EQUITY VALUATION IN R

Course Intro and Fundamental Valuation

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Time Value of Money

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Time Value of Money

- You will need to be compensated to forego receiving $100 today in favor of receiving $100 tomorrow. Why?
  - Uncertainty / Risk
  - The higher the risk, the larger the compensation
- $100 today is worth more than $100 tomorrow

Present Value

ONE YEAR

$$\frac{\$100}{(1+10\%)^1} = \$91$$

```
> fv <- 100

> r <- 0.10

> fv / (1 + r)^1
[1] 90.90909

# Check
> 90.90909 * (1 + r)
[1] 100
```

TWO YEARS

$$\frac{\$100}{(1+10\%)^2} = \$83$$

```
> fv <- 100

> r <- 0.10

> fv / (1 + r)^2
[1] 82.64463

# Check
> 82.64463 * (1 + r)^2
[1] 100
```

Discount Cash Flow valuation

- Free Cash Flow to Equity (FCFE)
- Free Cash Flow to Firm (FCFF)

FCFE vs. FCFF Models

Market Value Balance Sheet:

Assets = Liabilities + Equity

- Same accounting identity must hold but in ***Market Value*** not ***Book Value***

Free Cash Flow to Equity

- Direct valuation of the Value of Equity
- Cost of Equity (CAPM)

Free Cash Flow to Firm

- First values Assets then subtracts debt to get to Equity
- Weighted Average Cost of

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Let's practice!

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The Free Cash Flow to Equity Model

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What is "Free Cash Flow"?

- "Free Cash Flows" are cash flows after you have paid out
  - All your suppliers, employees, lenders, and government (taxes)

    and
  - Setting aside money for capital investments and additional working capital needs ***and***
  - Net of new borrowings and debt repayments
- No effect on firm's projected operations
- No effect on firm's projected growth

After-Tax Income

[1] **Revenues** *# Also called "Sales"*
[2] Less: Cost of Goods Sold
==========
[3] **Gross Profit**
[4] Less: Operating Expenses
==========
[5] **Operating Income or EBIT** *# Earnings Before Interest & Taxes*
[6] Less: Interest Expense *# Compensation to debt holders*
==========
[7] **Pre-Tax Income**
[8] Less: Taxes *# Payment to the government*
==========
[9] **After-Tax Income** *# Also called "Net Income"*

Adjustments to Arrive to FCFE

[9] **After-Tax Income**

[10] Add: Depreciation and Amortization

 # Non-cash charge. Cash spent at time of purchase

[11] Less: Capital Expenditures

 # Cash spent on capital investments

[12] Less: Increases in Working Capital

 # Cash spent on additional working capital needs

==========

[13] **Free Cash Flow to Equity**

Terminal Value

Terminal Value is the value of the cash flows beyond the forecast period

Commonly estimated using the **Perpetuity with Growth Model**, which is

$$TV = \frac{FCFE_{T+1}}{k_e - g} = \frac{FCFE_T * (1+g)}{k_e - g}$$

where

- TV = Terminal Value
- $FCFE_{T+1}$ = Free Cash Flow to Equity the year after the end of the forecast period
- k_e = Cost of Equity

Terminal Value in R

Suppose you have a 5 year forecast period, such that $FCFE_5 = \$100$.
Assume that $g = 3\%$ and $k_e = 15\%$, then in R:

```
> FCFE_5 <- 100

> g <- 0.03

> k_e <- 0.15

> FCFE_5 * (1 + g) / (k_e - g)
[1] 858.3333
```

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Calculating Equity Value

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Present Value

The firm's equity value is equal to:

$$V = \sum_{t=1}^{T} \frac{FCFE_t}{(1+k_e)^t} + \frac{TV_T}{(1+k_e)^T}$$

The two terms on the RHS of the equation are as follows:

- Present Value of the FCFE during the projection period
- Present Value of the Terminal Value

PV of FCFE in R

Suppose the FCFE for each of the first five years is $100 million. Assuming a cost of equity of 15%, the present value of each cash flow is:

```
> k_e <- 0.15
> cf <- rep(100, 5)
> cf <- data.frame(cf)

> cf$period <- seq(1, 5, 1)

> cf$pv_factor <- 1 / (1 + k_e)^cf$period
> cf$pv <- cf$cf * cf$pv_factor
> cf
   cf period pv_factor       pv
1 100      1 0.8695652 86.95652
2 100      2 0.7561437 75.61437
3 100      3 0.6575162 65.75162
4 100      4 0.5717532 57.17532
5 100      5 0.4971767 49.71767

> pv_fcfe <- sum(cf$pv)
> pv_fcfe
```

PV of Terminal Value in R

```
> tv_yr5 <- 858.333

> k_e <- 0.15

> pv_tv <- tv_yr5 / (1 + k_e)^5
> pv_tv
[1] 426.7432
```

Equity Value and Equity Value Per Share

```
# Combine PV of FCFE and PV of Terminal Value
> equity_value <- pv_fcfe + pv_tv
> equity_value
[1] 761.9587
```

```
# To Convert to a Per Share Number
# Assume 15 million shares outstanding
> shout <- 15
> equity_per_share <- equity_value / shout
> equity_per_share
[1] 50.79725
```

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