



EQUITY VALUATION IN R

Course Intro and Fundamental Valuation

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Time Value of Money



Time Value of Money



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 Capital



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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
- g = Perpetuity Growth Rate (PGR)

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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Let's practice!



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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_fcfе <- sum(cf$pv)
> pv_fcfе
[1] 335.2155
```

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_fcf + 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
```



EQUITY VALUATION IN R

Let's practice!