

FINC 423
Advanced Corporate Finance
Fall 2020

Handout #27

**Calculate WACC for Pfizer
Following Recapitalization**

Estimate of the Original WACC

I will return to the work that I did on July 17, 2020 as the basis for estimating the weighted-average-cost-of-capital (WACC) for Pfizer (PFE) as the firm is currently levered. That work is shown in Handout #4. The familiar formula for the WACC is

$$r_{WACC} = \frac{S}{A} r_S + \frac{LTD}{A} r_{LTD} (1 - t_c) + \frac{STD}{A} r_{STD} (1 - t_c)$$

I will ignore the firm's small amount of preferred stock. But I will include the short-term debt, because it is substantial. You will need to decide whether or not to include the short-term debt in the calculation of WACC for your firm.

Common Stock

From the security description page for Pfizer from Bloomberg, I found the current share price (\$36.25), and the outstanding shares (5,554.8M). So, the estimated market value of equity is \$201,361.5M.

To estimate the required return of the common stockholders I use the Capital Asset Pricing Model (CAPM). As we know, the most vexing issue is how to estimate Beta. I collected five possible values. The estimates were reasonably tight. I threw-out the figure from *Value Line*, as it is far out-of-line with the others, 0.85. The lowest value is the beta based on the last 60-months of data at 0.62, the highest, based on the most recent 30-days from the Bloomberg Terminal is 0.725. So, I used something close to the average of these two, 0.68, which also happened to be the *Yahoo Finance!* estimate. In my earlier work I used the rate on 30-year Treasury bonds, 1.33%, as the risk-free rate, and 6.50% as the long-term excess return on the market portfolio. So, my estimate of the required return on equity was

$$r_S = r_f + \beta_S (r_M - r_f)$$

$$r_S = 0.0133 + 0.68 (0.065) = 0.0575 = 5.75 \%$$

Long-Term Debt

I collected data on Pfizer's long-term debt from the Bloomberg terminal. The implied market value for the firm's debt is \$50,857.58M, the weighted-average implied yield is 1.4845%, and the average time-to-maturity is 13.99 years. I assumed that the firm's marginal tax rate was 21% under the new US tax code.

Short-Term Debt

Estimating the parameters for the short-term debt was challenging. Looking at the 2019 Annual Report and the First Quarter 10Q, I determined that (for all practical purposes) Pfizer's short-term debt was commercial paper. They reported \$15,708M at the end of the first quarter. From looking at prevailing commercial paper rates in July 2020, I estimated that Pfizer must pay at most 0.25% on their paper.

Estimation of the Original WACC

That is all the required information to make an estimate of the WACC at the current (July 17, 2020) capital structure.

First, we need to calculate the implied value of the assets

$$A = S + LTD + STD \quad A = 201,362 + 50,858 + 15,708 = 267,927$$

Now, the estimate of WACC is

$$r_{WACC} = \frac{S}{A} r_S + \frac{LTD}{A} r_{LTD} (1 - t_c) + \frac{STD}{A} r_{STD} (1 - t_c)$$

$$r_{WACC} = \frac{201,362}{267,927} 0.0575 + \frac{50,858}{267,927} 0.014845 (1 - 0.21) +$$

$$\frac{15,708}{267,927} 0.0025 (1 - 0.21)$$

$$r_{WACC} = 0.7516 * 0.0575 + 0.1898 * 0.01728 + 0.0586 * 0.00198 = 0.04556$$

So, the estimate for the WACC for Pfizer on July 17., 2020 is about 4.556%. Close to the result on Handout #4.

Sensitivity Analysis for the Original WACC

Because the estimate of the beta can be problematic, I conduct a sensitivity analysis varying beta between 0.62 and 0.725. I leave to other assumptions as above.

	Risk-Free	Excess Ret	Required	Value	Before- Tax LT Debt	Value
Beta	Rate	Market	Return	Equity	Ret	LT Debt
0.620	1.330%	6.500%	5.360%	201,362	1.485%	50,858
0.680	1.330%	6.500%	5.750%	201,362	1.485%	50,858
0.725	1.330%	6.500%	6.043%	201,362	1.485%	50,858

Before- Tax ST Debt	Value	WACC
Ret	ST Debt	
0.250%	15,708	4.263%
0.250%	15,708	4.556%
0.250%	15,708	4.775%

So, it appears reasonable to assume that the WACC for Pfizer lies in a fairly tight range between 4.25% and 4.75%.

Estimate of the Capital Structure After Recapitalization

In Handout #18 I estimate the effect of recapitalization on Pfizer's Balance Sheet and Income Statement. I estimate that the market value of the firm's equity will fall from \$201,362M to \$166,495M. I will assume that the value of the existing long-term debt will remain at \$50,858M (in fact, it should probably decline in value slightly, but I will ignore this effect). We will also assume the value of the commercial paper will remain unchanged at \$15,708M. In Handout #18, we assumed that the new bond issue will equal the book-value of long-term debt on the most recent Balance Sheet, which is \$38,741M.

We also made an initial assumption that the firm would issue bonds with 10-years to maturity, which implied that these instruments should bear a yield of about 1.29% (from the data on the Bloomberg terminal on July 17, 2020).

Beta and Required Return on Equity for the Recapitalized Firm

On Handout #18, we also used the Hamada Formula to estimate the effect of the recapitalization on the beta of Pfizer. We were using 0.68 as the base-level of beta. The Hamada Formula suggests that the beta following the recapitalization is 0.8225.

Therefore, for the relevered firm the estimated Cost of Equity Capital is 6.676%.

$$r_L = r_f + \beta_L (r_M - r_f) \quad r_L = 0.0133 + 0.8225 (0.065) = 0.06676$$

Effect of Recapitalization on Bond Rating and the Cost of Long-Term Debt Financing

In Handout #26 we attempt to understand the effect of recapitalizing the firm on its bond rating and ultimately, its cost-of-debt-financing.

Pfizer's debt is rated AA-/A+. The Blume, Lim and McKinlay model suggests that the rating may drop by about one notch (A+/A).

The rates are currently very low, and the Yield Curve is reasonably flat. So, the effects of the changing ratings are not very dramatic.

Based on data from the Bloomberg Terminal, I presumed that if Pfizer's rating drops one notch, the rate on their 10-year bonds might rise by less than 5 basis points; somewhere between 1.30% to 1.35%.

In the absolute worst-case scenario, where the rating falls to A/A-, the rate might increase by up to 15 basis points, in the neighborhood of 1.45%.

Of course, any fall in rating will also affect the yield on Pfizer's already outstanding bonds.

When estimating WACC in Handout #4, I also calculated the Pfizer's long-term debt had a weighted-average time-to-maturity of about 14 years, and the weighted-average yield on the bonds was 1.4845%.

I guessed that the rate on these bonds might rise between 1 and 9 basis points, somewhere between 1.50% and 1.60%.

Effect of Recapitalization on Pfizer's WACC

We are now ready to consider the effect of doubling the outstanding book value of long-term debt on Pfizer's WACC. We will amend the WACC formula accordingly. I add another cell for the newly issued long-term debt, because it bears a different yield than the current bonds. Again, I omit the preferred stock, but include the short-term borrowing. It is simple to omit this if you choose.

$$r_{WACC} = \frac{S}{A} r_S + \frac{LTD_{Old}}{A} r_{LTD-Old} (1 - t_c) + \frac{LTD}{A} r_{LTD-New} (1 - t_c) + \frac{STD}{A} r_{STD} (1 - t_c)$$

The estimate of the value of assets is

$$A = S + LTD_{Old} + LTD_{New} + STD$$

$$A = 166,495 + 50,858 + 38,741 + 15,708 = 271,802$$

For the first-round of computations I will assume that the rate on the existing long-term bonds will rise to 1.55%, the rate on the new 10-year bonds will be 1.35%, and the rate on the commercial paper will remain at about 0.25%.

$$r_{WACC} = \frac{166,495}{271,802} 0.06676 + \frac{50,585}{271,802} 0.0155 (1 - 0.21) +$$

$$\frac{38,741}{271,802} 0.0135 (1 - 0.21) + \frac{15,708}{271,802} 0.0025 (1 - 0.21) = 0.04482$$

Compare this to the earlier estimate of 4.556% at the current capital structure. So, I am estimating that if Pfizer recapitalizes in this way, their WACC will decline slightly (about 7 Basis Points).

Note, that under the Modigliani & Miller assumptions we argued that WACC should decline if we add more debt to the capital structure. But, that was ignoring the rise in the cost-of-debt-financing. Here we have attempted to make this adjustment. But, given this level of debt issuance, the miniscule rise in the cost-of-debt is not large enough to off-set the value of the newly created tax shield for Pfizer.

WACC if Pfizer Issues 30-Year Bonds

In Handout #18, I noted that the managers of Pfizer would have to decide about the maturity of the new debt that they issue. We worked the example above assuming they issued bonds that mature in 10-years. But, on p. 13 of Handout #18, we noted that the 30-year bonds of Pfizer were bearing a yield of about 2.27% (on July 17, 2020). Of course, it is simple to rework the example assuming that the firm issues the long-term bonds. The results are shown in the last page of this handout.

Similar to the above, I will assume that the recapitalization will cause the rate on debt to rise by about five basis points, so the rate on the new long-term bonds will be about 2.32%.

Therefore, the estimate of WACC for Pfizer based on issuing the 30-Year bonds is

$$r_{WACC} = \frac{166,495}{271,802} 0.06676 + \frac{50,585}{271,802} 0.0155 (1 - 0.21) +$$

$$\frac{38,741}{271,802} 0.0232 (1 - 0.21) + \frac{15,708}{271,802} 0.0025 (1 - 0.21) = 0.04591$$

Note, that this suggests that issuing 30-year bonds, which bear a much higher rate, would actually cause WACC to rise slightly above the level at the original capital structure.

Sensitivity Analysis of WACC at the New Capital Structure

Of course, we want to conduct a sensitivity analysis of the estimate of WACC at the new capital structure. In this case it seems sensible to vary both the estimate of Beta and of the cost-of-debt-financing. My analysis is shown on the next page.

The Betas are distributed as Low, Medium and High. These correspond to the “original” Betas of 0.62, 0.68 and 0.725 used in the sensitivity analysis above. But, from the Hamada Formula, these take on values of 0.7373, 0.8086 and 0.8621 for the relevered firm. For the costs-of-debt financing, Notice the relevered beta is a bit lower than that I calculated in Handout #18 (0.8225) and used in the computations above. This is because I do not use preferred stock in the analysis in this handout.

I use the current rates on the old and new debt, both with 10 and 30-years to maturity. Then, I rise these rates increments of about 5-basis points to estimate the moderate and high rates. I used the moderate rates to calculate WACC in the examples above.

The sensitivity analysis is shown on the next page. Of course, the measure of Beta has a much larger effect on the estimate of WACC than the costs-of-debt financing. Because rates are so low, and the yield-curve is so flat, the rates have little effect on the estimates of WACC. Despite this there are several cases in this sensitivity analysis where the estimates of WACC are higher than for the original case.

Pfizer (PFE)

Estimates of WACC
Sensitivity Analysis

Original Market Value Equity	201,362
Original Market Value LT Debt	50,858
Original Market Value ST Debt	15,708
Original Total Value Debt	66,566
Original Total Capital	267,928
Recap Market Value Equity	166,495
Recap Market Value Old LT Debt	50,858
Recap Value New LT Debt	38,741
Recap Market Value ST Debt	15,708
Recap Total Value Debt	105,307
Recap Total Capital	271,802

New Required Return on Equity

Original Beta	Unlever Beta	Relever Beta	Risk-Free Rate	Excess Ret Market	Required Return
0.620	0.4916	0.7373	1.330%	6.500%	6.122%
0.680	0.5392	0.8086	1.330%	6.500%	6.586%
0.725	0.5749	0.8621	1.330%	6.500%	6.934%

Rate on Old LT Debt

Current	1.490%
Moderate	1.550%
High	1.600%

Rate on ST Debt

0.250%

Marginal Tax Rate

21.00%

Rate on New LT Debt

10-Year Maturity

Current	1.290%
Moderate	1.350%
High	1.400%

Rate on New LT Debt

30-Year Maturity

Current	2.270%
Moderate	2.320%
High	2.400%

Sensitivity Analysis - WACC

New Debt 10-Year Maturity

	Beta		
Rating	Low	Medium	High
Current	4.127%	4.411%	4.624%
Moderate	4.143%	4.427%	4.640%
High	4.156%	4.440%	4.653%

Sensitivity Analysis - WACC

New Debt 30-Year Maturity

	Beta		
Rating	Low	Medium	High
Current	4.237%	4.522%	4.735%
Moderate	4.252%	4.536%	4.749%
High	4.268%	4.552%	4.765%