Econ. 811
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Homework Set 2

Let r denote the instantaneous default–free Canadian interest rate, and f denote the spot price of British pounds in units of Canadian dollars. Assume they follow a joint stochastic process

$$\begin{aligned} dr &= [\kappa_1(\bar{r} - r) + \alpha(f - \bar{f})]\, dt + \sigma_1 r^{1/2}\, dz_1 \\ df &= \kappa_2 f(\bar{r} - r)\, dt + \sigma_2 f\, dz_2 \end{aligned}$$

with ρ as the instantaneous correlation coefficient between dz_1 and dz_2. Further suppose that because of market risk aversion the risk-adjusted drift in r differs is the objective drift $-\lambda_1 r$ and that of f is the objective drift $-\lambda_2 f$. Let the fixed parameters take the values

κ_1	κ_2	α	$\bar{r}$	$\bar{f}$	σ_1	σ_2	ρ	λ_1	λ_2
0.2	2.0	.005	.10	2.0	0.1	0.2	.2	$-.1$	.02

1. Interpret the dynamic equations for the interest rate and the exchange rate. What does the parameter α correspond to? (think of Bank of Canada policy). What theory of exchange rate movements is suggested by the equation for df?

2. Ignoring the random components, what is the 'steady state' level of the pair (r, f)?

3. Suppose the overnight Canadian interest rate was currently 4% and the spot exchange rate is \$2. Write a program using ADISET and ADSTEP that determines the following:

   (a) The value of a 2 year European call option to purchase 50 British pounds at a price of \$2 each.

   (b) The (objectively) expected exchange rate 2 years from now.

   (c) The equilibrium futures price of British pounds to be delivered 2 years from now.

   (d) The coupon rate per year that would prevail on 2 year Canadian bonds paying interest semiannually. (for new bonds, issued at par)

   (e) The coupon rate per year that would prevail on 2 year bonds with interest and principal payable in British pounds.

   (f) **Callable currency option bond:** The coupon rate per year that would prevail on 2 year bonds, where the interest and principal at each date is payable in either \$C or pounds, based on an exchange rate of \$2, at the option of the *bond holder*, but where the *bond issuer* has the option of 'calling in' the bonds at a redemption price of \$110 C. per \$100 of face value at any time.