

## Risk in Financial Services Formulae Sheet

### 1. Basic Pillar 1 Capital Requirement for Banks

$$\frac{\text{Capital}}{\text{Credit Risk} + \text{Market Risk} + \text{Operational Risk}} > 8\%$$

### 2. Risk Score

$$\text{Risk score} = \text{likelihood score} \times \text{impact score}$$

### 3. Credit Risks associated with Loan Defaults

$$\text{Expected loss (EL)} = \text{PD} \times \text{EAD} \times \text{LGD}$$

Where,

PD = Probability of Default (%)

EAD = Exposure at Default (Amount)

LGD = Loss Given Default (%)

### 4. Recovery Rate

$$\text{RR} = 100\% - \text{LGD}$$

### 5. Collateral Adequacy Calculation

$$\text{Collateral Adequacy Calculation} = \text{Collateral Value} + \text{Haircut}$$

$$\text{Haircut} = (\text{Collateral Value} \times \text{Volatility})$$

### 6. Measures of Central Tendency

- Mean – the average value of all the data
- Median – the middle item(s), with exactly half the data above and half below
- Mode – the most frequently occurring value in the data.

**Mean**

$$\text{The mean or average} \rightarrow \bar{x} = \frac{\sum x}{n}$$

The sum of all observed values

The number of observed values

## Median

2	5	8	9	12	13	15	16	18
Four numbers				Median	Four numbers			

If the data has an even set of numbers, then the median is equal to the average of the two middle items:

2	5	8	9	12	13	15	16	18	19
				Median = 12.5 $\frac{(12 + 13)}{2}$					

## 7. Range

$$\text{Range} = \text{Highest Value} - \text{Lowest Value}$$

## 8. Inter Quartile Range

Ranks data (such as performance returns from different funds), against each other and presents the data as a series of quartiles. It then measures the difference from the lowest rank quartile to the highest.

Fund	A	B	C	D	E	F	G	H	I	J	K	L
Return	3.5%	4%	4.75%	5%	5%	5.75%	6%	6.5%	7%	7.5%	8%	9%
Median 5.875%												
Quartile	1st quartile			2nd quartile			3rd quartile			4th quartile		
Inter-quartile range												

## 9. Quartile Deviation

$$\text{Quartile Deviation} = \frac{1}{2} (Q3 - Q1)$$

Q1 = First Quartile Position

Q2 = Second Quartile Value

Q3 = Third Quartile Position

## 10. Variance

Is a measure of dispersion and shows the spread of data around the mean.

The variance calculates the difference between each return from the mean and then squares it. These are then totaled, and their average then represents the variance.

### 11. Standard Deviation

It is the square root of the variance and is the most commonly used measure of dispersion.

$$\text{Population Standard Deviation} = \sqrt{\frac{\sum(x - \mu)^2}{n}}$$

$$\text{Sample Standard Deviation} = \sqrt{\frac{\sum(x - \mu)^2}{n - 1}}$$

$x$  = Each Value of the population

$\mu$  = The Population mean

$n$  = The size of the population

### 12. Probability

$$\frac{\text{The number of way an event can occur}}{\text{The total number of possible outcomes}}$$

### 13. Real Rate of Return

$$\frac{1 + \text{Nominal Rate}}{1 + \text{Inflation Rate}} = 1 + \text{Real Rate}$$

### 14. Compound Interest

$$S = X(1 + r)^n$$

$X$  = the original sum invested,

$r$  = the interest rate (5% is written as 0.05)

$n$  = the number of periods over which we are compounding

$S$  = the sum invested after  $n$  periods

### 15. Sharpe Ratio

$$\text{Sharpe Ratio} = \frac{\text{return on the portfolio} - \text{risk free return}}{\text{standard deviation of portfolio}}$$

### 16. Information Ratio

$$\text{Information Ratio} = \frac{\text{mean of excess returns}}{\text{standard deviation of excess return from the benchmark}}$$