Erasmus School of Economics

1 The Key Value Driver Formula

We estimate a company's value by considering the sum of two components:

1. The present value of free cash flows from the planning period
2. The present value of free cash flows from the continuation period

The second component is calculated as the present value of the *terminal value*. The *terminal value* (TV) is the value of a company's expected cash flows beyond the planning period.

The Key Value Driver (KVD) model estimates the terminal value by linking cash flows to growth and return on (newly) invested capital. We derive it as follows, let T be the last year of the planning period. Basically we want to obtain the present value of the sum of free cash flows from $t = T+1, ..., \infty$. Therefore we assume a constant growth rate g per year and we still discount with the $WACC$ for every coming year.

For instance, the value of the free cash flow from $t = T+1$, discounted back to $t = T$ (end of the planning period) is:

$$\frac{FCF_T \times (1+g)}{1+WACC} \tag{1.1}$$

Hence the value of the sum of free cash flows from all the coming years up to infinity, discounted back to $t = T$ becomes:

$$\begin{aligned}
&\frac{FCF_T \times (1+g)}{1+WACC} + \frac{FCF_{T+1} \times (1+g)}{(1+WACC)^2} + \frac{FCF_{T+2} \times (1+g)}{(1+WACC)^3} + ...\\
&= \frac{FCF_T \times (1+g)}{1+WACC} + \frac{FCF_T \times (1+g)^2}{(1+WACC)^2} + \frac{FCF_T \times (1+g)^3}{(1+WACC)^3} + ...\\
&= FCF_T \times \left(\frac{1+g}{1+WACC} + \frac{(1+g)^2}{(1+WACC)^2} + \frac{(1+g)^3}{(1+WACC)^3} + ...\right)\\
&= \sum_{i=1}^{\infty} FCF_T \times \left(\frac{1+g}{1+WACC}\right)^i\\
&= \sum_{i=0}^{\infty} FCF_T \left(\frac{1+g}{1+WACC}\right) \times \left(\frac{1+g}{1+WACC}\right)^i
\end{aligned}$$

The last expression is a geometric series. The series converges if the common ratio is in absolute value smaller than 1. The formula for the geometric series is: $\sum_{k=0}^{\infty} ar^k = \frac{a}{1-r}$, where the common ratio $|r| < 1$. In our case, this means that we should have $\left|\frac{1+g}{1+WACC}\right| < 1$, which boils down to $g < WACC$. Then we can apply the geometric series formula to obtain

$$\sum_{i=0}^{\infty} FCF_T \left(\frac{1+g}{1+WACC}\right) \times \left(\frac{1+g}{1+WACC}\right)^i = \frac{FCF_T \left(\frac{1+g}{1+WACC}\right)}{1 - \left(\frac{1+g}{1+WACC}\right)} \tag{1.2}$$

Rewriting this expression gives us:

$$\frac{FCF_T \left(\frac{1+g}{1+WACC}\right)}{1 - \left(\frac{1+g}{1+WACC}\right)} = \frac{FCF_T(1+g)}{WACC - g}$$

Since the free cash flows can not grow constantly without investing, we bring in the return on (newly) invested capital in the formula. We write the formula explicitly in this form, since we assume that the ROCB from year T will not be the same as the long run ROCB. Hence we rewrite from:

$$FCF = NOPAT(1 - IR)$$
$$Growth = g = IR \times ROCB \iff IR = \frac{g}{ROCB}$$

To obtain:

$$\frac{FCF_T(1+g)}{WACC - g} = \frac{NOPAT_T(1+g)\left(1 - \frac{g}{ROCB}\right)}{WACC - g}$$

Hence this also explains:

- Why we obtain the terminal value discounted to time $t = T$ and hence why we should discount the terminal value once again with the same discount factor as from $t = T$, to obtain the present value at $t = 0$.

- Why we first multiply the NOPAT of the last year of the planning period ($NOPAT_T$) with $(1 + g)$ before filling it in the KVD formula.