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INTRODUCTION TO DEFAULT SWAPS

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Summary

The default swap has quickly become the most liquid and widely used of all credit derivative instruments. In this article we describe in detail the structure of a default swap transaction and include a discussion of the legal aspects, including a summary of the recent advances made in document standardisation. We then approach the pricing of default swaps and give an analysis of the many factors which can drive default swap pricing. Following a discussion of the regulatory capital treatment for default swaps, we conclude with a list of their many uses.

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Introduction

Recent years have seen a dramatic expansion in the size of the market for credit derivative instruments. In the past year alone, the notional amount of credit derivatives outstanding is estimated to have doubled to $1 trillion (million million). This growth is likely to continue as institutional investors, corporates, broker-dealers, hedge funds and insurance companies all realise the various uses that these instruments have. These uses include the diversification and transfer of credit risk, the ability to leverage and the creation of new asset classes providing yield enhancement.

Of all the credit derivatives product types now in use, the credit default swap stands foremost as the basic tool for transfer of credit risk. It dominates the credit derivatives market with a market share of over 50% in 1997, according to the British Bankers' Association (BBA).

In 1998, 64% of default swap protection buyers were banks, says the BBA. A complete breakdown of market participants is shown in Table 1. This result is understandable given that banks are the institutions which have the most need to hedge themselves against their exposures to pools of illiquid loans. We also see that banks were the main sellers of default protection, motivated by the desire to take advantage of underused credit lines.

Going forward the expected proportion of banks in the credit derivatives market is expected to decrease as insurance companies, re-insurance companies, corporations and other groups become more familiar with the nature of the credit derivative product and the many uses and advantages they present.

Table 1 A breakdown of who buys and sells protection by market share

Counterparty	Protection buyer (%)	Protection seller (%)
Banks	64	54
Securities firms	18	22
Corporations	7	3
Insurance companies	5	10
Government/export credit agencies	4	1
Mutual funds	1	4
Pension funds	1	2
Hedge funds	0	4

Source: British Bankers' Association.

We now give a definition of the default swap, describe in detail all of the aspects of a default swap transaction, discuss the economic aspects of a default swap with respect to asset swaps and par floaters, examine the pricing of default swaps using what we call a static replication approach, present a discussion about the regulatory capital treatment for default swaps and conclude with a summary list of default swap uses.

Defining a default swap

A default swap is a bilateral contract that allows an investor to buy protection against the risk of default of a specified reference credit. Following a defined credit event, the protection buyer receives a payment usually intended to compensate him for the loss made on this reference credit.

In return the protection buyer pays a fee. This fee may be paid up front (for short-dated transactions), but more often is paid over the life of the transaction in the form of a regular, accruing cashflow.

A default swap is an over-the-counter contract. There are, therefore, several important features that need to be agreed between the counterparties and clearly defined in the contract documentation before a trade can be executed.

Credit event triggers the default swap

First and foremost is the definition of the credit event itself. This is obviously closely linked to the choice of the reference entity and obligation and may include such events as:

- bankruptcy
- failure to pay
- repudiation/moratorium
- material restructuring of debt
- acceleration or default.

Some of these events are now defined in *ISDA 1999 Credit Derivatives Definitions* (described below).

Reference asset

Some default swaps define the triggering of a credit event using a reference asset or class. The main purpose of the reference asset is to specify exactly the capital structure seniority of the debt that is covered. The reference asset is also important in determining the recovery value which is the price of the asset following default. This is needed in order to calculate the payoff in a cash settled default swap (see below). However, in many cases the credit event is defined with respect to a seniority of debt issued by a reference entity and the only role of the reference asset is in the determination of the cash settled payment. Also, the maturity of the default swap need not be the same as the maturity of the reference asset.

Settlement following credit event

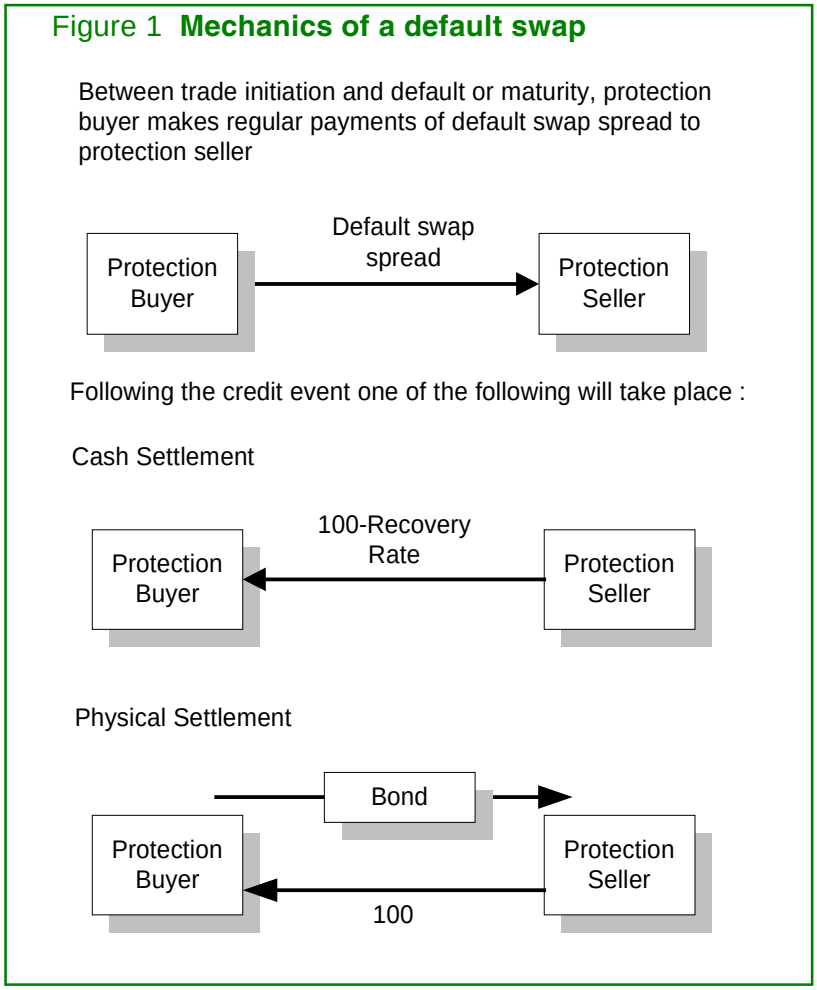
The contract must specify the payoff that is made following the credit event. Typically, this will compensate the protection buyer for the difference between par and the recovery value of the reference asset following the credit event. This payoff may be made in a physical or cash settled form — the protection buyer will usually agree to do one of the following:

- Physically deliver the defaulted security to the protection seller in return for par in cash. The contract usually specifies a basket of securities that are ranked pari passu which may be delivered in place of the reference asset. This feature is based on the observation that following default, assets from the same issuer with the same seniority tend to trade at the same price. As this is not strictly true, by choosing physical delivery, the protection buyer is long a cheapest to deliver option.
- Receive par minus the default price of the reference asset settled in cash. The price of the defaulted asset is typically determined via a dealer poll conducted within 14 to 30 days of the credit event, the purpose of the delay being to let the recovery value stabilise. In certain cases the asset may not be possible to price, in which case there may be provisions in the documentation to allow the price of another asset of the same credit quality and similar maturity to be substituted.

These choices are shown in Figure 1. If the protection seller has the view that either by waiting, or by entering into the work-out process with the issuer of the reference asset, he may be able to receive more than the default price, he will then choose to take physical delivery of the asset.

Unless already holding the deliverable asset, the protection buyer may prefer cash settlement in order to avoid any potential squeeze that could occur on default. Cash settlement will also be the choice of a protection buyer who is simply using a default swap to create a synthetic short position in a credit.

Figure 1 **Mechanics of a default swap**



Variations on payoff

Some default swaps have a different payoff from the standard par minus recovery price. The main alternative is to have a fixed pre-determined amount that is paid out immediately after the credit event. This is known as a binary default swap.

In other cases, where the reference asset is trading at a significant premium or discount to par, the payoff may be tailored to be the difference between the initial price of the reference asset and the recovery price.

Termination of premium payments

The protection buyer stops paying the premium once the credit event has occurred[1], and this aspect has to be factored into the cost of the swap payments. It has the benefit of enabling both parties to close out their positions soon after the credit event and eliminates the ongoing administrative costs that would otherwise occur.

1 Subject to the terms of the default swap the protection buyer may be required to pay the fraction of the premium which has accrued since the previous payment date.

Default swap documentation

In recent years one of the main problems hindering the growth of the default swap market has been the lack of standard documentation containing clear and legally watertight definitions.

This problem was first addressed in 1998 by the International Swaps and Derivatives Association (ISDA) which issued a standardised long form confirmation which made it possible to trade default swaps within the framework of the ISDA master agreement.

More recently, and partly in response to many of the documentation problems highlighted by the Russian crisis of September 1998, ISDA has published updated credit swap documentation[2] which aims to standardise definitions. In the past, many of the subtle differences in definitions in various default swap confirms have meant that more time is required to review transactions and this has acted as a brake on liquidity. The main aspects of the new definitions are:

- A re-definition of the restructuring event to distinguish between those due to credit deterioration and those which occur when the market permits a renegotiation of more favourable terms. Only restructuring due to credit deterioration trigger default.
- A notice period for physical delivery requiring the protection buyer to deliver a notice of intended settlement within 30 days of notice being given of the credit event. Physical delivery must take place within five days of settlement. If due to an event beyond the control of buyer and seller it is impossible or illegal for physical delivery to take place, there is the fall back of cash settlement.
- A removal of the credit event triggers on downgrade and credit event on merger due to their lack of widespread use in the default swap market.
- A new way to define the reference obligation and deliverable obligations, including a suggested tick the box approach.
- A 3-day grace period for the failure-to-pay trigger for the credit event. This is intended to prevent the accidental triggering of the credit event by an administrative error rather than an inability or unwillingness to pay.
- New dispute resolution procedures (which are yet to be implemented).

This standardisation of definitions is expected to reduce the legal risk between counterparties and make it easier for newcomers to enter the default swap market.

Default swap spreads, asset swap spreads and par floater spreads

The spread on a par floating rate note compensates the owner of the asset for the credit risk he bears. When the note is issued and is by definition trading at par, the maximum loss is par minus recovery price. In the same way, the asset swap spread of a bond compensates the asset swap buyer for any loss following default[3], and if the asset is trading at par, this also equals par minus recovery.

As we previously described, the default swap spread is the value of credit protection against default where the payoff is also par minus recovery. It is

2 *1999 ISDA Credit Derivatives Definitions*, International Swaps and Derivatives Association.

3 See "Introduction to Asset Swaps" by Dominic O'Kane, Lehman Brothers *Fixed Income Quantitative Research*.

therefore reasonable to expect that the par floater spread, asset swap spread (of a par asset) and default swap spread should all be similar, assuming that in all three cases the maturity and underlying reference credit is the same.

In practice this is not strictly the case due to effects such as liquidity and availability. There are also technical effects such as accrued interest and coupon recovery which can cause the asset swap spread and par floater spread to differ from the default swap spread.

Certain high quality assets may trade with negative par floater spreads. However the cost of buying protection against these assets will never go negative, and in practice the default swap spread would probably be a few basis points. This protection would only make sense provided the position is marked to market and highly collateralised.

Default swap pricing using static hedge arguments

It is possible to price a default swap by creating a static hedge. This involves creating a portfolio in which the payments of the default swap are exactly offset by the payments of the other instruments in the portfolio. This has to be true whether or not the default swap is triggered. Once set up nothing further need be done with the portfolio until the asset and default swap mature — the hedge is static. Pricing the default swap is then a matter of determining what value of the default swap spread will make the net present value of the portfolio equal to zero. The advantage of this approach is that it enables us to begin to estimate default swap spreads without getting into the complexities of credit modelling.

Static hedge for protection buyer

Consider first the protection buyer. They can statically hedge the payments of a default swap by purchasing a par floater with the same maturity as the protection or by purchasing a fixed rate par asset on asset swap. Suppose this par floater (or asset swap) pays a coupon of Libor plus F basis points and its default triggers the default swap. The purchase of this asset for par is funded at a rate which depends on the credit quality of the protection buyer or the rate at which the asset can be repoed. Suppose that it is Libor plus B, paid on the same dates as the default swap spread *D*. There are two possible events:

- If the reference asset does not default, the hedge is unwound at maturity at no net cost (the protection buyer receives the par redemption from the asset and uses it to repay the borrowed par amount).
- If default does occur, the protection buyer delivers the bond to the protection seller in return for par. It then repays the loan with this principal. The position has been closed out with no net cost.

As we end up with no net cost under these two scenarios, the breakeven value for the default swap spread has to be $D = F - B$.

For example, suppose the par floater pays Libor plus 25bp and the protection buyer is a single A bank which funds at Libor plus 20bp. For the protection buyer the breakeven default swap spread equals 25bp minus 20bp giving 5bp.

Static hedge for protection seller

The static hedge is different from the side of the protection seller. In this case the protection seller enters into a reverse repo to borrow a par floater asset with the same maturity as the protection and which pays a coupon of Libor plus F. They then sell the asset short. In the reverse repo, the protection seller receives interest at a repo rate of Libor plus S and pays the repo counterparty the coupon on the asset. Together with the payments on the

default swap, the net payment on each coupon date received by the protection seller equals D+S-F. Once again one of two possible events can occur.

- The asset does not default so that at maturity the protection seller receives par from the repo counterparty, pays par on the asset and ends up with a flat position.
- The asset defaults before maturity, in which case the protection seller terminates the repo, receiving par from the repo counterparty, the defaulted asset from the default swap counterparty (which is then returned to the repo counterparty) and then pays the par amount to the default swap counterparty. The protection seller does all this at no cost and ends up with a flat position.

Once again we have a statically hedged portfolio which has no net value today provided $D = F - S$. So taking the previous example of a par floater that pays Libor plus 25bp and the asset repos at Libor flat, the breakeven spread for the protection seller is $D = +25\text{bp}$.

Clearly the hedges are not symmetric. Indeed they may not even be realistic as it is frequently not possible to find the required asset on repo in order to short it. However, these arguments do provide a good starting point for determining the range in which an actual default swap will currently trade. They also highlight the fact that protection buyers with sub-Libor funding rates and protection sellers with above-Libor funding rates will find the default swap market more favourable.

Where exactly the traded default swap spread lies will also be determined by other factors including availability, liquidity, supply and demand and counterparty risk.

The disadvantage of this static replication approach is that it limits us to pricing default swaps where we have existing instruments with the required maturity and seniority. When these instruments do not exist, we must resort to credit modelling. This topic will be covered in a forthcoming *Analytical Research Series* paper.

Other factors affecting the default swap spread

The previous section provided an idealised starting point for pricing default swaps. In practice there are some additional factors which are also important determinants in default swap pricing.

Market liquidity, together with supply and demand, currently play a significant role in the pricing of default swaps. In some cases — typically US corporates — the cash market is much more liquid than the default swap market. On the other hand, in EMG markets the opposite is often the case. For example, a lack of liquidity and a lack of transparency caused by the OTC nature of the default swap market can maintain default swap spreads higher than the previous section would imply.

In terms of supply and demand, the market may wish to be a net buyer of protection on a given credit and this can push up the default swap spread. This can lead to significant dislocations between the cash and default swap markets.

Default swap as a way to take a view on a credit

Although the main purpose of a default swap is to provide protection against default, the mark-to-market of a default swap will also be sensitive to market perceived changes in the credit quality of the reference credit which fall short of a credit event. For example, if we buy protection for five years against the default of a specific 5-year bond issued by company XYZ, and after two years the credit quality of XYZ deteriorates. Clearly, the likelihood of default will have increased so the mark-to-market value of the protection will have increased. A profit can then be locked in by selling on this protection.

Using default swaps to obtain a funding cost advantage

Default swaps can be used to exploit the relative funding rates of different institutions. Consider two banks: one is rated AA and can fund itself at Libor minus 20bp, the other is rated A- and funds itself at Libor plus 20bp.

If the higher rated bank borrows at its funding rate and uses this to buy an asset paying Libor plus 50bp, it will earn a net spread of 70bp. If the second lower rated bank borrows to buy the same asset, it will only earn a net spread of 30bp (Libor + 50bp from asset minus Libor + 20bp in funding).

However, suppose the higher rated bank buys the asset and then buys protection from the lower rated bank through a default swap linked to the default of the aforementioned asset, and that this protection costs 40bp. The annual cash flows are shown in Table 2.

Table 2 **Funding cost advantage**

Leg	AA-rated Bank	A-rated Bank
Asset	Libor + 50bp	0
Default swap	–40bp	+40bp
Funding Cost	–(Libor - 20bp)	0
Net	+30bp	+40bp

The net consequence is that the AA bank now owns an asset and is protected against any default of the asset. The only default risk is the event in which the asset defaults and the A- bank is unable to pay out on the default swap. We would expect this joint probability to be small. As a result the AA bank is effectively long a risk-free asset which pays a net spread of +30bp a year. The lower rated A- bank has taken on the credit risk of the reference asset and is now earning 40bp a year instead of 30bp. The trade works for both parties.

As a consequence institutions with high funding costs will prefer to take on credit exposure through a default swap rather than through buying the credit. On the other hand, institutions with low funding costs will be able to earn return for little risk by funding the asset on balance sheet and buying protection. As already mentioned the risk of both the asset and the counterparty defaulting must be factored into the price.

Credit linked notes

For investors who are not permitted to trade in default swaps, one alternative may be to buy a credit linked note. These are usually simple notes which pay fixed or floating rate coupons and which have an embedded credit derivative. They are funded balance sheet assets and are usually issued by special purpose vehicles (SPV), corporations or trusts.

In the case of default swaps, the note might pay Libor plus a spread and embed a default swap linked to some reference asset. If this asset defaults, the credit linked note terminates, paying a redemption value linked to the recovery of the reference asset or delivering the defaulted asset.

This is a simple example. In practice there is a broad range of possible structures which can be set up.

Regulatory capital for default swaps

Individual banks are required by legislation to hold capital against their banking[4] and trading[5] book positions. The purpose of this is to ensure that the banking sector is sufficiently capitalised against any unexpected losses. As default swaps can be used to mitigate credit risk, they can also be used to reduce capital requirements.

A number of countries have issued guidance on the use of default swaps. For a banking book position, the assumption of credit risk via a sale of protection using a default swap is commonly treated as a direct credit substitute. We apply the same treatment as if we were long the reference asset. For corporates this is to take 100% of the notional which is then weighted at 8%.

Using a default swap to hedge an asset will only reduce the capital requirement if it can be shown that the transaction is equivalent to a guarantee from an OECD bank. Depending on the regulator, the maturities of the asset and default swap may also have to match (though some regulators recognise a partial relief where the default swap has a shorter maturity). If these conditions are satisfied, the risk-weighting of the asset becomes that of an OECD bank (20%).

In the trading book, the capital requirement for credit derivatives is split across a position risk requirement (PRR) and a counterparty risk requirement (CRR). Since the introduction of the second capital adequacy directive in 1996, EU banks have been allowed to use an approved value-at-risk (VaR) model to calculate the PRR. This may result in a lower capital requirement than allowed under the standard trading book rules.

For those without an approved VaR model, the standard trading book treatment is similar to that for the banking book. For a cash position hedged with a default swap, the treatment depends upon the regulating body for the entity into which the trade is booked. Regulators have in general tended to be conservative regarding offsets, only allowing them for positions hedged with no asset mismatch i.e. the triggering credit event for the default swap must be identical in terms of issuer and seniority to the asset being hedged. In some cases regulators will allow no offset where the maturity of the assets differ. In other cases a partial offset may be permitted. Investors must check the exact treatment with their own regulators.

The counterparty risk requirement is determined by taking the credit equivalent amount (CRA) and weighting it by the BIS risk weighting of the counterparty. The CRA is determined by taking the positive market-to-market

4 The banking book constitutes the loan and investment portfolio.

5 The trading book consists of positions where the bank intends to profit from short-term price differences. This generally constitutes the broker dealer operations.

value of the default swap and adding on a percentage of the notional amount (the potential future exposure). This percentage can be a function of the maturity and credit quality of the underlying asset. It varies between regulator.

Looking forward, the Basle Committee on banking supervision has recently issued a discussion paper[6] to examine the use of credit ratings in the determination of issuer risk weights. It rules out the use of internal credit models in the setting of capital requirements at this stage. In addition to overhauling significantly the current framework and to increasing the granularity of credit risk, these proposals if implemented will create a greater need for the transference of credit risk out of the banking sector which should increase the demand for default swap credit protection.

Summary of default swap uses

The main reasons for trading default swaps are :

- Buying protection through a default swap is an efficient way to hedge out the risk of default.
- Default swaps can be used to take a view on the deterioration or improvement of the credit quality of an issuer. Therefore, buying a default swap can be viewed as a synthetic alternative to selling the reference credit and may be preferable for several reasons. First, some investors may not be allowed to short sell an asset but may be allowed to buy a credit derivative. Second, it is not always easy to short an asset. There may not be a liquid reverse repo market, and if we do manage to short the asset, we are then vulnerable to short squeezes. Finally, shorting a credit via a default swap is a private transaction between two counterparties whereas short selling of a loan may require customer consent and/or notification. In many cases this confidentiality is essential in order to maintain good client relations.
- Investors can tailor the maturity and seniority of the credit to match their precise requirements. These assets may not exist in the cash market.
- Banks with high funding costs may find it cheaper to buy exposure to the credit via a default swap rather than buy the cash bond and fund it on balance sheet.
- Institutions with low funding costs will be able to earn return for little risk by funding a defaultable asset on balance sheet and buying protection.
- In certain markets, in particular some of the emerging markets, the default swap market may be more liquid than the cash market and is therefore the more efficient choice.
- We may want to hedge ourselves against the default of non-traded loans. In this case the only hedge would be to structure a default swap linked to these loans.

Conclusion

The default swap market is expected to grow rapidly over the next few years, from a level of about $350m at the end of 1998 to a predicted level of approximately $740m by 2000[7].

6 *A New Capital Adequacy Framework*, Basle Committee on Banking Supervision, June 1999.

7 British Bankers Association.

In addition to transferring credit risk, this growth will be driven by the identification of arbitrage opportunities, the need for higher yields and the relative simplicity which default swaps provide over their cash alternatives.

This growth will be aided by the recent standardisation of default swap documentation, an increasing familiarisation with default swaps across fixed income market participants, a more widespread use of credit analytic systems for pricing and hedging, and the increased use of model based methods for calculating capital requirements. Within the next few years we fully expect the default swap market to achieve the same level of standardisation and liquidity now seen in the interest rate swap market.

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