

SAMPLE QUESTIONS
Economics 482

1. Briefly define the meaning of the following terms:
 - (a) American put option
 - (b) boundary condition
 - (c) first-to-default swap
 - (d) CDO (collateralized debt obligation)
 - (e) zero-cost collar
 - (f) LIBOR rate
 - (g) default-at-maturity model (Black-Scholes-Merton)
2. Briefly explain the distinction between the following pairs of terms:
 - (a) futures contract vs. forward contract
 - (b) heating degree days vs. cooling degree days
 - (c) interest rate cap vs. interest rate swap
 - (d) physical delivery vs. cash settlement
 - (e) Monte Carlo vs. finite difference method
 - (f) cash flow vs. synthetic CDO
 - (g) convertible bond vs. regular bond
 - (h) static vs. dynamic hedge
 - (i) asset swap vs. interest rate swap
3. Answer the following questions. An algebraic expression is sufficient as an answer. Only the final answer is required:
 - (a) Let the state variable $s(t)$ follow the diffusion process $ds = k dt + \sigma s dz$. Suppose $y = t + \ln s$. What stochastic process does y follow?
 - (b) Let default by United Airlines be modeled as a Poisson process with intensity (arrival rate) of .3/year. What is the probability of default within 2 years?
 - (c) Let $s(t)$ be a stock price at time t , $C(s, t)$ be the price of an option on the stock, and $F(s, t)$ be the futures price of a share. Suppose the partial derivatives of C and F at the current s and t are:

$$C_s = 2 \quad C_t = 3 \quad F_s = 3 \quad F_t = 1$$

If you own one call option, what futures position would initially hedge you against s changes?

4. Answer in a few paragraphs the following questions:

- (a) Describe the process of asset securitization. What are its objectives and social benefits?
- (b) How would you combine a floating rate bank loan or bond with an interest rate swap to get the economic equivalent of a fixed rate bond? Illustrate with a concrete example (i.e., pick a hypothetical swap rate and show what fixed rate results).

How would you further combine it with a credit default swap to get the equivalent of a default-free fixed rate bond?

- (c) Suppose you own a tree. The tree grows. Its volume at age t is $1 - e^{-t}$ cubic metres. It can be cut and sold for lumber at any time up to age 50 years (after which pine beetles render it worthless). The spot price $p(t)$ of wood (\$ per cubic metre) evolves randomly according to the (risk-neutral) process

$$dp = k(\bar{p} - p) dt + \sigma p dz$$

Let $V(p, t)$ denote the market value of your tree at age t with lumber prices then at p .

Outline a computer program to determine $V(p, t)$ and conditions under which the tree is optimally cut down.