Statistics of Solutions to A Stochastic Differential Equation Set

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Outline

Introduction

Original SDEs

$$\begin{cases} \dfrac{du(t)}{dt} = (-\gamma(t) + i\omega)u(t) + b(t) + f(t) + \sigma W(t), \\ \dfrac{db(t)}{dt} = (-\gamma_b + i\omega_b)(b(t) - \hat{b}) + \sigma_b W_b(t), \\ \dfrac{d\gamma(t)}{dt} = -d_\gamma(\gamma(t) - \hat{\gamma}) + \sigma_\gamma W_\gamma(t) \end{cases} \tag{1}$$

In which the initial values are all complex random variables, with their real and imaginary parts both obey the normalized Gaussian distribution, i.i.d.