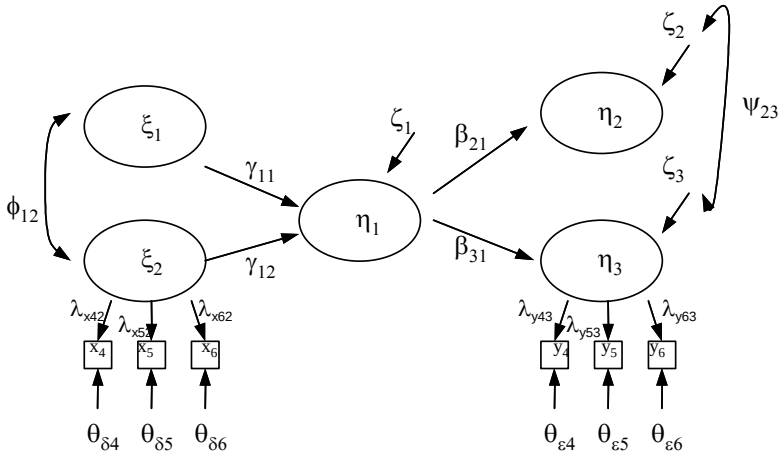
LISREL Matrix Notation

LISREL (which stands for "linear structural relations") involves eight matrices that organize the causal paths, loadings, correlations, and error terms in any model. Although this makes a cumbersome syntax, it is used in the mathematical description of SEM in the vast majority of statistical articles. A shortened, simpler four-matrix version (shaded rows below) can be used instead for specifying models in LISREL and is presented in some articles (see page 2). The figure below contains an example that illustrates all of the Greek letters.



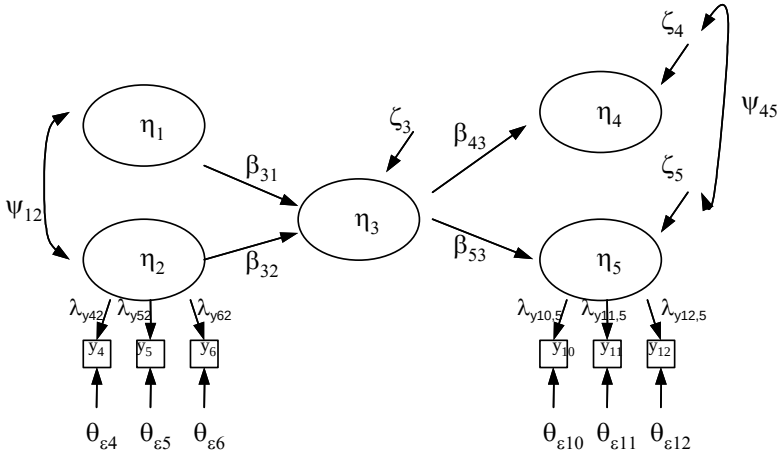
(x1 through x3 and y1 through y3 are omitted from the diagram)

Parameter symbol (lowercase Greek Letter)	English Spelling	Matrix symbol (capital Greek letter)	Description
λ_x	lambda-x	Λx	loadings for exogenous variables
λ_y	lambda-y	Λy	loadings for endogenous variables
ϕ	phi	Φ	variance & covariances of exogenous latent variables
ψ	psi	Ψ	endogenous disturbance, covariances among endogenous disturbances
γ	gamma	Γ	causal path from exogenous to endogenous
β	beta	B	causal path
θ_δ	theta delta	Θ_δ	measurement errors for exogenous variables
θ_ε	theta epsilon	Θ_ε	measurement errors for endogenous variables
ξ	xi (ksi)	not used as matrix, only in naming factors (see Φ matrix)	exogenous latent variables
η	eta	not used as matrix, only in naming factors (see Ψ matrix)	endogenous latent variables
ζ	zeta	not used as matrix, only in naming disturbance (see Ψ matrix)	disturbances for endogenous variables

Note: Shaded symbols are used in four-matrix notation and syntax. This approach is much simpler and is equivalent to the eight matrix. Psi represents the variances and covariances for exogenous variables.

LISREL "All Y" Matrices

The "all-y" Lisrel notation is a much simpler system. Many researchers who use Lisrel, use the all-y format for syntax programs. There are also a number of statistical papers that use the all-y matrices to present information. The all-y notation does not distinguish between exogenous and endogenous. Variances and covariances among exogenous variables are now represented in the Psi matrix. To distinguish between disturbances for endogenous variables (or their covariances) and variances for exogenous variables (and the covariances), one simply determines if the element in the psi matrix is associated with an exogenous or endogenous variable in the model.



(y1 through y3 and y7 through y10 are omitted from the diagram)

Parameter symbol (lowercase Greek Letter)	English Spelling	Matrix symbol (capital Greek letter)	Description
λ_y	lambda-y	Λ_y	loadings for all measured variables
ψ	psi	Ψ	variance & covariances of exogenous latent variables, endogenous disturbance, covariances among endogenous disturbances
β	beta	B	causal path
θ_ε	theta epsilon	Θ_ε	measurement errors for all measured variables
η	eta	not used as matrix, only in naming factors (see Ψ matrix)	exogenous and endogenous latent variables
ζ	zeta	not used as matrix, only in naming disturbance (see Ψ matrix)	disturbancesfor endogenous variables

Note: Zetas and etas are simply used for naming. For example, the disturbance, zeta, is presented as an element in the psi matrix. Eta is used only for naming variables, the variance for an exogenous variable is a diagonal element in the psi matrix.