

## USING THE EQUITY RESIDUAL APPROACH TO VALUATION: AN EXAMPLE

Planned changes in capital structure over time increase the complexity of valuing a company. In particular, the analyst has to accommodate the potential changes in a firm's debt/equity mix. Such changes can affect shareholders' exposure to risk. This note provides one method of incorporating a changing capital structure into the equity residual valuation of a company. While such an analytic technique is useful, careful application must be wary of the approximations made in implementing the approach.

### The Situation

To illustrate the issue consider an example: NEWTIME Inc. is the target of an LBO attempt. Exhibit 1 contains the forecasted net income and debt schedule under the proposed LBO. The proposed purchase price is \$1.6 billion which includes \$1.2 billion in debt with an interest rate of 11.5%. The owners plan to pay down the debt over the next eight years with the aim of achieving a steady state debt-to-capital ratio (in market value terms) of 35% at the end of year 8. After year 8 the steady state free cash flows are anticipated to have a zero growth rate. At that time the firm will refinance the existing debt to achieve the target capital structure of 35% debt. Exhibit 2 contains relevant market data.

The challenge is to value the equity position in NEWTIME assuming the LBO occurs. We will proceed in two stages: A) estimating the residual cash flows and terminal value and B) combining these cash flows with a set of equity required rates of return.

### A. Estimate Residual Cash Flows and Terminal Value.

Step 1. Construct the residual cash flows (cash flows to equity) for years 1 – 8 using the projections in Exhibit 1.

**Figure 1**

	<b>Residual Cash Flows</b>									
Year	<u>0</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	
Ending Debt	\$ 1,200	\$ 1,155	\$ 1,100	\$ 1,050	\$ 1,000	\$ 925	\$ 840	\$ 740	\$ 640	
EBIT		\$ 235.00	\$ 244.40	\$ 254.18	\$ 264.34	\$ 274.92	\$ 285.91	\$ 297.35	\$ 309.24	
<u>Interest</u>		<u>138.00</u>	<u>132.83</u>	<u>126.50</u>	<u>120.75</u>	<u>115.00</u>	<u>106.38</u>	<u>96.60</u>	<u>85.10</u>	
PBT		97.00	111.58	127.68	143.59	159.92	179.54	200.75	224.14	
<u>Tax (33%)</u>		<u>32.01</u>	<u>36.82</u>	<u>42.13</u>	<u>47.39</u>	<u>52.77</u>	<u>59.25</u>	<u>66.25</u>	<u>73.97</u>	
Net Income		\$ 64.99	\$ 74.76	\$ 85.54	\$ 96.21	\$ 107.14	\$ 120.29	\$ 134.50	\$ 150.18	
+deprec		80.00	80.00	80.00	80.00	80.00	80.00	80.00	80.00	
-Cap ex		(72.00)	(72.00)	(72.00)	(72.00)	(72.00)	(72.00)	(72.00)	(72.00)	
-change in NWC		(21.00)	(21.00)	(21.00)	(21.00)	(21.00)	(21.00)	(21.00)	(21.00)	
<u>Repay Debt</u>		<u>(45.00)</u>	<u>(55.00)</u>	<u>(50.00)</u>	<u>(50.00)</u>	<u>(75.00)</u>	<u>(85.00)</u>	<u>(100.00)</u>	<u>(100.00)</u>	
RCF		\$ 6.99	\$ 6.76	\$ 22.54	\$ 33.21	\$ 19.14	\$ 22.29	\$ 21.50	\$ 37.18	

Step 2. Estimate steady state terminal value:

•Estimate Steady state WACC:  $WACC = K_D \times (1 - T) \times \frac{Debt}{Capital} + K_E \times \frac{Equity}{Capital}$

$$= .09 \times (1 - .33) \times .35 + .13 \times .65 = .0211 + .0845 = .1056 = 10.56\%$$

Where  $K_D = 9\%$  based on Exhibit 2,  $K_E = 13\%$  is based on the CAPM ( $R_F = 8\%$  and Market Risk Premium is 5.6%) and the levered Beta of .98 based on an unlevered Beta of .72, tax rate of 33% and a debt-to-equity ratio of .54.

(Note:  $D/(D+E) = .35$  implies that  $D/E = .54$ ). Note  $K_E$  is rounded here.

$$B_L = B_U \times (1 + (1 - T) \times \frac{Debt}{Equity})$$

•Estimate Free Cash Flows for Year 8:

**Figure 2**

<b>Steady State</b>	
EBIT	\$ 309.24
<u>Interest</u>	<u>0</u>
PBT	309.24
<u>Tax</u>	<u>102.05</u>
Net Income	\$ 207.19
+deprec	80
-Cap ex	-72
-change in NWC	-21
<u>Repay Debt</u>	<u>0</u>
FCF	\$ 194.19



and the long run target of 35% debt to capital (i.e., Debt to Equity of .35 to .65 = .53) estimate a cost of equity using the CAPM.

$$\begin{aligned} B_{lev} &= B_{ulev} \left( 1 + \frac{(1-T)D}{E} \right) \\ &= .72 \left( 1 + \frac{(1-.33).35}{.65} \right) \\ &= .98 \end{aligned}$$

$$K_e = 8\% + .98(5.6\%) = 13.47\%$$

Now we can value the residual cash flows from Figure 3 using a 13.47% cost of equity. The resulting value estimate for the equity stake in the LBO is \$526.18 million. This valuation suggests the purchase is a good deal since you only have to put up \$400 million of equity in the LBO (\$1.6 billion – 1.2 billion (debt) = \$.4 billion = \$400 million equity).

A bit of reflection may lead one to think this is an overestimate of value. After all, the LBO only gets to a 35% debt structure in year 8 if the projections materialize. At year 0, the transaction is much more highly levered and exposes the equity owner to more risk. Quite likely the 13.47% calculated is too low a discount rate considering this extra financial risk during the first years of the LBO.

One could pick a rate higher than 13.47%, but how much higher? Theory offers one bit of guidance as the next section shows.

## 2. Adjusting the cost of equity each year

If we assume that business risk (i.e. the unlevered beta) is constant over time, then the shareholders' risk (i.e. the levered beta) will change as the debt/equity mix changes. An obvious problem is that we can't observe the market value of equity to get a market value D/E ratio. One way to navigate the problem is to work backwards. Based on our estimate of terminal value, we can estimate the debt/equity mix in the last year and hence the appropriate equity required rate of return for that year. Using this required return we can estimate the firm's equity value one year prior to the last year as the present value of the terminal value of equity plus the present value of residual cash flow in the last year. Now we have an estimate of equity value in the next to last year of our horizon. We can use the amount of outstanding debt in the next to last year to estimate the firm's D/E ratio. This D/E ratio allows us to estimate the required return appropriate in the year prior to the last year. If the D/E has changed the levered beta and equity required return will change. Now we can repeat the process to get to two years prior to the last year and so on. The overall result is that we can map out how the firm's market value D/E changes over time and hence how the equity required return changes over time. For instance, in an LBO that is paying down debt over time, we would expect the equity required return to be higher in the early years but drop as the firm pays down debt and reduces its D/E ratio.

Step 1. Estimate the market value of equity in year 7.

- Estimate the equity required return in the last year:

D/E = .54 so the levered Beta is .98 (see above)

$$K_E = .08 + .98 (.056) = .1347 = 13.47\%$$

- Estimate the market value of equity in year 7:

$$\text{Equity (year 7)} = \frac{\text{RcF (yr. 8)} + \text{Equity Value (yr. 8)}}{1 + .1347}$$

$$= \frac{37.18 + 1,199.00}{1.1347} = \$1089.39$$

Step 2. Calculate the debt-equity ratio in year 7

Debt = \$740 (from Exhibit 1)

Equity = \$1089.39 (from above calculations)

$$D/E = \$740/\$1089.39 = .68$$

Now you can repeat the process in step 1 to get to year 6, 5, 4, . . . Figure 4 shows the results for the D/E ratio, the levered Beta and hence the levered cost of equity.

**Figure 4**

**Estimate of the Equity Value**

<u>Year</u>	<u>0</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>
<b>Ending Debt</b>	1200	1155	1100	1050	1000	925	840	740	640
<b>Ending Equity</b>	463.57	539.18	623.02	700.66	776.14	872.61	975.61	1089.39	1199.00
<b>D/E</b>	2.59	2.14	1.77	1.50	1.29	1.06	0.86	0.68	0.53
<b>Levered Beta</b>	1.97	1.75	1.57	1.44	1.34	1.23	1.14	1.05	0.98
<b>Levered Ke</b>	19.02%	17.82%	16.80%	16.08%	15.51%	14.90%	14.36%	13.87%	13.47%
RCF		\$6.99	\$6.67	\$22.54	\$33.21	\$19.14	\$22.29	\$21.50	\$37.18
<u>Terminal Equity</u>									<u>1,199.00</u>
Total RCF		\$6.99	\$6.67	\$22.54	\$33.21	\$19.14	\$22.29	\$21.50	\$1,236.18
Levered Ke		17.82%	16.80%	16.08%	15.51%	14.90%	14.36%	13.87%	13.47%
Discount Factor		0.8488	0.8562	0.8615	0.8657	0.8704	0.8744	0.8782	0.8813
Cumulative Disc. Factor		0.8488	0.7267	0.6260	0.5419	0.4717	0.4125	0.3622	0.3192
Pres. Val. RCF		\$5.93	\$4.91	\$14.11	\$18.00	\$9.03	\$9.19	\$7.79	\$394.61
Total Pres. Val. RCF	\$463.57								

Step 3. Finally we can summarize the results as shown in Figure 4. The value of equity at time 0 is \$463.57. This figure can be calculated in two ways. One is the process shown above where we work back one year at a time. This is shown in the upper portion of Figure 4. Second is application of the cumulative discount factors to the year by year RCF and the terminal value in year 8. This is shown at the bottom of Figure 4. The cumulative discount factor is the result of multiplying together the relevant discount factors for each individual year, the two procedures are equivalent mathematically.

**The Valuation Estimate**

The valuation suggests that the equity in NEWTIME is worth \$463 million. Looking back (\$463 billion) at the proposed LBO, this value implies that the buyers are getting equity worth \$463 billion by putting up .4 billion of their equity funds.

<u>Proposed Transaction</u>	
Enterprise Price	\$1.6 billion
- Debt	<u>1.2 billion</u>
Equity Needed to Purchase	.4 billion

Put another way the valuation suggests the enterprise is worth \$.463 (Equity) + \$1.2 (Debt) = \$1.663 billion, only slightly above the \$1.6 billion purchase price.

## **Practical Implications**

In the process of doing the valuation the equity required return (levered  $K_E$ ) dropped from 17.8% in the early years to 13.47% by year 8. The drop was due to a declining debt equity mix as the firm repaid debt. This drop lowered the shareholders' exposure to risk. Note also that the value estimate of \$463 million is lower than the \$526 figure we obtained if we just used a constant discount rate of 13.47%. The lowering of value estimate is precisely the extra penalty for financial risk.

While the above analysis has solid theoretical underpinnings, it depends heavily on levering betas according to a particular formula. The savvy analyst should take these estimates with a grain of salt. As testament, many LBO practitioners use very high hurdle rates (often in the 30% range) and may keep them the same over a few years. Nonetheless, an accomplished analyst should have the analytical know how to deal with the type of valuation challenge NEWTIME presents.

## **A Comment**

Some LBO practitioners often look at deals in terms of internal rates of return. At a purchase price of \$400 million (equity), the RCF in Figure 4 yields an IRR of 17.75%. Would you invest in this LBO?

Exhibit 1

**USING THE EQUITY RESIDUAL APPROACH TO VALUATION  
WHEN THE CAPITAL STRUCTURE IS CHANGING: AN EXAMPLE**

Projected Income statement

<b>Year</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>
<b>Beginning Debt</b>	\$ 1,200	\$ 1,155	\$ 1,100	\$ 1,050	\$ 1,000	\$ 925	\$ 840	\$ 740
<b>Ending Debt</b>	\$ 1,155	\$ 1,100	\$ 1,050	\$ 1,000	\$ 925	\$ 840	\$ 740	\$ 640
<b>Deprec</b>	80	80	80	80	80	80	80	80
<b>Cap Ex</b>	72	72	72	72	72	72	72	72
<b>Change in NWC</b>	21	21	21	21	21	21	21	21
<b>EBIT</b>	\$ 235.00	\$ 244.40	\$ 254.18	\$ 264.34	\$ 274.92	\$ 285.91	\$ 297.35	\$ 309.24
<b>Interest</b>	<u>138.00</u>	<u>132.83</u>	<u>126.50</u>	<u>120.75</u>	<u>115.00</u>	<u>106.38</u>	<u>96.60</u>	<u>85.10</u>
<b>PBT</b>	97.00	111.58	127.68	143.59	159.92	179.54	200.75	224.14
<b>Tax</b>	<u>32.01</u>	<u>36.82</u>	<u>42.13</u>	<u>47.39</u>	<u>52.77</u>	<u>59.25</u>	<u>66.25</u>	<u>73.97</u>
<b>Net Income</b>	\$ 64.99	\$ 74.76	\$ 85.54	\$ 96.21	\$ 107.14	\$ 120.29	\$ 134.50	\$ 150.18

Exhibit 2

**USING THE EQUITY RESIDUAL APPROACH TO VALUATION  
WHEN THE CAPITAL STRUCTURE IS CHANGING: AN EXAMPLE**

Market Data

Risk-free rate	=	8%
Market Risk Premium	=	5.6%
Unlevered Beta	=	.72
Steady State cost of Debt	=	9%
Target steady state debt to Capital ratio	=	35%