Non-normal drift structures and linear stability analysis of numerical methods for systems of stochastic differential equations

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We investigate mean-square asymptotic stability of equilibria of linear systems of stochastic differential equations with non-normal drift coeffcients, with particular emphasis on the role of interactions between the drift and diffusion structures that act along, orthogonally to, and laterally to the flow. Hence we construct test systems with non-normal drift coeffcients and characteristic diffusion structures for the purposes of a linear stability analysis of the θ-Maruyama method.
Once the test systems have been identified, we can discretise them and examine the mean-square asymptotic stability of equilibria of the resulting systems of stochastic difference equations. Finally we give an example that shows how this approach may help to shed light on certain numerical discretisations of stochastic partial differential equations with multiplicative space-time perturbations.