

BANKING FINANCIAL MANAGEMENT and FINANCIAL ECONOMICS

Introduction to
Credit Derivatives
Dave Coker

OBJECTIVES

- Define and codify *credit risk*
- Understand what *credit derivatives* are
- Learn what a *credit default swap* is
- Define *credit events*
- Valuation of credit default swaps

Types of Credit Risk

- Bonds are not risk free e.g.,
 - Interest rate risk
 - Inflation risk
 - Credit risk
- Credit risk can be disaggregated
 - default risk
 - downgrade risk
 - credit spread risk

Types of Credit Risk

Default risk

Risk the issuer will fail to pay interest or repay principal

Downgrade risk

Risk of unanticipated downgrade

- causes the credit spread to increase

Credit spread risk

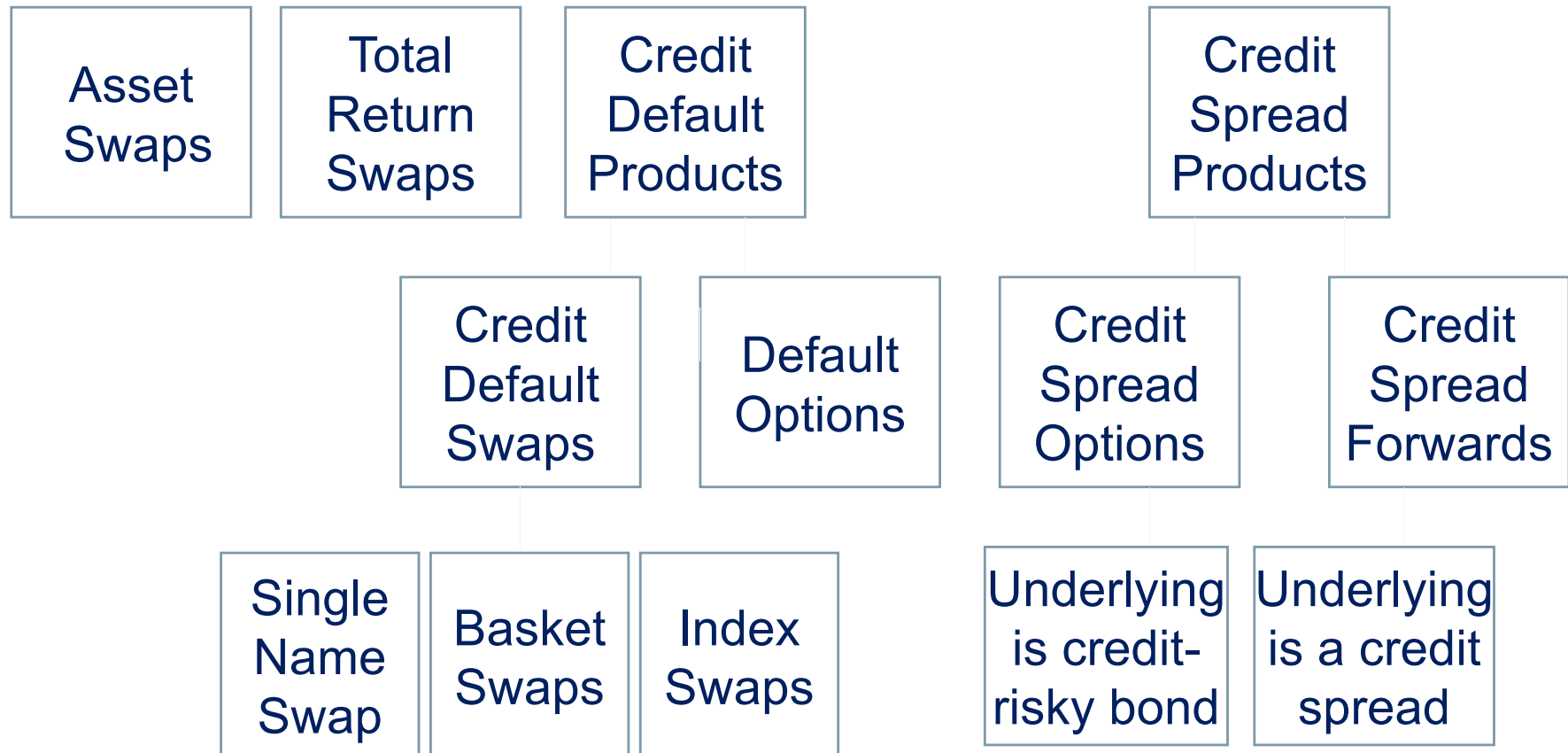
Risk that issuer's bond will perform poorly relative to other bonds due to an increase in its credit spread

- As spreads increase prices decline
- As spreads decrease prices rise

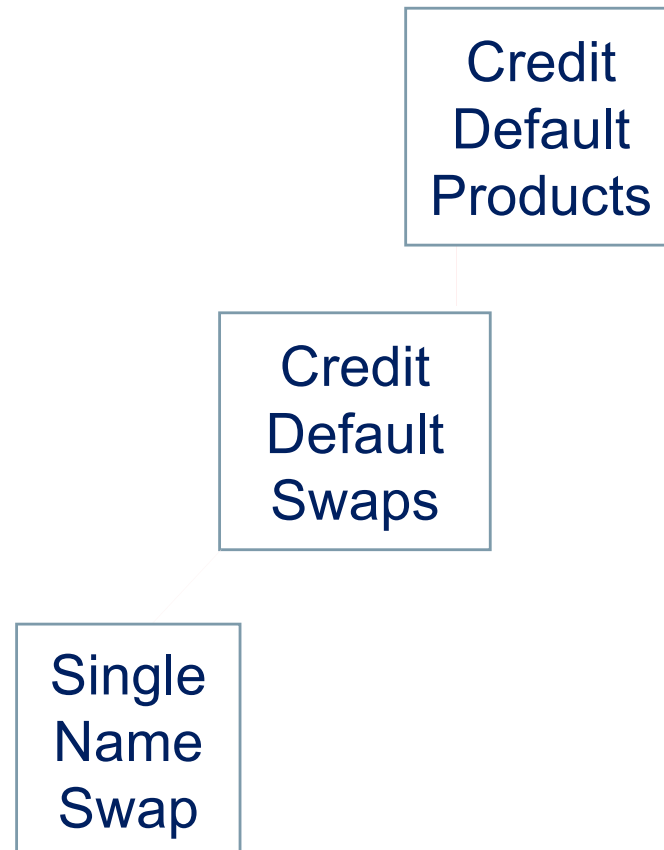
Categorization of Credit Derivatives

- Many ways to characterize credit derivatives
 - This presentation is focused in detail on one
- BUT
 - some of derivatives noted are not true credit derivatives
 - they DO NOT provide protection against credit risk
- RATHER
 - Provide protection against both interest rate and credit spread risk
 - Applies to asset swaps and total return swaps
- Key concept – pure credit default products provide protection against *credit events*

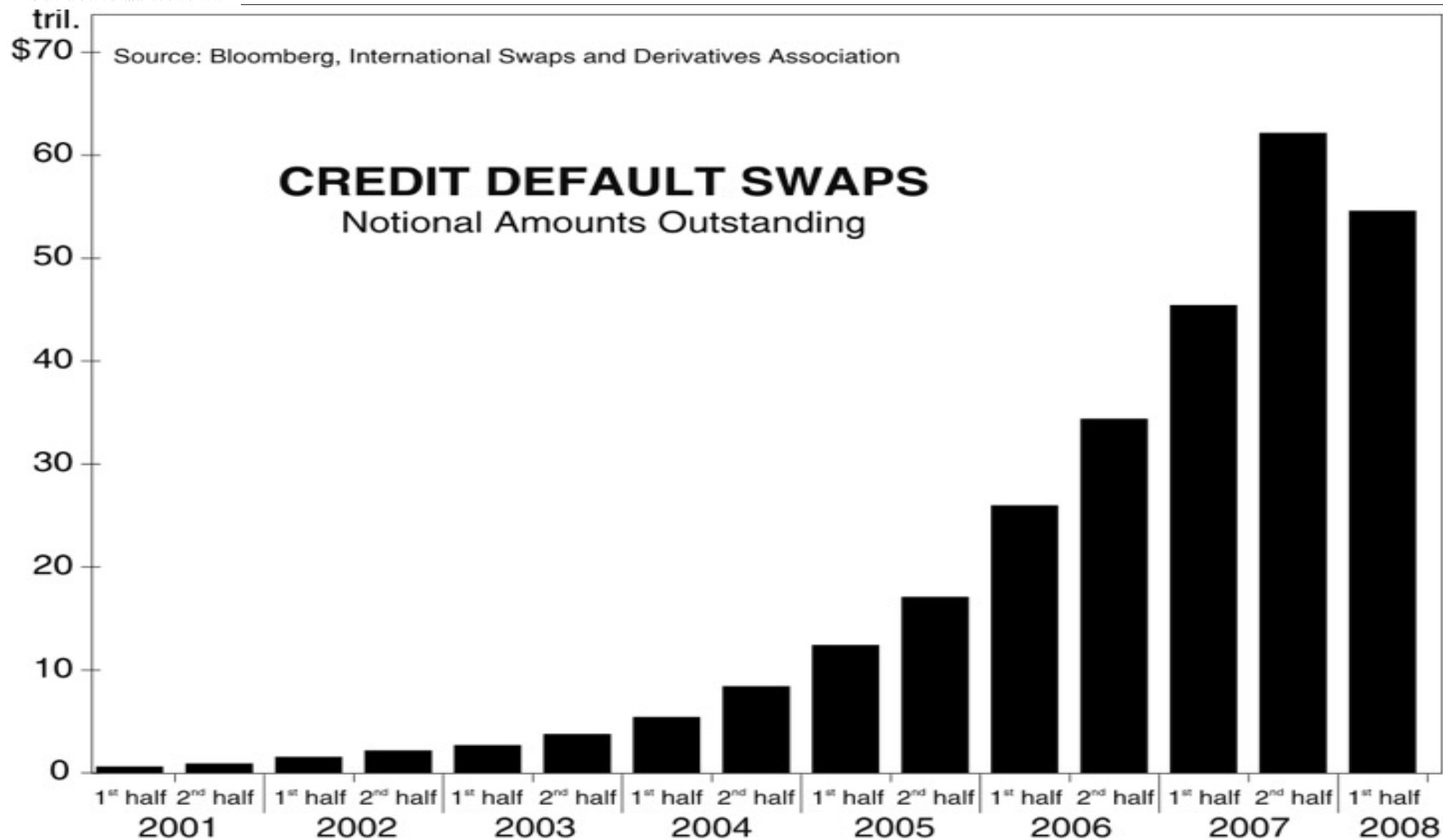
Categorization of Credit Derivatives



Categorization of Credit Derivatives



Credit Default Swaps



Brief history of Credit Derivatives

1995

- *Credit Default Swaps (CDS) & Collateralized Debt Obligation (CDO) structures created by JP Morgan, led by Blythe Masters*
- **JP Morgan drives *industry transformation away from long term relationship banking towards short term credit trading***
- Accounting and regulatory arbitrage *generates significant revenues*; this is widely noticed
- *Shifting of credit risk off bank balance sheets by pooling credits and remarketing portfolios, and buying default protection after syndicating loans for clients drive significant changes*

Brief history of Credit Derivatives

1996

- Single name *CDS market begins to grow*, albeit slowly
- New profit generating strategy emerges: build portfolios of debt securities then *package and sell off tranches* of the portfolio based on default probabilities
- **Slice and dice becomes accepted revenue generating strategy for banks, allows *highly customized risk/return profiles for investors*; market sees sharp increases in liquidity**
- *ABS, CDS, emerging market debt all packaged, sliced and sold off* in tranches to investors seeking exposure

Brief history of Credit Derivatives

1998-1999

- Basket portfolio trading begins; heterogeneous credits assembled into *tradable baskets with single credit rating*
- New CDS contracts allowing investors to hedge below-investment grade and high yield loans *drives liquidity into market*
- ***ISDA expands and markedly updates CDS documentation, supplementing it to reflect changing market needs***
- CDS market becomes increasingly standardized, volume increases significantly as *new investors are attracted*

Brief history of Credit Derivatives

2000-2001

- \$100B volume of CDS contracts are traded, *far exceeding the volume of cash bonds (\$30 billion)*, and creating a risk of price squeezes on defaulted bonds used for physical delivery
- *Cash settlement terms introduced* to avoid dangers of physical settlement in CDS market
- **Wave of defaults as dot.com boom crashes; “first significant test” passes without incident, reinforces importance of this market to investors**
- Credit Linked Note (CLN) market in Europe grows rapidly, paving the way for following CDS growth into Europe

Brief history of Credit Derivatives

2002

- ***CDX index created, JP Morgan and Morgan Stanley both issue CDS index products - heavy trading***
- Tradeable credit indices cause *massive increases (100% per year) in transaction volumes*
- Internet revolution allows structured credit trading anywhere, smaller players and emerging markets enter *driving liquidity*
- Deconsolidation wave begins with "outsourcing" of risky strategies by investment banks to *separate entities (SPV) formed for purpose of generating higher yields.*
- Deficiencies in risk management *lays the groundwork for potential market shocks*

Brief history of Credit Derivatives

2003

- *ISDA definitions agreed market standard*
- **Collateralized Debt Obligation (CDO) market expands rapidly as *liquidity attracts investors***
- Fleet Bank middle market group packages illiquid private company loans and selling tranches to investors; *industry follows by packaging everything possible*
- Concerns about Systematic Risk grow: Enron balance sheet/special purpose vehicles used to securitize assets, FASB 113 Financial Insurance regulation leads to MBIA earnings restatement rocking markets

Brief history of Credit Derivatives

2005

- *ISDA creates definitions on CDS of ABS*
- *Delphi default reveals significant counterparty risk and problems with market corners - short squeeze and documentation failures*
- **Problems attract highest level attention: *U.S. Fed Chairman orders major credit market players to clean up documentation and settlement procedures or face halt in trading; industry tries***
- Sharp rise in pooling, tranching using CDO, CDO², Nth-to-Default, Special Purpose Vehicles proves to be *extremely lucrative business* for major broker-dealers and specialty fund managers

Brief history of Credit Derivatives

2006

- ***ISDA: Credit derivative volume expands to \$26T***
- *Notional value of single name CDS outstanding now \$19-25T versus \$40T for bonds*
- Industry-specific indexes are developed and traded - CMBS, ABS (ABX), High Yield (100 names), allowing *risk mitigation and driving liquidity*
- Banks with huge balance sheets no longer need to anchor new debt issues due to broad availability of credit derivatives; this drives *fundamental changes into the market and the way businesses raise debt capital*

Brief history of Credit Derivatives

2007 - present

- Increasing *industry push to cash settlement/auction* pricing of defaulted credits upon credit event to avoid short squeeze
- *Markit, CDX, and iTraxx accepted as standard pricing sources*, enabling broad trading of credit derivatives
- ***DTCC clearing system increases speed of trade clearing and settlement, reduces costs and operational risks***
- *Permanent Capital Vehicles (PCVs) formed to invest in credit markets with money locked in for 5Y or more*, allowing managers to trade longer term arbitrage, capital structure, and cycle plays

ISDA Standardisation

Reference Entity

- Issuer of the debt instrument
- Can be a corporation or a sovereign government

Reference Obligation

- Also known as the *reference asset*
- Debt issue for which the credit protection is being sought.

Example

- Reference entity Ford Motor Credit Company
- Reference obligation a specific Ford Motor Credit Company bond issue

ISDA Standardisation

Credit Events

- Credit default products pay when credit event occurs
- The *1999 ISDA Credit Derivatives Definitions*
 - detail eight credit events
 - attempt to capture all situations that could
 - cause deterioration of reference entity credit quality
 - cause decline in value of the reference obligation
- Revised in *2003 ISDA Credit Derivative Definitions*
 - The major change was to restructuring, ...

ISDA Standardisation

Credit Events detailed in The *1999 ISDA Credit Derivatives Definitions* :

bankruptcy
failure to pay
repudiation / moratorium
restructuring

cross default
downgrade
credit event upon merger
cross acceleration

ISDA Standardisation

- *Bankruptcy*
 - As defined by relevant bankruptcy or insolvency laws
- *Failure to pay*
 - when a reference entity fails to make one or more required payments
- *Repudiation / moratorium*
 - If a reference entity challenges the validity of an obligation
- *Restructuring*
 - If terms of obligations are altered
 - New terms less attractive to debt holders than original terms

ISDA Standardisation

- *Cross default*
 - IF borrower defaults on *another* obligation, this is construed as default on the obligation under consideration
- *Downgrade*
 - Of an issuer or perhaps issues
- *Credit event upon merger*
 - Two entities merge, if *any* credit event occurs due to the merge (acquisition)
- *Cross acceleration*
 - When a reference entity breaches a covenant, it has defaulted on its obligation and obligations are due and payable before the scheduled maturity

BANKING FINANCIAL MANAGEMENT and FINANCIAL ECONOMICS

TWENTY MINUTE BREAK

Asset Swaps

- Investor possesses an asset and wants to
 - TRANSFORM cash flow characteristics
 - Investor is said to have constructed an asset swap
- Most common asset swap
 - Investor purchase credit-risky bond fixed rate
 - Converts cash flow to floating rate
- If the issuer of bond defaults THEN
 - investor must continue to make payments to the counterparty of the interest-rate swap
 - still exposed to the credit risk of the issuer

Asset Swaps

- Basic asset swap
- Investor purchases \$10M par value of a 7.85%, 5Y rated BBB
- Coupon payments are semiannual
- Simultaneously investor enters into a five-year interest-rate swap
 - Investor pays fixed-rate swap rate (assume this is 7.00%)
 - Investor receives six-month LIBOR
- Cash flows for the investor every six months for the next five years:

Received from utility bonds:	7.85%
– Payment to dealer on swap:	7.00%
+ <u>Payment from dealer on swap:</u>	<u>6-month LIBOR</u>
Net received by investor:	0.85% + 6-month LIBOR

- Regardless of how interest rates change, if the utility issuer does not default on the issue, the investor earns 85 basis points over six-month LIBOR

Asset Swaps

- Investor has converted a fixed-rate BBB 5Y bond into
 - A 5Y floating-rate bond with a spread over six-month LIBOR
 - This is a synthetic floating-rate bond (asset swap)
- Asset swap combines
 - the sale of a credit-risky bond to a counterparty at par (with no interest accrued)
 - WITH an interest-rate swap
- If there is a default by the issuer of the credit-risky bonds
 - the asset swap transaction is terminated
 - defaulted bonds are returned to the investor
- The investor is still exposed to the issuer's credit risk

Asset Swaps

- Coupon on the bond in the par asset swap paid in return for LIBOR
 - plus a or minus spread
- Spread is called *asset swap spread*
 - Effectively is the price of the asset swap
- Asset swap allows investors that pay LIBOR-based funding
 - to receive the asset swap spread
- Spread is a function of the credit risk
 - of the underlying credit-risky bond

Total Return Swaps

- A swap in which one party makes periodic floating-rate payments to a counterparty in exchange for the total return realized on a reference obligation or a basket of reference obligations
- If reference obligation is a bond market index
 - swap is referred to as a *total return index swap*
- Party that agrees to make floating payments AND receive total return is referred to as the *total return receiver*.
- Party that agrees to receive floating payments AND pay total return is referred to as the *total return payer*.

Total Return Swaps

Benefits of Total Swaps

- Purchase of reference obligations is NOT necessary
 - Only a fee is paid to receive total return
- Total return receiver achieves economic exposure
 - to a **basket** of assets in **one** swap transaction
 - otherwise several cash market transactions are needed
- Investor who wants to short the corporate bonds
 - May find it difficult to do so
 - Lack of bonds for lending
 - This is easily done in total return swap market
 - In this case the investor will use a total return swap in which it is a total return payer and will receive a floating payment.

Credit Default Swaps

- Credit default swaps
 - most widely used credit derivative
- Hedge credit exposure
 - to a particular asset or issuer
- Single name credit default swap
 - one reference obligation
- Basket credit default swap
 - reference obligation is a *portfolio* of bonds
 - Example:
 - 10 high-yield corporate bonds
 - from 10 different issuers

Credit Default Swaps

Mechanics of a Credit Default Swap

- Protection buyer
 - pays periodic fee to protection seller
 - to “insure” reference obligation or reference entity
 - receives payment if credit event occurs
 - by the reference obligation or the reference entity
- Protection seller
 - must pay if credit event occurs
 - payment can be either cash OR
 - physical settlement

Credit Default Swaps

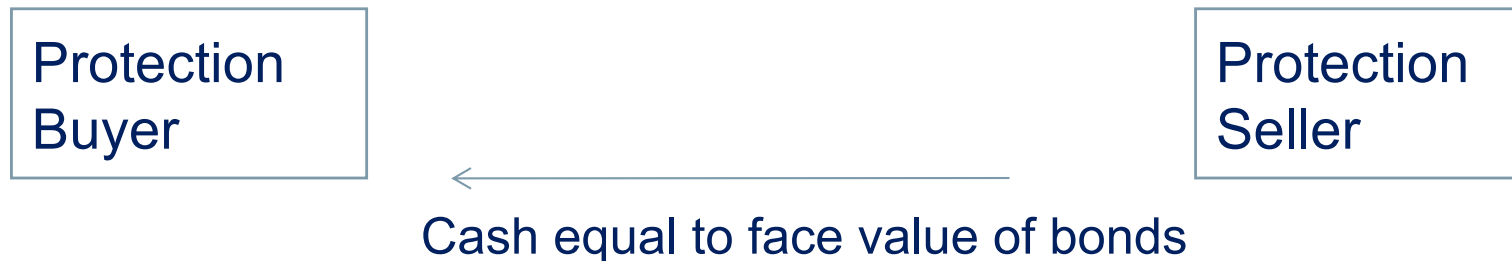
- Determining payment methods vary widely
 - UP FRONT
 - can specify (at the contract date) the exact amount of payment that will be made by the protection seller should a credit event occur
 - ON EVENT
 - or can be structured so amount of the swap payment by the seller is determined after the credit event

Mechanics of Credit Default Swap

Cash Flows Before a Credit Event



Cash Flows After a Credit Event



Credit Default Swaps

Mechanics of a Credit Default Swap

- May be settled in cash or by physical delivery
- Physical delivery considered more efficient
- If no credit event by the maturity of swap
 - the swap agreement is terminated
 - and no further obligations are incurred

Credit Default Swaps

Mechanics of a Credit Default Swap

- If credit event occurs
 - *termination value* is determined
 - market practice for settlement is *physical delivery*
 - where protection buyer delivers a specified amount of the face value of bonds of the reference entity to the protection seller
- Calculating termination value in default
 - Multiple methods exist & can vary greatly
 - Contract can specify exact amount of payment
 - Or amount can determined after the credit event
 - Most common - protection seller pays protection buyer full face value of bonds (i.e., cash)

Single-Name Credit Default Swap

- Standard contract specifies quarterly payment
- Quarterly payment considers
 - Notional Amount
 - Swap Rate
 - Actual number of days in a quarter
- Bond market day count conventions apply
- Swap Premium is amount paid

$$\text{SwapPrem} = \text{NotionalAmount} * \text{SwapRate} * \frac{\text{ActualNumberOfDaysInQuarter}}{360}$$

Single-Name Credit Default Swap

Assume:

Notional amount is \$10 million

92 actual days in a quarter

Swap spread is 102 basis points (0.0102)

Swap Premium = $\$10,000,000 * 0.0102 * 92/360$

Swap Premium = \$20,066.66

Applications of CDS'

- Free up balance sheet
 - Regulatory treatment less severe as guarantee is held
- Very efficient *short vehicle*
 - Relatively difficult to short corporate bonds
 - Same effect by purchasing default protection
- Gain economic exposure
 - Without acquiring underlying asset
 - Very popular technique for institutional investors
- Transfer credit risk
 - No impact on client relationship
 - Doesn't trigger tax event
 - Allows for hedging of non transferable / non marketable

Example of CDS usage

Synthetic risk free asset

- Buy a floating-rate security
 - issued by reference entity
 - with maturity T
 - paying C_{FR}
- Fund the purchase of floating-rate security
 - by borrowing for the term of the security (which is also the term of the credit default swap), T , at cost C_B
- To hedge credit risk
 - purchase protection by buying a credit default swap with a maturity of T on the reference entity, paying premium C_P
- This is risk-free investment yielding $C_{FR} - C_B - C_P$
- The payoff is identical for both outcomes
 - no credit event occurs
 - credit event occurs

BANKING FINANCIAL MANAGEMENT and FINANCIAL ECONOMICS

TWENTY MINUTE BREAK

Basket Default Credit Swaps

- Covers multiple names – a “basket”
- Time of payout is always specified
- Can be structured in different ways
 - The simplest case is that if any of the reference obligations default, there is a payout and then termination of the swap
 - This type of swap is referred to as a *first-to-default basket swap*
- In general
 - if it takes k reference obligations to trigger a payout, the swap is called a k -to-default basket swap.

CDS' on Noncorporate Reference Entities

- Traded since mid 2000
- Largest volume
 - Municipal Credit Default Swaps
 - Credit Default Swaps on Securitized Products
- Municipal Credit Default Swaps
 - ISDA documentation is limited
 - not all credit events are applicable to municipal entities
- Three credit events apply to Municipal Credit Default Swaps
 - bankruptcy
 - failure to pay
 - restructuring

Municipal Credit Default Swaps

- ISDA's standardized confirmation for municipal credit default swaps
 - Requires parties to a trade to specify the type of municipal bond that is the underlying one for a trade
- The ISDA confirmation provides the following three choices for the type of municipal bond:
 - backed by the full faith and credit of the municipal government (full faith and credit obligations)
 - paid from funds on hand (general fund obligations)
 - backed by specific revenue streams (revenue obligations)

Credit Spread Options

- **Underlying is a Reference Obligation with a Fixed Credit Spread**
- *A credit spread put option*
 - an option that grants the option buyer the right, but not the obligation, to sell a reference obligation at a price that is determined by a strike credit spread over a referenced benchmark at the exercise date
- *A credit spread call option*
 - is an option that grants the option buyer the right, but not the obligation, to buy a reference obligation at a price that is determined by a strike credit spread over a referenced benchmark at the exercise date

Credit Spread Forwards

- *A credit spread forward*
 - requires an exchange of payments at the settlement date based on a credit spread
- The underlying can be either
 - the value of the reference obligation
 - or the credit spread
- The payoff depends on the credit spread at the settlement date of the contract
 - The payoff is positive (i.e., the party receives cash) if the credit spread moves in favor of the party at the settlement date
 - The party makes a payment if the credit spread moves against the party at the settlement date

Credit Spread Forwards

- Portfolio manager wants to benefit from an increase in the credit spread, payoff is:
 - $(\text{credit spread at settlement} - \text{credit spread in contract}) \times \text{notional amount} \times \text{risk factor}$
- Portfolio manager wants to benefit from a decrease in the credit spread, payoff is:
 - $(\text{credit spread in contract} - \text{credit spread at settlement}) \times \text{notional amount} \times \text{risk factor}$

Structured Credit Products

- *Structured credit products*
 - create debt instruments with structures whose payoffs are derived from the credit characteristics of a basket of reference obligations
- Two most common structures employing credit derivatives are
 - synthetic collateralized debt obligations
 - credit-linked notes

Structured Credit Products

Synthetic Collateralized Debt Obligations

- Collateralized debt obligation (CDO) backed by a diversified pool of one or more types of debt obligations
- The funds to purchase the collateral assets are obtained from the issuance of bonds
- CDO are either *cash CDO* or a *synthetic CDO*
 - “cash” means that the collateral manager purchases cash market instruments
 - Synthetic CDO structured from CDS’
 - Absorb the credit risk, but not the legal ownership, of the reference obligations

Credit-Linked Notes (CLN)

- Issued by an investment banking firm or another issuer who has credit risk to a second issuer (called the reference issuer)
- The issuer of a CLN is the credit protection buyer
- The investor in the CLN is the credit protection seller
- CLNs are usually short term maturity

REVIEW

- Discussed the Credit Derivatives market
- Took a broad overview of
 - history and development
- Focused on Credit Default Swaps
- Introduced simple model for valuation
- Discussed alternative uses
 - Synthetic risk free security

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