CHAPTER 1

A Primer on Credit Default Swaps

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A credit default swap (CDS) is a contract in which the buyer of default protection pays a fee, typically quarterly or semiannually, to the seller of default protection on a reference entity, in exchange for a payment in case of a defined credit event[1] such as default (see Figure 1.1). Default swaps allow credit risk to be isolated and traded between investors. In a sense, they are synthetic bond equivalents, where the buyer of default protection has a position equivalent to shorting a bond, and the seller is in effect being long the bond. However, default swaps introduce counterparty risk. In particular, the buyer of protection is exposed to the seller contingent on the credit event. The intent of this chapter is to provide a basic understanding of the single-name CDS product and its practical implementation in the credit derivatives marketplace.

THE MARKET FOR CREDIT DEFAULT SWAPS

The market for CDSs originated with banks looking to hedge credit risk in their loan portfolios. This market has grown exponentially since 1997, exceeding the expectations of market participants, and the pace of its growth shows little sign of abating (see Figure 1.2). The set of participants has expanded as well, as more players are seeking credit hedges or yield (a pickup over conventional cash instruments). Banks, insurance companies, corporations, and hedge funds actively trade in the default swap market, which is expected to grow substantially in coming years.

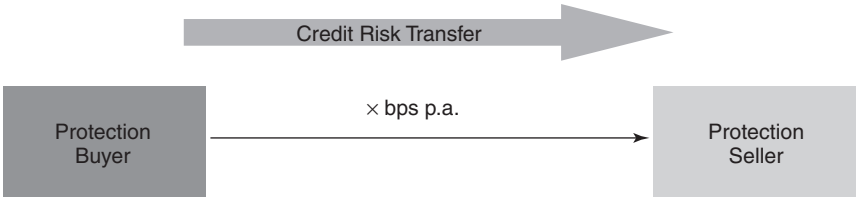

FIGURE 1.1 Cash Flow in a Credit Default Swap Transaction
Source: Citigroup.

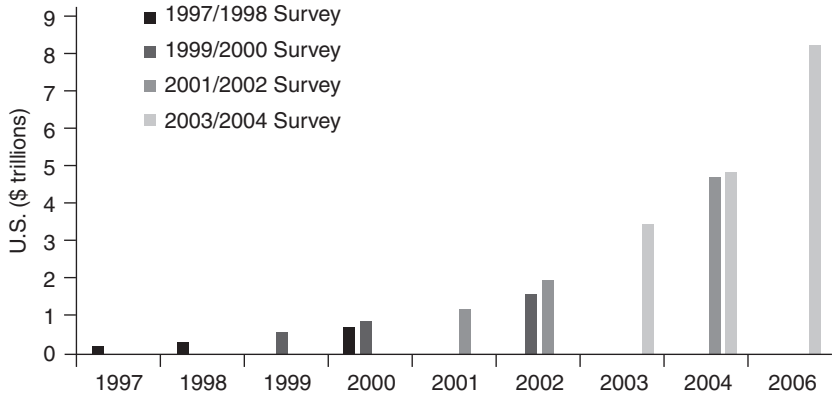

FIGURE 1.2 Credit Derivatives Market Growth, 1997 to 2006E
Source: BBA Surveys.

The amount of CDSs outstanding is more than doubling every year, according to the data provided by two industry sources, the International Swaps and Derivatives Association (ISDA)[2] and the British Bankers' Association (BBA).[3] According to the BBA, the credit derivatives market stood at a mere $180 million in 1997, measured by total outstanding notional. From this humble beginning, ISDA figures document that the market grew to more than $1 trillion by the end of 2001, to $8.42 trillion by the end of 2004, and to $12.43 trillion by the middle of 2005. This represents a growth rate of 123 percent in 2004 and 48 percent during the first six months of 2005. In its recently published 2003/2004 Credit Derivatives Report, the BBA continues to estimate close to 100 percent projected growth for the market.

The spate of debt restructurings, defaults, and high-profile bankruptcies in 2001 and 2002 also increased the awareness for the need to manage credit exposure. CDSs received a further boost in liquidity in 2003 when a broad consortium of dealers got together and began to trade investment-grade, high-yield, and emerging market CDS indexes under the CDX and iTraxx names. These indexes typically consist of baskets of 100 to 125 liquid default swaps, equally weighted. We discuss these indexes and their applications more fully in Chapter 4. Finally, regulatory factors, shareholders demanding higher returns, the ability to customize the maturity of the desired credit exposure (a feature not available in the cash market), and the standardization of default swap contracts have all played important roles in popularizing CDSs.

Credit derivatives have been tested on several occasions through various triggering credit events. In the first few years of the twenty-first century, there have been several high-profile corporate credit events or defaults, including WorldCom, Parmalat, Marconi, Railtrack, British Energy, Charter Communications, Calpine, Delphi, Dana, Delta Airlines, and Northwest Airlines. After most major bankruptcies, settlements caused only a minimal level of dispute. In a few cases, disputes and difficulties arising due to credit events caused the language in CDS contracts (particularly pertaining to restructuring) to be modified to reflect the experience. Overall, the experience so far has enhanced the robustness of the product and the enforceability of the contract.

Single-name CDSs constituted approximately half of all outstanding credit default contracts in 2003, but their market share was expected to fall to about 40 percent by 2006, primarily as a result of the rise in popular usage of index and index-linked products. In addition to CDSs, a range of products has accompanied the growth in the market, including synthetic portfolio/CLO products, credit-linked notes, total return swaps, basket products, and credit spread options (see Figure 1.3). Innovations in synthetic structures will continue to develop, and industry participants expect index and ABS and loan-based credit derivatives products to increase in market share over the next few years. However, in this chapter we discuss CDSs based solely on corporate credit.

The composition of market participants has also changed over the past few years. According to its 2003/2004 Credit Derivatives Report, the BBA found that banks and securities houses were still the main buyers of credit protection. Banks constituted 51 percent of the buyers' market share in 2003. This share is expected to decrease to 43 percent in 2006 as more players enter the credit derivatives market. Securities houses constituted

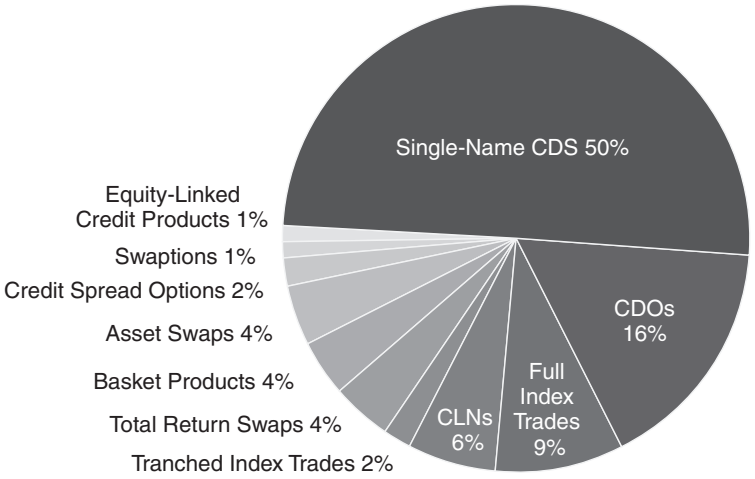

FIGURE 1.3 Breakdown of Credit Derivative Products by Current Outstanding Notional (Year 2003)
Source: BBA Survey 2004.

16 percent of the market share in 2003, and their share is expected to drop to 15 percent in 2006 with the advent of new entrants. The biggest recent change is the emergence of hedge funds as buyers of credit protection. In 2003, hedge fund market share was at 16 percent, equal to that of securities houses, whereas in 2001 it had been only 12 percent. The increase in hedge fund market share follows from the fact that hedge funds are active buyers of default swaps as well as the first-loss tranche in synthetic securitization deals. It is projected that hedge funds will maintain their market share in the future and potentially even replace securities houses as the second-biggest market participant on the buy side. The rest of the market is distributed among insurance companies, corporations, mutual and pension funds, and others (see Figure 1.4).

On the sell side of the credit protection market, banks still held the largest market share in 2003 at 38 percent, but their share is expected to drop to 34 percent in 2006 as the market continues to eveolve. Monoline insurance companies and reinsurers were second with a combined 17 percent share in 2003, and they are expected to retain their market share through 2006. The sell-side market share of securities houses and hedge funds has remained steady in recent years at about 15 percent and will probably stay

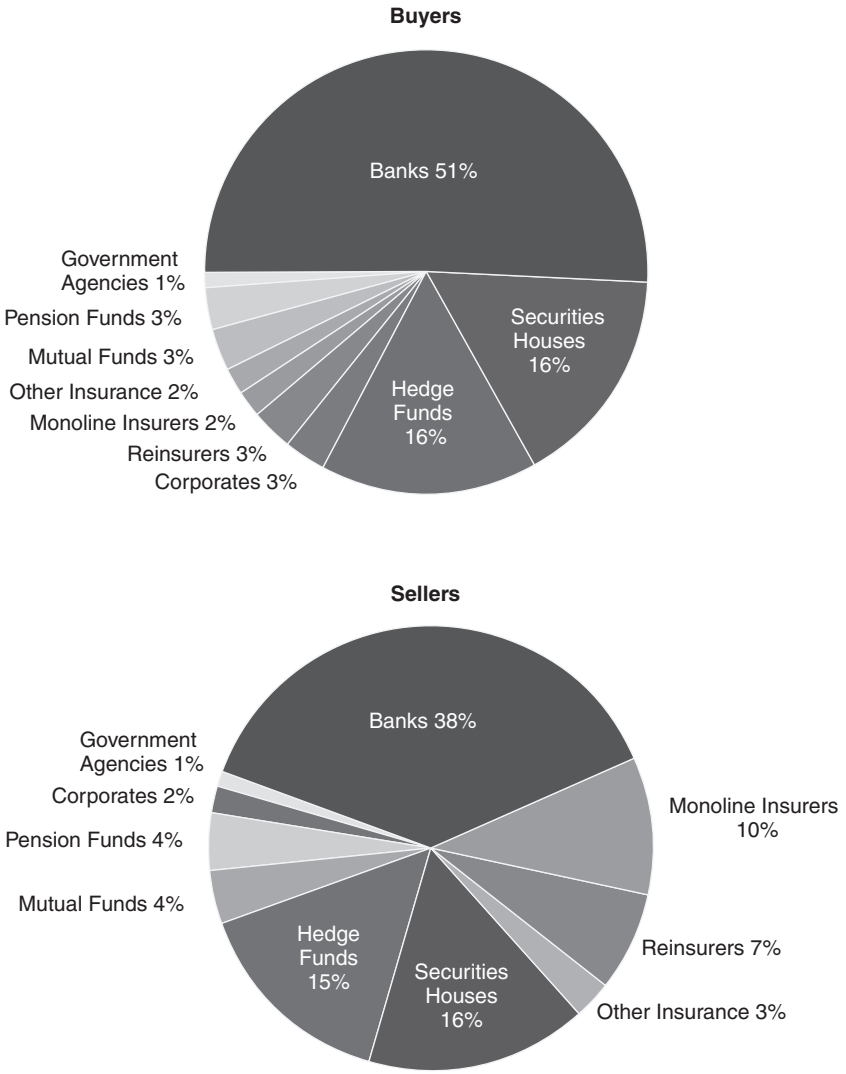

FIGURE 1.4 Credit Derivatives Market—Buyers and Sellers Breakdown (Year 2003)
Source: BBA Survey 2004.

at the same levels. The rest of the market participants are not expected to capture a substantial portion of the sell-side market for default protection (see Figure 1.3). In the next section, we describe the product in greater detail and outline the operation of the basic default swap transaction.

TRANSACTION TERMINOLOGY AND MECHANICS

Although a CDS is one of the simplest forms of credit derivative, there are nonetheless some mechanical details that are important to the practitioner desiring to participate in the CDS market. In this section, we describe some of the details of a CDS confirm, explain what happens if a credit event actually takes place, discuss how such transactions can be unwound, and introduce the market conventions regarding the spread between CDS and cash instruments.

Prerequisites for Credit Derivatives Transactions

Before entering into a transaction, both parties in the default swap usually have a signed ISDA confirmation document in place. This is an agreement that sets forth the rights and duties of the two parties under all swap contracts. Early credit derivative contracts suffered from the ambiguity surrounding the documentation of the agreements. Since 1999, the ISDA has provided a standard template to document a default swap transaction between the two parties. These contracts are governed by a set of common rules and definitions published by the ISDA. Before a CDS is executed, credit lines between the counterparties must be in place because each party is taking on credit exposure to the other.

The terms of a CDS contract are flexible and are negotiated between the buyer and seller of protection. Some key terms are:

- *Reference entity* is the obligor on which protection is being either bought or sold (e.g., ABC Corporation).
- *Reference obligation* is an obligation of the reference entity that is referred to in the default swap contract. The characteristics of the reference obligation often provide a basis on which to compare any obligation that may be delivered to the protection seller (a "deliverable obligation") if a credit event occurs. These characteristics typically require that any deliverable obligation be pari passu with the reference obligation in the priority of payments of the debt of the reference entity.

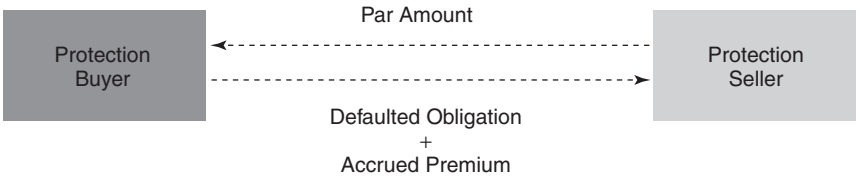

FIGURE 1.5 Cash Flow in a Credit Default Swap Transaction in Case of a Credit Event
Source: Citigroup.

- *Notional amount* (also referred to as *floating-rate payer calculation amount*) of the default swap is the amount of exposure to a particular credit (the reference entity) for which protection is being either bought or sold for a particular period of time.
- *Tenor for which risk is being transferred* is the period for which the protection under the default swap will remain effective (typically five years).
- *Credit events* are the circumstances that must occur for the protection buyer to exercise its right to exchange a deliverable obligation with the protection seller for a payment of par. For CDSs on corporate entities, these events typically include failure to pay, bankruptcy, and restructuring. For CDSs on sovereign entities, obligation acceleration and moratorium/repudiation are also considered credit events.
- *Default swap premium* is the premium (fixed rate) that the buyer agrees to pay the seller in exchange for the transfer of credit risk. The U.S. market convention is to pay quarterly on an Actual/360 basis.

What Happens in Case of a Credit Event?

If no credit events occur during the term of the default swap, the swap expires unexercised. If a credit event on the underlying reference entity should occur, the CDS is designed to unwind in an orderly manner. Figure 1.5 shows the typical exchange of cash flow that takes place when a credit event occurs. The following sequence of events is generally executed upon a credit event:

Occurrence of Credit Event Is Established A credit event is often documented in local newspapers, business magazines, or other publications that are publicly available. The recording of such an event allows the buyer to exercise the right to put the deliverable obligation to the seller at par. There are typically two options for settlement—physical and cash settlement—and the contract will specify which one applies to the specific situation.

Credit Event Notice Is Delivered by Either the Buyer or the Seller One of the counterparties (buyer or seller) delivers the "credit event notice" to acknowledge the occurrence of the event. A "notice of publicly available information" concerning the credit event must also be delivered (either as part of the credit event notice or separately). This notice cites the sources of information confirming the occurrence of the credit event. When both the notices are effective, the settlement period is initiated.

Buyer Delivers Notice of Intended Settlement to the Seller This notice is an expression of the buyer's intent to physically settle the CDS contract. The notice also contains a detailed description of the type of deliverable obligations that the buyer reasonably expects to deliver to the seller.

Physical Settlement: Buyer Delivers a Deliverable Obligation to the Seller and Receives Par If the contract calls for physical settlement, the protection buyer receives $N \times 100$ from the seller, where N is the notional amount, and gives the seller N units of a deliverable obligation. These are obligations of the reference entity that may be delivered, per the CDS contract, in connection with physical settlement. A deliverable obligation must typically be a bond or a loan and must meet certain characteristics. Investors should see the ISDA credit derivatives definition documents for details, but in the most common version of CDS, the deliverable obligation must be pari passu with senior unsecured obligations of the reference entity.

Cash Settlement: Seller Pays Par Minus Recovery Value to the Buyer If the contract is cash settled, a market value is determined for the reference obligation and the protection seller makes a cash payment to the protection buyer for the implied loss on that obligation. Specifically, the protection seller pays the buyer $N \times (100 - R)$, where R is the price of the reference security after the credit event (recovery value) and N is the notional amount.

As an example of a cash settlement, in a $10 million notional transaction, when the defined credit event occurs, assume that the market value of the reference security is 15 percent. The swap is then terminated, and the seller pays the buyer a redemption amount of $(100 - 15\%) \times 10{,}000{,}000 =$ $8.5 million.

If the settlement were physical, the seller would pay $10 million to the buyer, while the buyer would deliver to the seller the deliverable obligation with a face amount of $10 million (current market value of $1.5 million). Occasionally, the settlement may give one of the counterparties the choice of cash or physical settlement, or the cash settlement may be for a predetermined amount. In either case, the buyer owes the seller the accrued fraction of the default swap premium up to the credit event. The swap then terminates.

Unwinding Default Swap Transactions

When market conditions dictate, an investor may wish to terminate the swap prior to the final maturity of the default swap—for example, when the investor wants to book a profit. In such a situation, the investor will unwind the default swap contract at the current market value of the swap. Suppose the investor buys protection today on Acme Corporation credit (i.e., short Acme Corporation credit risk) at a spread of, say, 100 basis points (for five years). Now suppose Acme Corporation credit deteriorates and default spreads steadily widen. Assume that one year after having entered into the transaction the investor finds that protection on Acme Corporation credit is worth 400 bp, and the investor can book a profit by unwinding the transaction (typically with the dealer from whom the investor bought protection). Unwinding the transaction reduces to "selling" protection on Acme Corporation for the remaining life of the original default swap transaction—that is, four years. In practice, however, a transaction is unwound by way of a tear-up, where the dealer effectively tears up the original contract after agreeing to pay (in this case) an amount that represents an investor's profit on the trade. In this example, the investor receives either (1) a running coupon representing the difference between the two positions (i.e., the premium received from selling protection, or 400 bp per annum, minus the premium paid for buying protection, or 100 bp per annum) or (2) the present value of 300 bp per annum, running for four years discounted for the likelihood of Acme Corporation defaulting during the next four years. The discounting referred to here is the same that is used to price a CDS transaction after its inception and is described mathematically in the appendix after Chapter 4. The value of a default swap contract at a certain maturity T, per basis point, is referred to as the Spread01 at that maturity. Many examples of the sensitivity of default swaps to credit changes may be found in this chapter's case study and also in Chapter 5.

The DV01 of a Credit Default Swap

Taking exposure to a company for two years is very different from taking credit exposure for ten years. Quantifying the exposure of a default swap to changes in the company's credit quality is done using the concept of DV01, defined as the change in value of the swap for a 1 bp shift in the credit curve. Closely related to the spread DV01 of a credit-risky bond, the DV01 of a default swap is essential to quantifying the mark-to-market risk of an investor. For example, the value of default protection for five years in an investment-grade corporate will increase by approximately $4,400 per $10 million per basis point.

The Default-Cash Basis

While default swaps are quoted as a spread premium, corporate bonds are often quoted as a spread to Treasuries. Because most cash bonds are issued as fixed-rate instruments and because most investors fund on a London Interbank Offered Rate (LIBOR) basis, it is necessary to convert the Treasury spread to a spread to LIBOR[4] so that a comparison between default swap spreads and the spreads on the corresponding-maturity cash instruments is possible.

Default swap spreads, which are often leading indicators of deteriorating credit quality in addition to being more volatile than cash spreads, will typically be slightly wider than the spreads of comparable-maturity cash bonds (to LIBOR)—that is, the default-cash basis is generally positive. Many technical and fundamental factors affect the level of the default-cash basis, but the most important is the fact that default swaps have slightly greater risk than bonds or loans for a particular reference entity. An investor who buys a bond or loan knows exactly what obligation she holds in the event of a credit downturn, but the protection seller can only estimate that he will hold a senior unsecured bond or loan that meets the criteria of a deliverable obligation. He will not know the specific bond or loan he will receive until there is a credit event.[5]

SOME USES OF DEFAULT SWAPS

The following is a summary of the most common applications of default swaps, and illustrations with examples of trades are provided when appropriate. Investors can choose different recovery values based on their views on the credits involved.

Buying a Note versus Selling Default Protection

The cash flow of a (funded) cash instrument such as a corporate bond can be replicated using a CDS. In this sense a default swap is a synthetic substitute for a bond and provides investors an alternative to investing in cash instruments for essentially the same risk.

As an example, consider a trade in which an investor is faced with the choice of either buying the cash instrument or selling protection as described in Table 1.1.

The investor has the alternative of earning 205 bp per annum by selling ABC protection or earning a spread of 200 bp by buying the corresponding ABC notes. Some considerations in making an investment in the credit risk of ABC Corporation are highlighted in Table 1.2.

Note that the default-cash basis was implicit in the investor's choice.

TABLE 1.1 ABC Corporation—Cash or Derivative Exposure?

Buy 8 Percent ABC Notes 1/15/11	Sell Five-Year ABC Protection
Indicative bid/offer spread of 260 bp/250 bp to five-year Treasury.	Indicative bid/offer of 205 bp/215 bp in default swaps.
At +250 bp, with midmarket swap spreads of 50 bp, the notes asset swap to LIBOR + 200 bp.	Unfunded position, so seller receives 205 bp per annum.
If financing cost is LIBOR flat, net spread on the five-year trade is 200 bp per annum.	

Source: Citigroup.

TABLE 1.2 Investor Considerations in the Cash Versus Default Trade

Buy ABC Corporation Cash Bond	Sell Protection on ABC Corporation
Investor holds a specific bond.	If a credit event occurs, the protection seller will receive the cheapest ABC bond or loan (within certain parameters) at par.
LIBOR + funding costs results in lower spread pickup.	Larger benefit for investors who fund at LIBOR +.

Source: Citigroup.

Freeing Up or Using Bank Credit Lines

Banks with a mismatch between their credit lines and their desired portfolios often use the default swap market to close the gap. In fact, this was one of the very first applications of default swaps and the key reason that the CDS market got going. For example, an American or European bank with an unused credit line to a particular corporate name could use the default swap market to create a synthetic asset that pays it for taking on risk against that name, something that may not be possible if that corporation has not issued cash bonds or if existing bonds are illiquid or of an inappropriate maturity. In this case, the bank would effectively sell default protection. Alternatively, a bank wishing to reduce concentrated exposure to a particular corporation (e.g., a deteriorating credit with which it has a long-standing and extensive credit relationship) could buy default protection from a third party to effectively defease some of the credit risk.

Filling a Maturity Gap

Many credits do not have a full yield curve, and even when some bonds exist, they could be illiquid and rarely traded. This is particularly true for off-the-run credits, which often have just a couple of traded instruments. The default swap market offers an additional venue for taking a credit position for maturities different from those of the outstanding cash instruments. A short-maturity default swap allows the investor to take an almost pure credit position on default, effectively decoupling the credit risk from the spread duration risk inherent in longer securities. The investor looking to get short credit risk has the additional advantage of not having to short an illiquid bond, thus avoiding the risk of volatile repurchase agreement (repo) rates and short squeezes.

For example, in January 2006, General Motors Acceptance Corporation (GMAC), a General Motors (GM) subsidiary, traded at distressed spreads because of the travails of GM, but many investors felt that GMAC was likely to be spun off or bought and eventually return to investment-grade status. These investors expressed that view by selling six-month or one-year default protection in GMAC, even though short-dated GMAC bonds were not available.

Expressing Curve or Forward-Rate Views

A variant on the theme of expressing a cross-credit view is that of expressing a view that a particular part of a credit curve is too steep or too flat, or to synthetically express a view on the forward curve, where the forwards are not traded directly. For example, let us say the investor feels that ABC Corporation's credit curve between the 5- and 10-year point is too flat—in other words, that the implied probability of default between 5 and 10 years is lower than justified by the fundamentals. If the investor expects the spread between 5-years and 10-year CDs to steepen, the investor would sell 5-year protection on $X million and buy 10-year protection on $Y million (X and Y are chosen in a spread DV01-neutral ratio, (typically 1.3:1 to 1.8:1) such that the trade is neutral to parallel shifts of the spread curve) to express this view. This is a DV01-neutral curve steepener. Furthermore, the investor could capture the benefit of the (usually) positive carry of the trade and of the likely sharp roll-down in the under-five-year part of most credit curves (roll-down between 5 and 10 years is typically lower). Note that the investor is net long default risk on ABC to the tune of $X–$Y.

Now consider another investor who is bullish on ABC Corp, but who believes that the spread of the 10-year CDS is too wide relative to

the 5-year CDS. Such an investor might be expecting a rally in ABC as well as a flattening of ABC's 5 to 10s spread, and therefore might wish to be long duration as well as a flattener. Selling $10 million of 10-year default protection and buying $10 million of 5-year default protection (equal notional amount) is a credit-neutral but long-duration trade. This investor would be immune to default for the first five years, and would benefit from a curve flattening and/or a parallel spread curve rally, but would be exposed to a credit sell-off in a mark-to-market sense, as well as to further steepening of the 5- to 10-year CDS spread.

Other types of curve trades, such as. DV01-neutral flatteners, forward credit shorts, etc. are possible. The analysis and application are similar to the examples above.

Barbell-Bullet Trade

A third version of the CDS curve trade is one where the investor believes, as in the preceding trade, that the slope of ABC's 5s to 10s CDS curve is too steep, but he is not bullish on the credit. Such an investor would enter a DV01-neutral curve flattener. This would be the exact opposite of the DV01-neutral curve steepener, and thus would involve selling $Y amount of 10-year protection and buying $X amount of 5-year protection, resulting in a negative carry. Notice that in this case, the investor is short $X–$Y of ABC credit, but may not believe that ABC has significant risk of suffering a credit event.

In this type of duration-matched relative-value curve trade (whether involving cash or CDS instruments), investors can neutralize themselves to the default event while improving the negative carry by selling an appropriate amount of short-maturity default protection. Thus, the investor can sell 1-year protection in addition to the 5- and 10-year legs. This trade is referred to as a barbell-bullet or butterfly.

Taking Advantage of Tight Repo Levels without Financing

Certain bonds may trade at tight (''special'') levels in the repo (financing) market. That is, an investor long the bond and using it as collateral to borrow against would be charged a lower interest rate than normal (the so-called general collateral or GC rate). The yields of bonds that are trading special are usually slightly lower to reflect their repo advantage. Yet, many asset managers do not finance and usually face the unpleasant alternatives of not buying in that maturity range or putting up with inferior yields.

However, through the default swap market they can realize at least a part of the financing advantage. For example, while in early 2006 the Republic of Brazil 12.5% of 2016 bond was trading more than 100 basis points tight to general collateral in repo, the investor could purchase a note tied to a default swap of similar tenor with the Republic of Brazil as the reference entity that paid a spread of about 50 bp higher than the LIBOR spread of the bond.

Since the spread earned on a default swap can be as long as the maturity of the bond, it has the effect of monetizing the implied repo curve for the full life of the security. In contrast, the repo market itself does not normally make financing available for terms longer than a few months to a year.

CASE STUDY: RELATIVE VALUE—CASHING IN ON THE CURVE STEEPNESS IN TELECOMS

The following case study illustrates many advantages of CDSs described earlier in the chapter. By providing an opportunity to short credit risk, the CDS lets the investors express specific views about various parts of the credit curve. In October 2004, the curves in the telecom market were very steep and sophisticated investors could position for flattening by playing in the CDS and the cash market at the same time. The case study, taken from Citigroup's ''Bond Market Strategy'' publication, demonstrates our recommendation at the time on how this strategy could be implemented.

How to Blend CDs and Cash in Long-Maturity-Curve Trades

We have highlighted in our recent research the continued steepening in credit curves across most sectors of the market, particularly in higher-beta sectors such as autos and telecoms. Persistent portfolio-related selling of protection (i.e., buying credit) has helped fuel a significant rally in the short end of the curve, while the rally in Treasuries has evoked stronger expectations for a healthy backup in rates and, hence, investors seeking to shed longer-duration securities. Credit curves in the telecom sector specifically have been influenced by the buying back of some short-dated paper (Sprint is a case in point), further exacerbating the steepness across many curves; for example, many 10s/30s credit curves that we monitor are at their 100th percentiles.

To put the steepness among telecom credit curves into perspective, Table 1.3 depicts a list of benchmark nonfinancial issuers, the five-year CDS spread, the corresponding on-the-run long bond asset swap spread, and the differential (on an absolute and relative basis) between them. Telecoms (in boldface) account for five of the top seven steepest curves on an absolute basis. We also highlight that the majority of names are BBB-rated, higher-beta credits (excluding Cingular and Verizon), and for many the significant upward-sloping credit curve partly reflects strong short-term liquidity but potential concerns over credit quality going out more than a few years.

While market participants more often examine curves within either the CDS or cash markets, instead of both, we focus on these differentials across both the 5-year CDS and

TABLE 1.3 Steepness of 5/30s Credit Curves Across Select Benchmark Issuers (5-Year CDS, 30-Year Cash), October 2004

Issuer	Ratings	Coupon (%)	Maturity	Par ASW	Five-Year CDS (bp)	ASW—CDS (bp)	Ratio[a]
AT&T Corp.	**Ba1/BB+**	**8**	**2031**	**378**	**225**	**153**	**1.7**
Sprint Capital Corp.	**Baa3/BBB−**	**8.75**	**2032**	**164**	**60**	**104**	**2.7**
DaimlerChrysler	A3/BBB	8.5	2031	168	65	103	2.6
AT&T Wireless	**Baa2/BBB**	**8.75**	**2031**	**134**	**33**	**100**	**4.0**
Georgia Pacific Corp.	Ba3/BB+	8.875	2031	219	127	92	1.7
Cingular Wireless	**A3/A**	**7.125**	**2031**	**109**	**29**	**81**	**3.8**
Verizon Maryland	**Aa3/A+**	**5.125**	**2033**	**112**	**35**	**77**	**3.2**
Amerada Hess	Ba1/BBB−	7.125	2033	138	64	74	2.2
Devon Energy Co.	Baa2/BBB	7.95	2032	112	43	69	2.6
GMAC	A3/BBB	8	2031	241	173	68	1.4
Kroger Co.	Baa2/BBB	7.5	2031	115	48	66	2.4
SBC Communications	**A1/A**	**6.45**	**2034**	**102**	**39**	**63**	**2.6**
Safeway Inc.	Baa2/BBB	7.25	2031	121	58	62	2.1
May Dept. Stores	Baa2/BBB	6.9	2032	119	60	58	2.0
BellSouth Corp.	**A1/A**	**6.55**	**2034**	**94**	**37**	**57**	**2.6**
Valero Energy	Baa3/BBB	7.5	2032	112	57	55	2.0
Norfolk Southern	Baa1/BBB	7.25	2031	85	32	53	2.7
Walt Disney	**Baa1/BBB+**	**7**	**2032**	**93**	**42**	**51**	**2.2**
AOL Time Warner	**Baa1/BBB+**	**7.7**	**2032**	**115**	**64**	**51**	**1.8**
Kellogg Co.	Baa2/BBB−	7.45	2031	61	23	38	2.7
Comcast Corp.	**Baa3/BBB**	**7.05**	**2033**	**105**	**67**	**37**	**1.6**
Wyeth	Baa1/A	6.5	2034	109	74	34	1.5
Ford Motor Co.	Baa1/BBB−	7.45	2031	227	198	29	1.1
Boeing Co.	A3/A	6.125	2033	53	26	27	2.1
Wal-Mart Stores	Aa2/AA	7.55	2030	44	18	26	2.4
Caterpillar Inc.	A2/A	7.3	2031	48	25	24	2.0
Sara Lee Corp.	A3/A+	6.125	2032	43	24	19	1.8
Target Corp.	A2/A+	6.35	2032	40	23	17	1.7
Viacom Inc.	**A3/A−**	**5.5**	**2033**	**70**	**53**	**16**	**1.3**
IBM	A1/A+	5.875	2032	38	22	16	1.7
Procter & Gamble	Aa3/AA−	5.8	2034	26	14	12	1.9

[a]Ratio = Par ASW/five-year CDS.
Source: Citigroup.

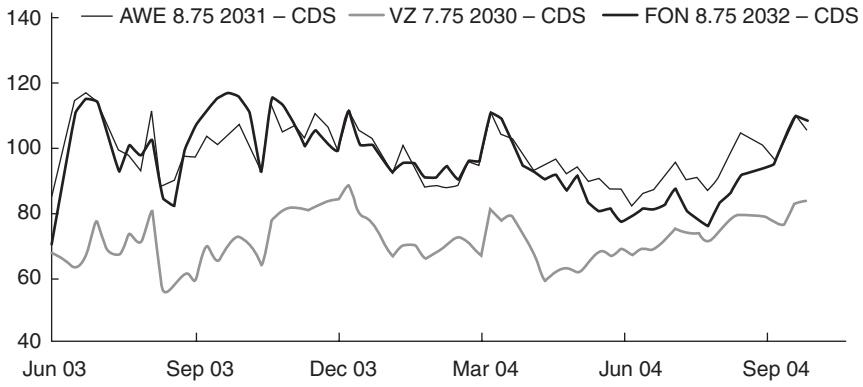

FIGURE 1.6 AWE, FON, and VZ 5s/30s Credit Curves: At Their Steepest Levels Year to Date
Source: Mark-It Partners and Citigroup.

30-year cash markets for a few reasons. First, liquidity in the five-year bucket of the CDS market is robust and allows investors to go long protection (short credit) more efficiently vis-a-vis the cash market. Second, there is no liquidity in the 30-year CDS bucket and limited liquidity in the 10-year bucket. A sizable amount of credit curve trading occurs in the CDS market, but in many instances the all-in transaction costs of 5 to 10 basis points in the single-name space (with the exception of 8 to 10 specific issuers, including Ford, GM, and AT&T) diminish the widespread application of such trades at this stage of the market's maturity. Third, we believe that the lack of focus on examining opportunities across the entire credit curve in the cash and CDS markets offers some new, interesting opportunities.

In Figure 1.6 we highlight these relationships across three selected telecom names, depicting the absolute spread differentials between AT&T Wireless (AWE), Sprint (FON), and Verizon (VZ) long bonds and five-year CDS spreads, which are all approaching year-to-date widest levels. On closer examination we find that the recent widening has been driven by the tightening in 5-year CDS spreads more than by a sell-off in 30-year bond spreads, whereas in March 2004 when the relationships traded at similar levels the large differential was driven primarily by a widening in long bond spreads, as expectations for interest rate hikes rose substantially.

In our view, the current rally in the CDS market has largely run its course, particularly for these arguably higher-quality, low- or mid-beta names that are trading well inside of historic averages. For example, Sprint has rallied about 45 to 58 bp (mid), AT&T Wireless has tightened over 20 to 33 bp (mid), and Verizon has tightened about 14 to 31 bp (mid) versus a tightening of 7 to 55 bp (mid) on the CDX.IG Series 2 index. We believe that at current levels, spreads are approaching a floor, and thus buyers of protection face limited downside risk.

We foresee two plausible scenarios:

1. **Higher-probability scenario**. The overall credit environment remains supportive of five-year CDS spreads, and these credits find a floor a few basis points inside of current levels. Long bond spreads begin a gradual grind tighter as investors become increasingly comfortable with the outlook for interest rates, and seek extra spread pickup in credits with constructive outlooks. Our telecom analyst Henry Mitchell carries an overweight recommendation on AWE and FON and a slight overweight on VZ.
2. **Lower-probability scenario**. The overall credit environment turns sour, as a result of weaker-than-expected third-quarter earnings/guidance, rising oil prices, or problems in Iraq, and five-year CDS spreads begin unwinding the large gains accumulated over the past few months, outpacing the more modest widening that would likely occur in long bond spreads.

We suggest a trade strategy for each of these views in the next section.

Implementing Credit Curve Flatteners—Two Basic Approaches

Implementing credit curve trades across either the investment-grade cash or CDS markets is generally accomplished in one of two ways: equal-weighted notional or spread-DV01 neutral. A third method is default neutral, but given our overall market view and individual credit views on these telecom names over the next six months, this is not a relevant strategy because we do not anticipate FON, AWE, or VZ to default.

Depending on which of the two scenarios outlined earlier is accorded a higher probability by the investor, he or she will pursue one of two strategies.

For the higher-probability (i.e., more optimistic) scenario, the credit bull flattener, implementing the trade equal notional (e.g., buying $10 million of five-year protection and $10 million notional of bonds) would be appropriate. This strategy can be dissected into two trades (for clarification purposes); an investor is explicitly long the flattener and long outright credit risk due to the larger duration of the long bond relative to CDS. These trades generate a positive payoff if spreads tighten in a parallel shift, or if the curve flattens; these trades generate a negative payoff if spreads were to widen in a parallel shift or if the curve were to steepen.

Table 1.4 illustrates the payoff of the equal notional trade, where an investor buys US$10 million notional of AWE 8.75 percent of 2031 at 130.7 and buys US$10 million of AWE five-year protection. Note the payoffs depict only the credit risk component of the trade; the interest rate component can be eliminated by putting on an asset swap—swapping the fixed-rate cash flows received from buying the bond into floating-rate cash flows.

There are two other (secondary) components that will affect the payoff of the trade: transaction costs and cost of carry. Assuming an average bid/offer cost of 6 bp all-in (3 bp bid/offer for CDS, 3 bp for the bond), transaction costs will total approximately US$61,000. In the case of the AWE example, the trade actually results in positive carry of US$98,000 per annum. If we assume an investor holds the position for six months (i.e.,

TABLE 1.4 Equal Notional Strategy

Strategy 1	Buy $10 million AWE 8.75 2031 at +141 bp over 30-year government (130.7, dollar price)
	Buy $10 million AWE five-year CDS at +32 bp

Scenario Analysis — Profit and Loss Parallel Shift — AWE Credit Curve (**AWE** Tightens, Widens Uniformly)			Shift in AWE 8.75 2031 Only (**AWE** Curve Flattens, Steepens)		
	−20 bp	+20 bp		−20 bp	+20 bp
Bond leg	320,175	−308,518	Bond leg	320,175	−308,518
CDS leg	−92,455	92,455	CDS leg	0	0
Net P&L	227,720	−216,063	Net P&L	320,175	−308,518

Source: Citigroup.

US$49,000), the transaction costs minus the positive carry results in a slightly negative payoff of—US$12,000. In this example breakeven for the trade will be about a 1 bp flattening in the curve.

For the lower-probability (i.e., less optimistic) scenario, the credit bear flattener, implementing the trade spread-DV01 neutral would be more appropriate. In this strategy an investor is explicitly long the flattener but neutral credit risk due to the matched duration of the long bond with the CDS. That is, an investor will generate a positive payoff if the curve flattens but is indifferent if spreads either tighten or widen in a parallel shift; these trades generate a negative payoff if the curve steepens.

Table 1.5 illustrates the payoff of the spread-DV01-neutral trade, where an investor buys US$10 million of AWE 8.75 percent of 2031 and buys approximately US$33 million of AWE five-year protection. We estimate transaction costs for this trade at approximately US$92,000 and positive carry of US$24,000 per annum. If we assume that an investor holds the position for one-half year (e.g., USD$12,000), the transaction costs minus positive carry totals roughly US$80,000. In this example breakeven for the trade will be about a 5 bp flattening in the curve.

The structure of the payoff profiles in general will be similar across the telecom names listed in Table 1.3. However, we like implementing the trade in AWE given the significant degree of curve steepness in the name and, as a result the positive carry offered in either strategy (more so in the equal notional trade). Most spread-DV01-neutral trades of a similar nature—that is, buying protection and buying long bonds—will result in negative carry because the trade requires buying about 3.3 times as much CDS for a given amount of long bonds. Therefore the ratio of the par ASW spread to the CDS spread would have to be greater than 3.3:1 to result in a positive carry trade (as it is in this case).

One alternative to the AWE trade(s) described earlier, either equal-weighted notional or spread-DV01 neutral, would be to put the trade on by buying Cingular (CNG) CDSs as opposed to AT&T Wireless (AWE) CDSs, as the CNG CDS trades about 3 to 4 basis points

TABLE 1.5 Spread-DV01-Neutral Strategy

Strategy 2	Buy $10 million AWE 8.75 2031 at +141 bp over 30-year government (130.7 dollar price) Buy $33 million AWE five-year CDS at +32 bp (Spread-DV01 neutral)

Scenario Analysis — Profit and Loss Parallel Shift — AWE Credit Curve (**AWE** Tightens, Widens Uniformly)			Shift in AWE 8.75 2031 Only (**AWE** Curve Flattens, Steepens)		
	−20 bp	+20 bp		−20 bp	+20 bp
Bond leg	320,175	−308,518	Bond leg	320,175	−308,518
CDS leg	−302,358	302,358	CDS leg	0	0
Net P&L	17,817	−6,160	Net P&L	320,175	−308,518

Source: Citigroup.

inside the AWE, meaning that the CNG is a cheaper short. As the AWE-CNG merger is completed at a future date[6] we would expect AWE and CNG CDS to converge, so we would prefer to be short the tighter of the two credits. We also recommend that investors consider putting on the trade in VZ and FON, referenced earlier as credits with very steep credit curves (and generally constructive fundamental outlooks).

APPENDIX: EQUIVALENCE OF A BOND SPREAD AND DEFAULT SWAP PREMIUM

Here we show how one may price a default swap using the market spread of a bond issued by the same reference entity. Our approach will be first to derive expressions for a simplified default swap and then to add correction terms to bring the pricing closer to reality. We assume the following simplified default swap as a starting point:

- The swap is written on a single par floater and initiated on a coupon date.
- There is no payment of the accrued default swap premium to the seller of protection in case of default.
- The swap has no transaction costs and financing specialness.
- Termination payments are made by physical settlement at the coupon date immediately after the credit event.

Now consider a portfolio consisting of the following:

- A short position in default protection (you have sold default protection) where you receive a premium U and in case of default you receive a security worth R and make a payment of 1.
- A long position in a risk-free floater that pays L on coupon dates of the risky bond.
- A short position in the risky security issued by the reference entity that requires payments of $L + S$ on coupon dates.

If there is no default, the net cash flow is zero, because both the risky and risk-free bonds mature at par. If a default event does occur, the portfolio is liquidated at the coupon date immediately after the event. In this case the long position in the floater brings a cash flow of +1, the contingent payment results in a cash flow of $-(1 - R)$, and covering the short position $-R$, which again net out to zero. So, to prevent arbitrage, the intermediate cash flows must be zero, and we have $U + L - (L + S) = 0$, or $U = S$. We will now examine the other factors that affect the pricing and attempt to relax some of the simplifying assumptions.

Specialness of the Underlying

Assume the underlying risky security is special in repo, with specialness Y. In this case, the intermediate cash flows are U from the default swap premium, L from the long position in the risk-free security, and $-(L + S) - Y$ from the short position. These cash flows must all add up to zero, so that $U + L - (L + S) - Y = 0$, or $U = S + Y$. In practice, it is difficult to estimate the effective specialness Y because default swaps typically run much longer than available term repos.

Effect of Accrued Default Swap Premium

The market convention is that the buyer of protection must pay the accrued default swap premium that has accrued since the last coupon date. The expected difference between the time of the credit event and the previous coupon is approximately half of the coupon period, so given that a default has occurred, the expected advantage to the writer of protection is half a coupon, or U/4 assuming semi-annual coupons, where U is the default swap premium rate. Assuming semiannual coupons, if the semiannual probability of default is q, for a one-period par bond we have

$$\frac{(1-q)[1+(r+s)/2]+qR}{1+r/2}=1$$

so that

$$q=\frac{s/2}{1+(r+s)/2-R} \tag{1.1}$$

where s is the spread over the risk-free rate r, and therefore equals the arbitrage-free default swap premium rate U for a par floater under the same simplifying assumptions as before. The annualized probability of default is given by $q_a = 1-(1-q)^2$. Therefore, the advantage to the seller of protection is approximately:

$$v=\frac{U}{4}q_a=\frac{s}{4}q_a=\frac{s}{4}[1-(1-q)^2] \tag{1.2}$$

To illustrate the orders of magnitude involved, assume the risk-free rate is $r = 6\%$, the spread is $s = 5\%$, and the recovery value is $R = 20\%$. Using Equations 1.1 and 1.2 we get $q = 2.94\%$, $q_a = 5.76\%$, and $v = 7.2$ bp. This is a benefit to the writer of protection, and so reduces the default swap premium.

Accrued Interest on the Underlying Risky Security

Similarly, the writer of protection does not owe accrued interest on the underlying risky security in case of default. There is a benefit to the writer of protection, which is given by:

$$v'=\frac{c}{4}q_a$$

where c is the coupon on the risky security.

Accrued Interest on the Underlying Risk-Free Security

As we argued for the starter case, the protection seller has a net cash flow of $-(1-R)$ with the protection buyer and $(1-R)$ from liquidating the positions, which add up to zero. However, this calculation ignores the accrued interest on the risk-free security. The expected value of this accrued interest conditional on default is $L_{avg}/4$, assuming semiannual compounding, where L_{avg} is the average future value of the default-free forward rate L

through maturity. In spread terms, this is equivalent to the unconditional expected value $w = q_a \cdot L_{avg}/4$). If the average value of the risk-free forward rate is L_{avg}, $q_a = 5.76\%$ from the earlier example, we have $w = 10$ bp. This is a benefit to the writer of protection, and so reduces the default swap premium.