Part A

1. Which of the following are possible reason(s) to run a short or long

position in a credit default swap

(D) all of the above

2. By which set of the following terms is a credit default swap classified?

(B) reference entity, settlement mechanism, term, premium and credit

event definition

3. The spread to Libor paid or received in a total return swap is a function

of which of the following?

(D) insufficient information to answer ( any required profit margin the amount and the value of the reference asset)

4. What is "jump-to-default risk"?

(B) sudden default of the reference name in the market in the very

near future, as opposed to a gradual credit deterioration

Part B

1. Find hazard rate(intensity) of the following function.

(a)

h(t) = = λ

(b)

h(*x*|α,β) = αβ(α*x*)β – 1 , where scale parameter α > 0 and shape parameter β > 0

2. The Probability Generating Function of a discrete random variable *X* is defined to be the generating function *G*(*s*) = E(*sX*) of its probability mass function.

(a)

*If X has p.g.f. G*(*s*)*, then*

**E**(*X*) = *G*’(1);

more generally, the kth factorial moment is

μ (k) = E(X(X − 1) . . . (X − k + 1)) = G(k) (1);

and, in particular,

var (X) = G”(1) + G’(1) − (G’(1))2

as s = 1

G’(s) = k, so that G’(s) = k-1

Hence G’(1) = EX

G”(s) = k – 2

Hence G”(1) = = E(X(X – 1) = EX2 - EX

and var (X) = EX2 – (EX)2 = G”(1)) + EX – (EX)2

= G”(1) + G’(1) − (G’(1))2

(b)

X ~ Poisson (λ)

GX(s) = e-λ e-λ eλs = eλ(s – 1)

(c)

G’(s) = λeλ(s - 1) if s = 1

then

G’(1) = λ if λ = 1

Then

G’(1) = 1

So

Expected number of default is one

(d)

Let *N(t)* be Poisson process with intensity λ > 0: Then *M(t):= N(t) - λt* is a martingale (compensated Poisson process) (we note that *EN(t) = λt):*

*E[N(t) – λt | F(s)] = E[N(t) - N(s) + N(s) - λt + λs – λs | F(s)]*

*= N(s) - λs + E(N(t) – N(s) + N(s) - λt + λs)*

*= N(s) – λs*

where we've used independency increments of *N(t)* and that *EN(t) = λt*:

Let *F(s)F(t)* if *0 ≤ s ≤ t*  be given. Because *N(t) – N(s)* is independent of *F(s)* and has expected value *λ(t – s),* we have

*E[M(t) | F(s)]=E[M(t) – M(s) | F(s) + E{M(s) | F(s)]*

*= E[N(t) – N(s) – λ(t – s) | F(s)] + M(s)*

*= E[N(t) – N(s)] – λ(t – s) + M(s)*

*= M(s)*

3) In the context of the Merton (1974) model, at any time *t* the firm assets *Vt* are assumed to be sum of its debt *Dt* and its equity *Et*,

*Vt* = *Et* + *Dt:*

a)

The fact that the firm can only default at time T. This assumption is important to be able to treat the firm's equity as a vanilla European call option, and therefore apply the

Black-Scholes pricing formula.

b)



4. Suppose that the probability of company A defaulting in one year is 10% and the probability of company B defaulting in one year is 15%. Assuming default correlation is 30%, calculate the probability that both company default in one year by using bivariate Gaussian copula.

QA = 0.1, QB = 0.15, ρAB = 0.3

uA = N-1(0.1) = -1.28155

uB = N-1(0.15) = -1.03643

M(-1.28155, -1.03643, 0.3) = 0.029781

βAB(1) = 0.137979

