

## Statistical Tests Comparing Difference in Means (Average Values)

A **t-Test** is used to compare the difference in means (average returns) between two samples is undertaken when sample size less than 30

For large samples, such as financial stock returns or exchange rates, we use **Z-Test** Statistic

We assume a normal distribution for sample size  $n > 30$  and so we use p-value to test the difference in means for large samples

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For large samples  $n > 30$  we use Z-Test Statistic => **Z-value** , where:

$$Z = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$

Choose an  $\alpha$  level of significance say 0.05 which implies  $(1 - \alpha)$  or 95% Confidence Interval

Hypothesis Testing:

Null Hypothesis  $H_0: \mu = \mu_0$  (Assume the two samples have same average stock returns or exchange rates)

Alternate Hypothesis  $H_a: \mu \neq \mu_0$  (Assume the two samples **do not** have same average stock returns or exchange rates)

Derive a p-value from z-statistic (an online calculator link below)

<https://www.socscistatistics.com/pvalues/normaldistribution.aspx>

If  $p - value \leq \alpha$  : Reject  $H_0$  Null Hypothesis

If  $p - value > \alpha$  : Fail to Reject the Null Hypothesis (Alternate Hypothesis holds!)

Rationale: A  $p - value \leq \alpha$  implies that our test statistic lies further in extreme to the critical cut-off region determined by  $\alpha$  the level of significance enabling us to reject the null hypothesis

Online Reference:

<https://www.youtube.com/watch?v=5FmxvmlOmfA>

You can also use Excel, and will need to Add-in "Analysis-Toolpak"

Here is the procedure: Go to File, then, Options, then Addin-in, select Go,

Select and Check in "Analysis-Toolpak"