QUESTION NO.3A Consider an investment of ₹ 10 million in A Ltd. and an investment of ₹ 5 million in B Ltd.. Suppose that the daily volatilities of these two assets are 2% and 1%, respectively and that the coefficient of correlation between their returns is 0.7. What is the 10-day 99% value at risk for the portfolio? By how much does diversification reduce the VaR?

Solution:

The variance of portfolio (in millions of rupees) is 0.02^2 x ₹ 10^2 + 0.01^2 x ₹ 5^2 + 2 x 0.7 x 0.02 x ₹ 10 x 0.01 x ₹ 5 = ₹ 0.565 millions

The standard deviation is $\sqrt{0.0565}$ = ₹ 0.2377 per million

the 1-day 99% VaR is 2.33 x ₹ 0.2377 = ₹ .5538 per million

The 10-day 99% VaR is ₹ .5538 x $\sqrt{10}$ = ₹ 1.7513 per million.

The total 10-day 99% VaR is therefore ₹ 1,751,300

The 10-day 99% value at risk for the L & T investment is 0.02 x ₹ 10 million x $\sqrt{10}$ x 2.33 = ₹ 14,73,621

The 10-day 99% value at risk for the Sun Pharma investment is 0.01 x ₹ 5 million x $\sqrt{10}$ x 2.33 = ₹ 3,68,405

The diversification benefit is = ₹ 14,73,621 + ₹ 3,68,405 - ₹ 1,751,300 = ₹ 1,26,626

TYPES OF RISK

QUESTION NO.9 TRC Cables Ltd. (an Indian Company) is in the business of manufacturing Electrical Cables and Data Cables including Fiber Optics cables. While mainly it exports the manufactured cables to other countries it has also established its production facilities at some African countries' due availability of raw material and cheap labour there. Some of the major raw material such as copper, aluminum and other non-ferrous metals are also imported from foreign countries. Hence overall TRC has frequent receipts and expenditure items denominated in Non-INR currencies.

Though TRC make use of Long-Term Debts and Equity to meet its long term fund requirements but to finance its operations it make use of short-term financial instruments such as Commercial Papers, Bank Credit and Term Loans from the banks etc. If any surplus cash is left with TRC it is invested in interest yielding securities. Recently due to stiff competition from its competitors TRC has relaxed its policy for granting credit and to manage receivables it has formed a separate credit division.

Further to hedge itself against the various risk it has entered into various OTC Derivatives Contracts settled outside the Exchange.

Required: Evaluate the major risks to which TRC Ltd. is exposed to.

Solution:

Following are main categories of risks to which TRC Cables is exposed to:

(i)Financial Risks: TRC is exposed to following financial risks:

(1)Currency Risk: Since most of the Receipts and Payments of TRC are denominated in Non-INR currencies it is exposed to Currency Risk.

(2)Commodity Risk: As major constituents of production of TRC are commodities such copper, aluminum etc. it is subject to Commodity Risk.

(3)Interest Rate Risk: As TRC borrows and invest money in short-term instruments it is exposed to Interest Rate Risk.

(4)Counter Party Risk: Due to relaxation of norms for granting credits certainly the receivable amount must have increased resulting in increased in Credit Risk.

(5)Liquidity Risk: Since for short-term funding requirements TRC is using Commercial Papers etc. they are exposed to Liquidity Risk as in time of need if funds are not available from these sources then securities shall be sold at

discounted price.

(6)Political Risk: As TRC is operating in various other countries it is also exposed to Political Risks such as Restriction on Conversion of local earnings into foreign currency, restrictions on remittance etc.

(ii)Settlement Risk: The use of OTC Derivatives by TRC also expose it to the settlement risk as the parties with whom it has entered into the contract may not honor the same.

WHEN ASSET VALUE OF MISSING IN QUESTION

QUESTION NO.11 On Tuesday morning (before opening of the capital market) an investor, while going through his bank statement, has observed that an amount of ₹7 lakhs is lying in his bank account. This amount is available for use from Tuesday till Friday. The Bank requires a minimum balance of ₹ 1000 all the time. The investor desires to make a maximum possible investment where Value at Risk (VaR) should not exceed the balance lying in his bank account. The standard deviation of market price of the security is 1.5 per cent per day. The required confidence level is 99 per cent. **Given**

Standard Normal Probabilities

z	0.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
2.2	.9861	.9864	.9868	.9871	.9875	.9878	.9881	.9884	.9887	.9890
2.3	.9893	.9896	.9998	.9901	.9904	.9906	.9909	.9911	.9913	.9916
2.4	.9918	.9920	.9922	.9923	.9925	.9929	.9931	.9932	.9934	.9936

You are **required** to determine the maximum possible investment.

Solution:

Particulars	Amount (₹)
Amount available in bank account	7,00,000
Minimum balance to be kept	1,000
Available amount which can be used for potential investment for 4 days	6,99,000
Maximum Loss for 4 days	6,99,000
Maximum Loss for 1 day = 699000/ $\sqrt{4}$	3,49,500

Daily VaR = Amount Of Investment x Table Value x Daily Standard Deviation

3,49,500 = Amount Of Investment x 2.33 x .015

or Amount Of Investment = 1,00,00,000

CALCULATION OF FINANCIAL DIFFICULTY PROBABILITY

QUESTION NO.12 ABC Ltd. is considering a project X, which is normally distributed and has mean return of Rs. 2 crore with Standard Deviation of Rs. 1.60 crore.

In case ABC Ltd. loses on any project more than Rs. 1.00 crore there will be financial difficulties. Determine the probability the company will be in financial difficulty.

Given: Standard Normal Distribution Table (Z-Score) providing area between Mean and Z score

Z Score	Area
1.85	0.4678
1.86	0.4686
1.87	0.4693
1.88	0.4699
1.89	0.4706

Our Hopes & Dreams should be like Hair & Nail. No matter how many times they are cut, but they never stop growing.

Solution:

For calculating probability of financial difficulty, we shall calculate the area under Normal Curve corresponding to the Z Score obtained from the following equation (how many SD is away from Mean Value of financial difficulty):

$$Z = \frac{x - \mu}{\sigma} = \frac{-1.00\,\text{crore} - 2.00\,\text{crore}}{1.60\,\text{crore}} = \text{-1.875 say 1.875}$$

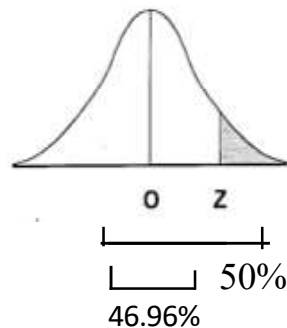**Corresponding area from Z Score Table by using interpolation shall be found as follows:**

Z Score	Area under Normal Curve
1.87	0.4693
1.88	0.4699
0.01	0.0006

The corresponding value of 0.005 Z score = 0.005 x $\dfrac{0.0006}{0.01}$ = 0.0003

Thus the Value of 1.875 shall be = 0.4693 + 0.0003 = 0.4696

Thus the probability the company shall be in financial difficulty is 50% - 46.96% = 3.04%

Additional Analysis: Why 50% is used ? Because area from mean to left tail is 50%; Remember Total Area is 100%. Why 46.96% is deducted from 50% ? This will be understood from the following graph. We need shaded region area because the word in the question is like this:"In case ABC Ltd. loses on any project **more than Rs. 1.00 crore** there will be financial difficulties"

0   Z

50%

46.96%