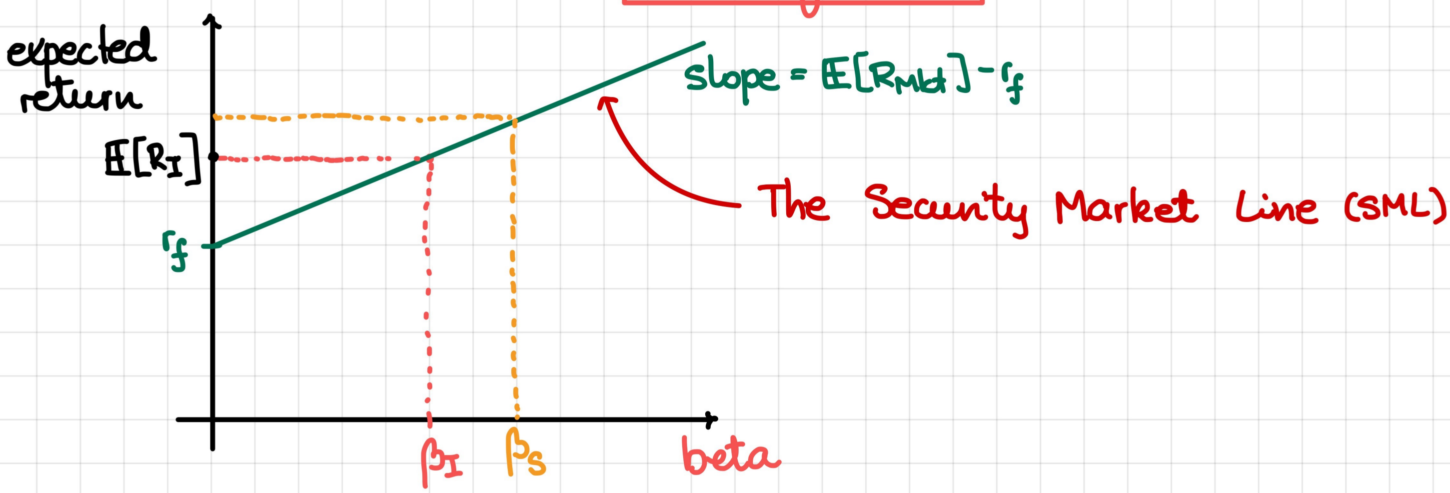
The Equity Cost of Capital.

In CAPM: for all investments I:

independent of investment I

$$\mathbb{E}[R_I] = r_I = \underbrace{r_f}_{\text{intercept}} + \beta_I \underbrace{\left(\mathbb{E}[R_{Mkt}] - r_f\right)}_{\text{the slope.}}$$

$\boxed{\text{"independent argument"}}$



Beta estimation.

Linear Regression.

Explanatory Random Variable : X

Response Random Variable : Y

Model:

$$\boxed{Y = \alpha + \beta \cdot X + \varepsilon}$$

intercept (α), slope (β)

w/ $\varepsilon \sim \text{Normal}(0, \text{variance})$

variance: assume to be the same for all values of X

Observed values: (x_i, y_i) , $i = 1..n$

$$\hat{\beta} = \frac{SD[Y]}{SD[X]} \cdot corr[X, Y]$$

$$Y = \alpha + \beta X + \varepsilon \qquad \text{(SLR)}$$

"Attacking" the SLR w/ the expectation.

$$\mathbb{E}[Y] = \alpha + \beta\,\mathbb{E}[X] + 0$$

They can be estimated from the least·squares line.

<u>In our applications:</u>

$$\underbrace{R_I - r_f}_{\substack{\text{excess return}\\ \text{for investment } I}} = \alpha_I + \beta_I\,(\underbrace{R_{Mkt} - r_f}_{\substack{\text{excess return}\\ \text{of market}}}) + \varepsilon_I$$

RESPONSE

EXPLANATORY

the error term

the intercept of the linear regression

the slope of the linear regression

Now, we see how we can estimate α_I and β_I from the observed values of excess returns across different time intervals.

Taking the expectation above, we get

$$\mathbb{E}[R_I] - r_f = \alpha_I + \beta_I\,(\mathbb{E}[R_{Mkt}] - r_f) + \overbrace{\mathbb{E}[\varepsilon_I]}^{=0}$$

$$\mathbb{E}[R_I] = \underbrace{r_f + \beta_I\,(\mathbb{E}[R_{Mkt}] - r_f)}_{\text{the Security Market Line}} + \alpha_I$$

the distance from the SML, i.e., the stock's <u>alpha</u>