Appendix 18A The Adjusted Present Value Approach to Valuing Leveraged Buyouts[1]

Introduction

A leveraged buyout (LBO) is the acquisition by a small group of equity investors of a public or private company financed primarily with debt. The equityholders service the heavy interest and principal payments with cash from operations and/or asset sales. The shareholders generally hope to reverse the LBO within three to seven years by way of a public offering or sale of the company to another firm. A buyout is therefore likely to be successful only if the firm generates enough cash to serve the debt in the early years, and if the company is attractive to other buyers as the buyout matures.

In a leveraged buyout, the equity investors are expected to pay off outstanding principal according to a specific timetable. The owners know that the firm's debt–equity ratio will fall and can forecast the dollar amount of debt needed to finance future operations. Under these circumstances, the adjusted present value (APV) approach is more practical than the weighted average cost of capital (WACC) approach because the capital structure is changing. In this appendix, we illustrate the use of this procedure in valuing the RJR Nabisco transaction, the largest LBO in history.

The RJR Nabisco Buyout In the summer of 1988, the price of RJR stock was hovering around $55 a share. The firm had $5 billion of debt. The firm's CEO, acting in concert with some other senior managers of the firm, announced a bid of $75 per share to take the firm private in a management buyout. Within days of management's offer, Kohlberg, Kravis, and Roberts (KKR) entered the fray with a $90 bid of their own. By the end of November, KKR emerged from the ensuing bidding process with an offer of $109 a share, or $25 billion total. We now use the APV technique to analyze KKR's winning strategy.

The APV method as described in this chapter can be used to value companies as well as projects. Applied in this way, the maximum value of a levered firm (V_L) is its value as an all-equity entity (V_U) plus the discounted value of the interest tax shields from the debt its assets will support (PVTS).[2] This relation can be stated as:

$$\begin{aligned} V_L &= V_U + \text{PVTS} \\ &= \sum_{t=1}^{\infty} \frac{\text{UCF}_t}{(1+R_0)^t} + \sum_{t=1}^{\infty} \frac{t_C R_B B_{t-1}}{(1+R_B)^t} \end{aligned}$$

In the second part of this equation, UCF_t is the unlevered cash flow from operations for year t. Discounting these cash flows by the required return on assets, R_0, yields the all-equity value of the company. B_{t-1} represents the debt balance remaining at the end of year $(t-1)$. Because interest in a given year is based on the debt balance remaining at the end of the previous year, the interest paid in year t is $R_B B_{t-1}$. The numerator of the second

[1]This appendix has been adapted by Isik Inselbag and Howard Kaufold, The Wharton School, University of Pennsylvania, from their unpublished manuscript titled "Analyzing the RJR Nabisco Buyout: An Adjusted Present Value Approach."

[2]We should also deduct from this value any costs of financial distress. However, we would expect these costs to be small in the case of RJR for two reasons. As a firm in the tobacco and food industries, its cash flows are relatively stable and recession resistant. Furthermore, the firm's assets are divisible and attractive to a number of potential buyers, allowing the firm to receive full value if disposition is required.

Table 18A.1
RJR Operating Cash Flows (in $ millions)

	1989	1990	1991	1992	1993
Operating income	$2,620	$3,410	$3,645	$3,950	$4,310
Tax on operating income	891	1,142	1,222	1,326	1,448
Aftertax operating income	1,729	2,268	2,423	2,624	2,862
Add back depreciation	449	475	475	475	475
Less capital expenditures	522	512	525	538	551
Less change in working capital	(203)	(275)	200	225	250
Add proceeds from asset sales	3,545	1,805			
Unlevered cash flow (UCF)	$5,404	$4,311	$2,173	$2,336	$2,536

Table 18A.2
Projected Interest Expenses and Tax Shields (in $ millions)

	1989	1990	1991	1992	1993
Interest expenses	$3,384	$3,004	$3,111	$3,294	$3,483
Interest tax shields (t_C = 34%)	1,151	1,021	1,058	1,120	1,184

term, $t_C R_B B_{t-1}$, is therefore the tax shield for year t. We discount this series of annual tax shields using the rate at which the firm borrows, R_B.[3]

KKR planned to sell several of RJR's food divisions and operate the remaining parts of the firm more efficiently. Table 18A.1 presents KKR's projected unlevered cash flows for RJR under the buyout, adjusting for planned asset sales and operational efficiencies.

With respect to financial strategy, KKR planned a significant increase in leverage with accompanying tax benefits. Specifically, KKR issued almost $24 billion of new debt to complete the buyout, raising annual interest costs to more than $3 billion.[4] Table 18A.2 presents the projected interest expense and tax shields for the transaction.

We now use the data from Tables 18A.1 and 18A.2 to calculate the APV of the RJR buyout. This valuation process is presented in Table 18A.3.

The valuation presented in Table 18A.3 involves four steps.

Step 1: *Calculating the present value of unlevered cash flows for 1989–1993* The unlevered cash flows for 1989–1993 are shown in the last line of Table 18A.1 and the first line of Table 18A.3. These flows are discounted by the required asset return, R_0, which at the time of the buyout was approximately 14 percent. The value as of the end of 1988 of the unlevered cash flows expected from 1989 through 1993 is:

$$\frac{5.404}{1.14} + \frac{4.311}{1.14^2} + \frac{2.173}{1.14^3} + \frac{2.336}{1.14^4} + \frac{2.536}{1.14^5} = \$12.224 \text{ billion}$$

[3]The pretax borrowing rate, R_B, represents the appropriate discount rate for the interest tax shields when there is a precommitment to a specific debt repayment schedule under the terms of the LBO. If debt covenants require that the entire free cash flow be dedicated to debt service, the amount of debt outstanding and, therefore, the interest tax shield at any point in time are a direct function of the operating cash flows of the firm. Because the debt balance is then as risky as the cash flows, the required return on assets should be used to discount the interest tax shields.

[4]A significant portion of this debt was of the payment in kind (PIK) variety, which offers lenders additional bonds instead of cash interest. This PIK debt financing provided KKR with significant tax shields while allowing it to postpone the cash burden of debt service to future years. For simplicity of presentation, Table 18A.2 does not separately show cash versus noncash interest charges.

Table 18A.3
RJR LBO Valuation (in $ millions except share data)

	1989	1990	1991	1992	1993
Unlevered cash flow (UCF)	$ 5,404	$4,311	$2,173	$2,336	$ 2,536
Terminal value: (3% growth after 1993)					
Unlevered terminal value (UTV)					23,746
Terminal value at target debt					26,654
Tax shield in terminal value					2,908
Interest tax shields	1,151	1,021	1,058	1,120	1,184
PV of UCF 1989–1993 at 14%	12,224				
PV of UTV at 14%	12,333				
Total unlevered value	$24,557				
PV of tax shields 1989–1993 at 13.5%	3,834				
PV of tax shield in TV at 13.5%	1,544				
Total value of tax shields	5,378				
Total value	29,935				
Less value of assumed debt	5,000				
Value of equity	$24,935				
Number of shares	229 million				
Value per share	$ 108.9				

Step 2: *Calculating the present value of the unlevered cash flows beyond 1993 (unlevered terminal value)* We assume the unlevered cash flows grow at the modest annual rate of 3 percent after 1993. The value, as of the end of 1993, of these cash flows is equal to the following discounted value of a growing perpetuity:

$$\frac{2.536(1.03)}{0.14 - 0.03} = \$23.746 \text{ billion}$$

This translates to a 1988 value of:

$$\frac{23.746}{1.14^5} = \$12.333 \text{ billion}$$

As in Step 1, the discount rate is the required asset rate of 14 percent.

The total unlevered value of the firm is therefore $12.224 + $12.333 = $24.557 billion.

To calculate the total buyout value, we must add the interest tax shields expected to be realized by debt financing.

Step 3: *Calculating the present value of interest tax shields for 1989–1993* Under the prevailing U.S. tax laws in 1989, every dollar of interest reduced taxes by 34 cents. The present value of the interest tax shield for the period from 1989–1993 can be calculated by discounting the annual tax savings at the pretax average cost of debt, which was approximately 13.5 percent. Using the tax shields from Table 18A.2, the discounted value of these tax shields is calculated as:

$$\frac{1.151}{1.135} + \frac{1.021}{1.135^2} + \frac{1.058}{1.135^3} + \frac{1.120}{1.135^4} + \frac{1.184}{1.135^5} = \$3.834 \text{ billion}$$

Step 4: *Calculating the present value of interest tax shields beyond 1993* Finally, we must calculate the value of tax shields associated with debt used to finance the operations

of the company after 1993. We assume that debt will be reduced and maintained at 25 percent of the value of the firm from that date forward.[5] Under this assumption it is appropriate to use the WACC method to calculate a terminal value for the firm at the target capital structure. This in turn can be decomposed into an all-equity value and a value from tax shields.

If, after 1993, RJR uses 25 percent debt in its capital structure, its WACC at this target capital structure would be approximately 12.8 percent.[6] Then the levered terminal value as of the end of 1993 can be estimated as:

$$\frac{2.536(1.03)}{0.128 - 0.03} = \$26.654 \text{ billion}$$

Because the levered value of the company is the sum of the unlevered value plus the value of interest tax shields, it is the case that:

$$\begin{aligned}\text{Value of tax shields (end 1993)} &= V_L \text{ (end 1993)} - V_U \text{ (end 1993)} \\ &= \$26.654 \text{ billion} - \$23.746 \text{ billion} \\ &= \$2.908 \text{ billion}\end{aligned}$$

To calculate the value, as of the end of 1988, of these future tax shields, we again discount by the borrowing rate of 13.5 percent to get:[7]

$$\frac{2.908}{1.135^5} = \$1.544 \text{ billion}$$

The total value of interest tax shields therefore equals \$3.834 + \$1.544 = \$5.378 billion.

Adding all of these components together, the total value of RJR under the buyout proposal is \$29.935 billion. Deducting the \$5 billion market value of assumed debt yields a value for equity of \$24.935 billion, or \$108.9 per share.

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[5]This 25 percent figure is consistent with the debt utilization in industries in which RJR Nabisco is involved. In fact, that was the debt-to-total-market-value ratio for RJR immediately before management's initial buyout proposal. The firm can achieve this target by 1993 if a significant portion of the convertible debt used to finance the buyout is exchanged for equity by that time. Alternatively, KKR could issue new equity (as would occur, for example, if the firm were taken public) and use the proceeds to retire some of the outstanding debt.

[6]To calculate this rate, use the weighted average cost of capital from this chapter:

$$R_{\text{WACC}} = \frac{S}{S+B}R_S + \frac{B}{S+B}R_B(1 - t_C)$$

and substitute the appropriate values for the proportions of debt and equity used, as well as their respective costs. Specifically, at the target debt-to-value ratio, $B/(S + B) = 25$ percent, and $S/(S + B) = (1 - B/(S + B)) = 75$ percent. Given this blend:

$$\begin{aligned}R_S &= R_0 + \frac{B}{S}(1 - t_C)(R_0 - R_B) \\ &= 0.14 = \frac{0.25}{0.75}(1 - 0.34)(0.14 - 0.135) \\ &= 0.141\end{aligned}$$

Using these findings plus the borrowing rate of 13.5 percent in R_{WACC}, we find:

$$\begin{aligned}R_{\text{WACC}} &= 0.75(0.141) + 0.25(0.135)(1 - 0.34) \\ &= 0.128\end{aligned}$$

In fact, this value is an approximation to the true weighted average cost of capital when the market debt-to-value blend is constant or when the cash flows are growing. For a detailed discussion of this issue, see Isik Inselbag and Howard Kaufold, "A Comparison of Alternative Discounted Cash Flow Approaches to Firm Valuation," The Wharton School, University of Pennsylvania (June 1990), unpublished paper.

[7]A good argument can be made that because post-1993 debt levels are proportional to firm value, the tax shields are as risky as the firm and should be discounted at the rate R_0.

Concluding Comments about LBO Valuation Methods As mentioned in this chapter, the WACC method is by far the most widely applied approach to capital budgeting. We could analyze an LBO and generate the results of the second section of this appendix using this technique, but it would be a much more difficult process. We have tried to show that the APV approach is the preferred way to analyze a transaction in which the capital structure is not stable over time.

Consider the WACC approach to valuing the KKR bid for RJR. We could discount the operating cash flows of RJR by a set of weighted average costs of capital and arrive at the same $30 billion total value for the company. To do this, we would need to calculate the appropriate rate for each year because the WACC rises as the buyout proceeds. This occurs because the value of the tax subsidy declines as debt principal is repaid. In other words, no single return represents the cost of capital when the firm's capital structure is changing.

There is also a theoretical problem with the WACC approach to valuing a buyout. To calculate the changing WACC, we must know the market value of a firm's debt and equity. But if the debt and equity values are already known, the total market value of the company is also known. That is, we must know the value of the company to calculate the WACC. We must therefore resort to using book value measures for debt and equity, or make assumptions about the evolution of their market values, to implement the WACC method.