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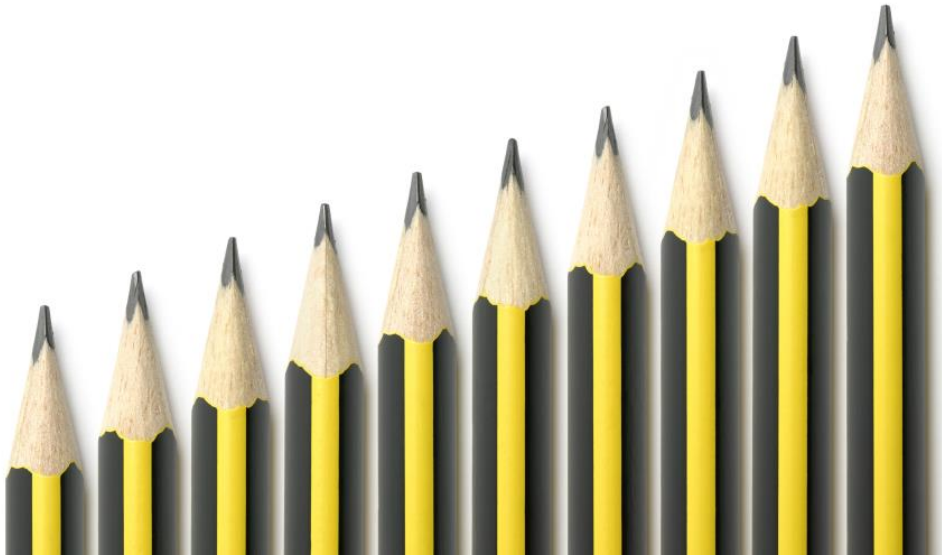
Introduction to Derivative Instruments – Part 2

Link'n Learn



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Preface

This presentation (along with Webinar Link'n Learn: Introduction to derivatives Instruments Part 1) is designed to give an introductory overview of the characteristics of some of the more prevalent derivatives along with addressing some topical issues currently faced when valuing these instruments.

Further learning references regarding valuation and analysis of these instruments will be referenced at the end of this webinar.

Contents

1. Introduction

Recall from our first presentation that a derivative is a financial instrument who's value changes in response to changes in the value/level of an underlying variable.

Its value is derived from the value of the underlying. For example:

Interest rate swap	• Value is derived from current spot and forward interest rates
Commodity forward	• Value is derived from the spot value of the commodity
Equity option	• Value is derived from the spot value of the equity

Other characteristics of derivatives

- There is either no initial net investment (e.g. interest rate swap) or an initial net investment that is smaller than would be required for other contracts with similar responses to market movements (e.g. an equity option)

- It is settled at a future date or series of future dates.

Uses of derivatives

- Hedging
  - Use an IRS to hedge an interest rate exposure
- Speculation
  - Use an option to get leveraged equity exposure
- Arbitrage
  - Buy commodity forward for 100 in one market / sell same for 150 in another market

Leverage example

XYZ shares currently trade at EUR 100. We believe these shares will perform well in the coming year.

Choice?

1. Invest EUR 100k directly in XYZ shares (i.e. buy 1,000 shares)

Or

2. Invest EUR 100k in call options at strike EUR 110, expiring at year end.

These options cost EUR 5 per option where each option gives the holder exposure to 1 share of the underlying equity.. Therefore, we have purchased the option to buy 20,000 shares at EUR 110 per share, at expiry.

Let's look at two outcomes at year end (option expiry)

1. XYZ shares trade at EUR 120

1. We have seen a 20% growth in our initial investment.
   It is now worth EUR 120k
   = 100k * (120/100)

2. We have seen a 100% growth in our initial investment of EUR 100k.
   We will realise EUR 200k if we exercise the option
   = 20,000 * max (120-110, 0)

Let's look at two outcomes at year end (option expiry)

1. XYZ shares trade at EUR 90

1. We have seen a 10% loss on our initial investment.
   It is now worth EUR 90k
   = 100k * (90/100)

2. We have seen a 100% loss on our initial investment of EUR 100k.
   The option are worthless
   = 20,000 * max (90 -110, 0)

1. Credit Linked Notes

Definition:

A credit linked note (CLN) is a form of funded credit derivative. It is structured as a security with an embedded credit default swap allowing the issuer to transfer a specific credit risk to credit investors.

It is issued by a special purpose company or trust, designed to offer investors par value at maturity unless the referenced entity defaults in which case the investors receive a recovery rate. The trust will also have entered into a credit default swap with a dealer. In case of default, the trust will pay the dealer par minus the recovery rate, in exchange for an annual fee which is passed on to the investors in the form of a higher yield on their note.

The purpose of the arrangement is to pass the risk of specific default onto investors willing to bear that risk in return for the higher yield it makes available.

Example

Let's suppose a trust issues medium term notes and wants to structure a CLN. How is it put together? Typically the trust would select a reference entity and would then sell protection using a credit default swap (CDS) on that selected reference entity. Selling protection would mean the trust received a regular fixed payment from the CDS counterparty (dealer). The following example assumes that the CDS is physically settled.

The trust now issues the CLN. The CLN would be for the same principal amount and maturity as the CDS. The final terms of the CLN would mirror the terms in the CDS transaction.

The CLN investor would pay cash to the trust to buy the CLN. The trust would pay the investor regular interest until the maturity of the note.

Provided there is no credit event by the reference entity the investor receives back the principal investment on the maturity of the note

What happens if the reference entity experiences a credit event?

The CLN investor will experience a credit loss, this is what happens:

1. The CDS on which the trust sold protection is triggered. The trust pays to the CDS counterparty the principal amount of the CDS in cash. The trust receives in return a deliverable instrument normally a bond that was issued by the reference entity that is now in default.

2. The CLN is also triggered. The investor does not get his principal returned, instead the trust delivers the deliverable bond to the CLN investor.

The investor will have experienced a loss as a result of the credit event because the delivered bond will be worth less than the original sum invested. The scale of the loss incurred will depend on the market value of the delivered bond.

Why investors purchase CLNs

- The investor has the credit risk on the reference entity as well as the CLN issuer and therefore obtains a **higher return** on the CLN than would have been achieved on a normal medium term note.

- This means that different CLNs can be issued that exactly fit the investor's criteria including return, rating, maturity and amount. It can also mean that investors who are restricted from using credit derivatives because of operational, legal or regulatory constraints can still create the investments they want.

- Furthermore some investors are "real" investors - they have cash and need to use it. CLNs are cash based investments and meet these investor's requirements.

Why issuers sell CLN's

- The issuer receives cash from the sale of the CLN. This has two advantages:
    - First it can mean that the cost of funding for the issuer can be at or below the target cost of funding.
    - Second because the issuer has cash it means that the embedded CDS is effectively 100% cash collateralised, (remember that the issuer is selling protection to the market place but buying protection from the investor). If there is a credit event the issuer is in control of the cash and is not dependent on the performance of the investor, (as it would normally be the case with a CDS).

2. OIS Discounting

Valuation Matters

Valuation Approach used for Interest and FX Swaps and forwards

- Fair value of IRS, FX swap and forward at inception is usually Zero

- Once the swap is struck, its market value will generally no longer be zero because:

  a) interest rate will change over time

  b) market value of swaps will change over time due to changes in implicit forward rates

  c) Change in counterparty risk (credit spreads)

OIS Discounting – Why the change?

- Before the onset of the credit-crisis in 2007, derivatives dealers used LIBOR, the short-term borrowing rate of AA-rated financial institutions, as a proxy for the risk-free rate.

- However, the onset of the credit crisis during 2007-2010 raised questions about the liquidity and creditworthiness of big banks and affected how deals such as interest-rate swaps are entered into and valued.

- Dealers were under increasing pressure to mitigate counterparty risk associated with OTC derivative transactions, especially after the Lehman collapse and its default on OTC derivative counterparty obligations. This lead to a movement toward use of more stringent measures requiring daily margin/collateral calculations and maintenance.

OIS Discounting – Why the change? (cont'd)

- Amidst all this change, central banks, such as the U.S. Federal Reserve, continued to provide abundant liquidity via their bank lending windows using Fed Funds ("cash") and short dated T-Bills. These short dated "risk free" assets became the acceptable deliverable assets for collateral maintenance.

- Additionally, regulatory investigations into the computation of LIBOR by large banks that are members of the LIBOR fixing panels led to distrust of LIBOR as an "accurate and fair" market rate fixing.

- The combination of these various market trends led toward market adoption of the overnight index swap (OIS) curve as the "new risk-free swap curve."

OIS Discounting - What is it?

- An Overnight Indexed Swap is a fixed/floating interest rate swap where the floating rate is calculated using the published effective federal funds rate (USD) or the euro overnight index average (Euros) or the sterling overnight index average (GBP) etc.

- OIS discounting means discounting the expected cash flows of a derivative using a nearly risk free curve such as an overnight index swap (OIS) curve.

- OIS-discounted swap rates are calculated with different formulae than the traditional LIBOR single-curve method, utilizing a dual-curve (DC) method.

- Dual curve discounting refers to the practice of using one interest rate curve to project a swap's cash flows and another curve to discount them.

- When calibrated to the same set of swap rates, the OIS/DC-stripped swap curve produces slightly different forward rates, and consequently forward swap rates, compared to those from the traditional single-curve LIBOR approach.

OIS Discounting – Issues

- The greatest challenge regarding valuations is the lack of available market data. Active OIS curves exist for only a few currencies.
- Although the curves may be quoted out to longer tenors, market liquidity is relatively deep only out to the five year term in most cases.
- Calibration of the dual curves can be also difficult in the case of cross-currency swaps because one has to calibrate an OIS curve in one currency based on the cross currency basis.
- Reporting issues: the transition from LIBOR to OIS curves may cause larger portfolio MTM changes resulting in greater income statement volatility.
- Furthermore challenges may arise in assessing hedge effectiveness, especially fair value hedges. There may be situations where the hedge uses OIS discounting but the hedged item continues to be valued based on LIBOR discounting. This could lead to increased ineffectiveness and a potential to fail to qualify as an effective hedge.

3. Credit Valuation Adjustment

Counterparty credit risk – what is it?

- Credit crisis also served to highlight the problem of **counterparty risk**

- Counterparty risk is the risk that an entity with whom one has entered into a financial contract (the counterparty to the contract) will fail to fulfil their side of the contractual agreement.

- Counterparty risk is typically defined as arising from two broad classes of financial products:

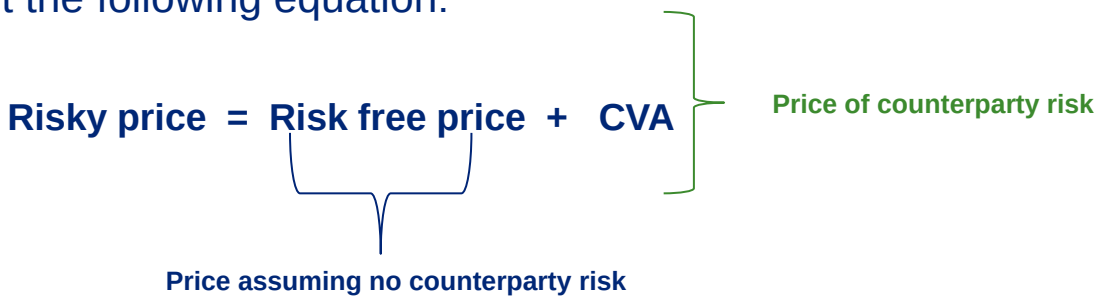
    1. OTC derivatives including interest rate swaps, FX forwards and credit default swaps. This is the most significant class due to the size and diversity of the OTC derivatives market and that a significant amount of the risk associated with these instruments is not collateralised.

    2. Securities financing transactions e.g. repos and reverse repos and securities borrowing and lending

Credit Valuation Adjustment (CVA) - Quantification

- Traditional calculation methods of counterparty risk tend to work in a binary fashion:
  - For example the use of a credit limit – if the limit is breached, financial institution would refuse to enter into a transaction.
  - Problem with this is that only the risk of a new transaction is being considered – but potential profit of the new transaction should also be a factor in the decision making process.

- By pricing counterparty risk, one can move beyond a binary decision making process:
  - The question of whether to enter a transaction becomes simply whether or not it is profitable once the counterparty risk component has been priced in.
  - In other words we adopt the following equation:



Credit Valuation Adjustment (CVA) – Quantification (cont'd)

- The CVA "charge" discussed in the previous slide needs to be calculated in a sophisticated way. Primarily it needs to include the following:
  - The default probability of the counterparty;
  - The default probability of the institution (known as DVA);
  - The transaction in question i.e. is it an interest rate swap or an FX forward;
  - Whether there are other offsetting positions with the counterparty that will result in a netting effect;
  - Whether of not the transaction is collateralised;
  - Any hedging aspects of the underlying transaction.
- As such, CVA attempts to price counterparty risk directly – decision by an institution to enter a transaction can now include whether or not the profit from the transaction more than covers the CVA "charge".

Credit valuation adjustment – challenges

- While CVA valuation methodologies are well advanced, they are still not standardised:
  - Can range from relatively simple to highly complex methods;
  - Methodology used largely driven by sophistication and resources available to market participant;
  - Depending on a particular participant, CVA can be quite large.

- Common challenge for all entities computing CVA is obtaining the necessary market data:
  - Requires some degree of judgement in coming up with proxy data in order to compute CVA;
  - Whether or not credit spreads are available.

- Regardless of methodology used to compute CVA, a certain level of expertise and management judgment is required to ensure that CVA has been considered and appropriately applied.

Useful references

Paul Wilmott on Quantitative Finance, Paul Wilmott

Option, Futures and Other Derivatives, John C. Hull

Credit Derivatives: Trading, Investing and Risk Management, Geoff Chaplin

Counterparty Credit Risk and Credit Valuation Adjustment, Jon Gregory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