sup>1</sup> 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.

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

**1. Calculate the value of the firm's bonds as of the end of 2014**

$$\begin{aligned} \text{Market Value of Bonds} &= C \frac{\left(1 - \frac{1}{(1+YTM)^N}\right)}{YTM} + \frac{\text{Face}}{(1+YTM)^N} \\ &= 70 \frac{\left(1 - \frac{1}{(1.03)^{30}}\right)}{.03} + \frac{1000}{(1.03)^{30}} \\ &= 1,784.017 \text{ per bond} \end{aligned}$$

The firm has 30.584 bonds outstanding for a total market value of 54,562.3759 or 54.5624.

**2. Calculate Farm Hill's NOPLAT, Invested Capital, ROIC, FCF, and market based WACC for 2014.**

*Note that I'm including values with respect to Private Equity since the client appears to value it as an important part of a potential investments*

$$\begin{aligned} \text{NOPLAT} &= (\text{Operating Rev} - \text{Operating Exp}) + \text{Dep} - \text{Adjusted Tax} \\ &= (253.64 - 244.99)(1-.32) = 5.882 \\ &= \text{EBIT} (1-T_M) \\ &= 8.658 (1-.32) = 5.882 \end{aligned}$$

$$\begin{aligned} \text{Invested Capital} &= \text{NWC} + \text{FA} \\ &= (93.483 - 30.571) + (32.17 + 14.76) = 109.842 \end{aligned}$$

$$\text{ROIC} = \frac{\text{NOPLAT}}{\text{IC}} = \frac{5.882}{109.842} = .0535 \text{ or } 5.35\%$$

$$\begin{aligned} \text{FCF} &= \text{NOPLAT} + \text{Depreciation} - \Delta \text{NWC (increase)} - \text{NCS} \\ &= 5.882 + 3.890 - 2.472 - 7.93 = -0.63 \end{aligned}$$

$$\text{WACC} = \left(\frac{E}{V} \times R_E\right) + \left(\frac{P}{V} \times R_P\right) + \left(\frac{D}{V} \times R_D\right) (1 - T_C)$$

$$V = E + P + D = 55.5224 + 0.125 + 55.4439 = 118.3104$$

$$\begin{aligned} R_{\text{ECAPM}} &= R_F + (R_M - R_F)\beta \\ &= .04 + (.07 - .04)(0.96) = .0688 \text{ or } 6.88\% \end{aligned}$$

$$R_P = \frac{\text{Preferred Dividends}}{\text{Preferred Stock}} = \frac{0.025}{0.125} = 0.20 \text{ or } 20\%$$

$$R_D = \text{YTM} = .06 \text{ or } 6\%$$

$$\begin{aligned} &= \left(\frac{62.663}{147.93} \times 0.0688\right) + \left(\frac{0.125}{147.93} \times 0.20\right) + \left(\frac{85.146}{147.93} \times 0.6\right) (1 - 0.32) \\ &= 0.02914 + 0.0000169 + (0.0345)(0.68) \\ &= .0529 \text{ or } 5.29\% \end{aligned}$$

**3. Calculate the firm's value based on a Discounted Cash Flow model using NOPLAT as the cash flow and the Key Value Drive model for the continuing value.**

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 use WACC for this value throughout this entire problem set.

$$\text{Value}_{\text{DCF/KVD}} = PV_{\text{DCF}} + PV_{\text{CV}}$$

$$PV_{\text{DCF}} = \sum \frac{\text{NOPLAT}_t}{(1+WACC)^t}$$

$$CV = \frac{\text{NOPLAT}_{2020} \left(1 - \frac{g}{\text{ROIC}_{2020}}\right)}{WACC - g} = \frac{9.649 \left(1 - \frac{0.04}{0.0594}\right)}{0.0528 - 0.04} = 130.301$$

$$PV_{\text{CV}} = \frac{CV}{(1+WACC)^t} = \frac{130.301}{1.0528^5} = 100.746$$

Now you can think about the DCF equation as follows:

$$\begin{aligned} \text{Value}_{\text{DCF}} &= \sum \frac{\text{NOPLAT}_t}{(1+WACC)^t} \\ &= \frac{6.388}{1.0528^1} + \frac{6.937}{1.0528^2} + \frac{7.534}{1.0528^3} + \frac{8.182}{1.0528^4} + \frac{8.885}{1.0528^5} \\ &= 6.0678 + 6.2589 + 6.4563 + 6.6599 + 6.87 \\ &= 32.3126 \end{aligned}$$

$$\text{Value}_{\text{DCF/KVD}} = 32.3126 + 100.746 = 133.059$$

4. Calculate the firm's value using an Economic Profit model (Econ  $\pi$ ) using the following form:

The Economic Profit model is driven by the use of Invested Capital, ROIC and WACC through which we can think of economic profit as = invested capital x (ROIC-WACC). In this formation we can see that  $ROIC > WACC$  drives value while  $ROIC < WACC$  destroys value. The model captures both the explicit and continuing periods Economic Profit Model in its complete form can be thought of as:

$$\text{Value}_{\text{ECON}\pi} = \text{Invested Capital}_0 + \text{Present Value of Forecast Economic Profit During Explicit Period} + \text{Present Value of Forecast Economic Profit After Explicit Period (CV period)}$$

We'll think of these as  $\text{Value}_{\text{ECON}\pi} = \text{IC}_0 + \text{PV}_{\text{DCF}(\text{Econ } \pi)} + \text{PV}_{\text{CV}(\text{Econ } \pi)}$ , where in  $\text{IC}_t$  is simply obtained through our table of values. We understand economic profit to me that profit realized after all real and opportunity costs have been included, in this case with specific focus on operational values. As such, the firm's invested capital must be included in the equation to allow a total value to be assigned. Were this not the case, the resultant value would simply note the value calculated in excess of the firm's invested capital and would not be comparable to values calculated by other model types (DCF/DG, DCF/KVD and APV). The following equations help define the economic profit model:

$$\text{Value}_{\text{ECON}\pi} = \text{IC}_0 + \text{PV}_{\text{DCF}(\text{Econ } \pi)} + \text{PV}_{\text{CV}(\text{Econ } \pi)}$$

$$\text{PV}_{\text{DCF}(\text{Econ } \pi)} = \sum \frac{\text{IC}_t(\text{ROIC}_t - \text{WACC}_t)}{(1 + \text{WACC}_t)^t}$$

$$\text{PV Econ } \pi_{\text{CV}} = \frac{\text{CV}_{\text{ECON}\pi}}{(1 + \text{WACC})^t}$$

$$\text{CV}_{\text{ECON}\pi} = \frac{\text{IC}_1 \times (\text{ROIC}_1 - \text{WACC}_1)}{\text{WACC}_1 - g}$$

The following values provide us with the value of Economic Profit:

	Year	IC	ROIC	WACC	Econ Profit	PV <sub>ECONπ</sub>	Total PV <sub>ECONπ</sub>		
	2014	109.842	0.0535	0.0528	0.0829				
1	2015	116.914	0.0546	0.0528	0.2154	0.20	0.20	IC <sub>0</sub>	109.84
2	2016	124.594	0.0557	0.0528	0.3593	0.32	0.53	PV <sub>EXPLICIT</sub>	2.20
3	2017	132.935	0.0567	0.0528	0.5155	0.44	0.97	CV <sub>Eπ</sub>	-30.09
4	2018	141.993	0.0576	0.0528	0.6852	0.56	1.53	PV <sub>CV</sub>	-23.27
5	2019	151.830	0.0585	0.0528	0.8695	0.67	2.20	VALUE <sub>Eπ</sub>	88.77
	2020	162.513	0.0594	0.0528	1.0696				

<b>The Farm Hill Group, Ltd.</b>					
<b>Balance Sheet (millions)</b>					
<b>Year Ending December 31</b>					
	<b>2013</b>	<b>2014</b>		<b>2013</b>	<b>2014</b>
<b>Current Assets</b>			<b>Current Liabilities</b>		
Cash & Securities	9.780	7.933	Accounts Payable	13.360	6.641
Accounts Receivable	37.470	38.910	Other	21.150	23.930
Inventory	47.700	46.640	<b>Total</b>	<b>34.510</b>	<b>30.571</b>
<b>Total</b>	<b>94.950</b>	<b>93.483</b>			
			<b>Long Term Debt</b>		
<b>Fixed Assets</b>			Mortgages	0.320	0.960
PPE	28.130	32.170	Bonds	26.330	30.584
Private Equity	14.760	14.760	<b>Total</b>	<b>26.650</b>	<b>31.544</b>
<b>Total</b>	<b>42.890</b>	<b>46.930</b>			
			<b>Owner's Equity</b>		
			Common Stock	5.440	5.570
			Preferred Stock	0.080	0.090
			Accumulated Retained Earnings	71.160	72.639
			<b>Total</b>	<b>76.680</b>	<b>78.299</b>
<b>Total Assets</b>	<b>137.840</b>	<b>140.413</b>	<b>Total Liabilities and Owner's Equity</b>	<b>137.840</b>	<b>140.413</b>

<b>Additional Financial Information</b>					
	<b>2013</b>	<b>2014</b>		<b>2013</b>	<b>2014</b>
<b>Preferred Stock Value</b>			<b>Common Stock Value</b>		
Shares Outstanding (millions)	0.040	0.050	Shares Outstanding (millions)	5.440	5.570
12/31 Price per Share	2.500	2.500	12/31 Price per Share	12.000	11.250
Market Value (millions)	0.100	0.125	P/E Multiple	22.000	24.000
			EPS	0.998	0.524
			Market Value (millions)	65.280	62.663
			Book Value / Liabilities	26.650	31.544

<b>The Farm Hill Group, Ltd.</b>		
<b>Income Statement (millions)</b>		
<b>January 1 - December 31</b>		
	<b>2013</b>	<b>2014</b>
<b>Income</b>		
Product Sales	234.980	252.780
Services		
Private Equity	0.550	0.860
<b>Total Income</b>	<b>235.530</b>	<b>253.640</b>
<b>Expenses</b>		
COGS	196.690	211.460
Sales & Marketing	23.500	29.640
Administration		
Depreciation	3.640	3.890
<b>Total Expenses</b>	<b>223.830</b>	<b>244.990</b>
<b>Interest Paid</b>		
General Interest	3.720	4.360
Total Interest Paid	3.720	4.360
Taxable Income	7.980	4.290
Taxes Paid	2.554	1.373
<b>Net Income</b>	<b>5.426</b>	<b>2.917</b>
<b>Distribution of Earnings</b>		
Dividends (Common)	1.360	1.413
Dividends (Preferred)	0.020	0.025
Addition to Retained Earnings	4.046	1.479