X^2 - TEST

Hypothesis Testing Framework

Ho Ha

1) Setup the Null and Alternate Hypothesis

2) Choose the right test statistic

3) Left tailed vs Right tailed vs Two-Tailed

4) Compute P-value

5) If P- value is less than alpha, then reject the null hypothesis.

ttest

Numerical v/s Categories (2 Categories) — Ttest

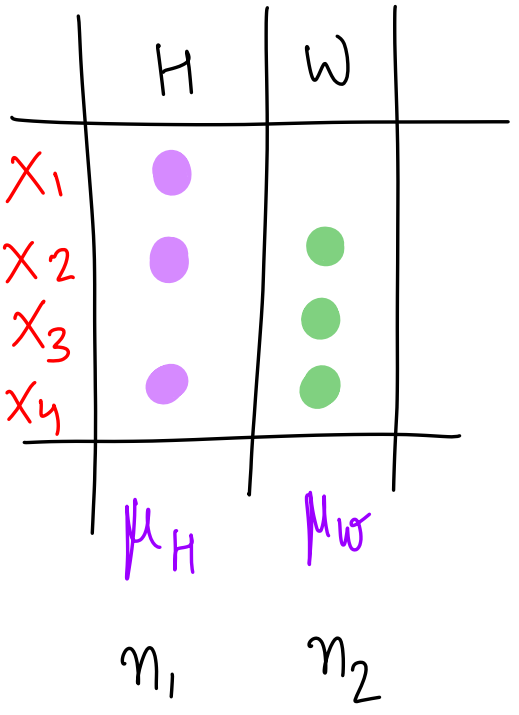
Categorical v/s Categorical — Chi square test

Degree of freedom

= 36

If I have 'n' places to fill & I know the mean

→ degree of freedom = n-1



$$(n_1 - 1) + (n_2 - 1)$$

$$DOF = n_1 + n_2 - 2$$

Cities

Candidate	A	B	C	D	
X_1	x_1	100	90	x_3	350
X_2	x_2	20	20	x_4	50
X_3	80	20	50	50	200
	150	140	160	150	600

$x_1 + x_2 = 70$ (1)

$x_1 + x_3 = 160$ (2)

$x_3 + x_4 = 100$ (3)

$x_2 + x_4 = 10$ (4)

x_1, x_2, x_3, x_4

Rows = m (3)

Columns = n (4)

$$\frac{(m-1) + (m-1) + (m-1)}{3}$$

$$DOF = (m-1) \times (n-1)$$

Chisquare

- Goodness of fit
- Test of Independance

① Coin toss

50

H_0: Coin is fair

H_a: Coin is biased

	Heads	Tails
OBSERVATION	28	22
EXPECTATION	25	25

$$\chi^2_{stat} = \frac{(28-25)^2}{25} + \frac{(22-25)^2}{25}$$

frequencies

$$\chi^2 stat = \sum \frac{(observation - Expectation)^2}{Expectation}$$

S1 $\chi^2_{stat} = 0.72$

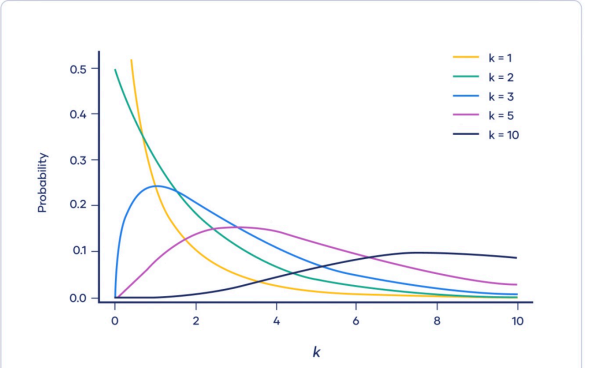
Coin is fair

H_0

S2 $\chi^2_{stat} = 32$

Coin is working hard

H_a

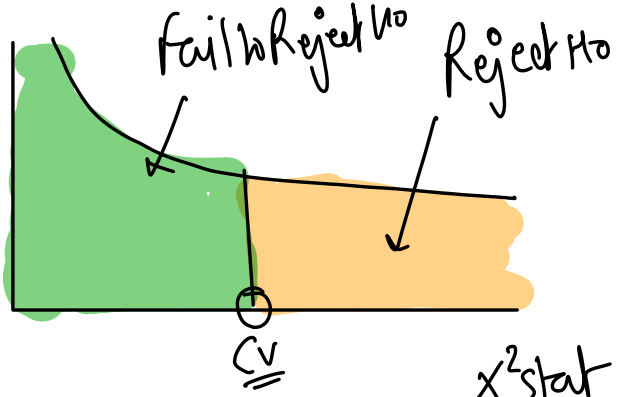


S1

	Heads	Tails
OBSERVATION	28	22
EXPECTATION	25	25

S2

	Heads	Tails
OBSERVATION	45	5
EXPECTATION	25	25



X^2 tests are always Right Tailed.

Profit 10600

Profit 11800

Bulb manufacturer.

		10	20	30	100	50	60	80	
		B1	B2	B3	B4	B5	B6	B7	
	Expectations	50	20	30	10	40	30	20	200
	OBSERVATIONS	60	10	10	30	50	20	20	
	No. of bulbs	100	100	100	100	100	100	100	
20,000	Revenue	1000	2000	3000	10000	5000	6000	8000	
	no. of defective	50	20	30	10	40	30	20	
8200	Refund	500	400	900	1000	2000	1800	1600	
		60	10	10	30	50	20	20	
Refund 9400		600	200	300	3000	2500	1200	1600	

TEST OF INPENDANCE

observation

Amazon

	f	m	
offline	527	72	599
Online	206	102	308
	733	174	907

Expected freq -

	f	m	
offline	484	115	599
Online	249	59	308
	733	174	907

Ho Gender dosent affect buying pattern (Indipendant)

Ha · Gender affect buying pattern (dipendant)

If we know that 60% of Total people prefer offline shopping, how many females will prefer to buy offline.

observed

527	72
206	102

expected