An Introduction to Credit Derivatives

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Agenda

- Introduction
- Credit risk
- Credit risk and credit derivatives
- Credit events
- Instruments and applications
- Synthetic CDOs and credit derivatives
- Asset-swap pricing

Introduction

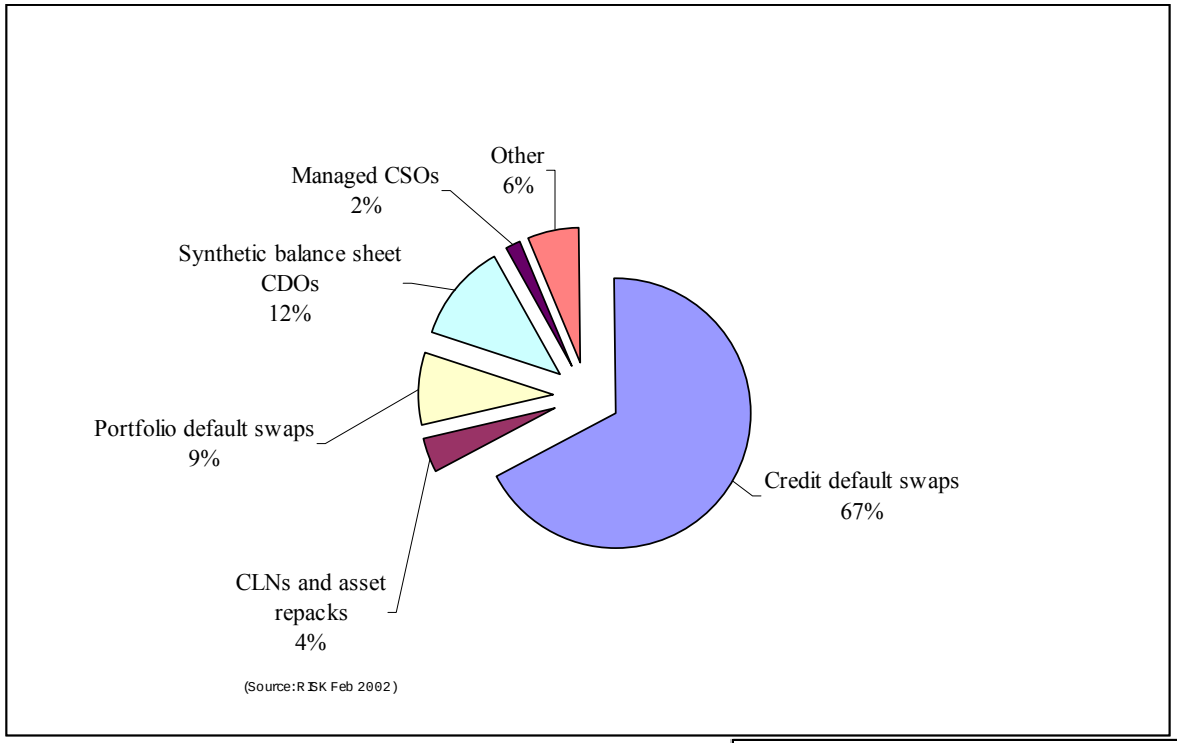
- **Credit Derivatives** are a major asset class in the debt capital markets industry
- They are relatively recent products, dating from 1994, but growth has been rapid and they are now traded in all major financial centres.
- Credit derivatives are derivative instruments because their value is linked to an underlying or **reference** cash market product such as a bond or loan.
- Credit derivatives are designed to reduce or eliminate credit risk exposure and enable credit risk to be taken on or reduced synthetically.
- Payout under a credit contract is dependent on the occurrence of a pre-defined **credit event.**

Credit derivatives

- Credit derivatives are instruments that allow the isolation and management of credit risk from all other elements of risk.
- They enable participants to trade credit risk exposure, whether for the purposes of risk management, hedging or speculation
- They are bilateral OTS contracts.

- **Types of credit derivative:**
  - **Credit default swap**
  - **Total return swap**
  - **Credit-linked notes**
  - **Credit spread products**
  - **Credit spread options**

Volume and product



Notional volumes $ bln (Source: BBA)					
1997	1998	1999	2000	2001	2002 est
180	350	668	1009	1971	2554

Credit Risk

- Credit risk is the risk of loss arising from default, downgrade, bankruptcy or other similar event such that the value of an investment is reduced or wiped out.
- Any inability to service loan interest or repay part or all of a loan principal is a form of default. This will lead to loss by investors.
- Magnitude of credit risk is described by a formal **credit rating**. This is assigned after a qualitative and quantitative analysis of the obligor firm, its industry and other factors.
- Magnitude of credit risk is measured by the credit risk premium, the yield spread over the equivalent maturity **benchmark** security.
- The yield spread fluctuates according to general movement in interest rates as well as changes in the fortune of the obligor.

Advantages of Credit derivatives

- In a **single-name** credit derivative, the reference entity is a single obligor
- Multiple-name credit derivatives (known as **basket** or **portfolio** products) are referenced to more than one obligor.
- For portfolio managers, **benefits** of using credit derivatives include:
  - Can be tailor-made to meet specific needs (eg., don't need to match terms)
  - Can be "sold short", which is not possible with say, a bank loan
  - A bank can off-load credit risk without taking the loan off balance sheet, thus preserving client relationships
  - As they isolate credit, enable this to be valued as an asset class in its own right, and thereby create a credit term structure
  - They are OBS instruments, with greater flexibility and reduced administrative burden for a similar type of exposure as cash assets

Applications

Diversifying the credit portfolio

- Write protection on assets it owns, generating fee income
- Enhancing portfolio returns by issue of structured notes with return linked to portfolio; investors gain exposure to certain part of portfolio, manager can crystallise an arbitrage spread or generate cheaper funding

Reducing credit exposure

- Portfolio manager with short-term risk exposure but no desire to remove assets, or bank not wishing to sell loan book

Acting as a credit derivatives market maker

- A bank can act as market maker, buying or selling credit protection, whether or not it owns the reference assets. Trade to meet client demand but also manage book to reflect its own view

Trading credit spreads

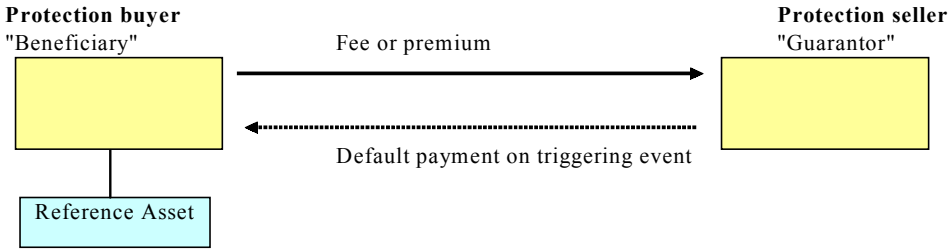
- Across different ratings and entities, and default swap basis trading

Credit Events

- The occurrence of a specified credit event will trigger payment (under settlement terms) from the protection seller to protection buyer.
- Contracts are physical or cash settlement.
- The following may be specified as credit events in the legal documentation governing the credit derivative instrument:
  - financial or debt restructuring, whther under administration or US bankruptcy laws;
  - bankruptcy or insolvency of reference entity;
  - default on debt servicing and continued non-payment after specified period
  - technical default, non-payment of coupon
  - change in credit spread payable by obligor above a specified level
  - change in credit rating
- ISDA has standard default swap documentation, note this does not consider a change in credit rating as a credit event

Credit derivative instruments

- With a credit derivative one is transferring credit risk of specified asset(s) to a 3rd party while keeping the asset(s) on the balance sheet – so not a “true sale” but use of loss definitions
- In a credit derivative contract the buyer of protection pays a premium to the seller of protection, who is obliged to pay out on occurrence of a **credit event**
- **Credit default swap**



- The “trigger event” is the credit event as defined in the legal documentation for the contract
- A credit default swap is deemed to be an unfunded credit derivative, because the protection buyer is exposed to counterparty risk from bankruptcy of protection seller

Example of credit default swap

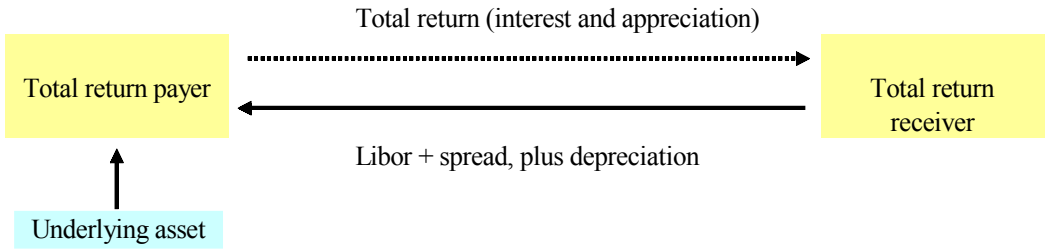
XYZ plc credit spreads are currently trading at 120 bps over government for five-year maturities and 195 bps over for 10-year maturities. A portfolio manager hedges a $10 million holding of 10-year paper by purchasing the following credit default swap, written on the five-year bond. This hedge protects for the first five years of the holding, and in the event of XYZ's credit spread widening, will increase in value and may be sold on before expiry at profit. The 10-year bond holding also earns 75 bps over the shorter-term paper for the portfolio manager.

Term	5 years
Reference credit	XYZ plc five-year bond
Credit event	The business day following occurrence of specified credit event
Default payment	Nominal value of bond x [100 – price of bond after credit event]
Swap premium	3.35%

We assume now that midway into the life of the swap there is a technical default on the XYZ plc five-year bond, such that its price now stands at $28. Under the terms of the swap the protection buyer delivers the bond to the seller, who pays out $7.2 million to the buyer.

Credit derivatives

- **Total return swap:** Like a credit default swap, a bilateral contract, but where the protection buyer exchanges the economic performance ("total return") achieved by the reference asset in return for periodic payment that is usually a spread over Libor. Similar to asset swaps, allowing the total return receiver to create a synthetic leveraged position in the reference asset



- **Credit-linked note:** A bond containing an embedded credit derivative, linked to the credit quality of the issuer *and* of the underlying reference credit. The investor – the protection seller – receives an increased coupon payment, as well as par value of the note on maturity assuming no credit event occurs. CLNs are funded credit derivatives since the issuer (protection buyer) receives payment upfront for the note and so has no counterparty risk exposure.

TRS...

The basic ingredients of a TR swap are that one party "funds" an underlying asset and transfers the total return of the asset to another party, in return for a (usually) floating return that is a spread to Libor. This spread is a function of:

- the credit rating of the swap counterparty;
- the amount and value of the reference asset;
- the credit quality of the reference asset;
- the funding costs of the beneficiary bank;
- any required profit margin;
- the capital charge associated with the TR swap.

The TR swap counterparties must consider a number of risk factors associated with the transaction, which include:

- the probability that the TR beneficiary may default while the reference asset has declined in value; hence this is a **funded transaction**
- the reference asset obligor defaults, followed by default of the TR swap receiver before payment of the depreciation has been made to the payer or "provider".

The first risk measure is a function of the probability of default by the TR swap receiver and the market volatility of the reference asset, while the second risk is related to the joint probability of default of both factors as well as the recovery probability of the asset.

Mechanics of credit derivatives

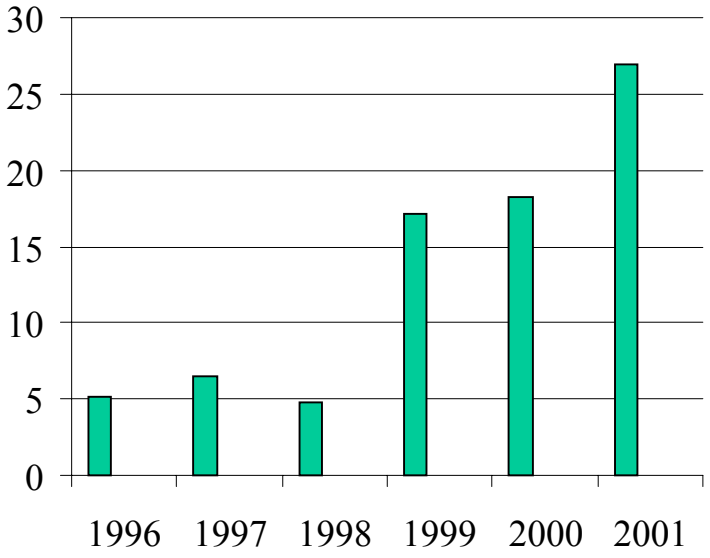
- **Credit derivatives are defined by:**
  - **Reference entity:** specified sovereign, agency or corporate
  - **Credit event:** describes the trigger event
  - **Deliverable obligation:** the reference credit that is delivered in the event of physical settlement (usually reference entity)
  - **Settlement mechanism:** whether cash or physical settlement. If cash settlement, typically protection seller pays [Notional x (100 – price)] to protection seller. If physical settlement, buyer delivers deliverable obligation in exchange for par
- **Reference entities:**
  - **Single name:** underlying reference asset
  - **Basket CDS:** small number of assets; “first-to-default”
  - **Portfolio CDS:** unfunded CDSs linked to portfolio of assets, used to transfer credit risk on reference portfolio, so in effect unfunded synthetic CDO

Introduction to CDOs

- **Collateralised Debt Obligations** (CDOs) are a major asset class in the securitisation and credit derivatives markets.
- CDOs provide **banks** and **portfolio managers** with a mechanism to outsource risk and optimise economic and regulatory capital management. For **investors** they are a tool by which to diversify portfolios without recourse to the underlying assets.
- CDOs split into two main types: **balance sheet** and **arbitrage**. Within these categories they may be either **cashflow** or **synthetic**.
- In a cashflow CDO the physical assets are sold to a special purpose vehicle (SPV) and the underlying cash flows used to back the principal and interest liabilities of the issued overlying notes.
- In a synthetic securitisation, **credit derivatives** are employed in the structure and assets usually retained on the balance sheet.

Background

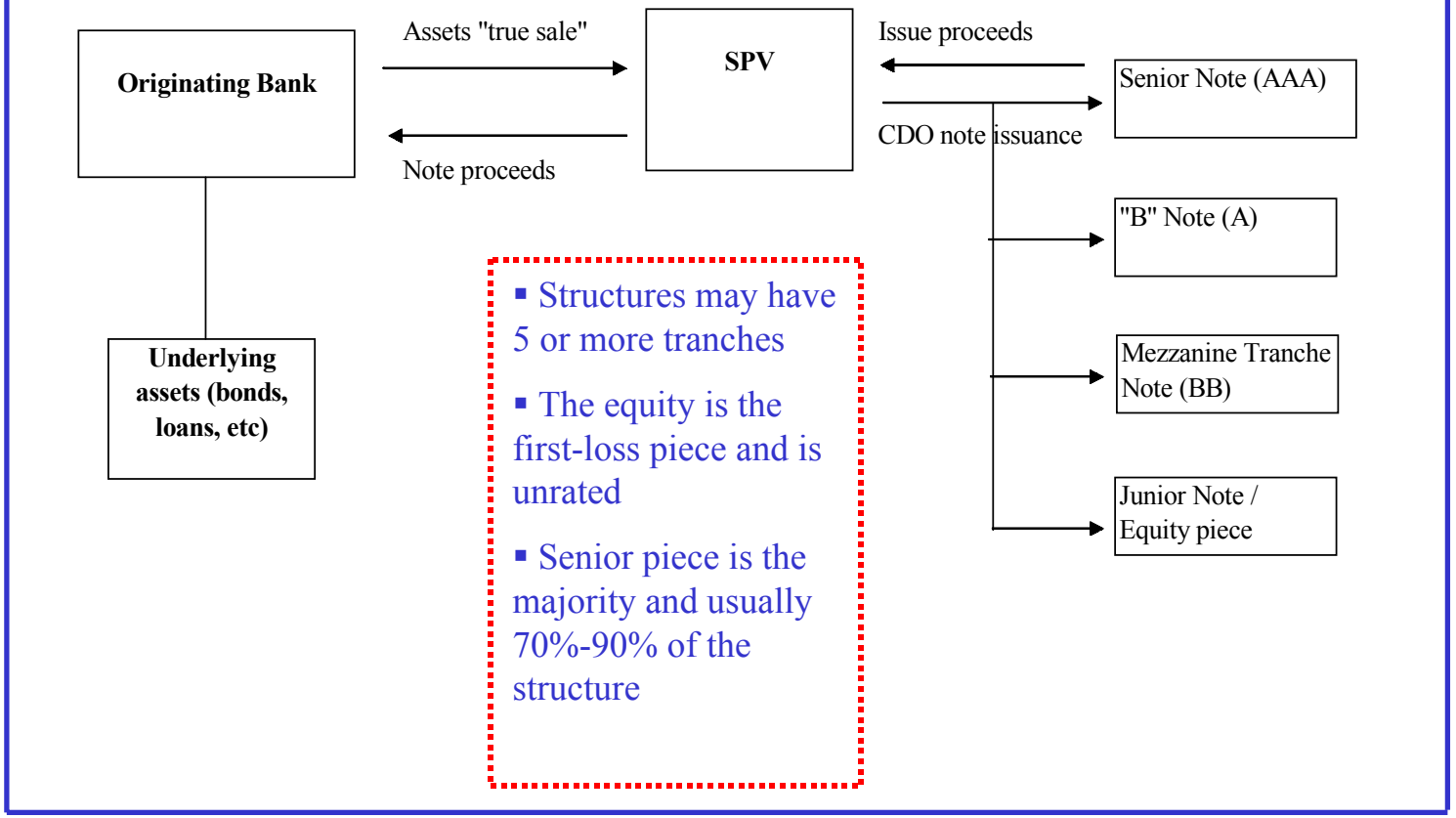
- CDOs involve transfer of a portfolio of loans **(CLO)** or bonds **(CBO)** or a mix of these (CDO), and issuance of a tranche of notes, splitting risk levels to suit different investors.
- **Balance sheet CDO:** originator manages its own balance sheet by freeing up economic or regulatory capital.
- **Arbitrage CDO:** asset manager expands assets under management, and/or exploits differences in funding costs of assets and liabilities; and meets investors' demand for specific tranche of risk.



Growth of European CDO market ($ bln)

(Source: RISK)

Cashflow CDO: simply a repack or “large ABS” ?!



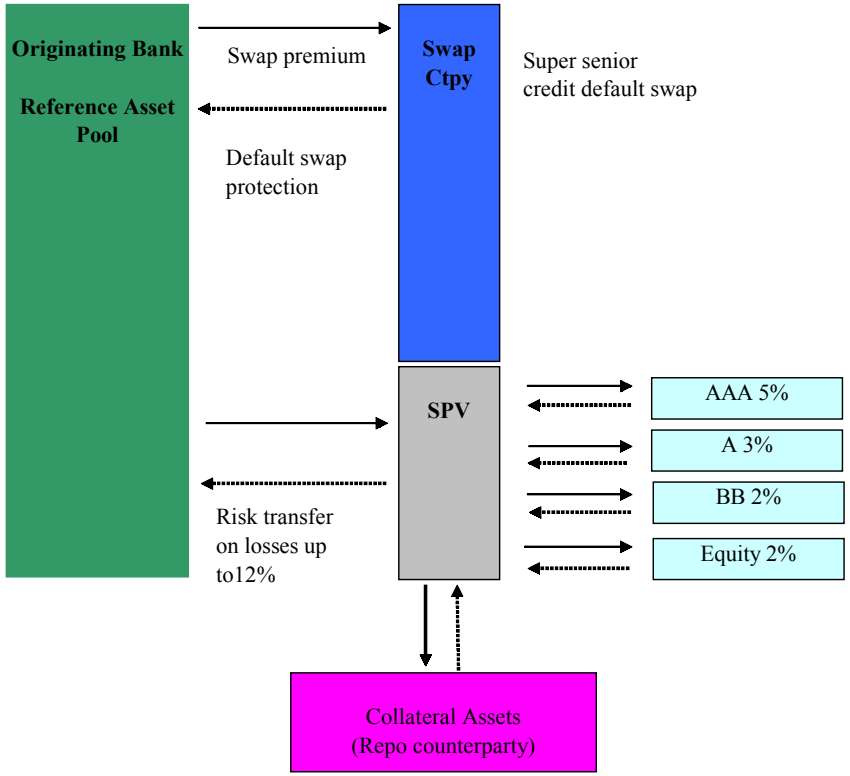
Using credit derivatives in securitisation

- **True sale versus synthetics: a true sale via SPV**
  - has higher costs
  - less flexibility
  - takes longer to bring to market
  - is more difficult across multiple legal and regulatory regimes
- **Unified documentation (ISDA)**
- **Flexibility to create customised exposure**
- **Enables separation of funding and credit risk management**
- **Synthetic CDOs**
  - "Second generation" CDO use CDS and/or CLN or SPV; unfunded, partially funded / fully funded
  - Third and fourth generation CDOs: Hybrid CDO mixing elements of synthetic CDO with cash assets (eg., Deutsche Bank "Jazz")
  - Managed synthetic or "CSO" (Robeco III)

Synthetic CDOs...

- Synthetic CDOs comprise over 50% of total CDO issuance and are in a greater majority in European market (source: Fitch).
- Synthetic CDOs combine securitisation techniques with credit derivatives and were introduced in Europe in 1998.
- **Mechanics:** the originator transfers the credit risk of a pool of reference assets via a **credit default swap**, or transfers the total return profile of the assets via a **total return swap**.
- Typically an SPV issues one or more tranches of securities which are the **credit-linked notes**, whose return is linked to the performance of the reference assets.
- Proceeds of note issuance form the first-loss protection reserve and are usually invested in liquid AAA-rated collateral.

Generalised partially funded synthetic CDO



- The majority of the credit risk is transferred by the "super senior" credit default swap
- The riskier element is transferred via the SPV which issues default swaps (unfunded) or credit-linked notes (funded)
- The first-loss piece is the unrated equity note.
- Each note has a different risk/return profile

Motivation behind synthetic CDOs

- The primary motivation for entering into an arbitrage CDO is to exploit the yield mismatch between a pool of assets and the CDO liabilities.
- Motivation behind a balance sheet CDO is to manage regulatory risk capital and engineer more efficient capital usage
- **Advantages of a synthetic structure**

  Typically the reference assets are not actually removed from the sponsoring firm's balance sheet. For this reason:

  - **synthetic CDOs are easier to execute than cash structures:** the legal documentation and other administrative requirements are less burdensome
  - **there is better ability to transfer credit risk:** especially partial claims on a specific credit reference asset
  - **risk transfer achieved at lower cost:** the amount of issuance is small relative to the reference portfolio. In a "partially funded" structure, funding is mainly provided by the sponsoring financial institution at lower cvost than fully funded structures.
  - **Lower risk weightings:** eg., 100% corporate loan vs 0% on funded portion

Synthetic Arbitrage CDOs

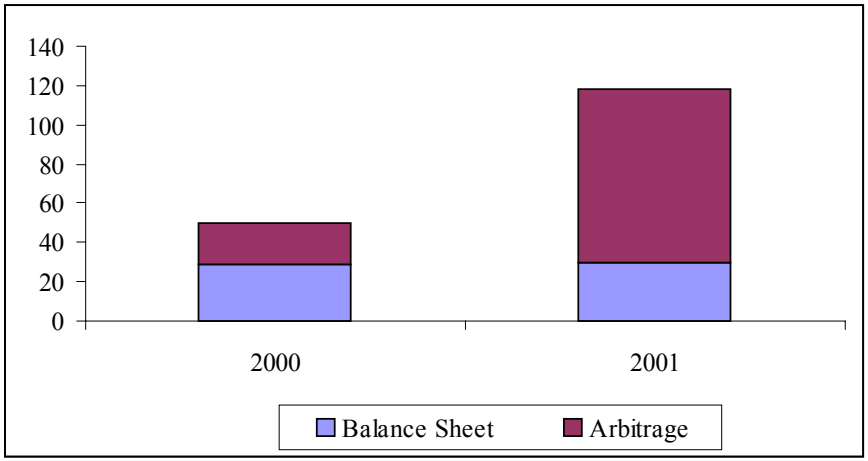
- Synthetic arbitrage CDOs create a leveraged exposure to the reference portfolio of bonds and/or loans
- The portfolio manager and investors seek to achieve returns on a leveraged basis [the arranging bank generates fee income and a means to market its origination activity].
- Typically the SPV enters into a series of TRS on a portfolio of assets that represent different obligors across country and industry. The portfolio may be in place at start (“close”) of deal, or “ramped up” after close, and is actively managed by the portfolio manager
- Under terms of the TRSs, the SPV pays Libor plus spread to bank swap counterparty, generally in line with bank;’s funding costs, and receives the total return on reference portfolio. SPV also issues notes/equity which are the first-loss pieces of the portfolio. The reference portfolio is typically funded on-balance sheet by the arranging bank
- The TRS is marked-to-market, hence there is market risk exposure not experienced in cash flow CDOs

Synthetic Balance Sheet CDOs

- Banks have originated synthetic CDO structures both to manage credit risk and to manage economic and regulatory capital, thereby improving return on capital
- Synthetic CDOs enable banks to achieve capital relief at lower funding levels compared to cash flow CDOs
- Later balance sheet CDOs are “CDO of ABS” (CIBC Euromax), transferring portfolio risk of structured bonds via partially funded CDOs
- Originating bank enters into super senior CDS (usually up to 100 or more separate CDSs). SPV issues notes up to 5 or more tranches whose overall return is linked to performance and default of reference assets. The originator retains the equity piece as comfort to investors.
- Note proceeds are invested in AAA-rated collateral, sometimes part of this invested in a “GIC” cash account.
- Most deals are *partially funded* with swap up to 95% of pool value, reflecting capital management motives rather than funding motives. Bank obtains capital relief through partially funded structure, with CDS providing credit protection and thereby lower capital charge

Development of Synthetic CDOs in Europe

- Within Europe synthetic CDOs have proved more popular than cash flow structures in both balance sheet and arbitrage categories
- Synthetics have evolved into “fourth generation” structures and borrowed featires of cash flow CDOs, such as call features of notes and early amortisation triggers, and active management of collateral pool
- Expected developments in areas such as CDO of CDOs, and new asset classes such as funds (“CFOs”) and equity investments.

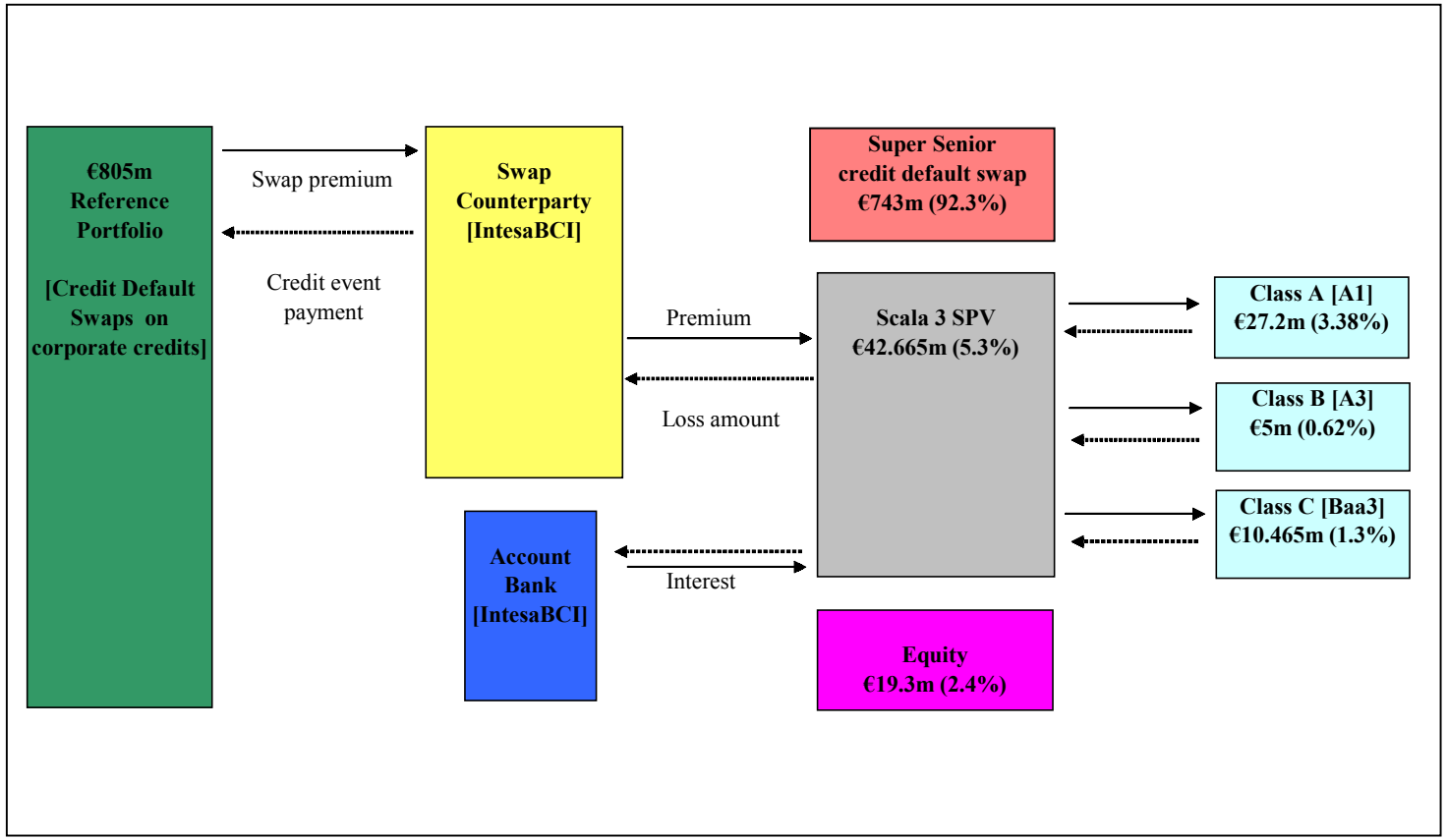


(Source: Moodys)

Scala Synthetic 3 plc

- This is a €805 million synthetic CDO comprised of a static reference pool, the deal originated by **IntesaBCI** with dublin SPV
- The reference portfolio is 80 European credits with Moody's diversity score of 53 and weighted average five-year rating factor of 269.
- IntesaBCIi enters into a credit default swap known as the "reference CDS" related to the portfolio of corporates. It buys protection from SPV.
- On occurrence of a credit event, a "Loss Amount" is calculated; when the cumulative loss amount becomes greater than the reference CDS threshold amount, Scala 3 pays the excess to IntesaBCI as credit protection. This is funded from the reserve account. The total value of the credit protection payment is related to a specified notional amount of its exposure to reference portfolio, equal to funded portion (€42m)
- Credit events are failure to pay; restructuring, bankruptcy, etc

Structure diagram: Scala 3



Scala Synthetic 3 plc summary

Class	Amount €m	Percent	Issue Price	Rating	Coupon Euribor 3m +
Senior swap	743.015	92.3	NR	AAA	-
A	27.2	3.38	100	A1	63 bps
B	5	0.62	100	A3	87 bps
C	10.465	1.3	100	Baa3	112 bps

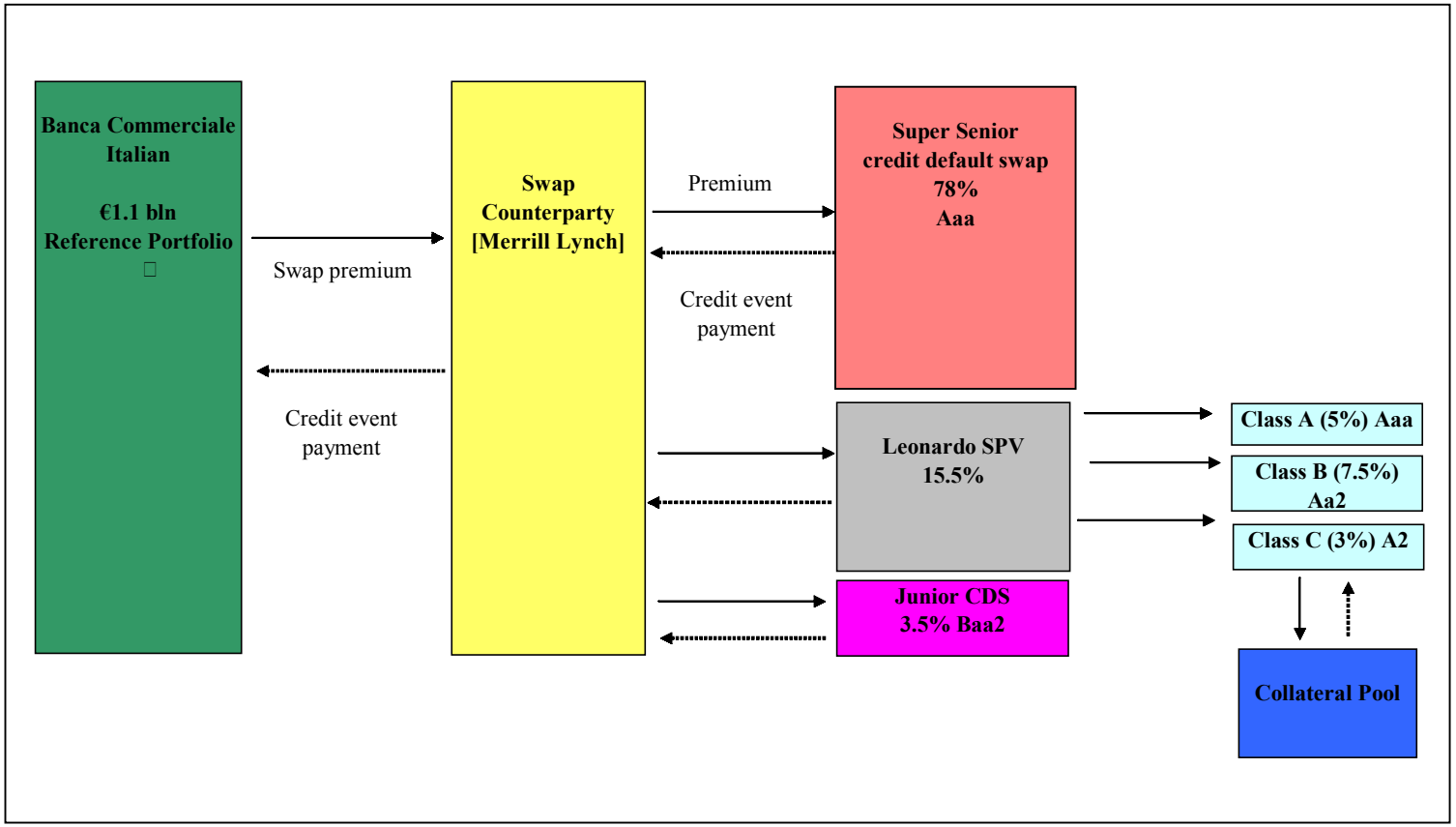
(Source: Moodys)

- Issue date July 2001
- Legal maturity July 2001
- Notional amount €805 million

Leonardo Synthetic plc

- This transaction is a synthetic securitisation of aircraft financing and aviation industry loans.
- The originator is Banca Commerciale Italiana, the objective of the deal is to transfer the credit risk exposure from a pool of aviation sector loans. This is achieved by means of a CDS between BCI and the swap counterparty (Merrill Lynch). The structure is partially funded by an SPV issue of CLNs. Note issuance is collateralised by Italian government bonds (Class A and B) and GIC account (Class C), which is loss reserve.
- As defined in deal documentation, credit events occur in the event of a failure to pay by obligor, which are airlines, and not the SPV. Investor exposure is therefore to reference obligor only.

Structure diagram: Leonardo



Leonardo Synthetic plc summary

Class	Amount €m	Percent	Issue Price	Rating	Coupon Euribor 3m +
Senior swap	780	78	NR	Aaa	-
A B C	55 82.5 33	5.0 7.5 3.0	100 100 100	Aaa Aa2 A2	[ ] [ ] [ ]
Junior CDS	35	3.5	NR	Baa2	

(Source: Moodys)

Asset-swap pricing

- 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.

Significance of asset-swap pricing

- The valuation of credit default swaps using the asset-swap technique was very common at the inception of the market and is still used today.
- Perhaps the most significant aspect of this is its use by middle-office risk managers and also by external auditors. When checking a traders mark-to-market, these areas frequently use this technique to obtain a valuation.
- To maintain credibility in the market, it is essential that the independent valuation of credit derivatives be as accurate as possible.
- For a number of reasons though, the credit default swap price will differ from the asset swap price.

Pricing differentials

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 swap 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 default swap seller:** 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

Simple illustration

- **Air Products and Chemicals 6.5% July 2007.**
- 18 January 2002, the asset-swap price for this bond to maturity was 41.6 bps.
- The CDS price to the same maturity was approximately 115 bps
- Using Bloomberg screens ASW and CDSW, we can see the source curves used in pricing the cash and synthetic markets
- On screen CDSW the user can select the generic discounted credit spreads model, or the JPMorgan Chase credit default swap pricing model.

<HELP> for explanation. N172 Corp **CDSW**

1<GO> to save Deal, 2<GO> to save curve source

CREDIT DEFAULT SWAP

Deal Information — 1<GO> Save Deal

Reference: **AIR PROD & CHEM**
Counterparty: [redacted] Deal#: [redacted]
Ticker: /[redacted] Series: [redacted] Privilege: U 68114
Business Days: EUR [redacted] Settlement Code: EUR
Business Day Adj: 0 None

Notional Amt: 10.00 MM Currency: EUR
Effective Date: 1/23/02
Maturity Date: 1/23/07 Day Count: ACT/360
Payment Freq: Q Quarterly Month End: N
Pay Accrued: T True First Cpn: 4/23/02
Use Curve Rate: T True Next to Last Cpn: 10/23/06
Recovery Rate: 0.50 22<GO> Coupon Dates
Deal Spread: 111.0 bps

Calculator

Settlement Date: 1/23/02 Model: D JPMorgan ids

Market Value: .00
PV01: 4382.64
Accrued: 0.00

Spreads

Source: S R-B Spreads
2<GO> Save Source
Curves: 20<GO> View Rates
Benchmark: S45 AAsk
EU BGN Swap Curve
Risky Crv: F 942
€ U.S.A. A3

Par Cds Spreads	(bps)	Default Prob
6 mo	75.4	0.007640
1 yr	71.4	0.015072
2 yr	89.7	0.039534
3 yr	93.0	0.064568
4 yr	102.4	0.097567
5 yr	111.0	0.134766
7 yr	124.0	0.217296
10 yr	141.5	0.354706

Frequency: Q Quarterly
Day Count: ACT/360
Recovery Rate: 0.50
21<GO> Save as User Sprds

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