

**11.1** Use the Itô formula to move from levels to log levels:

$$d \ln S_t = (\mu - \sigma^2/2)dt + \sigma dB_t.$$

Integrate the log returns from 0 to  $t$ :

$$\begin{aligned} \ln S_t - \ln S_0 &= (\mu - \sigma^2/2)t + \sigma (B_t - B_0) \\ \ln S_t - \ln S_0 &\sim N((\mu - \sigma^2/2)t, \sigma^2 t). \end{aligned}$$

Using the moment generating function (11.30) with  $X = \ln S_t - \ln S_0$  and  $\lambda = 1$  we find  $E_0 \left[ \frac{S_t}{S_0} \right] = e^{\mu t}$ . The corresponding yield is:

$$\frac{\ln E_0 [S_t/S_0]}{t} = \mu.$$

On the other hand, the expected yield is

$$E_0 \left[ \frac{\ln(S_t/S_0)}{t} \right] = \frac{E_0 [\ln S_t - \ln S_0]}{t} = \mu - \frac{1}{2}\sigma^2.$$

Hence the answer is (a).