CHANGES TO THE SYLLABUS AND CORE READING FOR SUBJECT ST6 FOR THE 2009 EXAMINATIONS

Changes to the Syllabus and their impact on Core Reading

There have been no changes to the Syllabus.

Changes to Core Reading

UNIT 16

Section 5.2

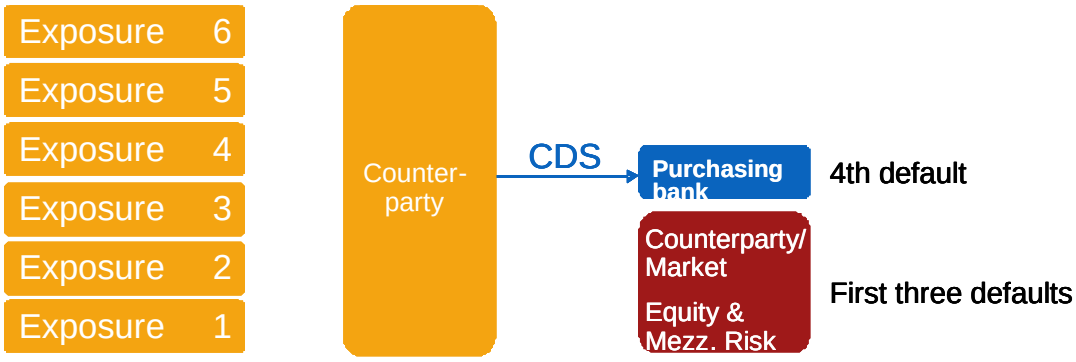
This section has been amended and augmented to the following:

5.2.2 Overview of basket default swap mechanics

Suppose an investor sells FTD protection on a six-name basket of reference credits. The investor receives a periodic payment (the "premium") in exchange for taking on the credit risk of the basket. If there are no credit events during the term of the basket default swap, the swap expires. However, if a credit event occurs during this term, the swap is terminated and the buyer of protection delivers compensation for the loss on the reference credit.

This process is similar to that of a single name credit default swap. A credit event is defined as in the single name market, with investors having the option of choosing whether to include restructuring as an event. When a credit event occurs, the seller of protection in the basket effectively loses the difference between the recovery value of the defaulted asset and par (100% of notional).

The following diagram illustrates a fourth-to-default swap with an underlying basket of six names:



In this example, the purchasing bank takes exposure to the fourth default via a CDS, whereas another counterparty (or the market in general) retains the exposure to the first three defaults. Unless the credits in the basket are very risky or highly correlated, the probability of recording a loss under a fourth-to-default CDS will be very low.

Hence an *n*th-to-default basket swap ($n > 1$) is similar to a senior Collateralised Debt Obligation (CDO) tranche. It is not exposed to initial losses, but is providing protection against increasingly severe loss scenarios (as *n* increases) arising from multiple credits default (sometimes known as "tail risk"). One key difference, though, is that the return profile of the protection seller in the *n*th-to-default basket ($n > 1$) is independent of the severity of the first loss.

Settlement in the event of default can be performed either physically using the reference entity (a security selected by the protection buyer that qualifies for delivery under the terms of the underlying default swap on the credit), or with a cash equivalent amount equal to an agreed difference between par and the recovery amount on the reference entity.

Quoted market prices for the swaps assume that the basket CDS seller/buyer would also buy/sell a delta-neutral amount of protection on the underlying credits from the basket. As with option delta-hedging, this enables the most efficient transaction to be put in place, since there would be no residual exposure to the credits at outset. If the investor wishes to trade without a delta-neutral transaction, the bid/ask spread would likely be wider.

5.2.3 Correlation

As with CDO tranches, correlation between defaults of the credits in a particular basket can have a dramatic effect on the pricing of the basket default swaps. This is because a higher correlation of default will result in a greater chance of a loss in the senior tranches (the higher values of *m* in the *m*th-to-default tranches). These tranches will therefore fall in price. Ultimately, if correlation is 100%, all the tranches will experience losses. Equally, if the overall expectation of loss for the portfolio remains unchanged, a higher correlation will result in a rise in price of the first-to-default tranche, the equity tranche. This is because the equity tranche will now share losses with the more senior tranches.

As a simple example, consider our basket of six credits, each with a default swap trading at a premium of 60bp (0.60%). In the case of 0% correlation, i.e. all credits are independent of each other, a first-to-default swap would carry a premium of approximately 300bp, the sum of the individual default swap premiums. But in the case of 100% correlation, the first-to-default swap would have a premium of 60bp, the maximum of the individual default swap premiums. The effect from correlation on the price of the first-to-default is clearly dramatic. The impact on the other tranches is lower, but more complicated to calculate.

So, fundamentally, an investor who buys or sells protection on a tranche is taking a view on correlation:

- An investor can be long correlation by being either long the FTD tranche or short a senior tranche.

- An investor can be short correlation by being either short the FTD tranche or long a senior tranche.

Mezzanine tranches, the middle values of *m* (e.g. second- or third-to-default from our basket of six credits), are more correlation neutral.

This sensitivity to correlation can change through time as a function of spreads, defaults and time decay. For instance, if all spreads in the underlying credits tighten significantly, a (correlation neutral) mezzanine tranche would begin to take on the correlation sensitivity of a senior tranche, i.e. as correlation increased, its premium would rise. Similarly, if all spreads widen significantly, the mezzanine tranche would begin to take on the correlation sensitivity of an equity tranche, i.e. as correlation increased, its premium would fall. The exact behaviour of this tranche would be a function of the magnitude of the spread change and the attachment point (value of *m*).

5.2.4 Uses of basket default swaps

5.2.4.1 Buying protection on a basket of credits

Buying first-to-default protection is effectively a way of shorting a basket of credits with less premium outlay than buying protection individually on each underlying credit. Since the swap gets terminated when the first credit event occurs, this makes the basket a better hedge for default risk (which ceases on a credit event) than spread risk (which continues to apply to the rest of the portfolio).

Buying FTD protection is also a way of hedging existing (long) exposure to credits, particularly for investors wanting to reduce concentration risk but not necessarily being negative on credit spreads. For example, if the investor has a generally positive view on the credits but would like to reduce concentration risk, rather than buying protection individually on a portfolio of names, buying protection on the basket will be cheaper and more useful. The buyer of protection is also effectively short correlation (i.e. an increase in correlation among the underlying names would be adverse).

Buying second-to-default protection (or more senior tranches) can be a significantly cheaper way of hedging existing long credit exposure when the investor is willing to take the risk of some losses on the first credit event, but wants to hedge against more severe default scenarios. The correlation exposure becomes more positive as the tranches become more senior.

5.2.4.2 Selling first to default protection

Suppose that an investor has a positive view on a basket of six credits and that each credit pays a premium of 60bp in the 5-year default swap market, as in the previous examples. By entering into six individual default swaps of £2 million each, the investor could gain notional exposure to each credit and effectively receive 60bp of premium per annum on £12 million notional for five years, assuming no credit event occurs. If there is one or more credit events, then there will be a principal loss on <u>each</u> default swap, as described above.

As an alternative, though, the investor could express a positive view on the same basket of credits by selling FTD protection on the basket with a notional amount of £12 million. This strategy can have advantages over the single-name approach, depending on the outcome.

If we assume a portfolio default correlation of 30% on the six-credit basket, the premium earned might be around 257bp (compared with a total portfolio spread of 300bp). To get the same spread from the single-name approach, the investor would have to write

protection on 4.3 times the amount of notional. Therefore, selling a FTD is a levered way of expressing a positive view on credits, but also exposes the investor to a higher level of default risk.

The seller of FTD is effectively long correlation.

5.2.4.3 Selling second to default (or more senior) protection

Selling protection in a second-through-sixth default basket is potentially a less volatile way to gain long exposure to a basket of credits. In exchange for a smaller premium, the protection seller has direct exposure to any defaults after the first credit event, but is protected from the first credit event. This is useful if the investor considers that one default is likely but multiple defaults are not, which could apply in an industry where demand is solid but competition is fierce, such as the airline industry. Hence an investor with a positive view on the underlying credits can sell protection via such a swap and potentially earn more premium than selling protection on some of the individual names.

In contrast to selling FTD protection, the seller of more senior protection is increasingly short correlation.

5.2.5 Delta hedging

5.2.5.1 Definition of Delta

All tranches are subject to mark-to-market (MTM) movements as credit spreads on names in the underlying portfolio move about over the life of the transaction.

We define the Delta of a credit in the underlying portfolio as the amount of protection the dealer sells (buys) on that name to hedge the MTM risk of a short (long) tranche position due to movements in the credit spread of that name.

More formally, we can define the Delta of a credit as the ratio of the spread sensitivity of the tranche position to the spread sensitivity of that credit:

$$\text{Delta of Credit} = \text{Change in MTM of Tranche} / \text{Change in MTM of Credit}$$

This relationship defines the percentage of the notional amount of the credit that needs to be sold (bought) in order to hedge a short (long) tranche position.

For example, assume that a credit in the underlying portfolio, originally with a spread of 60bps, widens by 1bp. Suppose this spread widening translates into an absolute MTM change of £4,650 on the credit. If this spread widening also resulted in an absolute MTM change on the short tranche position of £2,100, then the Delta for that credit would be equal to 45.2% (= 2,100 / 4,650). This means that to hedge the MTM risk of the tranche to small moves in the credit spread of that name, the dealer would sell protection on 45.2% of the notional of that credit. If the credit had a notional value of £2 million in the basket, the amount of protection sold would be £904,000.

To hedge the spread risk of a short position in a tranche, a dealer needs to sell protection on each of the underlying credits in the portfolio according to the Delta measure. Similarly, to hedge the spread risk of a long position in a tranche, a dealer needs to buy

protection on each of the underlying names in the portfolio according to the Delta measure.

There are no analytical formulae to calculate Delta. Instead, Deltas are generally calculated using 'brute force', by shifting the credit spreads on each individual name in the basket by a small amount (say 1bp), and then calculating the resultant MTM change of the tranche. Deltas range from 0% to 100%. The Delta of a single-name CDS is obviously 100%.

5.2.5.2 Dynamic hedging

Tranche deltas behave very similarly to options.

We calculate Delta for small spread changes in the underlying credits. For larger spread changes, a delta-hedged tranche is not totally immune to spread movements. A delta-hedged CDO position is still subject to spread convexity for larger spread moves, and as a result the Deltas will need to be dynamically rebalanced throughout the life of the transaction.

Dealers will typically manage the spread risk of a single-tranche position by dynamically rebalancing the Delta hedges as spreads move. However, as with options, there are practical limits to such a process:

1. There is a cost associated with rebalancing the hedges. Whilst underlying spread curves move on a daily basis, rebalancing will typically be on a less frequent basis as buying and selling small portions of credit risk can become relatively expensive when bid-offers are taken into account. The more frequent the rebalancing of Deltas, the more expensive the hedging cost.

2. It may not always be possible to transact single-name hedges in the precise Delta amounts that are produced from analytical models.

3. Not every name in the basket will have the same liquidity in the underlying single-name CDS market. This may cause a conflict between the need to rebalance hedges on a frequent basis and the availability of liquid CDS contracts for which to hedge. For more liquid names, tighter bid-offer spreads in the single name CDS market, helps mitigate the cost of rebalancing.

The only other changes that have been made to the Core Reading are to correct typographical errors and improve the style.

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