Validity, Reliability and Classical Assumptions

Presented by

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Sources:
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http://en.wikipedia.org/wiki/Heteroscedasticity
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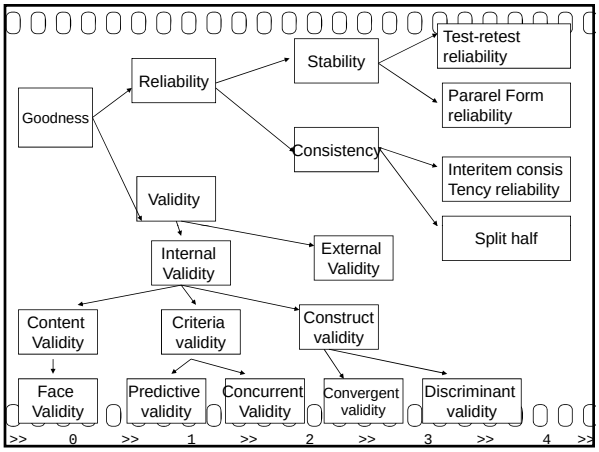
Data Quality Tests: Validity and Reliability

- **<u>Reliability</u>: the degree to which a measurement procedure produces similar outcomes when it is repeated.**
- **E.g., gender, birthplace, mother's name—should be the same always—**
- **<u>Validity</u>: tests for determining whether a measure is measuring the concept that the researcher thinks is being measured,**
- **i.e., "Am I measuring what I think I am measuring"?**



External Validity

- External validity is reached if data can be generalized in all different objects, time and situations.
  1. **Unbiased sample**
  2. **Big sample size**
  3. **Involve various situations**
  4. **Relatively long time period**

Internal Validity

- Internal validity is talking about actual concept of research.
1. Content Validity
2. Criterion-related validity
3. Construct validity
- Generally internal validity is helping fixing external validity

Content validity

- Face Validity
- "On its face" does it seems like a good translation of the construct.
  - Weak Version: If you read it does it appear to ask questions directed at the concept.
  - Strong Version: If experts in that domain assess it, they conclude it measures that domain

Criterion-related validity

- Measuring individual differences base on the criteria.
- Concurrent Validity Assess the operationalization's *ability to distinguish between groups that it should theoretically be able to distinguish between. Measured by low correlation coefficient between groups.*
- Predictive Validity Assess the operationalization's *ability to predict something it should theoretically be able to predict. Measured by high correlation coefficient between groups.*

Construct validity

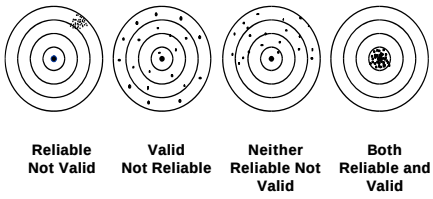
- Showing goodness of instrument in translating the theory.
- Convergent validity happens if two instrument that measure a concept have high correlation.
- Discriminant validity happens if theoretically two variables have not correlations and in fact the correlation is not exist. Tested by factor analysis.

RELIABILITY

1. Stability
   - Parallel form
     Giving respondent questions in different formats.
     Is the train ticket not expensive?
   - Double test / test pretest
     giving same question to same respondent in the different time
2. Consistency

2.1. Inter-item consistency, is consistency of respondent answer on all of questionnaire instrumentest.

2.2. Split-half reliability, showing correlation between two part of questionnaire



Reliable Not Valid | **Valid Not Reliable** | **Neither Reliable Not Valid** | **Both Reliable and Valid**

Validity and Reliability test

- Validity test is done by correlating item score with total score.
- *Rank Spearman correlation for ordinal data and product moment correlation for interval data*
- *Reliability is generally measured by Cronbach Alpha, Hoyt* dan *Spearman Brown* tests. Cronbach's Alpha > 0.7 is reliable

Note:

- **a valid test is always reliable but a reliable test is not necessarily valid**
- **e.g., measure concepts--positivism instead measuring nouns—invalid**
- **Reliability is much easier to assess than validity.**

Classical Assumptions Test

- Classical assumptions test are requirement tests for multiple linear regression that use Ordinary Least Square (OLS) techniques.
- Logistic and ordinal regression techniques don't need Classical assumption test.
- Classical assumptions test isn't needed in linear regression that use to count a value in a variable. For example, counting stock return use market model.

5 Types Test

1. Normality
2. Multicolinearity
3. Autocorrelation
4. Heteroskedacity
5. Linearity

There is no rules that states witch assumption that should be fulfilled first.

1. Normality

- Normality is test to know sample data distribution is come from population that is normal distributed or not.
- Central limit theorem said that big sample size (>25) tend to be normal distributed.
- Population research don't need normality test.

Detecting Data Normality

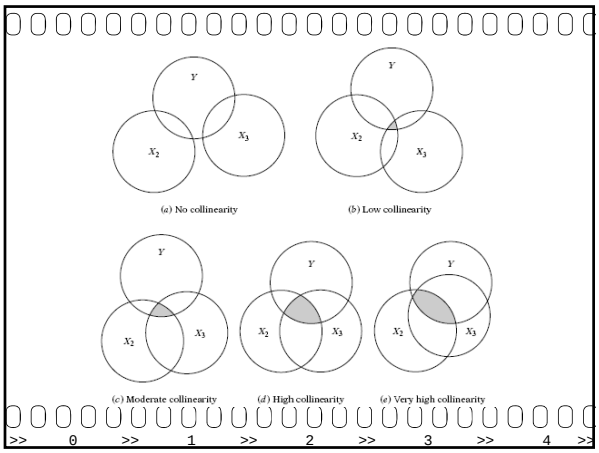
- Graph techniques (Histogram, P Plot)
- Chi Square
- Skewness and Kurtosis
- Lilefors test
- Kolmogorov Smirnov ➔ most common use. Criteria: Asymp. Sig (2 talied) > Alpha

Remedial Un-normal Data

- Data transformation (Log Natural, square root, inverse, etc.)
- Outliers trimming
- Adding sample

2. Multicoliearity

- Multicolinerity test is used to knowing high correlation between independent variable in multiple linear regression test.
- High colinearity between independent variables will disturb relationship between independent and dependent variable.
- Simple linear regression isn't need multicolinearity test.
- Multicolinearity test couldn't be performed if the research use variables that had been used by prior research with same phenomena in different palce.



Detecting Multiclolinearity

- Variance Inflation Factor (VIF) > 10
- Pearson correlation between variables (criteria: sig < Alpha)
- Eigen values
- Condition Indexes (CI)

Remedial Multicolinarity Variables

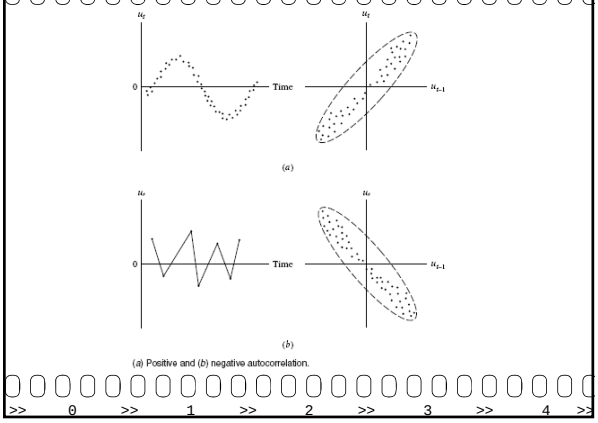
- Combining cross-sectional and time series data
- Dropping a variable(s) and specification bias
- Transformation of variables (Log Natural, square root, inverse, etc.)
- Additional or new data

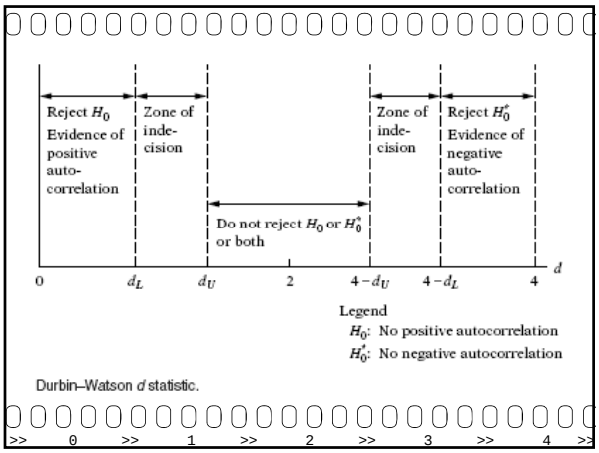
3. Autocorrelation

- Autocorrelation test to knowing whether any correlation between variables in t period with variables in prior period (t-1)
- Autocorrelation test is performed for time series data not for cross sectional data.

Detecting Autocorrelation

- Graphical Method
- The Runs Test
- Durbin-Watson Test (-2< D-W value >+2)
- A General Test of Autocorrelation:
  The Breusch-Godfrey (BG) Test





Durbin–Watson *d* statistic.

Remedial Autocorrelation Variables

- Data transformation
- Transforming regression into generalized difference equation

4. Heteroskedacity

- Heteroskedacity test is a test to indentify variance differences from residual in an observation with other observations.
- Regression model should have residual variance similarity between a odservation whith oter observation (homoskedastic).

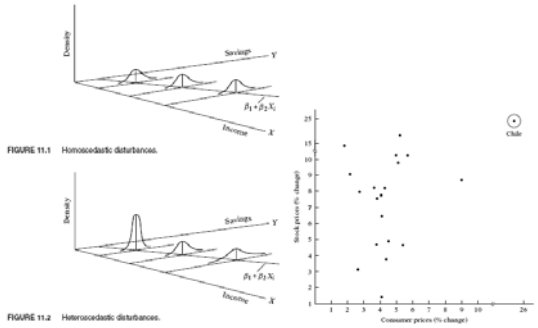
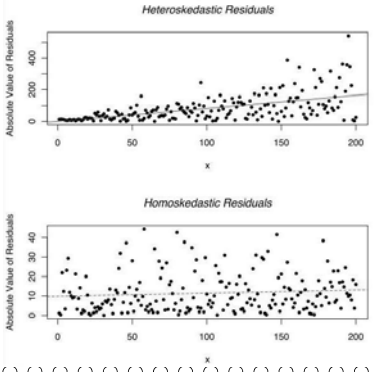


FIGURE 11.1 Homoscedastic disturbances.

FIGURE 11.2 Heteroscedastic disturbances.

Detecting Heteroskedacity

- Graph techniques (scater plot)
- Glejser test
- Park test
- White test
- Corelation spearman of residual (sig > alpha)



Remedial of Heteroskedacity

- Data transformation (Log Natural, square root, inverse, etc.)
- Outliers trimming

5. Linearity

- Linearity test to knowing whether the model that had been built is linear or isn't linear.
- This test is the most rare did in research because researchers built the model base on theories. That mean the model had been built already linear.

Detecting Linearity

- ANOVA linearity test significance value of F value (criteria: Deviation from linearity > alpha)
- Durbin-Watson
- Ramsey Test
- Lagrange Multiplier

Ridho Allah, keberuntungan dan keberhasilan
Akan selalu melekat pada orang yang selau berjuang dan bersyukur

== Mahendra AN ==