Forecasting Value: DCF/KVD[1]
Farm Hill Group, Ltd.
In-Class Problem

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 very interested in the firm based on the expectation it can lower Farm Hill operating costs by 3%[2] and improve sales by 2%[3], as a result of its combined buying power and managerial excellence, thereby increasing profits generally and increasing stakeholder value. While your client accepts Farm Hill's WACC to be a reasonable approximation for the cost of capital in an investment of this sort, you've been asked to determine if there may be a way to acquire the firm at or near its current enterprise value and still realize a 12% return.

Farm Hill manufactures products domestically and enjoys a competitive advantage over other producers based on innovation and quality rather than price. 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 (3% thereafter) 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. Farm Hill's product line includes doors specifically designed for the upscale, remodel market from which it is expected to drive an added 2%, above and beyond the market and leader increases, in annual sales.

Interest rates for credit worthy corporate borrowers, such as Farm Hill, 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 risk-free firms in this industry 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. The firm's outstanding bonds have a coupon rate of 14%, pay interest twice a year, and at the end of 2014, 15 years remaining to maturity, and are currently callable.

Finally, your client is interested in maintaining Farm Hill's Private Equity investment as it's 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, the following items will aid you in forming a production value for the firm and its assets.

The firm's combined federal and state corporate tax rate for the base year is 34%.

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

[2] This expected decrease in costs may be thought of as a "best owner" decrease

[3] This expected increase in sales may be thought of as a "best owner" increase; it is expected to persistent for a period of two years

1. **Calculate Farm Hill's NOPLAT, Invested Capital, ROIC 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.
   While
   NOPLAT = EBIT x (1-T)
   $\qquad$ = 8.65 x (1-.34) = 5.709

   Invested Capital = Net Working Capital + Fixed Operating Assets
   $\qquad\qquad$ = (93.483 − 30. 571) + (32.17 + 14.76) = 109.843

   ROIC = $\dfrac{NOPLAT}{IC}$ = $\dfrac{5.709}{109.843}$ = .052 or 5.20%

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

   $\qquad\qquad$ V = E + P + D = 62.663 + 0.125 + 55.52 = 118.31
   $\qquad\qquad$ R_{ECAPM} = $R_F + (R_M − R_F)\beta$
   $\qquad\qquad\quad$ = .04 + (.07 - .04)(0.96) = .0688 or 6.88%
   $\qquad\qquad$ R_P = $\dfrac{Preferred\ Dividends}{Preferred\ Stock}$ = $\dfrac{0.025}{0.125}$ = 0.20 or 20%
   $\qquad\qquad$ R_D = YTM = .06 or 6%

   = $\left(\dfrac{62.663}{118.310} \; x \; 0.0688\right) + \left(\dfrac{0.125}{118.310} \; x \; 0.20\right) + \left(\dfrac{55.522}{118.310} \; x \; 0.06\right)(1 − 0.34)$
   = 0.03644 + 0.0002113 + 0.01858
   = .0552 or 5.520%

2. **What is the current market value of Farm Hill's bonds?**

   Market Value of Bonds = $C \; \dfrac{\left(1-\frac{1}{(1+YTM)^N}\right)}{YTM} + \dfrac{Face}{(1+YTM)^N}$

   $\qquad\qquad$ = $70 \; \dfrac{\left(1-\frac{1}{(1.03)^{30}}\right)}{.03} + \dfrac{1000}{(1.03)^{30}}$

   $\qquad\qquad$ = 1,784.017 per bond

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

3. **What is Farm Hill's current enterprise value (market based)?**

   $EV = Market\ Cap\ Equity + Market\ Value\ Debt − Cash.$ In this case the market value of equity includes common and preferred stock valued as of 12/31/2014 at 62.663 and 0.125 respectively. Market value of debt include the market value of the firm's bonds at 54.5624 plus the outstanding balance on the firm's mortgage of 0.96 for a total of 55.5224. The firm's cash (cash and securities) is 7.933.

   EV = 62.663 + 0.125 + 55.522 − 7.933 = 110.377

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

Remodel Line	2.00%	Additional sales growth as a result of upscale, remodel door line
Market	6.00%	Market increase forecast
Quality	<u>0.60%</u>	Quality product increase, proportionately; over and above market
Total Increase	8.60%	

Note that national expansion increase at 3.5% is not expressly used as this is already reflected in the 6% general market increase.

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

FR$_{REV}$ = 8.60%

FR$_{COGS}$ = $\dfrac{COGS_t}{Revenue_t}$ = $\dfrac{211.460}{253.64}$ = 0.8337 or 83.37%

FR$_{S\&A}$ = $\dfrac{S\&A_t}{Revenue_t}$ = $\dfrac{29.640}{253.64}$ = 0.1169 or 11.69%

FR$_{DEP}$ = $\dfrac{Depresication_t}{Revenue_t}$ = $\dfrac{3.890}{253.640}$ = 0.0153 or 1.53%

FR$_{Interest}$ = $\dfrac{Interest_t}{Debt_{t-1}}$ = $\dfrac{4.360}{26.65}$ = 0.1636 or 16.36%

Note that I haven't changed any of the expense forecasts to reflect the "best owner" decrease in costs referenced in the introduction. Since forecast ratios express an expense as a percentage of revenues, it's best to identify the forecast ratio, convert the ratio to a value, and then reduce that value by the expected expense decrease. In this case I'm not going to decrease depreciation as this is not a directly manageable expense but is a function of the cost of existing capital equipment and IRS published depreciation schedules. I'm also not going to decrease interest expense here as these are functions of long term debt contracts. So it's really only COGS and S&A that might immediately be managed. At the end of this solution set I offer an alternative set of expense reductions inclusive of reduced interest expense.

6. **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.**

I've held the firm's ratio of debt to invested capital (D/IC) and revenue to invested capital (Revenue/IC) constant in this projection, based on 2014 values. Doing this supposes the firm's invested capital is, in part, a function of its willingness to attract debt capital and employ leverage. This results in projecting Net Working Capital (NWC) and Fixed Asset (FA) changes as a function of revenue changes as these variables follow changes in revenue of 8.6%. Ultimately this allows us to project FCF.

To project values for 2020 I've assumed a long run revenue growth rate of 3%. Though this is slightly higher than current expectations for changes in GDP, it seems reasonable for a firm in the building products industry with such a strong leadership role.

Year	Debt	Revenue	COGS	S & A Exp	Dep	EBIT	Int Exp	IC	NOPLAT	NWC	FA	FCF	ROIC
2014	31.544	253.640	211.460	29.640	3.890	8.650	4.360	109.842	5.709	62.913	46.930	-0.8035	0.0520
2015	34.257	275.453	229.646	32.189	4.225	9.394	5.161	119.289	6.200	68.323	50.966	-3.246	0.0520
2016	37.203	299.142	249.395	34.957	4.588	10.202	5.604	129.548	6.733	74.199	55.349	-3.526	0.0520
2017	40.402	324.868	270.843	37.964	4.982	11.079	6.086	140.689	7.312	80.580	60.109	-3.829	0.0520
2018	43.877	352.807	294.136	41.228	5.411	12.032	6.610	152.788	7.941	87.510	65.278	-4.158	0.0520
2019	47.650	383.148	319.431	44.774	5.876	13.067	7.178	165.928	8.624	95.036	70.892	-4.516	0.0520
2020	49.080	394.643	329.014	46.117	6.053	13.459	7.796	170.906	8.883	97.887	73.019	3.905	0.0520

7. **Provide FCF, KVD, and FMM model valuations using a 5-year explicit forecast period.** *You should use the most recently observed EV/EBIT multiple to motivate the FMM model. This will result in three separate valuations.*

I'll give detail on Value$_{KVD}$ = PV$_{FCF}$ + PV$_{CV}$, and will give multi-columnar valuation outcomes for both the KVD and FCF models.

This breaks into three parts: the use of a DCF Model to assign value during the explicit period, a KVD Model to assign value beyond that point, and an FMM model. In order to assign value based on a DCF model, we'll use the FCF 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.

The KVD Models is calculated in two parts: Part One is a simple discounted cash flow model based on projected FCF and assigns value during the explicit forecast period based on a discount rate and time – in this case we're using WACC as the discount rate.

We can think about the DCF equation as follows:

$$PV_{FCF} = \sum \frac{FCF_t}{(1+WACC)^t}$$

$$= \frac{-3.246}{1.0552^1} + \frac{-3.526}{1.0552^2} + \frac{-3.829}{1.0552^3} + \frac{-4.158}{1.0552^4} + \frac{-4.516}{1.0552^5}$$

$$= --3.077 - 3.166 - 3.259 - 3.354 - 3.451$$

$$= -16.306 \qquad\qquad \text{This is } PV_{FCF}$$

Part Two is the Key Driver Model (KVD) and assigns a continuing value after the explicit period. Part Two creates a value in the future, the same year as the end of the explicit period, and needs to be discounted back to a present value to be relevant to us – we'll use WACC for this as well.

$$CV = \frac{NOPLAT_{2020}\left(1-\frac{g}{ROIC_{2020}}\right)}{WACC-g} = \frac{8.883\left(1-\frac{0.03}{0,0552}\right)}{0.0552-0.03} = 148.822$$

$$PV_{CV} = \frac{CV}{(1+WACC)^t} = \frac{148.822}{1.0552^5} = 113.742$$

As VAL$_{KVD}$ = PV$_{FCF}$ + PV$_{CV}$, we now sum the terms as follows: VAL$_{DCF/KVD}$ = -16.306 + 113.742 = 97.436

The FMM model uses the same inputs for the explicit period as the FCF and KVD models, but uses a different method for calculating the continuing value (which is the same as an enterprise value at that point in time). The model uses an EV multiple, in this case an EV/EBIT multiple more commonly referred to as an EBIT multiple. In this case we're using the observed EBIT multiple from the base year of 12.76 (see Fin Stmt work sheet) multiple and multiplying it by EBIT1 for the continuation period (the EBIT for 2020): 12.76 x 13.459 = 171.737.

		FCF				**KVD**				**FMM**		
Period		FCF	PV_{FCF}	$\sum PV_{FCF}$		FCF	PV_{FCF}	$\sum PV_{FCF}$		FCF	PV_{FCF}	$\sum PV_{FCF}$
	0	-0.804				-0.804				-0.804		
	1	-3.246	-3.077	-3.077		-3.246	-3.077	-3.077		-3.246	-3.077	-3.077
	2	-3.526	-3.166	-6.243		-3.526	-3.166	-6.243		-3.526	-3.166	-6.243
	3	-3.829	-3.259	-9.501		-3.829	-3.259	-9.501		-3.829	-3.259	-9.501
	4	-4.158	-3.354	-12.855		-4.158	-3.354	-12.855		-4.158	-3.354	-12.855
0	5	-4.516	-3.451	-16.306		-4.516	-3.451	-16.306		-4.516	-3.451	-16.306
1	6	3.905				3.905				3.905		
			PV_{FCF}	-16.306			PV_{DCF}	-16.306			PV_{DCF}	-16.306
			CV_{FCF}	154.740			CV_{KVD}	148.822			CV_{FMM}	171.737
			PV_{CV}	118.265			PV_{CV}	113.742			PV_{CV}	131.256
			VAL_{FCF}	101.959			VAL_{KVD}	97.436			VAL_{FMM}	114.950

The remaining questions are intended to assist you in seeing how you might justify offering a higher price for an asset than that which might be estimated given the firm's current condition (growth plans, WACC, etc) and enterprise value.

8. **Given the values you've estimated in question 7, above, do you believe Farm Hill reasonably priced in the current market climate?** *Give this some attention and consider the estimated values versus the calculated enterprise value (EV).*

   With an EV of 110.38 and estimated values of 97.436 (KVD), 101.959 (FCF), and 114.95 (FMM) it would appear the market may have fairly valued Farm Hill fairly (the average of the three values being roughly equal to the Enterprise Value). However, were a firm to seek to acquire Farm Hill, it is likely the offer would need to be above EV, and as such. It's altogether possible market agents have foreseen this and priced in a potential offer.

9. **Estimate the firm's value using FCF, KVD, and FMM models but this time do so from the standpoint of the potential buyer. Be sure to consider the buyer's discount rate, revenue and expense improvements the buyer expects to obtain through the acquisition, and any other adjustment to the forecast you would think the buyer would want to make to determine if paying a price at or modestly above the current enterprise value is warranted.**

   Our sales forecast rate of 8.6% did not include a BOP on sales of 2%. I'm making the assumption that this is not a persistent increase for each period and am reducing the sales growth rate by 1% after the first year and the other 1% after the second.

I'm also going to assume the BOP for expense (3%) is consistent for each of the appropriate expense categories, which would not include either depreciation or interest. So, I've reduced the forecasted expense for COGS and S&A by 3% for each period as indicated. I've not included this BOP for depreciation based on the premise that depreciation is exogenous and not within an owner's control.

I've finally taken a more aggressive stance on an observable BOP for interest. Though this was not expressly stated as an adjustment the potential new owner might seek to make, it only makes sense they'd want to do so. We're told the firm can borrow at 6% and the firm's bonds are callable. So I've indicated a substantial interest savings by refinancing all of the debt at 6% (recall the coupon rate on the bonds are at 14%). This has no impact on EBIT or NOPLAT, but does impact EBIT, NOPLAT or FCF, but clearly effects Net Income and NOPAT. There is also no impact on WACC, which is 5.52%.

The overall impact on the firm for the relevant BOPs is to increase ROIC from 5.2% to 9.54%. This results in ROIC > WACC, whereas we'd been facing a scenario in which ROIC < WACC such that growth destroys value for the firm. The following provides a revenue and expense forecast (values in millions):

	Year	Debt	Rev	COGS	S & A	Dep	EBIT	Int	IC	NOPLAT	NWC	FA	FCF	ROIC
	Forecast Ratios		8.60%	83.37%	11.69%	1.53%		16.36%						
	Adjustments[1,2]		2.00%	3.00%	3.00%			10.36%						
	2014	31.544	253.640	211.460	29.640	3.890	8.650	4.360	109.8425	5.709	62.91	46.930	-0.804	0.0520
1	2015	34.888	280.526	226.859	31.798	4.302	17.567	1.893	121.486	11.594	69.581	51.905	-0.049	0.0954
2	2016	38.237	307.456	248.637	34.851	4.715	19.253	2.093	133.148	12.707	76.261	56.887	1.044	0.0954
3	2017	41.525	333.898	270.020	37.848	5.121	20.909	2.294	144.599	13.800	82.819	61.780	2.349	0.0954
4	2018	45.096	362.613	293.241	41.103	5.561	22.707	2.492	157.035	14.987	89.942	67.093	2.551	0.0954
5	2019	48.975	393.797	318.460	44.638	6.040	24.660	2.706	170.540	16.275	97.677	72.863	2.770	0.0954
	2020	50.444	405.611	328.014	45.977	6.221	25.399	2.939	175.656	16.764	100.607	75.049	11.647	0.0954

And further results in a FCF, KVD and FMM style valuations estimate greater than those obtained in the prior estimation, but only when if we continue to use the firm's cost of capital (WACC). When we consider the buyer's expected rate of return (12%) as the discount rate, the FCF and KVD model values decrease significantly, but the FMM value rises. Why is that? It's because the EV/EBIT multiple of 12.76, though what might be used by the firm, is higher than what an investor might settle on. That shouldn't necessarily surprise us, we would expect a buyer would want to make an offer based on a lower valuation multiple pay - after all, we see the Shark Tank investors do it all the time! If you work on this some you may find that the multiple at which the FCF, KVD, and FMM values converge is about 6.

	FCF				KVD				FMM		
	FCF	**PV$_{DCF(FCF)}$**	**Total** **PV$_{DCF(FCF)}$**		**FCF**	**PV$_{DCF(FCF)}$**	**Total** **PV$_{DCF(FCF)}$**		**FCF**	**PV$_{DCF(FCF)}$**	**Total** **PV$_{DCF(FCF)}$**
	-0.804				-0.804				-0.804		
	-0.049	-0.044	-0.044		-0.049	-0.044	-0.044		-0.049	-0.044	-0.044
	1.044	0.833	0.788		1.044	0.833	0.788		1.044	0.833	0.788
	2.349	1.672	2.460		2.349	1.672	2.460		2.349	1.672	2.460
	2.551	1.621	4.082		2.551	1.621	4.082		2.551	1.621	4.082
	2.770	1.572	5.654		2.770	1.572	5.654		2.770	1.572	5.654
	11.647				11.647				11.647		
		PV$_{DCF(FCF)}$	5.654			**PV$_{DCF}$**	5.654	**Observed**		**PV$_{DCF}$**	5.654
		CV$_{FCF}$	129.416			**CV$_{KVD}$**	127.711	**EV/EBIT**		**CV$_{FMM}$**	324.106
		PV$_{CV(FCF)}$	73.434			**PV$_{CV}$**	72.467	**12.760**		**PV$_{CV}$**	183.906
		VALUE$_{FCF}$	79.088			**VALUE$_{KVD}$**	78.120			**VALUE$_{FMM}$**	189.560

It's worth pointing out here that we might usually expect the valuation estimate to decrease when using the investor's expected return as the discount rate, but in this case the estimates are all higher, and the FMM estimate is MUCH higher, nearly double! Why is that? Because we saw the slight increases in revenue and reductions in expense make a substantial difference in the firm's value, so much so that the potential investor may now pursue the acquisition with a greater degree of confidence.

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

	2013	2014			2013	2014
Current Assets				**Current Liabilitites**		
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		Total	34.510	30.571
Total	94.950	93.483				
				Long Term Debt		
Fixed Assets				Mortgages	0.320	0.960
PPE	28.130	32.170		Bonds	26.330	30.584
Total	28.130	32.170		Total	26.650	31.544
Other Assets				**Owner's Equity**		
Private Equity	14.760	14.760		Common Stock	5.440	5.570
				Preferred Stock	0.080	0.090
Total Assets	137.840	140.413		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	Common Stock Value	2013	2014
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
Book Value / Liabilities	26.650	31.544	Market Value (millions)	65.280	62.663

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

	2013	2014
Income		
Product Sales	234.980	252.780
Private Equity	0.550	0.860
Total Income	235.530	253.640
Expenses		
COGS	196.690	211.460
Sales & Admin	23.500	29.640
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