Forecasting Value: Farm Hill Group, Ltd.[1]
Case Study[2]

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. In recent years the firm's management has seen troublesome declines in the midst of a market rebounding from a serious recession, resulting in concerned shareholders and a potentially interesting opportunity for the right owner.

Your client, a national construction product manufacturing and distribution operator, is interested in the firm based on the expectation it can lower Farm Hill operating costs by 3%[3] and improve sales by 2%[4], as a result of its combined buying power and managerial excellence, thereby increasing profits generally.

Farm Hill manufactures its products domestically and enjoys a competitive advantage over other producers based on quality rather than cost. The market for automatic overhead doors, like the residential and commercial construction market, is forecasted to have annual revenue increases of 6% over the next 5-8 years and is reflective of a modestly healthy national expansion of some 3.5% generally. The market for quality products is positioned to capture an additional 10%, proportionately, over and above the market increase.

Interest rates for credit worthy corporate borrowers in the current market are 6% with expected increases to as much as 8% in the next 2-4 years. The cost of equity capital for firms in this industry with very low beta factors, virtually risk free in your estimation, is 4%, while the market rate for firms with a beta factor of 1.00 is 7%: Farm Hill enjoys a beta factor of 0.96.

Finally, your client is as interested in Farm Hill's Private Equity investment as it a wholly owned subsidiary providing financing for the firm's retail and commercial customers, a profitable and complementing business unit your client's firm does not currently enjoy.

As you review Farm Hill's financial statements, consider how your client may realize value through a potential acquisition, and prepare to offer a recommendation based on relevant market values and relationships. The following items will aid you in forming a production value for the firm.

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[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] This expected decrease in costs may be thought of as a "best owner" decrease: see Appendix A

[4] This expected increase in sales may be thought of as a "best owner" increase: see revenue projections in question 2.

I'm going to provide solutions in two separate ways: 1) without the lower costs expectations of the client since I'm not sure they're all that credible, and 2) with the lower cost expectations (found in Appendix A following the firm's financial statements). In each case I'm including the lower interest expense environment the client enjoys and allowing that to inform R_D in WACC

Section One: prepare complete and detailed responses for items 1-5 as follows:

1. **Calculate Farm Hill's NOPLAT, Invested Capital, ROIC, FCF and 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 and that I'm using a market based WACC

NOPLAT = (Operating Rev – Operating Exp) – Adjusted Tax
= (253.64 – 244.99)(1-.32) = 5.882

Invested Capital = Net Working Capital + Fixed Operating Assets
= (93.483 – 30. 571) + 32.17 + 14.76 = 109.842

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

FCF = NOPLAT + Depreciation + Δ NWC (increase) + Δ NCS (increase)
= 5.882 + 3.890 - 2.472 – 7.936 = -.630

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

V = E + P + D = 62.663 + 0.125 + 85.146 = 147.93
R_{ECAPM} = $R_F + (R_M - R_F)\beta$
= .04 + (.07 - .04)(0.96) = .0688 or 6.88%
$R_P = \frac{Preferred\ Dividends}{Preferred\ Stock} = \frac{0.025}{0.125}$ = 0.20 or 20%
R_D = YTM = .06 or 6%

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

2. **Provide a well-reasoned and detailed "top-down", 5-year revenue projection for Farm Hill's critical operations.**

Best Owner	2.00%	Client expects increase in Revenue as a result of their participation
Market	6.00%	Market increase forecast
Quality	0.60%	Quality product increase, proportionately; over and above market
Total Increase	8.60%	

Note that national expansion increase at 3.5% not used as this is reflected in 6% market increase

3. Provide forecast ratios for Farm Hill's operating expense and interest categories.

FR_{REV} = 8.60%

$FR_{COGS} = \frac{COGS_t}{Revenue_t} = \frac{211.460}{253.64} = 0.8337$ or 83.37%

$FR_{S\&A} = \frac{S\&A_t}{Revenue_t} = \frac{29.640}{253.64} = 0.1169$ or 11.69%

$FR_{DEP} = \frac{Depreciation_t}{Revenue_t} = \frac{3.890}{253.640} = 0.0153$ or 1.53%

$FR_{Interest}$ = Client's current rate on borrowing = 6%

Note that I haven't changed any of the expense forecasts to reflect the "best owner" decrease in costs referenced in the introduction. While it might be reasonable to forecast this expected decrease, which would be represented by calculating the expense based on the forecast ratios and then reducing these values by 3% reduction. Appendix A includes a forecast and valuation analysis representing this increase.

4. Provide a forecast schedule of NOPLAT, Invested Capital, ROIC and FCF for a sufficient number of years to support a 5-year explicit period and continuing value forecast.

In this case I'm keeping a constant revenue to IC ratio (102.6052) suggesting this firm has revenue increases as a result of capital increases. I'm also holding a constant D/E ratio (.4029) and holding E as IC, which is an assumption, but somewhat reasonable. Notice the relatively constant ROIC resulting from this – without some substantial management or product innovation this might be what we'd expect to see.

Year	Debt	Rev	COGS	S&A Exp	Dep	Int Exp	IC	NOPLAT	Δ NWC	NCS	FCF	ROIC
2014	31.544	253.640	211.460	29.640	3.890	4.360	109.842	5.882	2.472	7.930	-0.630	0.0535
2015	31.544	275.453	229.646	32.189	4.225	2.014	116.914	6.388	2.685	8.612	-0.684	0.0546
2016	31.544	299.142	249.395	34.957	4.588	2.147	124.594	6.937	2.915	9.353	-0.743	0.0557
2017	31.544	324.868	270.843	37.964	4.982	2.291	132.935	7.534	3.166	10.157	-0.807	0.0567
2018	31.544	352.807	294.136	41.228	5.411	2.447	141.993	8.182	3.438	11.030	-0.876	0.0576
2019	31.544	383.148	319.431	44.774	5.876	2.616	151.830	8.885	3.734	11.979	-0.952	0.0585
2020	31.544	416.099	346.902	48.625	6.382	2.800	162.513	9.649	4.055	13.009	-1.034	0.0594

5. Provide separate DCF/DG and DCF/KVD Model value forecasts using a 5-year explicit value period.

DCF/DG

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. 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. 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.

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

$PV_{DCF} = \sum \frac{NOPLAT_t}{(1+WACC)^t}$ = 32.313

$= \frac{6.388}{1.0528^1} + \frac{6.937}{1.0528^2} + \frac{7.534}{1.0528^3} + \frac{8.182}{1.1053^4} + \frac{8.885}{1.0528^5}$

= 6.0675 + 6.259 + 6.456 + 6.66 + 6.87

= 32.313

$CV = \frac{NOPLAT_{2020}}{WACC-g} = \frac{9.649}{0.0528 - 0.086} =$ -290.603

$\text{PV}_{\text{CV}} = \frac{-290.603}{1.0528^5}$ = -224.689

Now you can think about the Valuation equation as follows:

$\text{Value}_{\text{DCF/DG}}$ = 32.313 – 290.603 = -192.376

DCF/KVD

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.

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

$PV_{DCF} = \sum \frac{NOPLAT_t}{(1+WACC)^t} = 32.313$

$CV = \frac{NOPLAT_{2020}\left(1-\frac{g}{ROIC_{2020}}\right)}{WACC-g} = \frac{9.649\left(1-\frac{0.086}{0,0594}\right)}{0.0528-0.086} = 130.30$

$PV_{CV} = \frac{PV_{CV}}{(1+WACC)^t} = \frac{-130.30}{1.0528^5} = 100.746$

$\text{Value}_{DCF/KVD} = 32.313 + 100.746 = 133.059$

Section Two: Prepare complete and detailed discussion for *one and only one* of the following three items (items 6-8)

6. Compare and contrast the values and interpretations of the DCF/DG and DCF/KVD models employed in 5.

The DCF/DG (modified) and DCF/KVD models provide substantially different valuations: 330.98 and 34.28 respectively. While the two models share the same value during the explicit period (27.91), their continuing value figures are widely disparate: 303.07 and 6.38 respectively. In each case these values are calculated as of the end of the explicit forecast period and discounted to a present value via a simple $P_0 = \frac{CV}{(1+WACC)^t}$ model.

The DG (modified) and KVD models for continuing value are of the same basic form with a value for $NOPLAT_{t+1}$ representing an expected income value for the period following some forecast period, or in the absence of a forecast period some income for the next period, forming the numerator and the term *WACC – g* as the denominator in a perpetuity value structure. The KVD model scales the NOPLAT by the term *1* - $\frac{g}{ROIC}$ or $\frac{\text{NOPLATt+1}\left(1-\frac{g}{ROIC}\right)}{WACC-g}$, while the DG (modified) model employs the income value unaltered: $\frac{\text{NOPLATt+1}}{WACC-g}$. It is the use of this term (*1*-$\frac{g}{ROIC}$) that growth's value destroying consequence in the event that *WACC > ROIC* may be observed. We know that growth destroys value when *WACC > ROIC* and creates value when *ROIC > WACC*. In the case of Farm Hill *WACC* = .1053 and *ROIC* = .0594, such that *WACC > ROIC* and growth destroys hence the DG model outcome ignoring the *WACC/ROIC* relationship is not likely to accurately reflect the firm's long term value.

7. Discuss the structure and flow of the APV model in as much detail as possible and indicate how it and its outcome differs from at least one other valuation model form.

The APV model employs the firm's free cash flow (FCF) and interest tax shield to arrive at an explicit forecast period valuation extended by a modified DG model for its continuing value (discounted to a present value figure): $APV_{EXTENDED} = V_{FCF} + V_{TAX} + PV_{CV}$, where $V_{FCF} = \sum_{t=1}^{\infty} \frac{FCF}{(1+k_u)^t}$, $V_{TAX} = \sum_{t=1}^{\infty} \frac{(T_m)Interest}{(1+k_{tax})^t}$, $CV = \frac{NOPLATt+1}{WACC-g}$ and $PV_{CV} = \frac{CV}{(1+WACC)^t}$. In this model for k_u is the opportunity cost of unlevered equity and k_{tax} is the opportunity cost of taxa. APV highlights changing capital structure more easily that do various extend DCF models. Through the use of k_u (unlevered cost of capital or the blended cost of capital for operating assets) and k_{tax} (cost of financial assets), which we assume to be equal to one another, we can then also derive k_e, the blended cost of equity. To calculate k_e we rely on the Modigliani & Miller theorem equation, $k_e = k_u + \frac{D}{E}(k_u - k_d)$. We observe values for k_u , k_d and the debt to equity ratio $\left(\frac{D}{E}\right)$ by reviewing the a firm's balance sheet and income statement data and can then calculate k_e if we'd like.

In the APV framework, we commonly assume a constant debt to equity ratio given that these are management decisions with regard to how the firm is capitalized rather than being the result of the firm's operations. This is back up by the Modigliani and Miller theorem confirming that a firm's capital structure does not impact the firm's operating income(s) except by effecting the tax rate via the interest tax shield. This assumption allows us to also assume $k_u = k_{tax}$. It may be important to note that the APV model does not expressly use ROIC, but the use of the firm's free cash flow and interest tax shield in the model allow it to provide outcomes only marginally different from a DCF/KVD or economic profit model. It is likely superior to a DCF/DG model.

8. Discuss the structure and flow of the Economic Profit model in as much detail as possible and indicate how it and its outcome differs from at least one other valuation model 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:

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

We'll think of these as **Value$_{ECON\pi}$** = IC_0 + $PV_{DCF(Econ\ \pi)}$ + $PV_{CV(Econ\ \pi)}$, where in **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:

Value$_{ECON\pi}$ = IC_0 + $PV_{DCF(Econ\ \pi)}$ + $PV_{CV(Econ\ \pi)}$

$$\mathbf{PV_{DCF(Econ\ \pi)}} = \sum \frac{IC_t(ROIC_t - WACC_t)}{(1+WACC_t)^t}$$

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

$$CV_{ECON\pi} = \frac{IC_1\ x\ (ROIC_1 - WACC_1)}{WACC_1 - g}$$

The Farm Hill Group, Ltd.
Balance Sheet (millions)
Year Ending December 31

	2013	2014
Current Assets		
Cash & Securities	9.780	7.933
Accounts Receivable	37.470	38.910
Inventory	47.700	46.640
Total	94.950	93.483
Fixed Assets		
PPE	28.130	32.170
Total	28.130	32.170
Other Assets		
Private Equity	14.760	14.760
Total Assets	137.840	140.413

	2013	2014
Current Liabilitites		
Accounts Payable	13.360	6.641
Other	21.150	23.930
Total	34.510	30.571
Long Term Debt		
Mortgages	0.320	0.960
Bonds	26.330	30.584
Total	26.650	31.544
Owner's Equity		
Common Stock	5.440	5.570
Preferred Stock	0.080	0.090
Accumulated Retained Earnings	71.160	72.639
Total	76.680	78.299
Total Liabilities and Owner's Equity	137.840	140.413

Additional Financial Information

Preferred Stock Value	2013	2014
Shares Outstanding (millions)	0.040	0.050
12/31 Price per Share	2.500	2.500
Market Value (millions)	0.100	0.125

Common Stock Value	2013	2014
Shares Outstanding (millions)	5.440	5.570
12/31 Price per Share	12.000	11.250
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

The Farm Hill Group, Ltd.
Income Statement (millions)
January 1 - December 31

	2013	2014
Income		
Product Sales	234.980	252.780
Services		
Private Equity	0.550	0.860
Total Income	235.530	253.640
Expenses		
COGS	196.690	211.460
Sales & Marketing	23.500	29.640
Administration		
Depreciation	3.640	3.890
Total Expenses	223.830	244.990
Interest Paid		
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
Net Income	5.426	2.917
Distribution of Earnings		
Dividends (Common)	1.360	1.413
Dividends (Preferred)	0.020	0.025
Addition to Retained Earnings	4.046	1.479

Appendix A: Forecast and Value Analysis

This analysis includes an expected 3% decrease in operating costs as a result of the "best owner" decrease proposed in the introduction. To do this I've calculated the annual expense values (other than depreciation) based on the forecast ratios and then multiplied the resultant values by (1-.03). For this forecast I've also supposed the debt can be renegotiated based on the new owner's potential cost of borrowing at 6%, far lower than the 16.36% calculated for the firm.

Adjusted Revenue and Expense Forecast

Year	Debt	Revenue	COGS	S & A Expense	Depreciation	Interest Expense	Invested Capital	NOPLAT	Δ NWC	NCS	FCF	ROIC
2014	31.544	253.640	205.116	28.751	3.773	4.229	109.842	10.879796	2.472	7.930	4.251	0.0990
2015	31.544	275.453	222.756	31.223	4.225	2.014	116.914	11.729	2.685	8.612	4.657	0.1003
2016	33.575	299.142	241.913	33.909	4.588	2.147	124.594	12.738	2.915	9.353	5.058	0.1022
2017	35.780	324.868	262.718	36.825	4.982	2.291	132.935	13.833	3.166	10.157	5.493	0.1041
2018	38.176	352.807	285.311	39.992	5.411	2.447	141.993	15.023	3.438	11.030	5.965	0.1058
2019	40.777	383.148	309.848	43.431	5.876	2.616	151.830	16.315	3.734	11.979	6.478	0.1075
2020	43.602	416.099	336.495	47.166	6.382	2.800	162.513	17.7182	4.055	13.009	7.035	0.1090

Adjusted Valuation

$VAL_{DCF/DG} = PV_{DCF} + PV_{CV} = 59.357 – 411.054 = -351.697$

$VAL_{DCF/KVD} = PV_{DCF} + PV_{CV} = 59.357 -86.815 = -27.458$

$APV = V_{FCF} + V_{TAX} = 27.78 + 3.683 = 31.46$

$E\pi = IC_0 + PV_{DCF/E\pi} + PV_{CV} = 109.842 + 29.315 – 198.581 = -59.424$

Note the changes between these model valuations and those performed without the expense adjustment. The changes are substantial. These are driven by the changes in NOPLAT, FCF and ROIC; also substantial. Finally, even though the firm's revenues and income variables are rising, and expenses are rising at a slower rate than revenues, we see that the valuations are largely worse than before. This motivates a consideration of the structural weakness of the valuation forms being used – as WACC < g we see negative values are too often presented.