

Homoscedasticity

$$\text{Var}(\varepsilon_j) = \sigma^2$$

Variance of error term is constant

When does heteroskedasticity occur

1. when value of Independent Variable increases

$$\text{money spent on vacation} = \beta_0 + \beta_1 (\text{family income})$$

low income \rightarrow spend less
less variation

high income \rightarrow more discretionary spending.
larger variation.

2. Measurement errors

3. Sub-population differences (or other interaction effects)



4. Model misspecifications

y instead of $\log(y)$

x^2 instead of X

Consequences

1. Do not provide estimate with smallest variance.
2. Standard errors will be biased.

$$w(\text{Wage}) = \beta_0 + \beta_1(\text{Educ}) + \beta_2(\text{Skills})$$

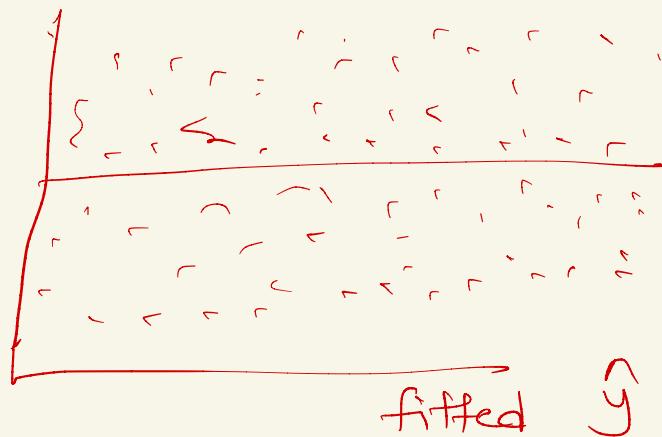


Detect heteroscedasticity

Visual Inspection

plot residuals vs fitted values

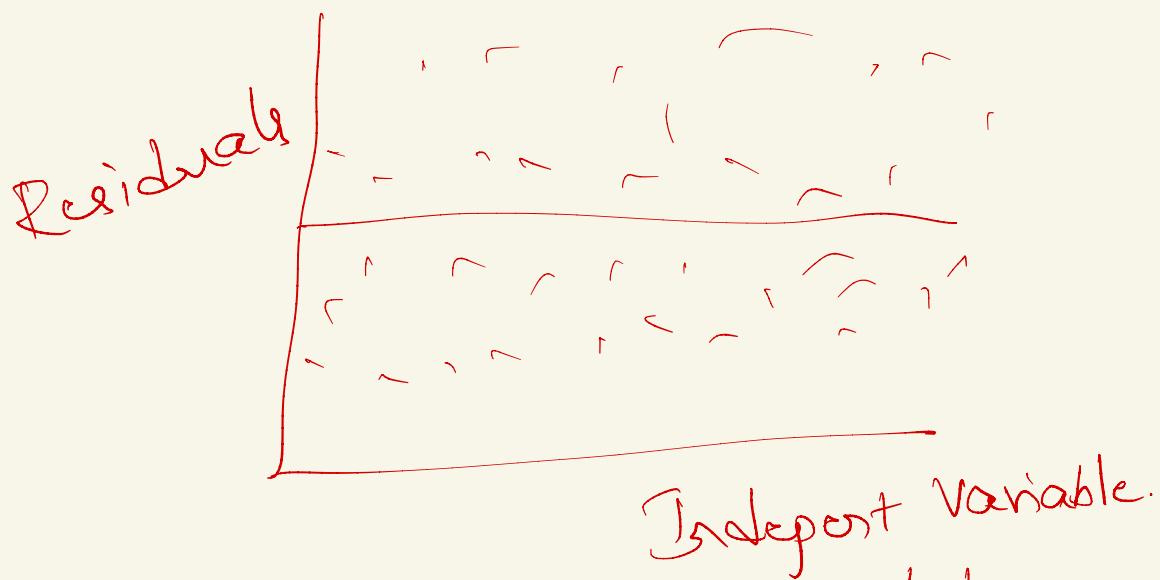
Residual
 $(y - \hat{y})$





In Stata rvp plot to plot
residuals vs fitted values.

Residuals vs Independent
Variables.



In Stata rvp plot to plot
residuals vs x variable.

white's test

H_0 : homoskedasticity

H_a : There is no homoskedasticity
(or) there is heteroskedasticity

$p > 0.05$, fail to reject H_0

regress y x

estat imtest, white

How to fix heteroscedasticity

1. Improper model Specification
 - check for left out variables
 - Transform variables
2. Use robust standard errors
reg y x, robust
3. Use weighted least squares regressions.