Using Discounted Cash Flow Models:
A simple DCF/DG and DCF/KVD comparison[1]
In-Class Problem[2]

As the CFO of YUGE Consulting Group you've been asked by the firm's managing partner to assign a value to the firm preparatory to it seeking capital in the public markets. The available data from the firm's year end income statement and balance sheets (2015) and annual report include sufficient information for you to offer some calculations.

- **2015 year end net operating profit less adjusted taxes (NOPLAT) is equal to $5,000**
- **The firm's weighted average cost of capital (WACC) is 8% as of the end of 2015**
- **The firm had invested capital (IC) of $45,455**
- **The firm's expected growth rate for the next 10 years is 7% per year**
- **The firms expected long run growth rate is 5%**

1. Calculate the firm's return on invested capital (ROIC).

Recall that $ROIC_t = \frac{NOPLAT_t}{IC_t}$

So in this case $ROIC_{2015} = \frac{5000}{45{,}455} = .11$ or 11%

2. Identify the value of the firm's discounted cash flows for its stated explicit period.

$$Value_{DCF} = \sum \frac{\text{NOPLAT}_t}{(1+\text{WACC})^t} = \frac{\text{NOPLAT}_{2016}}{(1+\text{WACC})^1} + \frac{\text{NOPLAT}_{2017}}{(1+\text{WACC})^2} + \frac{\text{NOPLAT}_{2018}}{(1+\text{WACC})^3} + \cdots + \frac{\text{NOPLAT}_{2025}}{(1+\text{WACC})^{10}}$$

So to calculate the present value of the discounted cash flow we first need to calculate the cash flow or NOPLAT for each year:

$NOPLAT_{2015} = 5000$	=	5000.00	base year: t = 0
$NOPLAT_{2016} = 5000*(1+.07)$	=	5350.00	
$NOPLAT_{2017} = 5000*(1+.07)(1.07) = 5000 * 1.07^2$	=	5724.50	
$NOPLAT_{2018} = 5000*1.07^3$	=	6125.22	
$NOPLAT_{2019} = 5000*1.07^4$	=	6553.98	
$NOPLAT_{2020} = 5000*1.07^5$	=	7012.65	
$NOPLAT_{2021} = 5000*1.07^6$	=	7503.65	
$NOPLAT_{2022} = 5000*1.07^7$	=	8028.91	
$NOPLAT_{2023} = 5000*1.07^8$	=	8590.93	
$NOPLAT_{2024} = 5000*1.07^9$	=	9192.30	
$NOPLAT_{2025} = 5000*1.07^{10}$	=	9835.76	

[1] This problem and solution set is intended to present an abbreviated discussion of the included finance concepts and is not intended to be a full or complete representation of them or the underlying foundations from which they are built.

[2] This problem set was developed by Richard Haskell, PhD (rhaskell@westminstercollege.edu), Gore School of Business, Westminster College, Salt Lake City, Utah (2016).

Value_{DCF}

$$= \frac{5350}{1.08^1} + \frac{5724.50}{1.08^2} + \frac{6125.22}{1.08^3} + \frac{6553.98}{1.08^4} + \frac{7012.65}{1.08^5} + \frac{7503.65}{1.08^6} + \frac{8028.91}{1.08^7} + \frac{8590.93}{1.08^8} + \frac{9192.30}{1.08^9} + \frac{9835.76}{1.08^{10}}$$

$$= \frac{5350}{1.08} + \frac{5724.50}{1.166} + \frac{6125.22}{1.259} + \frac{6553.98}{1.3360} + \frac{7012.65}{1.469} + \frac{7503.65}{1.587} + \frac{8028.91}{1.714} + \frac{8590.93}{1.851} + \frac{9192.30}{1.999} + \frac{9835.76}{2.159}$$

$$= 4953.70 + 4907.84 + 4862.39 + 4817.37 + 4772.77 + 4728.57 + 4684.79 + 4641.41 + 4598.44 + 4555.86$$

$$= 47523.14$$

3. Calculate the present value of the firm's continuation value based on a NOPLAT augmented form of the Dividend Yield model.

$$CV_{DG(0)} = \frac{NOPLAT_1}{WACC-g} = \frac{9835.76*1.05}{0.08-0.05} = \frac{10327.54}{0.08-0.05} = 344{,}251.33$$

$$\text{PV}_{\text{CV}} = \frac{CV}{(1+WACC)^t} = \frac{344{,}251.49}{1.08^{10}} = \frac{344{,}251.33}{2.159} = 159{,}449.44$$

4. Calculate the present value of the firm's continuation value based on a Key Value Driver model.

This will follow the same CV PVCV construction as question 3 above, but will use the KVD form of the CV equation. The resulting formula when combined is as follows:

$$\text{CV}_{\text{KVD(0)}} = \frac{\frac{NOPLAT_1\left(1-\frac{g}{ROIC}\right)}{WACC-g}}{(1+WACC)^t} = \frac{\frac{10327.54\left(1-\frac{0.05}{0.11}\right)}{0.08-0.05}}{1.08^{10}} = 86975.48$$

5. Calculate and compare the firm's value based on each of the two discounted cash flow model forms represented in parts 2, 3, and 4.

$\text{VALUE}_{(DCF/KVD)} = \text{PV}_{DCF} + \text{PV}_{CV(KVD)} = 47{,}523.14 + 86{,}975.48 = 134{,}498.62$

$\text{VALUE}_{(DCF/DG)} = \text{PV}_{DCF} + \text{PV}_{CV(DG)} = 47{,}523.14 + 159{,}455.05 = 206{,}978.19$

These values are different of course, so the question is why? The Value DCF/KVD brings in a variable not present in the ValueDCF/DG, which renders the latter equation less relevant than former. The ValueDCF/KVD includes what McKinsey refers to as the Key Value Drivers (KVD) of value creation. It's also worth pointing out that in this scenario the condition for consistent, positive outcomes using these model forms has been met: $g < WACC \leq ROIC$.