

## Question 2

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 $\xi_0$  = Initial value
 $r_0$  = Initial risk-free interest rate
N-sim = # of simulation
N = # of timesteps
T = 1
 $\Delta t = T/N$ 
r = zeros(M, N+1)
r(:, 1) = r0; (r(t=0))
 $\xi$  = zeros(M, N+1)
 $\xi(:, 1) = \xi_0$ ; ( $\xi(t=0)$ )
Q = [1, P; P, 1]
G = chol(Q)
 $\phi_1$  = zeros(M, N)
 $\phi_2$  = zeros(M, N)
I = zeros(M, 1)
for i = 1:M do
    for j = 1:N do
        [ $\phi_1(i, j)$ ,  $\phi_2(i, j)$ ] = G' * randn(2, 1)
    end
end
end

for T = 1:N do
    r(:, T+1) = r(:, T) + a(r - r(:, T)) $\Delta t$  + sqrt( $\xi(:, T)$ ) *
        r(:, T) *  $\phi_1(:, T)$ 
     $\xi(:, T+1) = \xi(:, T) + b(\bar{\xi} - \xi(:, T))\Delta t + c * \text{sqrt}(\xi(:, T)) * \phi_2(:, T)$ 
end

end
for k = 1:M
    I(k) = Taking Integral on -r(T, =) over [0, T]
end
Value = mean(exp(I))

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