1. The Hull-White interest model is defined in section 6.5. Read this section. You will see that the Hull-White model is also an affine-yield model and that one can find a formula for $B(t,T)$ by the same pde method we used in class for the two-factor Vasicek model (see also Shreve, pages 411-413).

   a) Do Exercise 6.3, Shreve.

   b) For the Hull-White model, as treated in Example 6.5.1, we would like to derive a stochastic differential equation model for the zero-coupon bond price itself. Using the results of Example 6.5.1 on the Hull-White model, show that
   \[ d_t[D(t)B(t,T)] = -\sigma D(t)C(t,T)B(t,T) d\tilde{W}(t) \] for $t \leq T$.

   (Apply Itô’s rule; use equations (6.5.8) and (6.5.9).)

   c) Let $\tilde{P}^T$ be the risk-neutral measure when $B(t,T)$ is used as a numéraire; see section 9.4.3. Use the expression for $d_t[D(t)B(t,T)]$ obtained in part b) to construct a process $\tilde{W}^T$ that is a Brownian motion under $\tilde{P}^T$. Let $dS(t) = R(t)S(t) dt + \gamma S(t) d\tilde{W}(t)$ ($\gamma$ is the volatility here since we have already used $\sigma$). Write a stochastic differential for the forward price, $F_{S(t,T)}$, in terms of $d\tilde{W}^T(t)$.

2. Shreve, Exercise 10.2

3. Shreve, Exercise 10.3

4. Shreve, Exercise 10.7