# DEBT SECURITIES

Topic 12: Credit derivatives and Conclusion

LA TROBE UNIVERSITY Faculty of Law and Management

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## References

> **Fabozzi, F.J. (2007)** *Fixed Income Analysis*. John Wiley and Sons. Chapter 24.





## Student learning objectives

12.1 Identify the different types of credit derivatives;
12.2 Explain the three ways credit risk can affect a portfolio;
12.3 Illustrate what a total return swap is and how it can be used by a portfolio manager to hedge or acquire credit exposure;
12.4 Explain what a credit default swap is and how it can be used to acquire credit protection;
12.5 Explain the types of events that can be included in a credit default swap to trigger a payout;
12.6 Explain what a credit spread option is and how it can be used to acquire credit protection;





## Student learning objectives

12.7 Explain a synthetic collateralized debt obligation and how a credit default swap is used in this structured credit product;
12.8 Explain the different types of basket default swaps; and
12.9 Compare the different types of basket default swaps in terms of credit protection provided.





Objective 12.1

## Definition of derivatives

> A **derivative** is a financial instrument designed to efficiently transfer some form of risk between two parties
> Just as interest rate derivatives are designed to transfer interest rate risk, **credit derivatives** are designed to transfer credit risk – enabling a portfolio manager to increase or decrease their exposure to credit risk
> A fixed interest portfolio may be sensitive to changes in the spread between riskless and risky assets and credit derivatives are an efficient way to manage this exposure
> Conversely a portfolio manager may use credit derivatives to target specific exposures as a way to enhance portfolio return





Objective 12.1

## Market participants

> The credit derivatives market consists of three groups of players:
> **End-buyers of protection** seek to hedge credit risk taken in other parts of their business
  – Typically commercial banks, insurance companies, pension funds and mutual funds
> **End-sellers of protection** seek to diversify their current portfolio or look for exposure to a specific credit or a basket of credits
> **Intermediaries** provide liquidity to end-users, trading on their own account looking for arbitrage and other profitable opportunities
  – Typically investment banking arms of commercial banks and securities houses

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Objective 12.2

## Types of credit risk

- Credit risk may affect a portfolio in three ways:
  - Default risk: the risk that the issuer will default on its obligations
  - Credit spread risk: the risk that the interest rate spread for a risky bond over a riskless bond will increase after the risky bond has been purchased
  - Downgrade risk: the risk that one of the nationally-recognised statistical credit rating organisations, Standard & Poor's, Moody's Investors Service or Fitch Ratings, will reduce its outstanding credit rating for an issuer based on an evaluation of that issuer's current earning power versus its capacity to pay its fixed income obligations when they fall due
- Each form of credit risk can have a detrimental effect on the value of a fixed income portfolio
  - Important aspect here is that you do not necessarily need a default event for an investment or portfolio loss to arise



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Objective 12.2

## Sale of credit protection

- It is not hard to see why a market participant with exposure to credit risk might want to hedge that risk by buying credit protection
- It is perhaps less clear why a market participant would want to sell credit protection
- Reasons for selling credit protection include:
  - The fact that there are credit upgrades as well as downgrades
  - An expectation of other events that will have a positive effect on credit risk – e.g. mergers and acquisitions, profitable investments, debt retirements or re-financing transactions
  - In a growing economy, banks may be willing to provide term loans to high-yield companies at more attractive rates than the bond market, which will have a positive effect on credit



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Objective 12.1

## Types of credit derivatives

- Total return swaps
- Credit default products
  - Credit default swaps
  - Binary credit options
- Credit spread products
  - Credit spread options
  - Credit spread forwards



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Objective 12.3

## Total return swaps

- One party (the **total return receiver**) makes periodic floating payments in exchange for the total return realised on a reference obligation (i.e. a credit risky bond)
- The total return payment includes all cash flows that flow from the reference obligation as well as any capital gain or loss
- As a result, the total return receiver is exposed to all credit and interest rate risks – for example, a gain from a reduction in the credit spread might be offset by an increase in the level of interest rates
- A total return swap is typically used by a portfolio manager to increase credit exposure



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Objective 12.3

## Total return swaps

- Becoming the total return receiver is similar to buying the reference obligation, in that it provides exposure to both credit risk and interest rate risk
- The benefits of a total return swap versus purchasing the reference obligation are:
  - The total return receiver does not have to finance the purchase of the reference obligation
  - The total return receiver can gain exposure to a diversified basket of assets in one swap transaction
  - Although an investor will find it difficult to short a bond in the corporate bond market, he can do so by becoming the total return payer under a total return swap, in which case he pays the total return and receives a floating payment



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Objective 12.4

## Credit default swaps

- In a **credit default swap**, the protection buyer pays a fee (called the swap premium) to the protection seller in return for the right to receive a payment conditional upon the occurrence of a **credit event** by the reference obligation or the reference entity.
- In a credit default swap, there can be cash or physical settlement.
- Credit default swaps act like a standby letter of credit or insurance
- This is the most popular type of credit derivative
- The inter-dealer market has standardised contracts based on:
  - 5 years maturity
  - Quarterly premium payments by the buyer
  - A fixed cash payment to the buyer on occurrence of a specified credit event

Objective 12.4

## Credit default swaps

- Settlement methods
  - Cash
  - Physical delivery
    - The reference obligation is delivered by the protection buyer to the protection seller in exchange for a cash payment
- Determination of the payment obligation by the seller
  - This can be set at the contract date
  - Alternatively, it can be determined after the credit event, based on the observed price of similar debt obligations
  - It can also be established in the same way as a credit put option (discussed later), where the payment obligation is based on a strike price less the current market value





Objective 12.4

## Credit default swaps

- A day count convention indicates the number of days in a month and the number of days in a year
  - This is relevant for computing the interest payment and swap premium amounts
- Day count conventions vary from market to market
- In the US government bond market, the day count convention is actual/actual
- The convention used in the US corporate bond market is 30/360
- The convention used for credit default swaps (as well as interest rate swaps) is actual/360





Example 12.4.1

## Credit default swap

- A portfolio manager holds $12.5 million par value of a senior bond issue of Ford Motor Company
- Its current market value is $10m; hence the manager buys a credit default swap with a notional value equal to $10m
- The credit default swap is entered into on 26 Nov 2005
- The bond matures on 26 Nov 2010
- The swap premium is 410 basis points
- Assume 92 days in the quarter
- **Calculate the quarterly premium and identify the assets exchanged on the occurrence of a defined credit event**





Example 12.4.1

## Credit default swap



- The quarterly premium equals:

$$\$10{,}000{,}000 \times 0.0410 \times \frac{92}{360} = \$104{,}777.80$$

- On the occurrence of a defined credit event:
  - The seller pays $10m to the buyer
  - The seller receives the bond holding with a par value of $12.5m
  - The swap then terminates





Objective 12.5

## Credit events triggering a credit default swap

- Credit default swaps are structured under the rules set out by the International Swap and Derivatives Association (ISDA)
- The 2003 ISDA Credit Derivatives Definitions outline that the following events should trigger a payment in a credit default swap:
  - Bankruptcy
  - Failure to pay
  - Obligation default
    - When the reference entity breaches a covenant requirement
  - Restructuring
    - When there is an alteration to the obligation terms which make the new terms less attractive to the debt-holders than the original terms
    - Such as a reduction in the interest rate, a reduction in the principal, a rescheduling of the principal repayment schedule or postponement of an interest payment, or a change in the level of seniority of the obligation in the reference entity's debt structure





Objective 12.6

## Credit spread options

- A **credit spread option** is an option whose value/payoff depends on the change in credit spreads for a reference obligation; i.e. a credit risky bond
- It is critically important to define what the underlying is
- The underlying can be:
  - A reference obligation with a fixed credit spread
  - The level of the credit spread for a reference obligation

Objective 12.6

## Credit spread options

- If the underlying is a reference obligation with a fixed credit spread, a credit spread option is defined as follows:
  - Credit spread put option
    - An option that grants the buyer the right, but not the obligation, to sell a reference obligation at a price calculated by the strike credit spread over a reference benchmark
  - Credit spread call option
    - An option that grants the buyer the right, but not the obligation, to buy a reference obligation at a price calculated by the strike credit spread over a reference benchmark
- To protect against credit risk, an investor would buy a credit spread put option (because an increase in the credit spread will cause the price of the reference obligation to fall)





Objective 12.6

## Credit spread options

- For a credit spread put option:
  - The payoff is positive when the credit spread at expiry is **greater** than the strike credit spread
  - This is because the market value is less than the value based on the strike yield
  - The buyer of the option has the right to sell the underlying asset for the higher value based on the strike yield
- For a credit spread call option:
  - The payoff is positive when the credit spread at expiry is **less** than the strike credit spread
  - This is because the market value is greater than the value based on the strike yield
  - The buyer of the option has the right to buy the underlying asset for the lower value based on the strike yield





Example 12.6.1

## Credit spread options

- A portfolio manager buys a credit spread put option to protect against credit risk
- The reference obligation of the credit spread option is an 8% 10-year credit risky bond selling to yield 8%
- The benchmark is the 10-year Treasury yielding 6%
- The strike is set at 300 basis points and expiry is in 6 months
- At the end of 6 months the 9.5-year Treasury rate is 6.5% and the reference obligation's market price is $82.59
- **What is the payoff at expiry to the holder of the option?**





Objective 12.6

## Credit spread options

- If the underlying is a credit spread on a reference obligation, the payoff for a call option and a put option are defined as follows:
  - Credit spread call option payoff
    - (credit spread at exercise – strike credit spread) x notional amt x risk factor
  - Credit spread put option payoff
    - (strike credit spread – credit spread at exercise) x notional amt x risk factor
- The risk factor is the percentage change in the price of a reference obligation from a 100 basis point change in interest rates
- To protect against credit risk, an investor would buy a credit spread call option (because an increase in the credit spread will result in a positive payoff under the option)
- Note that the payoff is not affected by changes in the benchmark





Example 12.6.1

## Credit spread options

- With the benchmark at 6.5% and the strike spread at 300 basis points, the strike yield is 9.5%
- At 9.5% the value of the bond is $90.75 per $100 par
- The portfolio manager can buy the 8% 9.5-year risky bond for $82.59 in the market and exercise the put option to receive $90.75
- The payoff is $8.16 less the cost of the option
- With a market price of $82.59, the bond is yielding 11%, and therefore has a credit spread of 450 basis points
- The strike yield is 9.5% – less than the market yield of 11% – and the strike spread is 300bp – less than the market credit spread of 450bp
- The put option is in the money; a call option would be out of the money





Objective 12.7

## Synthetic collateralized debt obligation

- Credit derivatives can be used to create a structure with a payoff linked to, or derived from, a reference obligation or entity
- These products are called **structured credit products**
- One example of a structured credit product is a **synthetic collateralized debt obligation**
- As we discussed in Lecture 11, a CDO can be classified as a **cash CDO**, where the collateral manager purchases the pool of assets behind the CDO, or a **synthetic CDO**
- Under a synthetic CDO:
  - The collateral manager does not actually own the pool of assets
  - A synthetic CDO absorbs the credit risk, but not the legal ownership, of the underlying assets

Objective 12.7

## Synthetic collateralized debt obligation

- The structure of a synthetic CDO is as follows:
  - Funds are raised by selling CDO securities
  - The funds raised are invested in assets with low risk
  - At the same time the manager enters into a basket credit default swap with a counterparty in which it will provide credit protection; i.e. the manager is a protection seller for which he will receive a premium
    - The basket of securities forming the credit default swap exposure replicates the senior bond class collateral
  - If a credit event does not occur, the return realised for the investors in the CDO is comprised of the return on the low risk assets plus the premium received on the credit default swap premium
  - If a credit event does occur this reduces the return available to meet payments to CDO bondholders





Objective 12.8

## Basket credit default swaps

- In a basket default swap, there is more than one reference entity (typically, three to five).
- There are three types of basket default credit swaps
  - Nth-to-default swaps
  - Subordinate basket default swaps
  - Senior basket default swaps
- Nth-to-default swaps
  - The protection seller makes a payment to the protection buyer only after there has been a default for the Nth reference entity and no payment for default of the first (N-1) reference entities
  - Upon payout the credit default swap terminates





Objective 12.8

## Basket credit default swaps

- Subordinate basket default swaps
  - There is a maximum payout for each defaulted reference entity
  - There is a maximum aggregate payout over the life of the swap
  - If this maximum aggregate payout is reached, the swap terminates
- Senior basket default swaps
  - There is a maximum payout for each defaulted reference entity which is applied to the threshold or paid out if in excess of the threshold
  - The payout is not triggered until after a specified dollar loss threshold is reached
  - At this time only the residual in excess of the threshold is paid out





Example 12.9.1

## Basket default swaps relative protection

- Consider a basket default swap with five entities
- Assume that defaults result in the following losses (shown at right) over the tenure of the swap:
- The maximum payout per entity is $10m

| | |
|---|---|
| First | $6m |
| Second | $10m |
| Third | $16m |
| Fourth | $12m |
| Fifth | $15m |

- **Evaluate the relative riskiness of the following swaps:**
  - **A first-to-default swap**
  - **A fifth-to-default swap**
  - **A subordinate basket default swap (maximum aggregate payout $15m)**
  - **A senior basket default swap ($40m threshold)**





Example 12.9.1

## Basket default swaps relative protection

- The payouts under each swap are as follows:

| | |
|---|---|
| First-to-default swap: | $6m |
| Fifth-to-default swap: | $10m |
| Subordinate basket default swap: | $15m |
| Senior basket default swap: | $6m |

- Ranking of these basket default swaps, from highest to lowest risk:

(1) Subordinate basket default swap
(2) First-to-default swap
(3) Fifth-to-default swap
(4) Senior basket default swap





## Subject summary

- This subject has been designed to give you a detailed coverage of what debt securities are and the role of debt markets within the wider capital market environment. Focus has been placed on:
  - The use of debt securities by governments and companies to raise capital and as an investment vehicle for various categories of investors
  - The various types of debt securities that exist, the different attributes that they may have, and the types of risks faced by lenders and borrowers involved in debt securities transactions
  - The various avenues that can be used to value debt securities, and the suitability of different approaches for specific types of debt securities
  - Identification of the factors that determine changes in the value and risk of debt securities, and how these effects can be measured and controlled for
  - How debt securities can be used to create new capital-raising and investment securities
  - The development of related derivative securities, and their use for risk protection and investment/speculation purposes

## Subject summary

- The content of Debt Securities is part of the Candidate Body of Knowledge for the CFA Program Curriculum and Exams
  - Level I includes topics 1-5 and 7 (Fabozzi (2007) Chapters 1-7)
  - Level II includes topics 6 and 8-12 (Fabozzi (2007) Chapter 8-11, 15 and 24)
- The supplementary purpose of this subject is to provide instruction in, and exposure to, these topic areas, as initial preparation for students considering sitting the exams to obtain the CFA charter accreditation





## Final examination information

- Scheduling of the final examination:
  - Date: Tuesday 26th June 2012
  - Time: 2.00pm to 5.15pm (15 minutes reading time and 3 hours writing time)
  - Location: Menzies College Conference Centre (MCCC)
- Structure of the final examination
  - Comprises two sections (A and B)
  - All questions on the final examination are compulsory and should be attempted
  - Section A comprises 20 multiple-choice questions which are each worth 1 mark.
  - Section B comprises 4 questions which are each worth 10 marks
  - The overall examination totals 60 marks and counts 60% to your final result
  - Note that there is a hurdle requirement associated with the final examination, with a mark of at least 50% on the final examination required to be eligible to pass the subject





## Final examination information

- Final examination contents:
- Section A multiple choice questions
  - These cover the entire syllabus content. There is either one or two questions from each of the 12 topics areas covered in the subject
  - There are no calculation-based multiple-choice questions
  - These questions should be answered using the computerised multiple-choice answer sheet provided
- Section B questions should be completed in the provided script book

① Analytical question relating to a corporate bond issue
  - Evaluation of characteristics and terms associated with the issue
  - Consideration of risks that investors in the issue are potentially exposed to
  - Evaluation of embedded option components available to both the issuer and investors





## Final examination information

② Calculation question relating to mortgage-backed securities
  - Calculate WAC and WAM for a mortgage passthrough security
  - Calculate the CPR, SMM for a particular month, servicing fee involved and the dollar passthrough investment price
  - Evaluate risk elements based on a comparison of two passthrough securities

③ Part calculation / Part theory question on bond valuation and the relationship between bond prices and yield changes
  - Value an option-free non-zero coupon bond issued by a company
  - Determination of the effect on bond price of an event / transaction impacting on bond yield and potentially on bond cash flows
  - Consideration of the relationship between bond yield and price changes based on a Government policy initiative

④ Calculation question relating to interest rate risk measurement
  - Interpret interest rate risk exposure across different corporate bonds
  - Determine the approximate percentage price change based on a specified yield change using the convexity-adjusted duration method
  - Compare the performance of this approach to the full valuation approach





## Final examination information

- Note that a formula sheet will not be included with the final examination paper. Calculations you need to be know are:
  - Standard discounted cash flow bond valuation for a non-zero coupon bond with a fixed coupon rate
  - WAC, WAM, SMM, CPR, servicing fee and the dollar investment price for a mortgage passthrough security
  - Duration formula
  - Convexity adjustment formulas (value for C and the overall convexity adjustment)
  - Approximate percentage change formula incorporating duration and convexity adjustment components
- Also remember that you are only allowed to bring non-programmable calculators into the final examination





## Final examination information

- Advice on final examination completion
  - Time management is important. Based on the mark allocation across the questions, allow one hour to complete Section A and 30 minutes to complete each of the Section B questions
  - Read questions closely to ensure that you fully understand what is being asked
  - Use a strategic approach to completing multiple-choice questions
  - In regards to calculation questions (where relevant), if you plan to use a calculator directly to work things out (such as a bond value or yield measure) also outline the calculator inputs or specify the equation being computed
  - Mathematical answers should be provided to a minimum of 2 decimal places, and preferably to 4 decimal places
  - A good practice is to check calculations for reasonableness against general rules and criteria (such as a negative relationship between yield changes and bond price changes, relationships between coupon rates, required returns and bond prices, and signs of duration and convexity adjustment values).

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## Final examination information

- Final examination preparation
  - Everything included in the final examination is covered in lectures and tutorial work. Mastering this material will allow you to succeed in the final examination. Further reference to the Fabozzi (2007) textbook should be undertaken for clarification on specific issues
  - Tutorial assessment tasks provide a good guide to how I write longer questions and how the Section B questions are likely to be structured
  - There is nothing directly examinable in relation to the assignment, apart from two multiple-choice questions relating to the Credit Analysis topic
  - I will provide a sample practice exam on the subject LMS site with solutions to multiple-choice and calculation questions to give you an idea about what the final examination paper might look like.



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## Consultation times and internal assessment results

- I will have the following consultation times during the exam period:
  - Mondays from 10.00am – 12.00noon
  - Wednesdays from 12.00noon – 2.00pm
  - Thursdays from10.00am – 12.00noon
  - I am also happy to answer questions by phone or e-mail (as long as they are short)
- Internal assessment results:
  - Assignment results will be available before the final examination. Results will be released on the subject LMS site when they are ready, and the assignments can be collected from Darren Henry's office after the results are released
  - Tutorial assessment task 5 results, and the overall results for the tutorial assessment task process, will be released next week on the subject LMS site. Tutorial assessment task 5 can be collected from Darren Henry's office after the overall tutorial assessment task results are released.