

1 Magnus expansion for $A \in \mathbb{R}^{2,2}$, $B = 0$ deterministic

We will concern ourselves with the following SDE:

$$dX_t = A_t X_t dW_t$$

with

$$A_t = \begin{bmatrix} f^{11}(t) & f^{12}(t) \\ 0 & f^{22}(t) \end{bmatrix}$$

Here we chose:

$$A_t = \frac{\tilde{A}_t}{\sigma(\tilde{A}_t)},$$

where $\sigma(A_t)$ is the spectral radius and

$$\tilde{A}_t = \begin{bmatrix} 2 & t \\ 0 & -1 \end{bmatrix}$$

1.1 Parameters

Parameter	value
-----------	-------

t_0	0
T	1
N_fine	10001
N	101
M_fine	1000
M	1000
d	2

1.2 Computational Times

Method	Log	Matrix Exp	Total
Run 1			
exact	0	0	0.797477
euler	0	0	4.45964
m2	0.0556691	0.52945	0.585119
Run 2			
exact	0	0	0.786464
euler	0	0	4.48794
m2	0.0557674	0.527644	0.583412
Run 3			
exact	0	0	0.785805
euler	0	0	4.52253
m2	0.0549068	0.555927	0.610833
Mean Time			
exact	0	0	0.789915
euler	0	0	4.49004
m2	0.0554478	0.537674	0.593121