Using derivatives to manage financial market risk and credit risk

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Moorad Choudhry

www.YieldCurve.com

Agenda

- Risk
- Hedging risk
- Derivative instruments
- Interest-rate and credit derivatives
  - **FRAs, Futures and Swaps**
  - **Credit default swaps and Total return swaps**
  - **Case study: ALCO 1 CDO**

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Risk

- Participants in the financial markets are, to some extent, exposed to risk as part of their normal operations. This is broadly defined as “uncertainty as to future outcomes”.
- This focus is on risk exposures of investment banks and commercial banks
- Risk is unavoidable and a normal course of undertaking the main operating activities of an investment bank. The bank seeks to effectively manage its risk exposure.
- The value-added by banks is in effect, as a risk manager: taking on risk as part of its normal service to clients
- The two main types of risk exposure are **market risk** and **credit risk.**

Market Risk

- Market risk is risk arising from movement in prices in financial markets. The most straightforward is price risk: I buy common stock at £1.00 per share….the risk is that the price of the stock falls below £1.00 while I am still holding it.
- Market risk includes
  - Foreign exchange risk
  - Interest-rate risk
  - Basis risk
- Banks will necessarily incur such risks in their daily operations. To maximise profit they will seek to minimise risk of loss by engaging in hedging.

Credit Risk

- Credit risk is a form of market risk that arises when one is holding assets that are not credit-risk free.
- Examples of such assets are corporate bonds, corporate loans, letters of credit, a line of credit, and so on.
- If the borrower of credit (“obligor”) is unable to service a loan or to repay it in full when the loan falls due, the lender experiences loss due to default.
- Banks routinely are exposed to credit risk during their normal course of activities. The “price” of credit risk is the spread on interest rate payable by the obligor over a risk-free asset interest rate.
- Commonly the risk-free asset is the benchmark government bond.

Hedging risk

- Banks hedge risk to minimise losses arising out of market or credit factors.
- Hedging can be undertaken by
  - Effecting the opposite position in the same instrument
  - Entering into offsetting agreement of similar credit risk
  - Using derivatives
- Some assets are easier to hedge than others: a government bond, for example, versus a corporate loan
- Some risks can be hedged in a number of different ways, such as interest-rate risk, using different instruments

Derivatives used to hedge interest-rate risk

- Consider this position:
  - I buy £100 million of government bonds. If the yield required on these bonds by the market rises, the price will fall and I will suffer a mark-to-market loss. To guard against this I can put on a short position in a bond that represents similar i-r risk, or I can use derivatives
- Banks often prefer to use derivatives because they are more liquid, and because they can be tailored to meet specific requirements
- These can include:
  - Forward rate agreements
  - Interest rate futures
  - Swaps
- Lets consider these….

Forward rate agreements

- Forward rate agreements (FRAs) are used to hedge short-term interest rate exposure.
- A FRA is a bilateral “over-the-counter” derivative contract is a forward starting loan, but with no exchange of principal between the two parties. The “loan” is contracted at a fixed interest rate.
- The buyer of the FRA is “borrowing” the amount contracted (but not really…!). The seller of the FRA is “lending” funds, say three-month money. Imagine the FRA is traded at 6.00%, for settlement in one month’s time, and for £10 million. So it is a 1v4 FRA.
- In one month’s time, if the rate for three-month money is higher than 6%, (let us say 6.5%), the seller will pay 0.5% of £10m, for three-month’s worth interest
- **Examples…**

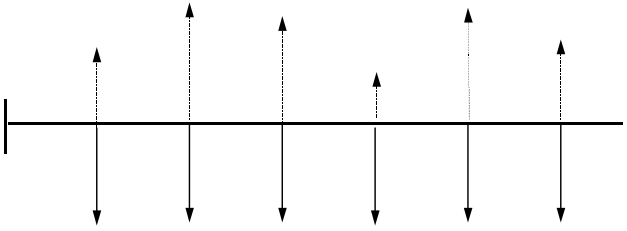
Interest rate futures

- These are exchange-traded contracts. This makes them standardised contracts of very high liquidity.
- The main types are short-dated Libor contracts such as the short-sterling contract on LIFFE, and bond futures such as the long gilt contract on LIFFE.
- The hedger would calculate risk exposure and then the equivalent number of contracts to match (and offset) this exposure.
- If the market moves against the bank, the gain on the future should offset the loss on the main position.
- **Examples…**

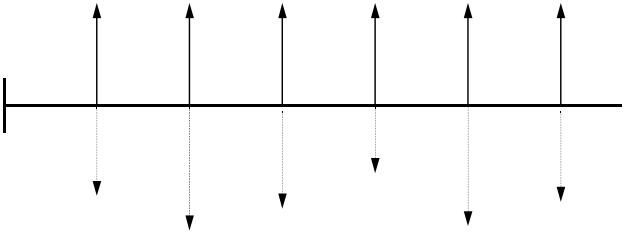
Interest rate swaps

- Interest-rate swaps are the most commonly traded derivative instrument in the market. They were first introduced just over 20 years ago and now every money centre in the world will have banks prepared to make a market in them.
- They are used to transform an interest rate basis, and so can be used to hedge interest-rate risk exposure.
- For a vanilla swap, two parties will enter into a contract for a *notional* amount, and agree to pay interest on this sum at periodic intervals. One party will be the fixed rate payer and the other the floating-rate payer.
- The fixed rate is the swap rate, the floating rate is not known until each fixing date and is based on libor.
- **Examples…**

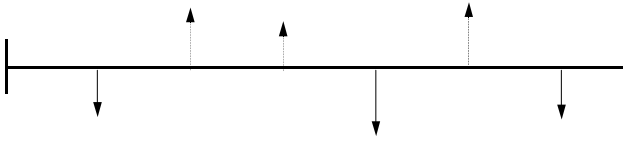
Interest rate swaps



(i) Cash flows for fixed-rate payer



(ii) Cash flows for floating-rate payer



(iii) Net cash flows

fixed payments

floating payments

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Interest rate swap example

Consider two companies borrowing costs for a 5-year loan of £50m

Company A: can pay fixed at 8.75% or floating at Libor. Its desired basis is floating.
Company B: can pay fixed at 10% or floating at Libor+100bp. Its desired basis is fixed.

Without a swap :
Company A borrows fixed and pays 8.75%.
Company B borrows floating and pays Libor +100bps

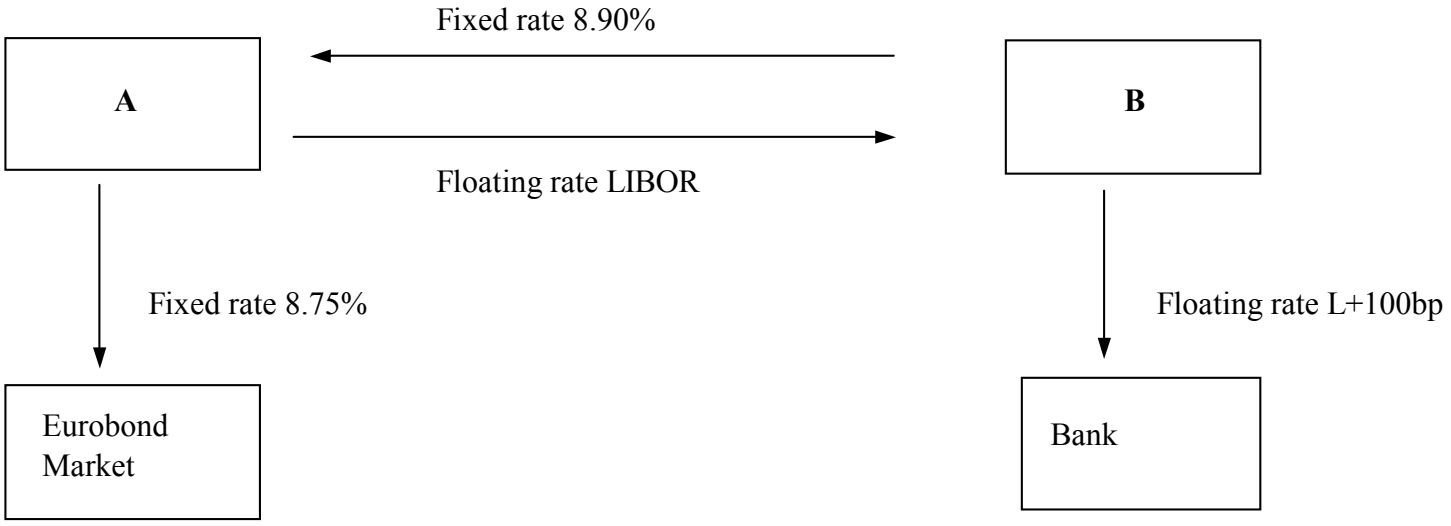
Let us say that the two companies decide to enter into a swap, whereby company A borrows floating-rate interest and therefore receives fixed from company B at the 5-year swap rate of 8.90%. Company B, who has borrowed at Libor+100bp, pays fixed and receives Libor in the swap. Company A ends up paying floating-rate interest, and company B ends up paying fixed. This is shown in the diagram below.

Result after swap:
A pays 8.75% + Libor - 8.90% = Libor-15bps
B pays Libor+100bps + 8.90% - Libor = 9.90%

Company A saves 15 bps (pays L-15bp rather than L flat) and B saves 10 bps (pays 9.90% rather than 10%).

Both parties benefit from a *comparative advantage* of A in the fixed rate market and B in the floating rate market (spread of B over A is 125 bps in the fixed-rate market but 100 bps in the floating rate market).

Interest rate swap example diagram



Derivatives to manage credit risk

- Credit derivatives are a relatively recent product, dating only from 1994 onwards, and were initially introduced by investment banbks for commercial bank customers looking to hedge loan books against default risk.
- Initially banks did not want to remove the loans themselves as this would impair customer relationships.
- Credit derivatives enabled banks to transfer the default risk associated with a corporate loan, without removing the loan itself.
- The market has rapidly grown into a large and liquid one, with over 20 banks in the City prepared to make markets in the two main types of credit derivative.

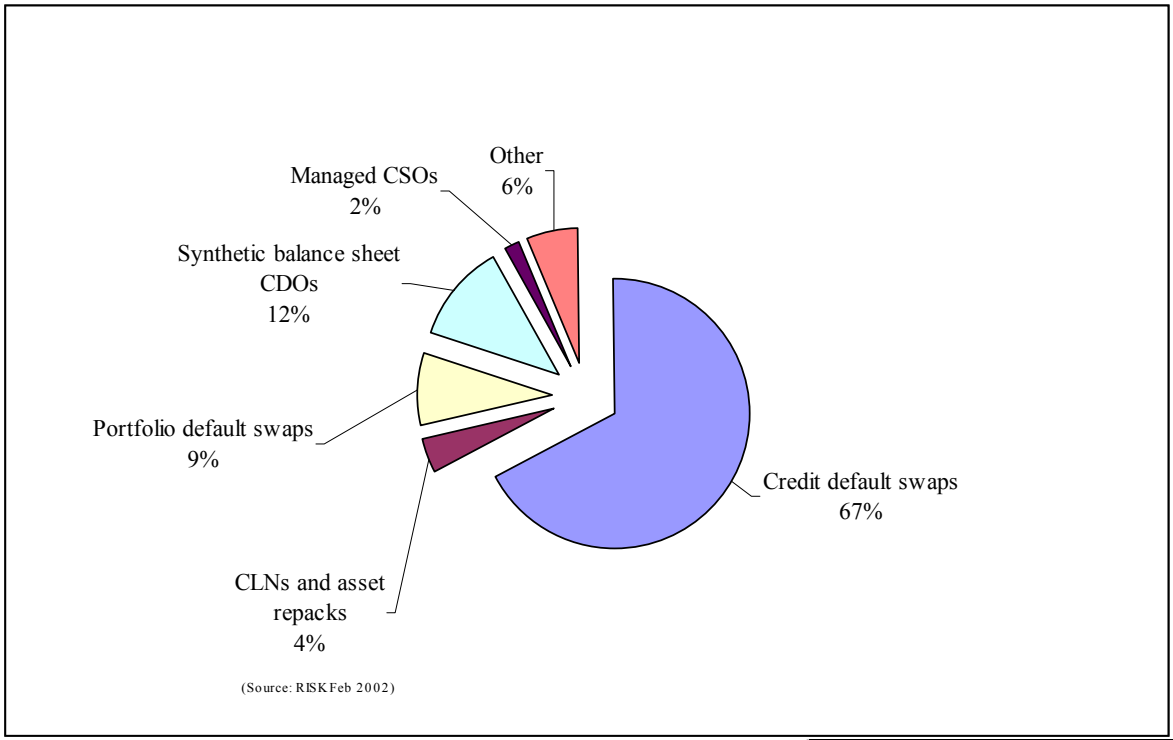
Credit derivatives

- Credit derivatives are instruments that allow the isolation and management of credit risk from all other elements of risk
- **Types of credit derivative:**
  - **Credit default swap**
  - **Total return swap**
  - **Credit-linked notes**
  - **Credit spread products**
  - **Credit spread options**
- 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

Credit Derivatives

- **Credit derivatives** are bilateral OTC contracts designed to reduce or eliminate credit risk exposure and enable credit risk to be taken on or reduced synthetically. Include credit default swaps, total-return swaps and CLNs.
- With a credit derivative one is transferring credit risk of specified asset to a 3rd party while keeping the asset on the balance sheet – so not a "true sale" but use of loss definitions to hedge risk exposure
- A **single-name** credit derivative names one reference entity. Basket or portfolio credit derivatives 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

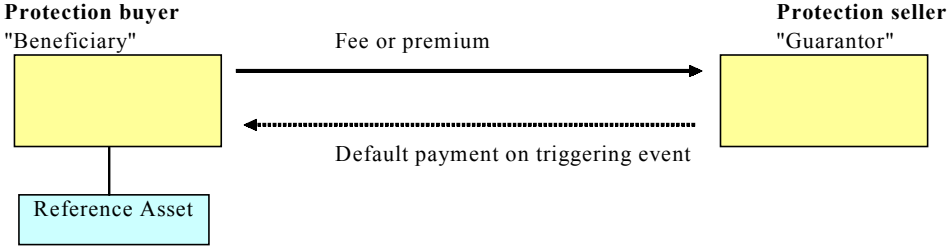
Volume and product: end-2001



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

Credit derivatives

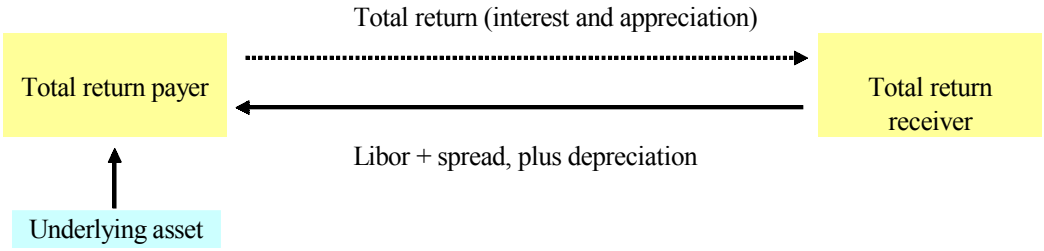
- With a credit derivative one is transferring credit risk of specified asset(s) to a 3rd party while keeping the asset(s) on the balance sheet – so not a “true sale” but use of loss definitions
- In a credit derivative contract the buyer of protection pays a premium to the seller of protection, who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

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.

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

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 Collateralised Debt Obligations**
  - "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" (eg., Robeco III and IV)

Synthetic CDOs...

- Synthetic CDOs combine securitisation techniques with credit derivatives and were introduced in Europe in 1998.
- A vehicle used to transfer credit risk via credit derivatives, rather than via a “true sale” of receivables to an SPV. The variations include:
  - Funded synthetic, where liabilities are solely credit-linked notes
  - Unfunded, where liabilities are solely credit default swaps
  - Partially funded: both credit-linked notes and credit default swaps
- The originator transfers the credit risk of a pool of reference assets via **credit default swaps**, 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.
- Synthetic CDOs have evolved into a number of forms (**static, dynamic, managed**)

Motivation behind synthetic CDOs

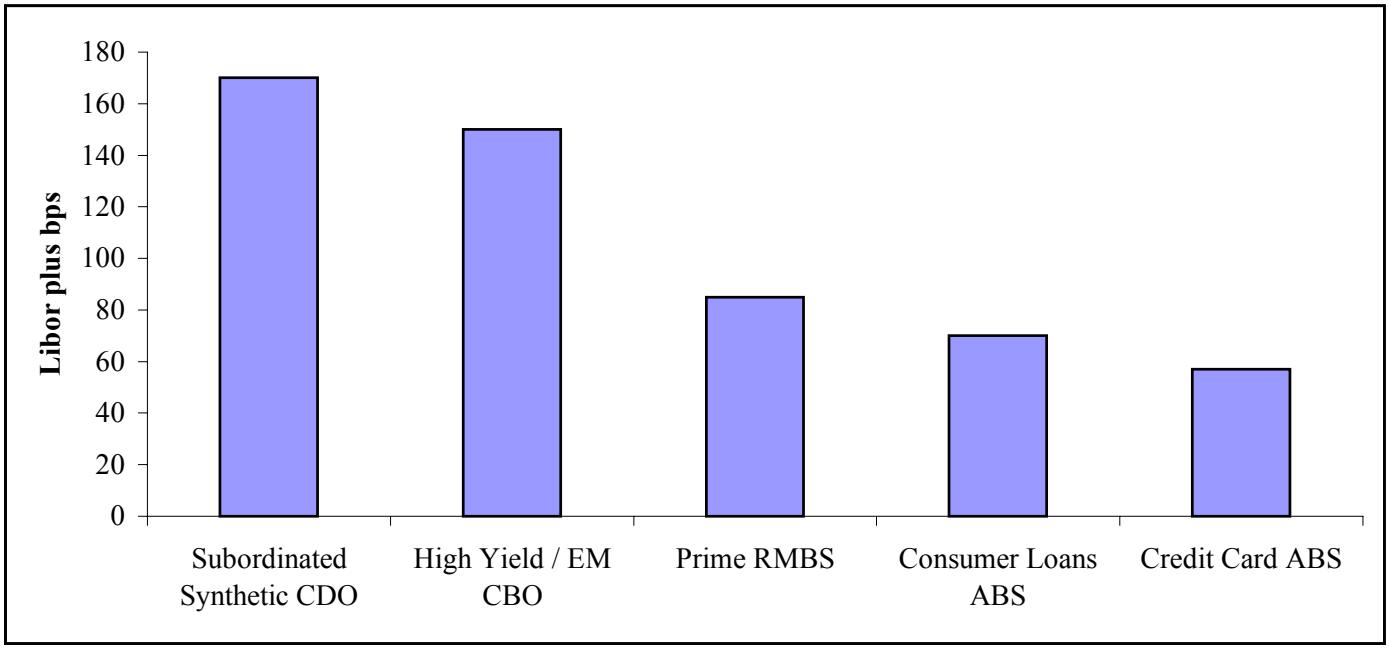
- The primary motivation for entering into an arbitrage CDO is to exploit the yield mismatch between a pool of assets and the CDO liabilities.
- Motivation behind a balance sheet CDO is to manage regulatory risk capital and engineer more efficient capital usage
- **Advantages of a synthetic structure**

  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 cost than fully funded structures.
  - **Lower risk weightings:** eg., 100% corporate loan vs. 0% on funded portion

Some ideas on yield (€ assets)

Average spreads over Libor as at February 2002



(Source: Bloomberg)

CASE STUDY

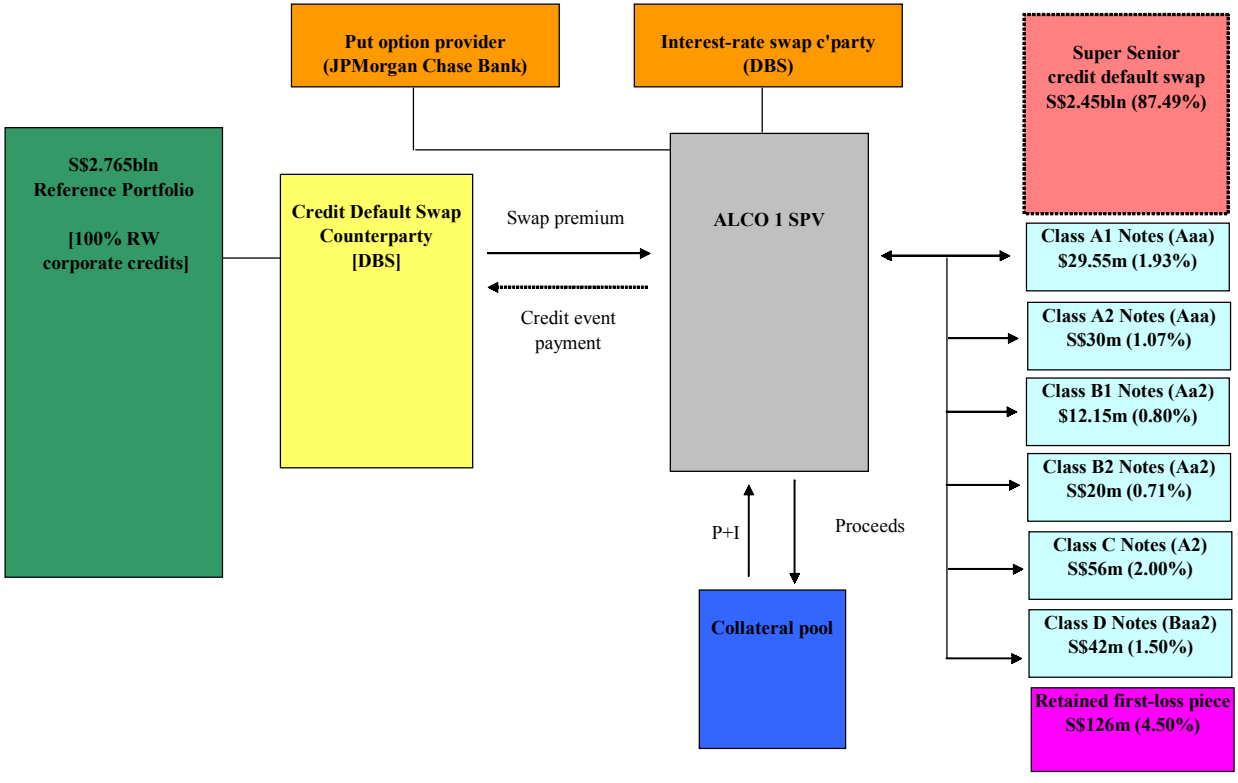
Development Bank of Singapore (DBS) and ALCO 1 Limited

- Issuer: ALCO 1 Limited
- Originator: The Development Bank of Singapore Ltd
- Arrangers: JPMorgan Securities Ltd and DBS Ltd
- Trustee: Bank of New York
- Currency swap and put option: JPMorgan Chase Bank
- Interest rate swap: DBS Ltd
- “The first rated synthetic balance sheet CLO from a non-Japanese Asian bank” (Moody’s)

ALCO 1 Limited, Series 1 Notes

- Development Bank of Singapore (DBS) originated Asia's first (ex-Japan) balance sheet partially funded synthetic collateralised debt obligations (CDO) in December 2001.
- Structure allows DBS to shift the credit risk on a S$2.8 billion reference portfolio of mainly Singapore corporate loans to a special purpose vehicle, ALCO 1, using credit default swaps.
- As a result: DBS can reduce the risk capital it has to hold on the reference loans, without physically moving the assets from its balance sheet.
- Structure is S$2.45 bln super-senior tranche – unfunded credit default swap – with S$224m notes issue and S$126m first-loss piece retained by DBS. The notes are issued in six classes, collateralised by Singapore government T-bills and GIC account
- By structuring the deal in this way, DBS obtains **capital relief** on the funded portion of the assets, but at lower cost and less administrative burden than a traditional cashflow securitisation, and without having to have a true sale of the assets.

ALCO 1 structure diagram



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Note tranche summary

Class	Amount	Per cent	Rating	Interest rate
Super senior swap	S$2.450m	87.49%	NR	N/A
Class A1	US$29.55m	1.93%	Aaa	3m USD Libor + 50 bps
Class A2	S$30m	1.07%	Aaa	3m SOR + 45 bps
Class B1	US$12.15m	0.80%	Aa2	3m USD Libor + 85 bps
Class B2	S$20m	0.71%	Aa2	3m SOR + 80 bps
Class C	S$56m	2.00%	A2	5.20%
Class D	S$42m	1.50%	Baa2	6.70%

(Source: Moody's)

- Credit support comes from first-loss piece (S$126m) plus note seniority
- Legal maturity March 2009
- Notional amount S$2.765 bln, of which S$224m notes issue

Deal arrangement – a “balance sheet synthetic”

- The issuer enters into a portfolio credit default swap with DBS as the CDS counterparty to provide credit protection against losses in reference portfolio
- In return for protection premium payments, after aggregate losses exceeding S$126 million “threshold” amount, the Issuer is obliged to make protection payments to DBS. The maximum obligation is the S$224m note proceeds value
- Losses above the threshold amount will be allocated to Notes in their reverse order of seniority.
- The Note proceeds are invested in collateral pool comprised initially of Singapore Treasury bills
- During the term of the transaction, DBS as the CDS counterparty is permitted to remove any eliminated reference obligations that are fully paid, terminated early or otherwise no longer eligible. In addition DBS has the option to remove up to 10% of the initial aggregate amount of the reference portfolio, and **substitute** new or existing reference names.

Recommended reading

Risk Management: Problems and Solutions

Beaver / Parker, McGraw-Hill 1995

Bond Market Securities

Moorad Choudhry, FT Prentice Hall 2001

Capital Market Instruments: Analysis and Valuation

Moorad Choudhry *et al,* FT Prentice Hall 2001

Financial Engineering

Lawrence Galitz, FT Pitman 1995

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info@yieldcurve.com

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