ECONOMETRIC TECHNIQUES FOR REVENUE FORECASTING USING EVIEWS

Session 3: Statistical Problems with Assumptions

Patrick Grady
Global Economics Ltd.

Violating Assumption 5: Multicollinearity

- If the independent variables are highly correlated, multicollinearity is said to exist.
- Can still be high R^2, but coefficients on correlated variables will have high standard errors.
- OLS estimator is still Best Linear Unbiased Estimate even if there is multicollinearity.
- What to do?

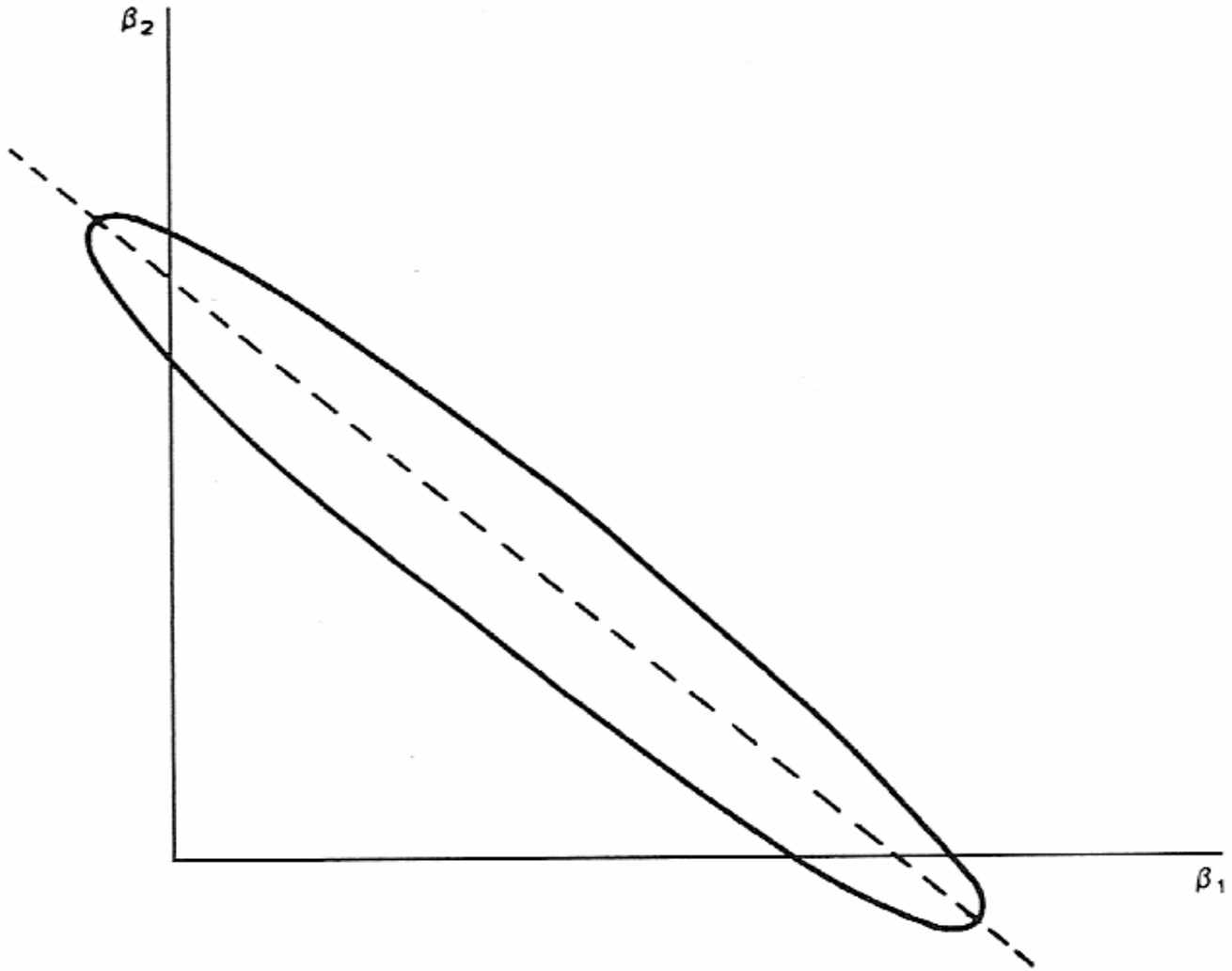

Figure 11.1 High negative covariance arising from collinearity

Source: Peter Kennedy, *A Guide to Econometrics* (2003).

Violating Assumption 1: Wrong Regressors, Nonlinearities, and Parameter Inconstancy

- Incorrect independent variables.
  - Omission of relevant independent variable.
  - Inclusion of irrelevant variables.
- Non-linearity of relationship
  - Transformations (polynomial, log, semi-log)

Some Common Transformations

- Log-linear lnR=a+b*lnt + c*linB
- Semi-log lnR=a +b*time
- Inverse $Y=a + b*X^{-1}$
- Polynomial $R=a +b*t+ c*B +D*B^2$
- Percent R/GDP=a + b*t*B/GDP

Violating Assumption 2: Non-Zero Expected Disturbances

- Disturbance term may have a non-zero mean because of systematically positive or negative errors in measuring dependent variable.
- The only problem is that OLS gives a biased estimate of constant term in regression.
- Omitting intercepts from equations can cause biased estimates.

Violating Assumption 3: Non-Spherical Disturbances , Heteroskedacticity and Autocorrelation

- Heterosekdacticity occurs when the variance of the disturbance term is not contstant
- Autocorrelation occurs when the disturbance term is correlated with its previous values.

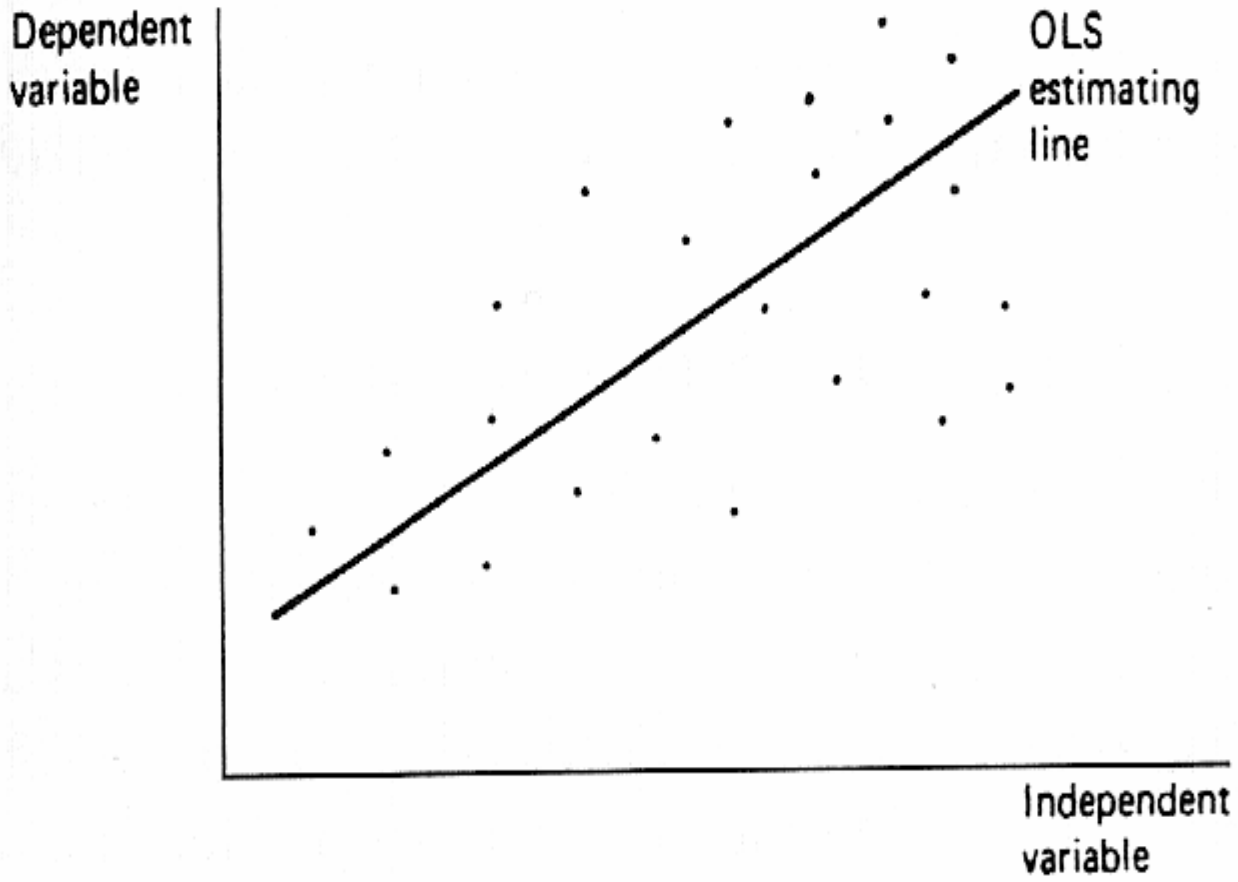

Figure 8.1 Illustrating heteroskedasticity

Source: Peter Kennedy, *A Guide to Econometrics* (2003).

Heteroskedacticity

- Heteroskedasticity does not cause parameters estimates to be biased
- But it does cause the estimates to not be efficient.
- What to do?
  - Transformations such as dividing by value of independent variable.
  - Use Generalized Least Squares to estimate parameters.

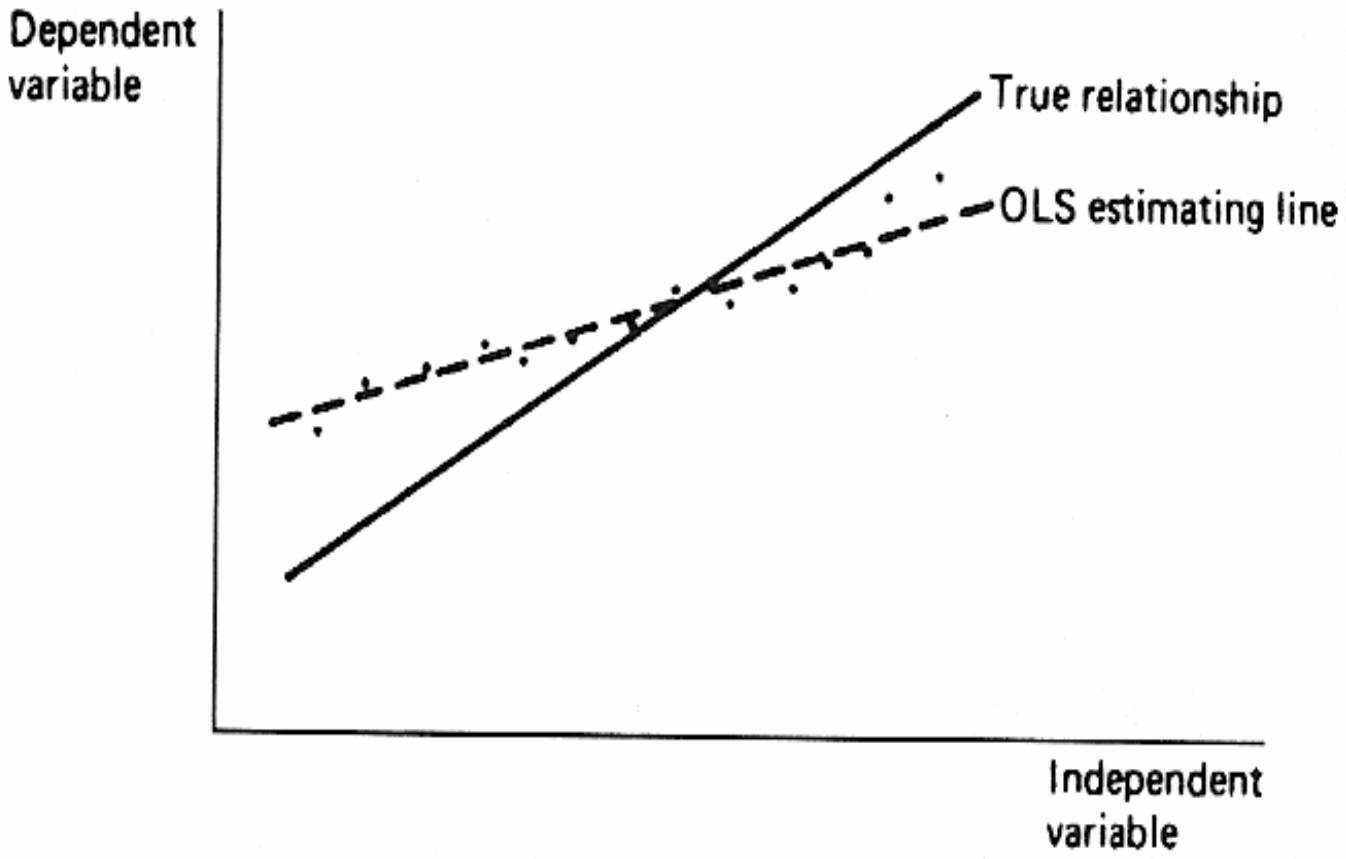

Figure 8.2 Illustrating positive autocorrelated errors

Source: Peter Kennedy, *A Guide to Econometrics* (2003).

Autocorrelation

- Autocorrelation is a more serious and less easily treatable problem.
- Could indicate misspecification.
- Does not generally cause parameter estimates to be biased (unless a lagged dependent variable is included).
- But makes parameter estimates less efficient.

Diagnosing and Treating Autocorrelation

- Inspect residuals.
- Tests
  - Durbin-Watson
  - Godfrey and Breusch
- Remedies
  - GLS estimators
  - Hildreth-Liu
  - Cochrane-Orcutt