EQUITY PRICING AND STOCK RETURNS

Lecture outline

- Calculate stock price and return, dividend yield and capital gain
- Dividend growth model (**Gordon growth model**)
- Understand factors favoring high and low dividend payout
- Calculate average and compounded stock returns, and standard deviation of stock returns
- Cost of Equity and CAPM (**Capital asset pricing model**)

How does investing in a stock work?

Let's assume the discount rate = 0%

(Investor/Shareholder)
Invest 100 dollars to buy one SHARE/STOCK issued by McDonald's

(Investor/Shareholder)
Yield 110+2=112$
2$ is **dividends,** 110 is **future stock price**

(Issuer)
Obtain 100$ **proceeds** from investors

Issuer pay back investor according to their earnings, assuming they pay 50% of their **earnings per share (EPS)** back to shareholder

2025	2026	2027 investor decide to sell
EPS is 4	EPS is 0	Price of McDonalds is 110$
2	0	110

Features of stocks – Common stocks

- What does “common” mean?
  - The stock has no special preference either in paying dividends or in bankruptcy
- Shareholders’ rights
  - Voting rights
  - Stockholders elect directors
- Other rights
  - Share proportionally in declared dividends
  - Share proportionally in remaining assets during liquidation
  - Pre-emptive right – rights to purchase their proportionate number of shares in any new stock offering in order to maintain their ownership in the company

Features of stocks – Preferred stocks

- Dividends
  - Must be paid before dividends can be paid to common stockholders (priority over common)
  - Not a liability of the firm
  - Can be deferred indefinitely
- Preferred stock generally does not carry voting rights

The Fundamental Theory of Valuation

The value of *any* financial asset equals the present value of all of its future cash flows.

- **Stock Valuation**

  - Cash flow: Dividends
  - Discount rate: Required Rate of Return, possibly considering growth rate

Common stock – Cash flows

If you buy a stock, you can receive cash in two ways:

- The company pays dividends – dividends
- You sell your shares to another investor in the market or back to the company – capital gain/expected price increase

The price of the stock is the present value of these expected cash flows (dividend + expected future price)

Difficulties with stock valuation

- A share of common stock is difficult to value
  - There are no promised cash flows
  - Cash flows are unknown in advance
  - The life of the investment is forever, unless you sell, common stock has no maturity
  - The rate of return required by investors is unobservable

At this moment, you just need to know what determines stock prices.

One period example

You are thinking of purchasing a share of stock. You expect it to pay a $2 dividend in one year and you believe that you can sell the stock for $14 at that time. If you require a return of 20% on investments of this risk, what is the maximum you would be willing to pay?

$$P_0 = Price = \frac{2 + 14}{1 + 0.2} = 13.33$$

$P_0 = \frac{DIV_1 + P_1}{1 + r_E}$, where r_E is called the **required rate of return** for stocks

Stock valuation formulas

One year investor:

$$P_0 = \frac{Div_1 + P_1}{1 + r_E}$$

Total return (r_E):

$$r_E = \frac{Div_1 + P_1}{P_0} - 1 = \underbrace{\frac{Div_1}{P_0}}_{\text{Dividend Yield}} + \underbrace{\frac{P_1 - P_0}{P_0}}_{\text{Capital Gain Rate}}$$

Question

Stock Prices and Returns

Problem

Suppose you expect Walgreen Company (a drugstore chain) to pay dividends of $1.40 per share and trade for $80 per share at the end of the year. If investments with equivalent risk to Walgreen's stock have an expected return of 8.5%, what is the most you would pay today for Walgreen's stock? What dividend yield and capital gain rate would you expect at this price?

1) What is P_1 and Div_1?

2) What is the price P_0?

3) What is dividend yield?

4) What is capital gain?

Question

Stock Prices and Returns

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1) What is P_1 and Div_1?
   $P_1 = 80\$$ $Div_1 = 1.4\$$
2) What is the price P_0?
   $P_0 = (P_0+Div_1)/(1+r_E) = (80 + 1.4) / (1+8.5\%) = 75.02$
3) What is dividend yield?
   $Div_1/P_0 = 1.4 / 75.02 = 1.87\%$
4) What is capital gain?
   $(P_1-P_0)/(P_0) = (80-75.02)/75.02 = 6.63\%$

Question?

Stock Prices and Returns

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Solution

Using Eq. 9.1, we have

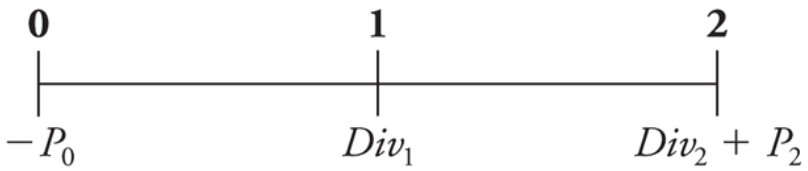
$$P_0 = \frac{Div_1 + P_1}{1 + r_E} = \frac{1.40 + 80.00}{1.085} = \$75.02$$

At this price, Walgreen's dividend yield is $Div_1/P_0 = 1.40/75.02 = 1.87\%$. The expected capital gain is $\$80.00 - \$75.02 = \$4.98$ per share, for a capital gain rate of $4.98/75.02 = 6.63\%$. Therefore, at this price, Walgreen's expected total return is $1.87\% + 6.63\% = 8.5\%$, which is equal to its equity cost of capital.

Two periods example

You decide to hold the same share for two years

D_1 = 2.00 (expected dividend at D_1)
D_2 = 2.10 (expected dividend at D_2)
P_2 = 14.70 (expected selling price at P_2)



Now how much would you be willing to pay today?

$$One\ period:\ P_0 = \frac{Div_1 + \mathbf{P_1}}{1+r_E} \quad P_1 = \frac{Div_2 + \mathbf{P_2}}{1+r_E}$$

$$Substitute\ P_1:\ P_0 = \frac{DIV_1 + \frac{\mathbf{DIV_2 + P_2}}{\mathbf{1 + r_E}}}{1 + r_E}$$

$$P_0 = \frac{Div_1}{1 + r_E} + \frac{Div_2 + P_2}{(1 + r_E)^2}$$

Multiyear investors

$$P_0 = \frac{Div_1}{1+r_E} + \frac{Div_2}{(1+r_E)^2} + \frac{Div_3}{(1+r_E)^3} + \cdots \cdot \frac{P_T}{(1+r_E)^T}$$

How do we get that?

Recall $P_0 = \frac{DIV_1+P_1}{1+r_E}$

We can do the same for P_1 , P_2 $\quad P_1 = \frac{DIV_2+P_2}{1+r_E}$

$$P_2 = \frac{DIV_3 + P_3}{1 + r_E}$$

$$P_0 = \frac{DIV_1 + P_1}{1 + r_E} = \frac{D_1 + \frac{DIV_2 + P_2}{1 + r_E}}{1 + r_E} = \frac{DIV_1 + \frac{DIV_2 + \frac{DIV_3 + P_3}{1+r_E}}{1+r_E}}{1+r_E} = \frac{DIV_1}{1+r_E} + \frac{DIV_2}{(1+r_E)^2} + \frac{DIV_3}{(1+r_E)^3} + \frac{P_3}{(1+r_E)^3}$$

Infinite periods

If we continue pushing the sale of the stock the price of the stock is really the PV of all expected dividends

$$P_o = \frac{Div_1 + P_1}{(1+r_E)} = \frac{Div_1}{(1+r_E)} + \frac{Div_2}{(1+r_E)^2} + \frac{P_2}{(1+r_E)^2}$$

$$= \frac{Div_1}{(1+r_E)} + \frac{Div_2}{(1+r_E)^2} + \frac{Div_3}{(1+r_E)^3} + \frac{P_3}{(1+r_E)^3}$$

$$= \frac{Div_1}{(1+r_E)} + \frac{Div_2}{(1+r_E)^2} + \frac{Div_3}{(1+r_E)^3} + \frac{Div_4}{(1+r_E)^4} + \ldots + \frac{Div_T}{(1+r_E)^T} + \frac{P_T}{(1+r_E)^T}$$

$$= \sum_{t=1}^{T} \frac{Div_t}{(1+r_E)^t} + \frac{P_T}{(1+r_E)^T}$$

No matter how high the stock price is in the very distant future, its present value is essentially zero

Set T → ∞

$$P_o = \sum_{t=1}^{\infty} \frac{Div_t}{(1+r_E)^t}$$

The stock price today is equal to the present value of all of the future dividends.

Zero Growth Case

Assume that dividends will remain at the same level forever:

$$D_1 = D_2 = D_3 = \cdots$$

Since future cash flows are constant, the value of a zero growth stock is the present value of a perpetuity

$$P_0 = \frac{D_1}{(1+r_E)} + \frac{D_2}{(1+r_E)^2} + \frac{D_3}{(1+r_E)^3} + \cdots$$

The stock can be viewed as an ordinary perpetuity with a cash flow (C) equal to *D* every period:

$$\boldsymbol{P_0 = \frac{D_1}{r_E}}$$

Constant Growth Case

Assume that dividends will grow at a constant rate, g, forever, i.e.

$$P_0 = \frac{D_1}{(1+r_E)} + \frac{D_2}{(1+r_E)^2} + \frac{D_3}{(1+r_E)^3} + \cdots.$$
$$= \frac{D_0 \times (1+g)}{(1+r_E)} + \frac{D_0 \times (1+g)^2}{(1+r_E)^2} + \frac{D_0 \times (1+g)^3}{(1+r_E)^3} + \cdots$$
$$= \frac{\boldsymbol{D_1}}{\boldsymbol{r_E - g}} = \frac{\boldsymbol{D_0(1+g)}}{\boldsymbol{r_E - g}}$$

$\boldsymbol{P_0 = \frac{D_1}{r_E - g}}$ is also known as '**Gordon Growth Model**' or 'Dividend Growth Model'.

Q1

Company K has just paid a dividend of $6.75 per share. You project that its dividend grows at a rate of 5%, what should be the fair price of K today if $r = 13.75\%$?

Just paid dividends mean than dividend occurs at time 0, which $\boldsymbol{D_0}$.

Q1

Company K has just paid a dividend of $6.75 per share. You project that its dividend grows at a rate of 5%, what should be the fair price of K today if $r = 13.75\%$?

Price today (P_0)

$$\frac{D_1}{r-g} = \frac{6.75 \times (1+5\%)}{13.75\%-5\%} = 81$$

Dividend policy

Dividend Irrelevance: In a perfect capital market with no taxes, transaction costs, agency conflicts, dividend policy does not matter

Dividend policy is the decision to use earnings to

- Pay dividends **now**

versus

- Retaining funds to reinvest in the firm/maintain **growth**

In theory, if the firm reinvests capital now, it will grow and can pay higher dividends **in the future**

$$r_E = \frac{Div_1 + P_1}{P_0} - 1 = \underbrace{\frac{Div_1}{P_0}}_{\text{Dividend Yield}} + \underbrace{\frac{P_1 - P_0}{P_0}}_{\text{Capital Gain Rate}}$$

Questions: are dividends irrelevant?

Pick between prefer “high dividends” and “low dividends (preferred future growth)”

- An investor living in country with no dividend tax but with 15% capital gain tax
  - High dividends
- A pensioner (80 years old)
  - High dividends as a pensioner desire current income than future income
- Companies that want to send a good signal to the market
  - High dividends as payouts is an indication of positive future prospects
- As a shareholder in a company where managers always spend cash on private jets, and other executive perks.
  - High dividends as dividends can compel managers to disgorge cash /reduce excessive cash => resolving agency problems
- As a shareholder who believes that bank can monitor managers’ behavior
  - High dividends as dividends, by reducing cash, can force firms to raise funds externally, e.g, from a bank. And bank can monitor managers.
  - Low dividends as raising external funds are costly:
    - 1) flotation costs: underwriting or legal fees,
    - 2) Debt covenants by banks limiting dividends payments

Factors Favoring a Low Payout

Taxes:

- Individuals in upper income tax brackets might prefer lower dividend payouts, with their immediate tax consequences.

Flotation costs (costs of issuing stock/bond):

- Low payouts can increase a firm's cash reserves, thereby decreasing the amount of capital that needs to be raised externally (debt or equity issuance), thereby lowering flotation costs

Dividend restrictions:

- Debt covenants may limit the percentage of income that can be paid out as dividends

Factors Favoring a High Payout - Investor's Perspectives

Desire for current income:

- Individuals who require current income, such as pensioners

Uncertainty resolution:

- No guarantee that the higher future dividends will or capital gains will materialize

Taxes:

- Individuals in low tax brackets
- For investors with dividends exemption from income tax (In Germany, dividend is tax-exempt if it does not go over a certain amount)

Factors Favoring a High Payout - Company's Perspectives

To reduce agency problems

- Absorb excess cash
- A higher dividend payout means the firm has to raise more funds externally, and in this case, firms have to undergo valuable disciplines from external market. (The market for corporate control)

Signalling theories

- By increasing the dividend, managers are signalling that they have positive information about the firm's future

Clientele theories

- Different investors seek out different stocks based on dividend policy, for example, dividends can attract investors who *want* high current investment income (and expect to forego anticipated long-term capital gains)

RISK AND RETURN

Recall-> Stock valuation formulas

One year investor:

$$P_0 = \frac{Div_1 + P_1}{1 + r_E}$$

Total return (r_E):

$$r_E = \frac{Div_1 + P_1}{P_0} - 1 = \underbrace{\frac{Div_1}{P_0}}_{\text{Dividend Yield}} + \underbrace{\frac{P_1 - P_0}{P_0}}_{\text{Capital Gain Rate}}$$

P_t

Risk and Return

Performance

EUR

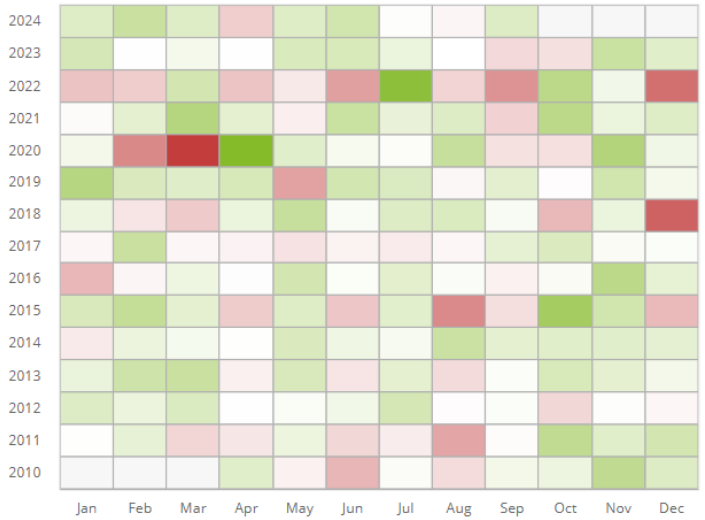
The performance numbers include distributions/dividends (if there are any). By default, the total performance of the ETF is displayed.

Returns overview

Table view

YTD	+18.29%
1 month	+0.77%
3 months	+5.18%
6 months	+8.91%
1 year	+24.26%
3 years	+37.75%
5 years	+105.59%
Since inception (MAX)	+636.74%
2023	+21.87%
2022	-12.86%

Monthly returns in a heat map

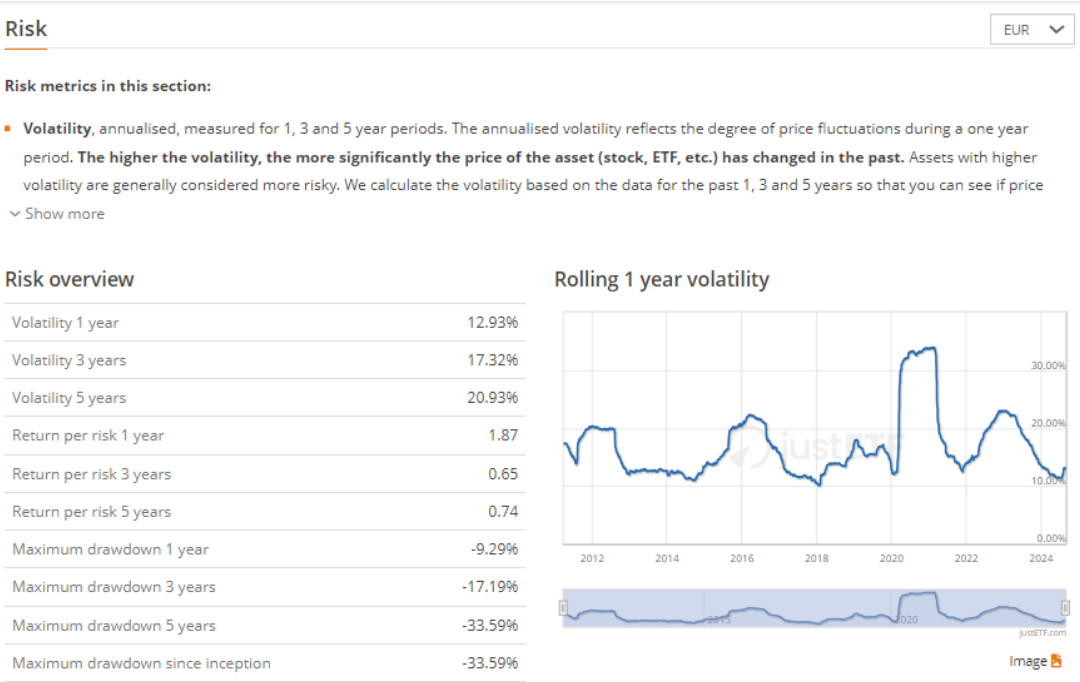


Just ETF: Amundi S&P 500 UCITS ETF

Performance

- **Average** return
- 1-month return, 1-year return, or 5-year return, year-to-date (YTD) return, they are based on **compounded return.**

Risk and Return



Risk

EUR

Risk metrics in this section:

- **Volatility**, annualised, measured for 1, 3 and 5 year periods. The annualised volatility reflects the degree of price fluctuations during a one year period. **The higher the volatility, the more significantly the price of the asset (stock, ETF, etc.) has changed in the past.** Assets with higher volatility are generally considered more risky. We calculate the volatility based on the data for the past 1, 3 and 5 years so that you can see if price

Show more

Risk overview

Volatility 1 year	12.93%
Volatility 3 years	17.32%
Volatility 5 years	20.93%
Return per risk 1 year	1.87
Return per risk 3 years	0.65
Return per risk 5 years	0.74
Maximum drawdown 1 year	-9.29%
Maximum drawdown 3 years	-17.19%
Maximum drawdown 5 years	-33.59%
Maximum drawdown since inception	-33.59%

Rolling 1 year volatility

Just ETF: Amundi S&P 500 UCITS ETF

Risk (Volatility)

- Measured by standard deviation of returns.
- It reflects the degree of price fluctuations.
- Assets with higher volatility are generally considered riskier, but offer better returns

Return Performances

- Realized returns

$$R_{t+1} = \frac{Div_{t+1} + P_{t+1}}{P_t} - 1 = \frac{Div_{t+1}}{P_t} + \frac{P_{t+1} - P_t}{P_t}$$

$$= \text{Dividend Yield} + \text{Capital Gain Rate}$$

- **Annual Compounded Returns based on Quarterly or Monthly Returns**

$$1 + \boldsymbol{R_{annual}} = (\mathbf{1} + \boldsymbol{R_{Q1}})\,(\mathbf{1} + \boldsymbol{R_{Q2}})(\mathbf{1} + \boldsymbol{R_{Q3}})(\mathbf{1} + \boldsymbol{R_{Q4}})$$

$$1 + \boldsymbol{R_{annual}} = (\mathbf{1} + \boldsymbol{R_{M1}})\,(\mathbf{1} + \boldsymbol{R_{M2}}) \ldots\ldots (\mathbf{1} + \boldsymbol{R_{M12}})$$

- Average Returns

$$\bar{R} = \frac{1}{T}(R_1 + R_2 + \cdots + R_T) = \frac{1}{T}\sum_{t=1}^{T} R_t$$

Risk: Variance / Volatility

$$\mathrm{var}(R) = \sigma^2 = \frac{\sum_{i=1}^{T} (R_i - \overline{R})^2}{T-1}$$

$$SD(R) = \sigma = \sqrt{\mathrm{var}(R)} = \sqrt{\sigma^2}$$

Realized returns

The returns on a stock from 2007 to 2010 are as follows: 4.9%, -2.6%, 7.3%, and 1.4%. What is the arithmetic average return?

- What is the Average Annual Return?

$$\bar{R} = \frac{(0.049 - 0.026 + 0.073 + 0.014)}{4} = 0.0275 \; or \; 2.75\%$$

Realized returns: Variance

The returns on a stock from 2007 to 2010 are as follows: 4.9%, -2.6%, 7.3%, and 1.4%.

The mean is 2.75%

- Var(R) = $\frac{(4.9\%-2.75\%)^2+(-2.6\%-2.75\%)^2+(7.3\%-2.75\%)^2+(1.4\%-2.75\%)^2}{4-1}$

=0.001895

SD(R) = $\sqrt{0.001895}$=0.043116

Example: Realized (Actual) returns

Microsoft Stock Price data at any dividend dates

Date	Price	Dividend	Return
12/31/03	27.37		
08/23/04	27.24	0.08	-0.18%
11/15/04	27.39	3.08	11.86%
12/31/04	26.72		-2.45%

$$R_{t+1} = \frac{Div_{t+1} + P_{t+1}}{P_t} - 1 = \frac{Div_{t+1}}{P_t} + \frac{P_{t+1} - P_t}{P_t}$$

$$= \text{Dividend Yield} + \text{Capital Gain Rate}$$

What is the return on 08/23/04?

$$\frac{0.08+27.24}{27.37} - 1 = -0.18\%$$

What is the compounded return for the year of 2004?

(1 – 0.18%) x (1+11.86%) x (1 – 2.45%) = 8.93%

Q2 (Microsoft price and dividends)

Quarters	Dividends	Price	Returns
2009Q4	0.13	28.67	
2010Q1	0.13	25.80	
2010Q2	0.13	23.47	
2010Q3	0.16	25.26	
2010Q4	0.16	27.91	

What are realized returns from 2010Q1 to Q4?

What are the annualized returns for the year of 2010?

Q2 (Microsoft price and dividends)

Quarters	Dividends	Price	Returns
2009Q4	0.13	28.67	
2010Q1	0.13	25.80	**-0.0956**
2010Q2	0.13	23.47	**-0.0853**
2010Q3	0.16	25.26	**0.0831**
2010Q4	0.16	27.91	**0.1112**

What are realized returns from 2010Q1 to Q4?
What are the annualized returns?

(1-9.56%)x(1-8.53%)x(1+8.31%)x(1+11.12%)-1=-4.37%

The Cost of Capital

- The cost to a firm for capital funding = the required return to the providers of those funds (including equity holders and debt holders)
  - A risk-adjusted return:
    - The return earned on assets depends on the risk of those assets; A firm's cost of capital indicates how the market views the risk of the firm's assets
  - A firm must earn at least the required return to compensate investors for the financing they have provided.
  - The required return is the same as the appropriate discount rate and can help firms with capital budgeting decisions.

The Cost of Equity: R_E

- The cost of equity is the return required by equity investors given the risk of the cash flows from the firm.
- The cost of equity is the same as the cost of capital for al-equity financed firm.
- Financial managers can employ CAPM to obtain an estimate of the cost of equity capital.
  - **Capital asset pricing model (CAPM)**
    - It describes the relationship between the expected return and risk of investing in a security

Risk Premium

- There is a reward for bearing risk (over a reasonably long period of time)
- The "extra" return (reward) earned for taking on risk is the risk premium
- Treasury bills (less than one year) are proxies for risk-free rate
- The risk premium is the return over and above the risk-free rate

12-month Treasury

GB12:GOV **12 Month**	0.00	4.62	4.85%	-21	-46	8:24 AM

The CAPM Approach

To compute the cost of equity:

- **Risk-free rate, R_f**
  - Example: Rate on Treasury bill (government bond)
- **Market return, $E(R_M)$**
  - Example: Return on stock market index (return on SP500, on DAX)
  - Market risk premium (market return in excess of risk-free rate): $E(R_M) - R_f$
  - $R_E - R_f$ is called risk premium of the stock, stock returns R_E in excess of risk-free rate R_f
- **Systematic risk of asset, β_E**

$$R_E = R_f + \beta_E \times \left(E(R_M) - R_f\right)$$

The CAPM Approach - Systematic Risk

- β_E is the sensitivity of stock returns to market returns
  - It can be measured by running a linear regression of the stock returns R_E on market returns R_M , or running a linear regression of the stock risk premium $R_E - R_f$ on market risk premium $R_M - R_f$
- β_E can measure systematic/market risk of a stock
- A stock with a beta of 2 –> When stock market drops/rises by 1%, the stock will drop/rise by 2%
  - High-beta stocks: Real Estate companies, Banking, High-tech
  - Low-beta stocks: Basic consumer goods, Food

Based on the beta estimates, which stock is Telsa, which one is Coco Cola.

Market Cap (intraday)	675.73B
Beta (5Y Monthly)	2.31
PE Ratio (TTM)	59.42
EPS (TTM)	3.56

Market Cap (intraday)	308.457B
Beta (5Y Monthly)	0.59
PE Ratio (TTM)	29.09
EPS (TTM)	2.46

Q3 - CAPM Model

Suppose your company has an equity beta of 0.58 and the current risk-free rate is 6.1%. If the expected market risk premium is 8.6%, what is your cost of equity capital?

Choose from the following

A) 7.55%
B) 11.1%
C) 4.99%

Q3 Solutions

Suppose your company has an equity beta of 0.58 and the current risk-free rate is 6.1%. If the expected market risk premium is 8.6%, what is your cost of equity capital?

$$R_E = R_f + \beta_E \times \left(E(R_M) - R_f\right)$$

Note that market risk premium is $\left(E(R_M) - R_f\right)$, which is 8.6%.

The cost of equity capital R_E is

$$R_E = 6.1\% + 0.58 \times (8.6\%) = 11.1\%$$