Algorithm 1 Euler for SDE 1d to simulate $\hat{X} \approx \langle X, \pi_{T,N} \rangle$.

inputs : drift $\mu(\cdot)$ and volatility $\sigma(\cdot)$

procedure EULER1D (S_0, T, N) $\quad$ S_0: initial state, T: terminal time

$\delta \leftarrow T/N$; $S_0^\delta \leftarrow S_0$; sum $\leftarrow 0$;

for $i = 0, 1, \cdots, N-1$ do

$t_{i+1} \leftarrow t_i + \delta$

$Z \leftarrow N(0,1)$

$S_{i+1}^\delta \leftarrow S_i^\delta + 0.03 S_i^\delta \delta + 6 S_i^\delta \sqrt{\delta} Z$.

if $(S_{i+1}^\delta - k) \cdot \text{otype} > 0$:

sum = sum + $(S_i^\delta - k) * \text{otype}$

return e^{-rT} sum /n