T-TEST, F-TEST, Z-TEST, CHI SQUARE TEST.
PARAMETRIC TEST

1. T-test
2. Z-test
3. F-test
1. T-TEST

T-test is a small sample test.

It was developed by William Gosset in 1908.

It is also called students t test (pen name).

\[ t = \frac{\text{Deviation from population parameter}}{\text{Standard error of 0}\text{th sample statistics}} \]
Size of sample is small (n<30)

Degree of freedom is v=n-1

T-test is used for test of significance of regression coefficient in regression model.

In multiple regression with 3 individual variable the regression coefficient are to be tested by- t-test.
To test the hypothesis that correlation coefficient in population is zero then we used t-test.

We used t-statistics when parameter of population are normal.

Population Variance are unknown.

It is also called Welch t-test.
Z-test was given by Fisher.

T-test is used when correlation coefficient of population is zero.
But if population coeff. Correlation is not zero then z-test is used.

\[ Z = \frac{Z_r - Z_p}{SE_z} \]
In z-test sample size is large (n>30)

Z-test is used to determine whether two population means are different, when

Population variance is known.

Z-test is based on standard normal distribution.

Z-test is also called large sample test.
For each significance level the z-test has single critical value ie. 1.96 for 5% two tailed.

Z-test conduct various tests like,

One sample test,
Two sample test.
Location test,
Maximum likelihood estimate.
Paired difference test.
F-test (Variance Ratio Test)

F-test also given by Fisher.

F-test is used to the **two independent** estimation of population variance.

Two sample have **same variance**. \( (S_1^2 \text{ and } S_2^2) \)

F-test is small sample test.

\[
F = \frac{\text{Larger estimate of population variance.}}{\text{Smaller estimate Of population variance.}}
\]
The variance ratio = \[ \frac{S_1^2}{S_2^2} \]

Degree of freedom for larger population variance is \( V_1 \) and smaller is \( V_2 \)

The null hypothesis of two population variance are equal ie \( H_0 : S_1^2 = S_2^2 \)

\( V_1(\text{larger}) \ n-1 \)
\( V_2(\text{smaller}) \ n-2 \)

F-test are design to test if two population variance are equal.
F-test is used by comparing the ratio of the two variances $\frac{S_1^2}{S_2^2}$.

The samples must be independent.

F-test never be negative because the upper value is greater than the lower.

Testing of overall significance of regression by – F-test.

Test for the significance of the adjusted coefficient of multiple determination is – F-Test.
F-test value lies bw 0 to $\infty$
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$\chi^2$ test is introduced by Karl Pearson.

$\chi^2$ test is sampling analysis for testing significance of population variance.

Chi square is non parametric test, it can be used for test of goodness of fit $r^2$.

Chi square test is use simple random sampling method.

Chi square test’s value lies bw 0 to 1.
1. Total frequency (sample size) is large. \((n > 50)\)

2. Samples are independent.

3. Cell frequency are linear.

4. Expected frequency will not small if it small \((e < 5)\) then pooling techniques is used.
ANALYSIS OF VARIANCE (ANOVA)

Given by **fisher**.

**Assumptions**-

1. Independence of sample.
2. Normal population.
3. Same population variance.
4. Based on qualitative data.