

# **Introduction to Credit Derivatives**

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## CQF Lecture 5.3

### May 2009



# Agenda

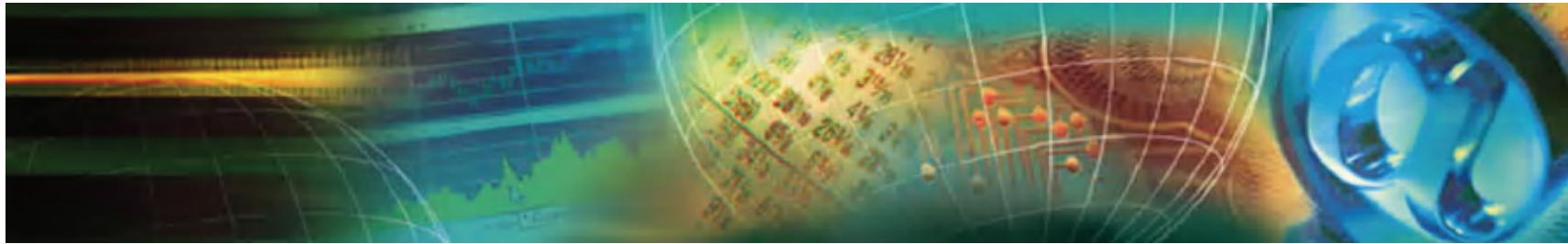
- 〃 Introduction to credit risk and credit derivatives
- 〃 Uses and applications
  - 〃 Credit default swap (CDS)
  - 〃 Total return swap (TRS)
  - 〃 Credit-linked note (CDS)
  - 〃 Basket CDS
  - 〃 Index products (iTraxx and CD-X)
- 〃 The CDS-ASW basis
- 〃 Structured credit products

Please read and note the **DISCLAIMER** at the end of this presentation.



## Credit risk

- 〃 Credit risk is the risk that a bond issuer (obligor) will
  - 〃 fail to service a debt instrument (i.e. **default**)
    - 〃 Miss coupon payment(s)
    - 〃 Fail to repay
  - 〃 Experience a change in credit rating (credit **migration**)
- 〃 The *likelihood* of this happening is expressed in the issuer's credit rating
  - 〃 Lower credit rating means higher borrowing (funding) costs
  - 〃 Funding costs are expressed as a **spread** (in basis points) over a benchmark rate, such as LIBOR or Government debt.



## Credit risk and return

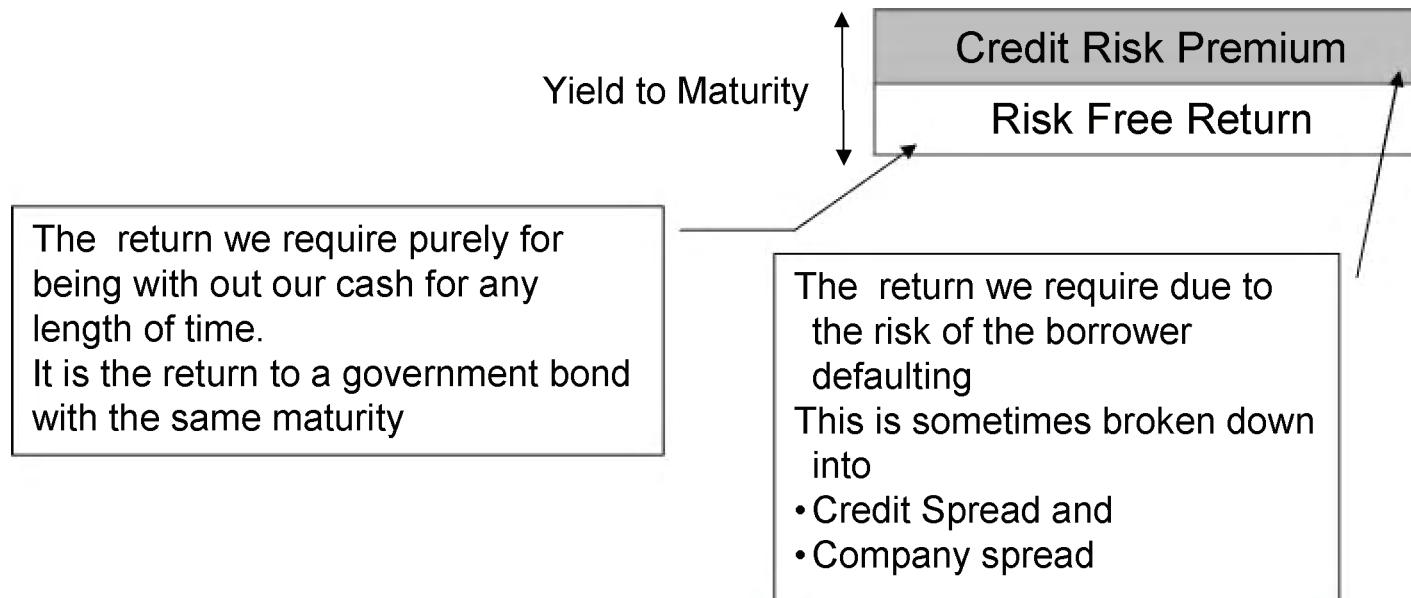
- // Companies are rated by Credit agencies (S&P, Moody's, Fitch) which represent probabilities of their likelihood to default on any debt cash flows
- // Equivalent bonds will trade at a lower price for a lower credit rating and hence provide a higher yield for added risk

AAA (or Aaa)	Prime grade	Investment Grade
AA (or Aa)	High quality grade	
A	Upper medium grade	
BBB (or Baa)	Medium grade	
BB (or Ba)	Low grade	Non-Investment Grade  HIGH YIELD
B	Speculative	
CCC (or Caa)	Poor grade (substantial risk)	
CC (or Ca)	Very speculative	
C	Extremely speculative	
CI	Noninterest bearing income bonds	
DDD, DD, D	Default	



## Credit Spreads

- Bond yield is a very rough approximation of the annual average return from holding a bond. It is known as the yield to maturity
- The YTM may be broken down into two major components:



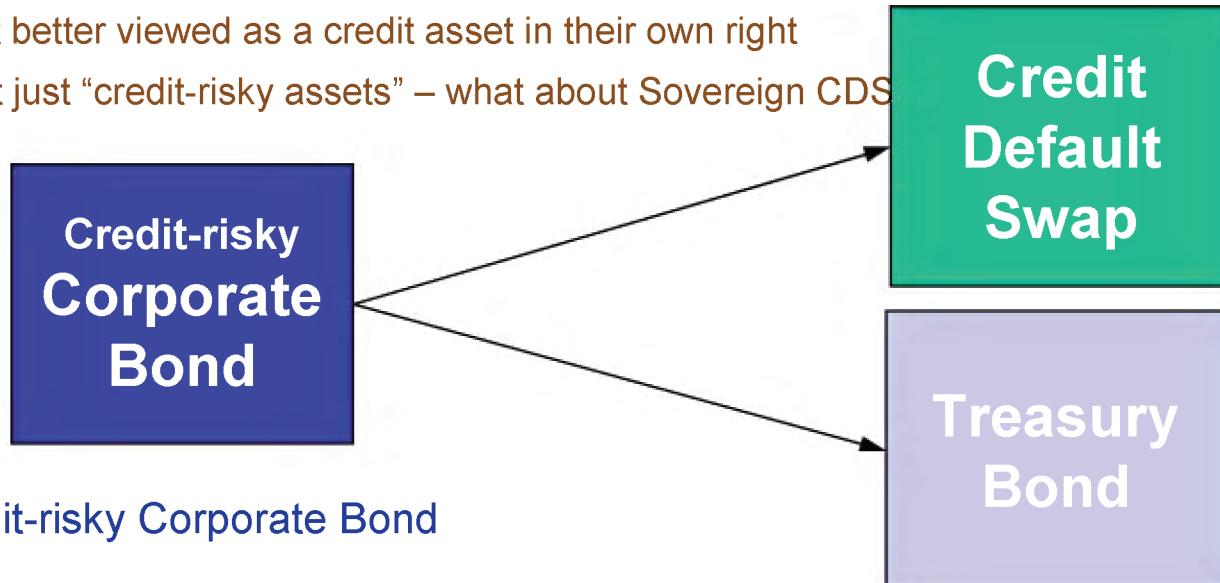


## What are Credit Derivatives?

### ☰ Credit Derivatives:

- ☰ Credit derivatives are synthetic credit-linked assets
- ☰ Originally defined as “tools to manage credit risk” or allowing users to “unbundle credit risk from other risks”
- ☰ But better viewed as a credit asset in their own right
- ☰ Not just “credit-risky assets” – what about Sovereign CDS

### Example



Split a credit-risky Corporate Bond into:

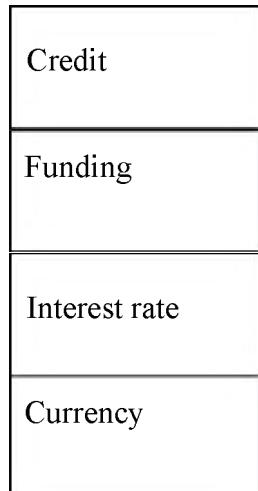
- ☰ Risk-free T-Bond (buy)
- ☰ Credit default swap (sell)



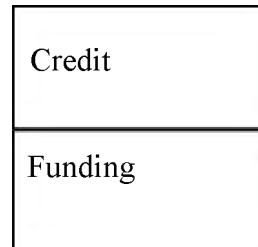
## Unbundling constituents of debt capital

Credit derivatives isolate credit as an asset class and risk element

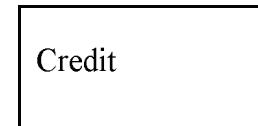
**Bond / Loan**



**Asset Swap**



**Credit Derivative**

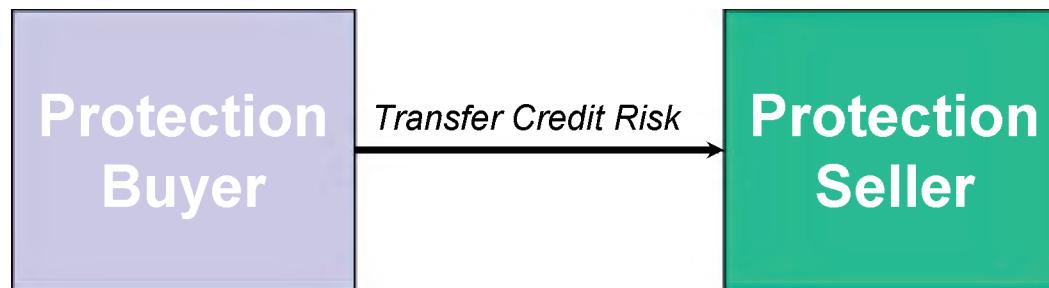




## Buying and Selling Credit Risk

Credit Derivative transactions generally involve two counterparties:

- 〃 One party is the **Protection Buyer** (Credit Risk Seller)
- 〃 The other party is the **Protection Seller** (Credit Risk Buyer)





## “1G” Motivations for using credit derivatives

- /// To manage credit risk
  - /// Credit risk may now more easily be transferred from one party to the next
- /// To earn income
  - /// Low-cost borrowers with large balance sheets can earn income from parties who want credit exposure without owning assets
- /// To enable users to *diversify credit risk*
  - /// Parties can selectively increase or decrease exposure to:
    - /// Countries
    - /// Market sectors
    - /// Types of financial instruments
- /// To provide access to exposures that would not otherwise be available
  - /// e.g. Investors can gain access to syndicated loans

### Examples:

- /// Do you want to lend to Zanussi but your country limit for Italy is fully utilised?
- /// Do you want to take exposure to Hong Kong without also incurring US interest rate risk?
- /// Do you want six-month exposure to Tunisia or Egypt but all securities in these markets have maturities longer than two years?



## **“2G” Motivations for using credit derivatives**

### */// To invest in credit markets synthetically*

- /// Accessing ABS markets by CDS
- /// Accessing a credit index
- /// Structured credit products

### */// To arbitrage between cash and synthetic markets (the “basis”) as previously done in interest-rate markets*

- /// The Basis

### */// To access otherwise unavailable credit product*

- /// Diversified portfolios (high yield CDOs, CLOs and synthetic CLOs)
- /// New markets (high yield, loans etc)
- /// Local currency products
- /// Securitisation of asset swaps
- /// Avoid withholding tax

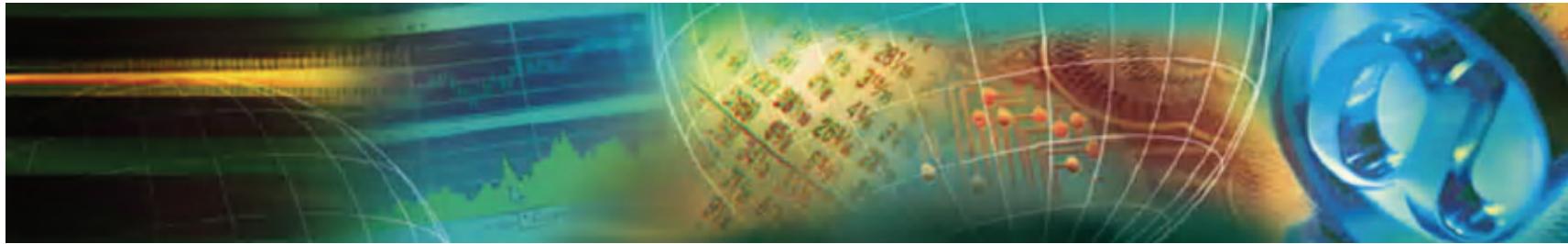
### */// To create customised exposures*

- /// Customised maturity
- /// Customised cashflows (discount or premium bonds)
- /// Diversified portfolios (high yield CDOs, synthetic CLOs etc)
- /// Tranching of credit risk



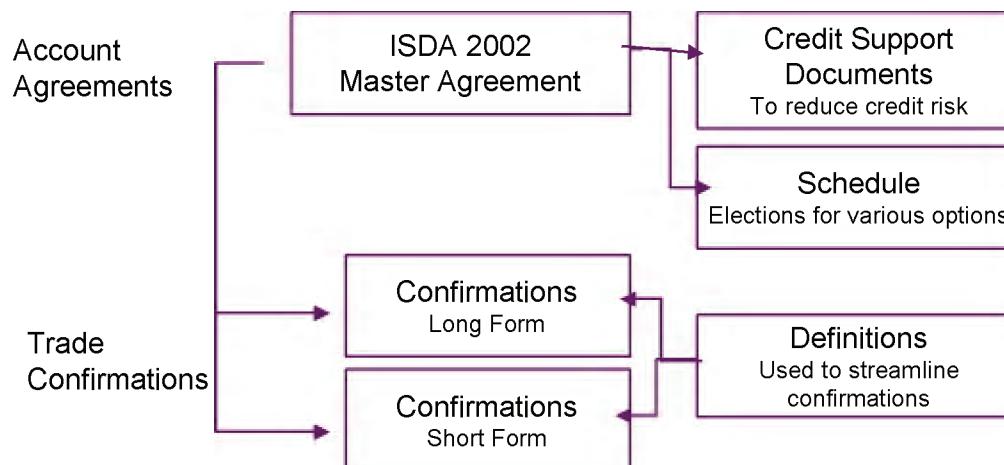
## Types of credit derivative

- 〃 Asset swaps
- 〃 Credit Default Swaps (CDS)
  - 〃 Single-name
  - 〃 Basket
- 〃 Total Return Swaps (TRS)
- 〃 Credit-Linked Notes (CLN)
- 〃 Credit Spread Options (CSO)
- 〃 Structured credit products:
  - 〃 CDOs – Collateralised Debt Obligations
  - 〃 CBOs – Collateralised Bond Obligations
  - 〃 CLOs – Collateralised Loan Obligations
  - 〃 ABCP and (now RIP) SIVs...



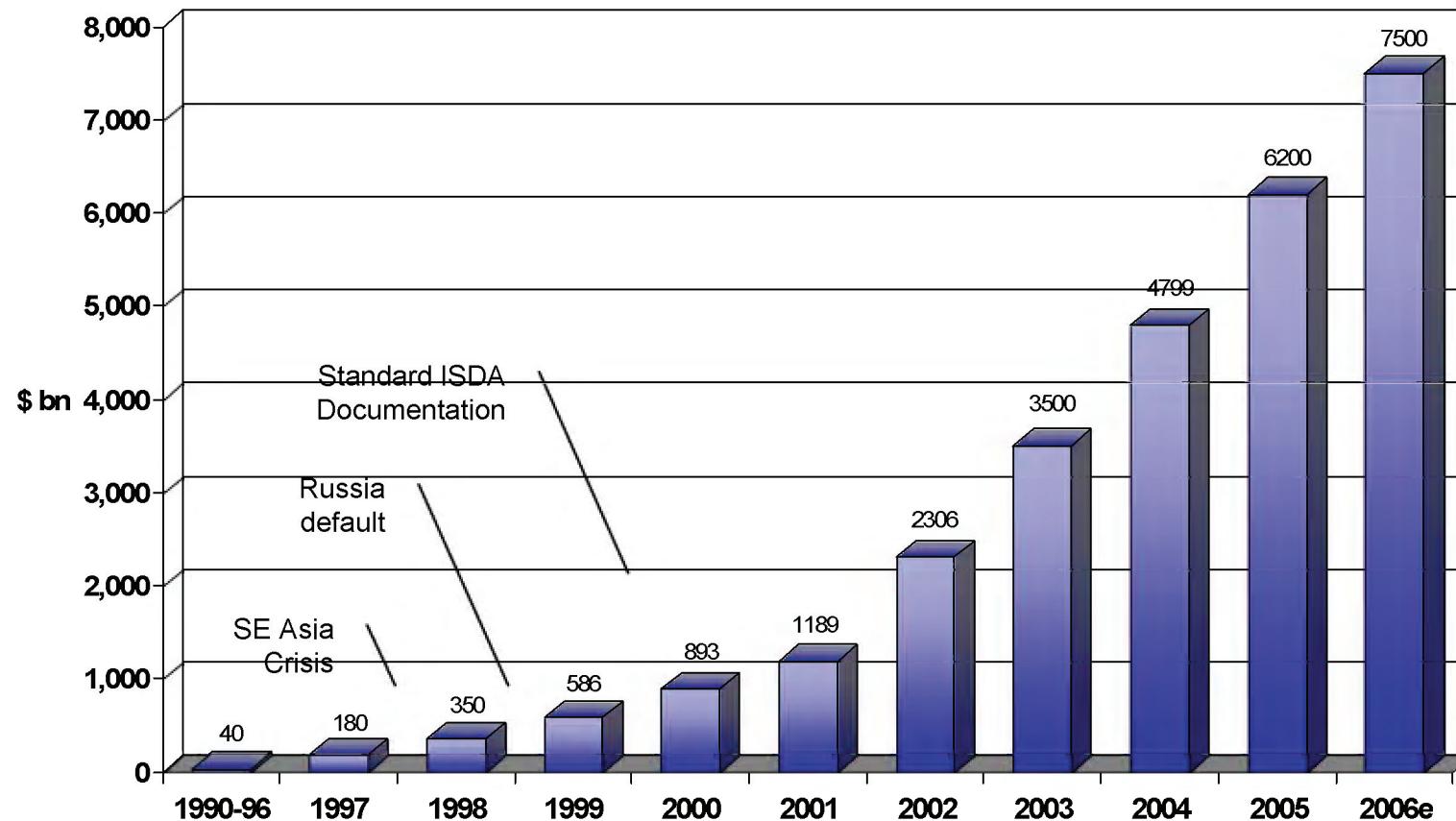
## ISDA Documentation

- // Credit derivatives are traded under an ISDA agreement between c/parties
- // ISDA is the International Swaps & Derivatives Association.
- // A Master Agreement that parties to derivatives transactions can use to identify, monitor and manage the risks associated with OTC derivative transactions.
- // Removes the risk and expense of individual contracts and provides standardised documentation that enables multiple transactions to be undertaken with reduced credit, legal, contract and liquidity risk.

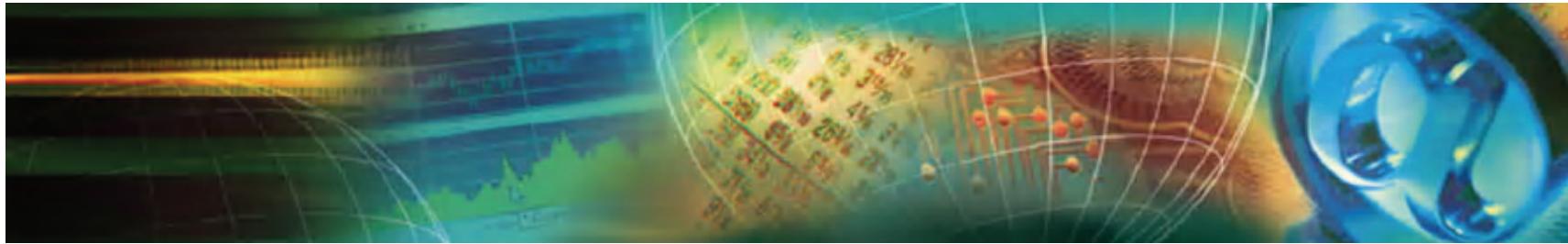




## Credit derivative market size

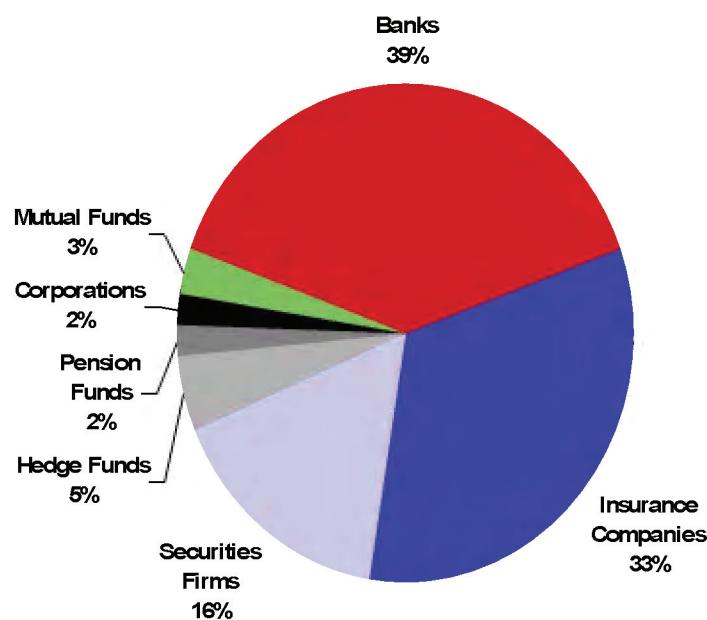


Sources: 2001/2002 British Bankers Association ("BBA") Credit Derivatives Survey; Risk Magazine 2002 Survey of Credit Derivatives Turnover

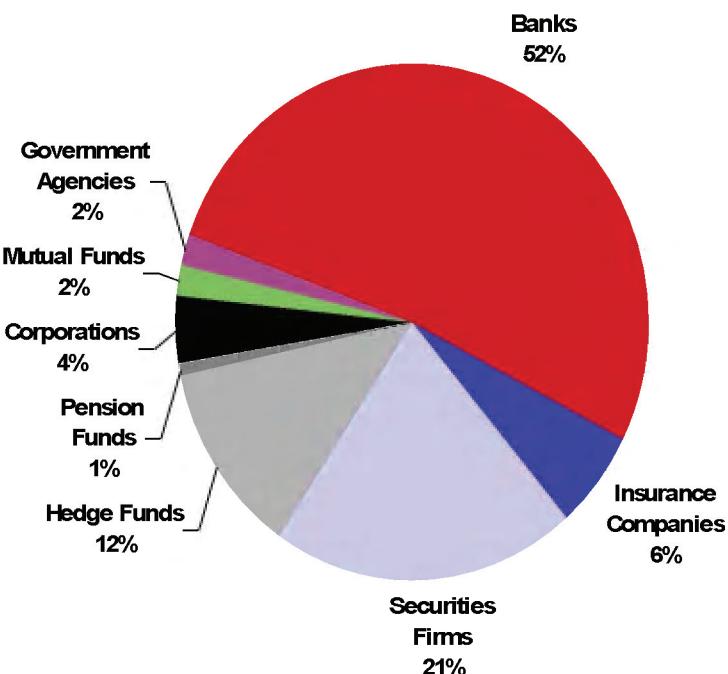


## Credit derivatives end-users

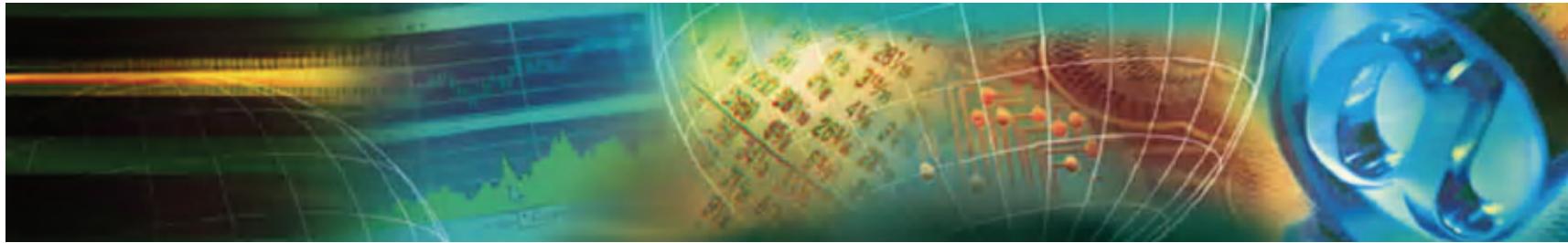
Protection Sellers



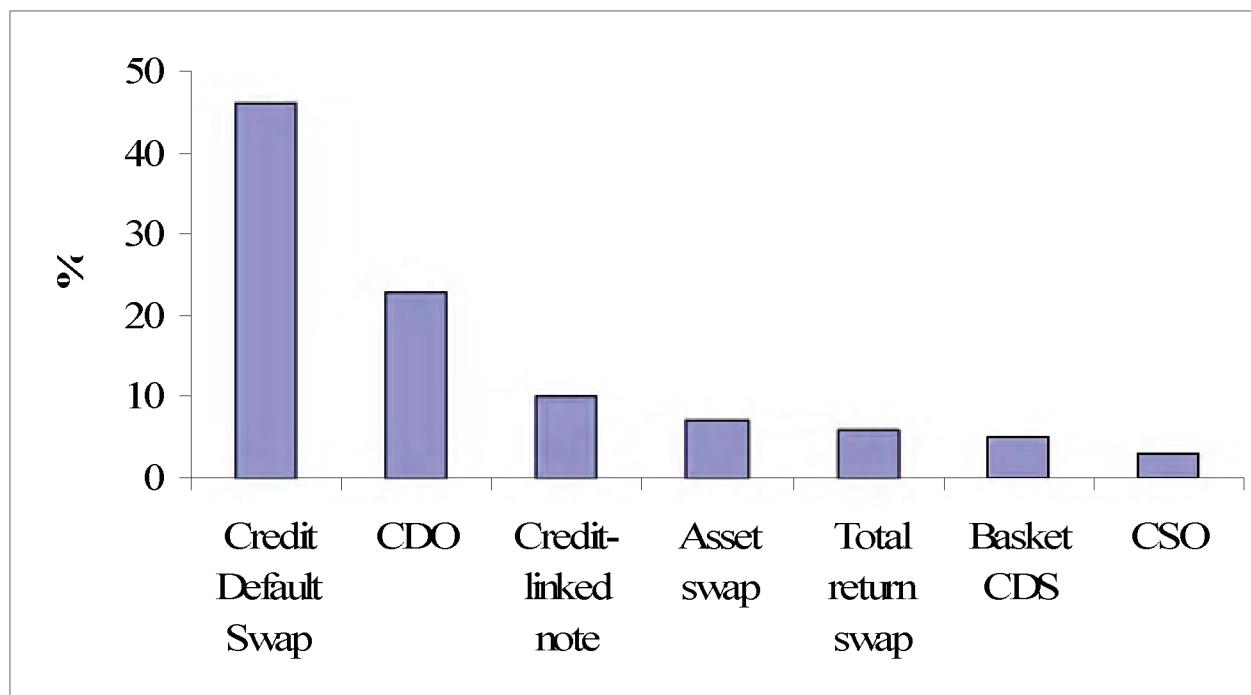
Protection Buyers



Source: British Bankers' Association Credit Derivatives Report, 2003



## Credit derivative usage by type



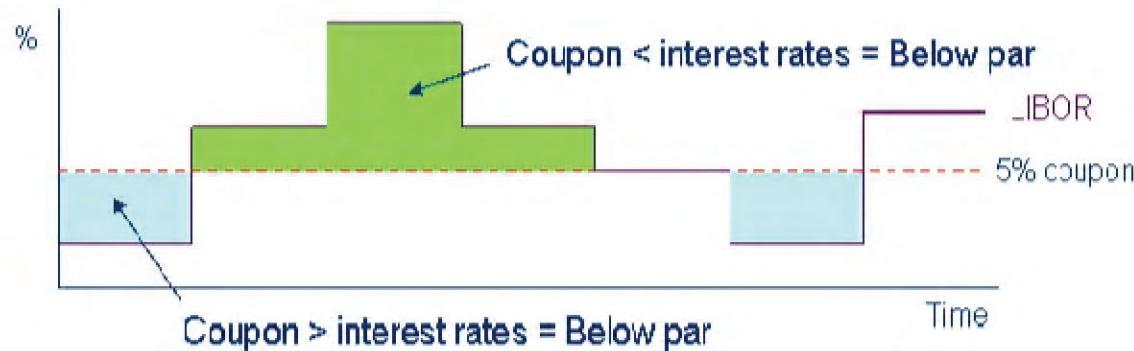
Source: BBA



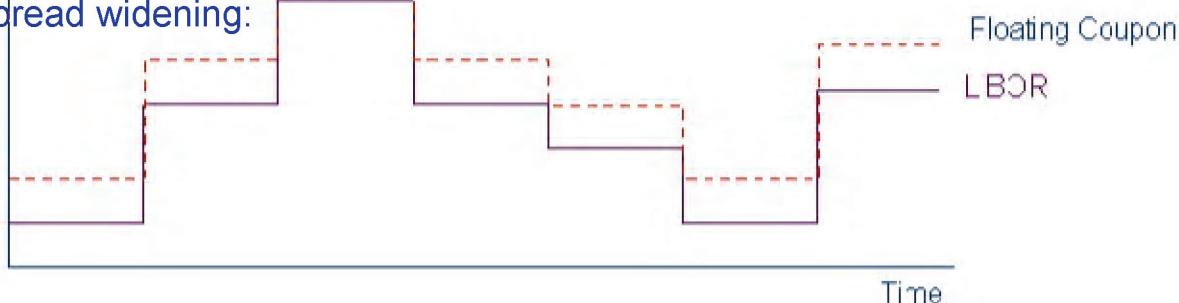
## Asset swaps – proto credit derivatives

### Floating-rate bonds and Interest Rate Risk

Fixed coupon bonds are more risky (sensitive to interest rates) than floating rate bonds (or FRNs). Fixed coupon bonds change from premium to par to discount with interest rate changes:



Whereas the price of floating coupon bonds remain essentially constant barring credit spread widening:

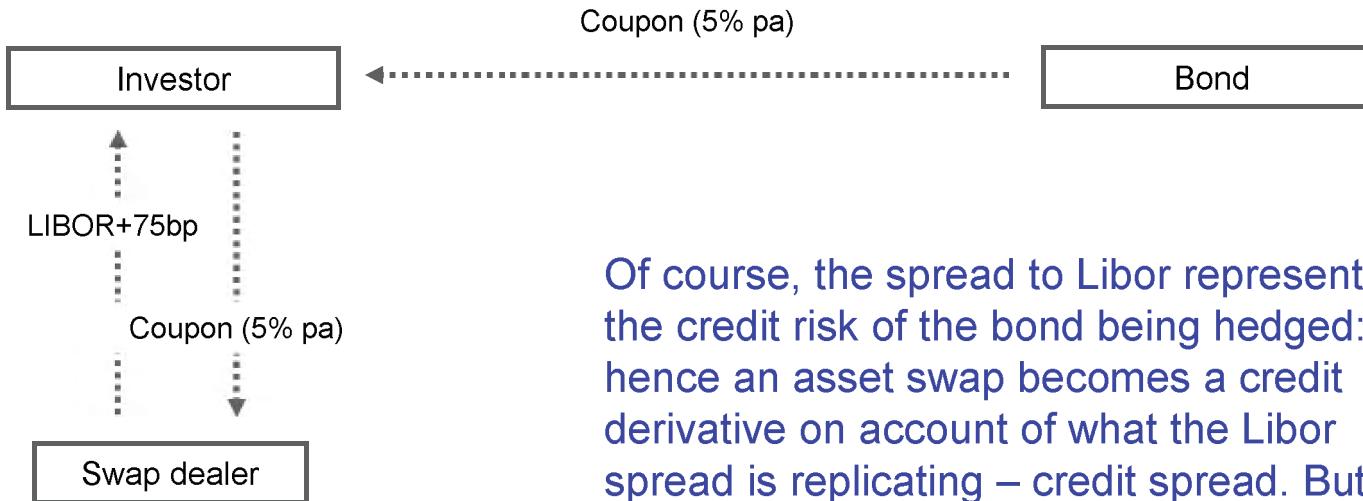




## Asset swaps – proto credit derivatives

### Eliminating Interest Rate Risk using an Asset Swap

An investor may remove interest rate risk using an interest rate swap, and pay away fixed coupon to transform return to floating basis. This combination of instruments is known as an **Asset Swap**:

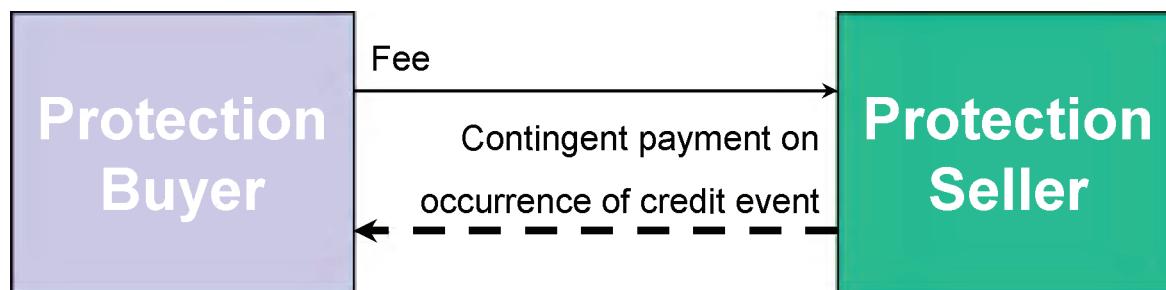


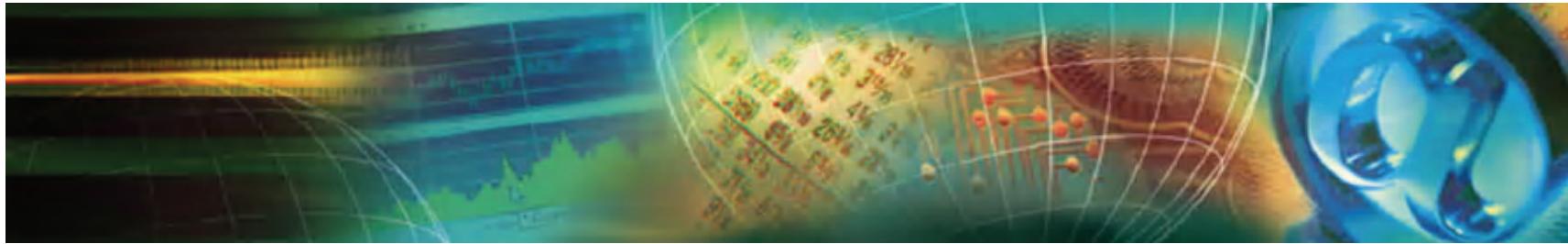
Of course, the spread to Libor represents the credit risk of the bond being hedged: hence an asset swap becomes a credit derivative on account of what the Libor spread is replicating – credit spread. But it doesn't protect against default...



## Credit default swap

- /// A credit default swap on a given Reference Name involves two counterparties:
- /// The Protection Buyer:
  - /// Pays a fee
  - /// Receives a contingent payment on occurrence of a credit event in the reference name
- /// The Protection Seller:
  - /// Receives a fee
  - /// Makes a contingent payment on occurrence of a credit event in the reference name





## Single Name credit default swap – Example

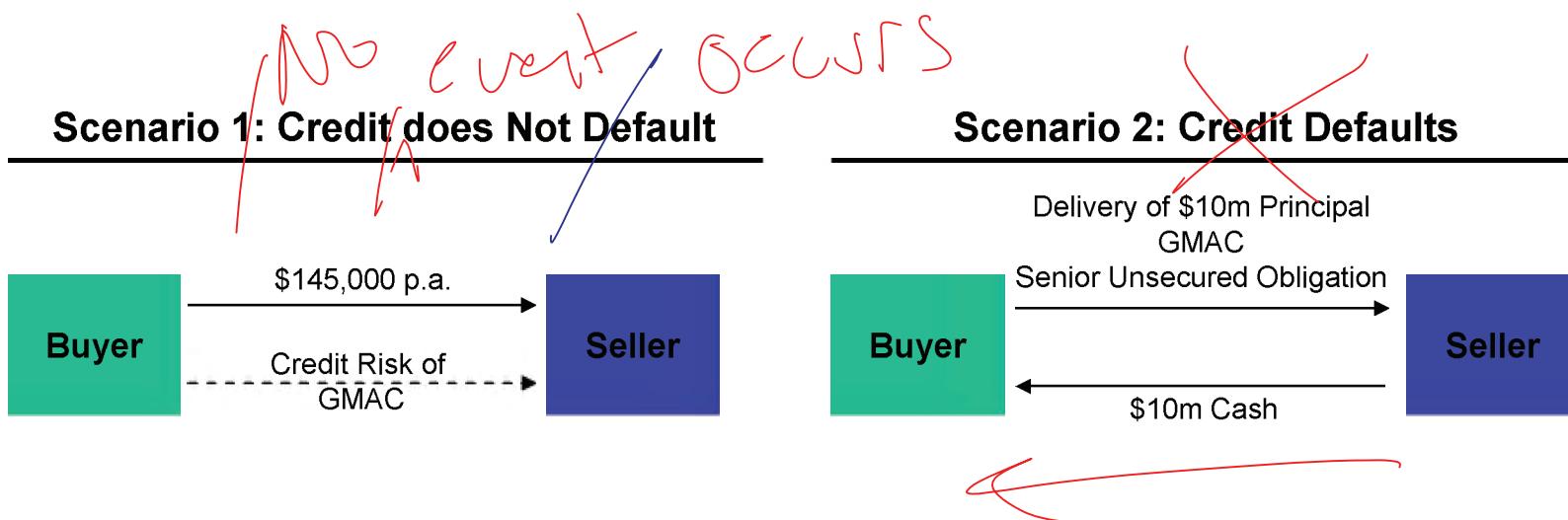
Reference obligation: GMAC (A3/BBB) Senior Unsecured Default Swap

Notional: \$10m

Term: 5yrs

Premium: 145bp p.a. paid quarterly in arrears

Settlement: Physically settled





## Market conventions

- /// Quotations are in basis points per annum
  - /// Typically with quarterly payments but can set any frequency you wish
  - /// Usual day-count convention is Act/360
  - /// Standard maturities 1, 3 and 5 years
  - /// Rolling quarterly maturities Mar, Jun, Sep and Dec. Odd dates can be set often at 0.5bp-2 bps added on to quote
- /// Transaction size:
  - /// \$5m - \$20m notional for a standard Investment Grade trade
  - /// \$2m for a standard High Yield trade
- /// Credits are available across:
  - /// Countries
  - /// Ratings categories
  - /// Asset classes
- /// Approximately 2000 credits quoted globally



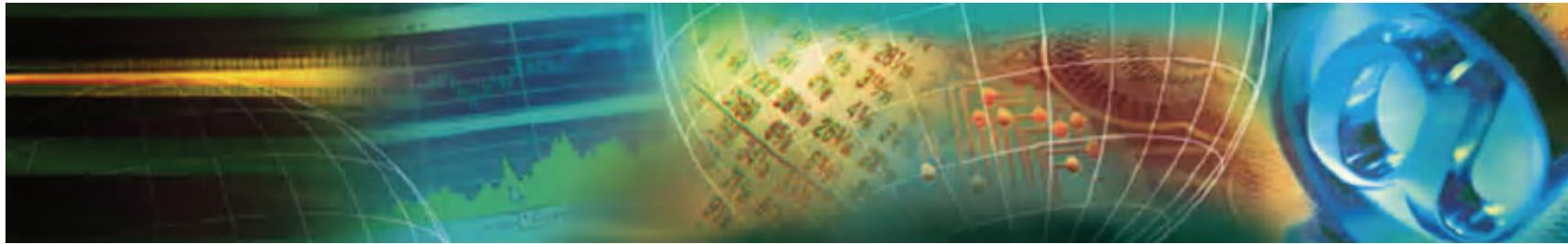
## **“Buying” and “Selling”**

### “Buy” means buying protection

- // Pay premium
- // Receive default payment if credit event occurs
- // Sells / hedges credit risk
- // Shorts the credit
- // Equivalent to selling a bond

### “Sell” means selling protection

- // Receive premium
- // Pay default payment if credit event occurs
- // Buys / takes on the credit risk
- // Goes long the credit
- // Equivalent to buying a bond



## Example CDS Term Sheet

CDS Seller:	XYZ Bank plc	Payment dates:	Oct 30, Jan 30, Apr 30, Jul 30
CDS Buyer:	ABC Pension Fund	First payment:	30 Oct 2003
Trade Date:	Aug 5, 2003	Conditions to payment:	Credit Event Notice (Notice of Publicly Available Information)
Effective Date:	Aug 6, 2003	Public Source:	Two Standard Public Sources
Termination Date:	Jul 30, 2005	Credit Events:	Bankruptcy, Failure to Pay (min \$1m)
Calculation Agent:	Seller	Obligations:	Borrowed Money
Reference entity:	Waterford International Inc	Settlement Method:	Physical Settlement
Reference asset:	Waterford International Inc 0% 30 Jun 2020 CUSIP: 947074AB6	Deliverable:	Bond or Loan
Reference Price:	100%	Documentation:	ISDA 2003
Calculation Amount:	\$7m		
Premium:	0.3% p.a. Act/360		



## CDS summary definitions

As CDS are negotiated transactions they can take many forms.

Key features are:

Reference Asset/Obligation



- Defines the reference entity for the CDS
- Asset used as a reference point for calculating the premium and determining whether default occurs
- ~~Usually a senior unsecured bond issued by the reference entity~~
- Determines the level of seniority of the debt that can be delivered if there is a credit event
- Does not need to have a maturity equal to the CDS

(RB)

Premium



- Expressed in basis points
- Calculated based on nominal amount of reference asset
- Normally paid quarterly

Credit Event



- Credit event triggers payment of compensation
- Events include bankruptcy, failure to pay and restructuring

Settlement upon Credit Event

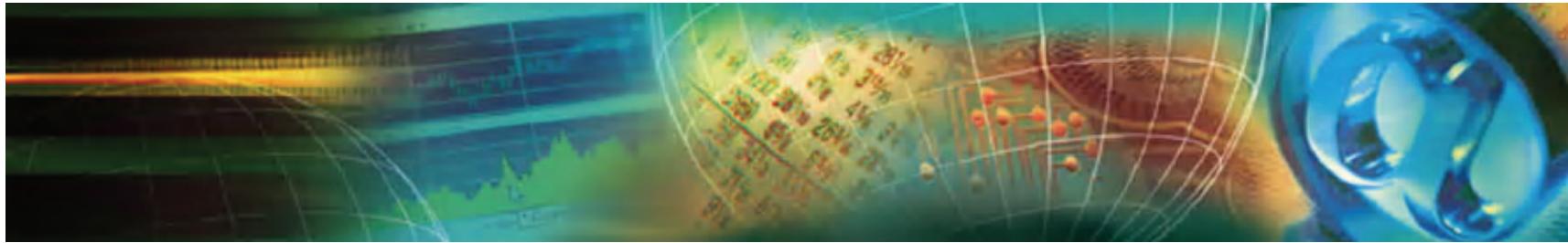


- Payment is only due if credit event takes place during life of contract
- Maturity dates normally in 3, 5 , 7 and 10 year range
- Payment can be either physical or cash settled



## Choosing a credit protection seller

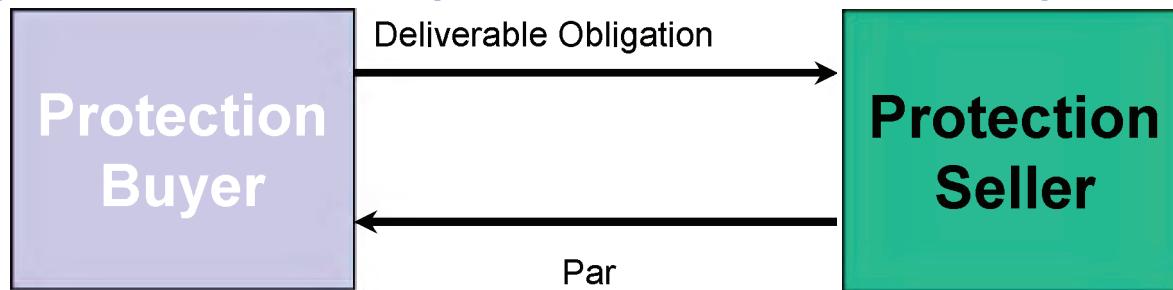
- /// Ideal counterparties are those with:
  - /// High credit ratings
  - /// Low correlation with the reference asset
- /// Examples (most desirable first):
  - /// AA-rated UK- bank selling protection on Emerging Market corporate
  - /// AA-rated US bank selling protection on a US insurance company
  - /// A-rated US bank selling protection on ABS tranche
- /// There is an apparent paradox...
  - /// Buying credit protection from an uncorrelated lower rated credit protection seller may be better...
  - /// ... than buying credit protection from a higher-rated seller that is highly correlated with the reference asset being hedged
  - /// ...unless it was Lehmans....:(



## Termination payments on credit event

When a credit event occurs, termination payments is most often in the form of:

- 〃 Payment of par in exchange for receipt of “deliverable obligation”



Alternatively:

- 〃 cash settlement

- 〃 Par settlement adjusted for Recovery Value or Market Value at time of occurrence of credit event

- 〃 Digital cash payment (rare...)

- 〃 A pre-agreed payment amount not related to the magnitude or impact of credit default



## Deliverable obligations

*Deliverable Obligations* can be:

- 〃 Direct obligations of the reference entity
- 〃 Obligations of a subsidiary of the reference entity
  - 〃 Known as “qualifying affiliate” guarantees”
  - 〃 Reference entity must hold 50% or more of the subsidiary’s voting shares
- 〃 Obligations of a third party guaranteed by the reference entity
  - 〃 Known as “qualifying guarantees”
  - 〃 Requires the option of “all guarantees” to be selected in the CDS contract

Protection Buyer can deliver *any* deliverable obligation of the reference entity...

Concept of the ***Cheapest to Deliver*** obligation, which might be (note ***MR*** and ***MMR***):

- 〃 The bond with the lowest coupon
- 〃 A convertible bond
- 〃 An illiquid bond
- 〃 An ABS bond (rather than a conventional fixed-coupon bond)
- 〃 A long-dated bond



## **Loan-only CDS**

// **Loan only Credit default swaps (LCDS) are CDS that reference an entity but protect its loan obligations only**

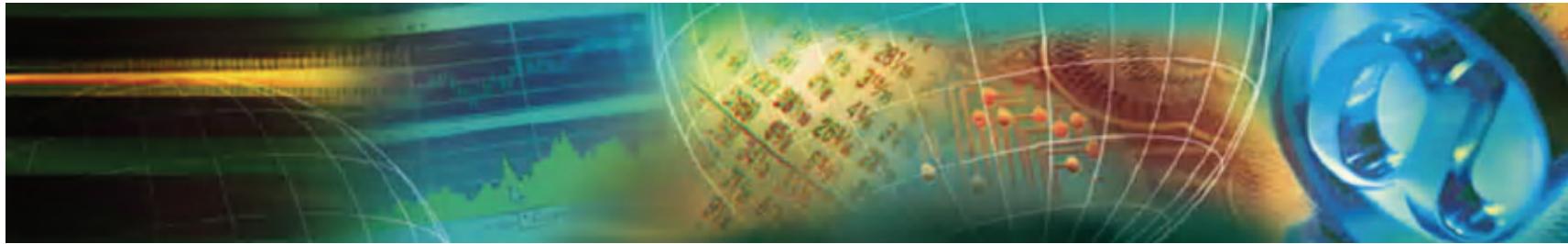
// **Development in the market from 2006**

// **Syndicated loans rank above bonds in corporate winding up so the LCDS protects a higher value obligation**

// **CDS described as analogous to insurance contract**

// **Reasons for Growth of LCDS**

// **Used for managing exposure of syndicated loan books**



## Characteristics of LCDS

### LCDS

- /// Reference obligations – in the European market the reference obligation for an LCDS is in all tranches of the syndicated loan in the name of the obligator
- /// Cancellability – in the cash market in Europe, syndicated loans may be paid off ahead of maturity date.
- /// Restructuring – European LCDS include loan re-structuring as a credit event. Such occurrences are fairly frequent in the syndicated loan market.
- /// Pricing – LCDS premiums, like vanilla CDS, are fixed. This contrasts with the underlying syndicated loan, which is invariably floating.
- /// Settlement – the settlement mechanism for both European and U.S. LCDS is predominantly physical. This has the potential to create delivery issues in the future if there is a shortage of deliverable assets. Notice of Physical Settlement (NOPS) must be delivered within 30 days of credit event determination date.
- /// Protection formulas for settlement of LCDS differ from vanilla CDS. Partly as a means to avoid such problems, in a European LCDS the protection seller can request cash settlement.



## Exiting a CDS contract

///CDS contracts have a maturity date but a party to a CDS can usually terminate the agreement prior to maturity in the same way that an IRS contract can be terminated.

///If a party to a CDS wishes to terminate it prior to expiration, the party can either:

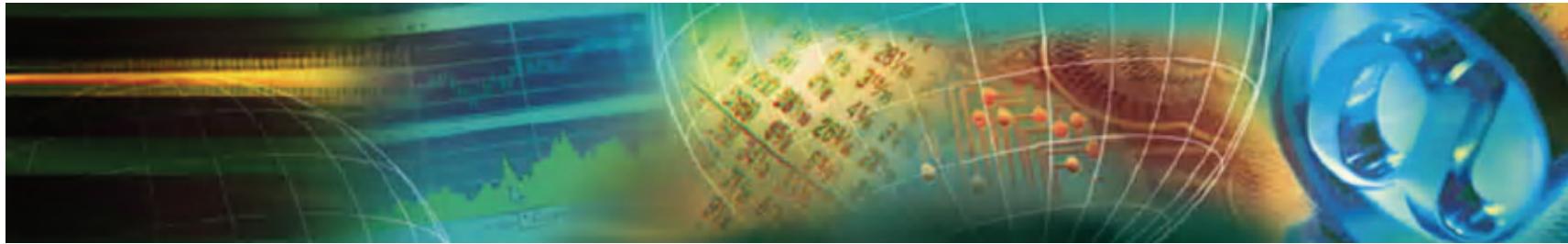
- /// Negotiate a termination to the agreement with the counterparty
- /// Find another counterparty and enter into a separate offsetting swap
- /// Arrange for a third party to take its place. This is known as **novation**



## Credit events

What defines a “credit event” is covered by ISDA 1999-2003 terms, and includes:

- /// Bankruptcy
- /// Failure to pay
  - /// Payment more than \$1m
  - /// After pre-specified grace period
- /// Restructuring / Modified Restructuring
  - /// Change in obligation's seniority causing obligation to become subordinated
  - /// Deferral or reduction of loan
  - /// Change in currency or composition of material debt obligation
- /// Obligation default
- /// Repudiation or moratorium



## What are credit events?

- The types of events that will trigger a payment under a credit default swap are set out in the ISDA Credit Derivatives Definitions. Most contracts are based on bankruptcy, failure to pay and restructuring and notice of an event may be delivered up to 14 days after maturity.
- The termination event is negotiable and can include other events, such as spread widening, an event in a country that might cause its sovereign debt to decline in price or any event that the two parties can agree and price.

### ■ Bankruptcy

- Bankruptcy is deemed to occur if the reference entity becomes insolvent or unable to pay its debts
- It includes any written admission of a company's ability to pay its debts in a judicial, regulatory or administrative filing

### ■ Failure to Pay

- The reference entity fails to make payments when due on one or more of its obligations
- Subject to any applicable grace periods
- A minimum threshold Payment Amount - is specified

### ■ Restructuring

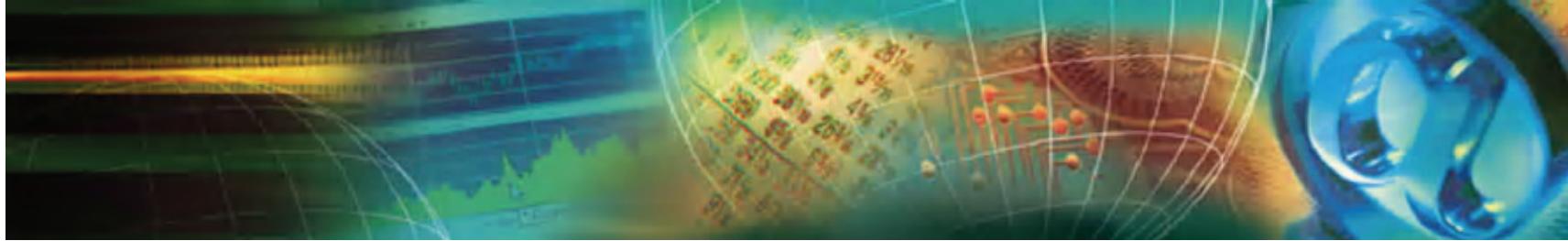
- Four options open when buying/selling CDS:
- No restructuring - eliminates possibility of protection seller incurring losses from soft credit events where buyer would not incur losses
- Full restructuring - Allows protection buyer to deliver bonds of any maturity after any restructuring of debt
- Modified restructuring in US markets - limits deliverables to bonds maturing no more than 30 months after restructuring
- Modified modified restructuring in European markets - limits maturity on deliverables to 60 months after restructuring for restructured and 30 months for non restructured



## Credit events in 2008...

- /// The Bear Stearns takeover didn't trigger payment on CDS, whereas...
- /// ....Fannie Mae and Freddie Mac did (they were "governorships" rather than a full nationalisation or takeover) although the bonds delivered were priced close to or at par!
- /// While of course Lehmans triggered payout as it was Chapter 11 bankruptcy, the recovery value on 16 September 2008 was 31%
- /// An added issue was that Lehmans was a big counterparty in CDS and had sold protection on ABS tranches including much sub-prime MBS tranches, so their bankruptcy left many market participants short of credit protection in the one market they most wanted protection in!



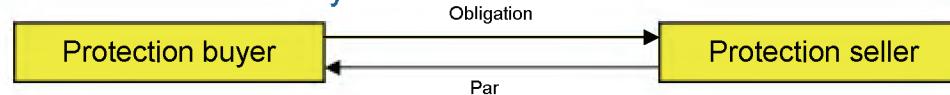


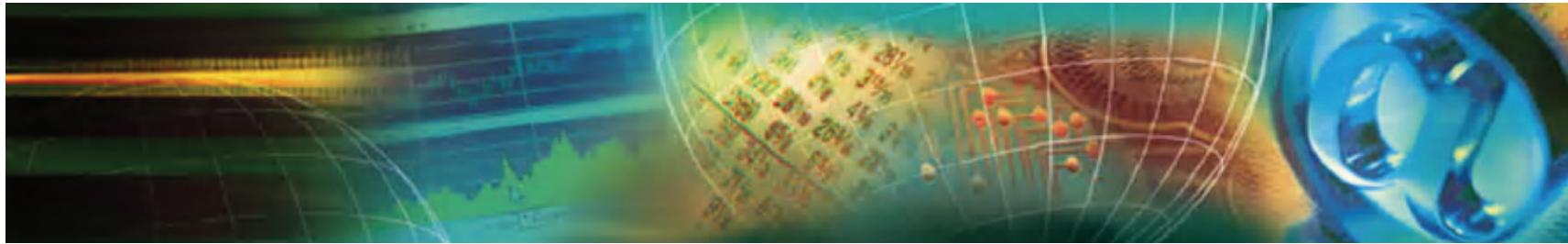
## CDS Settlement on credit event

- There are 2 main ways in which CDS contracts are settled:

**Physical Settlement** – this is when the protection seller takes delivery of the defaulted bond and pays  
the protection buyer par value

**Cash Settlement** – refers to a situation where the protection seller just pays the difference between the par value and the recovery value of the bond





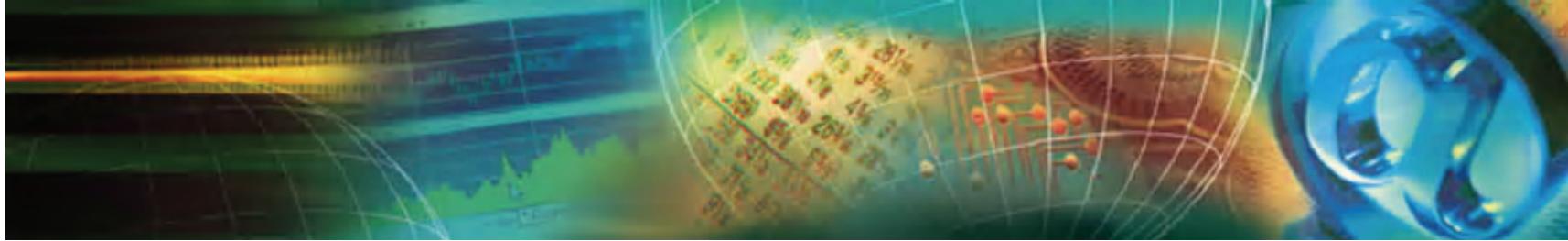
## HOWS DOES THE PHYSICAL SETTLEMENT PROCESS WORK?

- To be triggered, Physical Settlement requires a Credit Event Notice, a Notice of Physical Settlement and, if specified in the related Confirmation, a Notice of Publicly Available Information
- After a credit event has occurred, the protection buyer must send the 'Notice of Physical Settlement' to the seller no later than 30 days after the other notices are delivered. This notice confirms that the protection buyer will physically settle the credit derivative transaction and contains a detailed description of the Deliverable Obligations that the Buyer of Protection will deliver to the seller, including their nominal value and accrued but unpaid interests.
- The buyer then delivers to the protection seller bonds or loans (known as 'deliverable obligations') with a notional amount identical to the notional amount of the credit default swap and the protection seller pays the protection buyer the notional amount of the credit default swap (known as the 'Physical Settlement Amount')
- If credit events are linked to a reference obligation, the scope of *deliverable obligations* usually includes all obligations that have the same level of seniority (i.e. rank pari-passu) with the reference obligation. The protection seller will be delivered the obligation that is cheapest to deliver
- For example, for a standard \$10 million contract on General Motors (GM), if GM defaults, the protection buyer delivers defaulted bonds with a \$10 million face value and receives \$10 million from the protection seller. If the defaulted bonds are worth \$4 million (40% of their face value, where 40% is called the recovery rate), the protection buyer has effectively made \$6 million as a result of buying protection. The seller of protection could choose to sell the defaulted bonds, so achieving their recovery value



## HOWS DOES THE CASH SETTLEMENT PROCESS WORK?

- Cash Settlement requires a Credit Event Notice and if specified in the related confirmation, a Notice of Publicly Available Information
- The Cash Settlement Amount is sometimes a fixed amount determined in advance by the parties
- However, more often the Cash Settlement Amount is calculated using market prices for defaulted Reference Obligations. The seller pays the Buyer the notional amount of the trade (Floating Rate Calculation Amount) multiplied by the loss of value of the defaulted Reference Obligations. By doing so, the Seller covers the loss of value of the Reference Obligations caused by the Credit Event
- More formally, the ***Cash Settlement Amount is the Floating Rate Payer Calculation Amount multiplied by the Reference Price minus the Final Price***, where the Floating Rate Payer Calculation Amount is the notional amount of the transaction and the Final Price is the price of the Reference Obligation. The Final Price is determined through a Valuation Method and the parties choose, at the time of the trade, between methods based on 'market value' or 'highest quotations'
- For example, if the \$10 million IBM contract were to be cash settled, the protection seller would pay the protection buyer \$6 million, based on the 40% market value (recovery rate) of IBM's reference obligation

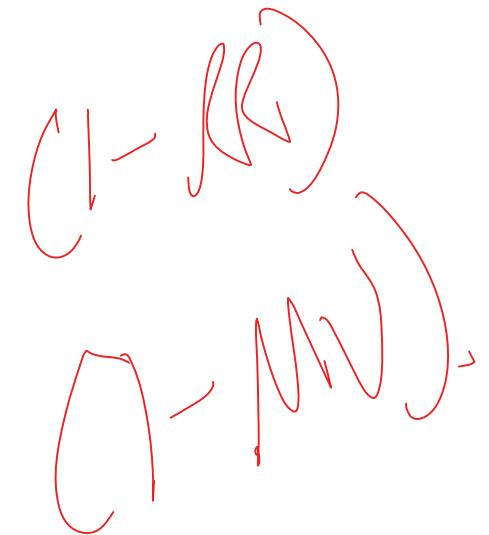


## Basket credit default swaps

- 〃 A *single name* CDS involves just one reference entity or obligation
- 〃 A *portfolio* or *basket* CDS involves two or more reference entities or obligations

There are two broad forms of portfolio CDS:

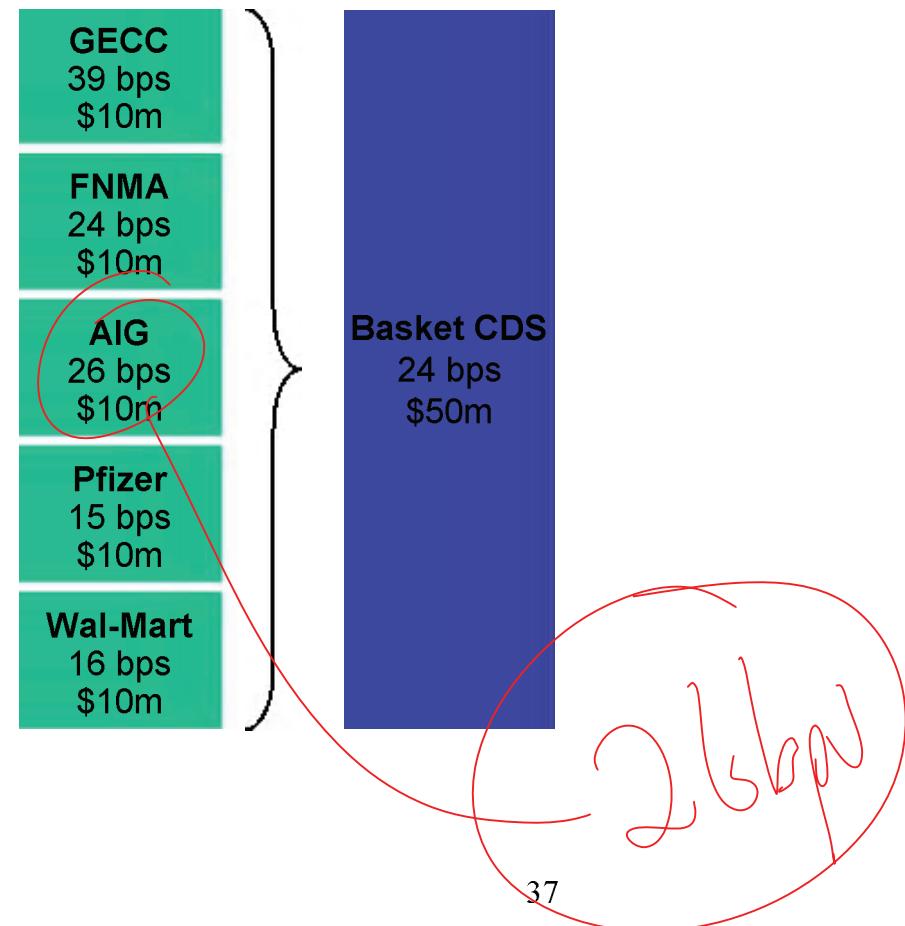
- 〃 Basket CDS
  - 〃 CDS is written on a portfolio of two or more reference names
  - 〃 If a default event occurs:
    - 〃 Protection payment is made
    - 〃 Notional principal is reduced
    - 〃 CDS continues in existence...
- 〃 First-to-Default CDS (and similar structures)
  - 〃 CDS is written on a portfolio of two or more reference names
  - 〃 Notional principal of each reference entity is the same
  - 〃 If a default event occurs:
    - 〃 Protection payment is made
    - 〃 CDS terminates





## Basket CDS Example (now more theoretical after iTraxx..)

- /// Basket CDS on notional portfolio of \$50m
- /// Comprises 5 names of \$10m notional each
- /// Premium for basket is the average of individual CDS premiums:
  - /// Total premium for 5 separate CDS: 120 bp
  - /// Average premium per entity: 24 bp
  - /// Premium for basket CDS: 24 bp
- /// Premium paid each year:  
 $24\text{bp} \times \$50\text{m} = \$120,000 \text{ p.a.}$



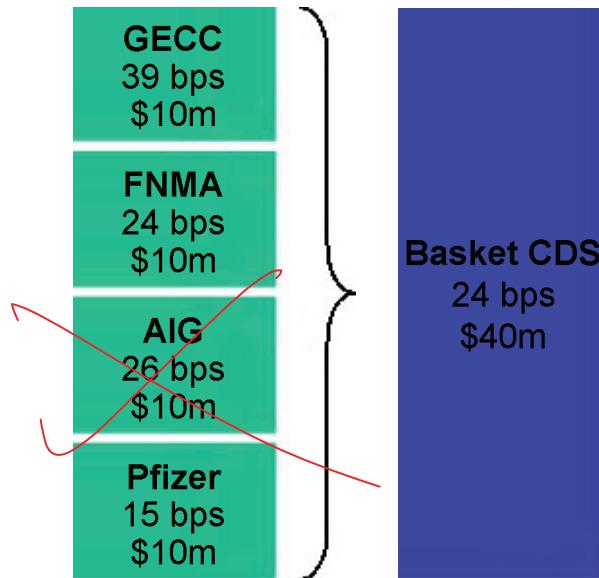


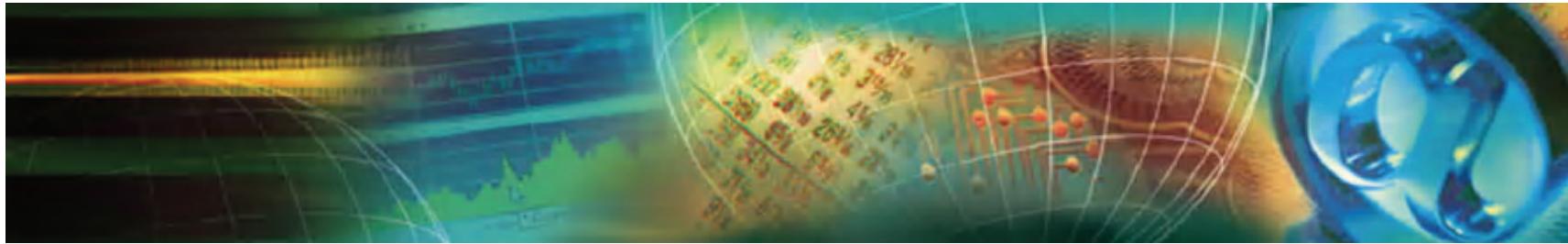
## Basket CDS Example – after default

Suppose Wal-Mart experiences a credit event...

- /// Basket CDS would make payment of \$10m less recovery value
- /// Principal on Basket CDS would be reduced to \$40m
- /// Basket CDS would continue
- /// Premium paid each year:

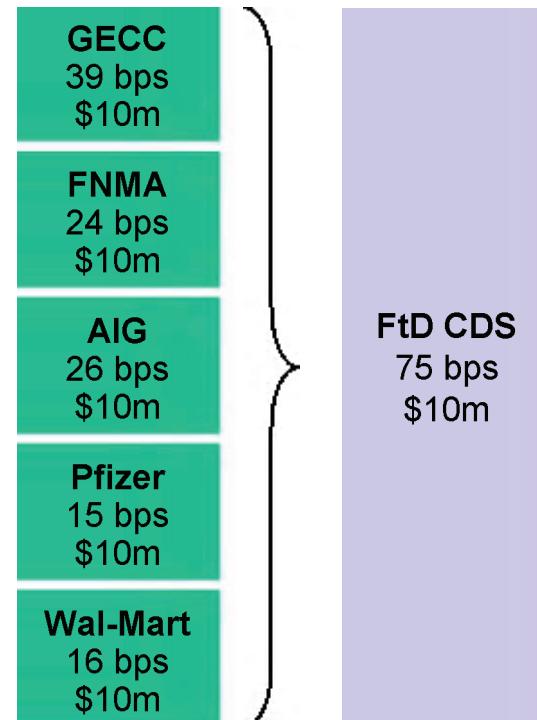
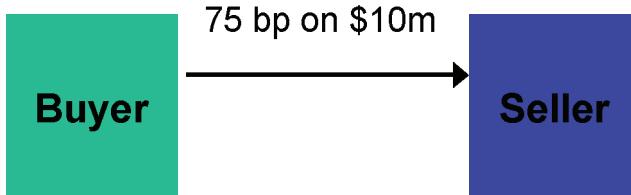
$$24\text{bp} \times \$40\text{m} = \$96,000 \text{ p.a.}$$





## First-to-Default CDS Example

- /// FtD CDS on notional portfolio of \$50m
- /// Comprises 5 names of \$10m notional each
- /// Premium for FtD less than sum of individual CDS premiums:
  - /// Total premium for 5 separate CDS: 120 bp
  - /// Premium for FtD CDS: 75 bp
- /// Premium paid each year:  
 $75\text{bp} \times \$10\text{m} = \$75,000 \text{ p.a.}$

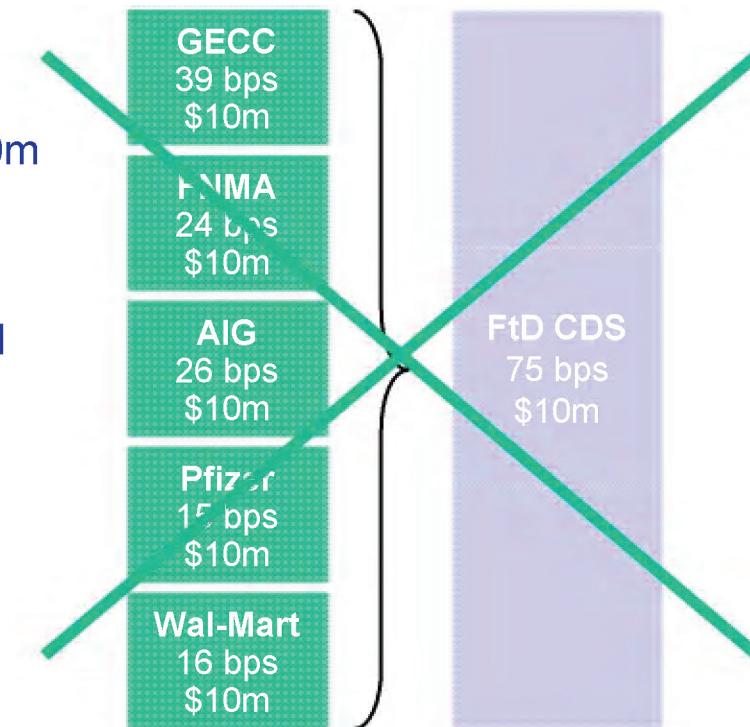
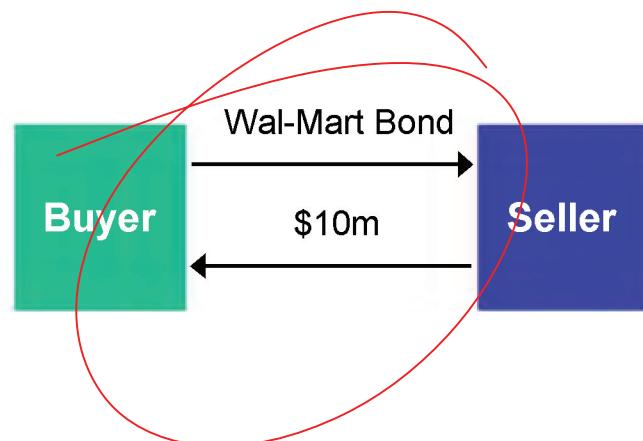




## First-to-Default CDS Example – After Default

Suppose Wal-Mart experiences a credit event...

- // FtD CDS would make payment of \$10m less recovery value
- // FtD CDS then terminates
- // Exposure of protection seller is limited to \$10m, not \$50m





## Total Return Swaps

- /// In a Total Return swap there are two counterparties:
  - /// the Total Return Payer
  - /// the Total Return Receiver
- /// Total Return Receiver
  - /// receives total rate of return from a reference asset
  - /// pays LIBOR plus a spread
- /// Total Return Payer
  - /// pays total rate of return from a reference asset
  - /// receives LIBOR plus a spread
- /// A Total Return swap is an off-balance sheet transaction
- /// Can be funded or un-funded
- /// Total Return Receiver therefore receives cash flow benefits associated with a reference asset but without actually owning it



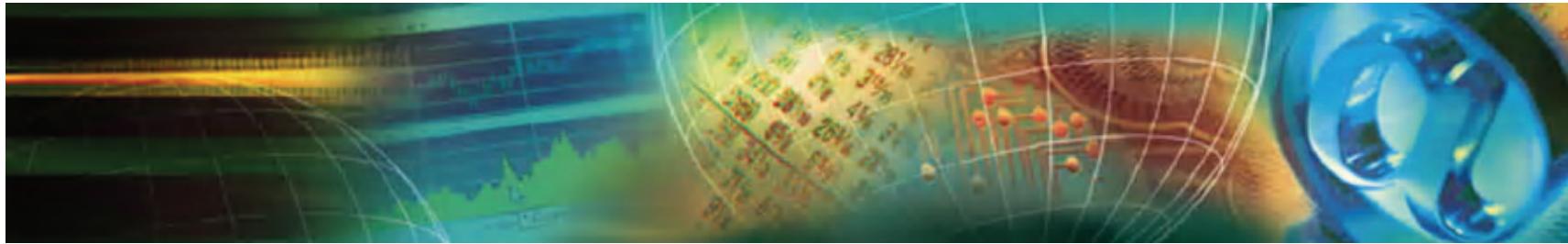
## The total return

**Total Return** comprises:

- 〃 Regular dividends or interest
- 〃 Capital appreciation (or depreciation)

$$\text{Capital Appreciation} = \text{Final Value} - \text{Original Value}$$

- 〃 In the event of default, “capital appreciation” will reflect the capital loss



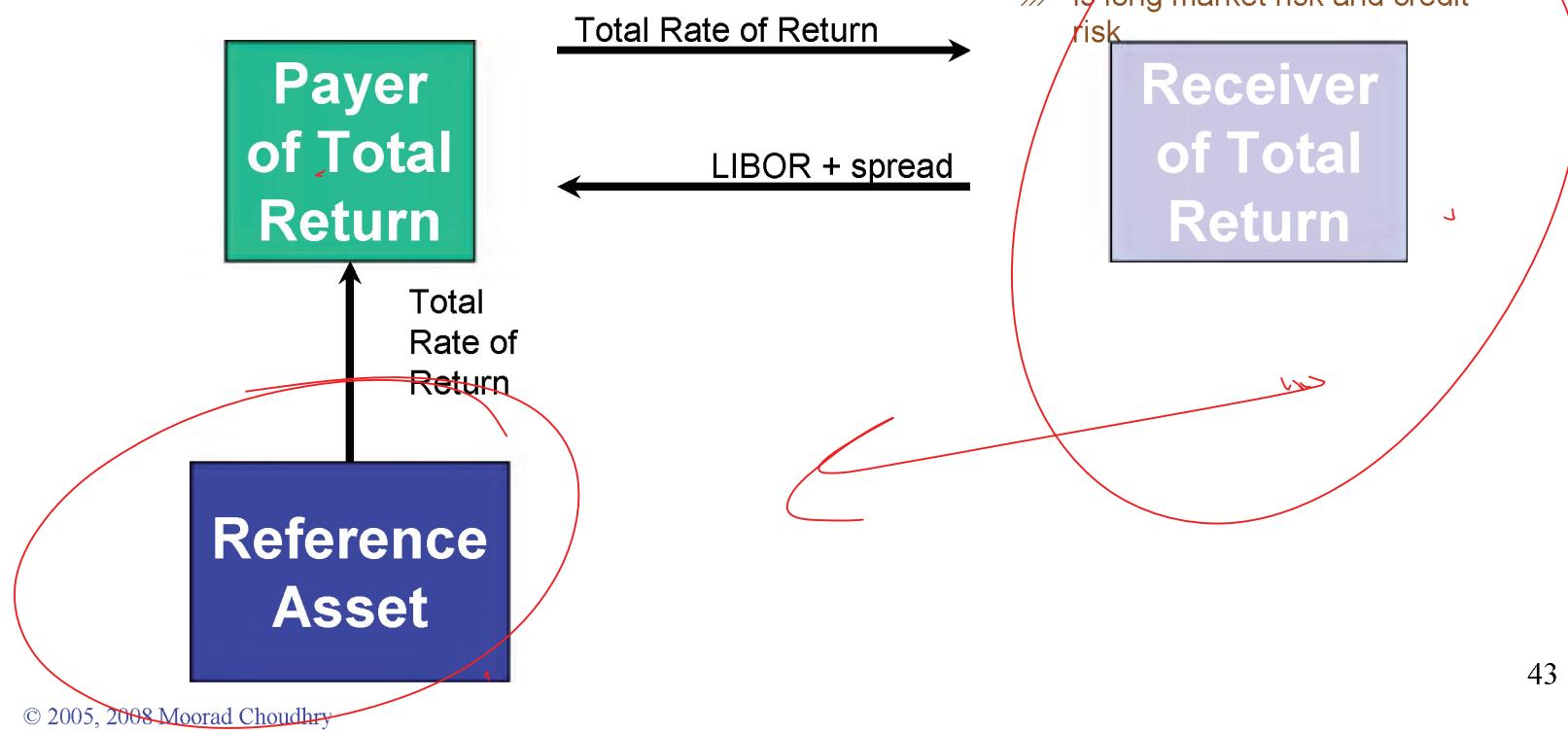
## Cash flows from total return swap

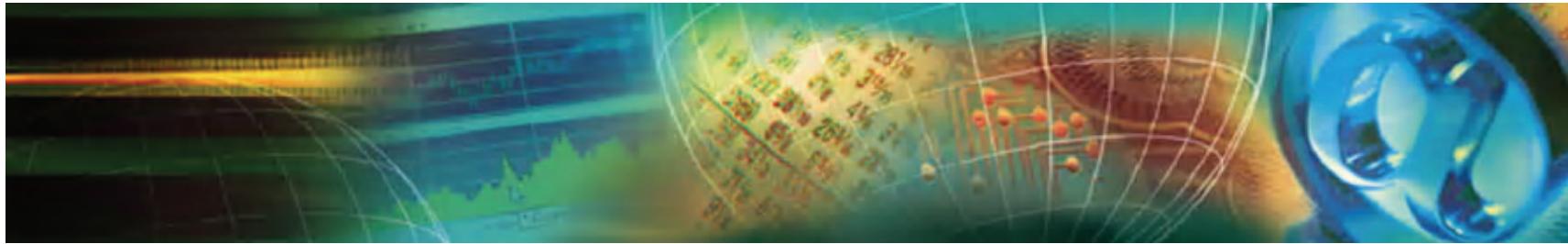
### The total return payer:

- is the legal owner of the reference asset
- shows the reference asset on their balance sheet
- is short market risk and credit risk

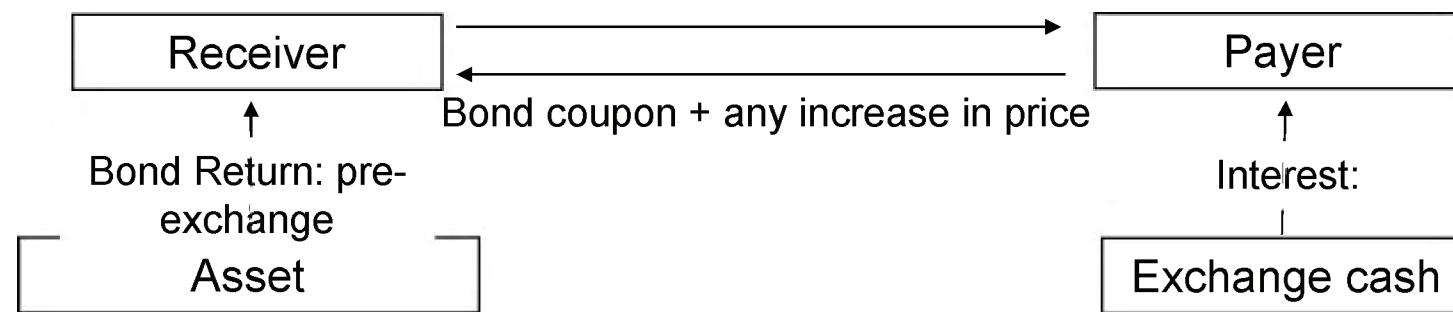
### The total return receiver:

- does not own the reference asset
- has an off-balance sheet instrument
- is long market risk and credit risk

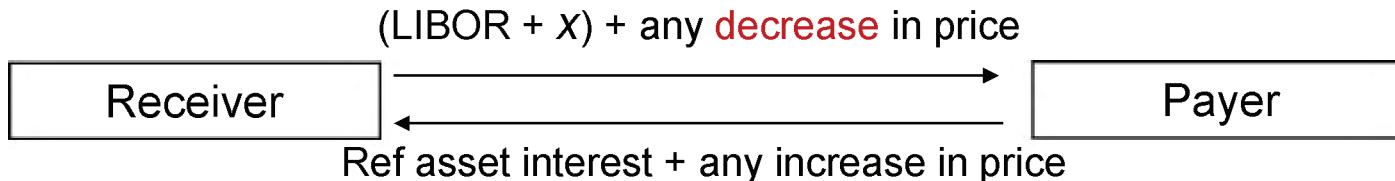


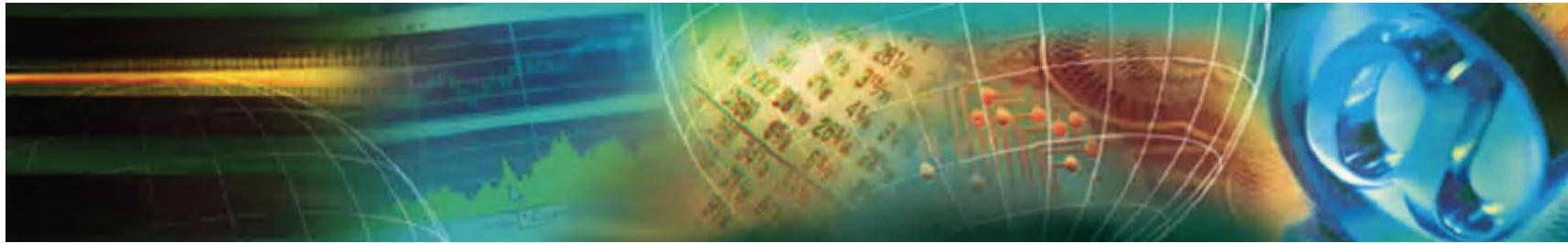


**Funded versus Un-Funded: Funded - exchange for cash market value**  
 $(LIBOR + X) + \text{any decrease}$  in price



- // A funded TRS involves the payer / receiver holding the relevant underlying assets:
- // An unfunded is a leveraged position with no holding of the underlying and exposure to fluctuations in value:

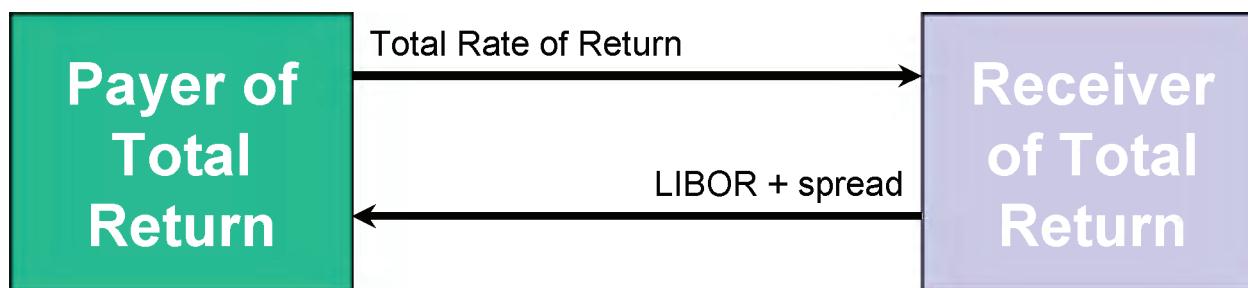


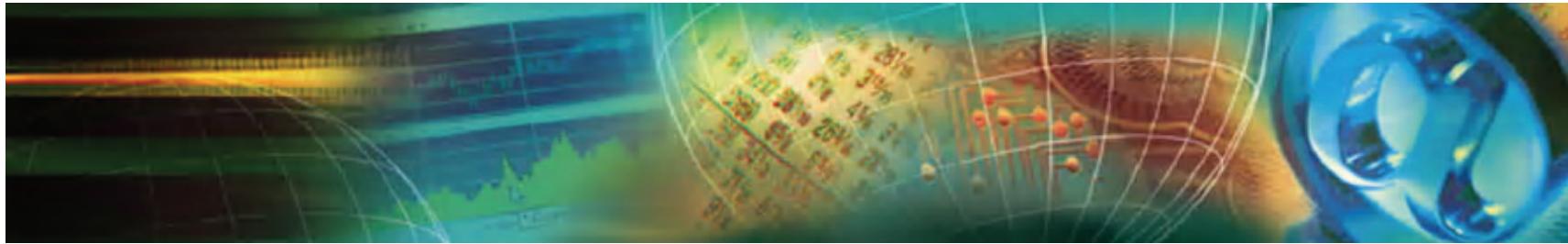


## Collateral

WYS -

- // In the event of default, financial losses from reference asset must be paid:
  - // By Total Return Receiver
  - // To Total Return Payer
- // Total Return Payer therefore has exchanged credit risk of reference asset for credit risk of Total Return Receiver
- // TR Payer normally demands collateral from TR Receiver to mitigate credit risk





## Example TRS Term Sheet

Total Return Payer:	J P Morgan	TR Payer pays:	All cash flows from reference bond
Total Return Rcvr:	Deutsche Bank	TR Receiver pays:	3mth LIBOR+25bp quarterly A/360
Reference Asset:	Corporate Bond	Termination pmnt:	All accrued payments plus $A \times (P_t - P_0)$ from TR Payer to Receiver
Issuer:	Ford Motor Corporation	Market Value:	Determined by dealer panel
Coupon:	7% s.a. 30/360	Early Termination:	Two business days following credit event
Final Maturity:	5 years	Credit Event:	When publicly available information is known of a credit condition
Collateral Type:	Senior unsecured	Credit Condition:	Payment default or bankruptcy
Initial Price:	100%	Calculation Agent:	Total Return Payer
Settlement Price:	100%		
Calculation Amount:	\$10,000,000		
Trade Date:	7 <sup>th</sup> December 2001		
Effective Date:	12 <sup>th</sup> December 2001		
Termination Date:	Effective Date + 1 year or "early redemption date"		



## Motivation of total return payer

- 〃 Hedging holdings of assets
- 〃 Creating synthetic short positions where this may be difficult in the cash market
- 〃 Creating a temporary hedge for an asset expected to suffer a temporary decline
  - 〃 ...by entering into Total Return swap with a shorter maturity than the reference asset
- 〃 Under some tax regimes, profits and losses can be deferred



## Motivation of total return receiver

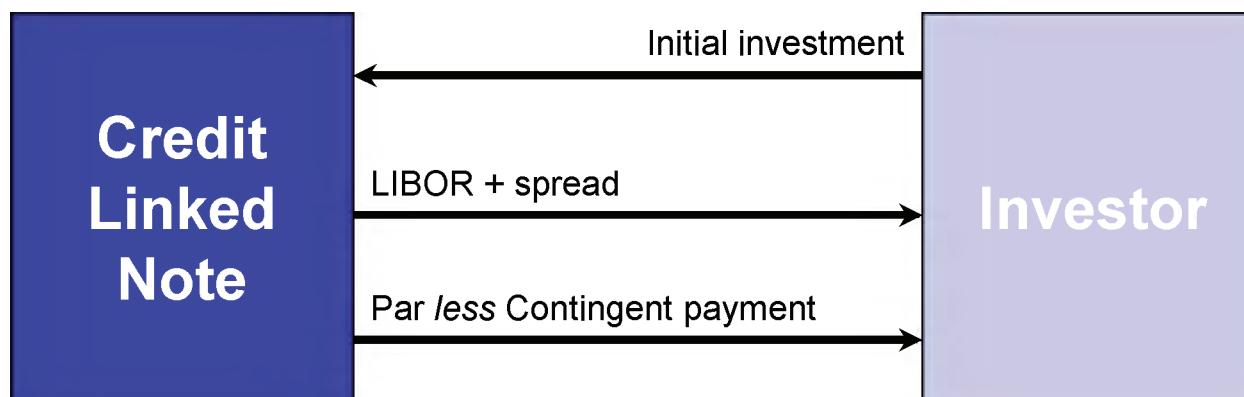
- /// Investors can create new assets with a specific maturity not normally available
- /// Investors gain efficient off-balance sheet exposure to a defined asset class to which they would not normally have access, e.g.
  - /// syndicated loans
  - /// emerging market bonds
- /// Investors may receive a higher return on capital
- /// Investors may adjust credit exposures in their portfolios
- /// Investors can reduce administrative costs via off-balance sheet purchases
- /// Investors can access entire asset classes by receiving the total return on an index
- /// Leverage, as illustrated earlier



## Credit Linked Notes (CLNs)

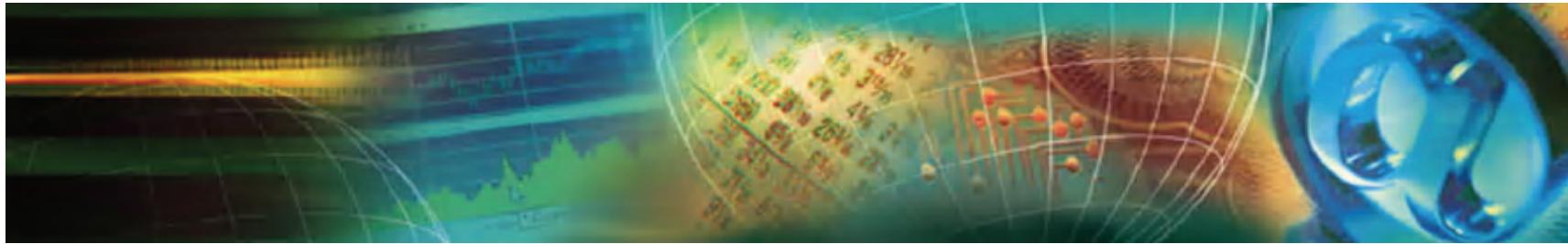
A Credit Linked Note is:

- 〃 A fully-funded security
- 〃 With a return linked to the credit risk of another reference asset



CLNS are sometimes to be deemed as such only if issued by an SPV or by a party that references a 3<sup>rd</sup> party. We define them as any bond whose return is partly or wholly linked to the credit performance of a named reference entity.

But then note issues in physical settlement...



## Example of a Credit Linked Note

### Total Return Loan Swap Index Note

Issuer:	AAA-rated SPV
Principal:	\$50m
Coupon:	3mth LIBOR + 250bp
Day count:	Act/360
Underlying asset:	Loan to XYZ Corporation
Maturity:	Earlier of: a) 1yr b) XYZ default event
Capital Price Adjustment (CPA):	$\text{Principal} \times (P_n - P_0)/P_0$ (where $P_0$ is original price of underlying asset)
Principal redemption:	Par plus CPA

Initial Loan Price: 100

Current Loan Price: Price as calculated by calculation agent, in accordance with calculation method, at 11am New York Time, two business days prior to each payment date.

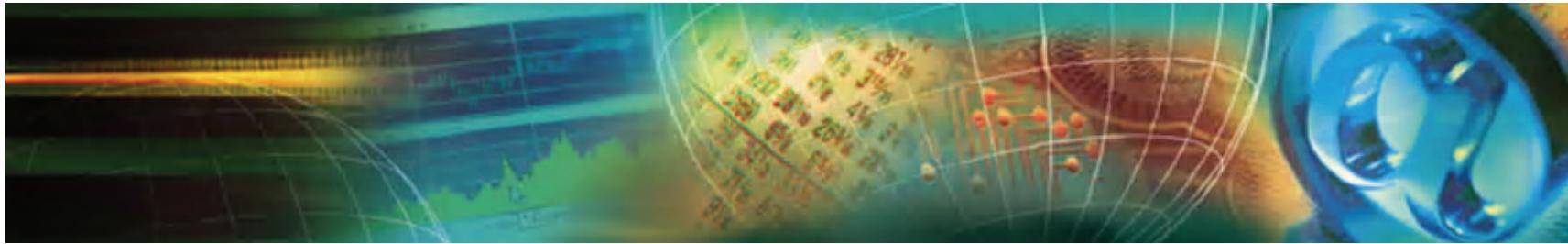
Calculation method:

- a) Sole opinion of calculation agent
- b) Dealer poll
- c) Screen or quote service

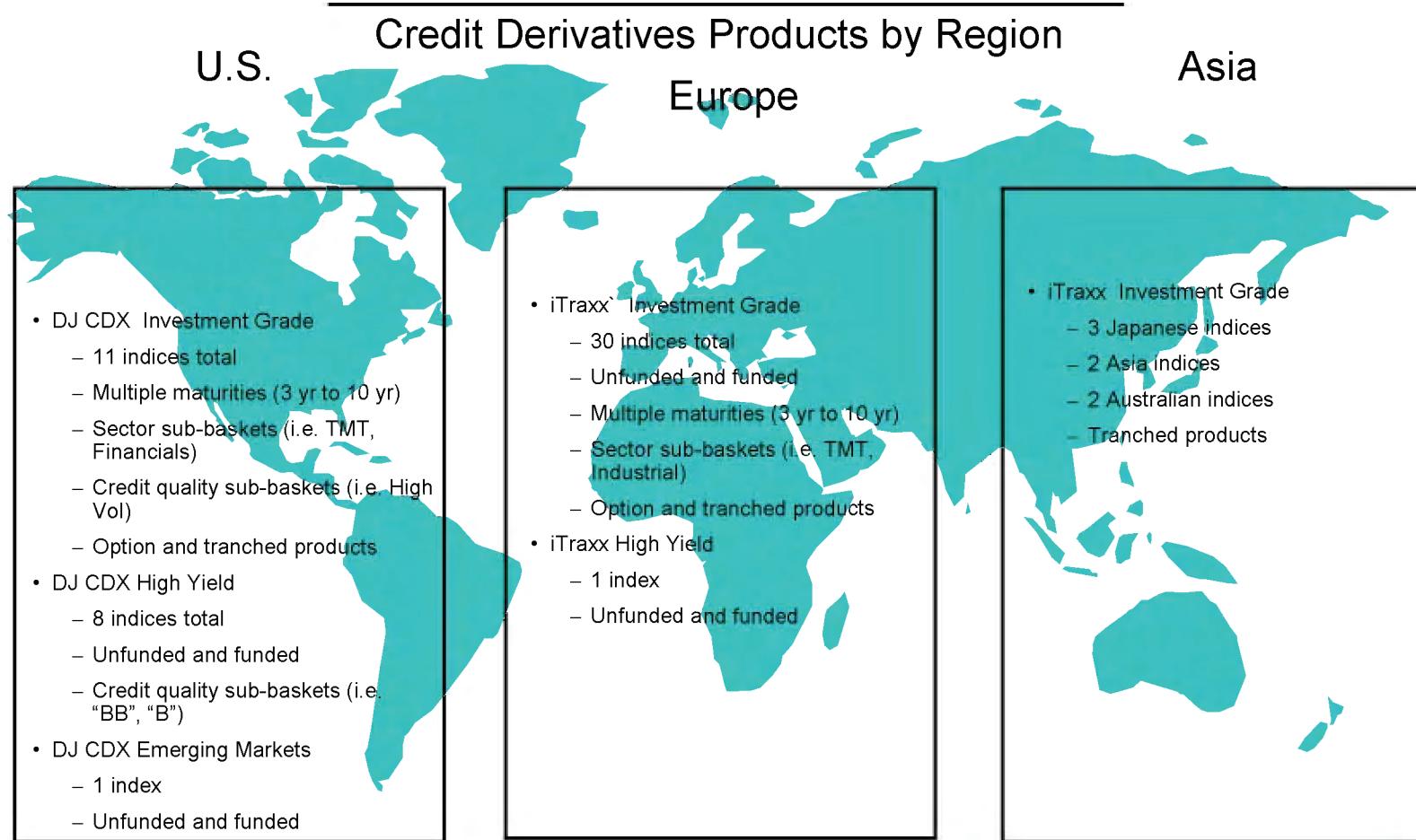


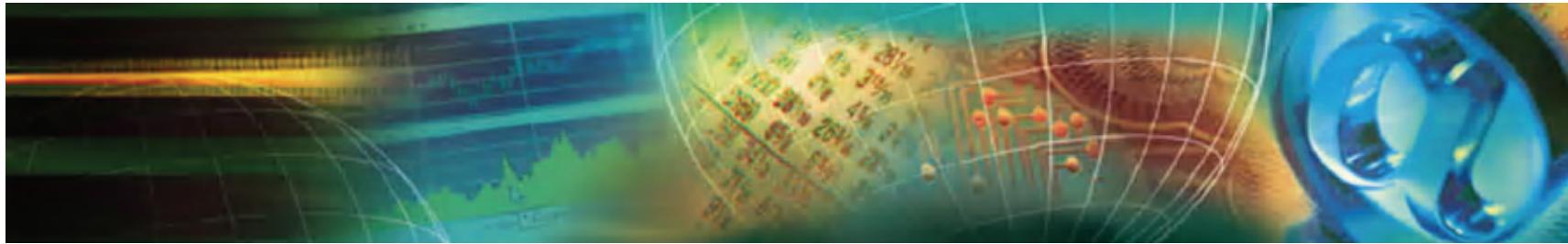
## iTraxx Indices

- /// Formed by merger of iBoxx CDX and Dow Jones TRAC-X indices
- /// Combined indices known as the Dow Jones CDX Indices.
- /// Member banks are:
  - /// ABN AMRO
  - /// Bank of America
  - /// Barclays Capital
  - /// Bear Stearns
  - /// BNP Paribas
  - /// Citigroup
  - /// Credit Suisse First Boston
  - /// Deutsche Bank
  - Goldman Sachs
  - HSBC
  - JPMorgan
  - Lehman Brothers
  - Merrill Lynch
  - Morgan Stanley
  - UBS
  - Wachovia
- /// Indexes provide investors with family of benchmark credit derivative indices



## Global Credit Derivatives Index Products





## iTraxx Europe

### Portfolio Composition

- 〃 Static portfolio of 125 equally-weighted CDS on European entities
  - 〃 Rules-based construction based on CDS volumes by Dealer Poll
  - 〃 Administered by the International Index Company (IIC)
    - 〃 Shareholders: ABN AMRO, Barclays Capital, BNP Paribas, Deutsche Bank, Deutsche Börse, Dresdner Kleinwort Wasserstein, JPMorgan, Morgan Stanley, UBS
    - 〃 Licensed market-makers of iTraxx indices include the above banks and: BBVA, Bear Stearns, Citigroup, Commerzbank, CSFB, Goldman Sachs, HSBC, Lehman Brothers, Merrill Lynch, Nomura, Royal Bank of Scotland, Société Générale
  - 〃 New series of DJiTraxx Europe issued every 6 months
- ### Rationale
- 〃 Highly liquid credit tool and hedging tool
  - 〃 Highly diversified European credit portfolio
  - 〃 Attractive to investors looking to diversify rather than track
  - 〃 Attractive to investors looking for European only exposure



## iTraxx Europe...

### //Construction and Roll

//The indexes are constructed considering the rating and liquidity of the underlying CDS of the individual component before it is included in the index.

- // The convention is that the indexes **roll** every six months on **March 20<sup>th</sup>** and **September 20<sup>th</sup>**
- // This is the convention by which new index members are selected and a new 'on the run' index is launched.
- // While there are many
- // **maturities** range from one year to ten years, the five year ('5Y') is the most liquid
- // Index CDSs are quoted on spread and trade *unfunded* (In some cases CDS are traded in funded form as notes where they are given a dollar price)



## iTraxx Europe...

### Example CDS Index

■ iTraxx Europe is the benchmark CDS index for the European investment grade market

- 125 equally weighted CDS on European investment grade issuers (reference entities)
- Traded with four maturities 3 year, 5 year, 7 year and 10 years
- Average credit rating is A-
- iTraxx has three credit events (CDX only has two):
  - Failure to pay
  - Bankruptcy
  - Modified-Modified Restructuring
- Several sub-indices defined by industry groups (sector baskets) and trading characteristics (Hi Vol and Low Vol index)
  - Most issuers are from the UK (36), France (25), Germany (22) and Italy (10)



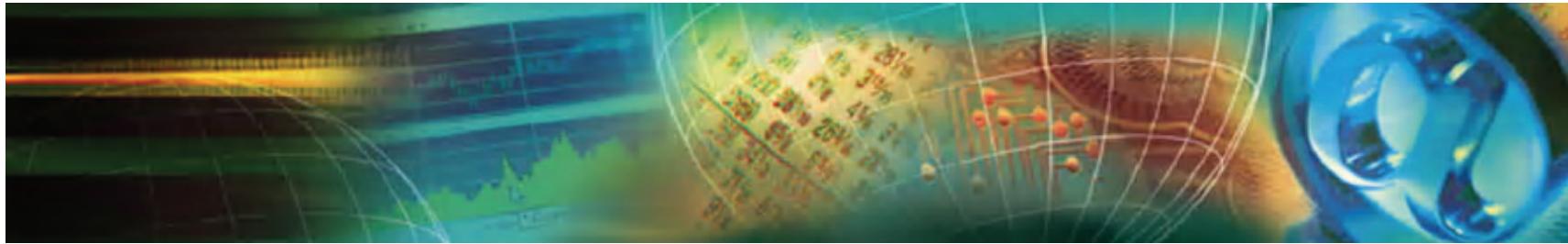
## iTraxx Europe (continued)

### Market Participants

- /// Bank Portfolio Managers
  - /// diversify into European credit risk
  - /// portfolio balancing tool
- /// Insurance
  - /// proxy hedge against senior CDO credit portfolio
- /// Corporate Treasury
  - /// enhanced access to diversified European credit risk
- /// Credit Correlation Trading Desks
  - /// attractive tool for portfolio hedging
  - /// easy "ramp-up"

### Terms & Conditions

- /// Tradable in CDS format or as a note issued by iBond Securities Plc
- /// Note will be rated by Moody's and S&P
- /// Standard maturities: 5 yrs for the notes, 5 and 10 yrs for the swaps



## iTraxx Europe – Trading Example (unfunded)

- /// Counterparty buys €10m iTraxx Europe
- /// CDS references the credit spread of the most current series at launch
  - /// Premium of the iTraxx Europe is 45 bps
- /// After two days:
  - /// Fair value of CDS is 40 bps
  - /// Counterparty wants to buy €10m DJiTraxx Europe exposure in CDS for
- /// CDS is executed at the fixed premium level of 45bps.
  - /// Market maker pays 45 bps p.a. qtrly to counterparty on notional amount of €10m
  - /// PV of difference between premium and CDS fair value is settled through an upfront payment on T + 3 days
  - /// Counterparty pays to the market maker the PV of 5 bps plus accrued interest
  - /// This equals €24,004 (as calculated by CDSW screen on Bloomberg)



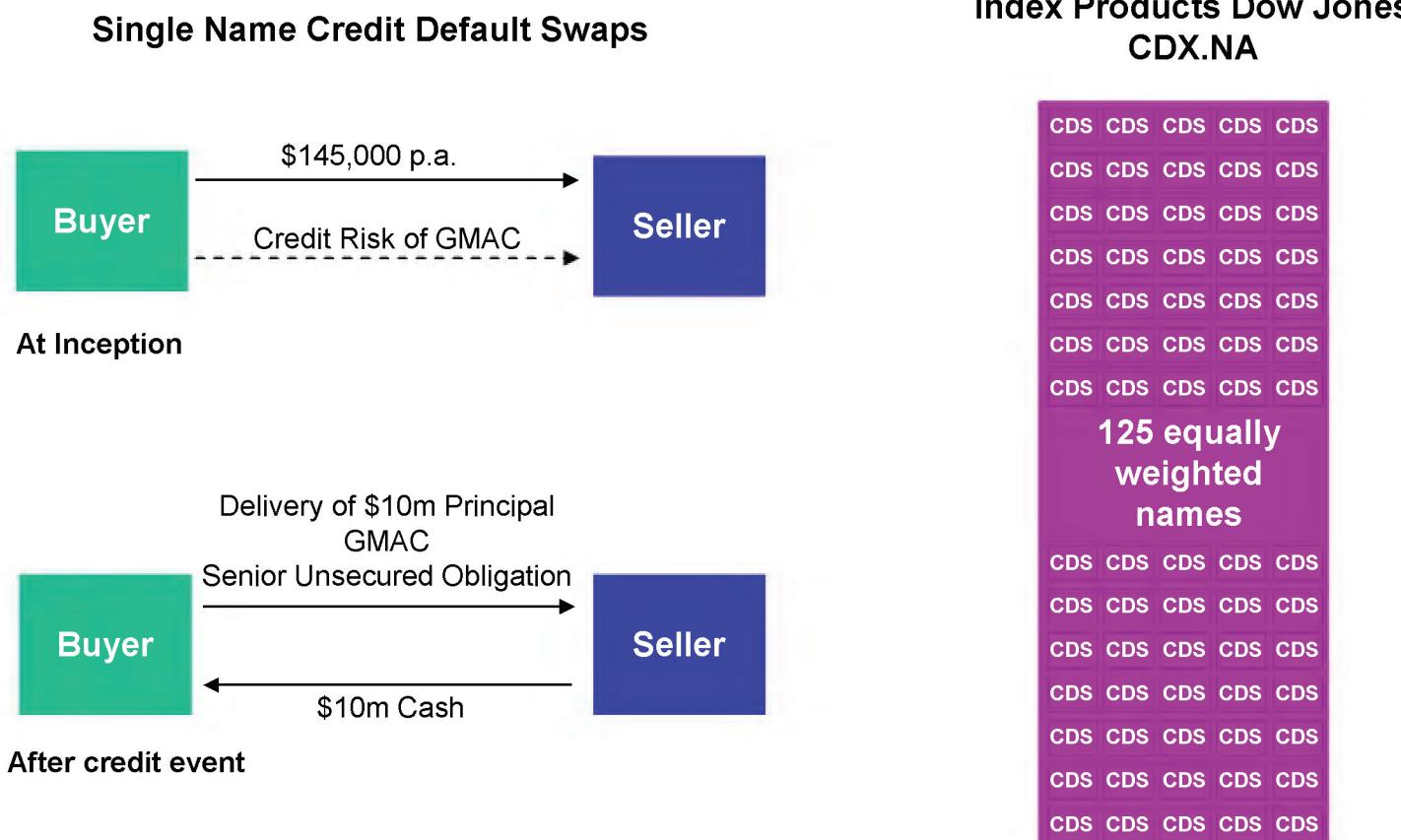


## iTraxx Europe – Trading Example (continued)

- /// At issue of a given series, assume credit spread ("premium") of 45 bps
- /// Market maker pays to counterparty 45 bp p.a quarterly on notional of €10m
- /// No Credit Event
  - /// Counterparty will continue to receive premium on original notional amount until maturity
- /// Credit Event on Reference entity in Year 3
  - /// Assume Reference Entity weighting is 0.8%
  - /// Counterparty pays to market maker  $(0.8\% \times 10,000,000) = €80,000$
  - /// Market maker delivers to counterparty €80,000 nominal face value of Deliverable Obligations of the Reference Entity (in practice cash settled)
  - /// Notional amount on which premium is paid reduces by 0.8% to  $99.2\% \times 10,000,000 = €9,920,000$
  - /// Post Credit Event, counterparty receives premium of 45 bps on €9.92m until maturity subject to any further credit events



## **Comparison of DJ CDX.NA.IG with Single-Name CDS**





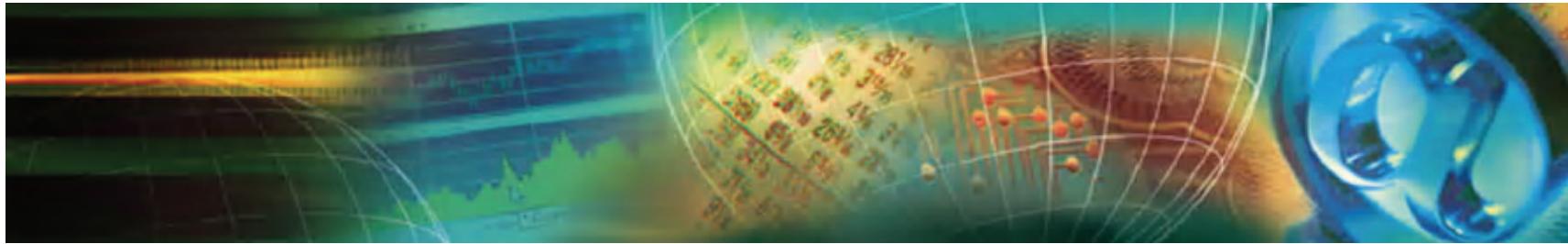
## Documentation

- /// DJ CDX and DJ TRAC-X NA use the 2003 ISDA Credit Derivative Definitions
- /// Documentation has been structured to allow for streamlined execution of transactions. The documents will consist of the following items:
  - /// Master Confirmation
  - /// Schedule of Reference Entities and Reference Obligations Transaction Supplement
  - /// Form of Exchanged Reference Entity Confirmation
- /// Investors will sign two Master Confirmations
  - /// One where the Investor is a net seller of protection
  - /// One where the Investor is a net buyer of protection
  - /// Investors do not need to sign both Master Confirmations initially



## iTraxx Index Default: Example

- /// Example: 2005 Default of Collins and Aikman Corp (CKC)
  - /// May 18th 2005: CKC filed for bankruptcy
  - /// CDX HY index required physical settlement but market agreed to a cash settlement process
    - /// Deliverable CKC debt was limited to a \$500 MM issue: 10.75% of 2011
    - /// CKC made up 1% of the index so each swap transaction had a relatively small exposure to settle
  - /// On June 14th 2005 an auction was held to determine the settlement price of 43.625
  - /// Since then, the market has used this process to cash settle defaults



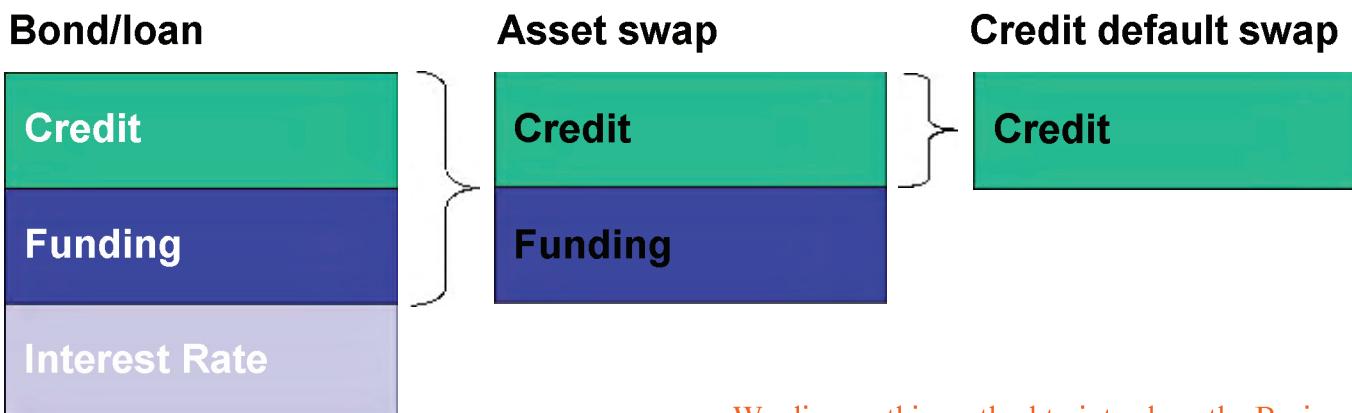
## Principles of CDS Pricing – Asset Swap Approach

- // A par asset swap typically combines the sale of an asset such as a fixed-rate corporate bond to a counterparty, at par and with no interest accrued, with an interest-rate swap.
- // The coupon on the bond is paid in return for Libor, plus a spread: the asset-swap spread. The spread is a function of the credit risk of the underlying bond asset.
- // As the spread is a function of credit risk, we could state with a certain logic that this spread is also the theoretical price for a credit default swap written on the same reference asset
- // The basis for this can be shown using the no-arbitrage pricing principle, involving a basis-type trade constructed via a long position in the reference asset and a long (buy protection) position in the credit default swap.
- // CDS market pricing does not follow this method. Pricing is not discussed in this lecture, an accessible presentation is available in the author's book "*The Credit Default Swap Basis*" (Bloomberg Press 2006)

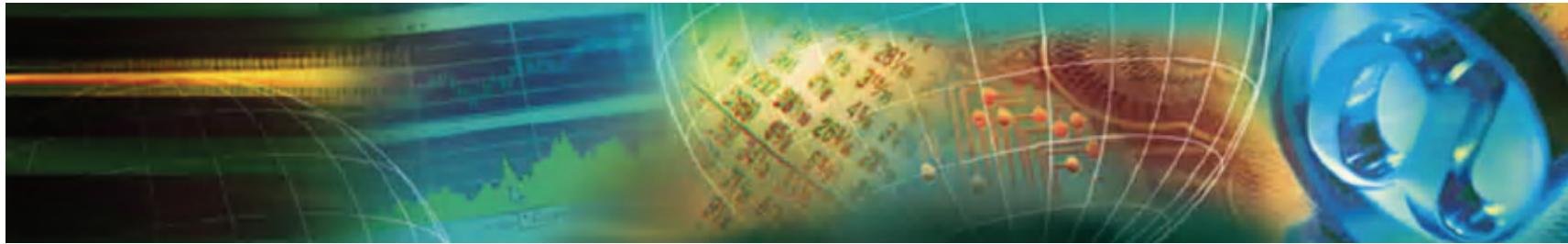


## Principles of CDS Pricing – Asset Swap Approach

- /// A bond or loan contains interest rate risk, funding risk, and credit risk
- /// Credit default swaps isolate and transfer credit risk
- /// To determine the theoretical price of credit risk
  - /// Swap the bond/loan into a floating rate investment (asset swap)
  - /// Remove the funding cost (assume a funding of LIBOR)
  - /// Credit risk remains, which gives you the theoretical price for credit protection



We discuss this method to introduce the Basis...



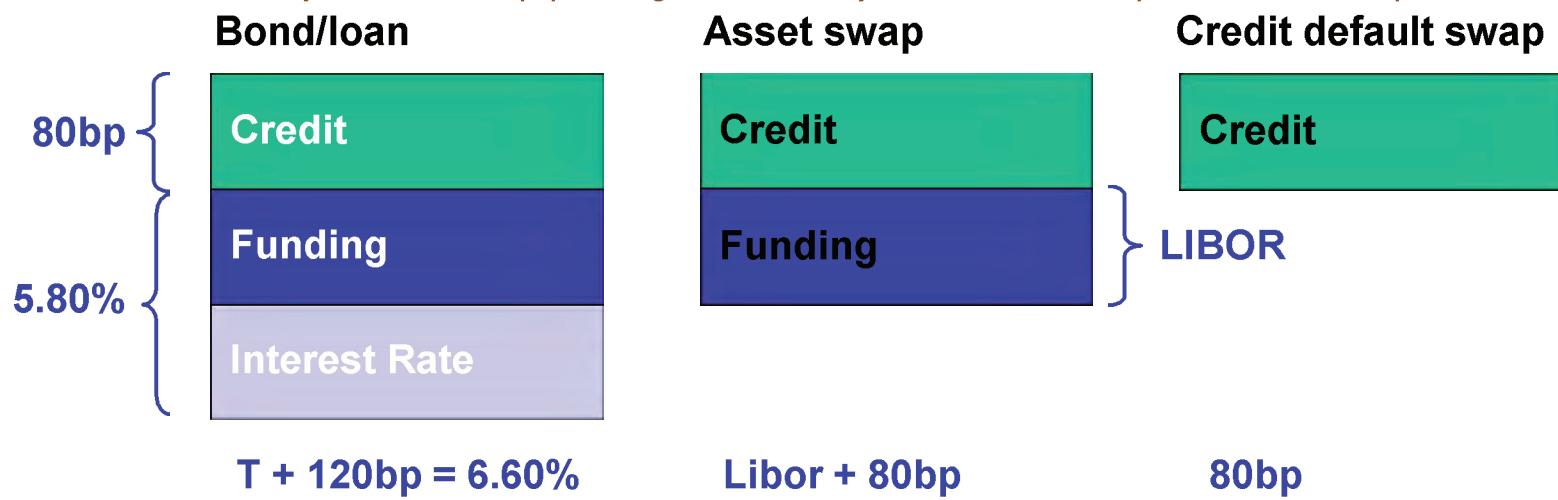
## CDS Pricing Example – Asset Swap Approach

### // Bonds

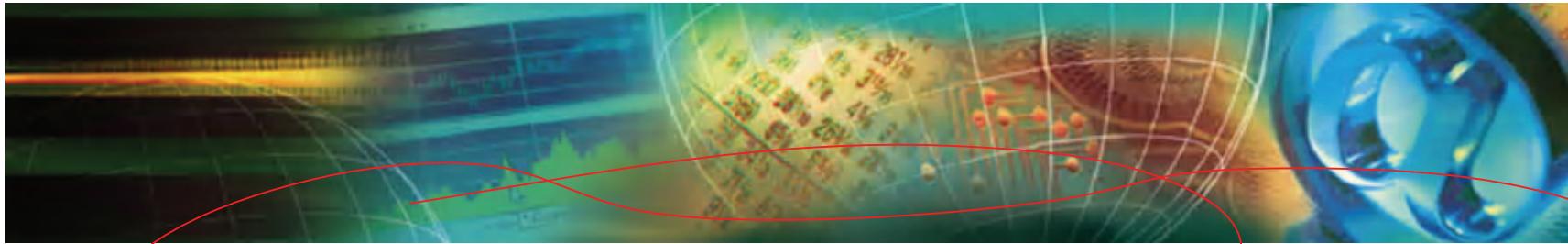
- // 5yr Treasuries trade at 5.40%
- // XYZ 5yr 6.6% Bond trades at a yield of 6.60% (T+120bp)

### // Asset Swap

- // 5yr Vanilla IRS trades at 5.80%
- // 5yr Asset Swap package on XYZ 5yr 6.6% bond is quoted at L+80bp



In practice, more sophisticated pricing techniques are used. Also note CDS-ASW Basis.



## Pricing differentials – the basis

CDS - RW

### Factors resulting in price differentials

A number of factors observed in the market serve to make the price of credit risk that has been established synthetically differ from that as traded in the cash market. Identifying (or predicting) such differences gives rise to arbitrage opportunities that may be exploited by basis trading across the markets. These include:

- 〃 **Bond identity:** the delivery option afforded the long CDS holder
- 〃 **Special status:** the impact of the borrowing rate in the cash market for “special” stock
- 〃 **AAA stock trading below Libor:** cash market versus premium in CDS market
- 〃 **Risk exposure of CDS seller may be greater:** the payouts required on technical defaults (definition of credit event) that are not full defaults
- 〃 **Counterparty risk of default swap buyer:** unlike cash bondholder, the default swap buyer is exposed to counterparty risk during term of trade
- 〃 **Supply and demand**
- 〃 **Bond trading away from par:** CDS is a par product, so will be protecting more or less than par compared to the cash



## Illustration of basis

Selected reference name credit default swap and asset swap spreads, May 2003

Reference credit	Credit rating	CDS spread	Asset swap spread (Libor plus)	Basis
<i>Financials</i>				
Ford Motor Credit	A2 / A	59.3	51.1	+8.2
Household Finance	A2 / A	72.2	57.2	+15.0
JPMorgan Chase	Aa3 / AA-	89.0	66.9	+22.1
Merrill Lynch	Aa3 / AA-	108.1	60.4	+47.7
<i>Industrials</i>				
AT & T Corp	Baa2 / BBB+	224.0	217.6	+6.4
FedEx Corp	Baa2 / BBB+	499.0	481.2	+17.8
General Motors	A3 / BBB	205.1	237.7	-32.6
IBM (6-yr callable bond)	A1 / A+	27.2	8.2	+19.0
IBM (4-yr callable bond)	A1 / A+	33.3	11.0	+22.3

Bonds used are 5-year conventional bullet bonds

CDS is five-year maturity

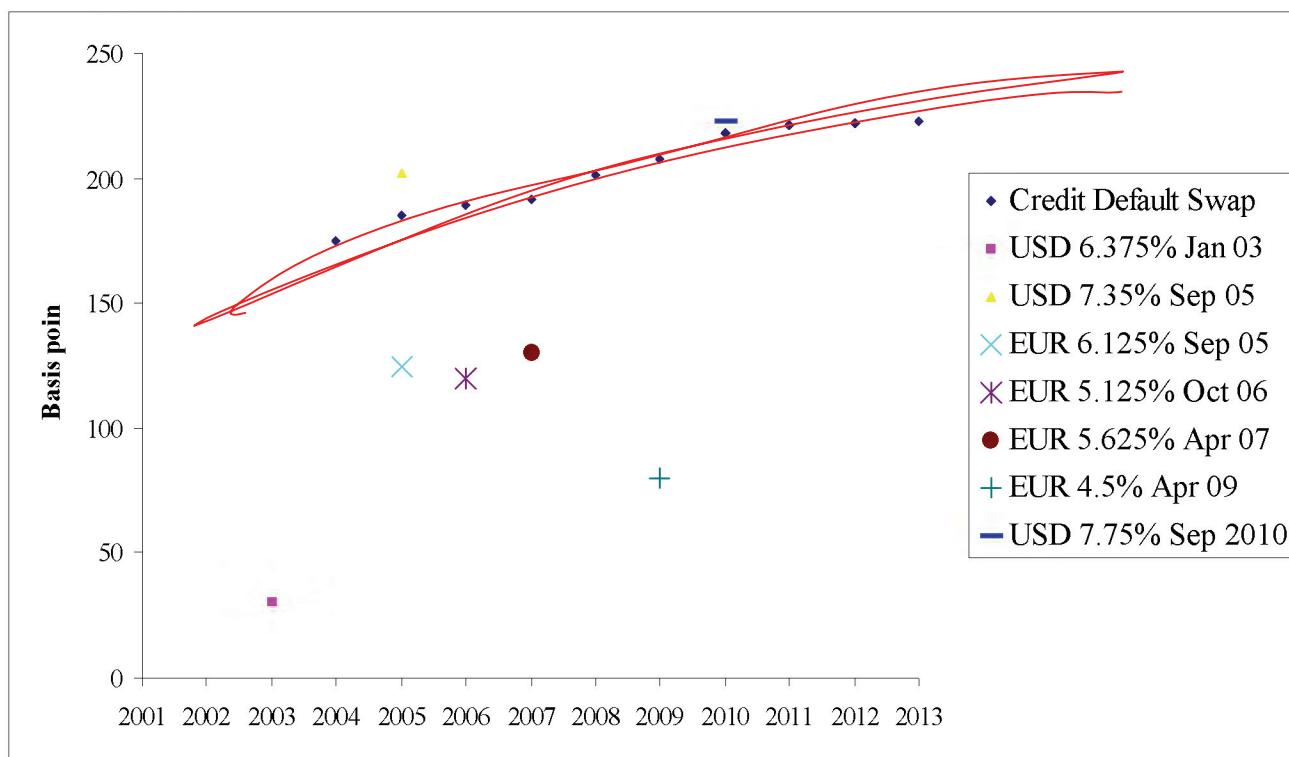
AT&T is 4-year maturity

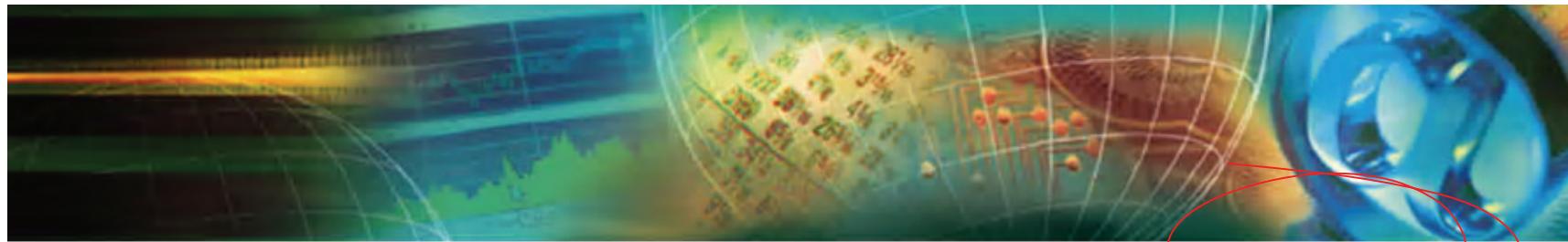
FedEx is 3-year maturity



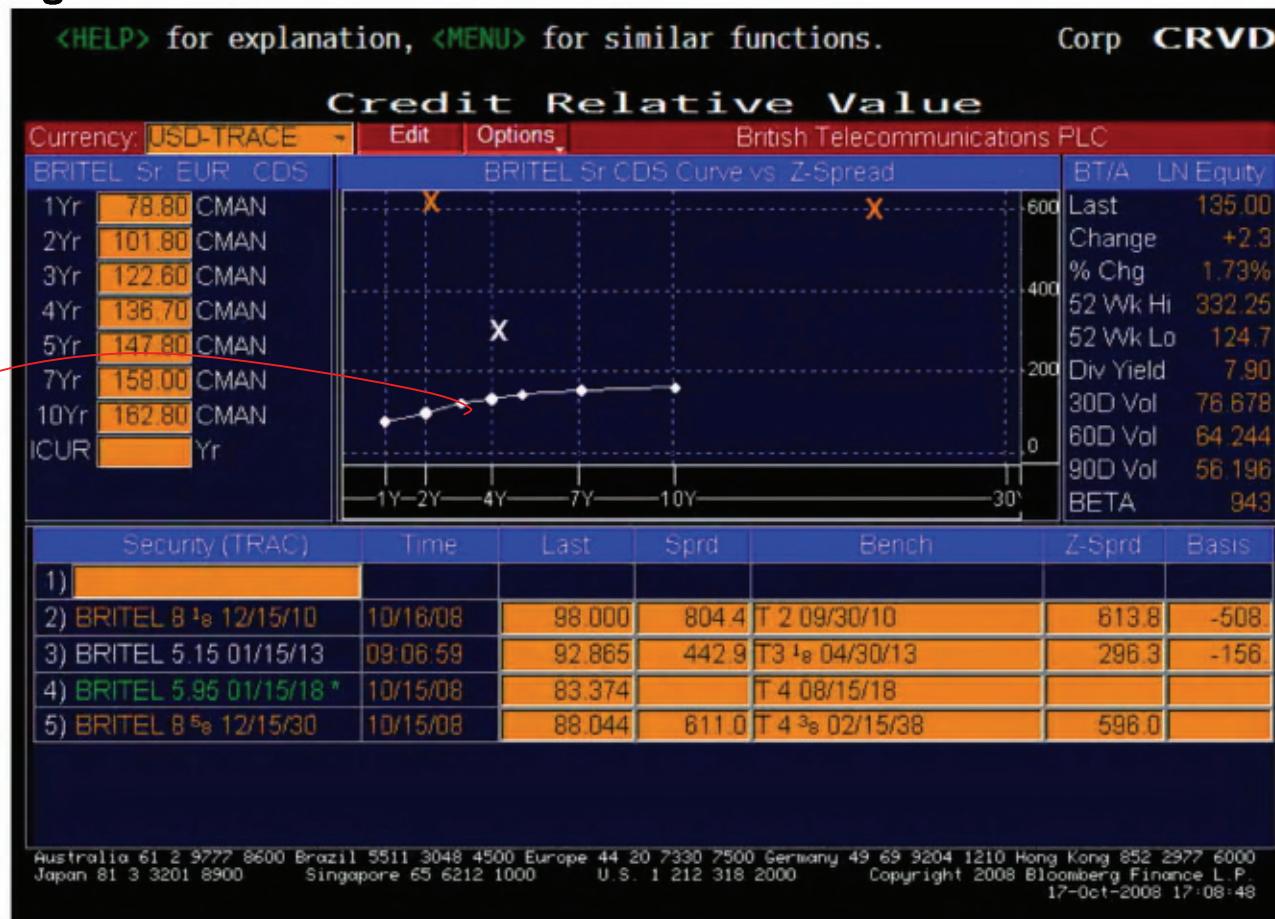
## Telefonica bond asset swap and CDS spread levels November 2002 --- note positive basis

(Source: Bloomberg)





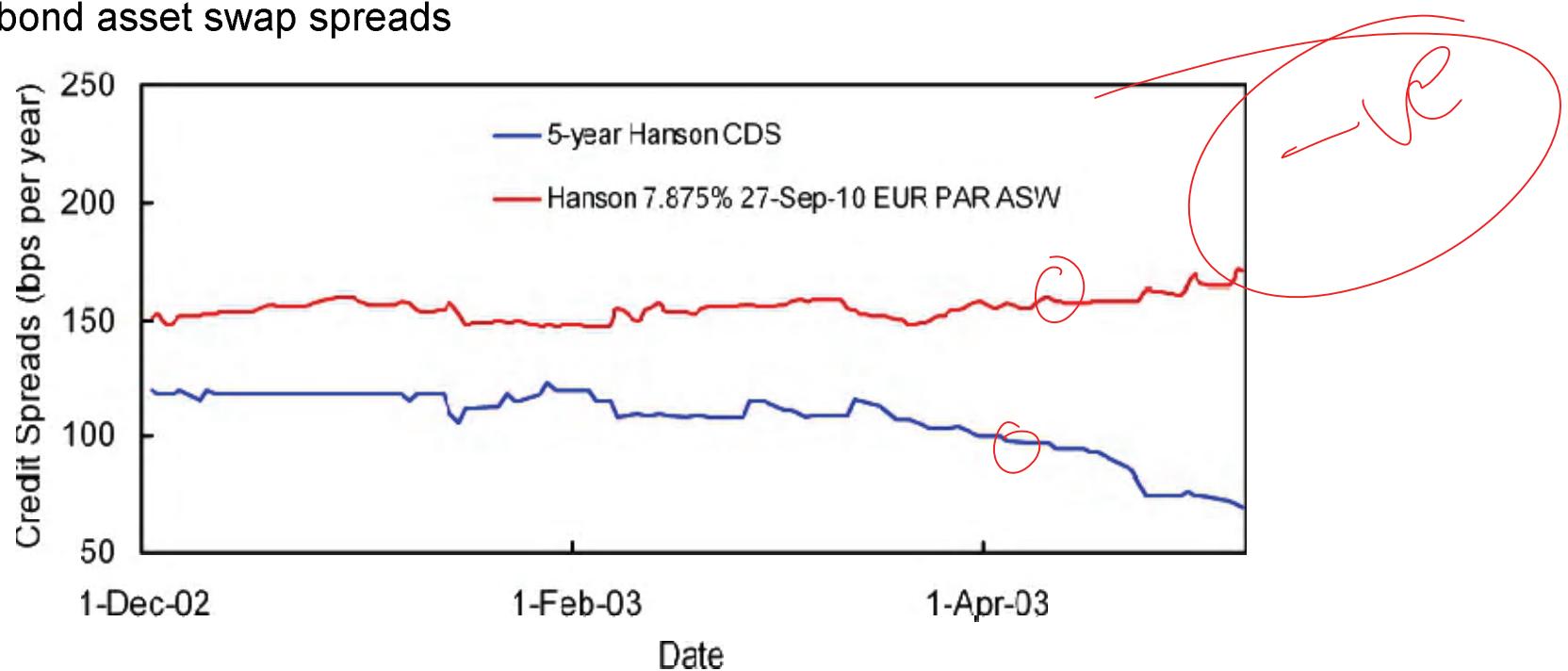
## British Telecom bond asset swap and CDS spread levels 17 October 2008 --- note negative basis

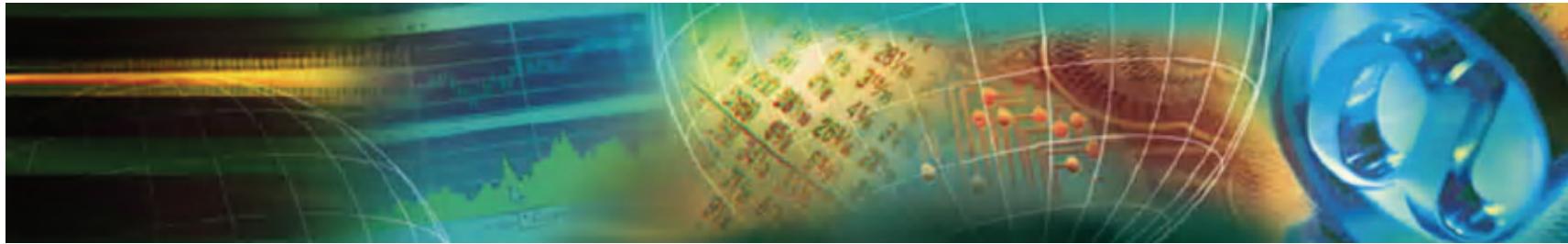




## Arbitrage basis trade illustration

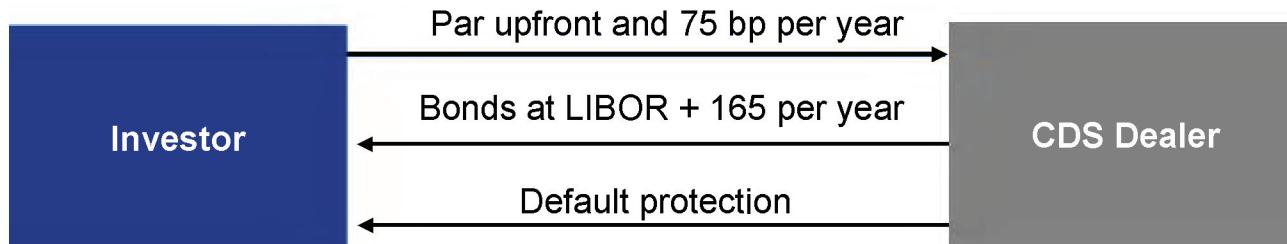
- 〃 During 2003-2004 Hanson was favoured by some synthetic securitizations
- 〃 This has driven the credit spread for Hanson default swaps tighter than bond asset swap spreads



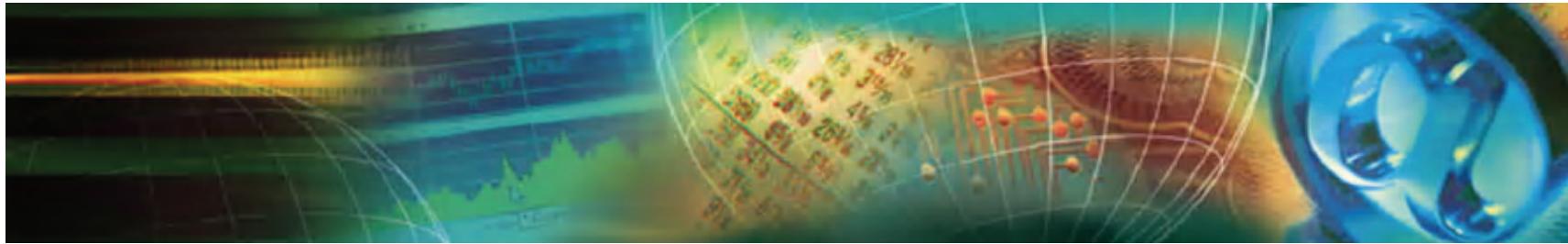


## Arbitrage basis trade

- 〃 As of early May 2003, the par asset swap spread on Hanson's 7.875% Sep 2010 bonds was 165 bp per year. The corresponding 5-year default swap spread was 75 bp per year
- 〃 Investors could buy default protection and bonds on a par asset swap basis and lock in a positive spread of 90 bp per year



Advantages	Disadvantages
<ul style="list-style-type: none"><li>▪ Low maintenance arbitrage trade with a net payment of LIBOR + 90 per year</li><li>▪ Cheapest to deliver option and option to unwind are valuable</li><li>▪ If the basis widens to positive territory, the trade can be unwound at a profit</li></ul>	<ul style="list-style-type: none"><li>▪ Volatility of basis</li><li>▪ CDS counterparty risk</li><li>▪ Some jump-to-default risk</li></ul>



## Arbitrage Trades

// Risk analysis of the long bond, long default protection position is outlined below:

Position	Size	Spread Income	Spread Risk (1% Shock)	Jump-to-Default Risk
Hanson 2010 bonds (asset swapped)	€100 mm	€1.65 mm	-€6.56 mm	-€75.00 mm
Hanson 5-year CDS	-€100 mm	-€0.75 mm	€4.36 mm	€60.00 mm
Total Hanson Exposure	-	€0.90 mm	- €2.20 mm	-€15.00 mm

People who buy very short dated protection are hedging their jump-to-default risk... one is hedging against a sudden default in the market in the near future, as opposed to a gradual credit deterioration



## Introducing Structured Credit Products

Structured credit products or collateralised products are structured products involving the securitisation of assets whereby:

- 〃 Illiquid assets of a financial institution or corporation are...
- 〃 Sold to a Special Purpose Vehicle, which...
- 〃 Repackages the assets into tranches having different characteristics, and...
- 〃 Sells the securities to investors
- 〃 Has the effect of transferring risk, reducing any regulatory capital and raising funds



## Types of Collateralised Products

Collateralised products include:

- 〃 CBOs – where the assets are bonds
- 〃 CLOs – where the assets are loans
- 〃 CDOs – where the pool of assets comprise a mix of debt obligations

Key difference between CDO and ABS:

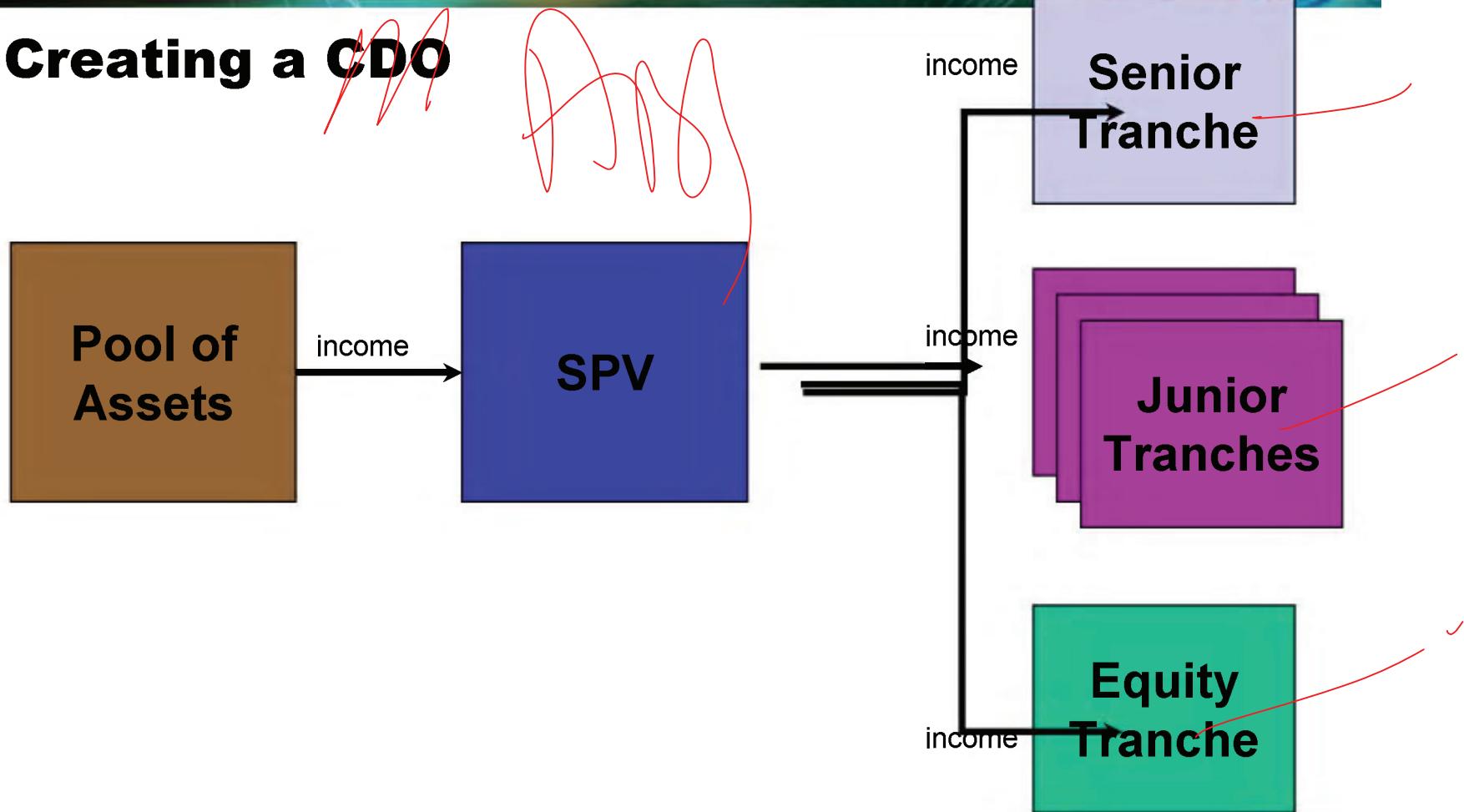
- 〃 Asset pool in ABS usually static
- 〃 Asset pool in CDO typically actively managed

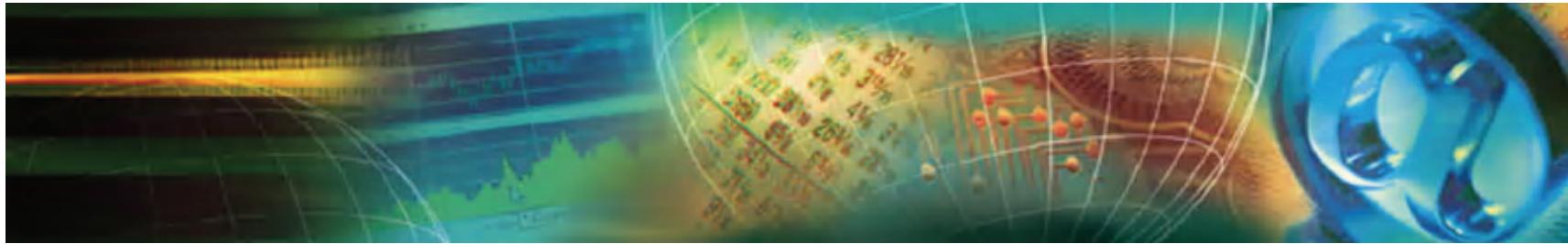
Example:

- 〃 Credit card receivables...
- 〃 As obligations are repaid, new credit card debt takes the place of old debt



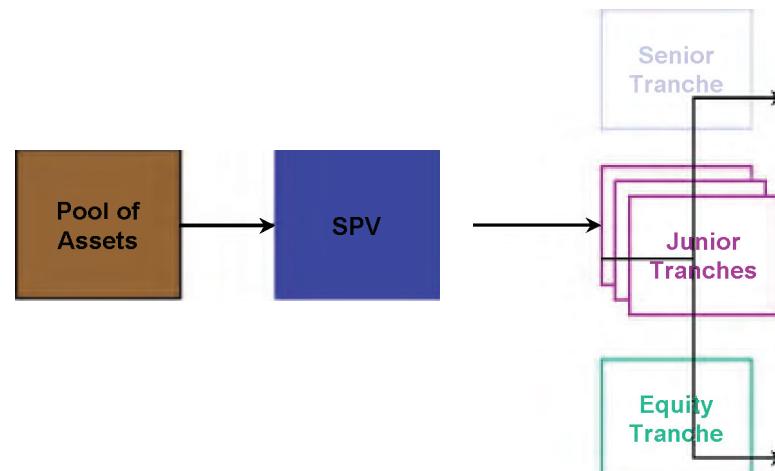
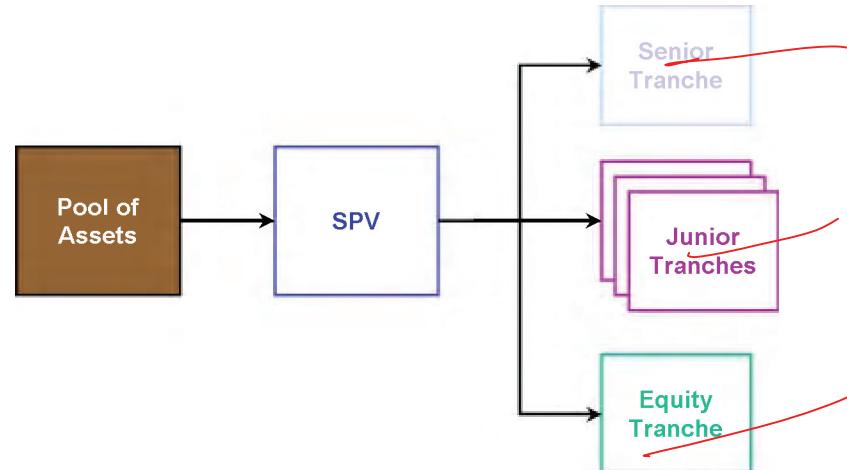
## Creating a CDO





## Cashflow waterfall – 1

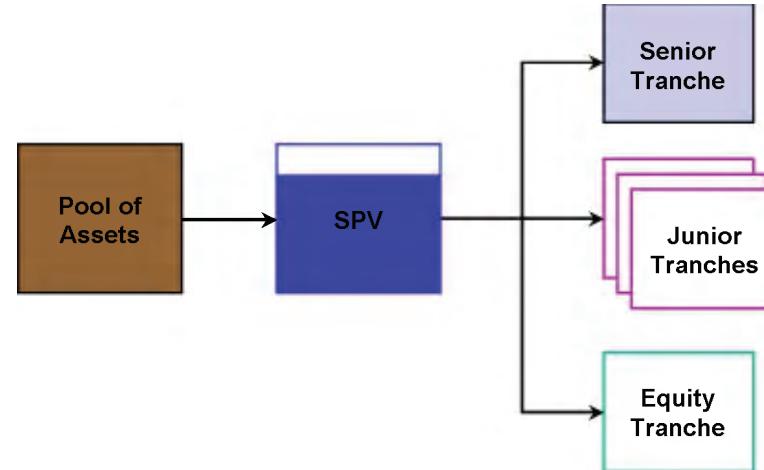
- // At the start of each period, SPV begins to accrue income from the pool of assets
  
- // By the end of each period, SPV accrues the period's income from the asset pool



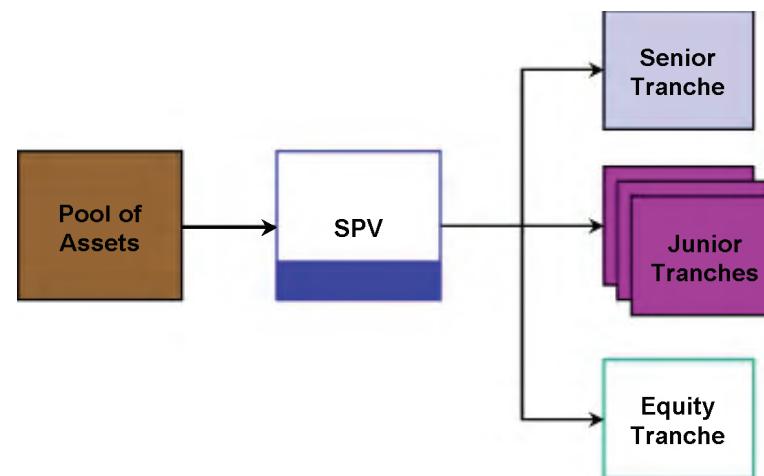


## Cashflow waterfall – 2

- Income accrued from the SPV is first paid to the Senior Tranche



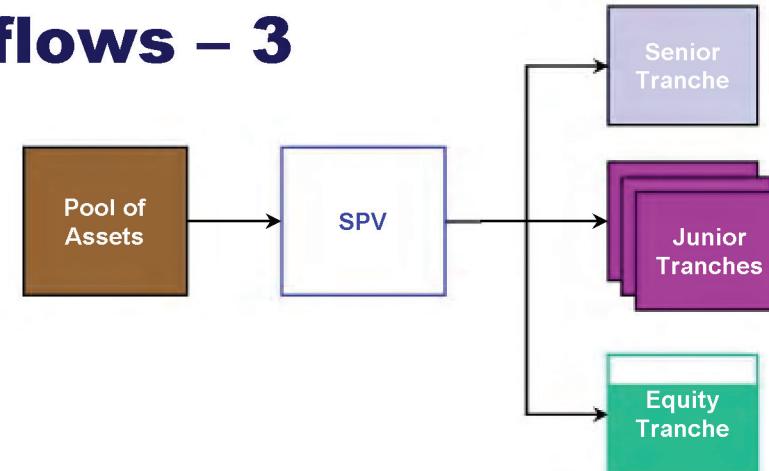
- Next, income is distributed to the Junior Tranches

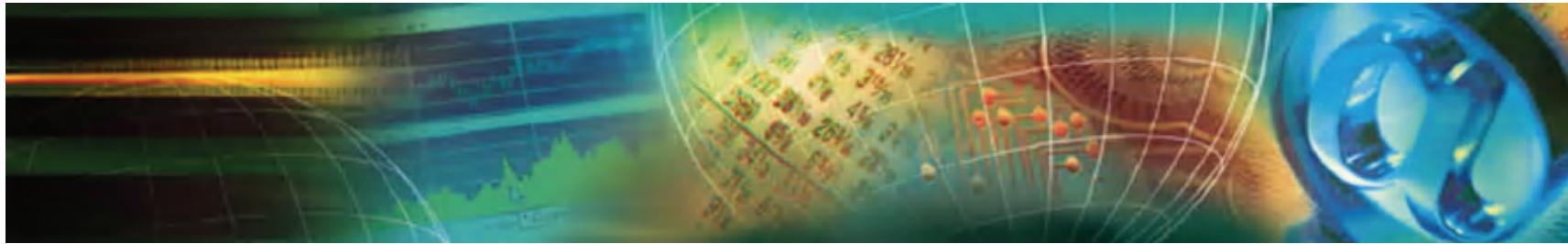




## The Waterflow of Cashflows – 3

- Finally, any residual income from the SPV is paid to the Equity Tranche





## CDO tranches

- 〃 Different tranches have tiered priority to the stream of income channelled from the asset pool through the SPV, and are structured with:
  - 〃 Credit ratings ranging from AAA to unrated
  - 〃 Expected earnings from low to high
- 〃 Even if the average credit quality of pooled assets is low (e.g. BB)...
- 〃 The Senior Tranche can nonetheless earn a AAA rating
  - 〃 A significant number of the pooled assets would need to default before investors were impaired
  - 〃 Senior Tranche investors are (virtually) guaranteed income and full capital repayment
- 〃 The Junior Tranche(s) protects the Senior Tranche
  - 〃 Will receive a higher coupon
  - 〃 May be some capital impairment if a significant number of credits in the pool default
- 〃 The Equity Tranche protects the Junior Tranche
  - 〃 It has the highest expected return...
  - 〃 ...but also suffers the greatest exposure to risk as it is the “first loss” piece
  - 〃 Investors can lose their entire investment if the number of defaults in the asset pool is significant



## CDO tranches

Credit rating on senior tranche depends on degree of collateralization

- 〃 AAA-rating requires approximately a 1.5× collateralization
  - 〃 AA-rating requires approximately a 1.25× collateralization
  - 〃 \$100m of pooled assets could create:
    - 〃 \$65m of AAA-rated senior tranche
    - 〃 \$35m of lower-rated junior tranches
  - Or...
  - 〃 \$80m of AA-rated senior tranche
  - 〃 \$20m of lower-rated junior tranches
- 〃 The bottom tranche(s) are actually pivotal to creating a CBO deal
    - 〃 Protects senior tranches
    - 〃 Relative difficulty of selling bottom tranche means that these usually have to be pre-placed before structure is launched
  - 〃 Bottom tranche has to be:
    - 〃 Large enough to absorb losses on senior tranches
    - 〃 Small enough for issuer to place



## Using credit derivatives in synthetic securitisation

- 〃 Traditional securitisation is “true sale” securitisation
- 〃 We can use credit derivatives – usually CDS but sometimes also TRS and CLN – to replicate the effect of a true sale without actually doing so. This transfers credit risk, or, crucially, allows exposure to reference names without having to buy them
- 〃 This means we can set up a synthetic CDO as a fund management vehicle
- 〃 Advantages:
  - more tailored structures
  - quicker to market
  - easier across multiple legal jurisdictions
  - unified ISDA documentation
  - enables separation of funding and credit risk management



## Synthetic securitisation

- These instruments facilitate **credit risk transfer** where this is more important than funding considerations.
- No objective of raising funding
- Credit derivatives are used either directly or via a SPV.
- The underlying assets are not moved from the originator's balance sheet – or, do not have to be on the balance sheet to start with. Rather the originator is a **credit protection buyer**.
- The investor is a **credit protection seller**.
- The process is invisible so originator (bank) and client relations are not affected.
- Market update: used for risk transfer purposes in year-end accounting in December 2008; reduced Reg Cap calculation



## Synthetic CDOs...

- 〃 In a **synthetic structure** the transfer of risk is achieved through the use of credit derivatives rather than by the **true sale** of assets to a SPV.
- 〃 The mechanics of the transaction are achieved by using CDSs or TRSs so that in effect the credit risk associated with the asset(s) is separated from the asset funding requirements.
- 〃 Typically CDSs are used to create these structures and a portion of the credit risk may be sold on as CLNs.
- 〃 So there are both funded and unfunded liabilities.

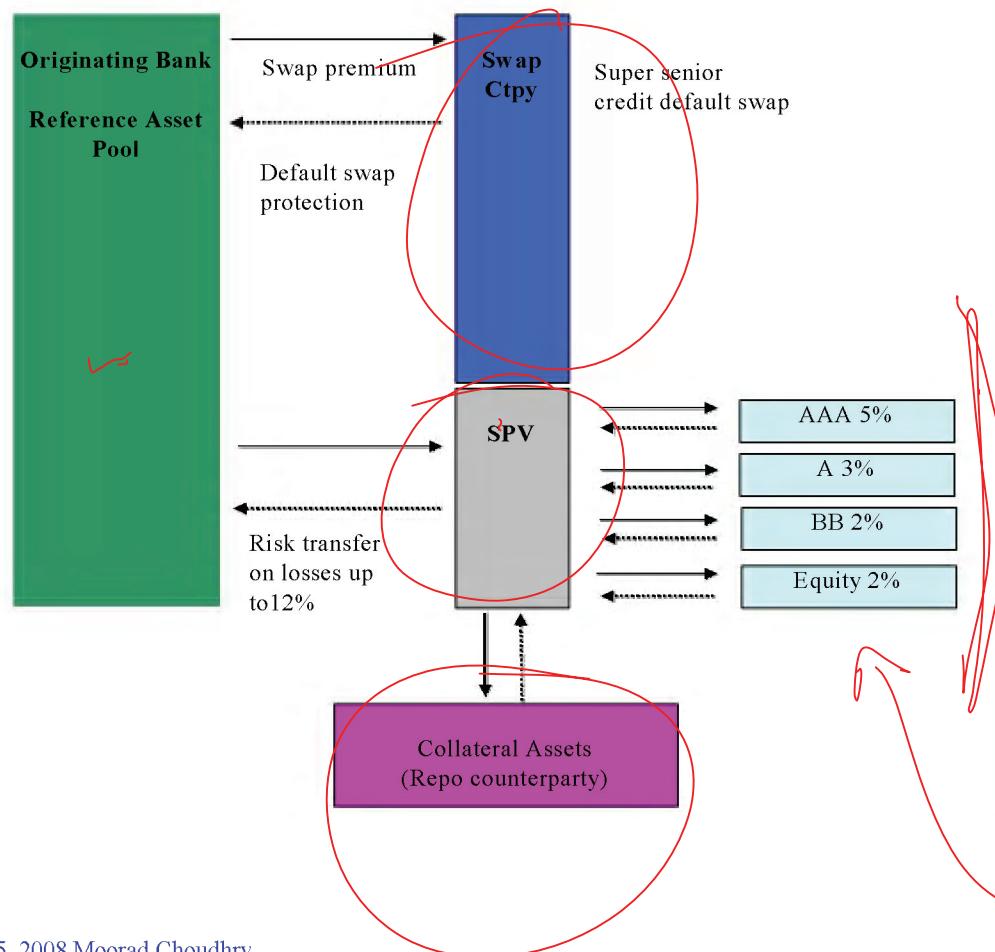


## Synthetic CDOs...

- ↗ The structure usually involves a **super senior CDS** transacted with a background swap counterparty and then sold on to monoline insurance companies at spreads over Libor significantly lower than the senior AAA-rated tranche of cash flow CDOs.
- ↗ **Mezzanine notes** will be sold to a wider group of investors the proceeds from which will be invested in risk-free collateral such as Treasury Bonds or Pfandbriefe.
- ↗ The **first loss piece** may be held by the originator
- ↗ When a credit event occurs in the reference asset set, the funds realised from the sale of collateral will be used to pay the principal on the issued notes less the value of the junior note.
- ↗ The diagram of the following slides illustrates a generic synthetic CDO structure.



## Generalised partially funded synthetic CDO



- The majority of the credit risk is transferred by the “super senior” credit default swap, usually sold on to an investor such as a monoline insurer
  - The higher-risk element is transferred via the SPV which issues CDS (unfunded) or credit-linked notes (funded)
  - The first-loss piece is the unrated equity note.
  - Each note has a different risk/return profile
- Updated diagram:** the super-senior is transacted via the SPV as well



## Synthetic CDOs

In a Synthetic CDO:

- 〃 Credit risk from a pool of assets is transferred to investors
- 〃 Assets themselves are *not* transferred
- 〃 Synthetic CDOs use credit derivatives to transfer credit risk while leaving ownership of the asset pool with the originator

Synthetic CDOs:

- 〃 First executed in the US in 1997 (JPMorgan's BISTRO deal)
- 〃 First appeared in Europe in 1998 (and may have disappeared in 2008...)
- 〃 Were particularly attractive in Europe because:
  - 〃 Legal jurisdiction makes true-sale cash-flow securitisation more difficult
  - 〃 US commercial banks are typically rated lower than their European counterparts – so funding element of cash-flow securitisation attractive
  - 〃 European commercial banks generally have higher ratings – so less need for funding component of cash-flow transaction



## Types of Synthetic CDO

Synthetic CDOs can be:

- /// Unfunded

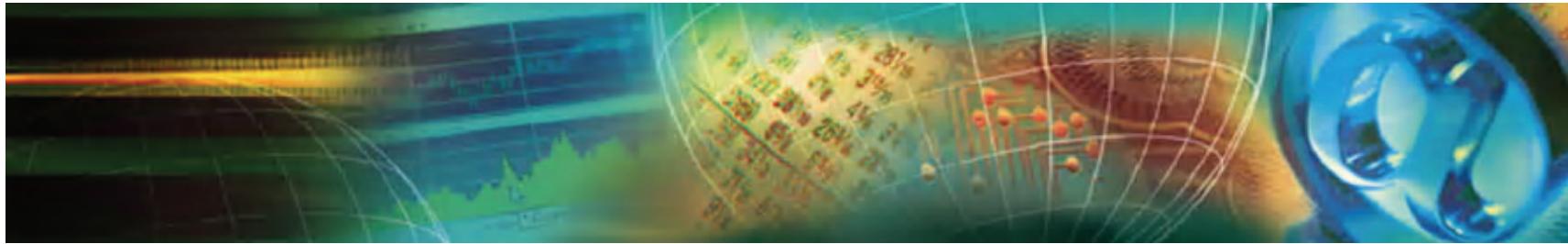
- /// CDS on 100% of the asset pool are used to transfer the credit risk

- /// Partially funded

- /// CDS purchased on part of the asset pool
  - /// Notes issued against the balance (as in cash-flow CDO)

- /// Fully funded

- /// Credit risk transferred through issue of Credit Linked Notes (CLNs)



## Creating a Synthetic CDO...

- /// Bank purchases a CDS on the major part of the asset pool
  - /// as CDS is "super senior" it carries very low swap premium
  - /// Example:
    - /// AAA premium: 45-50 bp **220 bps**
    - /// Super senior premium: 10-12 bp **80-100 bps**
- /// SPV issues CLNs on the remainder of the asset pool
- /// Proceeds from note issue invested in high-grade assets
  - /// to de-link rating of CLN from that of issuer
- /// If no default occurs:
- /// Note investors receive enhanced return on CLN provided by:
  - /// return from high-grade assets
  - /// swap premiums from bank
- /// If defaults occur:
  - /// bank pays first loss (owns equity piece)
  - /// CLNs provide protection on further losses
  - /// super senior CDS provides backstop credit protection

Pre-Aug 07  
and Sep 08  
spreads!!



## Synthetic CDOs

### Motivation for issuance

- /// “Arbitrage” CDOs: exploiting yield mismatch between assets and liabilities
- /// Balance sheet CDOs: regulatory capital and ALM management
- /// Synthetic CDOs are sometimes easier to execute than cash structures
- /// Better ability to transfer credit risk, especially partial claims on a specific reference asset
- /// Risk transfer at lower cost
- /// Lower risk weightings on OECD bank CDS counterparties



## Hybrid CDOs

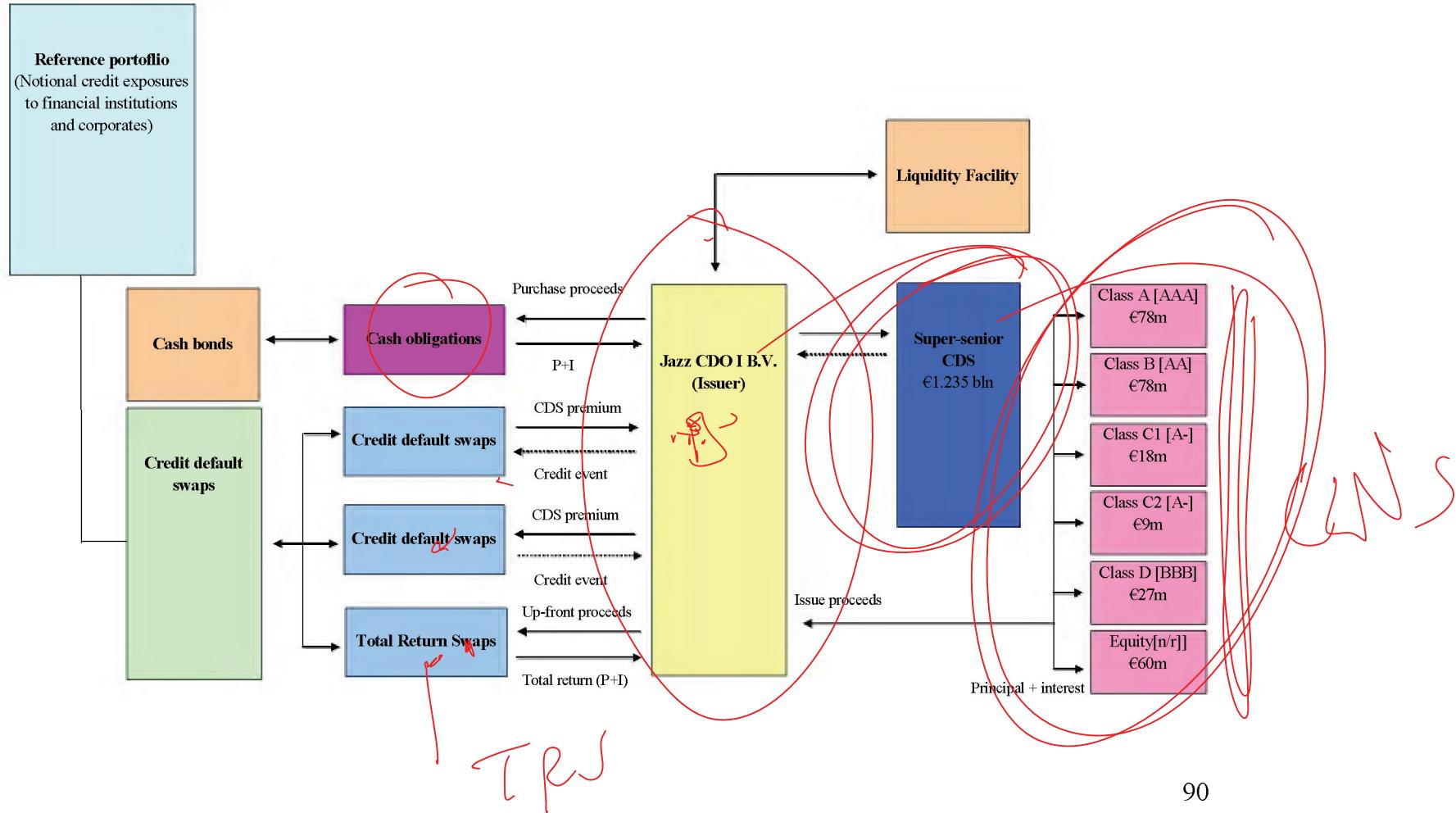
### Jazz CDO

- 〃 A structure from 2002 so not exactly new! But innovative nevertheless...
- 〃 This is in effect a fund management vehicle for its sponsor, AXA IM, that combines both a cash and synthetic CDO
- 〃 Combines super-senior swap and note issue. Note proceeds can be used to purchase cash bonds, or placed in collateral account.
- 〃 Swap and notes assume credit risk of the reference portfolio. Cash assets can be bonds, HY, ABS, etc
- 〃 In effect, an SIV-type structure that combines securitisation, portfolio management expertise and cash and synthetic credits in one vehicle



## Structure diagram Jazz CDO BV

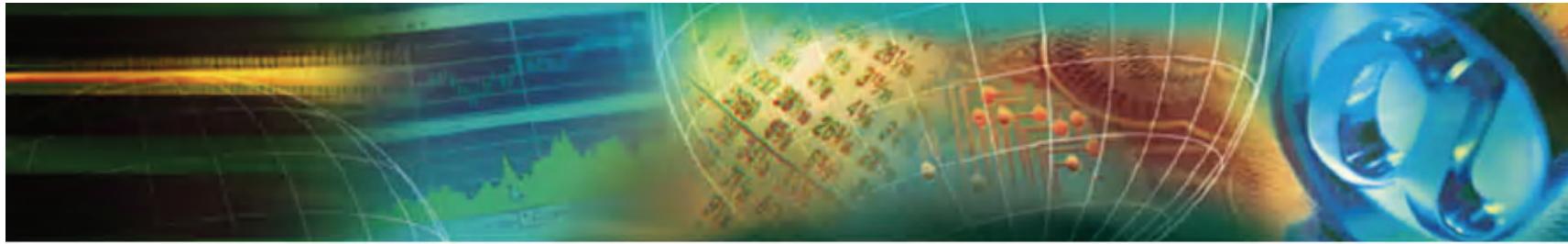
*(Handwritten red annotations)*





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