FitchLearning

Investment Management Certificate

Formulas

Mean and Standard Deviation

Mean (central tendency)

$$\bar{x} = \frac{\sum x}{n}$$

Standard deviation (measure of dispersion)

$$\sigma_x = \sqrt{\frac{\sum(x - \bar{x})^2}{n}} \qquad s_x = \sqrt{\frac{\sum(x - \bar{x})^2}{n - 1}}$$

Geometric Mean

$$G = \sqrt[n]{(1+x_1)\times(1+x_2)\times....\times(1+x_n)} - 1$$

Calculating Correlation Coefficient

$$\text{Correlation coefficient, } (\rho \text{ or } r) = \frac{\text{Cov}(x, y)}{\sigma_x \sigma_y}$$

Where:

Cov(x,y) = Covariance of x and y

σ_x = Standard deviation of x

σ_y = Standard deviation of y

Linear Regression

$$y = a + bx$$

Where:

y is the dependent variable (car engine size in the example)

x is the independent variable (salary in the example)

a and b are coefficients of the equation

Compounding formula

$$TV = PV(1 + r)^n$$

Where:

TV is the terminal value of the deposit (how much capital and compounded interest there will be in total).

PV is the amount of money to be deposited, or the present value of the deposit.

n is the number of periods the deposit is to run for (the usual period is a year)

r is the rate of interest on the deposit per period.

Calculating present values

$$PV = \frac{TV}{(1+r)^n}$$

Where:

TV is the amount of money to be received in the future.

PV is the present value of the amount (how much TV is worth now)

n is the number of periods until the amount is received (the usual period is a year)

r is the rate of interest on the deposit per period.

Formula for present valuing an annuity

$$\text{PV annuity} = £X \times \frac{1}{r}\left[1 - \frac{1}{(1+r)^n}\right]$$

Where:

£X is the annuity payment each year; paid at the end of the year.

r is the interest rate (normally annual) over the life of the annuity.

n is the number of periods (normally years) that the annuity will run for

Perpetuity

$$\text{PV perpetuity} = \frac{£x}{r}$$

Total Return

$$\text{Total return} = \frac{(\text{end value - start value}) + \text{dividends received}}{\text{start value}}$$

Gordon’s Growth Model

Calculation

Gordon’s Growth model calculates the ex-div price of a share using an assumed growth rate of dividends:

$$\text{Ex - div share price} = \frac{D_0(1+g)}{(r - g)}$$

Where:

D0 is the most recent dividend

g is the growth rate of the dividend

r is the investor’s required rate of return

Bond Calculations

An alternative is to use the annuity formula to take care of the coupons and simply add the capital present value afterwards:

$$£7 \times \frac{1}{0.08}\left[1 - \frac{1}{(1+0.08)^5}\right] + \left[\frac{£100}{(1+0.08)^5}\right]$$

$$\left(£7 \times \frac{1}{0.08} \times 0.3194\right) + \left[\frac{£100}{(1+0.08)^5}\right]$$

$$\left(\frac{£7}{0.08} \times 0.3194\right) + £68.06$$

$$£27.94 + £68.06$$
$$£96.00$$

Bond yield Calculations

Flat yield:

$$\text{Flat yield} = \frac{\text{Gross annual coupon}}{\text{Market price}} \text{ x } 100\%$$

Prices and Yields

Gross redemption yield

$$\text{Bond price} = \pounds\text{coupon x } \frac{1}{r} \text{x} \left[1 - \frac{1}{(1+r)^n}\right] + \frac{\text{CAP}}{(1+r)^n}$$

Net redemption yield

$$\text{Bond price} = \pounds\text{coupon } (1 - t) \text{ x } \frac{1}{r} \text{x} \left[1 - \frac{1}{(1+r)^n}\right] + \frac{\text{CAP}}{(1+r)^n}$$

Macaulay Duration

A relative measure of a bond's sensitivity:

$$\text{Duration} = \frac{\sum\left(\text{Present val of cash flow x time to cash flow}\right)}{\sum\text{Present value of cash flow}}$$

i.e. the bond's price

Modified Duration

The approximate percentage change in a bond's price for a 1% change in yield:

$$\text{Modified Duration} = \frac{D}{(1+r)}$$

Where D is the bond's duration and r is its present yield.

The International Fisher effect

$$\frac{F}{S} = \frac{(1 + i_{variable})}{(1 + i_{base})} = \frac{(1 + r_{variable})}{(1 + r_{base})}$$

Where:

F = the forward rate.

S = the spot rate.

$i_{\mathbf{variable}}$ $i_{\mathbf{base}}$ = the inflation rates for each currency, variable and base.

$r_{\mathbf{variable}}$ $r_{\mathbf{base}}$ = the interest rates for each currency variable and base.

Delta: basics

$$\delta = \frac{\text{Change in value of option premium}}{\text{Change in value of underlying}}$$

Returns to a portfolio

The holding period return

$$HPR = \frac{Val_{END} - Val_{START}}{Val_{START}}$$

The Capital Asset Pricing Model (CAPM)

$$E\left(R_p\right) = R_F + \beta_P \underbrace{\left(R_M - R_F\right)}_{\text{Market risk premium}}$$

Jensen

Jensen measure $= R_p - R_{CAPM}$

Where

R_p is the return to the portfolio

R_{CAPM} is the return predicted by CAPM

Sharpe

$$\text{Sharpe} = \frac{R_p - R_f}{\sigma_p}$$

Where :

R_p is the return to the portfolio

R_f is the risk free return

σ_p is the standard deviation of the portfolio

Treynor

$$\text{Treynor} = \frac{R_p - R_f}{\beta_p}$$

Where :

R_p is the return to the portfolio

R_f is the risk free return

β_p is the beta of the portfolio

Measuring bond portfolio risk

$$E(R_p) = R_F + \frac{D_P}{D_M}(R_M - R_F)$$

Earnings per share (EPS)

$$\text{EPS} = \frac{\text{Profit available to ordinary shareholders}}{\text{Number of ordinary shares}}$$

Price-earnings ratio (PE ratio)

$$\text{PE ratio} = \frac{\text{Market price per share}}{\text{Earnings per share}}$$

Dividend yield

$$\text{Dividend yield} = \frac{\text{Net dividend per share}}{\text{Market price per share}} \text{ x } 100\%$$

Dividend cover

$$\text{Dividend cover} = \frac{\text{Earnings per share}}{\text{Net dividend per share}}$$

Gearing (or debt/equity)

$$\text{Debt/equity ratio} = \frac{\text{Total long term debt}}{\text{Total equity}} \times 100\%$$

Current and quick ratios

$$\text{Current ratio} = \frac{\text{Current assets}}{\text{Current liabilities}}$$

$$\text{Quick ratio (acid test)} = \frac{\text{Current assets - Stock}}{\text{Current liabilities}}$$

ROCE: Calculation

$$\text{Return on capital employed (ROCE)} = \frac{\text{Operating profit}}{\text{Capital employed}} \times 100$$

Where:

- **Capital employed** = Total assets - Current liabilities
- **PBIT** = Profit **before** interest and tax

Price Elasticity of Demand (PED)

Shows degree of consumer response to variations in a good's price.

$$e_P = \frac{\%\Delta Q}{\%\Delta P}$$

Cross Elasticity of Demand

$$\text{Cross elasticity of demand} = \frac{\text{Percentage change in quantity demanded}}{\text{Percentage change in price of a substitute or complement}}$$

Income Elasticity of Demand

$$\text{Income elasticity of demand} = \frac{\text{Percentage change in quantity demanded}}{\text{Percentage change in income}}$$

The Consumption Function

The relationship between consumption (C) and income.

$C = a + bYd$

Aggregate Demand

Multipliers

The **Keynesian** multiplier is the phenomenon where an increase in income leads to a disproportionate increase in consumption.

Closed economy

$$Multiplier = \frac{1}{(1 - MPC)}$$

Economy with international trade

$$Multiplier = \frac{1}{[1 - (MPC - M)]}$$

- Where M is the marginal propensity to import

The Fisher Equation

$$MV = PT$$

M – Money supply, V – Velocity of circulation, P – Price, T – Transactions