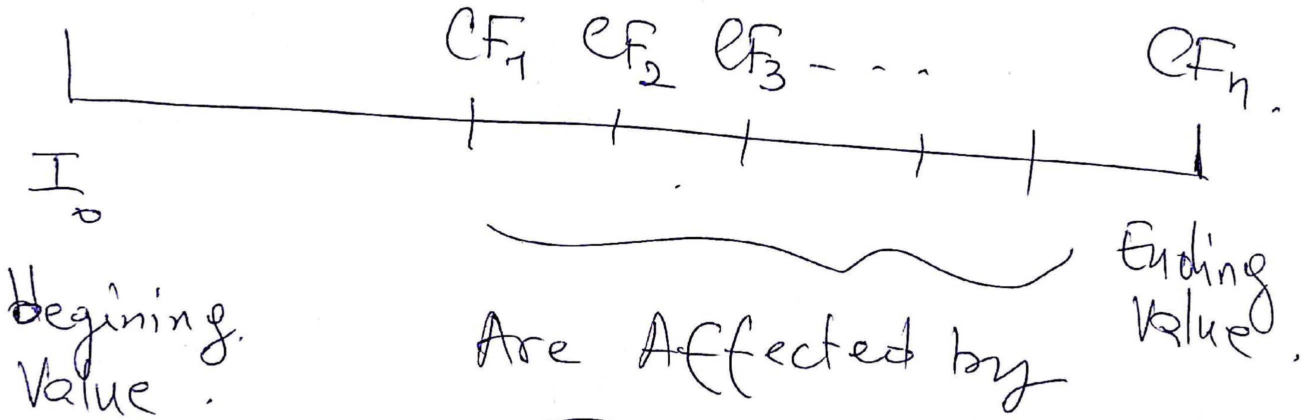
Theory: Chapter 1:

Q_1 – Defining Investment.
– Why investing.

Refer to Slides 1–2, Chapter 1.



Are Affected by
- Time Value of Money
- Inflation.
- Risk.

Inflation $\xrightarrow{-}$ Investment.

Inf ↑↑. Investors ask for a higher expected return to cover inflation.

Inf ↑↑ ⟶ NRFR ↑↑ ⟶ $E(R_i)$ ↑ ⟶ I ↓↓
I

$$\text{Risk} \xrightarrow[E(R_i)]{-} \text{Investment}$$

Syst. + unsyst.

$\rightarrow$ Investors are risk averse

$\downarrow$

Risk Premium

$\downarrow$

SML — $E(R_i)\uparrow\uparrow \longrightarrow$ (discount Rate) $\uparrow\uparrow$

$$NPV = -I_0 + \sum_{i=1}^{n} \frac{CF_t}{(1+k)^t}$$

if $k\uparrow\uparrow \longrightarrow NPV\downarrow\downarrow \longrightarrow Invt\downarrow\downarrow$

Question 8:

The NRFR is affected by:

NRFR

Inflation

Market conditions -

Inf ↑↑ → NRFR ↑↑

$$\overset{\uparrow\uparrow\uparrow}{NRFR} = (1 + RRFR)(1 + \overset{\uparrow\uparrow}{Inf}) - 1$$

Central Banks should consider for the expected Rate of Inflation when determining the NRFR because RRFR > 0

- Market liquidity
- Money Supply
- Demand of Money

All the Monetary Policy variables:

During Business Cycles, Inflation is Volatile. So, NRFR is Strongly affected by Inflation Volatility

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Prob. 5

a/ $$E(R_i) = \sum_{i=1}^{5} \frac{R_i}{5}$$

We are using historical data of annual Rates of return (HPY).

For Stock T:

$$E(R_T) = \sum_{i=1}^{5} \frac{R_T}{5} = 5.4\%.$$

For Stock B:

$$E(R_B) = \sum_{i=1}^{5} \frac{R_B}{5} = 1.6\%$$

~~We~~ Using the $E(R_i)$, We Select Stock T, $E(R_T) > E(R_B)$

$\boxed{b}$

$$\sigma^2(R_i) = \frac{\sum_{i=1}^{5}\left(R_i - E(R_i)\right)^2}{n},$$

<u>For Stock T:</u>

$$\sigma^2(R_T) = \frac{\sum\left(R_T - E(R_T)\right)^2}{n}$$

With $E(R_T) = 5.4\%$.

$$\sigma(R_T) = \sqrt{\sigma^2(R_T)} = \cancel{0,0047}$$
$$= \underline{0,1147 = 11.47\%}$$

<u>For Stock B:</u>

$$\sigma(R_B) = 0,057 = \underline{5,7\%}$$

~~and~~ Using only Risk, we Select Stock B having the lowest level of Risk.

<u>Comment</u>: We have a Conflicting results between $E(R_i)$ and Risk $\Longrightarrow$ $\underline{CV}$.

	Stock T	Stock B
$E(R_i)$	5.4%	1.6%
$\sigma(R_i)$	11.47%	5.7%
$CV(R_i)$ $\frac{\sigma}{E}$	$\frac{11.47}{5.4}$ = $\underline{2.12}$	$\frac{5.7}{1.6}$ 3.56

<u>Comments</u>:

For Stock T, Risk as measured the S.D ~~equal~~ represents 2.21% for each unit of additional expected Return. It is equal to 3.56% for Stock B.

given that investors are risk averse (Hypothesis), ~~we~~ So, we Select the Stock with the lowest <u>CV</u>, $CV_T < CV_B$

d) The Geometric Mean: (GM).

Years	Stock T (HPR)	Stock B (HPR)
1	1.19	1.08
2	1.08	1.03
3	0.88	0.91
4	0.97	1.02
5	1.15	1.04

HPY = HPR − 1 ⇒

HPR = HPY + 1

$$\boxed{GM = \left[\prod_{i=1}^{5} HPR\right]^{\frac{1}{5}} - 1}$$

$$GM = \left[\prod_{i=1}^{n} HPR\right]^{\frac{1}{n}} - 1$$

n: number of historical data (5 years)

For Stock T: 0.046 = 4.6%

For Stock B: 0.014 = 1.4%

- If Returns are different $\Rightarrow$
  AM $\neq$ GM

- AM $>$ GM

- AM is used for Short-term. Invt Expected Return.

- GM is used for Long-term Invt Expected Return.

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d)

$$\sigma^2(R_T) = \frac{\sum^{5} \left(R_T - E(R_T)\right)^2}{5}.$$

$E(R_T) \rightarrow$ AM —— Question a)

$E(R_T) \rightarrow$ GM —— Question d)

$$\sigma^2(R_T) = \frac{\sum_{i=1}^{5} \left(R_T - GM(R_T)\right)^2}{5}$$

$GM_T < AM_T \Rightarrow \sigma^2_{GM} > \sigma^2_{AM}$

$GM_B < AM_B \Rightarrow \sigma^2_{GM} > \sigma^2_{AM}$

Pb 6 :

We use Prob. distribution to compute the $E(R_{MB})$.

$$\boxed{E(R_i) = \sum_{i=1}^{n} R_i \, p_i}$$

$$\boxed{E(R_{MB}) = \sum_{i=1}^{4} R_{MB} \, p_i}$$

A.N :

$$E(R_{MB}) = \cancel{(-0{,}10 \times 0{,}3)} + \cancel{(0{,}10 \times 0{,}3)} + (0{,}25 \times 0{,}3) = 7{,}5\,\%$$

* Comment :

if $p_1 = p_2 = \text{———} \; p_n$; We move from the Prob. distribution to historical Data.

$$E(R_{MB}) = \sum_{i=1}^{4} \frac{R_{MB}}{4}.$$

Pb:7

$$\boxed{E(R_{LC}) = \sum_{i=1}^{6} R_i p_i}$$

$$\boxed{E(R_{LC}) = 16\%}$$

Pb8:

Without Computing the S.D For each Stock, we expect that Risk For Lauren Computer is higher than Madison Beer Stock.

We can refer, to another alternative measure of Risk: Range

For Stock MB: Range $= 25\% - (-10\%)$
$= 35\%$

For Stock LC: Range $= 80\% - (-60\%)$
$= 140\%$

Risk is higher For LC

$\Longrightarrow$

Also, given the positive relationship between Expected Return and Risk, we can conclude that:

$$E(R_{LC}) > E(R_{MB})$$

$$\Rightarrow Risk(LC) > Risk(MB)$$

Pb 9:

IF
- U.S.G. ~~Bonds~~ T.Bills : 5,5% (nominal NRFR)
- US. Long Term Bonds 7,5%
- US Stocks 11,6%

$CPI_{t+1} = 172$.

$CPI_t = 160$

a) The Inflation Rate:

$$\left(\frac{CPI_{t+1} - CPI_t}{CPI_t}\right) = \frac{172-160}{160}$$

$$= 7,5\%$$

The Real Rate of Return:

$$R\ Return = \left[\frac{1+Nominal}{1+Inf}\right] - 1$$

For:

US. T. Bills: $\left[\frac{1+5.5\%}{1+7.5\%}\right] - 1 = -1.86\%$

For US LT. Bonds: $\left[\frac{1+7.5\%}{1+7.5\%}\right] - 1 = 0\%$

For US. Stocks: $\left[\frac{1+11.6\%}{1+7.5\%}\right] - 1 = 3.81\%$

For, US. T. Bills, the RRFR < 0, because inflation is higher than the NRFR. 7.5% > 5.5%.

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[b] Compute the Real Return for the PF if it is an Equally Weighted. (use 2 Methods)

Method 1:

$$\left(\text{Real Return}_{PF}\right) = \sum_{i=1}^{3} w_i \left(\text{Real Return}_i\right)$$

in this case:

$$w_1 = w_2 = w_3 = \frac{1}{3}.$$

Equally Weighted Portfolio.

$$\left(\text{Real Return}_{PF}\right) = \left[\frac{-1.86\% + 0\% + 3.81\%}{3}\right]$$

Method 2:

$$HPR_{PF} = \frac{EV(PF)}{BV(PF)}$$

$$\Rightarrow \boxed{HPY_{PF} = HPR_{PF} - 1} \text{ (Nominal).}$$

$\Rightarrow$ We can calculate the Real HPY:

$$\text{Real HPY} = \left[\frac{1 + NHPY}{1 + Inf}\right] - 1$$

Pb 3, p. 34:

We use historical data (2003 - 2007).

a) $AM_{US\,G.} = \frac{\sum_{i=1}^{5} R_i}{5} = \frac{\sum_{i=1}^{5} HPY_i}{5}$

Similarly,

$AM_{UK\,Stocks} = \frac{\sum HPY_i}{5} =$

S.D:

$$\boxed{\sigma^2(HPY) = \frac{\sum (HPY - E(HPY))^2}{n}}$$

n = 5.

$SD_{T.Bill}$

$S.D_{UK\,Stocks}$

$SD_{(Stock)} > SD_{(T.Bills)}$

$\boxed{b}$ Relative Risk is measured by CV.

$\Rightarrow CV_{T.Bills} < CV_{UK\,Stocks}$

$\boxed{c}$ $GM = \left[\prod_{i=1}^{5} (HPR)\right]^{\frac{1}{5}} - 1$

HPR = HPY + 1