1. **Hedge for an undiscounted self financing strategy** Suppose that a security \( \eta \) has a self financing strategy given by

\[
\eta = C_T
\]

\[
dC_t = \theta_t^{(0)} d\Lambda_t + \theta_t^{(i)} dS_t \tag{1}
\]

\[
C_t = \theta_t^{(0)} \Lambda_t + \theta_t^{(i)} S_t \tag{2}
\]

where \( \Lambda_t \) is a zero coupon bond. Determine the delta in terms of quadratic variations of \( \Lambda_t, S_t \) and \( C_t \).

2. **Hedge for a barrier option.** The price of a European down and in call option is given either by Hull’s *Options, Futures and other Derivatives*, or can be obtained from lecture 8 in Fall. Determine the delta for this option, using the quadratic variation form.

3. **Hedge for a conservative payoff.** Derive the last equation on the last page of the Lecture 1 notes. Derive the implications for a convex European payoff.

4. **Hedge for future simulation exercises.** Let \( dS_t = rS_t dt + \sigma S_t dB_t \), where \( B \) is a Brownian motion, \( r = 0.05, \sigma = 0.2, T = 1, \) and \( S_0 = 100 \).

   Let \( X_t = \log S_t, M_t = \max_{0 \leq u \leq t} X_u, \) and \( m_t = \min_{0 \leq u \leq t} X_u. \) Set the payoff \( \eta = X_T/(M_T - m_T) \), at time \( T. \) Find, by simulation the price of \( \eta \) at time 0. You may use analysis to reduce the problem first.