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We present a reparameterization of vector autoregressive moving average (VARMA) models that allows parameter estimation under the constraints of causality and invertibility. This reparameterization is accomplished via a bijection from the complicated causal-invertible parameter space to Euclidean space. The bijection facilitates computation of maximum likelihood estimators (MLE) via unconstrained optimization, as well as computation of Bayesian estimates via prior specification on the constrained space. The proposed parameterization is connected to the Schur-stability of polynomials and the associated Stein transformation, which are often used in dynamical systems; we establish a fundamental characterization of Schur stable polynomials via a novel characterization of positive definite block Toeplitz matrices. Our results also generalize some classical results in dynamical systems.