To complete what we did in class on the behaviour of

$$\frac{d\left(\frac{D}{Y}\right)}{dt} = \frac{D}{Y}\left[\frac{\dot{D}}{D} - \frac{\dot{Y}}{Y}\right] \quad (1)$$

The sign of (1) depends on the sign of the square brackets which, in turn, depends on the sign of $\frac{\dot{D}}{D}$ and $\frac{\dot{Y}}{Y}$. Therefore, there could be nine cases:

1) $\frac{\dot{D}}{D} < 0, \frac{\dot{Y}}{Y} < 0$. In this case, $\frac{d\left(\frac{D}{Y}\right)}{dt} < 0$ if $\left|\frac{\dot{D}}{D}\right| > \left|\frac{\dot{Y}}{Y}\right|$
2) $\frac{\dot{D}}{D} < 0, \frac{\dot{Y}}{Y} > 0$ In this case, $\frac{d\left(\frac{D}{Y}\right)}{dt} < 0$
3) $\frac{\dot{D}}{D} > 0, \frac{\dot{Y}}{Y} < 0$ In this case, $\frac{d\left(\frac{D}{Y}\right)}{dt} > 0$
4) $\frac{\dot{D}}{D} > 0, \frac{\dot{Y}}{Y} > 0$ In this case, $\frac{d\left(\frac{D}{Y}\right)}{dt} < 0$ if $\frac{\dot{D}}{D} < \frac{\dot{Y}}{Y}$
5) $\frac{\dot{D}}{D} = 0, \frac{\dot{Y}}{Y} < 0$ In this case, $\frac{d\left(\frac{D}{Y}\right)}{dt} > 0$
6) $\frac{\dot{D}}{D} = 0, \frac{\dot{Y}}{Y} > 0$ In this case, $\frac{d\left(\frac{D}{Y}\right)}{dt} < 0$
7) $\frac{\dot{D}}{D} > 0, \frac{\dot{Y}}{Y} = 0$ In this case, $\frac{d\left(\frac{D}{Y}\right)}{dt} > 0$
8) $\frac{\dot{D}}{D} = 0, \frac{\dot{Y}}{Y} > 0$ In this case, $\frac{d\left(\frac{D}{Y}\right)}{dt} < 0$
9) $\frac{\dot{D}}{D} = 0, \frac{\dot{Y}}{Y} = 0$ In this case, $\frac{d\left(\frac{D}{Y}\right)}{dt} = 0$