Asset Betas and Cash Adjustments

Joy van der Veer, May 2021

1. Introduction

In un-levering equity betas often "Cash & Marketable Securities" are taken into consideration because "Cash & Marketable Securities" have near to zero betas, which means that if we doesn't adjust for these items, the determined asset beta could be incorrect and therefore (possible) less informative in assessing the firm's pure business risk[1]. How to adjust in a proper and consistent way, is discussed in this short note.

Damodaran uses the next equation to adjust the asset beta for "Cash & Marketable Securities",

$$\beta_{a,adj} = \frac{\beta_a}{\left[1 - \frac{Cash}{V_F}\right]} \qquad (1)$$

Where, "Cash" is "Cash & Marketable Securities" and V_F the firm value (market value equity plus debt).

In explaining the adjustment procedure I use the following balance sheet, based market values,

Vu	200	Equity	150
TS	50	Debt	115
Cash	15		
Firm Value	265	Firm Value	265

I assume an Equity Beta of 1,20, based on market data analysis. In this note I also assume, as financing policy, the Fixed Ratio policy (Harris & Pringle)[2].

[1] Cash items could be operationally bounded, meaning that they are a part of net working capital.
[2] The Hamada approach can be used as well, adding the tax-component.

2. Basic approach

Before we can adjust the asset beta, we have to un-lever the equity beta first. This can be done, based on the Harris & Pringle equation, as follows,

$$\beta_a = \frac{\beta_e}{\left[1 + \frac{D}{E}\right]} \qquad (2)$$

We can assume that the beta debt is equal to zero due to the often short look back reflection period (max 5 years) and a near to zero probability of default.

This means that the adjusted asset beta, based on the given balance sheet and equations (1) and (2), can be determined as,

$$\beta_{a,adj} = \frac{\frac{\beta_e}{\left[1 + \frac{D}{E}\right]}}{\left[1 - \frac{Cash}{V_F}\right]} = \frac{\beta_e}{\left[1 + \frac{D}{E}\right] * \left[1 - \frac{Cash}{V_F}\right]} \qquad (3)$$

The denominator of the second component of equation (3) can be rewritten as,

$$\left[1 + \frac{D}{E}\right] * \left[1 - \frac{Cash}{V_F}\right] = 1 + \frac{D}{E} - \frac{Cash}{V_F} * \frac{V_F}{E} \qquad (4)$$

and thus,

$$\beta_{a,adj} = \frac{\beta_e}{\left[1 + \frac{D}{E} - \frac{Cash}{V_F} * \frac{V_F}{E}\right]} = \frac{1{,}20}{1 + \frac{115}{150} - \frac{15}{265} * \frac{265}{150}} = 0{,}72$$

If we are assuming fixed debt as financing policy (Hamada) instead, equation (4) can easily be adjusted with adding the tax component (1-Tc).

3. Complications

Equation (3) can be rewritten as follows, seen from capital providers claim preferences,

$$\beta_{a,adj} = \frac{\beta_e}{\left[1 + \frac{D - Cash}{E}\right]} \qquad (5)$$

This equation implies that Cash should be deducted from debt to get the net-debt level. This seems reasonable because debt holders have the first claim on the assets and thus on the free available Cash. What equation (3) doesn't recognizes is the case where the cash level is higher than the debt level, and also (often) doesn't recognizes its operationally bounded part of cash.

The correct approach, if the cash level is higher than the debt level, is that the net-debt level is zero and the cash difference is being adjusted on the equity of the firm, assuming that this remaining cash level can be distributed to its shareholders without any limitations.

The following procedure should be used to determine the Asset Beta properly,

Step 1:

$$Total\ Cash - Operational\ Cash = Cash$$

Step 2:

$$if \qquad 1 + \frac{D}{E} - \frac{Cash}{V_F} * \frac{V_F}{E}\ or\ \left(1 + \frac{D}{E}\right) * \left(1 - \frac{Cash}{V_F}\right) \leq 1 \quad \rightarrow\ \beta_e = \beta_a$$

$$if \quad 1 + \frac{D}{E} - \frac{Cash}{V_F} * \frac{V_F}{E}\ or\ \left(1 + \frac{D}{E}\right) * \left(1 - \frac{Cash}{V_F}\right) > 1 \qquad \boldsymbol{then\ step\ 3},$$

Step 3:

$$\beta_{a,adj} = \frac{\beta_e}{\left[1 + \frac{D}{E} - \frac{Cash}{V_F} * \frac{V_F}{E}\right]}$$

The next numerical example will show how it works when the Cash is higher than the debt level.

Vu	200	Equity	275
TS	50	Debt	50
Cash	75		
Firm Value	325	Firm Value	325

Step 1:

Let's assume that the cash level (75K) is fully excess cash.

Step 2:

$$1 + \frac{D}{E} - \frac{Cash}{V_F} * \frac{V_F}{E} = 1 + \frac{50}{275} - \frac{75}{325} * \frac{325}{275} = 0{,}9091$$

This means that the equity beta (1,20) is equal to the asset beta (1,20). In this case we have (implicitly) assumed that the debt holders are paid first and that the remaining cash (25k) is paid to the shareholders. Factually this means that this firm is all equity financed.

This section can be summarized as that if $\left[1 + \frac{D}{E} - \frac{Cash}{V_F} * \frac{V_F}{E}\right]$ is greater than one, equation (5) can be used, where the denominator is the adjusted $\left(1 + \frac{D}{E}\right)$, and otherwise we can conclude that the equity beta is equal to the asset beta, as in an all equity case.

4. Combination with Financial Distress Factor

Regarding the case that $\left[1 + \frac{D}{E} - \frac{Cash}{V_F} * \frac{V_F}{E}\right] \leq 1$, we don't have to deal with a financial distress factor. This is only the case if this equation is significantly higher than one.

An elegant way to adjust the asset beta for financial distress, in case the debt ratio is too high, is using the Feldhütter-Schaefer matrix[3], which can be expressed as,

[3] Feldhütter and Schaefer (2018), The Myth of the Credit Spread Puzzle, page 17. This is a general average model. Specific settings can lead to an adjusted matrix.

F&S Financial Distress Matrix			
	debt ratio		Adj.Factor
	Lt	< 0,25	1,00
0,25	< Lt	< 0,36	1,05
0,35	< Lt	< 0,46	1,10
0,45	< Lt	< 0,56	1,20
0,55	< Lt	< 0,76	1,40
0,75	< Lt		1,80

The adjusted debt ratio (DR) can be determined based on equation (4), which can be expressed as,

$$DR_{adj} = \frac{\left(1+\frac{D}{E}\right) * \left(1-\frac{Cash}{V_F}\right) - 1}{\left(1+\frac{D}{E}\right) * \left(1-\frac{Cash}{V_F}\right)} \qquad (6)$$

and thus equation (5) can be expanded, including the financial distress factor, as follows,

$$\beta_{a,adj} = \frac{\beta_e}{\left[1+\frac{D-Cash}{E}\right]} * FS - factor \qquad (7)$$

That un-levering equity betas are sensitive to misinterpretations of Cash items and/or financial distress factors can be shown in the next table.

Equity Beta	D/E	Debt Ratio	Cash / Firm Value	Asset Beta #1	Cash/FS Asset Beta #2	Eq (4)	Adjusted Debt Ratio	Eq (5) if Eq (4)>1 Asset Beta #3	Eq (6) Asset Beta #4	Diff #1	Diff #2
1,02	0,0227	2,22%	31,64%	1,0015	1,47	0,71		1,02	1,02	(0,02)	0,44
1,05	0,8985	47,33%	8,35%	0,5537	0,73	1,74	42,58%	0,60	0,66	(0,11)	0,06

The asset beta (#1) is based on the H&P equation (2). Asset beta (#3) is equal to the equity beta if equation (4) is one or lower, and otherwise based on equation (5). Asset beta (#4) is equal to asset beta (#3) multiplied by the financial distress factor, if applicable.

I have presented two cases, the first case is based on the setting that D/E is low with a high cash level and the second one based on a high D/E and relatively low cash level. Asset Beta (#4) is the correct beta. Differences are presented in the last two columns and are obvious, implying that the cost of equity unlevered would be determined wrongly based on the asset beta's (#1) and (#2).

5. Closing thoughts

In a top-down construct we use financial market data to determine the expected cost of equity. Executing the APV-approach, the expected cost of equity unlevered is needed. This means that we have to use the asset beta to determine this cost of equity. Because the asset betas are not (directly) observable, we must determine the equity beta first. Based on this equity beta we can use an un-leverage equation, which is primarily based on the assumed financing policy, to calculate the asset beta. If we are not assessing and using the "Cash" component and the possible "financial distress" factor correctly, the asset beta would be determined wrongly with as result having an incorrect cost of equity unlevered. How to deal with these items were the topics in this short note. I proposed a procedure to avoid failures in calculating the asset beta, which is a critical component of the cost of equity unlevered.