

# Heteroscedasticity:

Pranav shekhar  
Assistant Professor  
Department of economics  
Subject-Econometrics  
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# Meaning and concept

- In statistics, heteroskedasticity (or heteroscedasticity) happens when the standard errors of a variable, monitored over a specific amount of time, are non-constant. With heteroskedasticity, the tell-tale sign upon visual inspection of the residual errors is that they will tend to fan out over time, .
- Heteroskedasticity often arises in two forms: conditional and unconditional. Conditional heteroskedasticity identifies nonconstant volatility when future periods of high and low volatility cannot be identified. Unconditional heteroskedasticity is used when futures periods of high and low volatility can be identified.



# The Types Heteroskedasticity

- Unconditional
- Unconditional heteroskedasticity is predictable, and most often relates to variables that are cyclical by nature. This can include higher retail sales reported during the traditional holiday shopping period or the increase in air conditioner repair calls during warmer months.
- Changes within the variance can be tied directly to the occurrence of particular events or predictive markers if the shifts are not traditionally seasonal. This can be related to an increase in smartphone sales with the release of a new model as the activity is cyclical based on the event but not necessarily determined by the season.

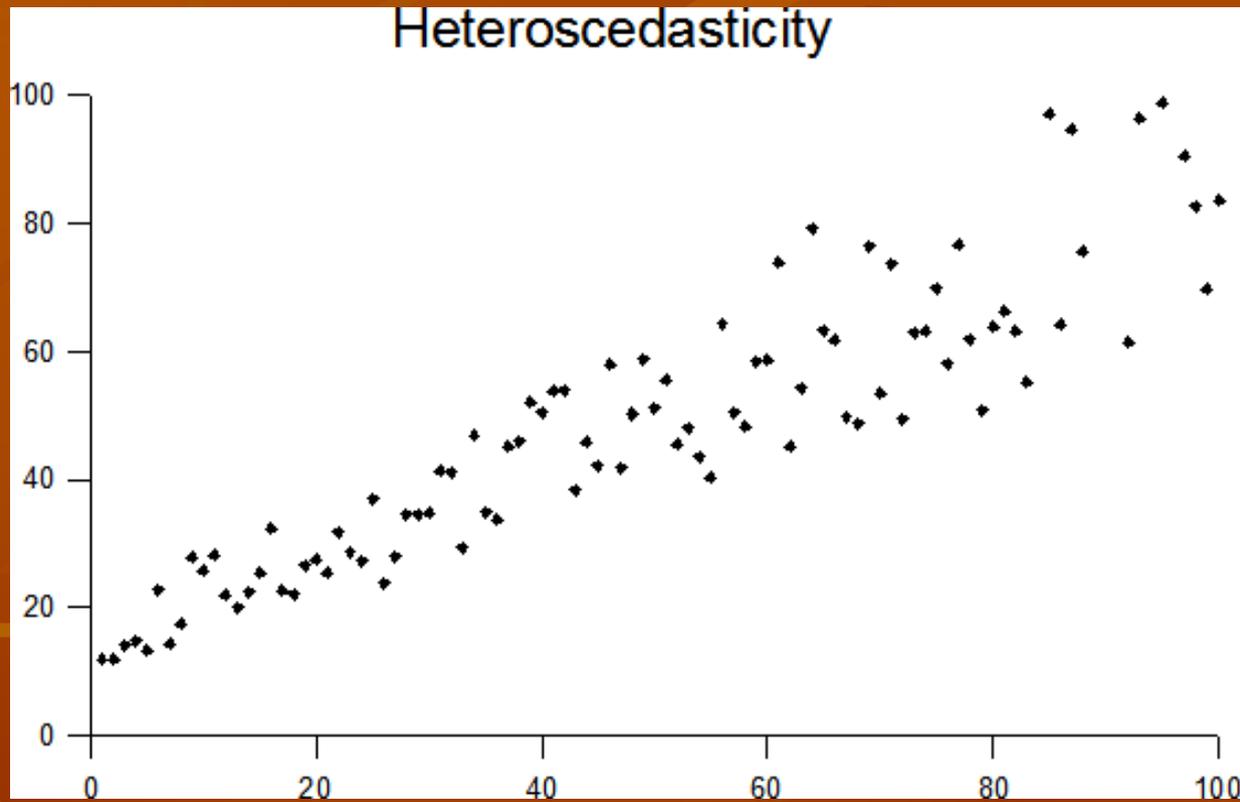


# conditional Heteroskedasticity

- Conditional
- Conditional heteroskedasticity is not predictable by nature. There is no telltale sign that leads analysts to believe data will become more or less scattered at any point in time. Often, financial products are considered subject to conditional heteroskedasticity as not all changes can be attributed to specific events or seasonal changes



# Graphs of Heteroskedasticity



# Test of Heteroscedasticity

- **Bartlett Test**
- Bartlett's test is used to test if variances across samples is equal. It is sensitive to departures from normality. The Levene test is an alternative test that is less sensitive to departures from normality.
- You can perform the test using 2 continuous variables, one continuous and one grouping variable, a formula or a linear model.



# Breusch Pagan Test

- **Breusch Pagan Test**
- Breusch Pagan Test was introduced by Trevor Breusch and Adrian Pagan in 1979. It is used to test for heteroskedasticity in a linear regression model and assumes that the error terms are normally distributed. It tests whether the variance of the errors from a regression is dependent on the values of the independent variables. It is a  $\chi^2$  test.
- You can perform the test using the fitted values of the model, the predictors in the model and a subset of the independent variables. It includes options to perform multiple tests and p value adjustments. The options for p value adjustments include Bonferroni, Sidak and Holm's method.



# Score Test

- **Score Test**
- Test for heteroskedasticity under the assumption that the errors are independent and identically distributed (i.i.d.). You can perform the test using the fitted values of the model, the predictors in the model and a subset of the independent variables



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