

Example of the  
reason as why these  
stocks move in  
opposite direction to  
the state...

[Business](#), [Marketing](#)



**Answer a)**

T-Bills are independent from state of economy on account of having back up faith of US Treasury. In other words, T-Bills are risk free from default probability because the return of 5.5% will be realized irrespective of state of economy. US Treasury will have to redeem the T-Bills in any economic state.

However, the rate of 5.5% is composed of Risk Free Rate(2.5%) + Inflation premium(3%) and since there is uncertainty about level of inflation in the future, T-Bills are not purely risk free in terms of purchasing power. For Example if Inflation averaged to be 3.5% during the year, then the realized return will be  $5.5\% - 3.5\% = 2\%$  during the year. Also if after investment in T-Bills, rates falls this would lead to fall in nominal income and thus an investor is exposed to re-investment risk also. Thus, T-bills does not offer completely risk-free return.

2)

Return of High Tech Stocks are positively correlated with the economy. For instance if the economy is boom, firm under High Tech industry will experience increased sales and profits and similarly, under Recession, the firm will experiences same type of downs as the economy.

Whilst, for Collection, firms under this industry are negatively related to the state of economy. Collection of past due debts increases because of inability of individuals to pay their debt during bad times, thus if stock market crashes, investors in this stock should earn good returns.

**Answer B)**

$$E(r) = \sum P_i R_i = P_1 R_1 + P_2 R_2 + \dots + P_n R_n$$

$P_i$  = Probability of state of economy

$R_i$  = Return in state of economy

$E(R)$  = Expected Return

**Thus,**

$$E(R_{\text{High tech}}) = \sum [\{.1 * (-.45)\} + \{.2 * (-.07)\} + \{.4 * .15\} + \{.2 * (.30)\} + \{.10 * .45\}]$$

$$= 10.6\%$$

$$E(R_{\text{Collections}}) = \sum [\{.1 * (.39)\} + \{.2 * (.25)\} + \{.4 * (.05)\} + \{.2 * (-.02)\} + \{.10 * (-.28)\}]$$

$$= 7.7\%$$

$$E(R_{\text{Rubber}}) = \sum [\{.1 * (.06)\} + \{.2 * (-.14)\} + \{.4 * (0)\} + \{.2 * (.41)\} + \{.10 * (.26)\}]$$

$$= 8.6\%$$

$$E(R_{\text{Market Portfolio}}) = \sum [\{.1 * (-.17)\} + \{.2 * (-.03)\} + \{.4 * .10\} + \{.2 * (.25)\} + \{.10 * (.38)\}]$$

$$= 10.5\%$$

**Answer C)**

C1)

**In finance, standard deviation is a common measure of investment risk and for individual security is calculated as:**

$$\text{Std Deviation} = \text{SQRT}[\sum P_i (R_i - E(R))^2]$$

$P_i$  = Probability of state of economy

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$R_i$  = Return in state of economy

$E(R)$  = Expected Return

Std Deviation =  $\text{SQRT}[\sum P_i(R_i - E(R))^2]$

=  $\text{SQRT}(572.438)$

= 23.925%

Std Deviation =  $\text{SQRT}[\sum P_i(R_i - E(R))^2]$

=  $\text{SQRT}(581.122)$

= 24.106%

Std Deviation =  $\text{SQRT}[\sum P_i(R_i - E(R))^2]$

=  $\text{SQRT}(372.64)$

= 19.303%

Std Deviation =  $\text{SQRT}[\sum P_i(R_i - E(R))^2]$

=  $\text{SQRT}(229.85)$

= 15.160%

### **Standard deviations of the other alternatives:**

$\sigma$  High tech = 23.925%

$\sigma$  collection = 24.106%

$\sigma$  USRubber = 19.303%.

$\sigma$  Market portfolio = 15.160%.

C 2)

Standard Deviation is measure of investment risk used for calculating the stand alone risk of an investment alternative. Higher the standard deviation, more is the probability that the actual realized returns will be less than the

expected returns.

C 3)

**The above graph proves that the High Etch Stock carries maximum risk.**

Answer D)

D1)

$$E(R) = W_i R_i + W_{i1} R_{i2}$$

$$= .50 * 10.6 + .50 * 8.6$$

$$= 5.3 + 4.3$$

$$= 9.6\%$$

**Thus, Standard Deviation of Portfolio will be:**

$$= \text{Sqrt}[(-19.5 - 9.6)^2 * .10 + (-10.5 - 9.6)^2 * .20 + (7.5 - 9.6)^2 * .40 + (35.5 - 9.6)^2 * .2 + (35.5 - 9.6)^2 * .10]$$

$$= \text{Sqrt}(84.68 + 80.80 + 1.764 + 134.162 + 67.08)$$

$$= \text{Sqrt}(368.486)$$

$$= 19.195\%$$

D2)

Calculating Standard Deviation of the portfolio, we find that the stand alone risk of the portfolio is less than the standard deviation of the individual stocks. This is because of negative correlation among stocks during four stages of economy except at the stage of above average when both stocks were at high returns. Thus combining the stocks provides diversification benefits, which was not possible had the stocks been held in isolation.

## Answer E)

E 1)

Diversification benefits provided by portfolio construction are relevant for any investor. Generally, the stand alone risk of an investment is measured by its standard deviation. However this calculation may only be important for a non-diversified investor because a rational and risk-averse investor is keen to know the impact that the stock has on the riskiness of his portfolio than knowing the stand alone risk. Since stand alone risk can be diversified away through a negatively correlated and diversified portfolio what remains is the market/systematic risk which is a non-diversified risk as it remains in the portfolio even when entire market portfolio is held.

Academic studies and research have revealed that as we increase the number of stocks in a portfolio, provided that stock being included are negatively correlated, the risk of portfolio starts decreasing towards the level of systematic risk. The number of stocks to be included to reach the level of systematic risk is still debated but it is assumed that 30 stocks would be good enough for the portfolio risk to reach the level of non-diversifiable risk.

$N = 30$

The above figure shows that as the investor increase the number of stocks in his portfolio to 30, the standard deviation reaches the constant level and the risk which is left is systematic or nondiversifiable risk.

E 2)

Holding only one stock portfolio will expose the investor to high degree of risk but he cannot be expected to receive risk premium for the risk taken by investing in single stock portfolio. The reason for the same is that if the

returns from single stock portfolio were high enough to compensate for high risk taken, the rational and diversified investors will start buying that stock and with more demand/buying pressure, price of the stock will go up and return will decrease. Thus, it is not possible to find stocks which can provide returns enough to include them and form a single stock portfolio.

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