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Structured Credit Research

Explaining the Basis:

Cash versus Default Swaps

HIGHLIGHTS

- There are a number of reasons that cause cash and default swap spreads to diverge. We divide these into two groups - fundamental and market reasons.
- Fundamental reasons relate to the precise mechanics of how a credit default swap contract and a cash bond differ.
- Market reasons relate to liquidity, supply and demand and other real world factors that can differentiate between cash and default swaps.
- We examine the driving factors behind these fundamental and market reasons, and the discuss the effect they have on the default swap basis.
- An understanding of the basis can enable credit investors to take advantage of the many opportunities which the cash and default swap markets present.

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INTRODUCTION

This research piece endeavors to be a comprehensive look at the differences between the cash and default swap market. The aim is to explore the differences between the cash and default swap markets for a given credit and develop a framework for looking at these differences. Ultimately, the goal is to enable the reader to identify and understand the many reasons for the divergence between the two markets and to give the reader the tools to evaluate it.

The considerable growth of the default swap market has been driven by its use as a proxy for cash instruments. This is predicated upon the assumption that a default swap and a par floater closely replicate the same credit exposure. However, this relationship is not exact and this is reflected in the market where we observe that significant divergences can occur between default swap and cash credit spreads. We call this spread divergence the default swap basis and define it as the **default swap spread minus the corresponding par floater spread, i.e.**

DEFAULT SWAP BASIS = DEFAULT SWAP SPREAD - PAR FLOATER SPREAD

The reasons for this divergence can be broken down into two categories, which we shall call **fundamental** factors and **market** factors. We define fundamental factors as reasons that relate to the precise specification of a default swap contract that make it behave differently from a cash bond. Market factors refer to the nature of the market in which the cash and default swap contracts are traded and so include effects such as liquidity, supply and demand, as well as the nature of the market's participants.

Before proceeding, a reminder of the details of the default swap contract can be found in the appendix of this paper. Readers requiring a more complete description of the default swap contract are directed to the Lehman publication *Credit Derivatives Explained*[1].

The Theoretical Risk-Free Trade

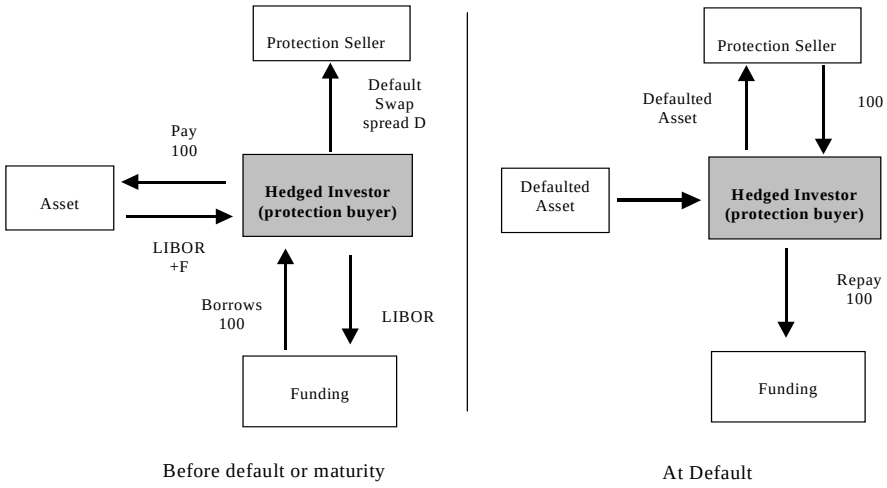
Before we explain why default swaps and cash can trade at different spread levels, we must first establish why they are related. To do this, we describe what we call the *theoretical risk-free trade*. This is a strategy involving a cash bond and a default swap, which subject to certain assumptions, can be shown to be risk-free.

The two parts to this risk-free trade are :

1. Purchase of a par floating rate asset paying a coupon of LIBOR plus a floater spread F. Assume that the asset is either funded on balance sheet or on repo at LIBOR flat.
2. Purchase of protection on this asset in the default swap market to the maturity of the asset. The default swap spread is denoted by D.

[1] See the Lehman publication - *Credit Derivatives Explained* by Dominic O'Kane, March 2001

Figure 1: **Static hedge for a protection buyer showing the payments before and in the event of default**



This strategy is shown in Figure 1. In the event of a default the investor delivers his defaulted asset to the protection seller in return for par. This par amount is then used to pay off the funding leg. The net strategy is therefore *credit risk free* as the investor has no exposure to the default of the asset.

In this strategy the investor earns an annual spread of *(F-D)* over LIBOR for assuming no credit risk, where *(D-F)* is the **default swap basis**. If the floater spread is greater than the default swap spread, investors will attempt to earn a risk-free spread by buying the cash and buying protection, thus driving the default swap basis to zero. If the par floater spread is less than the default swap spread then investors can sell protection and short the asset, receiving a positive spread for no credit risk until the default swap basis is driven back to zero. The theoretical arbitrage-free relationship is therefore that the par floater spread must equal the default swap spread, i.e. the default swap basis is zero.

We have only been able to establish this link by making several assumptions that do not apply in the real world. To simplify and structure the exposition, the reasons behind the non-zero default swap basis have been grouped into two categories - fundamental and market factors.

Fundamental Factors

By fundamental factors we mean factors relating to the inherent differences between the mechanics of a cash bond and a default swap contract that can cause their spreads to differ. A summary of fundamental factors and their effect on the basis is shown in Table 1.

Table 1: **Fundamental Reasons and their effect on the basis**

Fundamental Reasons which …	
Increase the default swap basis	**Decrease the default swap basis**
The Delivery Option	Funding
Risk of technical default	Off Balance Sheet
Coupon step-ups in the bond	Leverage
P&L Realisation	Accrued Interest
Default Swap Spreads must be positive	Counterparty Risk
Assets trading below par	Assets trading above par

1. Funding

Unlike cash bonds, default swaps are unfunded transactions which lock in an effective funding rate of LIBOR. The funding cost of the institution looking to go long or short the credit therefore plays a role in determining the more efficient strategy - cash bond or default swap. We believe that most market participants fund above LIBOR, and are therefore willing to accept narrower default swap spreads than cash spreads. This decreases the basis.

For certain types of investors, purchasing a cash bond requires the funding of the purchase price at a rate which is not necessarily LIBOR. This rate depends on the credit quality of the investor. Alternatively, the asset can be funded on repo - the asset is used as collateral on a loan of the par amount. This can usually be achieved close to LIBOR flat. However, it also depends on the credit quality and specialness of the asset, with assets in demand repoing to sub-LIBOR levels.

Institutions with high credit quality such as insurance companies and AAA-rated banks may fund sub-LIBOR. For them, a scenario in which the default swap spread equals the par floater spread makes the cash bond return a higher spread than selling protection in the unfunded default swap. Consequently, sub-LIBOR funding investors will prefer to go long the cash rather than sell protection with default swaps if the spread differential between the cash par floater spread and default swap spreads is less than the difference between LIBOR and the investor's funding level. Consider the example where the asset pays LIBOR plus 38bps, the default swap spread is 40bps and the asset is funded at LIBOR minus 5bps. Buying the asset returns a net spread of (LIBOR+38bps)-(LIBOR-5bps) = 43bps. Compare this to the default swap which returns 40bps.

The situation is reversed for lower rated investors who may have to fund at levels well in excess of LIBOR. For them, the default swap market is the higher yielding investment as long as the default swap does not trade through the cash by an amount equal to the difference between LIBOR and their funding level. For example, take an A-rated bank which funds at LIBOR plus 20bps. If the par floater trades at a spread of 65bps and the default swap spread trades at 50bps, then buying the cash bond will return a net spread of 45bps per annum. The default swap will pay 50bps.

However, rather than fund these assets on balance sheet, most above LIBOR funders will prefer to repo out the asset in which case the cost of the funding will be equal to the repo rate of the asset.

Although funding is an investor-specific factor, at a market level the average funding level of protection buyers and sellers can play an important role in determining the basis between cash and default swaps. Since most market participants fund above LIBOR, we expect that they will therefore be willing to accept a lower default swap spread and so funding should have the effect of decreasing the default swap basis. Note that this ignores counterparty risk which we discuss in another section.

2. The Delivery Option

If a credit event occurs, the protection buyer in a default swap specified with physical settlement has the ability to deliver one of a large number of deliverable assets into the contract. Depending on the type of credit event, and the basket of deliverables, this ability to switch out of one asset into a cheaper asset to deliver into the contract can have be of significant value. As this is a potentially valuable feature, it makes a long protection position more valuable than a short cash position, and so has the effect of widening the default swap spread and thus of increasing the basis.

In theory, all assets issued by the reference issuer with the same seniority should trade at the same price following a credit event, irrespective of coupon and maturity. Bondholders of pari passu assets should have an equal claim to the assets of the company. In practice this does not always occur. If it is the sort of credit event which does not render all of the deliverable obligations immediately due and payable, then these assets may continue to trade with a price differential. Examples of credit events which may have this effect are restructuring, and the default of an asset with which the other deliverable obligations are not linked via cross default language. If the credit event is a **full default**[2], one would expect all pari passu assets to trade at the same price and the delivery option to be worthless.

The wider the spectrum of deliverable bonds and loans in terms of covenants, maturities and coupons, the more value the delivery option may have. In cases where securities are not trading at liquidation value, one would expect the following :

- Longer dated assets trade at a lower price than shorter dated assets.
- Assets with low coupons, such as convertible bonds, trade at a lower price than assets with high coupons.
- More liquid issues trade above the less liquid issues.
- Issues with embedded options trade below plain vanilla issues since investors in distressed debt generally prefer to buy vanilla bullet bonds.

Added to this is the fact that in most markets, both bonds and loans are deliverable into the default swap contract. Empirical evidence, graphed in Figure 2 shows that the recovery value of senior loans is slightly greater than that of senior unsecured bonds. This reflects the fact that loan documentation often has better protection for

[2] We define a full default as a credit event in which all deliverable obligations become immediately due and payable.

Figure 2: **Average Defaulted Bond Price from 1970-2000 by Security and Seniority**[3]

lenders than cash bonds. This is not always the case - loans generally recover less than bonds in emerging markets. This is due in part to the fact that the size of outstanding loans is typically much greater relative to the size of the cash market in emerging markets than in the developed corporate bond markets.

Another factor is that bond investors who sell protection are generally not familiar with loans and may demand a higher spread from the default swap in order to compensate them for the risk of being delivered a loan.

It is very difficult to quantify the value of the delivery option in a default swap. Clearly, it must be proportional to the likelihood of default and to the difference in payout gained by switching out of a more expensive deliverable into a cheaper deliverable. However we can attempt a simple *back-of-the-envelope* estimate. Supposing a 1-year default probability of 1% (approximately consistent with an asset with a default swap spread of 50bps and a 50% recovery rate[4]) and a potential gain of 5 points by switching to a cheaper deliverable, the up-front value of this option over a 5-year period would be approximately $5 \times 1\% \times 5$ points which equals 0.25 points. Amortising this over the 5-year life of the default swap would imply a spread value of about 5bps. This shows that even for investment grade assets this can be significant. If the reference issuer deteriorates and the implied default probability increases, the value of this delivery option can become large.

As a digression, one can readily take real-world estimates and try to imply out what the market believes the price differential will be between the average delivered bond and loan. Some of the emerging markets have well developed default swaps markets in which both bonds-only and bond-and-loan deliverable default swaps are traded. For example, prior to the recent market disruption, the spread between bonds-only and bonds-and-loans default swaps in Turkey has been between 25bps and 50bps, with default swap spread levels around the 400bps level.

[3] Source: *Moody's Default and Recovery of Corporate Bond Issuers: 2000* published February 2001, Moody's Investor's Service.
[4] We use the Credit Triangle relationship which states the the annualised default swap spread is equal to the annualised probability of default multiplied by the loss in the event of a default which equals *100-R*.

Assuming a bond recovery rate of 20%, we estimate that the market is pricing in a 4-8 point difference between bonds and loans in the event of default. We have also done this calculation in Poland where the spread between bonds only and bond and loans default swaps is around 3-5 bps with default swap spreads at about 50bps. Once again we find that the market is pricing in a differential of about 4 points between the price of bonds and loans following a credit event. This calculation also validates our comment that it is generally believed that defaulted loans will trade below defaulted bonds in emerging markets.

3. Off Balance Sheet/Leverage

As a default swap is an unfunded transaction, it does not appear on the balance sheet of a bank. The fact that it is unfunded also makes it easier for investors to leverage a credit exposure. For certain investors this has the effect of making the default swap a more attractive way to take a credit exposure and so causes the basis to decrease.

4. Risk of Technical Default

We define the risk of technical default as the risk that the definitions or the legal structure used in the purchase of the default protection differ from those which would constitute default on the cash bond. The main concern for protection sellers worried is that they may have to pay out on an event which is not a full default. As compensation, protection sellers demand a higher spread, thereby increasing the basis.

Default swaps are traded within the framework of the International Swaps and Derivatives Association (ISDA) Master Agreement and the legal definitions for the various types of credit events are those provided in a document published by ISDA in July 1999. Within these documents, the credit events are defined as follows:

- Bankruptcy
- Failure to pay
- Obligation acceleration/default
- Repudiation/Moratorium
- Restructuring

While the aim is to shadow as closely as possible the events which will result in the effective default of the bond, circumstances may arise in which the credit events listed above will actually trigger a credit default swap even when a material deterioration in the credit has not actually occurred.

The main example of this is the Restructuring event. While the definitions within ISDA '99 do specify circumstances such as reduction in interest payments, reduction in principal payment amounts, postponement or deferral of interest or principal payments which would all naturally be expected to constitute a form of default, they do not take into account surrounding circumstances in which the issuer would alleviate these events with offsetting benefits.

This was highlighted in August 2000 when the US Insurance company Conseco restructured its debt, which included the deferral of a loan's maturity by three months. At the same time, Conseco altered other aspects of

their debt - increasing the coupon, adding a new corporate guarantee and adding new covenants favourable to the lenders. Nonetheless, this constituted a credit event under ISDA and so payment was triggered on outstanding default swap contracts[5].

Protection buyers are not as concerned about technical default as protection sellers as they can always profit from a technical default by delivering a bond trading below par. The protection seller is concerned about having to pay out in a wider range of circumstances and demands a higher default swap spread as compensation. Technical default risk therefore causes the basis to widen.

Before moving on to the the next section, we mention documentation risk - the risk that it may not be possible to enforce the default swap contract. While this was a concern in the early days of the default swap market, we believe that the legal framework provided by the ISDA in terms of their market standard confirmation documents plus the ISDA '99 standardised default swap contract definitions have more or less eliminated this risk.

5. Risk on the bond is the dirty Price, Risk on default swap is 100

A default swap is a par asset - it compensates the protection buyer against the loss on a par value of the asset. Fixed rate assets which can typically trade significantly above (or below) par expose the investor to a greater (lower) credit risk than the same face value default swap. As a result, the credit spread of these assets should reflect the different credit risks. Bonds trading below par should pay a lower spread than default swaps while bonds trading above par should pay a larger spread than default swaps.

The equivalence between the par floater spread and the default swap in the theoretical risk-free trade requires that the asset trade at par. In practice, this is not always the case. An investor who pays \$120 for \$100 face value of an asset has a higher credit exposure than one who sells protection on the same face value in default swap form. If the asset defaults with a recovery rate of \$70, the bond investor loses \$50 while the default swap investor loses only \$30. This means that an investor who wishes to hedge a non-par amount using default swaps must purchase a face value scaled by a factor

$$Q = \frac{P - R}{100 - R}$$

where P is the price of the bond and R is the expected recovery price. In the example above, the hedging ratio Q should be 1.67 i.e. the investor should purchase face value \$167 of default swap protection. However, this ratio depends on a forecast of the recovery rate which means that there is no theoretically static credit risk hedge, although one can always overhedge by purchasing a zero recovery digital default swap on a notional equal to the price paid.

The conclusion here is that the default swap spread paid should be higher than the LIBOR spread paid by a floating rate bond trading below par. The opposite is also true - the default swap spread must be less than that paid by a referenced floating

[5] For a more comprehensive discussion of the legal risks associated with default swaps see *Understanding the Risks in Credit Default Swaps*, Jeffrey S. Tolk, Moody's Investors Service, March 16 2001

rate bond which is trading above par.

The credit risk of the asset swap is slightly different from a par floater since there is also a default contingent exposure to the mark-to-market on the interest rate swap which may work for or against the investor. For this reason, risk-averse investors should be content to receive a lower spread on the default swap than is paid by the asset swap.

6. Coupon step-ups in the bond

Some bonds, such as the recent telecom issues with ratings-linked coupon step-ups, have embedded features which make them more valuable to the investor. Compared to the default swap which does not have these features, these bonds should pay a lower spread. They therefore trade inside the default swap i.e. they have a positive basis.

The inclusion of coupon step-up covenants in many of the new telecom issues, has, to a certain extent, caused the basis for the new telecom issues (between cash and default swap spreads) to widen. Holders of the bonds with step-up language benefit from the coupon step-up provisions in the case of credit deterioration, but sellers of default protection do not. If they had the same spread, speculators could buy the cash and buy protection and benefit from any step-up in the cash on a downgrade. Therefore, step-up covenants should drive cash spreads tighter while causing default swap spreads to widen out.

7. Counterparty Risk

A cash bond is a straightforward transaction between an issuer and a bondholder involving no other credit risk. However, a default swap is a bilateral over-the-counter derivative transaction which is entered into with a counterparty. This adds the new dimension of counterparty credit risk to the default swap. Protection buyers will therefore tend to pay a lower spread as compensation against the risk of counterparty default. This reduces the default swap basis.

For the protection seller, the exposure is to a loss of mark-to-market caused by a narrowing of spreads. The size of the loss therefore depends on the initial level of the spreads with sub-investment grade and emerging market protection sellers at a greater risk than investment grade investors. For example, a 5-year default swap with a spread of 100bp and a PV01 of 4.5 can only narrow by at most 100bp resulting in a maximum mark-to-market exposure of about 100bp $\times$ 4.5 = 4.5 points.

For the protection buyer, the risk is that, contingent on a credit event, the counterparty is unable to make the payment of credit protection. For a physically settled default swap this corresponds to a payment of par when the defaulted asset is delivered. The protection buyer's exposure can therefore be considerable. As it is a default contingent exposure, it is highly dependent upon the degree of default correlation between the reference entity and the counterparty. A high default correlation means that it is likely that default of the reference issuer will be associated with default of the counterparty, and vice-versa.

For example, buying protection on a Korean company from a Korean bank may

be viewed as a highly correlated trade in which the protection buyer must consider the likelihood that if the Korean company defaults the Korean bank may be unable to compensate the buyer for the loss. The protection buyer is not likely to be willing to pay much for this "protection".

At the level of each trade, the market does not generally price the counterparty risk into the default swap spread. Either one party decides that it is not willing to take on the counterparty risk of another and the trade does not occur, or some other means is used in order to alleviate the counterparty risk. Most typically, some dynamic collateral posting agreement is reached.

At a market level, counterparty risk is mostly a concern to protection buyers which would tend to make them prefer to short the cash bond. However the difficulty in shorting corporate and emerging market sovereign bonds makes this an unrealistic alternative. The upshot is that counterparty risk is a concern at a trade level, but does not play a significant role at a market level. Its effect would be to cause default swap spreads to narrow as protection buyers require a compensation for their counterparty exposure.

8. P&L Realisation.

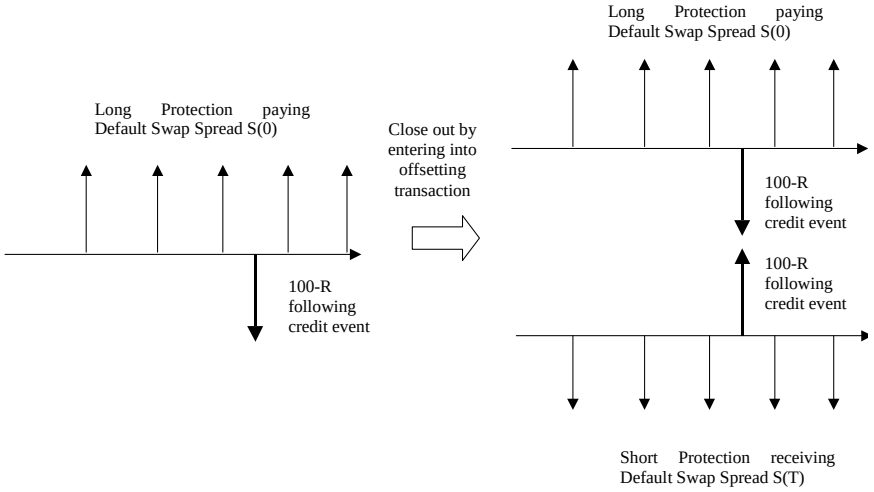
Locking in a gain or loss from a change in default swap spreads usually involves entering into the offsetting transaction. However, the full mark-to-market can only be monetized by waiting until the trade matures. This also exposes the investor to default risk in the sense that if default occurs, the remaining spread payments terminate and any remaining P&L is lost. This implies that the investor would require a higher spread as compensation and hence that the basis should widen.

When an investor wishes to monetize a gain or loss stemming from a cash position they simply sell the bond into the market for its current full (dirty) price. For an investor who has sold protection as a means to obtain a credit exposure equivalent to holding the par floater asset, locking in a profit or loss involves closing out the initial position. This can be done in one of 3 ways:

1. The default swap can be terminated with the initial counterparty for a cash payment.
2. The default swap can be reassigned to another counterparty, subject to the agreement of the first counterparty for a cash payment.
3. The offsetting transaction with the same maturity date can be entered into with another counterparty. Figure 3 shows an example where an investor has bought protection at a time 0 at a spread *S(0)* and at a later time *T* enters into an offsetting sale of protection at a spread *S(T)*. Note that if a default occurs both transactions net out.

In cases (1) and (2), the investor/hedger can immediately lock in a known and fixed amount that is realised immediately. However in case (3) the investor is left with two offsetting positions. No cash changes hands immediately, instead the investor pays and receives premium on the two default swaps over their remaining lives. The expected present value of this premium stream should be the same as the cash amount paid in (1) and (2). However, more competitive bid-offer spreads are often obtained using method (3) and for many it is the easiest way to close out

Figure 3: **Closing out a default swap by entering into the offsetting transaction**



the position.

This has two implications - first, investors who use credit default swaps to express a view about spreads have to wait until the default swap maturity is reached before they can realise their full *expected* gain or loss. Second, there is the risk that the asset may suddenly default. If this were to happen both protection legs would net out exactly. However, both premium legs would also terminate leaving the investor with no remaining cashflows of spread. Any remaining unpaid profit would be lost.

As a result, investors taking a view on credit spreads will prefer the cash market. In compensation, the default swap may have to trade wider than the cash spread.

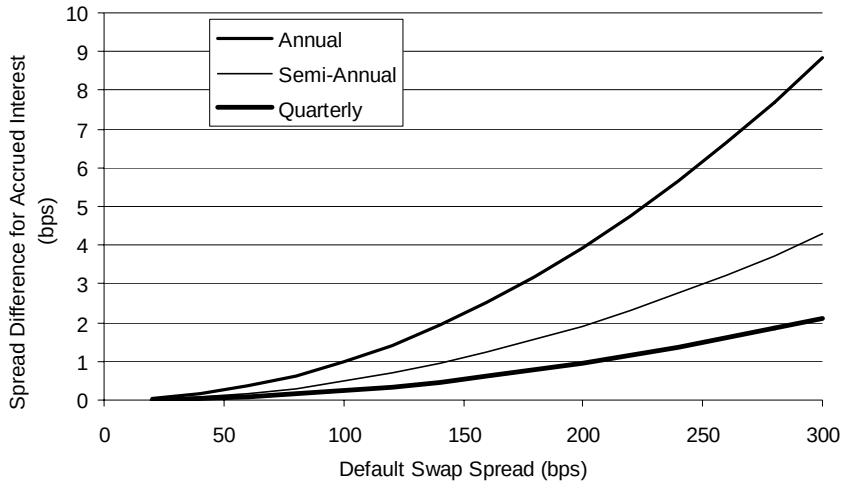
9. Accrued Premium

Depending on what is agreed within the default swap contract, the protection buyer may or may not have to pay the portion of the default swap premium that has accrued between the previous payment date and the credit event. Compare this to the cash where the investor loses all remaining coupons upon default, including accrued. The effect of this is to make the default swap spread basis smaller to compensate the protection buyer for the extra payment which may have to be made on default.

Clearly if the default swap includes the payment of accrued, then the fact that the coupon on a defaulted asset is lost completely means that the protection buyer in a long bond, long protection trade will effectively lose this accrued spread following a credit event - the trade is not credit risk free.

Arbitrage requirements therefore imply that the default swap spread should be slightly *less* than the par floater spread of the cash bond. The difference is proportional to the size of the default spread, the likelihood of a default, and the time period between coupons. For investment grade assets the difference is small - about 1-2 bps. The difference increases rapidly as we fall to sub-investment grade

Figure 4: **The spread difference due to the payment of accrued spread following a credit event as a function of the (annualised) default swap spread and the payment frequency.**



spread levels as shown in Figure 4. These numbers were generated using our proprietary default swap valuation model[6].

The conclusion here is that default swaps which require the payment of accrued following a credit event should trade slightly inside the corresponding cash spread.

10. Default swap spreads must be positive.

Buying default protection on any reference credit is similar to buying insurance and so must cost more than zero, even when the reference entity is the US treasury. However, highly rated government bonds can asset swap at a negative spread to LIBOR. The basis therefore is generally positive for high quality names.

LIBOR represents the rate at which roughly AA-rated commercial banks fund and serves as a benchmark interest rate for the credit derivatives market. It is therefore possible for entities with a higher credit rating to actually trade sub-Libor due to their superior credit quality. This means that par floater spreads and asset swap spreads can actually go negative.

However, it is impossible for the default swap spreads on the same entity to go negative. After all a default swap buyer is taking on the default risk of the reference entity, which though very small, is definitely greater than zero. In practice the default swap spread would be a few basis points.

[6] Note that one can easily ball-park the value of the accrued interest spread difference. For example, a 5-year default swap with a default swap spread of 200bp, assuming a 50% recovery rate has a roughly 4% probability of defaulting per year. If the spread payments are annual then the most that can be lost in any period is 200bp - the credit event occurs just before a spread payment. The least that can be lost is 0bp - the credit event occurs just after a spread payment. The average loss is therefore approximately 100bp. The expected value is therefore 4% times 5 times 100bp which gives 20 cents. Amortising this over the life of the default swap results in a spread difference of about 4bp. This agrees very well with the result calculated and shown in Figure 4.

Table 2: **Market-Driven Reasons and their effect on the basis**

Market Reasons which …	
Increase the Default Swap Basis	**Decrease the Default Swap Basis**
New Issuance	Technical Short
Convertible issuance	Funding Risk
Repo Optionality	Liquidity
Demand for Protection	Digital Default Swaps
Liquidity	
Regulation	

MARKET REASONS

1. Technical Short

The majority of participants in the default swap market are risk-takers who want to sell protection in single-name default swaps. More recently, this market technical has been reinforced by the growth in large synthetic CDO trades. Brokers hedging these structures source the credit risk in the single-name default swap market, driving the market even further short and reducing the default swap basis.

Most of the participants in the default swap market, be they banks, funds or insurance companies, are protection sellers who are seeking to be paid for assuming credit risk. In the credit derivatives market, this is most often done using single name default swaps. However, a growing number of large synthetic portfolio trades are being transacted. In these, the investor assumes some of the losses of a large underlying portfolio of credit names. The key to this sort of trade is that it makes it possible to leverage or de-leverage the credit risk of a portfolio of names to create products which match the risk-return appetites of different investors.

In order to synthetically create these risks, investment banks need to source the credit risk. Balance sheet constraints cause them to do this by selling protection on the portfolio of assets in the single-name default swap market. Due to the significant size of the underlying portfolios (typically in excess of $500m) involved in these trades, a significant synthetic short is created in the market, thus driving default swap spreads tighter.

2. New Issuance

New issuance generally causes default swap spreads to widen in order to make them more attractive relative to the new supply of cash. The basis then starts to decline once all of the bonds have been placed. Also, when large credit exposures are taken by banks in the cash market that are subsequently hedged in the default swap market, this can drive up the default swap spread and increase the default swap basis.

When supply comes to the market for certain credits, bond and default swap spreads generally widen. Default swap spreads widen along with bond spreads as the new

supply provides banks the opportunity to go long the company's credit risk through the cash market: the demand for default swaps weakens, causing default swap spreads to widen. Once the bonds have been placed, especially with longer term holders, bond supply "drys up" and demand for default swaps increases again causing a tightening in default swap spreads. However, although default swap spreads temporarily widen in this case, they tend to revert to the cash spread.

If the bond supply is massive (i.e. in telecoms and auto-finance sectors), banks have ample supply of bonds and loans to go long credit risk. In particular, banks with extensive exposure to the telecom and autofinance sectors through bonds, loans, and lines of credit are big buyers of protection to reduce their exposures. They also have the incentive to buy protection in order to free up regulatory capital. The overall effect of this is to increase the default swap basis.

Furthermore, speculators with a view on basis widening, can push the spread between default swaps and cash wider. This is caused by the speculators buying bonds and simultaneously buying default protection on the credit, hoping for a capital gain on a further cash-to-default basis widening, which will outweigh the negative carry on the trade.

3. Issuance of convertibles and exchangeables

Equity arbitrage players buy convertibles since they provide a cheap source of equity volatility. They hedge out the credit risk in the default swap market, thus driving out default swap spreads and increasing the basis. Typically this widening of the basis is not sustained.

New convertible and exchangeable corporate issues are being issued with attractive cheap equity call options to improve the market participation in the new deals. Equity arbitrage players have been major buyers of the convertibles with the aim of arbitraging out the cheap equity volatility implied by the embedded call option versus that in the over-the-counter equity option market. Most players will hedge out the credit risk either through default swaps (on an unfunded basis) or through asset swaps (on a funded basis). The net effect is to drive default swap spreads wider, especially if there are few outstanding bonds. As default swap spreads and hence credit spreads widen, the value of the call option increases and thus the arbitrage opportunity decreases. This puts a cap on the spread widening. However the spread widening is often not sustained, as after the hedging abates, default swap spreads tend to revert to earlier levels.

4. Demand for Protection

Due to the difficulty of shorting credit risk in the cash market, a negative market sentiment around the quality of a given credit can have the effect of widening default swap spreads relative to cash securities. The basis widens as a consequence.

A negative view around a credit can be expressed in two ways - either the bond can be sold short or protection can be bought in default swap form, widening both cash and default swap spreads in the process. For those looking to go outright short a credit, most corporate and EMG sovereign bonds are fairly illiquid and hence very difficult to source on repo in order to be sold short. In many cases it is much easier to buy protection in default swap format. This has the effect of driv-

ing out the default swap spread relative to the cash.

Banks in particular are buyers of protection. In certain circumstances they may make a loan that they then hedge at a higher spread in the default swap market. The negative carry is the cost the bank is willing to assume for maintaining the client relationship.

5. The Client Base

The type and sophistication of the client base can have a significant effect on the usage of default swaps and therefore on the supply and demand dynamic of the market. Generally, a market with an investor base that is favourable to credit derivatives will have a narrower default swap basis than a market with an investor base that is not.

Within some regions, most notably the US, the relative importance of total rate of return investors, who are often restricted from investing in all forms of derivatives, suppresses the demand for default swaps. However, we note that there are clear signs that this is changing. We also note that this type of market can offer significant opportunity for investors willing to enter the credit derivatives market.

The sophistication of the client base in terms of its familiarity with derivatives also plays a role. For example, historically the European investor base has been a major purchaser of derivatives and this implies that they are generally less wary about entering into a credit derivative contract. An investor base which is more favourable to doing default swap transactions will cause the basis to narrow.

6. Repo Optionality

Being a collateralised loan, repo funding is usually done at or close to LIBOR. However, if the asset goes special, its repo rate will decrease and this will be favourable to the asset owner. If the asset is not special, its repo rate may increase and this can have a negative impact on the economics of the trade. However there is a cap on the funding cost of the asset in the form of the investor's own unsecured funding level, which the investor can receive by switching out of the repo. In a sense, the cash investor has repo optionality which is not present in the default swap. This causes the default swap basis to widen.

7. Funding Risk

A default swap locks in an effective funding rate of LIBOR flat until it terminates. Since there is no exposure to changes in the cost of funding, investors may be content with a lower default swap spread than in the cash. Funding risk therefore reduces the default swap basis.

When an asset is purchased and funded on repo it is usually not possible to lock-in the repo rate for any significant period of time. Typically the repo rate can only be locked in for terms of up to one month, and must be rolled over periodically. The economics of a cash position are therefore exposed to this changing funding level. There is also the extreme case in which the investor's credit lines are reduced or cut which can force the investor to move the assets onto the balance sheet and may cause a sudden increase in funding costs.

Either way, an investor who has chosen to implement a credit position, and fund it using the repo market, is exposed to changes in the funding rate. On the other hand, an investor who has chosen the default swap market has effectively locked in a repo rate of LIBOR flat to the termination of the trade. This lack of repo or funding risk that occurs with default swaps makes them more attractive from an investor viewpoint and can therefore cause the basis to decrease.

8. Relative Liquidity

The liquidity of the cash and default swap markets is very different. Different parts of the credit curve behave differently and this can result in variations in the basis as a function of maturity.

In terms of liquidity, the cash and default swap markets have very different characteristics. For a start, liquidity in the cash market is restricted to the maturities of the outstanding bonds. As these bonds roll down the curve, the liquid maturities shorten accordingly. Furthermore, those bonds with large outstanding notionals are generally more liquid than those with small outstanding notionals. Trades within the cash market are generally executed in various sizes ranging from $1mm to $40mm.

We contrast this with the default swap market. With respect to maturities, the default swap market is most liquid around the 5 year point, followed by the 3 year and then the 1 and 10 year points. There is no roll-down - as time passes these liquidity points do not change. As for trade size, most default swap transactions are executed in blocks of $10mm. For large trades at the 3 or 5 year maturity points, the default swap market may be more efficient from an execution standpoint and an investor may be willing to accept a slightly reduced spread relative to the cash market.

There is a wide disparity in liquidity across markets, with default swaps often perceived as more liquid than cash in certain emerging market countries, especially where there is a lack of vanilla benchmark bond issues. However, the cash market is generally perceived to be the more liquid in large mature credit markets such as the US.

9. Regulation

A number of different professional and regulatory bodies play a role in shaping the credit derivatives market across different regions and different markets. These include the Basel Committee on banking and local banking regulators, insurance company regulators including the National Association of Insurance Commissioners (NAIC), accounting regulators such as the Financial Accounting Standards Board (FASB), and rating agencies. Their regulations can affect the economics of trading default swaps and so affect the basis.

The most important of all are the bank regulators. As banks play a dominant role in the credit derivatives market, accounting for around 50% of the outstanding notional as both protection buyers and protection sellers, these rules can significantly affect the market. The lack of an explicit treatment for credit derivatives in the 1988 Basel Capital Accord means that local bank regulators currently have a significant amount of discretion in determining how banks within their region assign regulatory capital against credit derivative positions and the extent to which

offsets may be granted when credit derivatives are used to mitigate credit exposures. However, much of this discretion may be reduced in 2004 when the new Basel Capital Accord, which has an explicit treatment for credit derivatives, comes into force.

For corporates, the recent move to the FAS 133 and IAS 39 accounting regulations, which require the marking-to-market of derivative positions, and allow the use of hedge accounting for certain hedging transactions, may have an effect on the usage of default swaps and therefore affect the supply and demand characteristics of the market. Were it to increase the usage of default swaps for hedging credit exposures e.g. receivables, this would have the effect of driving of default swap spreads wider.

Insurance companies are also subject to various regulations. In March 2000, the US National Association of Insurance Commissioners (NAIC) adopted model regulation covering replicating (synthetic asset) transactions - known as RSATs - which are expected to give US insurers more flexibility to participate in the credit derivatives market[7].

CONCLUSIONS

We hope that this paper has gone some way to explaining the many factors which drive the dynamics of the default swap basis, and provided a framework for understanding, and where possible, quantifying them.

We believe that an understanding of the basis provides the credit investor with an important tool for taking advantage of the many opportunities which the cash and default swap markets present.

[7] For more information, see the Lehman publication *Developments and Opportunities in the Credit Derivatives Market*, by Klein, Chang and Covey, October 2000

APPENDIX - INTRODUCING THE DEFAULT SWAP

The credit default swap has become the most liquid credit derivative instrument. In terms of outstanding notional, it represents 38% of the credit derivatives market which has a total outstanding notional now believed to be in excess of $1 trillion. Not only is it the most important credit derivative instrument, it is also the building block for many of the other more exotic structures traded in the credit derivatives market.

A default swap is a bilateral contract that enables an investor to buy protection against the risk of default of a security issued by a specified reference credit. Following a legally defined **credit event**, the buyer of protection receives a payment linked to the loss incurred on the reference credit. The credit event includes the following as triggers :

- Bankruptcy
- Failure to pay
- Obligation acceleration/default
- Repudiation/Moratorium
- Restructuring

In return for this protection, the protection buyer pays a fee as a regular stream of cashflows which terminate at default or at maturity, whichever occurs first. The annualised cashflow is known as the **default swap spread** and is linked to the credit quality of the referenced security. Following a credit event, the default swap contract is settled in one of two ways :

- **Physical Settlement** - The protection buyer delivers the defaulted security to the protection seller in return for par in cash. Note that the contract usually specifies a basket of securities that are ranked pari passu which may be delivered in place of the reference asset.
- **Cash Settlement** - The protection buyer receives par minus the default price of the reference asset paid 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.

Physical Settlement has now become the market standard. The mechanics of a default swap are shown in Figure 5.

Figure 5: **Mechanics of a Default Swap**