Forecasting Value: DCF/KVD[1]
Farm Hill Group, Ltd.
In-Class Problem[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, 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 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, the following items will aid you in forming a production value for the firm and its assets.

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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.

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.

   NOPLAT = (Operating Rev – Operating Exp) +Dep – 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%

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

   $V = E + P + D = 62.663 + 0.125 + 55.4439 = 118.3104$

   $R_{ECAPM} = R_F + (R_M - R_F)\beta$
   = .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%

   $R_D = \frac{Interest\ Paid_{2014}}{Long-term\ Debt_{2013}} = \frac{4.36}{26.65} = 0.1636$ or 16.36%

   $= \left(\frac{62.663}{118.3104} \times 0.0688\right) + \left(\frac{0.125}{118.3104} \times 0.20\right) + \left(\frac{55.5224}{118.3104} \times 0.1636\right)(1 - 0.32)$

   = 0.03644 + 0.0002113 + (0.07678)(0.68)

   = .0889 or 8.89%

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

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

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

   = 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.

$EV = 62.663 + \ 0.125 + 55.5224 - 7.93 = 110.3804$

4. 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% 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$_{Interest}$ $= \dfrac{Interest_t}{Debt_{t-1}} = \dfrac{4.360}{26.65} = 0.16.6$ 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.**

Notice that I've changed the firm's level of debt and invested capital in this projection. I've done this by supposing the firm retains a constant debt/invested capital ratio and that invested capital is changing as Net Working Capital (NWC) and Net Capital Spending (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, wh ich 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 $IC_1 = IC_0 + \Delta IC = IC_0 + NCS + \Delta NWC$.

Year	Debt	Revenue	COGS	S & A Expense	Dep	Interest Expense*	Invested Capital	NOPLAT	Δ NWC	NCS	ROIC
2014	31.544	253.640	211.460	29.640	3.890	4.360	109.842	5.882	2.472	7.930	0.0535
2015	31.544	275.453	222.756	31.223	4.225	5.161	121.139	11.729	2.685	8.612	0.0968
2016	34.788	299.142	241.913	33.909	4.588	5.691	133.407	12.738	2.915	9.353	0.0955
2017	38.311	324.868	262.718	36.825	4.982	6.268	146.730	13.833	3.166	10.157	0.0943
2018	42.137	352.807	285.311	39.992	5.411	6.894	161.199	15.023	3.438	11.030	0.0932
2019	46.292	383.148	309.848	43.431	5.876	7.573	176.912	16.315	3.734	11.979	0.0922
2020	50.805	398.474	322.242	45.168	6.111	8.312	193.977	16.968	4.055	13.009	0.0875

7. **Provide a DCF/KVD Model value forecast using a 5-year explicit value period.**

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.

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

$$CV = \frac{NOPLAT_{2020}\left(1 - \frac{g}{ROIC_{2020}}\right)}{WACC - g} = \frac{16.9677\left(1 - \frac{0.04}{0,0875}\right)}{0.0889 - 0.04} = 188.4736$$

$$PV_{CV} = \frac{CV}{(1+WACC)^t} = \frac{188.4736}{1.0889^5} = 123.1379$$

Now you can think about the DCF equation as follows:

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

$$= \frac{11.729}{1.08389^1} + \frac{12.738}{1.0889^2} + \frac{13.8335}{1.0889^3} + \frac{15.0231}{1.0889^4} + \frac{16.3151}{1.08839^5}$$

$$= 10.7721 + 10.7438 + 10.7156 + 10.6874 + 10.6594$$

$$= 53.5783 \qquad\qquad\qquad \text{This is } PV_{DCF}$$

$$Value_{DCF/KVD} = 53.5783 + 123.1379 = 176.7162$$

8. **What is the firm's $\frac{NOPLAT}{Enterprise\ Value}$ ratio and what relevance do you suppose this might hold?**

The firm's $\frac{NOPLAT}{Enterprise\ Value} = \frac{5.882}{110.38}$. If we turn this around and consider it as the firm's $\frac{EV}{NOPLAT}$ ratio it becomes a form of an earnings multiple: $\frac{EV}{NOPLAT} = \frac{110.38}{5.882} = 18.7657$, or the firm's value is 18.7657 times its earnings as observed via NOPLAT.

This might seem high, so let's consider the firm's PE ratio becomes $\frac{Price}{Earnings} = \frac{Mkt\ Cap\ Common}{NI} = \frac{62.663}{2.917} = 21.482$. With a PE ratio at these levels the market is simply affirming that it expects meaningful increases in the firm's earnings over time. Compared to other firms these are not a high ratios.

9. **Given your assessment for this firm, how else might you seek to improve the firm's value were you a potential new owner?**

We see that the firm has a high R_D (16.36%) largely effected by the coupon rate on its bonds. As the bonds are callable it appears it would make sense to refinance the bonds (call the bonds and pay them off with a new and simultaneous bond offering) and also include the mortgage in the new bond offering since a quick assessment suggests its interest rate is also higher than the 6% YTM available for this type of firm in the current market. Given expectations of rising interest rates (see introduction) we would want to do this ASAP rather than wait.

The market value of the firm's bonds were high as a result of them having been issued with a high coupon rate (14%) compared to the current rate of 6% (they appear to have been trading at a premium). As we refinance the firm's debt the new market value becomes the amount of the refinance which for our purposes is simply the book value (outstanding balances) of the debt. As a result the weights change **AND** R_D changes such that WACC falls from 8.89% to 5.96% (which is significant) as follows:

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

$$V = E + P + D = 31.54 + 0.125 + 55.4439 = 94.328$$

$$R_{ECAPM} = R_F + (R_M - R_F)\beta$$

$$= .04 + (.07 - .04)(0.96) = .0688 \text{ or } 6.88\%$$

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

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

$$= \left(\frac{62.663}{94.332} \; x \; 0.0688\right) + \left(\frac{0.125}{94.332} \; x \; 0.20\right) + \left(\frac{31.544}{94.332} \; x \; 0.06\right)(1 - 0.32)$$

$$= 0.0457 + 0.000265 + (0.02006)(0.68)$$

$$= .0596 \text{ or } 5.961\%$$

Modigliani and Miller have argued that a firm's capital structure has no effect on its value, and we've discussed how this appears largely accurate, but if WACC has changed, then VALUE will also change.

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

$$CV = \frac{NOPLAT_{2020}\left(1 - \frac{g}{ROIC_{2020}}\right)}{WACC - g} = \frac{16.9377\left(1 - \frac{0.04}{0,0875}\right)}{0.0596 - 0.04} = 496.5707$$

$$PV_{CV} = \frac{CV}{(1+WACC)^t} = \frac{496.5707}{1.0596^5} = 351.5354$$

Now you can think about the DCF equation as follows:

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

$$= \frac{11.729}{1.0596^1} + \frac{12.738}{1.0596^2} + \frac{13.8335}{1.0596^3} + \frac{15.0231}{1.0596^4} + \frac{16.3151}{1.059369^5}$$

$$= 11.0694 + 11.3451 + 11.6276 + 11.9172 + 12.214$$

$$= 58.1734 \qquad\qquad\qquad\qquad \text{This is PV}_{DCF}$$

$$\text{Value}_{DCF/KVD} = 58.1734 + 351.5354 = 409.7088$$

So… did we just disprove Modigliani and Miller? Not expressly, because the theorem states the capital structure doesn't effect value. It does not state that the cost of capital doesn't change the firm's value. But honestly, we did come up with a pretty strong argument that makes M&M less obviously and consistently accurate.

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

Current Assets	2013	2014			Current Liabilitites	2013	2014
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

Income	2013	2014
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	2013	2014
Dividends (Common)	1.360	1.413
Dividends (Preferred)	0.020	0.025
Addition to Retained Earnings	4.046	1.479