OLS ASSUMPTION	EFFECT OF VIOLATION	PROPERTIES LOST	PROPERTIES REMAINING	CORRECTION MEASURES
1) Normality $\varepsilon_i \sim$ N	1) OLS is no longer maximum likelihood. 2) Statistical tests are no longer strictly valid.	1) Efficiency	1) Unbiased 2) BLUE 3) Consistent 4) Asymptotically Efficient if variance is finite via Central Limit Theorem.	a. Maximum likelihood based on true distribution. b. Robust estimation methods such as least absolute value. c. Bootstrap. d. GMM e. Ignore if sample is large.
2) Zero mean of error term				
i) E(ε_i) = μ	1) Biases intercept (α) E(α) = α + μ 2) Estimate of variance unbiased. Significance tests still valid.	All for α None for slope parameters (β)	None for α All for β	No problem if only concerned about estimates of slope coefficients.
ii) E(ε_i) = μ_i				
a) cov (X_i, ε_i) = 0	Increases variance and, therefore, lowers power of significance tests.	All efficiency properties for β. All properties for α.	1) Unbiased 2) Consistent	Usually means model is misspecified, therefore the solution is to specify the correct model.
b) cov (X_i, ε_i) $\neq 0$		All	None	Same as above.
3) Homoskedasticity var (ε_i) = σ^2	1) Estimate of variance is biased, therefore statistical tests are biased.	All 3 efficiency properties: 1) BLUE 2) Efficient 3) Asymptotically Efficient	1) Unbiased 2) Consistent	1) If you know σ_i^2 or know $\sigma_i^2 = \mathrm{f}(X_i)$ you can regain all properties with weighted least squares (GLS). 2) If $\sigma_i^2 = \mathrm{f}(X_i)$ must be estimated then you can use FGLS or maximum likelihood. 3) Follow White *Econometrica* (1980): 817-838 to get consistent estimates of standard errors.

OLS ASSUMPTION	EFFECT OF VIOLATION	PROPERTIES LOST	PROPERTIES REMAINING	CORRECTION MEASURES
4) No autocorrelation $E(\varepsilon_i \varepsilon_j) = 0 \quad i \neq j$	1) Estimate of variance is biased, therefore statistical tests are biased.	All 3 efficiency properties	1) Unbiased 2) Consistent	1) If you know ρ then apply GLS (rarely the case). 2) Use FGLS or maximum likelihood. 3) Autocorrelation is often a sign of misspecification, so the solution may be to respecify the model. 4) Newey-West covariance matrix
5) Non-stochastic X				
i) X is random and independent of ε.	1) Statistical tests are valid only given the particular X's in the sample.	None	All	No problem.
ii) X is not independent, but is uncorrelated with ε, i.e., $cov(X_i, \varepsilon_i) = 0$.		Lose all small sample properties.	1) Consistent 2) Asymptotically Efficient	Make sure your sample is large enough that asymptotic properties are appropriate.
iii) $cov(X_i, \varepsilon_i) \neq 0$ (simultaneity is a common example)		All	None	Instrumental variables such as in 2SLS or 3SLS. Other alternatives are FIML and GMM.

SPECIAL CASES (Continued)

OLS ASSUMPTION	EFFECT OF VIOLATION	PROPERTIES LOST	PROPERTIES REMAINING	CORRECTION MEASURES
1) Multicollinearity	1) Coefficients are imprecise. 2) Increases variances.	None	All	1) Increase sample size. 2) Make a tradeoff between bias and decreased variance. 3) Ignore it.
2) Omit Relevant Variable	Violates assumption 2.			
i) Omitted variable is uncorrelated with RHS variables.	$E(\varepsilon_i) = \mu_i$ $cov(\varepsilon_i, X_i) = 0$	All efficiency properties for β. All properties for α.	1) Unbiased 2) Consistent	Include relevant variable.
ii) Omitted variable is correlated with RHS variables.	$E(\varepsilon_i) = \mu_i$ $cov(\varepsilon_i, X_i) \neq 0$	All	None	Include relevant variable.
3) Inclusion of irrelevant variable.	1) Estimators of variance unbiased, tests of significance still valid.	Lose all efficiency properties.	1) Unbiased 2) Consistent	Drop the irrelevant variable (restricted least squares).
4) Lagged dependent variable.	1) Violates assumption 5 (ii) Lagged Endogenous. 2) Biases Durbin-Watson statistic towards 2.	Lose all small sample properties.	1) Consistent 2) Asymptotically Efficient	Use Durbin's H-statistic or Godfrey test to test for autocorrelation. Use a large sample size.
5) Lagged dependent variable and autocorrelation	Violates assumption 5 (iii) Simultanity	All	None	1) Use maximum likelihood. Cochrane-Orcutt is <u>not</u> acceptable. 2) Use instrumental variables.
6) Errors in the dependent variable.	1) Increases variance	None, if errors are random.	All	
7) Errors in an independent variable.	Violates assumption 5 (iii) Simultanity	All	None	1) Be extremely careful to prevent any data errors. 2) Instrumental variables.
8) Do not know true model.				1) Estimate a model that includes all possible models as special cases. Thus only lose efficiency properties. 2) Use restricted least squares or pretest and thus introduce possibility of losing all properties. 3) Examine fragility. 4) Better theory. 5) Misspecification testing.