$$dZ_t = \left[\frac{(\alpha\theta_0 - \theta_t)\sin(\sqrt{2\alpha\theta_0}Z_t) - \theta_t(1-2p_t) + 2\dot{p}_t}{\sqrt{2\alpha\theta_0}\cos\left(\sqrt{2\alpha\theta_0}Z_t\right)} \right] dt + dW_t\,. \tag{1}$$

Now,

$$\frac{d}{dt}\mu_Z(t) = \mathbb{E}[b(Z_t)] \tag{2}$$

The drift $b(\cdot)$ is nonlinear. Expanding the drift around the mean we get

$$\frac{d}{dt}\mu_Z(t) = \mathbb{E}[b(\mu_Z(t)) + b'(\mu_Z(t))(Z_t - \mu_Z(t)) + \cdots] \tag{3}$$

An approximation of the mean of $Z(t)$ can be obtained solving the following equation

$$\begin{cases} \frac{d}{dt}\mu_Z(t) & = b(\mu_Z(t)) \\ \mu_Z(0) & = \mathbb{E}[Z_0] = \mathbb{E}[\frac{1}{\sqrt{2\alpha\theta_0}}\arcsin(2(V_0+p_0)-1)]\,. \end{cases} \tag{4}$$

An approximation of the variance of $Z(t)$, $v_Z(t) = \mathbb{E}[(Z_t - \mu_Z(t))^2]$, can be obtained solving the following equation

$$\begin{cases} \frac{d}{dt}v_Z(t) & = 2b'(\mu_Z(t))v_Z(t) + 1 \\ v_Z(0) & = \,. \end{cases} \tag{5}$$

The first-order linear ODE in (5) admits the solution

$$v_Z(t) = e^{2\int b'(\mu_Z(t))dt} \int e^{-2\int b'(\mu_Z(t))dt} dt + Ce^{2\int b'(\mu_Z(t))dt}\,. \tag{6}$$