# Chap 10
# Corporate Finance (Ross)

Standard deviation = $SD(R) = \sqrt{Var(R)}$

↑ variance

For the relationship between the return of one stock and another .....
we use

## Covariance and correlation Tah dah!

after having determined variance and std. deviation ...

Company A , Company B

2 steps for covariance

① $(R_A - \bar{R}_A) \times (R_B - \bar{R}_B)$

rate of return

expected rate of return

calculate this for the "states" we are considering
ex: rate of return in a (depression, recession, normal, boom)

② Then take the average of all 4 calculations (for example)

This is covariance ✱ $\sigma_{AB} = Cov(R_A, R_B) = \dfrac{\text{all computations of step 1 added together}}{\#\text{ of "states"}}$

ex: $\dfrac{0.00187 + -0.01087 + -0.02187 + .02}{4}$ (depression, recession etc)

Chap 10
Ross

stock$_1$ ↗ , stock$_2$ ↘

If there is an inverse relationship between stocks (negative correlation)

If there is a direct relationship between stocks (positive correlation)

stock$_1$ ↗ stock$_2$ ↗

We prefer stocks with a negative correlation to keep balance.

## To Calculate correlation

divide the covariance by the standard deviations of both securities.

ex: for stocks A & B

$$\rho_{AB} = Corr(R_A, R_B) = \frac{Cov(R_A, R_B)}{\sigma_A \times \sigma_B} = \frac{-0.004875}{0.2586 \times 0.1150} = -0.1639$$

The correlation is always between -1 ∅ and 1.
due to the standardizing procedure of dividing by the two std. dev.

If the number is positive (+), then positive correlation.
If the number is negative (−), then negative correlation.
If ∅, then no correlation.

Chap 10 corporate Finance

A portfolio is more than 1 stock.

$X$ = proporation of \$ in portfolio

Here we are dealing with 2 securities

ex: $X_A$ and $X_B$

60% of \$ 40% of \$

$\bar{R}$ = expected return
AKA Average
or weighted average

therefore, the expected return...

$$\frac{\text{Expected return on portfolio}}{(\bar{R}_p)} = X_A\bar{R}_A + X_B\bar{R}_B = \bar{R}_p$$

Variance of the portfolio

depends on the variances of the individual securities and the covariance between securities.

positive relationship increases the variance of the portfolio.

negative relationship decreases the variance of the portfolio. (lower risk)

with a negative relationship the securities offset eachother ("achieving a hedge")

$$Var(\text{portfolio}) = X_A^2\sigma_A^2 + 2X_AX_B\sigma_{A,B} + X_B^2\sigma_B^2$$

the std dev of the portfolio is $\sqrt{Var \text{ of portfolio}}$.

A diversified portfolio attempts to reduce risk.

Good when the standard deviation of the portfolio is less than the average of individual securities standard deviations.

weighted average AKA Average

The diversification effect occurs when the correlation between securities is less than 1.
(negative)

what % of the portfolio is each security?
which proportion is better 30%, ? ... 40% which will be the best (below 1) covariance? search for a negative correlation!

ex: 90% $stock_A$ and 10% $stock_B$
or
30% $stock_A$ and 70% stock B

etc. which has the negative correlation - searching for a negative number.

"minimum variance portfolio" - the lowest possible standard deviation

"perfect negative correlation" = -1 (very rare)

"The variance of the return on a portfolio is more dependent on the covariances between the individual securities.

30 stocks is needed to achieve optimal diversification.
(some say between 10 to 30)

Beta - "measures the responsiveness of a security to movements in the market portfolio"

$$\beta_i = \frac{Cov(R_i, R_M)}{\sigma^2(R_M)}$$

covariance between return on asset, and return on market portfolio

variance of the market

* should concerned with . . . . . (but not if it is a butter, $ is root of all evil)
"How an individual security contributes to variance of the portfolio"

## Capital Asset Pricing Model

$$\bar{R} = R_F + \beta(\bar{R}_M - R_F)$$

risk free rate

Beta

expected return of market

risk free rate (90 day T-bill)

Supposedly . . . "the expected return on a security is positively (linearly) related to it's Beta"