MSc. Finance/CLEFIN
2015/2016 Edition

Advanced Tools for Risk Management and Asset Pricing

October 2016 Exam for Non-Attending Students – Solutions
Time Allowed: 75 minutes

Family Name (Surname)	First Name	Student Number (Matr.)

Please answer all questions by choosing the most appropriate alternative and/or by writing your answers in the spaces provided. You need to carefully justify and show your work in the case of "open" questions. There is only one correct answer(s) for each of the multiple choice questions: each selected alternative that is correct will be awarded one point. Only answers explicitly reported in the appropriate box will be considered. No other answers or indications pointing to potential answers will be taken into consideration. In the case of "open" questions, the maximum number of points is indicated.

Question 1 (2 pts.). Assume a CDS quoted spread is 300 basis points and the recovery rate is estimated to be 60%. Under the assumptions that i) the premium leg of the CDS pays continuously and ii) the hazard rate is constant, what is the value of the hazard rate?

☐ (A) 5%
☑ (B) 7.5%
☐ (C) 500
☐ (D) 750

Question 2 (2 pts.). Which of the following statements about the Vasicek Portfolio Loss model is TRUE?

☐ (A) The mean of the portfolio loss distribution is a function of ρ
☐ (B) The variance of the portfolio loss distribution is a function of ρ^2
☐ (C) By the law of large numbers, the portfolio loss distribution is asymptotically normal
☑ (D) The Economic Capital has been derived under the assumption that all the idiosyncratic risk has been diversified away

Question 3 (2 pts.). Which of the following statements about Copula is TRUE?
- ☐ (A) D-dimensional copula function is decreasing
- ☐ (B) $C(u_1, u_2) = max(u_1 + u_2, 0)$ is a copula function
- ☑ (C) $C(\boldsymbol{u}) = 0$ if $\boldsymbol{u} \in [0,1]^d$ has at least one component $u_i = 0$
- ☐ (D) Copulas can be used in conjunction with joint density functions to construct multivariate distribution functions

Question 4 (2 pts.). Which of the following statements about First Passage Time models is TRUE?

- ☐ (A) Default can occur only at maturity
- ☐ (B) The Black Cox model allows for a flexible CDS calibration
- ☐ (C) AT1P models always produce reasonable results
- ☑ (D) Default is described through an endogenous process

Question 5 (2 pts.). Which of the following statements about Mapping methods for bespoke portfolios is FALSE?

- ☐ (A) Mapping consists in associating to the selected bespoken tranche an equivalent base tranche on a standard (index) portfolio
- ☐ (B) The correlation used to price the bespoke tranche is taken to be the correlation at the equivalent standard strike
- ☐ (C) In the ATM method the invariant measure of risk in a tranche is the strike as a fraction of its expected loss
- ☑ (D) The ATM method works well when taking into account the portfolio dispersion

Question 6 (2 pts.) Which of the following statements about Reduced Form (Intensity) models is TRUE?

- ☑ (A) In deterministic intensity models, survival probabilities have the same structure as zero coupon bonds in short rate models
- ☐ (B) Survival probabilities obtained through calibration to CDS quotes can decrease with time
- ☐ (C) In a time inhomogeneous Poisson process, the survival probability is given by: $P(\tau < T) = e^{-\Gamma(T)}$
- ☐ (D) None of the above

Question 7 (2 pts.). Consider a standard CDS's Index (e.g., i-Traxx). Which of the following statements is TRUE?

- ☑ (A) The copula is parametrized by a matrix of 9000 pairwise correlation values
- ☐ (B) The copula is parametrized by a matrix of 125 pairwise correlation values
- ☐ (C) The copula is parametrized in terms of a unique pairwise correlation value
- ☐ (D) None of above

Question 8 (2 pts.) Which of the following statements about Basel III is TRUE?

☑ (A) The Credit risk capital charge is the same as in Basel II
☐ (B) The CVA capital charge has been introduced to take into account default risk
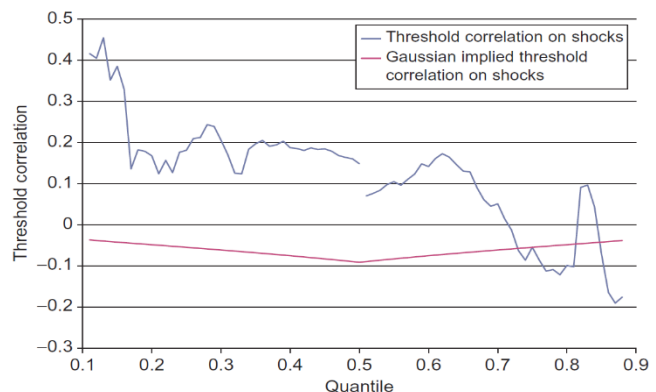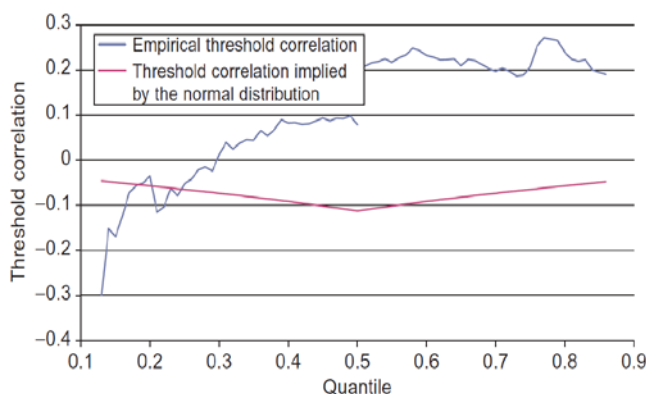☐ (C) The CCR capital charge is the same as in Basel II
☐ (D) None of the above

Question 9 (4 pts.). Consider the following formula:

$$\Pr(T_A < 1, T_B < 1) = \Phi_2\big(\Phi^{-1}(F_A(1)), \Phi^{-1}(F_B(1)), \gamma\big)$$

1. What does it represent? (1 point)
2. Explain the meaning of every single term appearing in it. (3 points)

Answer. See Lecture 6 "(Basic) Multi-Name Credit Derivatives" (slide 13/69).

Question 10 (2 pts.). The following plots,

imply that:

☐ (A) Raw data correlations deviate from a bivariate normal because the data show positive excess correlation in the left tail and negative excess correlation in the right tail; the standardized residuals of a GARCH modelling exercise show instead the opposite pattern but fail to be fitted by a bivariate Gaussian model
☐ (B) While the raw data deviate from a bivariate Gaussian model, the standardized residuals of a GARCH modelling exercise do not
☐ (C) Raw data correlations deviate from a bivariate normal because the data show negative excess correlation in the left tail and in the right tail; the standardized residuals of a GARCH modelling exercise show instead the opposite pattern but fail to be fitted by a bivariate Gaussian model
☑ (D) None of the above

Question 11 (2 pts.). A three-year Express investment certificate with coupons that grow over time in case the certificate is not auto-called, is replicated by:

☐ (A) Buying the underlying; buying a barrier option call down-and-out; selling a call with strike equal to the express strike; buying a series of digital/barrier puts of knock-out type with strike equal to the express strike, maturities equal to the liquidation dates, in number that increases according to the slope that one wants to impress to the coupon payment schedule

☑ (B) Buying the underlying; buying a barrier option put down-and-out; selling a call with strike equal to the express strike; buying a series of digital/barrier calls of knock-out type with strike equal to the express strike, maturities equal to the liquidation dates, in number that increases according to the slope that one wants to impress to the coupon payment schedule

☐ (C) Buying a zero-coupon bond; buying a barrier option call down-and-in; selling a call with strike equal to the express strike; buying a series of digital/barrier puts of knock-out type with strike equal to the express strike, maturities equal to the liquidation dates, in number that increases according to the slope that one wants to impress to the coupon payment schedule

☐ (D) None of the above

Question 12 (2 pts.). Which of the following statement is correct?

☐ (A) A Leverage certificate implies a leverage that is function of the level of the underlying, given a fixed strike

☑ (B) One drawback of a Leverage Certificate is the "compounding effect"

☐ (C) A Turbo certificate is characterized by a constant leverage ratio

☐ (D) None of the above

Question 13 (2 pts.). Kyryl is a structurer at Bank CreditDebit. He has been asked by his boss to select a basket of stocks to maximized the participation to performance of an Equity Protection Certificate written on the basket, with 100% protection. He would more likely choose:

☐ (A) Stocks that are highly correlated and not very volatile

☐ (B) Stocks characterized by low correlation and high volatility

☐ (C) Stocks that are highly correlated and highly volatile

☑ (D) Stocks that are characterized by low correlation and low volatility

Question 14 (3 pts.). Consider the term sheet below:

Underlying	FTSE MIB
Maturity	5 Years
Protection	100%
Participation	50%
Payoff at maturity	Issue Price *100%+Max[0%; (Participation * (S(T)/S(0)-1)]
S(T)	Value of FTSE MIB at Maturity Date
S(0)	100% of the value of FTSE MIB at the Strike Date

1. Draw a chart representing the payoff of the certificate at maturity. (1 point)
2. Explain how this payoff can be replicated. (2 points)

Answer.
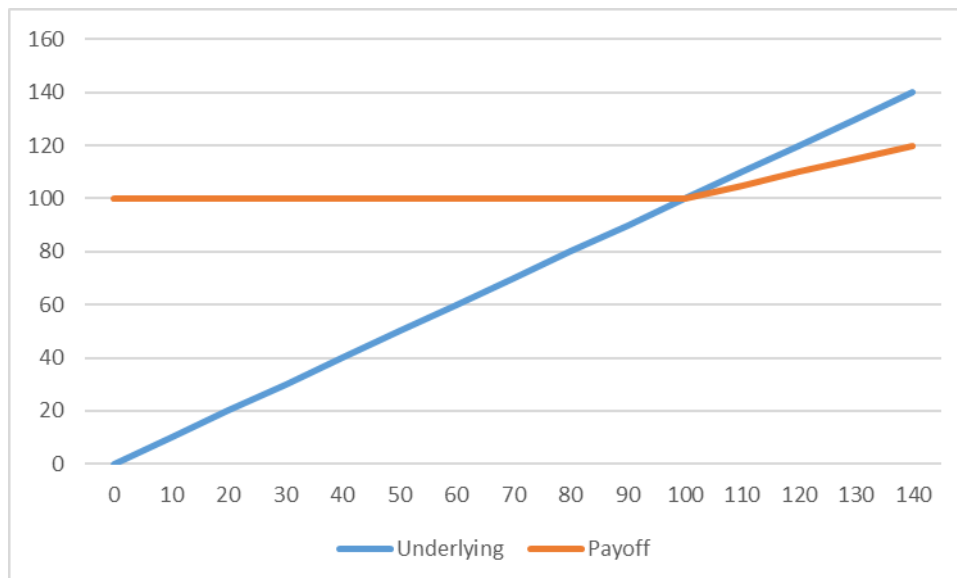
The certificate can be replicated by buying a ZCB with 5-year maturity plus 50% of an ATM call option on Ftse Mib with 5-year maturity.