

Bank Lending BFC5914

Monash Business School

Monash University

Week 12, 2021

① General

② Exam Instructions

③ Part 1

④ Part 2

Structure of The Course

- The principles and techniques of lending
 - Topics 1 to 5.
- Making a decision : Credit risk measurement, Special customers, loan pricing and ethics in lending
 - Topics 6, 7 and 8.
- Regulate Banks, Important Issues and Prevent Defaults
 - Topics 9 and 10.

Exam Instructions

- There are **3 compulsory questions** in the whole exam paper.
- The duration of exam : **2 hours and 10 minutes**.
- It is an **Open-Book** exam, **only** open to all the materials provided on Moodle and textbooks.
- **No formula sheet.**
- **Only** HP 10bII+ or Casio FX82 (any suffix) calculator permitted.

Exam Instructions

- The final exam will be run on the Moodle platform, similar to the MST platform.
- Do not navigate between questions to avoid any system errors.
- The university will use similarity-detection software to compare your works. **Both of you will be graded 0**, if your answers bear a **remarkable similarity** or are **the same**. If it happens, no negotiation will be applied.
- Do not input %, \$ or million \$ in your calculated solutions.
 - E.g., obtain 11.5%, then input **0.12** in the solution box.

Exam Instructions

- Exam Time : **18th Nov 2021, 13 :00 - 15 :10.** (Check your timetable)
- Question 1 (20 marks) : Four Calculation Questions.
- Question 2 (20 marks) : A Lending Case Study.
 - Punctuate properly and express clearly
 - Three sub-questions
- Question 3 (20 marks) : Three Short-Answer Questions.
- Again : this is **an individual assessment**, **cooperation is not allowed.**

Exam Instructions

- If you experience any issues during the exam :

1 **Technical system issues**, please contact **+61 3 9903 2777**

2 Clarifying questions, contact CE via email :

ying.liang@monash.edu

- Apply **Special Considerations** via the online process, not CE.

<https://www.monash.edu/exams/changes/special-consideration>

Final Exam

- 60% of final grade.
- Hurdle requirement - must obtain **45%** on the final exam.
- Based on material covered throughout the semester.
- **Do not browse any other websites during the exam**
 - Especially, do not open Google translation during the exam.

Part 1 : Topic 1 - 5

- General Lending Principles
- Application of 5 Cs : Credit scoring system, personal loans, corporate loans etc.

Topic 6 : Traditional Approaches to Credit Risk Measurement

How to Measure Credit Risk ?

- Four Categories :
- Expert systems (human judgement)
- Risk premium analysis (market-based premium)
- Econometric based systems (statistical methods)
- Hybrid systems (financial theory)

Topic 6 : Traditional Approaches : Risk Premium Analysis

- Assuming a world with **no arbitrages** : the difference between the risk free bond and the risky bond, should exactly **compensate** the investor for the risk of default
 - Case 1** : No recovery rate if firm defaults
Then we have : $p(1+r) = 1+i$
 - Case 2** : With recovery rate, get back **$e(1+r)$** if firm defaults
Then we have : $e \times (1-p) \times (1+r) + p(1+r) = 1+i$
 - Case 3** : Multi-periods loans
Cumulative Default Probability $= 1 - p_1 \times p_2 \times p_3 \dots p_n$
 - NO Arbitrage Condition (Geometric)* : we have
 $(1+i_{0,2})^2 = (1+i_{0,1})(1+i_{1,1})$
 - Then we have the **expected forward rate** : $i_{1,1} = \frac{(1+i_{0,2})^2}{(1+i_{0,1})} - 1$
 - Similar computation applied to have $r_{1,1}$; then derive the probability of repayment $p_2, p_3, \dots p_n$

Topic 6 : Traditional Approaches :Marginal Mortality Rate

- Also using the information contained in the term structure of interest rates, an alternative is to use the observed historical default rates of bonds which have characteristics similar to those of the loan we are evaluating
- Determine the **marginal default rate** (or called Marginal Mortality Rate, MMR) :

$$MMR_{it}(R) = \frac{m_{it}(R)}{M_{it}(R)} \quad (1)$$

- Pricing risky debt using the info above and considering the ratings migration.

Topic 6 : Traditional Approaches : Econometric Analysis

- Two main techniques are **regression analysis** and **discriminant analysis**
- **Regression Analysis** : There are a large number of various regression based approaches which relate default to observable variables
- **Discriminant Analysis**
 - The Z score model takes the form of
 - $Z = 1.2X_1 + 1.4X_2 + 3.3X_3 + 0.6X_4 + 1.0X_5$
 - If the Z score is **below 1.81** the loan is a bad risk, and **above 2.99** the loan is a good risk ; a score between 1.81 and 2.99 is indeterminate.

Topic 6 : Traditional Approaches : Hybrid Systems

- Advantages of this approach
- RAROC is the risk adjusted return on capital model
-

$$RAROC = \frac{\text{Risk Adjusted Return}}{\text{Loan Risk}}$$

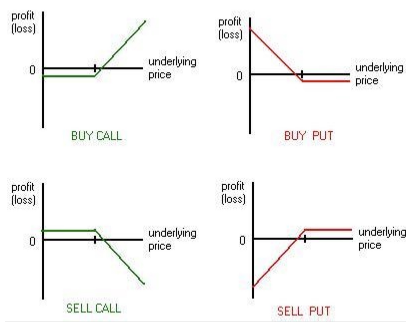
(or credit risk capital)

- Risk adjusted income
 $= (\text{Spread} + \text{Fees} - \text{Expected Loss} - \text{Operating Costs})(1 - \tau)$
- Denominator :

$$\Delta L = -D_L \times L \times \frac{\Delta R}{1 + R_L}$$

Topic 7 : Credit Risk Models Based on Stock Price

- Option Pricing Theory, the general form : Option Value
= $f(S, X, r, \sigma, \tau)$
 - S the price of underlying, X the strike price, r the interest rate, τ the maturity, σ^2 the volatility of the underlying



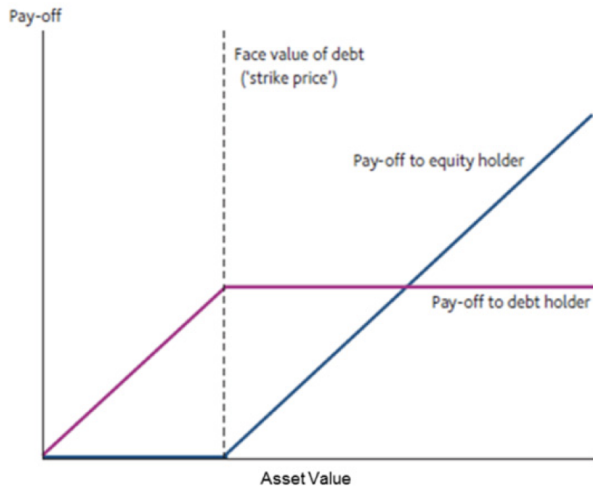
Topic 7 : Equity As a Call Option

- The equity holders have exactly the same **payoff** as a call option as held by the firm with an exercise price of D
- The option would be exercised when the assets of the firm is worth more than D ; and the payoff would be the difference between the stock value and D and otherwise the option is worthless
- The equity of the firm is a call option on the assets of the firm where the exercise price and maturity are given by the face value and the maturity of the debt.

Topic 7 :Debt As a Put Option

- At maturity :
 - If the asset is worth $< D$, one sells the asset for D using the put option and uses that to pay back the debt, with nothing left over
 - If the asset is worth $> D$, one sells it and uses the proceeds to pay the debt, and does not use the put option

Topic 7 : Pricing Equity and Debt through Option Model



Topic 7 : KMV Model

- **Expected default frequency (EDF)** is a forward-looking measure of actual probability of default ; EDF is firm specific
- KMV model is based on the structural approach to calculate EDF (credit risk is driven by the firm value process)
- Three steps to derive the actual probabilities of default :
 1. Estimation of the market value and volatility of the firm's asset
 2. Calculation of the distance to default, an index measure of default risk
 3. Scaling of the distance to default to actual probabilities of default using a default database

Topic 7 : KMV Model Schematic

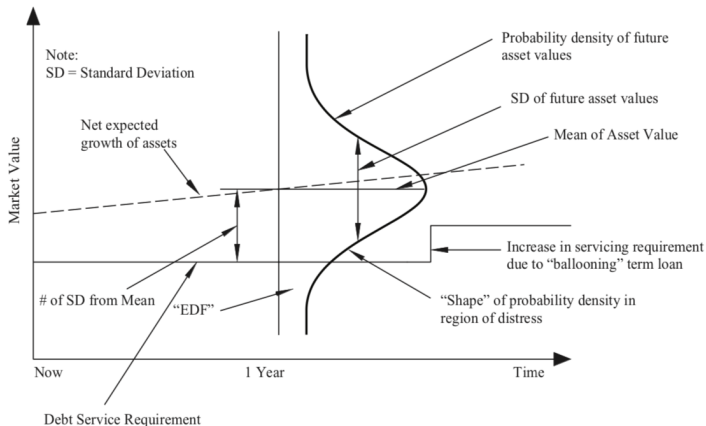


FIGURE 11.1 KMV Model Schematic
Source: Moody's KMV Corporation (1995).

Topic 8 : Special Customers /Pricing Loan/ Ethics in Bank Lending

- Advances to Special Customers
 - Calculate the **amount** according to the builder's contract
- The lender needs to look for clauses covering the following :
 - Fluctuations in cost
 - Penalties
 - Extension of time to permit interim payments
 - Retention fund
- **Property investment**
- **Property development**

Topic 8 : Pricing Loans

- Cost-Plus Pricing Models

$$\begin{array}{ccccccc} \text{Loan} & & \text{Marginal} & & \text{Nonfunds} & & \text{Estimated} \\ \text{interest} & = & \text{cost of raising} & + & \text{operating} & + & \text{margin to} \\ \text{rate} & & \text{loanable funds} & & \text{costs} & & \text{compensate for} \\ & & \text{to lend to} & & & & \text{default risk} \\ & & \text{the borrower} & & & & \\ & & & & & & \text{Desired} \\ & & & & & & \text{profit} \\ & & & & & & \text{margin} \end{array} \quad (1)$$

- Price Leadership Pricing Models
- Below Prime Market Pricing
- Loans Bearing Maximum Interest Rates
- Customer Profitability Analysis

Topic 8 : Pricing Loans

- Contractually Promised Return on a Loan
- **Gross return on loan (k) per dollar lent :**

$$1 + k = 1 + \frac{[f + (BR + m)]}{[1 - b(1 - R)]}$$

- Loan origination fee (f),
- Compensating balance requirements (b) : a fraction of the loan principal required to be held in demand deposits at the bank
- Reserve requirement (R)
- Base Rate (BR)

Topic 8 : Ethics in Bank Lending

- Ethical dilemmas that a banker may face
- Effort made by banks : Equator Principles, BankTrack etc
- Conflicts of Interests
- Predatory Lending
- Responsible Lending

Topic 9 : Problem Loans/Regulations in Banking

- Loan Default : **‘a loan where repayments are overdue’**
- Causes of Loan Default (not well-designed policies, Inadequate controls, Over-concentration, Insufficient knowledge)
- Timing of Loan in the Business Cycle
- Provisions : If payment more than **90 days**, loan is considered an **‘impaired asset’**
 - Specific Provisions,
 - General Provision,
 - Bad-Debt Write-Offs
 - Dynamic provisioning

Topic 9 : Problem Loans(Dealing With Defaults)

- If the loan is in default, the bank must act to minimise the losses arising from defaulting clients and may **reschedule payments** rather than liquidate loan
- Classify defaulting clients into three categories :
 - Mild financial distress
 - Moderate financial distress
 - Severe financial distress
- Lender needs to very carefully evaluate whether it is better to :
 - i Liquidate firms to recover greatest percentage of loan possible ;
or
 - ii Restructure debt (inclusive of debts to other lenders) to maintain operations to allow firm to trade out of current crisis or be sold as going concern

Topic 9 : Why Regulate Banks

- Financial system is among the most heavily regulated sectors of the economy.
- Banks are among the most heavily regulated of financial institutions. **Why ?**
- Regulations could sometimes impede development of banks.
- Regulations sometimes can't prevent financial crisis.
- Are banking regulations beneficial ?

Topic 9 : Aim of Regulations

- **Market confidence** - to maintain confidence in the financial system
- **Financial stability** - contributing to the protection and enhancement of stability of the financial system
- **Consumer protection** - securing the appropriate degree of protection for consumers.
- **Reduction of financial crime** - reducing the extent to which it is possible for a regulated business to be used for a purpose connected with financial crime.
- regulating foreign participation in the financial markets.

Topic 9 : How to Regulate Banks ?

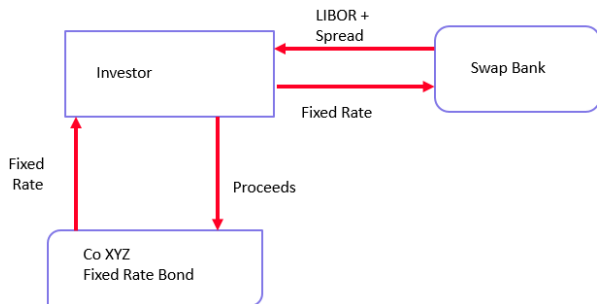
- There are nine basic categories of bank regulation, which we will examine from an asymmetric information perspective.

Topic 10 : Overview of Products

- **Asset swaps**
 - Asset swaps, Callable and Puttable Asset Swaps and Asset swap switches and asset swap options
- **Credit default swaps** (Company reference, index)
- **Credit spread forwards**
- **Total return swaps**
- **Basket swaps**
- **Credit spread options**

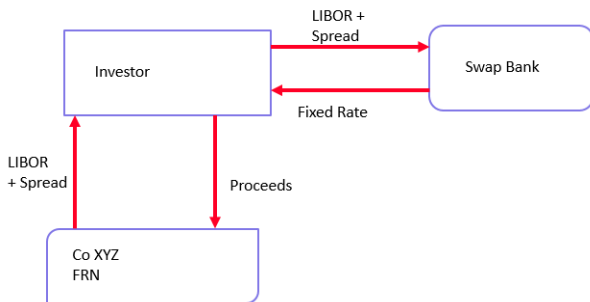
Topic 10 : Asset Swaps

a Synthetic FRN Investment Package

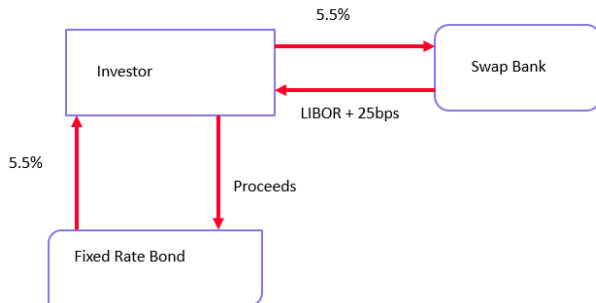


Topic 10 : Asset Swaps

b Synthetic Fixed Rate Investment Package

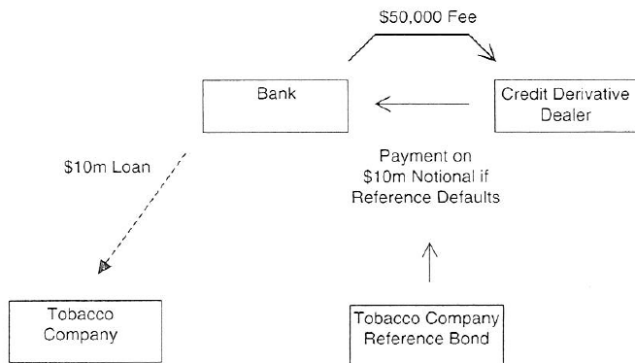


Topic 10 : Asset Swaps Arbitrage



- Option 1 : LIBOR +15bps on a 3-year FRN or + Bond
- Option 2 : Using Swap and receiving LIBOR +25bps or + Bond

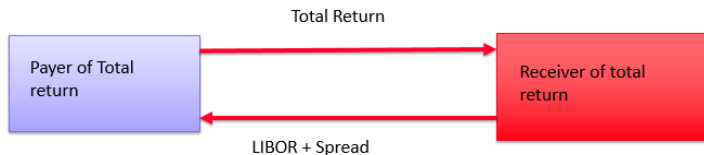
CDS on Tobacco Company Reference



Topic 10 : Factors Affecting The Price of a CDS

- **Time To Maturity** : The longer the maturity, the greater the likelihood of default, the higher the premium
- **Default Probability Reference Credit** : The higher the probability of default, the higher the premium
- **Credit Rating of CDS Counterparty (as Seller)** : The lower credit rating of the CDS counterparty, the lower the premium
- **Correlation between CDS Seller and Reference Credit** : The higher the correlation between the seller and reference, the lower the premium
- **Expected Recovery Rate** : The higher the recovery rate, the lower the premium

Total Return Swaps



- $\text{Total Return} = \text{Interest Flows} + (\text{Final Value} - \text{Original Value})$
- Total return receiver is long both the price and default risk of the reference asset
- Total return payer is the legal owner of the reference asset and has changed to credit risk of the reference asset into credit risk of the total return receiver

It never gets **easier**, you just get **better**! Work hard and have fun!

Wish you good luck for all the final exams!