

Exogenous variable (see also **endogenous variable**): A factor in a causal model or causal system whose value is independent from the states of other variables in the system; a factor whose value is determined by factors or variables outside the causal system under study. For example, rainfall is exogenous to the causal system constituting the process of farming and crop output. There are causal factors that determine the level of rainfall—so rainfall is endogenous to a weather model—but these factors are not themselves part of the causal model we use to explain the level of crop output. As with endogenous variables, the status of the variable is relative to the specification of a particular model and causal relations among the independent variables. An exogenous variable is by definition one whose value is wholly causally independent from other variables in the system. So the category of “exogenous” variable is contrasted to those of “purely endogenous” and “partially endogenous” variables. A variable can be made endogenous by incorporating additional factors and causal relations into the model. There are causal and statistical interpretations of exogeneity. The causal interpretation is primary, and defines exogeneity in terms of the factor’s causal independence from the other variables included in the model. The statistical or econometric concept emphasizes non-correlation between the exogenous variable and the other independent variables included in the model. If x_j is exogenous to a matrix of independent variables X (excluding x_j), then if we perform a regression of x_j against X (excluding x_j), we should expect coefficients of 0 for each variable in X (excluding x_j). Normal regression models assume that all the independent variables are exogenous.

Engle, R. F., D. F. Hendry, and J. F. Richard. 1983. Exogeneity. *Econometrica* 51:277-304.

Pearl, Judea. 2000. *Causality: models, reasoning, and inference*. Cambridge: Cambridge University Press.

Woodward, James. 1995. Causation and Explanation in Econometrics. In *On the Reliability of Economic Models: Essays in the Philosophy of Economics*, edited by D. Little. Bostn: Kluwer Academic Publishers.

Encyclopedia of Social Science Research Methods, edited by Michael Lewis-Beck (University of Iowa), Alan Bryman (Loughborough University), and Tim Futing Liao. Sage Publications.