

NORMALISED DISTRIBUTION

1. The Normal Distribution (most common meaning)

This is the classic **bell-shaped curve** (also called the Gaussian distribution).

When we say returns (or any data) follow a **normal distribution**, we mean:

- The data are symmetrically distributed around the mean
- Most values cluster near the average
- Extreme values become progressively rarer the further you move from the mean

Standard deviation is especially useful here because of the well-known rules:

Distance from the mean Approximate % of observations

± 1 standard deviation $\approx 68\%$

± 2 standard deviations $\approx 95\%$

± 3 standard deviations $\approx 99.7\%$

This is why standard deviation is such a powerful risk measure when returns are assumed to be normally distributed.

2. The Standard Normal Distribution (Normalised / Standardised form)

This is a **special version** of the normal distribution that has been “normalised” (or standardised) so that:

- Mean (μ) = 0
- Standard deviation (σ) = 1

Any normal distribution can be converted into this standard form using the **z-score** formula:

$$z = \frac{x - \mu}{\sigma}$$

Once data are expressed as z-scores, they follow the **standard normal distribution**. This makes it easy to compare different datasets or calculate probabilities from standard normal tables.

In short

- **Normal distribution** = the familiar bell curve.
- **Normalised / Standard normal distribution** = the same curve after it has been scaled so that mean = 0 and standard deviation = 1.

In property investment analysis, when we use standard deviation as a risk measure, we are usually assuming (or approximating) that returns follow a **normal distribution**.