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A special review by Moorad Choudhry

The credit swap default basis: assessing the interplay between cash and synthetic markets

The credit default SWAP BASIS:

assessing the interplay between cash and synthetic markets

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In this article we consider the close relationship between the synthetic and cash markets in corporate credit. This relationship manifests itself most clearly in the shape of the credit default swap basis. First, we consider briefly why the synthetic market price spread will necessarily differ from the cash spread. We then look in further detail at the factors that drive the basis and the implications this has for market participants.

The most commonly executed credit derivative instrument is the credit default swap. The rapid growth of the credit derivatives market has resulted in a liquid market in credit default swaps across the credit curve. This liquidity in turn has helped to generate further growth in the market. We illustrate market growth in Exhibit 1, which shows the growth in credit default swap volumes from 1998, with projections for 2003.[1]

For a large number of corporate, and certain sovereign, names the liquidity of the credit derivative market frequently exceeds that available for the same reference names in the cash market.[2] As well as greater liquidity, the synthetic market also offers other potential advantages to investors who would generally consider only the cash markets. For illustration we list some potential advantages in Exhibit 2.

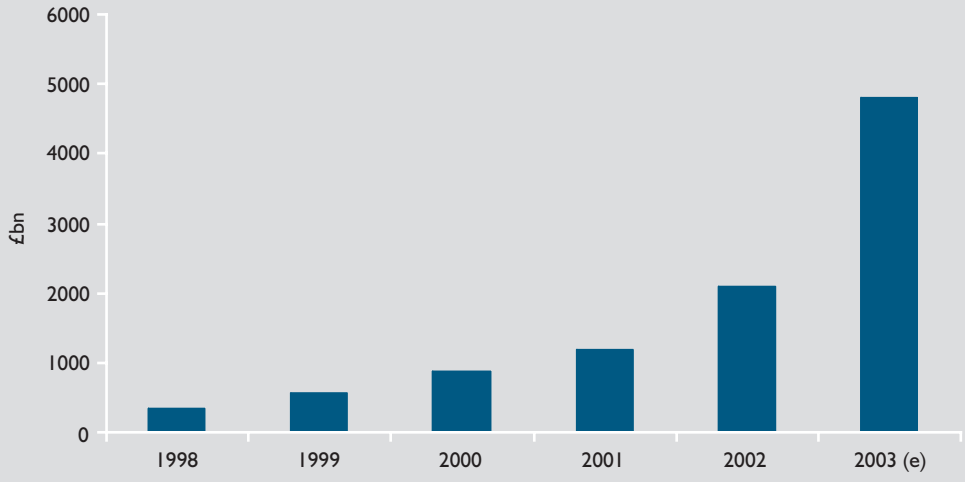
THE ASSET SWAP PRICE

A well-established risk management technique in the market combines an interest rate swap to transform the coupon base of a corporate bond. This produces an asset swap. The coupon on the bond is paid in return for Libor, plus a spread if necessary. This spread is the asset-swap spread and is the price of the asset swap. On the basis that the swap rate payable by a bank with standing in the interbank market is Libid, this asset swap spread is a function of the credit risk of the underlying bond asset.[3] This is why it may be viewed as equivalent to the price payable on a credit default swap written on the same asset, because it reflects the credit risk of the asset over and above interbank credit risk.

Choudhry (2001) describes the no-arbitrage argument that indicates why this should be the case. As noted in Choudhry (*ibid*) however, there are a number of reasons why the asset swap spread will differ from the same-reference asset credit

Credit default swap volumes, British Bankers' Survey

Exhibit 1



Source: British Bankers' Association

Comparing cash and derivatives markets for investors

Exhibit 2

	Cash bonds	Credit derivatives
Corporate (issuer) names available	Existing issuers only	Any name required
Liquidity	Variable liquidity	No limit to size of trade
Bid-offer spread	Greater below AAA names	Smaller
Maturity	Fixed dates	Any date required
Principal guaranteed	Rare	Available if reuqired
Coupon	Typically fixed	Fixed or floating
Yield	Lower	Higher

Source: YieldCurve.com

default swap premium.[4] This is also noted in Bomfim (2002), who illustrates the divergence of asset swap (ASW) and credit default swap (CDS) spreads using financial entity and industrial entity reference names. However, during the initial phase of the CDS market, the asset swap price was frequently used in CDS valuation, and is still used as such in certain applications, particularly by middle office and risk management staff in banks.

THE CREDIT DEFAULT SWAP BASIS

While the theoretical case can be made to show that the CDS price should be equal to the ASW price, market observation tells us that this is not so. This difference in pricing between the cash and synthetic markets was noted in the previous section and results from the impact of a combination of factors. The difference between the CDS and the ASW price is known as the *basis*. The basis is given by:

credit default spread (D) – the asset swap spread (S.) [5]

Where D – S > 0 we have a positive basis. A positive basis occurs when the credit derivative trades higher than the asset swap price, and is common. Where D – S < 0 we have a negative basis. This describes where the credit derivative trades tighter than the cash bond asset swap spread.

Selected reference name credit default swap and asset swap spreads - May 2003 — **Exhibit 3**

Reference credit	Credit rating	CDS spread	Asset swap spread (Libor plus)	Basis
Financials				
Ford Motor Credit	A2 / A	59.3	51.1	+8.2
Household Finance	A2 / A	72.2	57.2	+15.0
JPMorgan Chase	Aa3 / AA-	89.0	66.9	+22.1
Merrill Lynch	Aa3 / AA-	108.1	60.4	+47.7
Industrials				
AT & T Corp	Baa2 / BBB+	224.0	217.6	+6.4
FedEx Corp	Baa2 / BBB+	499.0	481.2	+17.8
General Motors	A3 / BBB	205.1	237.7	-32.6
IBM (6-yr callable bond)	A1 / A+	27.2	8.2	+19.0
IBM (4-yr callable bond)	A1 / A+	33.3	11.0	+22.3

Bonds used are five-year conventional bullet bonds
CDS is five-year maturity
AT&T is four-year maturity
FedEx is three-year maturity

Source: Bloomberg LP

Exhibit 3 shows the basis for a sample of reference credits during May 2003. We use mid-prices for five-year CDS and ASW for each name. The sample reflects the customary market state, with a positive basis for all but one of the names.

We illustrate further the different trading levels by looking at one issuer name in the Euro-markets, Telefonica. Exhibit 4 shows the yield spread levels for a selection of US dollar and Eurobonds issued by Telefonica, as at November 2002. We note that the credit default swap price is at levels comparable with the cheapest bond in the group, the 7.35% 2005 bond, issued in US dollars.

The basis will fluctuate in line with market sentiment on the particular credit. For instance, for a worsening credit the basis can become positive quite quickly. This is illustrated in Exhibit 5, which shows the widening in spread between the five-year credit default swap levels with the similar-maturity May 2006 bond of the same name (in this case, British Airways plc). The impact of the deteriorating business outlook in the last quarter of 2001 is prevalent, with the improving situation also illustrated towards the end of the year.

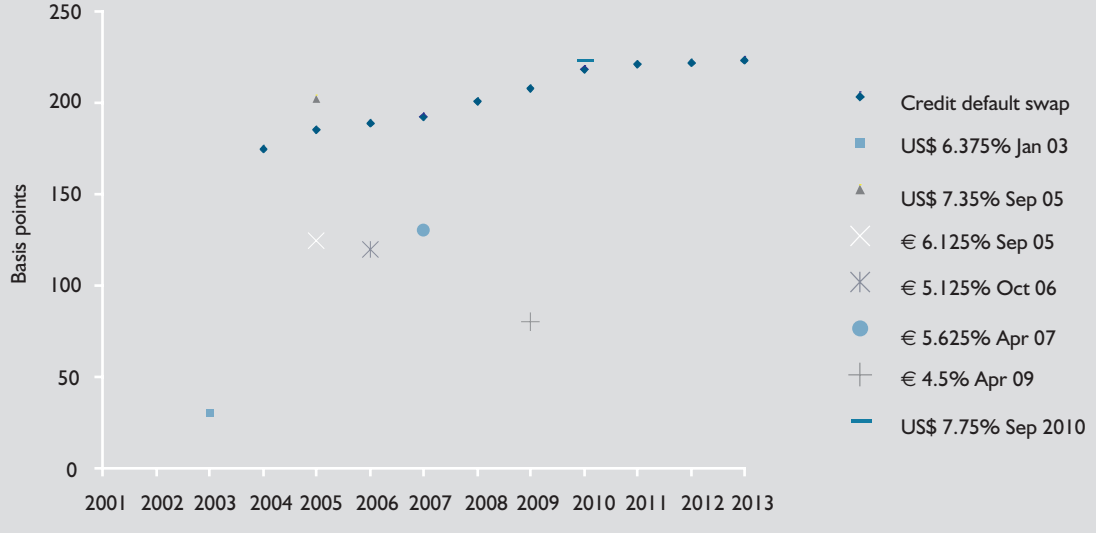
FACTORS BEHIND THE BASIS

The basis arises from a combination of factors, which we may group into:

- technical factors; and
- market factors.

Technical factors, which are also referred to in the market variously as fundamental or contracatual factors, are issues related to the definition or specification of the reference asset and of the CDS contract. *Market* factors, which are also referred to as trading factors, relate to issues connected with the state of the market in which contracts and reference assets are traded. Each factor exerts an influence on the basis, forcing it wider or tighter; the actual market basis at any one time will

Telefonica bond asset swap and credit default swap spread levels, November 2002 — **Exhibit 4**



Source: Bloomberg LP

reflect the impact of all these factors together. We consider them in detail next.

Technical factors

Technical factors that will influence the size and direction of the basis include the following:

CDS premiums are above zero

The price of a CDS represents the premium paid by the protection buyer to the protection seller – in effect an insurance premium. As such it is always positive. Certain bonds rated AAA (such as US agency securities, World Bank bonds or German Pfandbriefe) frequently trade below Libor in the asset swap market; this reflects the market view of credit risk associated with these names as being very low and also above bank quality. However, a bank writing protection on such a bond will expect a premium (positive spread over Libor) for selling protection on the bond. This will lead to a positive basis.

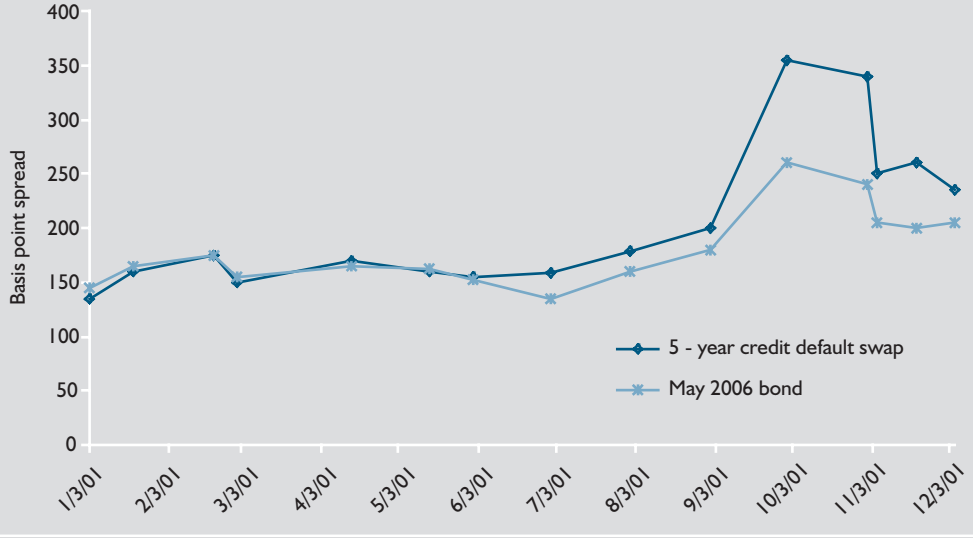
Greater protection level of the CDS contract

Credit default swaps are frequently required to pay out on credit events that are technical defaults, and not the full default that impacts a cash bondholder. Protection sellers will therefore demand a premium for this additional risk, that makes the CDS trade above the ASW spread.

Bond identity and the delivery option

Many CDS contracts that are physically settled name a reference entity rather than a specific reference asset. On occurrence of a credit event, the protection buyer often has a choice of deliverable assets with which to effect settlement. The looser the definition of deliverable asset is in the CDS contract documents, the larger the potential delivery basket: as long as the bond meets pre-specified requirements for seniority and maturity, it may be delivered. Contrast this with the position of the bondholder in the cash market, who is aware of the exact issue that (s)he is holding in the event of default.

British Airways plc, credit default swap versus bond spread levels — **Exhibit 5**



Source: Bloomberg LP

Default swap sellers on the other hand, may receive potentially any bond from the basket of deliverable instruments that rank *pari passu* with the cash asset – this is the delivery option afforded the long swap holder.

In practice therefore, the protection buyer will deliver the *cheapest-to-deliver* bond from the delivery basket, exactly as it would for an exchange-traded futures contract. This delivery option has debateable value in theory, but significant value in practice. For instance the bonds of a specific obligor that might be trading cheaper in the market include:

- the bond with the lowest coupon;
- a convertible bond;
- an illiquid bond;
- an ABS bond compared to a conventional fixed coupon bond; and
- a very-long-dated bond.

As a consequence of all these factors, protection sellers will demand a higher premium for taking on a long position synthetically compared to a cash position.

Accrued coupon

In certain cases, the reference bond accrued coupon is also delivered to the protection buyer in the event of default. This has the effect of driving the CDS premium (and hence the basis) higher.

Assets trading above or below par

Unlike a long cash bond position, a CDS contract provides protection on the entire par value of the reference asset. On occurrence of a credit event, the CDS pay-out will be par minus the recovery value (or minus the asset price at the time of default). If the asset is not trading at par, this pay-out will either over- or under-compensate the protection buyer, depending on whether the asset is trading at a premium or discount to par. So if the bond is trading at a discount, the protection seller will experience a greater loss than that suffered by an investor who is holding the cash bond. For instance, an investor who pays US$90 per US$100 nominal to buy a cash bond has less value at risk than an investor who has written CDS protection on the same bond. If the bond obligor defaults, and a recovery value for the bond is set at US$30, the cash investor will have lost US$60 while the CDS seller will have lost US$70. As a result, the CDS price will trade at a higher level than the ASW price for the same asset where this is trading below par, leading to a larger basis.

The reverse applies for assets trading above par. If the reference asset is trading at a premium, the loss suffered by a CDS seller will be lower than that of the cash bondholder. This has the effect of driving the basis lower.

Funding versus Libor[6]

The funding cost of a bond plays a significant part in any trading strategy associated with it in the cash market. As such it is a key driver of the ASW spread. A cash bond investor will need to fund the position, and we take the bond's repo rate as its funding rate.[7] The funding rate, or the bond's cost-of-carry, will determine if it is worthwhile for the investor to buy and hold the bond. A CDS contract however is an unfunded credit derivative that assumes a Libor funding cost. So an investor that has a funding cost of Libor-plus will wish to compensate for this in the synthetic market, which has the effect of increasing the basis.

Counterparty risk

The protection buyer in a CDS contract takes on the counterparty risk of the protection seller, which does not occur in the cash market. This exposure lasts for the life of the contract, and will be significant if, on occurrence of a credit event, the protection seller is unable to fulfil its commitments. This feature has the effect of driving down the basis, because to offset against this risk, the buyer will expect a CDS premium that is below the cash asset swap spread. In addition, the protection buyer will wish to look for protection seller counterparties that have a low default correlation to the reference assets being protected, to further reduce counterparty risk exposure.

Legal risk associated with CDS contract documentation

This risk has been highlighted in a number of high-profile cases, where a (unintended) broad definition of 'credit event' as stated in the contract documents has exposed the protection seller to unexpected risks. Typically this will be where a 'credit event' has been deemed to occur beyond what might be termed a default or technical default. This occurred for instance with Conseco in the US, as first discussed in Tolk (2001).

Market factors

Market factors that will influence the size and direction of the basis include the following:

Market demand

Strong demand from protection buyers such as commercial banks protecting loan books, or insurance companies undertaking synthetic short selling trades, will drive the basis wider. Equally, strong market demand from protection sellers will drive the basis tighter.

Liquidity premium

The CDS for a particular reference asset may reflect a liquidity premium for that name. An investor seeking to gain exposure to that name can buy the bond in the cash market or sell protection on it in the CDS market. For illiquid maturities or terms the protection seller may charge a premium. At the two- to five-year maturities, the CDS market is very liquid (as is the cash market). For some corporate names however, cash market liquidity dries up towards the 10-year area. In addition, depending on the precise reference credit, the default swap may be more liquid than the cash bond, resulting in a lower default swap price, or less liquid than the bond, resulting in a higher price.

Shortage of cash assets

In some markets it is easier to source a particular reference name or reference asset in the CDS market than

Basis smile, November 2002 — **Exhibit 6**

Source: JPMorgan Chase, Bloomberg LP

in the cash market. This has always been the case in the loan market; while there has been a secondary market in loans in the US for some time, it can be relatively illiquid in Europe. In the bond market, it can be difficult to short some corporate bonds due to problems in covering the position in repo, and also the risk that the bonds go special in repo. When cash assets are difficult to short, traders and speculators can buy protection in the CDS market. This does not involve any short covering or repo risk, and also fixes the cost of 'funding' (the CDS premium) at trade inception. The demand for undertaking this in CDS will have a positive impact on the basis.

THE BASIS SMILE

If plotted graphically, the CDS-cash basis tends to exhibit a smile. This is illustrated in Exhibit 6 and is known as the *basis smile*. This reflects a number of the features we have discussed above. The main reasons for the smile effect is that highly-rated reference names, such as AA or higher, fund in the asset swap market at sub-Libor. However if an entity is buying protection on such a name, it will pay above Libor premiums. The basis therefore tends to increase with better quality names and results in the smile effect. Other factors that impact the smile are the cheapest-to-deliver option for lower-rated credits.

THE DYNAMICS OF THE DEFAULT SWAP BASIS

Positive and negative basis situations

At any time, the CDS basis will reflect the combined impact of all the above factors. Some of these will affect the basis with positive bias, whereas others will have a negative bias. Generally, technical and market factors that tend to drive the basis higher include:

- CDS premiums above zero;
- the delivery option;
- accrued coupon;
- bond price below par;
- funding below Libor;
- market liquidity;
- legal and documentation risk; and
- difficulty of shorting cash bonds.

The factors that tend to drive the basis lower include:

- counterparty risk;
- bonds priced above par; and
- funding above Libor.

However a reversal of the market circumstances can lead to the same factor having a reverse impact. For instance, if a credit is viewed in the market as being of decreasing quality, factors such as the delivery option, bonds trading below par, difficulty in shorting the cash bond and worsening liquidity will all push the basis wider. However if the credit is viewed as improving in terms of quality, the impact of these factors will diminish (for instance, the delivery option has decreasing value as the probability of a credit event occurring decreases).

The market norm is a positive basis, for all the reasons that we have discussed. While some of the factors above do influence the basis towards a negative value, observation tells us that the market norm is a positive basis. The combination of all the various factors tends to result in a negative basis for reference names that are highly rated in terms of credit quality. This is because those factors that drive the basis lower carry greater influence for highly-rated names. As well as being relatively uncommon, a negative basis is usually temporary, as they reflect a particular set of circumstances, which disappear over a relatively short time.

Market observation of the basis trend

To illustrate the interplay between cash and synthetic markets, and the influence of all the above factors acting in concert, we show in Exhibit 7 the ASW and CDS spreads for a sample of 100 investment-grade US dollar-denominated corporate bonds, during June-December 2002. This shows the default swap basis trend during this

period, with the overall basis staying positive on the whole but moving between positive and negative.

We conclude from this observation that:

- the overall default swap basis was essentially positive;
- the CDS spread volatility at least matches that of the cash market, and sometimes exceeds it;
- at times the basis moved with the cash spread, but not to the same extent, thus widening as the cash spread widened;
- there is a high degree of correlation between the two markets, as we would expect; and
- the basis itself moves in the direction of the market; in other words, we observe that the basis widens as cash and synthetic spreads widen.

We may conclude that the basis value moves in response to movements in both cash and CDS markets. The CDS market has a two-way relationship with the cash asset-swap market, and each will lead the other according to circumstance.

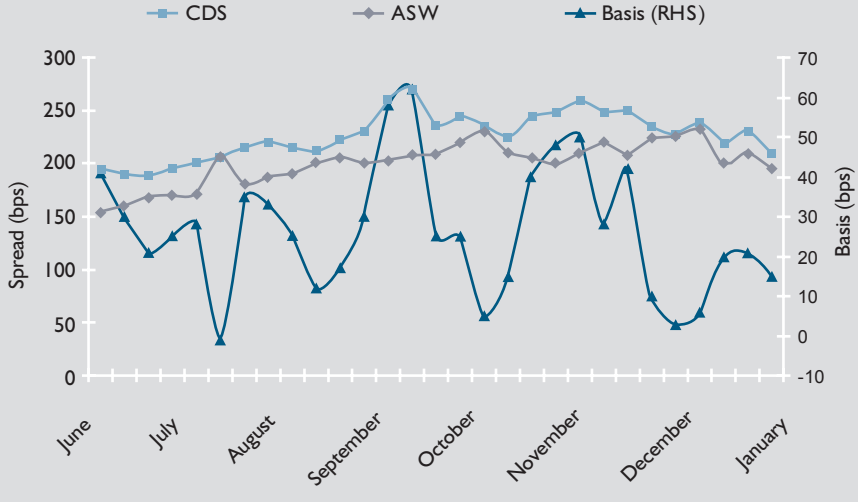
THE IMPACT OF THE BASIS ON TRADING STRATEGY

The existence of the basis enables us to quantify the theoretical gain for the arbitrageur. As with other basis-type trades, typified by the government bond basis, the existence of a non-zero basis implies a risk-free arbitrage opportunity. If the basis is non-zero, a trader can put on a credit-risk free arbitrage trade across the cash and synthetic markets. The two scenarios are:

- Positive basis: sell the cash bond and sell protection on that bond.
- Negative basis: buy the bond and buy protection using a CDS. In this trade, the investor has the value of the delivery option (we assume a physically settled CDS).

The first trade requires short-covering in the repo market, which exposes the investor to funding risks if the bond goes special. The latter trade is easier to implement as there are no short-cover issues to consider,

The dynamics of the default swap basis, 2002 - 2003 — **Exhibit 7**



Source: YieldCurve.com

but it must be funded on the balance sheet. Therefore, the investor's funding costs will also impact the profitability of the trade. If it is sub-Libor, the trade should look attractive and the investor will profit by the amount of the basis; if the funding cost is above Libor, it must be below the negative basis value for the trade to work. However because the basis trade for a negative basis is easier to implement, negative basis values rarely stay negative for long and revert to positive once arbitragers get to work.

CONCLUSION

From this study of the credit default swap basis we can conclude that the CDS market is very liquid and very closely correlated to the movements of the cash bond market. Although the theoretical argument can be made, using the no-arbitrage principal, that the CDS premium must equal the asset swap premium, market observation tells us that a non-zero credit default swap–bond basis always exists between the CDS and asset swap markets. A non-zero basis arises from the influence of a number of technical and market factors, the impact of which varies with market conditions.

The basis moves closely with the markets as a whole. The relationship between the synthetic and cash markets, which is measured by the basis, mirrors the relationship in the interest-rate market between cash bonds and interest-rate derivatives, and is a clear indicator of the highly liquid nature of the credit default swap market.

Notes:

1. Technical details on credit default swaps and other credit derivatives can be found in Anson (1999) and Francis *et al* (1999).
2. The asset swap market is part of the cash market, despite the fact that an interest rate derivative (the swap element) is part of an asset swap.
3. Or, to put it another way, the Libor-flat asset swap rate is the rate payable for firms of roughly AA-rating quality, this being the accepted credit quality of the interbank market.
4. Or the same reference name.
5. We may state the formal definition of the credit default swap – bond basis as being the difference between the credit default spread and the par bond floating-rate spread of the same reference asset, the latter as expressed for an asset swap on the bond.
6. It is a moot point if this is a technical factor or a market factor. Funding risk exists in the cash market, and does not exist in the CDS market: the risk that, having bought a bond for cash, the funding rate at which the cost of funds is renewed rises above the bond's cost-of-carry. This risk, if it is to be compensated in the cash (ASW) market, would demand a higher ASW spread and hence would drive the basis lower.
7. This being market practice, even if the investor is a fund manager who has bought the bond outright: as the bondholder, it can repo out the bond, for which it will pay the repo rate on the borrowed funds. So the funding rate is always the bond's repo rate for purposes of analysis.

References:

Anson, M., *Credit Derivatives*, FJF Associates 1999.

Bomfim, A., "Credit Derivatives and their potential to synthesize riskless assets", *Journal of Fixed Income*, Vol 12, No 3, December 2002, pp. 6-16.

British Bankers' Association, *Credit Derivatives Report 2002/2003*, British Bankers' Association 2003.

Choudhry, M., "Some issues in the asset-swap pricing of credit default swaps", *Derivatives Week*, Euromoney Institutional Investor PLC, December 2, 2001.

Tolk, J., "Understanding the risks in Credit Default Swaps", *Moody's Special Report*, Moody's Investors Service, March 16, 2001

Choudhry, M., *The Repo Handbook*, Butterworth Heinemann 2002 (a), chapter 10.

Choudhry, M., "Combining securitisation and trading in credit derivatives: an analysis of the managed synthetic collateralised debt obligation", *Euromoney International Debt Capital Markets Handbook*, Euromoney Institutional Investor PLC, 2002 (b).

Francis, J., J. Frost, and J. Whittaker, *The Handbook of Credit Derivatives*, McGraw-Hill 1999.

Tavakoli, J., *Credit Derivatives and Synthetic Structures*, John Wiley & Sons, 2nd edition, 2001.

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