Morgan Stanley

SECOND EDITION 2006

Credit Derivatives Insights

Single Name Instruments & Strategies

Primary Analysts: *Sivan Mahadevan*
Peter Polanskyj
Vishwanath Tirupattur
Pinar Onur
Andrew Sheets

The Credit Derivatives Insights Series

The *Single Name Instruments & Strategies* book, now in its second printing, contains select previously published research reports on credit investment strategies, credit derivatives instruments and valuation techniques from our *Credit Derivatives Insights* publications. It also contains "primers" on credit derivatives concepts and a glossary with brief definitions for nearly 150 terms used in the market. We have organized the manual into six broad sections: instruments and primers, valuation and investment frameworks, basis ideas, credit curves, options and embedded options, and credit market themes. There are 52 chapters in all.

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Morgan Stanley & Co. Incorporated
February 27, 2006

SECTION C. BASIS IDEAS

SECTION D. CREDIT CURVES

SECTION E. OPTIONS AND EMBEDDED OPTIONS

SECTION F. CREDIT MARKET THEMES

Introduction

Primary Analyst: Sivan Mahadevan
Primary Analyst: Peter Polanskyj
Primary Analyst: Vishwanath Tirupattur

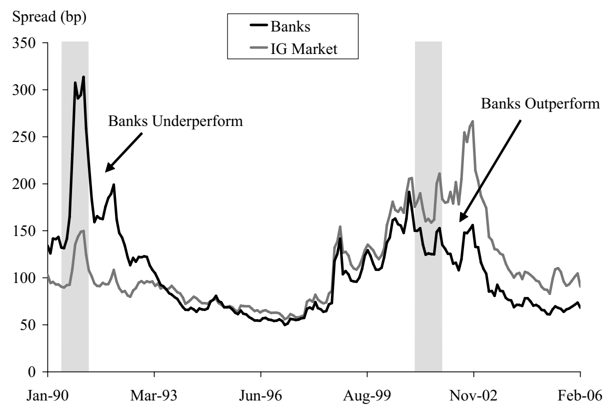
"A pessimist sees the difficulty in every opportunity; an optimist sees the opportunity in every difficulty."

- Sir Winston Churchill

Well over a decade after its birth, the credit derivatives market has forced a secular change in the management of credit portfolios. The key motivator for the growth of the market was credit stress in many of the emerging markets during the middle to late 1990s, followed by a rather sharp turn in the corporate credit cycle in the earlier part of this decade. These events also served as good tests of contract specifications and led to standardization. In fact, standardization was the key driver of growth in most corners of the credit derivatives market, from single-name to structured credit, demonstrating that there was, indeed, a large amount of pent-up demand. With increased liquidity, convergence among many market instruments, and an active structured credit market, the conventional model of credit investing was challenged like never before. Today, key themes include the risks and operational issues associated with the immense size of the market, new frontiers resulting from default swaps gaining acceptance in both the structured finance and leveraged loan worlds, and innovation in areas such as trading recovery risk.

The banking community numbered among the biggest early beneficiaries of credit derivative instruments, in that banks were able to manage corporate credit risk in ways that were difficult to imagine in the early 1990s. Such risk management was indeed one of the reasons why banks fared much better during the 2001 US recessionary period compared to the recession 10 years prior (see Exhibit 1). But if banks were the beneficiaries, did anyone suffer? In general, many more investors entered the credit markets as the result of credit derivatives, so in some sense, credit risk (and credit-related losses) was spread throughout the system.

exhibit 1
Banks Were Better Able to Manage Credit Risk



Source: Morgan Stanley, The YieldBook

LOOKS AND FEELS LIKE A BOND

What most early users of credit derivatives wanted to achieve was rather simple: a transfer of credit risk from one party to another. The early instruments, including credit linked notes and total return swaps, achieved this, but they had their shortcomings, as they were generally linked to a single bond or loan and lacked liquidity. Credit default swaps, over time, gained popularity largely because they looked and felt like bonds and loans, yet were not tied specifically to one bond or loan. The restructuring credit event was a popular theme to debate among various members of the investment community; much of the standardization discussions centered on these debates.

THE EVOLUTION OF THE CREDIT DEFAULT SWAP

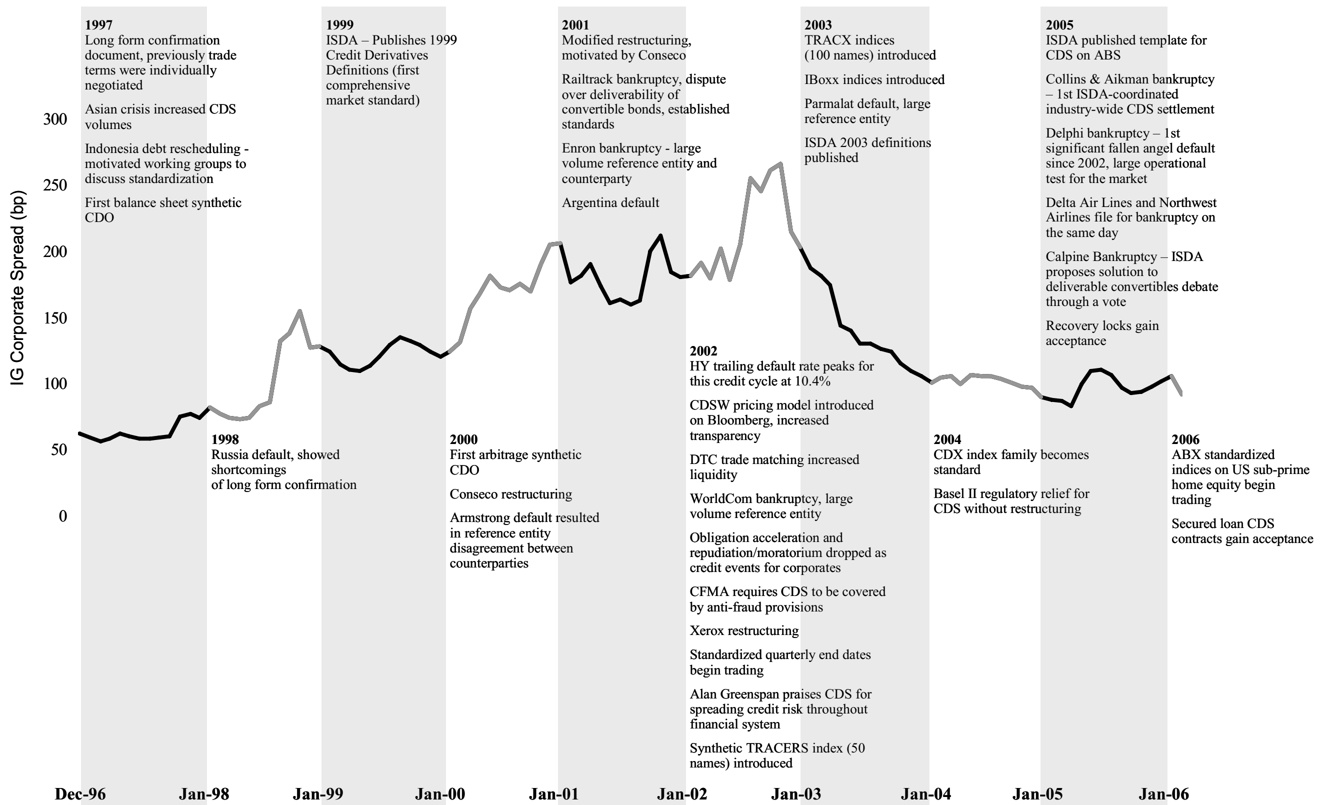
While credit derivatives trading volumes are dominated today by contracts that reference corporate entities, for those who are not familiar with the early days of the markets, emerging markets sovereign credit was where the default swap first gained popularity in the mid 1990s. Default swaps offered a simple way to trade sovereign credit risk to various terms. Furthermore, with many hedge fund participants in the emerging markets, the default swaps helped investors create outright short and long/short positions much more easily than by using bonds and the repo markets.

From 1997 through 2002, the credit default swap went through an incredible growing up process, driven by a deteriorating credit cycle that made for good tests and resulted in standardization, which, in turn, spurred more liquidity and opportunities for further tests (see Exhibit 2). The Asian emerging markets events of 1997, including the rescheduling of some of Indonesia’s debt payments, motivated the creation of working groups to address standardization. In the same year, a standard (long form) confirmation gained acceptance. Prior to this, most trade terms were individually negotiated. 1997 also witnessed the first synthetic CDO, the beginning of a structured credit market that contributed hugely to liquidity. The shortcomings of the original definitions of restructuring were revealed on numerous occasions through credit events triggered by Russia, Conseco and Xerox. Ultimately, such tests prompted rethinking the restructuring credit events, resulting in modified restructuring, modified modified restructuring, and even the growing use of no restructuring credit events. Other credit events were equally important. The Armstrong default highlighted the importance of clearly specified reference entities (at the appropriate level in the capital structure), and the Railtrack bankruptcy motivated specific details concerning the deliverability of convertible bonds. The Enron and WorldCom bankruptcies, along with the Parmalat and Argentina defaults, were good tests of the system in general, given the volume of contracts outstanding in each case and the number of counterparties involved (Enron was, itself, a counterparty).

Systems and procedures were important to the evolution of the credit default swap, as well. The Commodity Futures Modernization Act of 2000 (CFMA) required that default swaps be covered by anti-fraud measures, which created “walls” between lenders and hedgers in banking institutions. Depository Trust Company (DTC) trade matching helped increase liquidity dramatically, as did the introduction of the CDSW default swap pricing tool on the Bloomberg systems. Finally, the more recent injections of liquidity came from the near hyper-growth of trading in default swap indices, from TRACERS℠ to the Dow Jones TRACX℠ Index and IBoxx to the industry standardized Dow Jones CDX family of indices over the course of two years (2002 through 2004), aided by the birth of the credit hedge fund.

exhibit 2

Credit Default Swap Time Line



Source: Morgan Stanley

RECENT DEVELOPMENTS: BIG DEFAULTS IN A BIG WORLD

By the beginning of 2005, most would have argued that the corporate-credit-backed credit default swap was a relatively mature instrument, given the experience of numerous recession-period defaults and daily volume levels that were surpassing those of traditional corporate bonds. Yet, a decade after its birth, we would argue that events in 2005 were critical to the market, given the explosive volumes of outstanding risk driven both by the credit derivative indices and structured credit flows. The Collins & Aikman bankruptcy filing in mid-2005 represented the first CDX index constituent default (HY CDX), prompting the first ever industry-wide auction process, with over 400 institutional investors participating (see Chapter 6 for a description of this process). The bankruptcy filing of Delphi was the first significant US fallen angel default since 2002 and a name that appeared in both investment grade CDX index tranches and in nearly one-third of all outstanding bespoke synthetic CDOs.

Other significant 2005 credit events included two US airlines filing for bankruptcy literally within minutes of one another (Delta Air Lines and Northwest Airlines), and Calpine, a large US power company present in all of the HY CDX indices, with a complicated capital structure that brought into question the deliverability of certain convertible securities. Ultimately the ISDA protocol for CDS settlement determined which bonds would be deliverable (via the protocol), and the auction was conducted.

NEW FRONTIERS

While more than a decade has passed since the birth of single name credit derivatives, there is perhaps more development today than at any time since the early days. Within the corporate credit space, recovery locks, instruments that allow investors to hedge recovery risk alone, have gained popularity recently, providing an interesting alternative to traditional CDS (see Chapters 4 and 19). In the high yield space, the growing market for secured loans is attracting standardized CDS contracts as well, which will allow derivatives users to utilize the full debt capital structure (see Chapter 3). Furthermore, the market is developing an appetite for options on single-name CDS, although there is still a big gap between what the buy-side wants (long-dated, out-of-the-money options) versus what the sell-side can provide (short-dated, near-the-money options).

Within the securitized products space, 2005 saw the establishment of ISDA standards for CDS on structured finance securities, including asset-backed securities, commercial real estate securities and even cash CDOs (see Chapter 2). In early 2006, we saw the launch of the ABX indices, standardized indices for US sub-prime home equity (HEL) risk (see Chapter 2).

THE CREDIT DERIVATIVES INSIGHTS SERIES

The *Single Name Instruments & Strategies* book, now in its second printing, contains select previously published research reports on credit investment strategies, credit derivatives instruments and valuation techniques from our *Credit Derivatives Insights* publications. It also contains “primers” on credit derivatives concepts and a glossary with brief definitions for nearly 150 terms used in the market. We have organized the manual into six broad sections: instruments and primers, valuation and investment frameworks, basis ideas, credit curves, options and embedded options, and credit market themes. There are 52 chapters in all.

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ACKNOWLEDGEMENTS

We would like to acknowledge the many other Morgan Stanley strategists who were involved in some of the articles included in this manual, including Nikhil Agarwal, Anisha Ambardar, Brian Arsenault, Lindsey Burnett, Payal Dave, Viktor Hjort, Rizwan Hussain, Young-Sup Lee, Mohsin Naqvi, Rachel Ng, Greg Peters, Simmi Sareen, Gayatri Talreja, and Sejal Vora. We would also like to acknowledge our credit derivatives businesses within Morgan Stanley, whose team members have played a significant role in development of these markets, permitting investors and researchers to take a strategic approach to the markets. We would like to thank our creative services team, especially Dan Long and Linda Warnasch, for their assistance in preparing this manual. Finally, we very much appreciate the immeasurable amount of feedback that we have received on our reports from Morgan Stanley clients.

Section A

Getting Started: Instruments and Primers

chapter 1

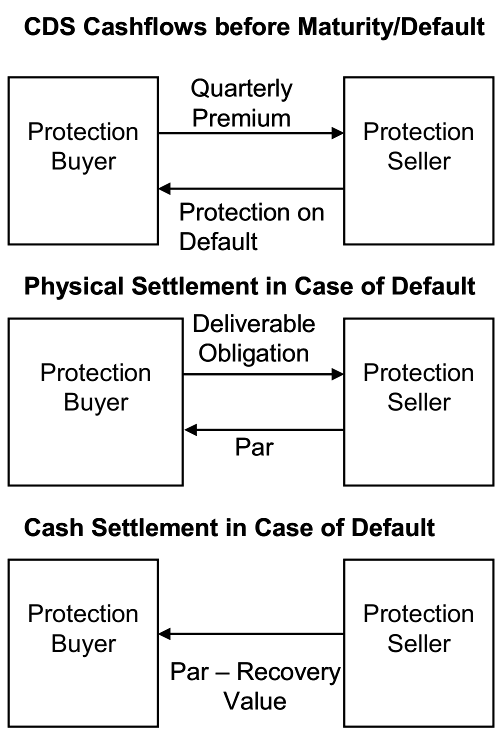
A Primer on Single Name Instruments & Strategies

Primary Analyst: Sivan Mahadevan
Primary Analyst: Peter Polanskyj

What Is a Credit Default Swap?

A single name credit default swap is an OTC contract between the seller and the buyer of protection against the risk of default on a set of debt obligations issued by a specified reference entity. A Credit Default Swap (CDS) is essentially an insurance policy that protects the buyer against the loss of principal on a bond in case of a default by the issuer. The protection buyer pays a periodic premium (typically quarterly) over the life of the contract and is, in turn, covered for the period. For issuers with a high likelihood of default, the bulk of the premium is typically paid up front, instead of periodically.

exhibit 1
CDS Cashflows



Source: Morgan Stanley

CREDIT EVENTS

A CDS is triggered if, during the term of protection, an event that materially affects the cashflows of the reference debt obligation takes place. For example, the reference entity files for bankruptcy, is dissolved or becomes insolvent. Other credit events include failure to pay, obligation acceleration, repudiation, and moratorium.

Restructuring is also considered a credit event for some, but not all, credit default swaps. If the CDS contract covers restructuring (referred to as "R", "mod-R", or "mod-mod-R"), events such as principal/interest rate reduction/deferral and changes in priority ranking, currency, or composition of payment also qualify as credit events. Better matching of requirements of protection seekers and CDS economics has been the primary driver behind the evolution of the restructuring feature. As we discussed in the Introduction section, Conseco and Xerox restructuring events played an important role in this evolution. We discuss more details of this feature later in this primer.

When a credit event triggers the CDS, the contract is settled and terminated. The settlement can be physical or cash. The protection buyer has a right to deliver any deliverable debt obligation of the reference entity to the protection seller in exchange for par. Deliverable debt obligations include bonds and loans in G6 currency, and not subordinated to the reference bond, which is mentioned in the trade confirmation. There can be additional maturity restrictions if the triggering credit event is a restructuring. The CDS buyer and the seller can also agree to cash settle the contract at the time of inception or at the time of exercise. In this case, the protection seller pays an amount equal to par less the market value of a deliverable obligation.

The protection buyer receives 100% of the par in exchange of the delivered obligation, implying that the difference between par and the ultimate recovery on the delivered obligation represents the protection seller's loss. It is this probability weighted expected loss that the CDS premium strives to capture.

REFERENCE ENTITY

A CDS contract specifies the precise name of the legal entity on which it provides default protection. Given the possibility of existence of several legal entities associated with a company, a default by one of them may not be tantamount to a default on the CDS. Therefore, it is important to know the exact name of the legal entity and the seniority of the capital structure covered by the CDS. This point sometimes gets overlooked in relative value trades between bonds and CDS, where the underlying exposures are closely related but are not legally identical.

The Armstrong default was a case in point, as knowing the appropriate level in the capital structure covered by the CDS turned out to be key in determining which obligations were protected against default. We will discuss relative value trading in the Basis section of this primer.

On a related topic, changes in ownership of the reference entity's bonds or loans can also result in a change in the reference entity covered by the CDS contract. The following table summarizes how the new reference entity is determined depending on the level of ownership changes:

exhibit 2 New Reference Entity When Ownership Changes

Ownership of bonds/loans	New reference entity
One entity assumes more than 75%	Successor
No entity assumes more than 75%, but one of more entities assume 25-75%	Divide the contract equally among such entities
No entity assumes more than 25%	Original legal entity

Source: ISDA

If the legal entity does not survive, the CDS contract follows the entity that succeeds to highest percentage of bonds or loans.[1]

STANDARDIZED PAYMENT DATES

Since 2002, a vast majority of CDS contracts have standardized quarterly payment and maturity dates to the 20th of March, June, September and December. This standardization has several benefits, including convenience in offsetting CDS trades, rolling over of contracts, relative value trading, single name versus the benchmark indices or tranched index products trading, etc.

[1]*Please refer to Chapter 7.*

CDS Pricing

The CDS premium reflects the expected cost of providing the protection, in a risk neutral sense. To calculate the CDS premium, one needs to estimate the probability of default and expected loss given default. The fair CDS premium is the one that equates present value of premium payments to the present value of expected losses.

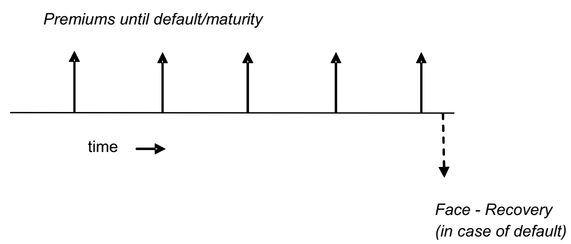
Exhibit 3 shows simplified cashflows of a CDS contract. (In addition, there is a typically a payment of accrued premium in case of default.) The following equations summarize the pricing approach:

PV of CDS Spread = PV of Expected Default Loss

*Expected Default Loss = LGD*Probability of Default*

Where LGD stands for expected loss given default and equates to
*Protection Notional *(1-Estimated Recovery Rate).*

exhibit 3
CDS Cashflows



Source: Morgan Stanley

Let us make some further simplifying assumptions to better understand CDS pricing. First, we assume that we have a CDS spanning only one period, with the premium paid at the end of the period (see Exhibit 4 for other details). We also assume that a default can happen only at the end of the period. In case of default, the protection seller pays for the loss on the bond (i.e. Par-Recovery). Now, we can calculate the implied probability of default from the given CDS spreads, using the logic mentioned earlier:

$$s1 \cdot (1 - p1) = p1 \cdot (1 - R)$$

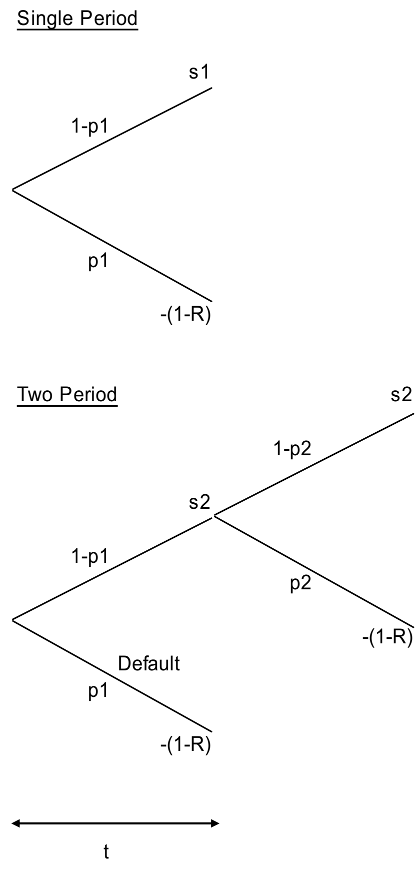
$$p1 = \frac{s1}{s1 + 1 - R} \approx \frac{s1}{1 - R}$$

chapter 1

exhibit 4
Determining Default Probabilities

Assumptions

s1	CDS spread for single period maturity
s2	CDS spread for two period maturity
p1	probability of default in the first period
p2	probability of default in the second period
R	recovery rate
t	time period
r	riskfree rate



Source: Morgan Stanley

Now, we extend the model to two periods. Similar to one-period calculations, we can equate the present value of CDS spread to expected losses in the case of default to get the implied probability of default in the second period, as shown in the two-period probability tree. The following equation summarizes this calculation:

$$\underbrace{\frac{s2\cdot(1-p1)}{1+r\cdot t}+\frac{s2\cdot(1-p1)\cdot(1-p2)}{(1+r\cdot t)^2}}_{\text{PV of Spread}}=\underbrace{\frac{(1-R)\cdot p1}{1+r\cdot t}+\frac{(1-R)\cdot(1-p1)\cdot p2}{(1+r\cdot t)^2}}_{\text{PV of Default}}$$

Since we know all the variables other than p2, we can calculate it from this equation.

NUMERICAL ILLUSTRATION

In Exhibit 5, we have shown a numerical example using the discussed approach to calculate default probabilities, given a CDS curve and fixed recovery rate assumptions.

exhibit 5 Default Probability – Numerical Example

1 Year Spread	0.50%
2 Year Spread	1.00%
Recovery Rate	40%
Risk-free Rate	2%
p1	0.83%
p2	2.48%
PV Default	0.0190
PV Premium	0.0190

Note: Calculation assumes annual premium payment.
Source: Morgan Stanley

CONTINUOUS TIME IMPLEMENTATIONS

Since defaults do not have to happen on payment dates, and premium frequency does not have to match the time steps in the calculation shown above, most commonly used CDS pricing models consider the default process as a continuous time phenomenon, along with discrete numerical techniques to estimate the present value of defaults and premiums. These models are calibrated to the market CDS curve (typically, to get a piecewise constant default intensity function for a given constant recovery rate).

The CDSW function on Bloomberg gives users an option to pick one of the three available numerical implementations of continuous time models. Further details on the three models are available in Bloomberg help.

Using these models, we can easily calculate a set of risk-neutral default probabilities from an issuer's CDS curve. We can then use them to value other debt obligations –

including bonds – and to calculate the mark-to-market value of a CDS struck at a price different from the prevailing market price. Additionally we can use these models to convert a running premium to upfront, and vice-versa.

POINTS UPFRONT

As we mentioned earlier, default swaps on issuers with high default probabilities typically trade on an upfront plus running basis, rather than on a par spread basis (i.e. quarterly premium, no upfront payment). That is, the protection buyer pays a large part of the premium at the inception of the contract and a lower spread quarterly. For example, instead of paying 2000 bp running the protection buyer would pay 34% upfront and 500 bp running.

Theoretically, the present value of the two premium streams should match when we take default probabilities and timing of cashflows into consideration. However, a higher upfront payment and lower running premium result in better cashflow matching from a hedging perspective, given that the reference entity's bonds would also be trading at a significant discount to par due to distress.

Given that the protection buyer stops paying quarterly premiums when a default occurs, the equivalent upfront payment should be lower than the simple present value of the running premium difference (1500 bp in our example) at risk-free rates.

The first step for conversion of par spread to upfront is to calculate default probabilities, as we explained in the CDS pricing section. Then using these probabilities we calculate the present value of the par spread (2000 bp in our example), by multiplying the spread with the probability of survival at the time of payment and then discounting back using risk-free zero rates. Now, this present value should equal the present value of upfront and running premiums (34% upfront and 500 bp running in our example), based on the same default probabilities.

A convenient way to do this conversion is to use the CDSW function on Bloomberg. We simply put "Deal Spread" to the running spread and value to the CDS using the par CDS spread. The "Market Value" represents the equivalent upfront payment. We provide additional details on this function in the Useful Bloomberg Functions section of this chapter.

IMPORTANCE OF RECOVERY RATE ASSUMPTION

As we discussed earlier, default probabilities and recovery rate are intricately related. That is why the recovery rate assumption can have a significant impact on the mark-to-market of an off-market CDS and hence there exists the possibility of disagreement between two counterparties on the payment required to close such transactions, even when both parties are using identical models.

The bottom line is that to price a credit default swap, we need to have a view on market-implied recovery rates and default probabilities. However, we cannot directly observe these variables in the marketplace. That said, assuming one of the two is fixed, we can estimate the other using on-the-run CDS pricing. Additionally, since bond spreads also capture default risk, we can use bond data to estimate CDS pricing, if it is not available directly in the marketplace.

USEFUL BLOOMBERG FUNCTIONS

There are a number of functions provided by Bloomberg for finding CDS levels and analyzing values. MSDU <GO> shows Morgan Stanley's daily pricing for various credit derivatives. Another function that facilitates searching for the current market premium levels for protection on an issuer is CDSD <GO>. The screen also allows the user to search for available CDS for different entities related to the same issuer. Additionally, one can observe the term structure of CDS in a selected currency and for a selected debt type – senior, subordinated, or other.

WCDS <GO> is another useful screen, where one can scroll down a list of the term structure of CDS by industry sectors.

CDSW <GO> is a default swap calculator, with which we can calculate market value, DV01, cashflows, and other sensitivities of a default swap contract. Potential applications of this tool include calculating delta neutral hedge ratios, marking-to-market, and converting running premium to upfront.

chapter 1

The Basis – CDS vs. Bond Arbitrage

For most issuers with liquid bonds trading, one can get a good estimate of the market price of the credit risk, and hence, the trading range for the CDS, if not observable directly from the market. This brings us to the subject of basis between an issuer's bonds and credit default swap, given that we can estimate the price of credit risk from both.

In our discussion, we have deliberately compared CDS levels to bond spreads above Libor, and not Treasuries. A CDS protection buyer and seller inadvertently takes counterparty risk to the banking system. This risk is captured by the difference between Libor and Treasury curves. As such, we tend to treat LIBOR as the risk-free rate throughout our research.

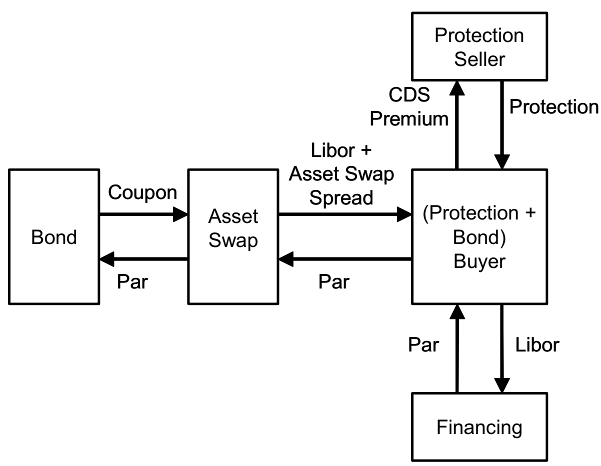
Conceptually, the CDS premium should equate to spread over LIBOR for the issuer's floating rate note trading at par, and represents the compensation for the default risk. While not all issuers have floating-rate debt outstanding, one can interpret this amount by calculating the zero volatility OAS or Z-spread (defined on the next page) on the issuer's fixed rate bonds, assuming the bonds are trading at par. If, however, the bonds are trading at a discount or premium, one needs to make some adjustments to determine the default risk premium.

CDS-BOND BASIS

The primary objective of this basis is to explore relative value opportunities and technical differences between CDS and bonds of an issuer. To make the bond cashflows comparable to CDS cashflows, the first step is an asset swap to convert fixed cashflows to floating.

exhibit 6

CDS – Bond Basis



Source: Morgan Stanley

The spread gives us an estimate of a spread over the swap zero curve that matches the present value of the bond's cash flows to its market price. The general price/yield relationship of a credit-risky bond is as follows.

$$P = \sum_{i=1}^{n} \frac{BondPayments}{(1 + Yield_i)^i}$$

We can then decompose the yield into a risk-free component and a spread component:

$Yield_i = RiskFreeRate_i + Spread$

In the case of Z-spread this is:

$Yield_i = ZeroLibor_i + Z\text{-}spread$

The basis is the difference between the CDS level and a given spread metric, assuming both instruments have the same maturity and the bond is trading at par. Typically, this takes the form:

$Basis = CDS - Z\text{-}spread$

As shown in Exhibit 6, if an investor buys a par bond and buys protection on the reference entity, while financing the transaction at LIBOR, he/she can lock in the basis. If the basis is negative (i.e. CDS premium lower than spread), the investor is getting a positive cashflow during the life of the contract. If the reference entity defaults on the obligation, the investor can simply deliver the bond to the protection seller and receive par, which he/she can use to close out the financing arm of this transaction.

We have made a number of assumptions in the above example, including that the bond is trading at par and that both CDS and the bond have matching maturities. There are other technical effects such as coupon recovery, accrued interest payments, and transaction costs, which make this argument only an approximate one.

While locking in negative basis is relatively straightforward, an attempt to lock in positive basis may prove frustrating, given difficulties involved in shorting bonds, including trying to short a hard-to-find bond over a long period.

Additionally, if the bond is trading above (or below) par, the credit risk on the CDS and the bond will not be the same, i.e. the amount of CDS protection will not be enough (or will be too much) in case of a default. Therefore, we would need to adjust the Z-spread for the principal mismatch. We refer to the difference between a spread metric and CDS as "adjusted basis". Our *Credit Derivatives Insights* weekly publication has been tracking the current and historical Z-spread adjusted basis since December 2002 for various sectors.

CURVE ADJUSTMENTS TO THE BASIS

Having adjusted the basis measure for maturity gaps between the bond and the CDS, as well as for the bond's market price being at a premium/discount to par, we can further sharpen our relative value measure by using the full term structure of CDS, which is now possible given the increased market liquidity across the curve.

For this adjustment, instead of using a constant CDS premium above the swap zero curve, we can use a spread that varies with the timing of the cashflows, in accordance with the term structure of default swaps. The first step is to determine probabilities of survival for various cashflow dates using the CDS curve. The next step is to calculate present value of cashflows, using survival probabilities for coupon and principal cashflows and default probabilities for the recovery value in case of default. Thus, we get a price for the bond that is consistent with the full CDS curve and current interest rate environment. The following equation summarizes the above calculation:

$$\sum_i \frac{CF_i \cdot (1 - p_i) + R \cdot P_i}{(1 + r_i)^{t_i}} = Price$$

where

$$p_i = f(s_i, C)\ ,\ P_i = g(s_i, C)$$

CF_i represents the bond's cashflows (coupon as well as principal), R is the recovery rate assumption, and r_i is the discount rate (boot-strapped from the swap curve). The default probabilities (p_i and P_i) above are determined from the CDS curve (s_i) and the constant C. The factor (1- p_i) represents the probability of survival up to i while P_i represents the incremental probability of default during period i. The constant C represents a parallel shift in the CDS curve, and by changing it we can match the present value of cashflows to the market price. For details on how to calculate default probabilities from spread, refer to the CDS pricing section of this primer.

Once we have the implied CDS curve from the bond price, we can calculate another measure of basis – this time between the actual default swap and the implied default swap spread. We call this measure the curve-adjusted or fair value basis, and have been tracking it in our publications since December 2004.

While the Curve-Adjusted basis indicates the true relative value taking into account the full CDS curve, the Z-spread basis captures the carry on the basis trade between the bond and the CDS (assuming that the bond is trading at par). When both the carry and the fair value basis measures point in the same direction and the gap is large enough to cover transaction costs, the relative value trade may be compelling, technical factors aside.

REASONS FOR NON-TRIVIAL BASIS

There are several reasons for the existence of a basis between bonds and CDS. We discuss the salient ones here:

- **Maturity Differences.** Maturities of an issuer's CDS seldom exactly match maturities of its bonds. Consequently, in most cases, one has to interpolate or extrapolate the CDS curve to estimate the default swap premium directly comparable to the bond spreads.

- **Bond Price.** In case of a default, the CDS pays the difference between par and recovery rate, implying that the protection would be insufficient for bonds trading at premium and too much for bonds trading at discount.

- **Difficulty in Shorting Bonds.** To arbitrage away positive basis, one needs to short the bond (and write protection in the form of CDS), which is not always easy, especially for an extended period of time.

- **Bond Covenants.** Bonds may have covenants, such as put/call options, tender with make-whole, coupon step-ups, change of control provisions, equity clawbacks, etc., which would affect their spread. This would distort the basis as CDS assumes a generic reference obligation and, in case of default, a protection buyer would look for a bond with the least attractive covenants for a physical settlement, given the embedded cheapest-to-deliver option.

- **Restructuring Feature.** Restructuring clauses in CDS contracts often create economic differences between taking credit risk in the form of CDS versus bonds (see the section on restructuring for more details). This would also tend to distort the basis.

- **Technical Factors.** Prevailing supply/demand imbalances in the marketplace between bonds and CDS also impact the basis.

- **Liquidity.** Liquidity may result in temporary misalignments between bonds and CDS, giving rise to negative or positive basis.

- **Transaction Costs.** To arbitrage the basis, one has to incur transaction costs associated with the bid-ask spread on bonds and CDS. Thus arbitrageurs have an incentive to trade only if the basis exceeds this band of transaction costs.

- **Interest Rate Exposure.** In case of a default, the cash flows of a CDS and the bond swapped into floating rate do not match. This is due to the reason that the interest rate swap does not disappear with default on the bond. Consequently, we have to incur additional transaction costs and bear the market risk of the interest rate swap.

Implications of Restructuring as a Credit Event

Earlier we briefly mentioned restructuring as one of the credit events covered by some default swaps. In this section, we further elaborate on this contract feature and analyze its potential implications on CDS pricing. Restructuring of a debt obligation refers to one or more of the following actions:

- A reduction in interest rate, amount payable or accrual
- A reduction in amount of principal or premium payable
- Postponement or deferral of interest or principal payments
- Change in ranking
- Change in currency to a “non permitted” currency

In order for the actions above to constitute a credit event, such actions must result, directly or indirectly, from a deterioration in the creditworthiness or financial condition of the reference entity.

The evolution of various restructuring options, which we will discuss shortly, directly reflects the motivation to improve the matching of economics behind protection selling and bond purchases. Not surprisingly, losses suffered by many protection sellers and buyers during various actual restructuring events were the main driver behind this evolution.

The most vibrant memory that comes to mind in this regard is that of Conseco, which restructured some of its debt. The restructuring did not materially affect the company’s bonds with comparable maturities; however, the outcome for the CDS protection seller was significantly worse, highlighting the dramatically different economics for default swaps and bonds. This motivated Modified-R changes (see below for details).

Current ISDA agreement offers four types of restructuring options that affect the protection buyer’s privileges:

Full Restructuring (Old-R)
Under this definition, a bond of any maturity is deliverable after a restructuring credit event by the reference entity. There are no limitations on maturity of deliverable obligations (up to 30 years) and no multiple holder requirement on the restructured obligation (see more details on this point in the Mod-R section).

No Restructuring (No-R)
This definition is typical in case of high yield CDS in the US and completely excludes restructuring as a credit event that could trigger the CDS. This feature gives a protection seller significant advantages over a bondholder. We will discuss the valuation implications shortly.

Modified Restructuring (Mod-R)
Modified restructuring has become a market standard in the US for CDS on investment grade credits. Under this definition, the most material change is the limitation on the maturity of deliverable obligations. In case of a restructuring credit event, the

protection buyer must deliver obligations with a maturity date that is the earlier of a) 30 months following the restructuring, or b) the latest final maturity date of any restructured bond or loan, but not shorter than the CDS contract. The argument for this limitation on the universe of potentially deliverable bonds is to prevent certain abuses of the restructuring feature. Since longer maturity bonds are more likely to trade at a significant discount to par due to interest rate moves even when there are no changes in the creditworthiness of the issuer, this provision limits gains to a protection buyer in cases where restructuring does not have an economic impact on the bond by excluding these obligations from the list of deliverables.

Another important feature of Mod-R is related to limitations on debt obligations that can trigger a restructuring credit event. Under Mod-R, these obligations have to be held by more than three non-affiliated holders in order to qualify for a restructuring event. Consequently, for example, a bilateral agreement between a bank and the issuer to extend the maturity of an outstanding loan does not trigger the default swap.

Modified-Modified-Restructuring (Mod-Mod-R)
Under this definition, which is more popular in Europe for both investment grade and high yield, the main difference from Mod-R is that the protection buyer can deliver a deliverable obligation with maturity up to 60 months after restructuring (in the case of the restructured bond or loan) and 30 months in the case of all other deliverable obligations. The goal of this improvement over mod-R is to allow for a wider range of deliverables, as in certain cases, the 30-month restriction may prove too limiting.

PRICING IMPLICATIONS OF RESTRUCTURING

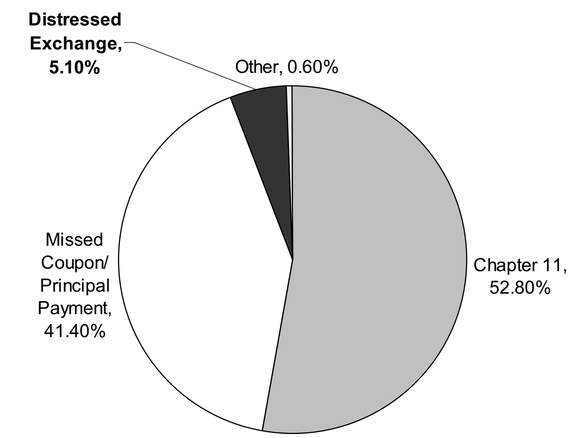
To understand the economic implications of these restructuring definitions, we assume that we have a fully hedged position combining a deliverable bond and a CDS. Now, if the CDS does not cover restructuring events, our hedge would not work perfectly in case of a restructuring of debt without an eventual default. On the other hand, if the CDS covers restructuring, it would protect us from any losses related to such an event. Furthermore, if the restructured obligation is not the obligation we own, there is a potential gain, even when there is no direct adverse impact on our position. Thus, we would be willing pay more for a CDS with restructuring than for a CDS without restructuring.

To get a sense of the magnitude of the impact of restructuring on CDS spreads, we looked at the US high yield market, where restructuring is more frequent. About 5% of total high yield defaults in the US result in some kind of restructuring (see Exhibit 7), implying a material difference between R and No-R contracts.

chapter 1

exhibit 7

Cause of HY Bond Defaults



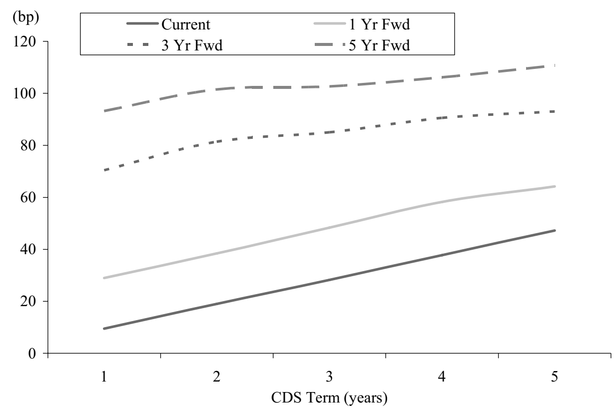
Source: Fitch Ratings

Trading Forward Credit Risk

As liquidity along the curves has developed in default swap markets, curve-based investment strategies have become increasingly popular. Despite increased liquidity and a decent amount of convergence with corporate bonds, default swap curve relationships are by no means mature; in fact, we would argue that the market is still in the infancy stages of thinking about credit term structures. The existence of liquid curves where investors can go long and short to different dates implies that investors can position for “forward” credit risk.

exhibit 8

Sample Spot and Forward Curves



Source: Morgan Stanley

Fortunately, we can borrow quite a bit of math and market experience from the interest rate world in determining forward credit spreads, but there are also some key differences. Most importantly, credit instruments are “risky” assets, and as such, any calculation of implied forward rates must take into consideration the probability of default.

We feel that it is important to take a few steps back and begin to discuss forward credit risk from an intuitive perspective. Once this is established, we can begin to explore valuation issues, curve shape expectations and better understand instruments that are built upon forwards, including CDS options and constant-maturity credit default swaps (CMCDS), which we will discuss in the next section of this primer.

WHAT CAN WE LEARN FROM INTEREST RATES?

In a nutshell, a forward interest rate is simply the break-even rate that makes all investments on the curve equally rewarding. If the forwards are realized, an investor should be indifferent about which point to invest in on the curve. As such, forward curves are important inputs into risk-neutral interest rate derivatives pricing models, which assume, among other things, that there is no relative value among various opportunities, given market pricing. The following equation shows the calculation of one year implied forward rate starting at the end of year 1, $F_{1\text{-}2}$, given the one year spot rate S_1 and the two year spot rate S_2:

$$F_{1\text{-}2}=(1+S_2)^2/(1+S_1) - 1$$

WHAT IS DIFFERENT IN CREDIT? – IMPLIED FORWARD CDS PREMIUMS

On the surface, the same math and relationships used in interest rates should hold for credit, but a key difference is that credit is "risky." As such, we have to make some adjustments to address the issue that if the reference entity defaults, the protection seller is not entitled to any future premiums and has to pay the difference between par and recovery value. From a set of CDS levels extending up to the end of the intended forward default swap, we can determine the forward spread using the following logic: A long position in a two-year CDS starting now is equivalent to a combination of a long position in a one-year CDS starting now and a long position in a one-year CDS starting one year from now.

The first step toward calculating implied forward rates is to calculate default probabilities for each payment period. To simplify, let us assume that we have two default swap contracts, CDS1 and CDS2, maturing at the end of year 1 and 2, respectively, with annual spread payments. Now we can determine the implied probability of default at the end of year 1 from CDS1, given a recovery rate. Similarly, given the probability of default in year 1 and CDS2 spread level, we can calculate the probability of default in year 2, given the reference entity does not default in year 1. Thus, we can impute default probabilities for each period from a whole credit curve. For more details, refer to the CDS Pricing section.

The combination of CDS1 and a forward default swap, which starts at the end of year 1, replicates CDS2. Therefore, by equating the two cashflow streams, we can determine the implied forward default swap level.

The following equations summarize the calculation of forward CDS rates (using the same notation as we used in the CDS Pricing section):

$$PV(CDS_t) + PV(FWD_{t-T}) = PV(CDS_T)$$

where

$$PV(CDS_T) = \sum_{t=1}^{T} DF_t \cdot \frac{S_T}{\left(1 + \frac{S_T}{1-R}\right)^t}$$

$$PV(FWD_{i-T}) = \sum_{t=i}^{T} DF_t \cdot \frac{F_{i-T}}{\left(1 + \frac{F_{i-T}}{1-R}\right)^t}$$

The first equation represents replication of a CDS maturity at T with a CDS of term t and a forward-starting CDS that starts at t and ends at T. DF_t represent discount factors and can be calculated using the swap curve.

exhibit 9 Forward Trading – Hypothetical Example

Year	CDS Spread	5 Yr Forward CDS
0	0.00%	0.50%
1	0.10%	0.72%
2	0.20%	0.97%
3	0.30%	1.23%
4	0.40%	1.53%
5	0.50%	1.88%
6	0.60%	
7	0.70%	
8	0.80%	
9	0.90%	
10	1.00%	

Source: Morgan Stanley

In Exhibit 9, we have assumed the current 5-year spread at 50 bp, while the 10-year spread is 100 bp. This results in an implied forward 5-year CDS five years from now of 188 bp. Now we can compare this figure with our expectations, and if this is too high, we can lock it in by going long 10-year CDS and short 5-year CDS. On the other hand, if we expect the credit environment to be much worse than implied, we can buy 10-year protection and sell 5-year protection.

chapter 1

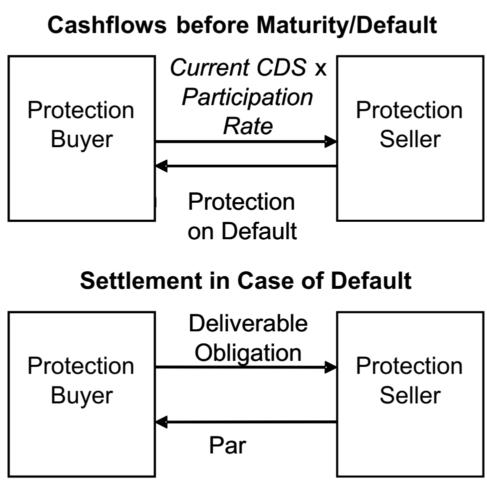
Recent Developments in CDS

CONSTANT MATURITY CREDIT DEFAULT SWAPS

Much of the development that resulted in today's standard credit default swap contract was driven by definitions of credit events, sparked, in turn, by the many bankruptcies, defaults and restructurings that the investment grade market experienced during the past credit cycle. Tight spreads and a lack of differentiation create a natural reach for yield phenomenon, but also cause concern among those who must be fully invested and don't feel great about the upside potential. Consequently, many market participants are exploring a new variant – constant maturity credit default swaps (CMCDS).

From an intuitive perspective, CMCDS is an instrument that provides investors with a convenient way to string together a series of forward credit curve trades. We feel that varying risk premiums along the credit curve, combined with the potential for spread regime shifts, can result in impractical forward spreads. One can therefore think of CMCDS as a convenient (and positive carry) means to lean against the forwards.

exhibit 10
CMCDS Cashflows



Source: Fitch Ratings

CMCDS MECHANICS

A constant maturity credit default swap is a default swap where the premium is reset (on a quarterly basis) to equal a fixed percentage (called the participation rate) of the then-prevailing premium of a plain-vanilla default swap for a certain term. While this is very much a developing market, a typical CMCDS trade today has a 5-year term and references a fresh 5-year default swap every quarter during that 5-year term. Assuming a 50% participation rate, the seller of CMCDS protection would receive 50% of the prevailing premium on a 5-year default swap every quarter, until the CMCDS expires (in five years) or until a credit event occurs (see Exhibit 11). Consequently, if spreads widen, the quarterly payment would also increase and the concomitant mark-to-market impact could be significantly lower than a regular default swap. The premium on a 5-year default swap is inferred from the market, generally by some type of a fixing process on the reset date by a calculation agent. There can also be a cap on the premium, usually at stressed premium levels.

exhibit 11 CMCDS – Sample Quarterly Premium Calculation

Notional	$10,000,000
Participation Rate	50%

Quarter	5 Yr CDS Spread (bp)	CMCDS Spread (bp)	Quarterly Payment ($)
1	100	50	12,500
2	125	62.5	15,625
3	150	75	18,750
4	120	60	15,000
5	100	50	12,500

Source: Morgan Stanley

PARTICIPATION RATE

Since the protection provided by a CDS and a CMCDS is essentially identical in case of a default, the pricing of the two instruments should be directly linked, as well. Said differently, buyers of protection in either instrument should expect to spend the same amount for the protection at the inception of the contracts. This linkage is enforced through the concept of a participation rate.

We start by using an analogy from the world of interest rate swaps. The fair fixed rate on a swap is the one that equates the present value of floating leg cash flows to the present value of fixed leg cash flows. Employing the same heuristic, the fair participation rate is the rate that equates the present value of payments of a regular CDS to the present value of CMCDS payments.

The intuition developed from interest rate forwards can be directly harnessed to understand the participation rate. If the interest rate curve is flat, then all the implied forward rates would also be flat. Similarly if the CDS curve is flat, the fair participation rate for the CMCDS would be 100%. On the other hand, if the interest rate curve is upward sloping, then the implied forward rates would be higher than the current short rate. For CMCDS, if the CDS curve is upward sloping then the participation rate would be less than 100%. Conversely, if the interest rate curve is inverted (downward sloping), the implied forward rates would fall below the current short rate. For CMCDS, the participation rate would be higher than 100%, if the CDS curve is inverted.

CMCDS PRICING – DETERMINING THE PARTICIPATION RATE

To determine the expected payments of a CMCDS, we need the implied forward CDS rates, just as we need forward Libor rates to calculate the fixed rate in the case of interest rate swaps. We have already discussed how to calculate the implied forward credit spreads earlier. In the numerical example that follows (Exhibit 12), we assumed a flat zero-coupon curve at 5%, annual payment frequency, and a participation rate of 40.6%, the calculation of which we will show shortly.

exhibit 12 Implied Forward CDS Rates – Numerical Example

Discount rate	5%
Recovery rate	40%

Year	Discount factors	CDS spread	5yr forward CDS	CMCDS
0	1.00	0.00%	0.50%	0.20%
1	0.95	0.10%	0.72%	0.29%
2	0.91	0.20%	0.97%	0.39%
3	0.86	0.30%	1.23%	0.50%
4	0.82	0.40%	1.53%	0.62%
5	0.78	0.50%	1.88%	0.76%
6	0.75	0.60%		
7	0.71	0.70%		
8	0.68	0.80%		
9	0.64	0.90%		
10	0.61	1.00%		

Source: Morgan Stanley

Once we have determined the forward CDS rates for each payment period, we can project the cashflows of both a regular CDS and a CMCDS. Now we can compute the participation rate that matches the present value of cashflows of a CMCDS to the present value of cashflows of a regular CDS.

We determine the participation rate, *X*, using the following relationships:

$$PV(CDS_T) = PV(CMCDS_T)$$

where

$$PV(CDS_T) = \sum_{t=1}^{T} DF_t \cdot \frac{S_T}{\left(1+\frac{S_T}{1-R}\right)^t}$$

$$PV(CMCDS_T) = \sum_{t=1}^{T} DF_t \cdot \frac{F_t * X}{\left(1+\frac{S_T}{1-R}\right)^t}$$

The following numerical example, in Exhibit 13, shows the calculation of the participation rate based on the forward CDS rates we just calculated:

exhibit 13 Participation Rate Calculation

	Spread PV	
Year	**CDS**	**CMCDS**
1	0.0047	0.0068
2	0.0045	0.0086
3	0.0042	0.0104
4	0.0040	0.0122
5	0.0038	0.0141
Total PV	0.0211	0.0521
Participation rate		40.6%

Source: Morgan Stanley

We have overlooked convexity adjustments in our pricing discussion above. Given a fixed participation rate, CMCDS payments change linearly with the benchmark CDS spread, while CDS values have a convex relationship with spread changes. Therefore, we need to make adjustments to reflect the hedging error. Furthermore, our assumption regarding the availability of a full CDS curve with default swaps available for each payment period is rather tenuous, resulting in further basis in our attempts to lock in implied forward CDS rates. These issues imply a wider than usual bid-ask for CMCDS, making some market participants reluctant.

INTUITIVE FEEL

There are effectively two ways one can think of CMCDS. First, as we mentioned above, CMCDS is a convenient way to string together a series of forwards. If the curve shape and spread levels implied by forwards are realized over the term, the CMCDS and CDS should have the same return at maturity, and this is the basis for pricing. Thus, a position in CMCDS (versus one in CDS) is a way of expressing the view that the forwards will not be realized. Second, ignoring forwards for the moment, CMCDS is really just a floating rate instrument, but the credit premium is what actually floats, as there is no interest rate. A floating premium can have more muted mark-to-market volatility than a fixed premium instrument.

RECOVERY SWAPS

In case of a recovery swap, the buyer and the seller agree on a fixed recovery rate; the party committing to take a floating recovery rate receives (or pays) the difference between the predetermined recovery rate and the actual recovery rate in case of a default.

Currently there are two market approaches for recovery swap pricing. First, no premiums are exchanged over the life of the contract and the only payment takes place if there is default. The second standard uses a combination of a zero-recovery default swap and a vanilla default swap to execute a recovery swap. Given a vanilla default swap pricing, we can easily determine the pricing of the corresponding zero recovery swap by dividing the premium by a factor of (1-recovery rate). For example, a CDS premium of 100 bp running with 40% recovery translates to 166.7 bp with 0% recovery. From our discussions, it appears that the market is leaning toward the former for pricing recovery swaps.[2]

CANCELABLE CDS

A cancelable default swap (also known as a callable default swap) is a credit default swap where the buyer of protection has the right to cancel the protection after a non-call period. The motivation behind cancelable CDS is an effort to hedge loans or bonds with uncertain maturity, such as prepayable bank loans, convertible/callable bonds, etc. For example, we can hedge a callable bond by buying cancelable protection, as we can cancel the CDS if the bond is called away. The motivation for the protection seller is the opportunity to make some additional spread, to compensate him/her for being short the option. A short cancelable CDS position (long protection) is implicitly bullish on spread, since the cancelable option becomes more valuable as spread declines. In other words, as spreads tighten, the long protection position would have a negative mark-to-market, and the option to cancel this contract would now be in-the-money.

SPREAD OPTIONS

Spread options provide a convenient way to hedge uncertain credit risk exposure and to position for volatility changes. Options to buy or sell protection on individual credits as well as diversified indices are now available in the marketplace, albeit liquidity may vary considerably depending on the credit.

Options on default swaps work in a fashion similar to the over-the-counter (OTC) options with a few subtle differences. Upon exercise of an option of CDS, the option buyer is enters a long or short default swap position, depending on the option.

TYPES OF OPTIONS

There are two types of options on credit default swaps, as explained below:

- Option to buy protection (put/payer). Upon exercise, the option holder enters into a long protection position on the underlying reference entity.

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[2] *Please refer to Chapter 4.*

- Option to sell protection (call/receiver). Upon exercise, the option holder enters into a short protection position on the underlying reference entity.

Option premium is typically quoted on an upfront basis. The strike is typically European in nature, i.e. the option can only be exercised on the expiration date. Upon exercise, the two parties enter into a default swap and the option seller makes an upfront payment reflecting the difference between the strike and the current CDS level, just as one does while entering into an off-market CDS transaction. Options with maturities up to one year are usually available, with the near term options typically being most liquid. The maturity dates usually coincide with the standard default swap payment dates.

It is noteworthy that single name spread options typically do not provide protection against default during their life. If a default occurs during this period, the option is simply knocked out. However, spread options on indices tend to trade without the knock-out feature, i.e. they provide protection during the option's life and the buyer has the right to exercise on defaults at expiration.

The default swap option premium depends on the current CDS level, the strike spread, Libor interest rate curve, volatility of spread, and maturity dates of the option and the CDS. The payoff function of an option to buy protection looks similar to an equity call payoff, while it resembles an equity put option for an option to sell protection.

chapter 2 Understanding Synthetic Structured Finance – First Steps

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The powerful credit derivatives force that began well over 10 years ago in the emerging markets sovereign debt arena and over time introduced a secular shift in the corporate credit markets is now in the early stages of potentially reshaping the structured finance markets as well. In both corporate and emerging markets credit, it has paved the way for the emergence of innovative ways of transferring credit risk, implementing hedging strategies and expanding investment opportunities for a wide range of market participants. In our view, it is too early to tell whether the derivatives culture will be as welcomed in structured finance as it was in the other two markets, but investor demand, the instruments and standardization discussions have certainly progressed enough to make synthetics more than just a niche within the structured finance world.

By our measures, the synthetic structured finance market is at least three years old, but significant recent developments have served as important first steps in what will likely be a multi-year development process. From a research perspective, we begin describing our first thoughts on this market with a brief review of the original credit derivatives markets, which provide an important benchmark for the amount of development and the tests that were necessary for derivative instruments to mature in the sovereign emerging and corporate credit markets.

A BRIEF HISTORY OF THE CREDIT DEFAULT SWAP[1]

Within the corporate credit and sovereign emerging markets, credit default swap contracts experienced many important tests over the past 10 years that both shaped the contract and eventually provided the motivation for standardization. Indonesia’s debt restructuring in 1997 encouraged working groups to address standardization, but it was not until 1999 that the International Swaps and Derivatives Association (ISDA) published the first market standard terms. Between 2000 and 2003, numerous credit events had significant impacts on the standardization process – including Conseco and Xerox (restructuring), Armstrong (reference entity disagreements), Railtrack (deliverability of convertible bonds), and the trio of Enron, Argentina and Parmalat (volume of outstanding contracts).

Today’s standard credit derivatives definitions (published by ISDA in 2003) reflect lessons market participants learned during this period, and have encouraged explosive growth in both single-name derivatives and in structured credit. Commercial banks, which lend directly to corporations, continue to be among the biggest and most natural buyers of protection in the market. Other significant buyers of protection include hedge

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[1]*Please refer to Chapter 1.*

funds, and corporates themselves. Estimates of the global outstanding single-name credit default swaps (Exhibit 1) by the Bank for International Settlements[2] demonstrate the imposing size the credit derivatives market has now achieved (about $11 trillion notional).

SYNTHETIC STRUCTURED FINANCE

In the initial few years of their introduction when there was no "street standard", the corporate credit default swap market used to be small and fragmented with limited liquidity, wide bid-offer spreads and a narrow base of market participants. However, with the development of standardized contract terms and documentation, the corporate CDS market has quickly evolved into the force that we know today. While market participants can certainly take comfort in knowing that credit default swap contracts referencing sovereign and corporate entities went through a 10-year growing-up process, we argue that issues related to structured finance securities are different along almost every dimension, as are drivers of demand and the natural buyers and sellers.

Structured finance (SF) securities[3] have been predominantly a long-only cash market, with limited opportunities for implementing sophisticated hedging or long/short strategies, thanks to the many unique and complex characteristics of SF securities. While CDS on SF securities have been in vogue for some years, mainly in the context of synthetic CDOs, the market for single-asset referencing SF CDS has been fairly limited. The absence of standardized documentation and a commonly accepted set of contract terms hampered the growth of a broader SF CDS market. With the publication of a standard confirmation by the ISDA for CDS designed for RMBS and CMBS reference obligations on June 21, 2005, standardization of documentation appears to be well on track.

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[2]See "OTC derivatives market activity in the first half of 2005," Bank for International Settlements, November 2005.

[3]We categorize asset-backed securities (ABS), residential mortgage-backed securities (RMBS), commercial mortgage-backed securities (CMBS) and securities issued by collateralized debt obligations (CDO) vehicles under the broad term of structured finance securities.

exhibit 1 Global Outstanding Single-Name CDS Notional Amount as of June 2005 ($ Billion)

	Maturity 1 Year or less		Maturity 1 to 5 Years		Maturity > 5 years		Total	
	Amounts outstanding bought	Amounts outstanding sold	Amounts outstanding bought	Amounts outstanding sold	Amounts outstanding bought	Amounts outstanding sold	Amounts outstanding bought	Amounts outstanding sold
Dealers	280	229	2,637	2,679	733	698	3,650	3,606
Other financial institutions	150	108	1,078	1,134	469	405	1,696	1,648
Non-financial institutions	15	7	118	129	32	27	164	163
Total	**444**	**344**	**3,832**	**3,942**	**1,234**	**1,129**	**5,510**	**5,417**

Source: Bank for International Settlements

As we will describe in more detail throughout this chapter, structured finance instruments have unique characteristics that motivate a different set of credit events and settlement mechanics from a standard default swap contract. These characteristics include available funds caps, payment-in-kind options, unscheduled amortizations, de-levering and principal writedowns, to name a few. In fact, the complexity of such instruments motivated many early users of derivatives to focus on total-return swaps, where cash flows and price movements are passed on directly from one party to the other. But with demand from structured vehicles (CDOs) combining with the recent advances in standardization (2005 ISDA definitions), we expect there to be quite a bit of focus on credit default swaps linked to structured finance instruments.

BUYERS AND SELLERS – TAIL WAGGING THE DOG?

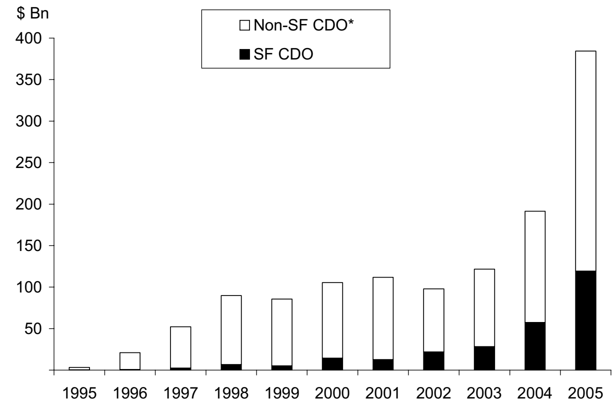
In the synthetic structured finance markets, the dealer community is playing the role that the banks do in corporate credit, i.e., serving as the natural buyers of protection. The credit exposure (through warehousing lines and the like) necessary to run a securitization business is not small by any measure, and further growth of these businesses within the broker/dealer community requires a more rigorous risk management approach.

If dealers are the natural buyers, structured vehicles are very much the natural sellers of protection. Investor demand for structured finance assets via CDO vehicles, manager demand to fill cash CDOs with collateral, and the efficiency of funding such structures through lower-cost super senior tranches are all examples of the demand to buy structured finance assets synthetically, particularly in the residential and commercial mortgage areas.

Cash CDOs with structured finance as underlying collateral have an increasingly dominant share of the total CDO market (Exhibit 2). According to our calculations, SF CDOs accounted for about 45% of global cash CDOs issued in 2005, with nearly $119 billion of issuance.

chapter 2

exhibit 2
Growth in SF Cash CDO Issuance



**Including CLOs, HY, IG, TRUPs and EM CBOs.*
Source: Morgan Stanley

Constraints on sourcing collateral have been a recurring theme pertinent to SF CDOs. Consequently, cash CDOs increasingly allow for "synthetic buckets" to enable them to acquire exposure using CDS technology.

That structured vehicles are responsible for leading the development of derivatives in structured finance has a bit of a "tail wagging the dog" feel to it. Synthetic CDOs were an important driver of the growth of single-name derivatives in the corporate credit markets, but only partly so, and significant activity in default swaps in corporate credit would certainly still exist even if CDOs were not a big force.

In the structured finance world, derivatives continue to be an "off-the-run" means to capture risk, as credit ratings are important to a large majority of investors. Yet, as the profile of market participants changes with new entrants from the hedge fund and reinsurance industries, demand for "unfunded" forms of structured finance risk will continue to grow.

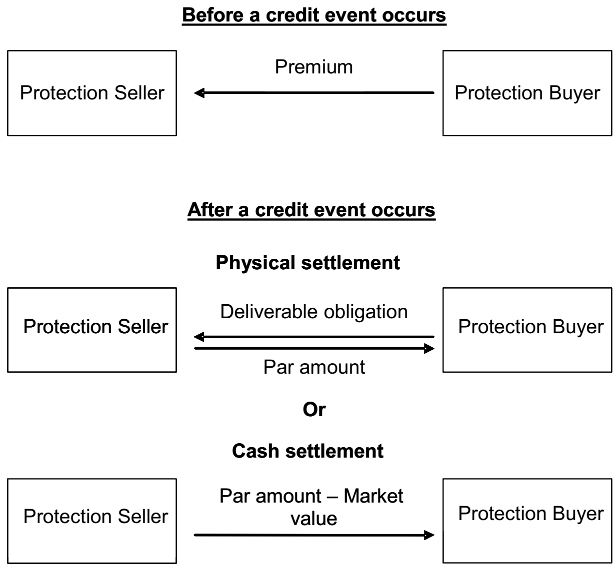
The remainder of this chapter serves as a primer for credit default swaps on structured finance securities. We review a typical corporate CDS, detail the unique characteristics of SF securities and their challenges to CDS, explain the mechanics of SF CDS along with a discussion of credit events and settlement mechanisms and illustrate strategies for the application of SF CDS for a broad range of market participants.

CDS BASICS

We review the basics of CDS before discussing their application in the context of SF securities (Exhibit 3). Recall that a corporate CDS protects the buyer of protection against the loss of principal in an underlying asset when a credit event occurs. The protection buyer pays a premium, typically on a quarterly frequency but quoted as basis points per annum, to the protection seller until the contract matures or a credit event occurs, whichever is earlier.

exhibit 3

How a Typical CDS Works



Source: Morgan Stanley

The underlying asset is defined by a reference obligation of a specified reference entity, which informs the scope of the protection. When a credit event occurs, depending upon the settlement mechanism specified in the CDS contract, the buyer of protection delivers a reference obligation to the seller and receives par in return (physical delivery) or receives the difference between the par and the market value of the referenced obligation from the seller (cash settlement).

The CDS contract specifies the credit events. Typical credit events include bankruptcy, failure to pay, restructuring of the obligations of the referenced entity, repudiation and obligation acceleration. As such, the buyer of protection is effectively "short" and the seller of protection is "long" the credit risk of the reference obligation. In contrast, in the context of the bond investor, a bond buyer is "long" and a bond seller is "short" the credit risk of the bond in question.

chapter 2

UNIQUE CHARACTERISTICS OF SF SECURITIES

The unique nature and structural mechanisms of SF securities make them different from corporate credit securities and pose several complexities not encountered during the development of a CDS market for corporate credit. These complexities have been challenging in the definition and determination of credit events as well as settlement mechanisms. In this section, we discuss some of these complexities and their relevance to the development of an SF CDS market, drawing parallels where appropriate to the corporate credit market (Exhibit 4 summarizes the unique characteristics of SF securities and compares them to corporate bonds in the context of credit default swaps).

Reference Entity / Reference Obligation: A typical corporate CDS refers to a credit event in a reference entity, which can have multiple *pari passu* obligations at a given level of seniority in the capital structure. When a credit event occurs, the protection buyer has the option to choose from potentially a number of deliverable reference obligations and use the cheapest of them for settling the CDS contract. With SF securities, the reference obligation is a specific tranche of a specific transaction. In other words, with SF CDS, protection is bought or sold on a specific CUSIP/ISIN. Consequently, the cheapest-to-deliver option of corporate CDS is largely absent with SF CDS. While it is conceivable that trusts issuing multiple bonds of similar credit quality and ratings may be treated as a broad class of potential reference obligations that may be delivered against a single credit event, at this juncture, SF CDS seem to be limited to specific tranches of specific transactions.

exhibit 4 Corporate and SF Securities in the Context of CDS: A Comparison

	Corporates	SF Securities
Reference Entity/ Reference Obligation	Issuer is usually a company. Potentially a number of deliverable obligations when a credit event occurs	Issuer is usually a special purpose vehicle. Limited number of deliverable obligations when a credit event occurs
Amortization	Typically bullet maturities Prepayment risk is largely absent CDS notional amounts can be fixed over contract life	Typically amortizing Significant prepayment exposure CDS notional amounts may need to change consistent with amortization and prepayments
De-levering	Generally, no automated de-levering provisions. De-levering is by management discretion	Automatic de-levering provisions with complex waterfall and structural subordination
Tenor	The term of CDS contract largely independent of underlying reference obligation	The term of CDS contract mirrors the maturity date of the underlying reference obligation
Timing of credit events	Structure has limited impact on the timing of credit events Significant management discretion may influence the timing of credit events	Unlikely to have credit events early in their life Little or no management discretion on influencing the timing of credit events
Available funds cap	Not applicable	Have a significant impact on certain types of SF securities (RMBS)
Payment-in-kind (PIK)	Not generally applicable	Have a significant impact on certain types of SF securities (CDOs)
Writedown, write up and reimbursements	Not applicable	Have a significant impact on certain types of SF securities (RMBS, CMBS and CDOs)
Credit Events		
- Bankruptcy	Applicable	Applicable but motivation for inclusion may be regulatory
- Failure to pay	Applicable	Significantly more complicated
- Restructuring	Applicable	Not applicable
- Ratings downgrade	Not applicable	Applicable
- PIK continuation	Not applicable	Applicable
- Writedown	Not applicable	Applicable

Source: Morgan Stanley

Amortization: Unlike most corporate bonds, SF securities amortize over their life, usually with prepayment exposure. Amortization may be either scheduled or accelerated, as in the case of cash CDOs, as a consequence of deterioration of the underlying collateral performance. In certain SF securities such as RMBS, amortization may result from pre-payments. In order for protection sellers to have similar economics as the underlying SF reference obligations, the concept of fixed notional amounts of a typical corporate credit CDS contract has to be modified for SF CDS. The notional amount of an SF CDS contract must amortize consistent with the amortization of the underlying reference security.

De-levering: SF securitizations include a wide range of senior and subordinated bonds issued by the same trust or other securitization vehicle with the same underlying collateral. Each transaction has a unique waterfall mechanism that determines the priority of principal and interest payments to the different bonds belonging to the same deal. It is typical that as a deal ages and pays down, some subordinated bonds may de-lever, as a result of which their credit risk might decline, all else being the same. In other words, seasoning implies a lower credit risk profile and hence a lower risk premium. With corporate credit default swaps there are no similar seasoning effects.

Tenor: The choice of the maturity date of a corporate CDS contract is largely independent of the maturity date of the underlying reference obligation. With SF securities, the maturity date of the CDS contract mirrors that of the underlying reference obligation. SF securities may have a legal final maturity date much later than their expected maturity date. As such, the maturity date of SF CDS contracts is the earlier of the legal final date of the reference obligation or when the notional amount is reduced to zero or the date when the assets in the collateral pool are liquidated.

Timing of Credit Events: Generally speaking, SF securities are unlikely to have credit events early in their life. Typical structures have built-in mechanisms in the form of overcollateralization, credit enhancement and diversion of cash flows within a deal's cash flow waterfall to avert a default. In light of these mechanisms, it seems likely that any potential credit events will be back-ended in SF securities.

A notable difference between corporate credit and SF securities is the fact that in SF securities the built-in mechanisms mentioned above kick in automatically, with little discretion to the trustee or manager of the transaction. With a corporation, the management can potentially exercise a degree of control to affect the timing of a credit event, which is largely absent in SF securities.

Available Funds Cap (AFC): In general, US home equity loan ABS are floating rate instruments with coupon resets linked to an index such as LIBOR. Their underlying home loans are generally fixed rate or hybrid adjustable-rate mortgages (fixed for the initial 2-5 years and floating thereafter), with periodic and lifetime caps. Because of this embedded interest rate risk, US home equity loan securitizations include a feature that limits interest payments on a tranche if the level of the applicable floating index rate plus margin rises above a certain pre-specified rate, called the available funds cap rate,[4] which is effectively the weighted average coupon of the underlying home equity loans. Therefore, when bond coupon rates rise above the AFC rate, there will be a shortfall in the interest payments received by the holders of the reference obligation, exposing them to interest rate risk unless there is enough excess interest in the deal to cover it.

Whether or not such interest rate risk is to be transferred to the sellers of protection in a CDS contract on an SF security has been a point of disagreement among market participants in the still-evolving SF CDS market. If the CDS contract is to mimic the economics of the underlying reference obligation, AFC risk has to be passed on as a part of the CDS contract. However, it introduces an element of interest rate risk to the CDS contract. We return to this topic in a later section to discuss the alternative ways this issue is being addressed.

Payment-in-Kind (PIK): Some SF securities, notably junior tranches of CDOs, permit the deferral of a scheduled coupon by increasing the outstanding principal balance of the transaction. Such a deferral may be temporary, caused by a cash flow mismatch in a deal and cured in a short period of time or permanent. If deferral continues over an extended period, it may trigger a credit event. Frequently, the risk of a PIK security is passed on to the seller of protection in a CDS contract by adjusting the fixed payment amounts paid by the protection buyer (CDS premium) by the PIK interest amount. When the reference obligation reverts to being current on its coupon and pays the accrued interest including the PIK-ed interest amount, such payments are passed back to the seller of protection.

Writedowns and Allocation of Losses: The principal balance of SF securities may be written down prior to their maturity date if losses experienced on the underlying collateral pool exceed available credit enhancement for the tranche or if some portion of the principal is used to cover an interest shortfall. A principal writedown may not always occur before the maturity date, but some transactions (for example, European SF securitizations) provide for a principal deficiency ledger (PDL) to be used in place of an actual writedown. This accounting ledger is debited when losses in a given tranche exceed available credit enhancement and is credited if and when such losses are reversed. This creates an effective writedown in place of an actual writedown.

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[4] *This feature, while commonly prevalent in US home equity loan securitization, can also be seen in European CMBS and some US RMBS.*

In practice, such writedowns may be either temporary – if the writedown is due to a short-term liquidity crunch and the principal written down is paid back to investors – or permanent when the deterioration in the collateral pool is severe enough and there is no possibility of an eventual recovery. For rated SF securities, rating agencies prescribe guidelines to determine when a writedown should be deemed permanent.[5]

Clean-Up Calls: Many securitization transactions have a provision by which the originator of a transaction can buy back the outstanding securitized instruments when the outstanding collateral balance has been substantially amortized, leaving a small amount of collateral to be serviced, which is often uneconomical. Usually, clean-up calls are exercised when the outstanding collateral balance falls below 10% of the original. In order to induce such clean-up calls to be exercised, there is usually a significant step-up in the coupon rate in the event the call is not exercised.

Given the many unique characteristics of SF securities discussed above, it follows that the mechanics of SF CDS, in terms of credit events and settlement mechanisms will be different from those of their corporate counterparts.

[5] *For instance, in order to classify a writedown as permanent, Fitch requires the appointment of a qualified third-party to project the future performance of an SF security, the prevailing rating for the security to be less than an applicable rating threshold, and the effective writedown to have been in existence for a material period of time. (See "Synthetic Structured Finance CDOs," Fitch Ratings, February 17, 2004.)*

SF CDS: CREDIT EVENTS

The meaning and the interpretation of a credit event in SF CDS may be significantly different from the same in corporate CDS. As mentioned earlier, the three most common credit events for corporate CDS are bankruptcy, failure-to-pay and different variations of restructuring. Restructuring as a credit event is not meaningful for SF CDS. However, ratings downgrade, writedown and PIK continuation are frequently included as credit events within SF CDS. We discuss each of these credit events below.

Bankruptcy: Recall that unlike corporate issuers, bankruptcy-remote special purpose vehicles issue SF securities. Given that the sole *raison d'être* for the special purpose vehicle is to issue and service the SF securities based on a specifically delineated collateral pool of assets and there are no other businesses associated with the issuer, it is difficult to imagine bankruptcy as a credit event for SF securities. Notwithstanding this point, a Standard & Poor's survey of synthetic CDO of ABS documentation found that 44% of the sample transactions included bankruptcy as a credit event.[6] Satisfying regulatory capital requirements appears to be the motivation for the inclusion of bankruptcy as a credit event.

Failure-to-Pay: In a corporate CDS, failure-to-pay is easy to characterize and is triggered when the reference entity fails to make a payment when due, in excess of a specified threshold after the allowable grace period. With SF CDS, a failure-to-pay credit event is more complicated in three important ways.

First, regarding principal payments, with the exception of the legal final maturity date, SF securities do not have a pre-defined schedule of dates when payments must be made. Instead, principal payments are "passed through" from the underlying collateral as and when available. Therefore, even when a default appears imminent, a failure-to-pay of principal may be determinable with certainty only at the legal final maturity date or upon an early termination of the referenced SF securities.

Second, a failure-to-pay may be due to a contractually defined feature such as a PIK provision or a decreased payment caused by available funds cap being triggered. Whether such a failure should constitute a failure-to-pay credit event and such risks should be passed on to protection sellers remains contentious at this juncture. Certain settlement provisions provide a plausible mechanism to deal with this issue. (Discussed further under the section, "Pay-as-you-go" below.)

Finally, the threshold should be specified such that superfluous, non-credit-related events do not trigger a credit event.[7] At the same time, it is also necessary to ensure that the threshold is consistent with the tranche size, which could be significantly small in some cases.

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[6] *See "Synthetic CDOs of ABS Documents Evolving Towards a Standard but Nuances Remain," Standard and Poor's, April 26, 2005.*

[7] *A report by Standard and Poor's suggests the threshold to be $10,000. (See "Structural Issues in CDOs with Synthetic ABS Exposure," Standard and Poor's, March 7, 2005.)*

In view of these complexities, the likelihood of a failure-to-pay event being triggered appears remote. However, from the perspective of a protection buyer, the inclusion of ratings downgrade and writedown as credit events might help mitigate the risks of failure to pay principal and/or interest since it is likely that they precede the triggering of a failure-to-pay event.

PIK Continuation: A PIK continuation credit event occurs when a security continues to PIK for an extended period of time. The logic behind such a credit event is that when PIK-ing continues beyond a certain period, it is unlikely that it will recover or be cured in the future. As such, the holder of the security would experience economic losses. The time period for a PIK-ing security to trigger a PIK continuation event is specified in the CDS contract and depends upon the scheduled coupon payment frequency. (For example, six consecutive months for a monthly coupon paying security, two consecutive quarters for a security that pays quarterly coupons and one coupon payment date for a security that pays coupon semi-annually.)

Ratings Downgrade: A ratings downgrade does not constitute a credit event with corporate CDS. For SF CDS, ratings downgrade as a credit event may be extremely valuable from the perspective of protection buyers in that it might capture credit risks not captured in other credit events and be better reflective of the economic risks of a holder of the SF security in cash form. Ratings related triggers may be stand-alone or in some instances used in conjunction with other credit events.

The rating level that triggers a credit event depends upon the number of agencies rating the particular reference obligation. If an SF security is rated by all three agencies (Moody's, Standard & Poor's and Fitch), a downgrade below the specified rating by two of the three agencies would constitute a downgrade credit event. If an SF security were rated by only two of the three agencies, a downgrade below the specified rating by one of the two agencies would constitute a downgrade credit event. Obviously, if an SF security is rated by only one agency, a downgrade below the specified rating would constitute a downgrade credit event. For the purpose of a downgrade credit event, withdrawn ratings are considered downgrades below the specified rating level.

Standard & Poor's has determined that in ABS transactions, a rating of CCC- is commensurate with default.[8] The level at which a ratings downgrade credit event is triggered is often set above CCC- (or the equivalent Moody's rating). However, it is not uncommon to see downgrades below B3/B-/B- (Moody's/S&P/Fitch) constituting the trigger levels.

Writedown: As long as the reference obligation does not provide for a reinstatement or reimbursement of written-down principal or does not pay interest on the written-down principal until reinstatement or reimbursement of principal, the occurrence of a writedown constitutes a credit event.

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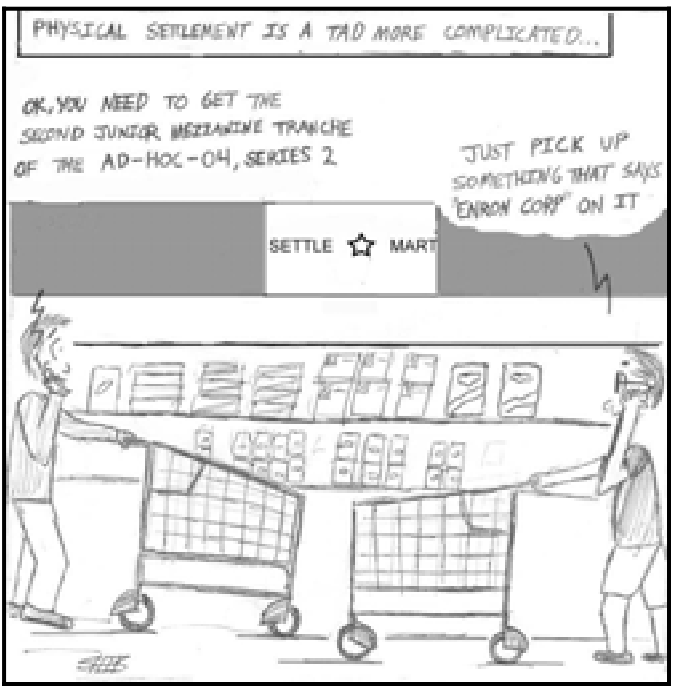
[8] *A report by Standard and Poor's suggests the threshold to be $10,000. (See "Structural Issues in CDOs with Synthetic ABS Exposure," Standard and Poor's, March 7, 2005.)*

As described before, a writedown has to be deemed permanent for it to be treated as a credit event. The determination of "permanence" of a writedown often rests with the calculation agent. Once a permanent writedown is established, the written-down amount is also the loss amount that the protection sellers owe protection buyers without any additional valuation mechanism to be put into place. Writedown as a credit event is not relevant in the context of pay-as-you-go, described in the next section.

Clean-Up Call: SF CDS contracts provide for optional termination of the CDS if the underlying transaction is not called, and if the CDS remains in effect, the premium usually steps up consistent with the coupon step-up.

SF CDS: SETTLEMENT MECHANISMS

Upon the occurrence of a credit event, the protection buyer may deliver a credit event notice to the protection seller and settle all or any portion of the notional amount. There are essentially three settlement mechanisms for settling credit events with SF CDS – physical settlement, cash settlement and pay-as-you-go. There appears to be a "continental divide" of preferences in terms of settlement mechanisms: European transactions seem more inclined towards physical settlement with a cash settlement option, while US transactions lean towards pay-as-you-go settlements with a physical delivery option.



Physical Settlement: As with corporate CDS, in physical settlement, the protection buyer delivers to the protection seller the underlying reference obligation and receives par in return. As mentioned earlier, unlike corporate CDS, with SF CDS, the reference obligation is a specific tranche of a specific transaction. As such, the cheapest-to-deliver option is largely absent even though, conceivably, trusts issuing multiple bonds of similar credit quality and ratings may be treated as a broad class of potential reference obligations that may be delivered against a single credit event. Still, depending upon the size of the outstanding reference obligation experiencing a credit event, sourcing the reference obligation for physical settlement may be challenging. There may be multiple physical settlements under the confirmation, with the credit event notice setting forth the notional amount to be physically settled. If the protection buyer physically settles less than the total notional amount of a transaction, the notional amount will be reduced by the physically settled portion and the transaction will continue.

Cash Settlement: While certain credit events (failure-to-pay principal at final maturity date and writedown) may avoid a market valuation process for determining amounts payable by protection sellers to protection buyers upon a credit event, credit events (bankruptcy, failure-to-pay interest, ratings downgrade) do require a market valuation process when cash settlement is used. Cash settlement is conducted on a date which is specified to be not less than “x” calendar days and not more than “y” calendar days after the date of determination of the credit event. The values of x and y are specified in the confirmation.

On the valuation date, bids are sought on the reference obligation (there is a minimum quotation amount requirement) and the final price is determined based on the highest bid received with the stipulation that there are at least two bids. If there are fewer than two bids on the valuation date, the process is repeated every five business days over the next 60 days until there are at least two bids on any one such valuation date. If unsuccessful for 60 days, there will be one last attempt made on the 60th business day, at which time if there is one bid for the full quotation amount, it will be used as the final price; if there are multiple but partial bids for the reference obligation notional, a weighted average bid will be used as the final price. If no bids are received, the final price will be deemed to be zero. The difference between par and final price is the cash settlement amount payable by the protection seller to the protection buyer.

The goal of the cash settlement process is that synthetic and cash investors of the same SF security should have similar economic consequences. Structural features such as the specification of minimum recovery rates, fixed recovery rates, minimum number of bids and dealers are mechanisms used to alleviate moral hazard risk concerns.

PAY-AS-YOU-GO

Given the unique nature of many SF securities, both cash and physical settlement mechanisms pose challenges in that it may be difficult to arrive at fair and timely outcomes from the perspective of both sellers and buyers of protection. Notwithstanding the attempts to standardize and clarify SF CDS documentation, the reliance on the language used in the documentation of the underlying reference obligation implies that a degree of ambiguity remains for the determination of loss events. Pay-as-you-go is a mechanism developed to avoid the difficulties of cash and physical settlement and to facilitate that the economics of acquiring exposure to an SF security in synthetic form mirror the economics of exposure in cash form.

Under the pay-as-you-go settlement, the shortfall/writedown amounts are classified as “floating payments” and the protection seller pays the protection buyer any principal or interest shortfall or principal writedown amounts on the reference obligation on a current basis (and hence the term "pay-as-you-go").

This means the buyer of protection does not have to declare a credit event with respect to these events and be forced into a physical settlement. To the extent the seller makes floating payments to the buyer and they are reversed, the buyer will pay reversed amounts back to the seller. This flexibility avoids uncertainty regarding the "permanence" of the written-down amount and the ambiguity related to whether or not the shortfall in principal or interest payment is due to short-term non-credit events.

The coverage of interest shortfall by protection seller will be done in one of three ways: (a) the seller pays interest shortfalls up to an amount equal to the fixed premium (fixed cap); (b) seller pays interest shortfalls up to an amount equal to LIBOR plus the fixed premium (variable cap); or (c) seller pays the entire amount of the interest shortfall (in other words, interest shortfall cap does not apply).

The buyer of protection reserves the right, upon a credit event,[9] to declare a credit event by notifying the seller for all or a portion of the notional amount and physical-settle that portion of the notional amount specified in the notification and be paid par in return for the delivery of the reference obligation. Further, the parties may elect to "step-up" the fixed rate payable by the buyer of protection to the seller in the event that the coupon on the reference obligation is increased on the step-up date. If such a "step-up" occurs, the protection buyer may choose to terminate the transaction.

Payments by Protection Buyers: There are two types of fixed payments made by the protection buyer to the seller. The first, called the "fixed amount" is the regular protection premium payable by the protection buyer equal to the notional amount of the swap multiplied by a fixed rate. The notional amount is adjusted throughout the life of the transaction – decreased by principal payments, principal writedowns and principal shortfalls of the reference obligation and any portion of the reference obligation that is physically settled and increased by the reimbursement of any writedown amount.

The second category of payments by the protection buyer is the "additional fixed amount", consisting of reimbursements of writedowns, principal shortfalls and interest shortfalls. The buyer pays such reimbursements to the seller only if the seller previously made such payments (writedowns or shortfalls) to the buyer which are subsequently reversed. It goes without saying that the additional fixed payments will never exceed the amount previously paid by the seller to the buyer in connection with writedowns or shortfalls (plus accrued interest).

Payments by Protection Sellers: The payment obligations of protection sellers are categorized as "floating payments" consisting of three types of payments – writedown

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[9] *Under pay-as-you-go, the credit events are: failure to pay principal, principal writedown, ratings downgrade and maturity extension.*

amounts,[10] principal shortfall amounts and interest shortfall payment amounts which are paid by the protection seller to the protection buyer on a "pay-as-you-go" basis when a shortfall or writedown occurs (unless the buyer chooses to physically settle the entire notional amount of the transaction) and the transaction will continue.

Treatment of AFC:[11] Interest shortfall payments are the mechanism through which AFC risk is addressed under pay-as-you-go. An interest rate shortfall is defined as the difference between actual and expected interest payment on the reference obligation. The latter is the amount of interest accrued on a reference obligation and determined without the regard to the applicability of any available funds cap. This mechanism effectively transfers AFC risk of the reference obligation to the protection seller.

Notwithstanding this transfer, the confirmation provides for three different types of elections for interest shortfall payments. Under the "fixed cap" election, the amount of interest shortfall payable by a protection seller to the protection buyer will be capped at the protection premium for the applicable period. If the "variable cap" election is made, the amount of interest shortfall payable by protection seller to the protection buyer will be capped at the protection premium for the applicable period plus LIBOR. If an election is made not to apply an interest shortfall cap, the protection seller pays the entire amount of the interest shortfall to the protection buyer.

In the last instance, the standardized confirmation provides for a one-time "initial payment" to be made and for the fixed rate paid by the protection buyer to be set at the stated spread of the reference obligation. If the reference obligation is trading at a discount, the protection buyer will make the initial payment to the protection seller, and if it is trading at a premium, the protection seller will make the initial payment to the buyer. This is not unlike the payment mechanics used in some corporate credit index tranches.

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[10]Principal writedown includes an "implied writedown" concept applicable for reference obligations that do not have a writedown provision. Such implied writedown is an amount equal to the amount by which the reference obligation is under-collateralized.

[11]While a similar treatment is conceivable to address PIK, as of this writing date, the standardized confirmation addresses RMBS and CMBS, which do not generally have PIK provisions. Any subsequent reimbursements of PIK-ed interest or AFC shortfall made by the underlying deal are reimbursed to the protection seller as and when they are made.

exhibit 5 A Comparison of Alternative Settlement Mechanisms

	Physical Settlement	Cash Settlement	Pay-as-you-go
Payments	Protection buyer delivers the reference obligation to protection seller Protection seller pays the protection buyer par	Protection seller pays the protection buyer (Par - final price)	Protection seller makes "floating payments" to protection buyer on a current basis Protection buyer pays protection seller back any (previously paid) reversed amounts
Market Valuation	Not applicable	Final price generally determined based on market valuation (may be avoided for certain credit events)	Not applicable
Partial Settlements	Possible	Possible	Protection buyer may physically settle all or a portion of the notional amount
Challenges	Sourcing of collateral upon a credit event	Potential for moral hazard issues	–

Source: Morgan Stanley

An Illustration: We use an example to illustrate this point further. We make the following assumptions for illustration purposes: a) the reference obligation has a stated coupon of LIBOR+400 bp and is trading at LIBOR+200 bp on the trade date; b) the protection premium payable by the protection buyer to the protection seller is set at 200 bp if the interest shortfall cap is applicable and at 400 bp if the interest shortfall cap is not applicable; and c) the reference obligation fails to pay interest on a given interest payment date.

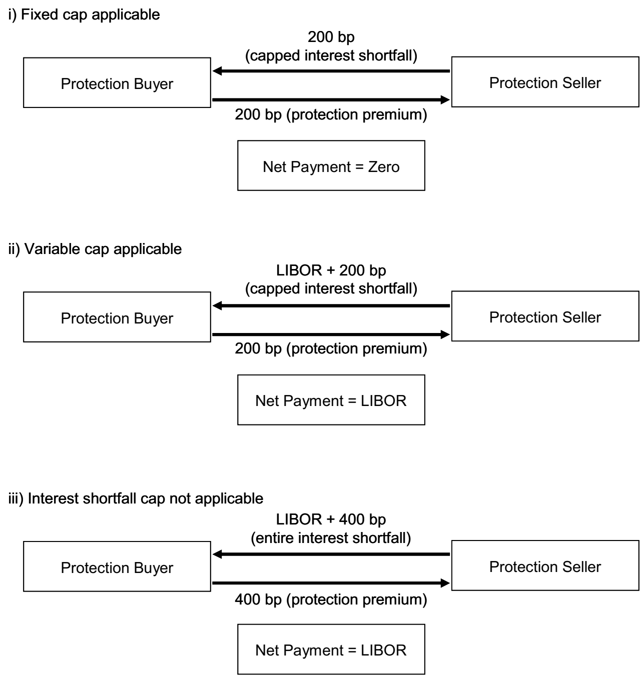
If the fixed cap is applicable, the interest shortfall of LIBOR + 400 bp will be capped at 200 bp. The protection seller pays the protection buyer 200 bp for the interest shortfall. Since the protection premium payable by the protection buyer to the protection seller is 200 bp, the two payments net out to zero.

If the variable cap is applicable, the interest shortfall of LIBOR + 400 bp will be capped at LIBOR + 200 bp. The protection seller pays the protection buyer LIBOR + 200 bp for the interest shortfall. Since the protection premium payable by the protection buyer to the protection seller is 200 bp, the two payments net out to LIBOR.

If the interest shortfall cap is not applicable, the protection seller pays the protection buyer the full amount of the interest shortfall, i.e., LIBOR + 400 bp for the interest shortfall. Since the protection premium payable by the protection buyer to the protection seller is 400 bp, the two payments net out to LIBOR. In this instance, an initial payment would have been made at trade inception.

exhibit 6

Transfer of AFC Risk: An Illustration



Note: Under (iii) above, an initial payment would have been made at trade inception.
Source: Morgan Stanley

THE TOTAL RETURN SWAP (TRS) ALTERNATIVE

An alternative to CDS structures for SF securities is to enter into a total return swap. A TRS can be funded or unfunded and involves two counterparties (A and B, for this illustration). In the funded form, counterparty A pays counterparty B the notional amount of the transaction on the effective date of the transaction and receives payments that exactly mirror the underlying reference obligation throughout the remaining life of the transaction as well as the price appreciation or depreciation of the underlying reference obligation.

In its unfunded form, there is no upfront payment. Instead, counterparty A makes periodic floating rate payments (LIBOR plus or minus a spread) and receives cash flows that exactly mirror the underlying reference obligation throughout the remaining life of the transaction as well as the price appreciation or depreciation of the underlying reference obligation. The maturity date of the TRS is generally set to match the legal final maturity date of the underlying reference obligation. The difference between a CDS structure and a TRS structure is that the latter includes a price return component and the former does not.

SF CDS: PRICING AND BASIS RELATIONSHIPS

Notwithstanding the many unique features of SF securities and the complexities of SF CDS, the basic principles of risk-neutral pricing remain similar to corporate CDS pricing[12] and the CDS premium reflects the expected cost of providing protection in a risk-neutral sense. The fair SF CDS premium equals the present value of expected losses or payments made under the provisions of the SF CDS under the risk-neutral measure. Still, given the unique characteristics of SF securities and the complexities of alternative credit events and the many variations in settlement mechanisms, implementing a theoretical pricing model for SF CDS in a risk neutral framework is bound to be more intricate and is beyond the scope of this chapter.

However, analogous to Z spread in corporate bonds, with SF securities we can use the discount margins (DM) to define a basis relationship between cash and synthetic instruments. Recall that unlike corporate bonds, SF securities are typically floating rate instruments. DM is a pricing analytic associated with floating rate instruments and represents the margin relative to the benchmark index rate of the SF security that makes its current price equal to the discounted present value of its cash flows. In the context of SF CDS, the difference between the CDS premium of a reference obligation and its DM represents the basis between synthetic and cash instruments. If the economics of risk exposure to a specific reference obligation in cash form or synthetic form through CDS are identical, the basis would be zero. However, just as is the case with corporate CDS, there are several reasons for the basis to be different from zero.

SF CDS: APPLICATIONS

Just as the introduction of CDS opened new avenues for the implementation of sophisticated hedging and investment strategies, there is a tremendous potential for their application within the broad arena of structured finance securities. SF CDS enable investors to be both long and short exposure and express directional views on specific securities or, more broadly, SF sectors, an opportunity that was hitherto difficult to implement. It would be possible to acquire exposure to assets that were difficult to source in the cash market as well as hedge existing exposures for better risk management and achieve efficient allocation of economic and regulatory capital.

Further, SF CDS enable investors to obtain leveraged exposures and use synthetic CDO technology to customize and manage the amount of such leverage. In fact, CDOs are natural sellers of protection within the SF CDS market, given the long ramp-up time increasingly noticed in SF CDOs due to the paucity of the collateral in the cash market. SF CDS also contribute towards an expansion of the collateral universe for a CDO manager to choose from, resulting in better diversified portfolios and better managed risks than would be possible if totally constrained to cash instruments.

To a large extent, this is already happening. Synthetic buckets in SF CDOs have increased significantly over the last year. Hybrid SF CDOs, which provide the flexibility for managers to obtain collateral in cash or synthetic form, are an emerging trend in SF CDOs. Managed synthetic SF CDOs, as well as credit default swaps on managed and static pools in SF portfolios, have also been on the rise. According to data complied by Creditflux, a UK-based provider of news and analysis for credit derivatives and the structured credit market, $94 billion of ABS-referenced portfolio credit default swaps were done during 2005. Standardization of documentation should,

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[12] *See Chapter 1 for a detailed exposition of risk neutral pricing as applied to CDS pricing.*

in our opinion, provide additional impetus to this phenomenon.

Arrangers of CDOs, and more generally, warehousers of securitization products, would be natural buyers of protection. Even if SF CDS were to achieve only a fraction of the market acceptance of their corporate counterparts, it would still mean that a brave new world of opportunities has been opened for SF market participants.

FROM ABS CDS TO ABX INDICES

Following the success of credit derivatives indices in the corporate credit market, the development of benchmark indices based on credit default swaps on structured finance securities was the next step in a logical progression of events in the evolution of synthetic structured finance. The first such group of benchmark indices, called ABX.HE, were launched in January 2006, focusing on the home equity ABS sector with the expectation that future indices will reference other ABS sectors.

The objective of these indices is to create liquid, transparent and standardized CDS benchmarks that will allow a broad range of investors to obtain exposure to the different ABS sectors, express directional views on them, efficiently hedge risk exposures and employ trading strategies. Each of these benchmark indices will have a portfolio of credit default swaps referencing a standardized basket of reference obligations. Such portfolios will be constructed using an objective, rules-based approach to promote transparency with a third-party administrator[13] providing daily prices and valuation analytics. Credit default swaps included in each of these indices will use standardized documentation to promote operational efficiency.

In the following sections, we provide a description of the ABX.HE indices, the rules for the construction of their underlying portfolios, their mechanics and their applications.

ABX.HE – A NEW STANDARD

ABX.HE represents a series of standardized indices for CDS on a basket of 20 recent home equity securitization transactions, with five ratings-based sub-indices for AAA, AA, A, BBB and BBB- rating categories. Each sub-index consists of a portfolio of 20 credit default swaps, each referencing a specific cash bond from each of the 20 home equity securitization deals. While reference obligations are equally weighted in the portfolio at the launch of the series, the subsequent portfolio composition may change depending upon on the performance of the underlying pools (pre-payments, defaults and amortizations, etc.). There are no substitutions allowed in the underlying portfolio over time.

DIFFERENCES BETWEEN ABX.HE AND SF CDS

The mechanics of the ABX.HE are similar to single-name SF CDS with a few important exceptions. First, while the single-name SF CDS documentation provides for alternative mechanisms for dealing with shortfalls (fixed cap, variable cap and no cap alternatives as described earlier), CDS referencing the ABX.HE will only have a fixed cap convention. Second, the pay-as-you-go mechanism applies but without the option

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[13] *Markit is the administration, calculation and marketing agent for the ABX series of indices.*

for physical settlement if there is a credit event. Third, the treatment of the clean-up call is different. SF CDS contracts provide for optional termination of the CDS if the underlying transaction is not called, and if the CDS remains in effect, the premium usually steps up. With the ABX.HE, there is no optional termination provision when a clean-up call is not exercised and there is no step-up in premium.

ABX.HE MECHANICS

Consistent with the pay-as-you-go approach, the obligation of the protection seller is to cover interest shortfall amounts up to the premium payments and any principal shortfall and writedown amounts of the reference obligations in the portfolio. Without the optional physical settlement provision, the maturity of the ABX.HE is effectively the maturity of the longest CDS within the underlying portfolio. The payments from the buyer and seller of protection are summarized in Exhibit 7 below.

exhibit 7 **Payments by Protection Buyers and Sellers on ABX.HE**

Protection Buyer (Fixed Rate Payer)	Protection Seller (Floating Rate Payer)
Pays a monthly premium (quoted as basis points per annum) to the protection seller on notional amount • The notional amount will decline over time based on the reference obligation amortization and any principal writedown	Receives a monthly premium (quoted as basis points per annum) from the protection buyer on notional amount • The notional amount will decline over time based on the reference obligation amortization and principal writedown
Receives payments from the protection seller in the event of the following • Interest shortfall (capped at the fixed rate) • Principal shortfall • Writedown	Pays the protection buyer in the event of the following • Interest shortfall (capped at the fixed rate) • Principal shortfall • Writedown
Pays to the protection seller in the event of the following • Interest shortfall reimbursement amount • Principal shortfall reimbursement amount • Writedown reimbursement amount	Receives from the protection buyer in the event of the following • Interest shortfall reimbursement amount • Principal shortfall reimbursement amount • Writedown reimbursement amount

Source: Morgan Stanley

To further illustrate the changes to the notional amount and payments in the event of a writedown, consider the following. The fixed rate paid by the protection buyer on a notional of $100 million is 70 bp; at index inception the factor on the reference obligation was 1.0 and is now 0.75; and a writedown in the amount of 1% of the current principal balance has occurred in year 3. The writedown amount is calculated as the product of (current factor * weighting of the reference obligation in the index * the writedown %) and the notional amount, which equals $37,500 = (0.75 * 0.05 * 0.01) * $100 million. The index notional amount will be reduced by 0.0375% and subsequent fixed payments (70 bp) by the protection buyer will be on the remaining index notional amount.

ABX.HE TRADES ON PRICE NOT SPREAD

Since there are no standard prepayment conventions, and since different investors make different prepayment assumptions resulting in different durations for the underlying reference obligations, trading the indices on spread terms can be complicated. Consequently, the ABX.HE indices trade on price terms. Each index has a predetermined premium that is fixed (as a percentage of notional) over the life of the index. Index prices will be quoted in a typical bond convention, as a percentage of par and any premium or discount is exchanged upfront. To illustrate this, assume that the index is at 100 and the index fixed rate is the market spread. If on a subsequent trade date the index is at 98, it means that the implied spreads have widened. For a trade initiated that day, the protection buyer pays the protection seller 2% * notional * current factor. On the other hand, if on that trade date, the index is at 102, it means that the implied spreads have tightened and the protection seller pays the protection buyer 2% * notional * current factor.

A RULES-BASED APPROACH TO PORTFOLIO CONSTRUCTION[14]

The portfolio of reference obligations for each ABX.HE series will be constructed such that the index is representative of the sub-prime home equity market. The third-party administrator will submit each participating dealer two deals from the largest 25 sub-prime home equity bond issuers based on the following criterion:

(a) Issued within the previous six months.

(b) Minimum issue offering size of $500 million.

(c) At least 90% of the deal's assets must be first lien mortgages.

(d) Weighted average FICO score of the borrowers in the pool < 660

(e) Referenced tranches must be floating rate payers indexed to one-month LIBOR

(f) At issuance, each deal must have tranches with ratings of each of the sub-indices with an average life greater than four years, except for the AAA tranche which must have an average life greater than five years

(g) All tranches rated by both S&P and Moody's – if split rated, the lower rating will apply

On the following day, each participating dealer will return to the third-party administrator a ranking of their deal preference for each issuer from the list provided. Based on this, the administrator will create a master list of 20 deals such that the list meets the concentration criteria that it contains no more than four deals with loans from the same originator and no more than six deals from the same master servicer.

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[14]*This section is largely drawn from the ABX Rules, January 17, 2006, available at http://www.markit.com/abx.jsp*

One day before the index creation date, each participating dealer will submit the fixed rate for each index, and the average of all such submissions (after discarding the top and bottom quartiles) will be the fixed rate for each index. The composition of each index series will be published four days prior to the creation of each new index series. Each index will contain the same list of reference obligations until all reference obligations are fully paid off or have matured.

A new series of indices will be issued approximately every six months. Each new series will reference a new set of home equity securitization transactions. As the composition of each series will be different, each new series will open up interesting opportunities to use the differences between them in creative ways.

ABX.HE: APPLICATIONS

The launch of the index opens up a plethora of opportunities for different investors with applications across a wide spectrum of market participants. It provides a quick and efficient means for acquiring diversified exposure to the sub-prime home equity ABS sector. It also provides an efficient risk management tool for hedging risk exposures to the housing sector in general and sub-prime home equity ABS sector in particular. This is significant for asset managers, particularly investors with portfolios of cash SF CDO tranches. For cash and hybrid SF CDOs, these indices offer a potentially shorter ramp up period, the ability to diversify vintage exposures and improved funding efficiencies. They also enable investors to express macro views on the housing market and facilitate directional trading based on such views.

NEXT STEPS

With indices on home equity ABS sector in place, the creation of indices in other ABS sectors is not far behind. Indices referencing commercial mortgage-backed securities are likely the next. There are also plans to launch leveraged tranches of these indices drawing upon the popularity of the tranches on corporate CDS.

On an analytical front, a significant benefit of the growth and liquidity in corporate CDS markets has been the ability to obtain market-implied forward-looking default probabilities based on CDS premiums. Hitherto, there was no clean way of isolating the credit risk component from the interest rate component using the market prices of credit risky fixed income securities. It has now become commonplace to discuss the credit risk of corporates in terms of CDS premiums. While some of the unique features of SF securities make such a clean isolation harder, improved liquidity in SF CDS should be a step in the right direction for improved transparency and analytics.

In conclusion, we revert to the point we made at the outset of this chapter. Current efforts toward standardization of documentation for SF CDS are likely to result in innovative ways for transferring credit risk, implementing hedging strategies and expanding investment opportunities for a wide range of market participants in the structured finance market. Synthetics are now more than just a niche within the structured finance world.

chapter 3

Leveraged Loan CDS: A First Step Up

February 17, 2006

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INTRODUCTION

Much of the innovation in the corporate credit markets over the past decade has been either in derivatives (CDS), structures (CBOs and CLOs) or combinations of both (synthetic structured credit). One major development in the single-name cash markets has been in leveraged loans, which, in their two main forms (bank and institutional loans), have experienced tremendous growth over the past few years. As demand has increased for exposure to secured high yield credit, there has been an important shift from bank loans to those targeted to institutional investors. As such, the investor base in leveraged loans has grown both directly (specialized funds and traditional high yield investors) and indirectly (CLOs, which have replaced CBOs as the preferred method of gaining structured exposure to high yield credit).

Loans used to be seen as arcane, clubby, documentation-intensive bilateral instruments with limited liquidity and secondary trading opportunities. This perception is changing. Syndicated loans have emerged as the dominant way for issuers to tap banks and other institutional capital providers for loans. The adoption of market-flex language – which allowed arrangers to change the pricing and other terms based on investor demand, is often seen[1] as the impetus for transforming the loan markets into the full-fledged capital markets we know them as today. Credit default swaps (CDS) referencing loans are the latest innovation in this market, which we expect to have a transformational impact on loan markets and, more broadly, corporate and structured credit markets. While leveraged loan CDS does have much in common with corporate CDS by virtue of the 2003 ISDA Credit Derivatives Definitions, there are important distinctions as well, both structurally and geographically.

In this chapter, we will discuss the unique characteristics of the loan market and highlight differences between bonds and loans to motivate a discussion of CDS on secured loans contrasted with the established CDS market for unsecured debt.[2] Furthermore, we will describe the mechanics and features of the leveraged loan CDS contract (as it looks today) emphasizing the differences between the US and European markets.[3] We will also discuss the factors that determine basis relationships between

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[1]See Standard and Poor's "A Guide to the Loan Market," September 2004 for a historical exposition. In later sections of this publication, we will draw upon the Standard and Poor's publication to discuss certain features of the loan markets and their terminology.
[2]We will refer to the standard CDS on unsecured instruments, such as corporate bonds, throughout this publication as corporate CDS.
[3]See our European colleagues' report "Leveraged Loan CDS: The Final Piece of the Jigsaw," November 4, 2005, for details on European loans and CDS.

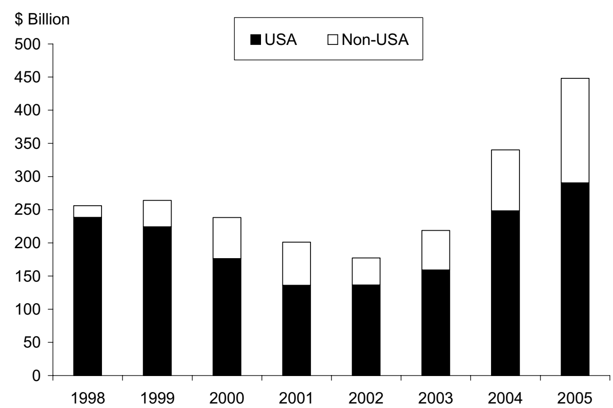
cash and synthetic instruments, as well as between corporate CDS and leveraged loan CDS. Finally, we discuss the applications of leveraged loan CDS from different perspectives. Note that we use the terms "leveraged loan," "secured loan" and even simply "loan" interchangeably in this chapter.

From a derivatives perspective, we want to make it clear upfront that plenty of evolution and maturing needs to occur for any standardized leveraged loan CDS contract. We feel the market is very much in the early stages, which readers will hopefully gather as they go through this publication, and we fully expect future credit events and the like to provide teething pains and to help create more mature contracts as the market moves forward.

WHY LEVERAGED LOAN CDS?

The market for secured loans has been booming for the last few years on both sides of the Atlantic (Exhibit 1). Record-breaking new issuance volumes amidst ever-tightening spreads, driven by the explosive growth in CLOs, as well as leveraged finance transactions, have been the hallmark of secured loans business. At the same time, significant changes are afoot that could have profound impacts on this market, with reverberations that could be felt in the broader corporate credit market. These include changes in the regulatory capital regime due to Basel II creating new demand for hedging bank loan exposures, changes to rating agency approaches to better distinguish the performance of secured loans as opposed to unsecured bonds, and growing institutionalization of the market, particularly in Europe.

exhibit 1
Global New-Issue Leveraged Loan Volume

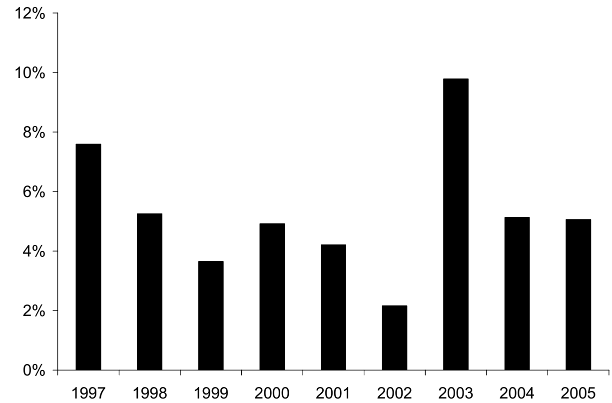


Source: S&P LCD

The consistent and stable performance of the loan market (to date) has generated a large expansion of investor interest and consequent cash inflows into the loan market. The returns from loan investing as reflected in the S&P LSTA Loan Index over the last several years have been impressive in absolute terms (Exhibit 2). Further, measured on a risk-adjusted basis using Sharpe ratios, loans compare favorably relative to other competing asset classes (see Exhibit 3, based on S&P LCD data).

exhibit 2

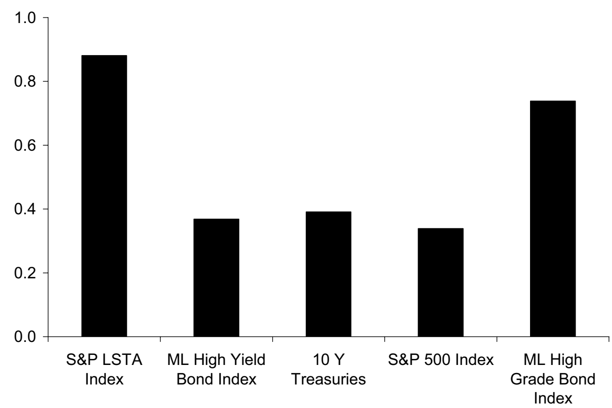
Total Return of S&P LSTA Index (1997-2005)



Source: S&P LCD

exhibit 3

Sharpe Ratio: S&P LSTA Index versus Other Asset Classes (1997-2005)



Source: S&P LCD

As the credit cycle appears to be on the cusp of turning, credit investors have demonstrated a shift in sentiment to move higher up in the capital structure by shifting from unsecured bonds to secured loans. This, coupled with the insatiable demand from CLOs, has made access to loans in the cash form a major constraint for investors trying to get long exposures to secured loans as an asset class. However, we caution that recovery value is a zero sum game, so to the degree that secured loans take the place of unsecured bonds in the capital structure, the historically high recoveries of loans are not sustainable.

At the same time, another section of investors is concerned with what is seen as declining credit quality, lack of diversity across CLO portfolios and exposure to LBOs embedded in the loan market; these investors seek instruments to short the loan market or efficiently hedge their exposures. In addition, commercial and investment banks require instruments that enable them to maintain relationships with issuers while simultaneously managing the capital risks of corporate lending.

Well constructed, standardized synthetic instruments can efficiently address these many demands from the long and short sides of this evolving market. Just as the development of CDS in corporate, emerging market and, more recently, asset-backed securities has radically transformed the underlying markets, development of a loan CDS contract has the potential to be similarly transformative for the loan sector. Current industry-wide efforts to develop a standardized contract for loan CDS are a natural outgrowth of these evolving dynamics in the marketplace for secured loans, paving the way for innovative methods of transferring risk, implementing hedging strategies and expanding opportunities for a wide range of market participants.

UNIQUE CHARACTERISTICS OF THE LEVERAGED LOAN MARKET

Floating Rate Instruments: Leveraged loans are typically floating rate payers with an interest amount equal to a floating rate index that is periodically reset (usually quarterly) plus a fixed spread (margin). Bonds may have either fixed or floating coupons.

Ratings: Most bonds are rated by at least one rating agency. While it is a lot more common for US loans to be rated as well, European loans frequently do not carry public ratings.

Loan Structure: The majority of loans may be structured as one of two categories – revolving credit facilities and term loans. A revolver is a commitment to make loans to a borrower up to the maturity date of the facility, and a borrower may borrow and repay a revolving credit facility multiple times until the maturity of the facility at the discretion of the borrower. Revolvers are generally unfunded and mainly used by investment grade borrowers. A term loan is funded at closing and any repayment results in a permanent reduction in outstanding amount, i.e., no re-borrowing. Because of the largely unfunded nature of the revolvers, they are not traded frequently.

There are two principal categories of term loans – amortizing term loans and institutional term loans. An amortizing term loan ("TLA") is a fully funded term loan with a specified amortization schedule (usually weighted towards the later years); it is generally syndicated to banks, along with revolvers, as a part of larger syndications. Institutional term loans ("TLB", "TLC", "TLD," etc.) are the type of loans that are of most interest to institutional lenders who generally do not maintain a relationship with the borrowers; these constitute the bulk of the traded loans and, as such, are the category of loans that will be of most interest in the context of loan CDS. Institutional term loans are secured, rank pari passu with other facilities, and usually have interest margins higher than revolvers or TLAs, repaid mostly in a bullet form (scheduled amortization, if any, is minimal and significantly back-ended). In addition, institutional term loans are longer dated (with maturities of five to seven years) but may be prepaid at any time at par (unless specifically structured with call protections) and used by leveraged borrowers (non-investment-grade borrowers with Debt/EBITDA greater than 2.0x). Multiple tranches with varying maturities can co-exist within a facility (TLB, TLC, TLD, and so on, are labeled as such for each maturity). The vast majority of the loan market is comprised of institutional loans.

While these structures (especially term loans) have some similarity to corporate bonds by way of differing maturities, their security, amortization and prepayability features are unique to loans.

Seniority and Security: Loans almost always rank senior to other parts of the debt capital structure. For non-investment-grade borrowers, they are also secured by all tangible and intangible assets of the borrower in the form of pledges of collateral. In some cases, loans are secured by specific assets. The secured and senior nature of leveraged loans is an extremely important feature that determines the recovery prospects for a loan if there is a default. Historically, the average recovery rates for secured loans have been significantly higher than unsecured debt (Exhibit 4).

exhibit 4 Average Recovery Rates for Corporate Debt Obligors (1982-2005)

	1982-2005
Loans	
Senior Secured	70.0%
Senior Unsecured	57.6%
Bonds	
Senior Secured	51.9%
Senior Unsecured	36.0%
Senior Subordinated	32.4%
Subordinated	31.8%
Junior Subordinated	23.9%

Source: "Default and Recovery Rates of Corporate Bond Issuers, 1920-2005," Moody's Investors Service, January 2006.

In this context, it is useful to discuss another growing type of syndicated leveraged loans – second-lien loans. As implied by their name, claims on second-liens rank behind those of the first-lien loans and, as such, trade at significantly wider premiums to first-lien loans. The recovery potential for second-lien loans is usually lower. The term "designated priority" is used to designate the lien status (whether the loan is first lien or second lien).

Covenants: A defining feature of leveraged loans, as opposed to bonds, is the significant and onerous set of restrictions on borrowers imposed through covenant protections. While there is a wide gamut of such restrictions specified in loan agreements, in general, the riskier the borrower, the larger the covenant package. Covenants can be affirmative (actions borrowers must take to be compliant with a loan), negative (limitations on the types and amounts of new debt, liens, asset sales, acquisitions, parent/subsidiary guarantees) and financial (enforcing minimum financial performance measures). Financial covenants can include limitations on coverage (minimum cash flow/earnings relative to interest and debt service), leverage (maximum level of debt relative to cash flow or earnings), current-ratio (minimum ratio of current assets to current liabilities), tangible net-worth (minimum levels of tangible assets excluding assets such as good will and intellectual assets) and maximum capital expenditure (limiting the purchase of property, plans and equipment).

The extent of covenant protection is critical in determining the riskiness of the borrower. While bonds, especially non-investment grade bonds, also have some form of such covenants, they are not typically as onerous as with loans. It is worth emphasizing that there is a wide variation in covenant packages across loan agreements. Furthermore, second lien loans typically have less restrictive covenant packages and maintenance covenants are set wide of the first lien loans.

Secondary Trading Conventions: Once a loan transaction is closed upon primary issuance, it can be traded in the secondary market. Such sales can be structured in one of two forms – assignments or participations. The differences between the two forms are mainly in terms of rights, as well as the degree of documentation and consents that need to be sought and obtained. Assignments usually require the consent of the borrower and the agent on a not-to-be-unreasonably-withheld basis; the assignee becomes the direct signatory to the loan and receives interest and principal payments from the administrative agent of the loan agreement. In the event of a borrower default, assignees will have complete rights and access to private information as lenders of record.

Participations do not have the consent requirements of assignments, and a buyer obtaining a loan through participation enters into a separate agreement with an existing lender to take a participating beneficial interest in the lender's position in the loan agreement. The existing lender remains the official holder of the loan and passes on interest and principal payments to the participant buyer. The voting rights of participants may be limited. In practice, varying degrees of voting rights are passed on through participations in the market. Access to syndicate information is different in that it is often indirect and there may be differences in the timing of receipt of information, in the event of a default.

Clearly, these trading conventions and differences of rights and responsibilities are not generally as onerous in the context of the secondary trading of bonds. Also, significant differences exist between European and US conventions in this context. Assignments in Europe can be much more restrictive than in the US, requiring the eligible assignees to be financial institutions, sometimes specifying only banks to be eligible. Therefore, institutions such as hedge funds and, in some cases, CLOs may not be deemed eligible assignees and may need to obtain exposure solely through participations. In general, the criterion for eligible assignees in the US is broader.

Public vs. Private Information: Most loan agreements require a borrower to periodically provide information ("syndicate information") to the lenders, which is generally not public. Access to such information is transferred when a loan is traded on assignment but not necessarily in participations. Further, traditional "loan-only" institutional investors (CLOs, prime funds) have, for the most part, chosen to remain private and therefore retain access to syndicate information. Clearly, other investors, such as hedge funds, high yield funds and other mutual funds, may have exposure to the borrower in other forms as well (bonds, for example), and access to non-public information could be problematic. Such investors should create legal or operational "wall-off" infrastructure internally or externally.

We highlight this as an important consideration for market participants. In the early days of (mainly investment grade) CDS contracts, a common criticism was that banks (who were natural buyers of protection) were privy to private information. In 2002, the

CFMA required that CDS be covered by anti-fraud measures, which created walls between lenders and hedgers in banking institutions.

Documentation: Loans are documentation intensive – much more so than bonds. Two separate markets exist within the secondary loan market, each trading with a different set of documentation – one for par loans (still performing and without any financial distress) and another for distressed loans (those already in default, perceived by the market to be on the verge of default, or otherwise considered to be under financial distress).

While the buyer's assumption of the seller's rights and obligations is limited to those that result from facts, events or circumstances arising or occurring on or after the closing date of the loan purchase, the determination of what the seller's obligations and liabilities are requires a significant amount of legal work. This has important implications for the development of a liquid loan CDS contract, and a mechanism has been created to deal with such issues.

exhibit 5 High Yield Bonds versus Leveraged Loans

	High Yield Bonds	Leveraged Loans
Interest	Fixed/Floating	Floating
Spread (Margin)	Unchanged	Potentially to ratchet.
Seniority	Senior or subordinated	Senior
Security	Unsecured	Secured (first lien or second lien).
Rated?	Yes	Yes, in the US and not usually publicly rated in Europe.
Calls, Prepays and Amortization	Call protections and premiums	Usually no call protections for first lien loans, but there are call protections in second lien loans. Loans are prepayable, mainly (bullets). Some loans amortize (revolvers and TLA).
Covenants	Incurrence covenants	Maintenance covenants
Documentation	Limited	Extensive. Credit agreement is the governing documentation. Separate documentation for Par and distressed loans for trading.
Funded/Unfunded	Funded	Usually funded. But some tranches are not (revolvers).
Secondary Trading Conventions	Trace eligible; some exchange trading	Not Trace eligible. Through assignments or participations.

Source: Morgan Stanley

Given the unique characteristics of loans and the differences between European and US market conventions, the development of standardized contracts has evolved to create synthetic instruments that best approximate the credit risk exposure of the loan markets specific to the market conventions of their underlying cash markets. Consequently, two forms of standardized CDS contracts, one each for trading in the US and in Europe, have emerged. In the US, the CDS contract is a lien-specific contract that is generally non-cancelable unless there are no secured loans outstanding. In Europe, the CDS contract terminates upon the full repayment of a specific loan. In the next section, we discuss the mechanics of the CDS contract in greater detail.

LEVERAGED LOAN CDS MECHANICS

Before delving into loan CDS mechanics, a brief review of CDS concepts in general, may be helpful. Recall that a CDS involves protection buyers and sellers, and the CDS protects the buyer of protection against the loss of principal in the underlying asset when a credit event occurs. The protection buyer pays a periodic premium to the protection seller, typically quoted as basis points per annum until the contract matures or a credit event occurs, whichever is earlier.

The underlying asset is defined as the reference obligation of a specific reference entity which informs the scope of the protection. When a credit event occurs, depending upon the settlement mechanism in the CDS contract, the buyer of protection delivers a reference obligation to the seller and receives par in return (physical delivery) or receives the difference between par and the post-credit-event market value of the referenced obligation from the seller (cash settlement). Credit events are specified in the CDS contract and typical credit events are bankruptcy, failure to pay, restructuring, repudiation and obligation acceleration. The buyer of protection is “short” and the seller of protection is “long” the credit risk of the reference obligation in contrast to the cash market where a bond/loan buyer is “long” and the seller is “short” the credit risk of the underlying bond/loan. A few notable differences between being long a leveraged loan in cash form or via CDS are worth mentioning. As long as there are no credit events, sellers of protection do not have voting rights and do not receive the benefits of any margin amendments or fees that the underlying cash loan might. Loan CDS mechanics are similar to other CDS mechanics in general, and the terms and provisions in the 2003 ISDA Credit Derivatives Definitions, combined with that document’s May 2003 supplement, do form the general framework for loan CDS documentation, with some important modifications discussed in detail below. Exhibit 6 summarizes the major differences in CDS between loans and bonds.

exhibit 6 How Is Loan CDS Different from Bond CDS?

	Leveraged Loans	Bonds
Reference Entity/Reference Obligation	Depends upon the tranche/lien	Depends upon the issuer
Credit Events	1. Bankruptcy 2. Failure to pay (non-curable default) 3. Restructuring is NOT a credit event in the US and is a credit event in Europe	1. Bankruptcy 2. Failure to pay (non-curable default) 3. Restructuring is a credit event for IG and NOT for HY issuers in the US. Restructuring is a credit event for HY in Europe
Cancelability	1. European standard contracts are cancelable if loan prepays 2. US standard contracts are cancelable only if loans go from secured to unsecured or if no secured loans are outstanding	Non-cancelable
Settlement	Physical delivery Cash settlement procedures are still evolving	Cash settlement and physical delivery
Documentation issues	– Par docs and distressed docs – Via assignments or via participations – ISDA standards still evolving	ISDA standard documentation

Source: Morgan Stanley

Syndicated Secured: An important, unique concept fundamental to loan CDS mechanics and documentation is the "syndicated secured" characteristic of a reference/deliverable obligation. It refers to any obligation to pay or repay borrowed money resulting from the funding of an unfunded commitment that arises from a loan agreement and trades as a loan of the designated priority.[4] Note that this is really a trading standard, as opposed to a legal standard, and is meant to reflect the trading practices in the current primary or secondary loan market.

Reference Obligation: The reference obligation is a loan of a designated priority (first-lien loan, second-lien loan, etc.). The CDS confirmation specifies a "relevant secured list", which lists syndicated secured obligations of the designated priority of the reference entity, published and amended from time to time by an appointed secured list publisher.[5] The confirmation provides for new tranches to be added as long as they are obligations arising under a syndicated loan agreement and trade in the secondary markets as a loan of designated priority or higher. The implication of this legalese is that all *pari passu* tranches/facilities would be deliverable obligations, including tranches and facilities added subsequent to the trade date. As such, this framework facilitates trading loan CDS on a "class" of assets. This definition is common to both US and European standardized contracts.

Cancelability: A notable difference between the US and European standards is that European loan CDS contracts are cancelable upon the full repayment of the underlying loan, while the US loan CDS contracts are not. In other words, if a loan facility is refinanced, CDS contracts under the European standard terminate, but the US loan CDS contracts do not. The latter are cancelable only when a loan goes from being secured to unsecured with no outstanding secured loans, or if it is determined that there are no substitute secured loans. In the case of corporate CDS, such cancelability provisions are usually not relevant.[6]

Substitution of Reference Obligation: It is possible that a designated reference obligation is no longer a valid reference obligation. Circumstances that necessitate such a situation include: a reference obligation is repaid in whole, or, in a case where it is a revolver, the relevant commitment is terminated and any funded commitment is repaid; the aggregate funded and unfunded commitments under the reference obligation are materially reduced due to redemptions; or the reference obligation may no longer satisfy the syndicated secured characteristic. Under such circumstances, the US loan CDS contracts provide for the substitution of the reference obligation with another reference obligation that satisfies the syndicated secured characteristic, ranks *pari passu* (or higher in seniority if no *pari passu* loan exists, at the option of the protection buyer) and preserves the economic equivalent delivery and payment obligations. The calculation agent identifies a candidate reference obligation for substitution in consultation with all the parties involved and notifies all the parties upon which it would be binding unless there is a manifest error. The confirmation provides for a dispute resolution mechanism in this context as well.

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[4] *First-lien loans represent the highest priority.*

[5] *The Markit Group is currently designated as the Secured List Publisher for the loan CDS contracts.*

[6] *In fact, corporate CDS are terminated prior to maturity without a credit event having occurred only under a rare M&A situation. See Chapter 7 for further details.*

Credit Events: The standard credit events for the US contract are bankruptcy and failure to pay. As is the case with the corporate CDS on US high yield bonds, restructuring is *not* a credit event. On the other hand, restructuring *is* a credit event for European loan CDS, in addition to bankruptcy and failure to pay. The motivation for the inter-continental differences has to do with regulatory relief. European regulators require restructuring to be included as a credit event for banks to obtain regulatory capital relief as protection buyers.

Deliverable Obligations: Any reference obligation that satisfies the syndicated secured characteristic is deliverable. For European loan CDS, deliverable obligations cannot have security diminished as a consequence of restructuring.

Borrower/Agent Consent: Loan CDS, being contracts between buyers and sellers of protection, effectively avoid borrower/agent consent issues and any associated transfer fees in the underlying cash loan market.

Settlement Mechanisms: Physical settlement is the default standard for both US and European loan CDS contracts. Cash settlement remains a somewhat distant goal; the procedures to effectuate settlement in cash form are still evolving. The seller of protection has the cash settlement option if unable to receive physical delivery or unwilling to accept participations. The differences in rights and information access discussed earlier may motivate the reluctance to accept the physical delivery of a loan as participation. It is important to emphasize that the protection seller is not obliged to take physical delivery of loans or participation and both parties have the right to elevate participation to an assignment or novation. The protection buyer must be either the lender of record on the loan or have similar voting rights via a similar CDS or participation agreement in order to transfer voting rights to the protection seller. In the US, voting rights transfer only in assignments and not via participations, as a default standard.

Given the documentation intensive nature of loans and the potential for legacy issues to be carried along the stream as a loan changes hands, efforts toward contract standardization include certain provisions to facilitate efficient and expeditious settlement. These provisions take the form of a physical settlement rider and a market standard indemnity.

The former provides detailed guidance to harmonize standards for physical settlement under a CDS with the standard market practices in the secondary loan market. Note that most of the complications we have discussed thus far are not due to the CDS contract per se but are really inherent to the underlying loan markets. As such, the credit specific standard practices evolve for dealing with the many complications that accompany the trading of loans in the secondary market. The physical settlement rider will utilize the closing mechanics and procedures developed by the LSTA, which will be modified as necessary to ensure efficient settlement of CDS contracts. The physical settlement rider confirms the current LSTA practice and effectively provides the order and the manner by which physical settlement of CDS contracts should take place – first by assignment, then by participation if settlement by assignment is not plausible, and then on the basis of partial cash settlement. As such, partial cash settlement is a fall-back settlement provision designed to determine cash payment owed by the protection seller to the protection buyer and applies if the protection seller does not take physical delivery of the reference obligation. As it is conceived, it is always at the protection seller's option. The specification of the market standard in this form should help preempt the lengthy negotiations that might otherwise be the case.

The market standard indemnity is also conceived to facilitate faster and efficient settlement through physical delivery following a credit event. As has been the case with corporate bond CDS, the outstanding CDS exposures are likely to exceed the outstanding amount of deliverable obligations. The potential scramble for physical delivery upon a credit event are further exacerbated given the time and the legal work necessary to review documentation across the upstream chain. The market standard indemnity seeks to protect the seller of protection from documentation deficiencies by requiring the protection buyer to indemnify the protection seller as a result of inconsistencies between the documents used to transfer the secured loan between the parties and the documentation used in the standard market practice applicable at the time of the transfer.

APPLICATIONS

Just as the introduction of corporate CDS opened new avenues for the implementation of sophisticated investment and hedging strategies for a wide range of credit investors, we see a similar potential for loan CDS. The interest in the use of loan CDS is likely to be multidimensional – ranging from investors seeking exposure to the loan asset class (including bond investors seeking to move up in the capital structure) and CLO managers seeking diversified collateral, CLO investors and commercial banks in pursuit of efficient hedging and risk management strategies, and hedge funds and other arbitrageurs seeking to exploit potential capital structure arbitrage strategies. We discuss each of the applications from the perspective of each of these classes of investors.[7]

Traditional Single Name Credit Investors: The consistent and impressive returns and the seniority in capital structure of leveraged loans have drawn a range of new investors as well as facilitated the increased allocations to the asset class of investors with existing exposure. Both of these categories include traditional bond investors such as insurance companies, pension funds and specialized mutual funds. For these investors, selling protection through loan CDS offers a much expanded universe of issuers to choose from instead of being reliant on the limited allocations in the new issue market or the relatively limited opportunities in the secondary market. Loan CDS open up access to private transactions, as well as to issuers that are no longer trading actively in the secondary market. For European loans, sellers of protection will have the ability to sell in USD or EUR or GBP, etc., regardless of the underlying currency of the loan. It is worth repeating that loan CDS, being contracts between buyers and sellers of protection, effectively avoid borrower/agent consent issues and any transfer fees.

CLO Managers: For CLO managers and arrangers, loan CDS offer several advantages. The difficulties associated with collateral sourcing in the cash loan markets and the consequent long ramp-up periods, as well as sector and/or issuer overlap across CLOs, are well known to the CLO market participants. The latter point is a significant limitation on CLO managers' ability to distinguish their performance from each other

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[7] *Our European colleagues, Viktor Hjort, Afsheen Naqvi and Javier Serna, have recently written about the loan CDS applications with a European focus. See "Leveraged Loan CDS: The Final Piece of the Jigsaw," November 4, 2005.*

since dependency on the tight, collateral-scarce cash loan markets constrains their universe of available assets – hence, the similarity across CLO portfolios managed by different managers.[8] Loan CDS offers a useful expansion of the universe of available issuers and assets, which helps to reduce ramp-up risk and enables managers to distinguish their performance by security and sector selection.

CLO Arrangers/Structurers: In addition to the advantages described above, loan CDS also enable cash CLOs to have larger synthetic buckets. It is conceivable that both regular issuance of 100% synthetic CLOs as well as hybrid structures that enable exposures to be acquired in cash and/or synthetic form will emerge in the CLO market. Thanks to the unfunded nature of the loan CDS, such structures would have distinct funding cost advantages, the benefits of which will accrue mainly to investors of CLO equity tranches.

CLO Investors: In addition to the advantages loan CDS bring to CLOs described above, CLO investors may have additional applications as well. Given the sector and issuer overlaps in CLOs, investors holding portfolios of CLO tranches are clearly exposed to overlap risk. Loan CDS offers them the potential to buy protection and hedge their exposures. The extent and the effectiveness of such hedging depends upon investors' risk tolerance, the tranches being held and their sensitivities to changes in loan CDS spreads and their analytical framework to deduce suitable hedge ratios. Nevertheless, loan CDS offer investors an instrument to hedge their exposures.

Commercial and Investment Banks: Single name loan CDS enable banks to hedge their loan exposures while maintaining their banking relationships by lending in the cash loan market and buying protection using loan CDS. Basel II provides an effective incentive to banks to hedge their loan exposures. As our colleagues Jackie Ineke and Christine Miyagishima noted in their report ("Leveraged Loans: Suffering Under Basel II", May 9, 2005), banks link risk weightings to credit ratings, which benefits higher-rated assets such as tranched credit and ABS but works against leveraged loans. But, if leveraged loan exposures are hedged by buying protection from a well-rated counterparty, the capital requirements drop significantly as demonstrated in Exhibit 7.[9] For example, minimum capital requirements for a €10 million exposure of a generic double B TLA loan could fall €0.94 million to just about €0.116 million.

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[8] *See "Taking a CLOser Look", November 21, 2005.*

[9] *For these calculations, we assume that the hedge counterparty is at least A rated. We also note that banks typically hold higher than their minimum required capital.*

exhibit 7 Basel II Impact on Leveraged Loan Risk Weightings

	Rating	Basel II Risk Weighting	Basel II Capital Requirements (MM) Without Hedge (For €10 MM Exposure)	Basel II Minimum Capital Requirement with Hedge (MM) (For €10 MM Exposure)
Term Loan A	BB	117.53%	€ 0.940	€ 0.116
Term Loan B	BB	130.33%	€ 1.043	€ 0.116
Term Loan C	BB	130.33%	€ 1.043	€ 0.116
Revolver	BB	117.53%	€ 0.940	€ 0.116
Term Loan A	B	174.67%	€ 1.397	€ 0.116
Term Loan B	B	185.56%	€ 1.484	€ 0.116
Term Loan C	B	185.56%	€ 1.484	€ 0.116
Revolver	B	174.67%	€ 1.397	€ 0.116

Source: Morgan Stanley

While corporate CDS do give banks a tool to hedge against such exposure, leveraged loan CDS give them a more effective hedge that is a better match relative to the risk exposure.

Hedge Funds, Proprietary Trading Desks and other Arbitrageurs: Loan CDS can be thought of as a definitive step towards trading the entire capital structure in synthetic form. With equity derivatives, CDS on unsecured bonds and now loan CDS, opportunities abound for identifying and exploiting potential arbitrage opportunities, the mainstay in the tool kit of hedge funds and other such arbitrageurs.

exhibit 8 Applications of Leveraged Loan CDS

Traditional Single Name Investors	- Expanded universe of issuers - Ability to sell protection in different currencies in the European market - Avoid borrower/agent consent issues and transfer fees
CLO Managers	- Shorter ramp-up periods - Expanded reference universe decreases sector/issuer overlap - Increased potential to distinguish performance by security and sector selection - Improved funding efficiency
CLO Arrangers/ Structurers	- Shorter ramp-up periods - Improved collateral sourcing thanks to expanded universe - Funding cost advantages will accrue to equity investors - Facilitate use of larger synthetic buckets (up to 100%)
CLO Investors	- Hedge CLO exposure and minimize overlap risks - Funding cost advantages will accrue to equity investors - Shorter ramp-up periods - Expanded universe of issuers
Commercial and Investment Banks	- Hedge loan exposure while maintaining banking relationships - Hedging reduces risk weightings and provides regulatory capital relief under Basel II regime - Proprietary trading opportunities
Hedge Funds, Prop Desks & Other Arbitrageurs	- Capital structure arbitrage - Ability to short credit in the loan space - Risk management and minimization of overlap risks - Expanded universe of issuers - Avoid borrower/agent consent issues and transfer fees

Source: Morgan Stanley

BASIS RELATIONSHIPS

Basis relationships in the context of leveraged loan CDS can be thought of in many alternative ways, but we would argue that a few key relationships are the most important: the basis between the leveraged loan CDS premium and the spread of the underlying loan, the basis between cancelable (European) and non-cancelable (US) leveraged loan CDS premiums, and the basis between CDS on leveraged loans and CDS on senior unsecured debt of the issuer. For those of us who have grown up with corporate CDS, there are useful parallels and lessons to be drawn from that now-mature CDS market.

The basis between the leveraged loan CDS premium and the spread of the underlying loan: The basis between leveraged loan CDS and the underlying loans can be affected by numerous factors. First and foremost, the demand for risk in synthetic versus cash form, as driven by risk taking from both end investors and structured vehicles, will be a key driver in determining relative pricing. Early in the development of the unsecured CDS market, there were many arguments for a positive basis versus cash bonds (for reasons like the cheapest to deliver optionality). Yet, we have experienced significant periods of a negative basis in unsecured investment grade credit.

Second, structural differences between the actual loans and the CDS contracts can bias their relative pricing. While loans themselves have provisions for the spread to increase or decrease, the coupon on the loan CDS is fixed, so the relative pricing will reflect the market's perception of likely changes in the future spread on the loan but this alone does not suggest a directional bias. Additionally, US contracts would likely survive the refinancing of a loan so long as a similar loan still exists, a feature for which sellers of protection in CDS contracts should presumably be paid. This suggests a positive basis (CDS trades wider than loans, all else being equal). This would be less true for the cancelable European CDS contracts. If the value of these differences is small enough, they could easily be overcome by the aforementioned relative demand dynamics between cash and synthetic products.

The basis between cancelable (European) and non-cancelable (US) leveraged loan CDS premiums: Given the difference in cancelability between contracts under the current European and US market standards, there is a theoretical argument for a positive basis between European and US contracts. Quantifying the size of any implied pricing differential for these reasons is less easy. This pricing differential will be driven by the markets' view of how likely any refinancing is to occur through time, the likelihood that loan is refinanced with a similar loan, and the expected differential between the current loan spread and the loan spread on the loan issued to refinance. As an example, for cuspy credits likely to experience upgrades to investment grade, access to unsecured financing could imply that the differences between European and US CDS premiums may be smaller.

The following would reduce the basis between loan CDS under the two standards: a lower likelihood of refinancing, a lower likelihood of a leveraged loan being issued in the refinancing, a lower expected spread differential between the current loan and any leveraged loan issued in a refinancing

The basis between leveraged loan CDS and senior unsecured CDS of the issuer: The basis between CDS premiums on secured and unsecured parts of the capital structure of the same issuer will be a function of the basis between loans and unsecured debt, which itself is driven by a myriad of factors, the most important of which we list below:

1. The size of the borrowings at the various levels of seniority (loans, senior secured debt, senior unsecured debt, subordinated debt, etc.) relative to the total borrowings of the company.
2. The absolute likelihood of default for the issuer.
3. The relative quality of covenants of the loan and senior bond obligations.
4. The likelihood of any capital structure changes and relative pricing of the loan and bond portions of a new capital structure in any corporate restructuring.
5. Any differentials in maturity profiles between the loans and bonds of the issuer.

CONCLUSION

If it feels like we covered a lot of ground in this chapter, we have our reasons. In our view, the community of investors with significant experience in *both* credit derivatives and leveraged loans is small, and therefore there are experience curves that most need to climb. Furthermore, credit derivatives tied to leveraged loans have unique issues that should result in some interesting tests of contract language over time. We are indeed excited about strategic opportunities in the secured high yield credit space involving both single-names and CLOs, as well as full capital structure plays. However, we do caution that we are in the early days of a market that will need time (and increased credit risk) to mature.

chapter 4 Trading Recovery Risk – The Missing Link

September 16, 2005

Primary Analyst: Sivan Mahadevan
Primary Analyst: Peter Polanskyj

The advent of credit default swap instruments has helped both seasoned and new credit market participants more rigorously analyze default risk over the past several years. We now have very important tools to determine default probabilities, which helps in the pricing of both single-name and structured credit instruments. As credits become stressed, these default probabilities are particularly meaningful in many contexts, from forming fundamental views to debt capital structure arbitrage and even the pricing of CDO tranches.

However, this process works best only when we have a good sense of what recovery value might be, in the event of a default or a bankruptcy filing. Some of our early work in the airline space was indeed feasible because we could make an assumption about the recovery value of unsecured airline debt (single digits %) without much debate, which, in turn, made the pricing of many other relationships in the debt capital structure much easier.[1] Yet, in most cases, the process of determining recovery values is itself complicated; thus, recovery values are the missing link in any type of stressed credit analysis, with the market providing us little information.

There is a tiny and perhaps budding market for trading recovery risk through conceptually simple instruments like recovery locks, a specific form of a recovery swap, which are actually the net position of a more complicated trade. Most of the trading activity we have seen in the recovery space is in stressed fallen angel credits. Trading recovery risk adds a whole new dimension to the credit puzzle, and it may take a turn in the credit cycle to become more mainstream in usage, notwithstanding its mention in the *Wall Street Journal* today. Yet, there are indeed motivating factors today, including the rise of idiosyncratic risk in select sectors and the proliferation of synthetic bespoke tranches issued with some form of fixed recovery protection.

HOW RISKY IS RECOVERY?

Before we delve into both the motivation behind trading recovery risk and the instruments used, it is worth at least mentioning how large the topic of recovery analysis really is. Ironically, recovery valuation is not always about determining the value of a firm's unencumbered assets. Most US companies that file for bankruptcy protection do so under Chapter 11 with the idea that they will restructure instead of liquidate (which would be Chapter 7). In these cases, recovery value is something that is negotiated through bankruptcy court, which is easy to lose sight of.

One can and should think about recovery risk almost independently of default risk, and then put the two together to make valuation decisions. Some recent examples can

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[1] *Please refer to Chapter 26.*

highlight this point. Northwest Airlines' decision to file for bankruptcy protection was a bit of a surprise, and one could argue that most of the movement in unsecured instruments was related to the probability of this event, not recovery once it happened, as unsecured debt recoveries in the airline sector have generally been low. Also, much further away from the mainstream, an Australian court recently ruled that unsecured creditors' claims on an Australian-domiciled entity would be pari passu to those of equity shareholders, which demonstrates the independence of recovery risk with respect to default risk, at least in this example.

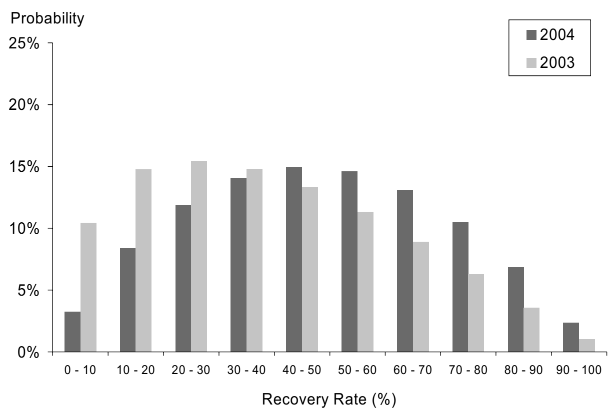
exhibit 1 Very Volatile – Senior Unsecured Bond Recovery Rates

Year	Mean	Median	Min	Max	StDev	Observations
2003	41.2%	34.0%	0.1%	99.5%	24.7%	34
2004	50.1%	47.0%	15.0%	95.8%	22.3%	33

Source: Morgan Stanley, Moody's

The question of how uncertain recovery risk is remains difficult to answer, but, anecdotally, we can use aggregate rating agency data to get a sense for the distribution of recovery rates on defaulted issuers (derived from data in "Moody's Default and Recovery Rates of Corporate Bond Issuers, 1920-2004"). The results are summarized in Exhibit 1 and offer some interesting insight. There is a significant amount of uncertainty around recovery rates, which is not surprising (the standard deviations quoted by Moody's are 25% and 22% for 2003 and 2004, respectively).

exhibit 2 Fitted Recovery Rate Distributions



Source: Morgan Stanley

Based on this data for senior unsecured debt, we fitted beta distributions to get a more robust sense of how uncertain recovery actually was in 2003 and 2004. The resulting distributions are shown in Exhibit 2 and illustrate that, in addition to being very volatile, recovery rates are likely skewed to the downside and appear even more skewed the lower the average recovery (at least based on this limited dataset).

MOTIVATION FOR TRADING RECOVERY RISK – STRESSED NAMES AND SPECIALIZED CDOS

Although any fundamentally oriented credit investor ought to be interested in isolating and trading recovery risk, it is still a new concept and the real motivation for the limited activity we see in the market is the result of two phenomena, in our view. First, the fact that we remain in a fairly benign credit environment from a default perspective reduces both the interest of end investors in trading recovery and the dollar value of doing so successfully. In other words, given today's spreads, the dollar value of a recovery point is much less than for an environment in which spreads, on average, trade wider. This phenomenon helps explain the concentration of recovery trading activity in the wide names in the market like Delphi, General Motors and Calpine.

Second, investor demand for synthetic CDOs where underlying default swaps have fixed recoveries creates supply of fixed recovery protection in the market without a natural other side. These types of CDOs have gained in popularity largely because fixed recoveries reduce the uncertainty of tranche losses, making them appealing to end investors.

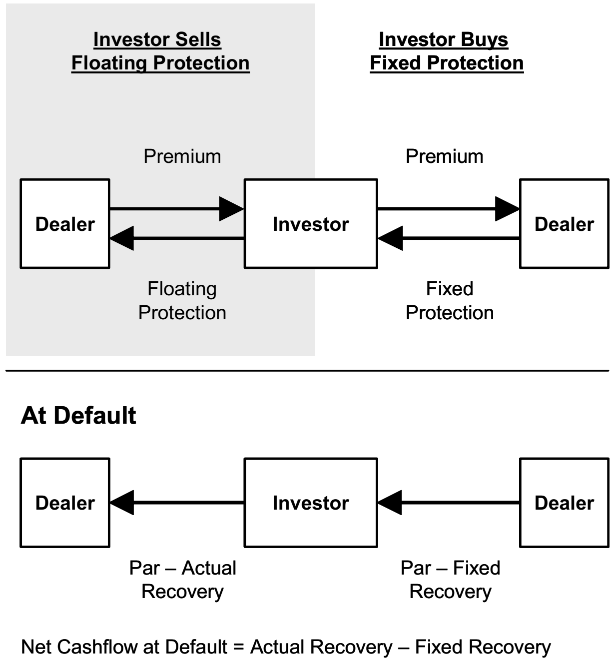
TRADING RECOVERY RISK – WHAT ARE THE INSTRUMENTS?

The standard credit default swap was crafted into being partly with the motivation of being as bond-like as possible. While this one point was critical for credit derivatives to gain acceptance in the corporate bond community, it did one disservice to investors: it did not allow for the dis-aggregation of default risk from recovery risk. Early variants of credit defaults swaps had fixed recoveries, which made it easier to think of default risk independent of recovery risk, but made bond versus credit default swap comparisons much more difficult.

Today, a form of recovery swaps that isolates recovery risk is termed a "recovery lock," which is simply a pairing of a standard (floating recovery) default swap with a fixed recovery default swap. A simple example serves best to explain the structure.

exhibit 3

What Is a Recovery Lock?



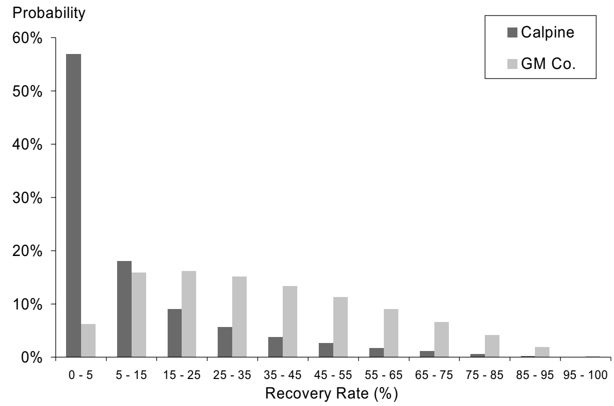
Source: Morgan Stanley

If one sells protection on a credit using standard CDS (where recoveries are not fixed but floating) and then buys protection on the same credit and term using fixed recovery (say 40%), then the net position the investor has is one that is long recovery risk, i.e., the investor would want the recovery on the issuer at default to be as high as possible. When there is a default, the investor would pay par and get delivered a bond (based on the terms of selling regular CDS protection) and at the same time receive par and pay the fixed recovery of 40% (based on the terms of buying fixed-recovery protection). The par payments cancel out and the net position is that the investor paid 40% for the defaulted bond. Clearly, the investor would want the actual recovery on the bond to be as high as possible, so therefore he or she is long recovery risk.

In the above example, it is common practice for the premiums on both legs of the default swap trades to be the same. In this case, the instrument (or actually net position) is termed a recovery lock. The fixed recovery required to make the two premiums the same is the market-implied recovery value, and it is this value that is quoted in the market for recovery swaps.

exhibit 4

Fitted Recovery Distribution (Calpine and GM Co.)



Source: Morgan Stanley

THINKING INSIDE THE RECOVERY BOX

While the ability to trade and hedge recovery risk is indeed one step in the direction of solving the missing link in credit analysis, recovery risk ultimately needs to be modeled just like default risk. If we combine the notion that recovery values are volatile (Exhibits 1 and 2) with recovery values that we observe in recovery swaps, we can measure the uncertainty of recovery values in a given credit.

When we consider fixed versus floating instruments, one concept that jumps out at us is the idea that taking default risk with fixed recovery should generate less premium than taking the same risk with uncertain recovery, assuming the fixed recovery is set at the correct level. What the current market for recovery locks gives us is that correct level, since the strike spread and maturity on both the fixed and floating leg are generally the same.

This happenstance gives us the ability to compare the risk associated with floating CDS (with their uncertain cashflows in default) and fixed CDS (with their certain cashflows in default). Conceptually, if we can come up a way to weight the various floating recovery scenarios, then we can isolate the default component of the risk and gain some insight into how investors think about recovery risk. In Exhibit 4, we demonstrate this uncertainty associated with recovery for two credits, combining market pricing on standard CDS, recovery locks and our results for the distribution of Moody’s recovery rates.

The recovery market for Calpine trades at a 12.5% level (mid) and our fitted distribution implies that there is a fair amount of certainty about a very low recovery. Contrasting this, we show the implied recovery distribution for 5-year GM Co., also based on recent market levels. For GM Co., the recovery market trades at a 37% level (mid), with a large degree of uncertainty surrounding the eventual recovery.

RECOVERY ANALYSIS IS THE MISSING LINK

While the current overall credit environment is not necessarily ripe for the development of a robust recovery swap market, there is potential for this space to expand in the more stressed corners of the credit markets, as we are beginning to witness now. Despite the simplicity of recovery locks, recovery risk itself is a whole dimension in the credit analysis puzzle that today is meshed with default risk in market standard instruments, like bonds and traditional default swaps. Recovery instruments will help to isolate these risks, but the market is still in need of development.

chapter 5 Floating a New Idea – CMCDS

January 21, 2005

Primary Analyst: Sivan Mahadevan
Primary Analyst: Peter Polanskyj
Primary Analyst: Ajit Kumar, CFA

Much of the development that resulted in today's standard credit default swap contract was driven by definitions of credit events, sparked, in turn, by the many bankruptcies, defaults and restructurings that the investment grade market experienced during the past credit cycle.

Although we are in a very different part of the credit cycle today, the environment for innovation in the single-name space seems ripe again, for several different reasons. First, the development of and liquidity injection into the credit curves is still a relatively recent phenomenon (over the past 15 months or so). Active credit curves are important inputs into pricing instruments like credit options and constant maturity credit default swaps. Second, from an investor's perspective, there is little dispersion in the market place today, particularly in investment grade, where spread compression is even higher than it was in 1997 (see "Couch Potato Prognosticating," January 14, 2005). Tight spreads and a lack of differentiation create a natural reach for yield phenomenon, but also causes concern among those who must be fully invested and don't feel great about the upside potential.

We rarely discuss very new credit derivatives instruments in our research, partly because until we see some indication of liquidity potential, it is difficult to determine strategic opportunities. However, many market participants have recently asked about one new variant in particular – constant maturity credit default swaps (CMCDS).

As a result, we focus this chapter on ideas involving CMCDS, an instrument that provides investors with a convenient way to string together a series of forward credit curve trades. We feel that varying risk premiums along the credit curve, combined with the potential for spread regime shifts, can result in impractical forward spreads.[1] One can therefore think of CMCDS as a convenient (and positive carry) means to lean against the forwards.

CMCDS MECHANICS

A constant maturity credit default swap is a default swap where the premium is reset (on a quarterly basis) to equal a fixed percentage (called the participation rate) of the then-prevailing premium of a plain-vanilla default swap for a certain term. While this is very much a developing market, a typical CMCDS trade today has a 5-year term and references a fresh 5-year default swap every quarter during that 5-year term. Assuming a 50% participation rate, the seller of CMCDS protection would receive 50% of the prevailing premium on a 5-year default swap every quarter, until the CMCDS expires (in five years) or until a credit event occurs (see Exhibit 1). Consequently, if spreads widen, the quarterly payment would also increase and the concomitant mark-to-market impact could be significantly lower than a regular default swap. The premium on a 5-

[1] *Please refer to Chapter 16.*

Morgan Stanley

year default swap is inferred from the market, generally by some type of a fixing process on the reset date by a calculation agent. There can also be a cap on the premium, usually at stressed premium levels.

exhibit 1 CMCDS – Sample Quarterly Premium Calculation

Notional	$10,000,000
Participation Rate	50%

Quarter	5 Yr CDS Spread (bp)	CMCDS Spread (bp)	Quarterly Payment ($)
1	100	50	12,500
2	125	62.5	15,625
3	150	75	18,750
4	120	60	15,000
5	100	50	12,500

Source: Morgan Stanley

PRICING – DETERMINING THE PARTICIPATION RATE

Since the protection provided by a CDS and a CMCDS is essentially identical in case of a default, the pricing of the two instruments should be directly linked, as well. Said differently, buyers of protection in either instrument should expect to spend the same amount for the protection at the inception of the contracts. This linkage is enforced through the concept of a participation rate.

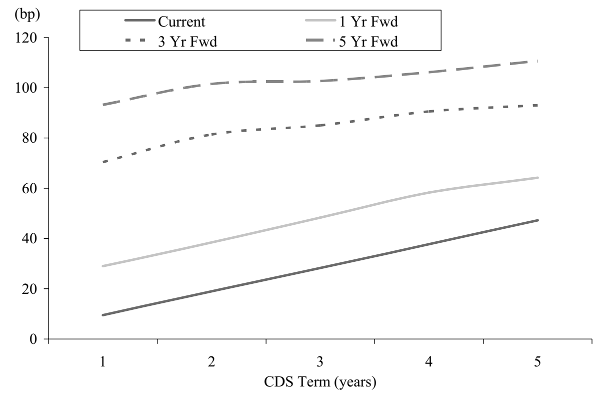
We start by using an analogy from the world of interest rate swaps. The fair fixed rate on a swap is the one that equates the present value of floating leg cash flows to the present value of fixed leg cash flows. Employing the same heuristic, the fair participation rate is the rate that equates the present value of payments of a regular CDS to the present value of CMCDS payments.

To determine the expected payments of a CMCDS, we need the implied forward CDS rates, just as we need forward Libor rates to calculate the fixed rate in the case of interest rate swaps.[2] Once we have forward rates, we can determine the participation rate that generates cash flows with a present value matching a plain-vanilla CDS.

[2] *Please refer to Chapter 16 for more details on the determination of forward rates.*

exhibit 2

IG CDX Spot and Forward Curves



Source: Morgan Stanley

INTUITIVE FEEL

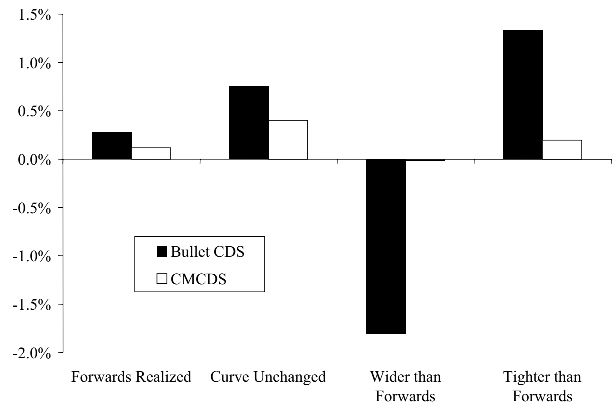
There are effectively two ways one can think of CMCDS. First, as we mentioned above, CMCDS is a convenient way to string together a series of forwards. If the curve shape and spread levels implied by forwards are realized over the term, the CMCDS and CDS should have the same return at maturity, and this is the basis for pricing. Thus, a position in CMCDS (versus one in CDS) is a way of expressing the view that the forwards will not be realized. Second, ignoring forwards for the moment, CMCDS is really just a floating rate instrument, but the credit premium is what actually floats, as there is no interest rate. A floating premium can have more muted mark-to-market volatility than a fixed premium instrument.

STRATEGIES AND HORIZON ANALYSIS

From a strategic perspective, the most interesting aspect of CMCDS is that it separates default risk from spread risk; these are packaged together in more traditional instruments, such as bullet bonds and CDS. This characteristic allows takers of risk to be paid a premium for exposure to default risk, while avoiding exposure to the market risk associated with spread movements. Given the pricing techniques we discussed above, we thought it would be worthwhile to examine how a CMCDS would perform against a bullet CDS under a variety of scenarios.

While the CMCDS does not have any direct exposure to spreads, the realized and implied spreads in the future can have an impact on the price of the swap. We highlight the performance of both a bullet 5-year CDS and a 5-year CMCDS for several scenarios 1 year forward (see Exhibit 3, where pricing is model-based). The first point to note is that price movements are less muted in CMCDS (compared to CDS) across all of the scenarios, but there is still some price volatility. Second, of the scenarios we chose, CMCDS outperforms CDS only in the case where spreads move wider than implied by the forwards. Part of the underperformance can be attributed to the fact that the floating premium on the CMCDS starts out lower than the CDS level. It should be noted that the floating premium is also expected to increase well above the initial CDS level as time passes.

exhibit 3
Muted Price Movements – CMCDS vs. CDS (One Year Forward)



Source: Morgan Stanley

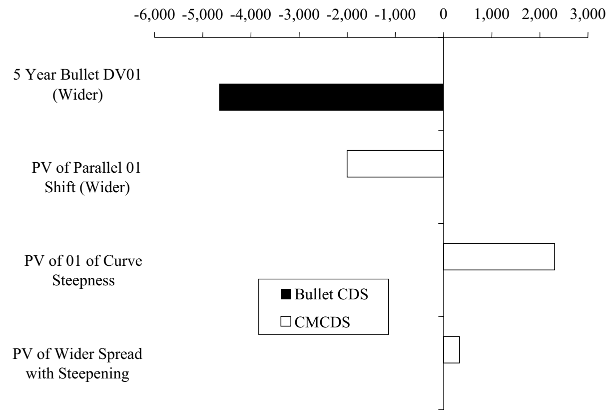
To explain this sensitivity, consider the simple example of a world with perfectly flat credit curves. In this world, the participation rate on a CMCDS would be 100%. As the curve gets steeper, the "fair" participation rate will decline. A CMCDS struck in a flat curve environment should thus appreciate slightly if a steeper curve environment ensues.

PLAYING CREDIT CURVE SHAPE

This sensitivity to credit curve shape leads to interesting implications for price sensitivity. Given a credit curve, we can distinguish between a parallel shift and a steepening or flattening to the same 10-year level. In Exhibit 4, we show the price sensitivity of a 5-year CDS to spread moves and a 5-year CMCDS to parallel shifts in the credit curve, as well as to flattening/steepening. Under some scenarios, these moves can offset one another to a large extent. For example, the negative impact of increased spread levels, which imply increased default risk, makes the CMCDS marginally less valuable. This can be offset if the shift is accompanied by a steeper curve, implying larger floating coupon payments as the instrument reaches maturity, which increases the value. Which one dominates will depend largely on the magnitude of the relative changes.

exhibit 4

CDS and CMCDS Spread and Curve Exposures (Price Sensitivity of $10MM 5 Year Positions)



Source: Morgan Stanley

WHO ARE THE NATURAL BUYERS AND SELLERS?

Right now, there are not many of either, and there may never be. Yet, as we saw above, the risk and return implications of CMCDS are significantly different from CDS in many scenarios (except when the forwards are realized) so it is indeed worth considering who might benefit from buying or selling CMCDS protection. In the current credit curve environment, the seller of protection gives up quite a bit of current premium, but could have less mark-to-market volatility and will outperform CDS when spreads go wider than implied by the forwards. For those who must be invested, but have a negative view on credit (over and above what is implied by forwards), selling CMCDS protection would be beneficial. It is also a simple way of implementing the view that default risk is benign, but spread levels are not very exciting (which fits our view, see “Breaking Down the Barriers,” December 17, 2004). Long/short strategies in tranches can also implement this view, but can be more complicated in nature.

The natural buyer of CMCDS protection is perhaps more straightforward, given that lower current premiums might seem appealing. For any protection buyer who feels that the forwards overstate spread widening over the term, buying CMCDS protection on its own would be more attractive than CDS protection itself. In either case (buyer or seller), lower potential mark-to-market volatility of CMCDS may be appealing to investors who value the lower volatility, or who must treat cash and derivative instruments differently.

SOME PRACTICAL ISSUES

For investors who are excited about the convenience of packaging forwards into a single instrument, and the resulting different risk and return characteristics (compared to traditional CDS), we caution that these instruments are still relatively nascent. Transaction costs and the potential that market prices can drift away from model-based valuations are important practical implications (consider how correlation skew has moved with spread levels). Also, while the cap in CMCDS is generally deep out of the money at inception, the pricing of this cap as stress enters a particular credit can be somewhat subjective, as well.

What little activity we have seen in the market for CMCDS has been centered around the benchmark indices, rather than individual credits. One debate in the market has focused on how to treat the index roll. From a risk-management perspective, we find it simpler to think of a CMCDS on an index to always be based on today's composition of the index; however, as indices roll and become off-the-run, it may prove difficult to apply a fixing process to levels on an off-the-run index. As a result, some market participants have proposed that, as the index rolls, the CMCDS should refer to the new index, which leaves the CMCDS users exposed to changes in index constituents. In any event, what we find interesting about this instrument is its vastly different risk and return profile, which can encourage investors to think outside of the box.

chapter 6 Standardized CDS Indices – Mechanics and Credit Event Settlement

Standardized credit default swap indices revolutionized corporate credit trading, opening the door for more liquidity and transparency, bringing in new credit investors, and creating important standardized vehicles for the structured credit markets. However, with all of this came an almost astronomical growth in notional volume of credit derivatives contracts, which, in turn, has created a very challenging operational environment. The 2005 bankruptcy filing of US auto parts supplier Collins & Aikman motivated the first industry-wide CDS settlement process for index trades that contained the credit. Subsequent bankruptcy filings, including Delta Air Lines, Northwest Airlines, Delphi and Calpine, went through a similar process. As we go to print, discussions abound among market participants to make the ISDA protocol for settlement a standard part of all CDS contracts on the CDX indices and potentially all corporate credit CDS trades.

In this chapter, we discuss the basic mechanics of the standardized indices of CDS and also summarize the latest CDS protocol for standardized auctions when index constituents experience credit events. Our discussion in this chapter applies largely to corporate credit indices, and many details will differ for emerging markets indices and the structured finance indices (see Chapter 2).

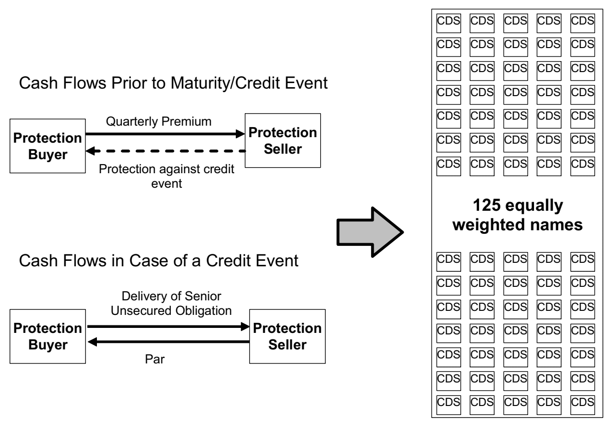
Credit Default Swap Indices

Credit default swap indices are simply portfolios of single-name default swaps, serving both as investment vehicles and as barometers of market activity. While intuitively very simple, the indices are responsible for increased liquidity and the popularity of tranching credit risk.

By buying protection on an index, an investor is protected against defaults in the underlying portfolio. In return, the buyer makes quarterly premium payments to the protection seller. If there is a default, the protection seller pays par in exchange for the reference obligation to the protection buyer. Exhibit 1 shows the cashflows in an index:

exhibit 1

DJ CDX Investment Grade Index



Source: Morgan Stanley

Several investment grade and high yield indices trade in the US, covering multiple maturities, sub-sectors, credit quality, etc. In addition, there are numerous similar indices for Europe, Pan Asia, and Emerging Markets. Pricing levels, descriptions, and calculators for these indices are available on the MSCD <GO> screen of Bloomberg.

IMPORTANT CHARACTERISTICS OF BENCHMARK INDICES

For details regarding the Dow Jones CDX indices, see the website www.djindexes.com. Some details on the indices are summarized in this section.

Static Underlying Portfolio

Once an index composition is fixed, it generally remains static, with changes being incorporated in new indices rather than a current index. It is also noteworthy that all names are typically equally weighted, as opposed to market weighted, which is common for benchmark bond indices.

Rolling Over of Indices

As time passes, the maturity term of indices decreases, making them significantly shorter than the benchmark terms, so new indices are introduced periodically and the latest series of the index represents the current on-the-run index. Markets have continued to trade previous series of indices, albeit with somewhat less liquidity.

Standardized Payment and Maturity Dates
Just like the single-name default swaps, the cash flow dates of indices are also standardized – the 20th of March, June, September, and December of every year. Market participants have also standardized maturity dates to the four standard payment dates of the maturity year.

Deal Spread
The indices have a predetermined "Deal Spread", which is paid on a quarterly basis. Consequently, if the index is currently trading away from the deal spread, an upfront payment is required to reflect the difference between the current market spread level and the deal spread. Conceptually, it is equal to the present value of the difference between the two, adjusted for default probabilities.

It is also important to note that all the underlying single-name contracts also have the same deal spread as the index. Just as a portfolio with different coupons has duration and convexity that differs from a corresponding portfolio with the same coupon for each of the bonds (assuming both portfolios have the same average coupon and maturity), the convexity characteristics of the index are somewhat different from that of an equal-weighted portfolio of the underlying single-name default swaps.[1]

Payment of Accrued Premiums
If an investor enters an index transaction in between the payment dates, the protection seller would make a payment of accrued premium to the protection buyer, to reflect the fact that although the protection buyer would pay premium for the full quarter on the next payment date, the protection is only for part of the quarter.

Restructuring Definitions
The market standards regarding restructuring definitions for indices and underlying credit default swaps are not always the same. For example, while most of the underlying single names for the DJ CDX NA IG index trade with a Modified Restructuring (Mod-R) definition, the index itself trades on a No-R basis. European indices, however, trade with the same restructuring definition as the underlying, Modified Modified Restructuring (Mod-Mod R). For further details on restructuring definitions, refer to Chapter 1.

DETERMINING THE UPFRONT PAYMENT

As we mentioned earlier, if the index is trading away from the deal spread, an upfront payment is required to reflect the difference between the current market spread level and the deal spread. Theoretically, the present value of the two premium streams should match when we take default probabilities and timing of cashflows into consideration.

The first step for calculating the upfront payment is to estimate default probabilities from the credit curve (see Chapter 1). Using these probabilities, we calculate the present value of the current spread, by multiplying the spread with the probability of survival at the time of payment and then discounting back using risk-free zero rates. This present value should equal the present value of upfront and running premiums (the Deal Spread), based on the same default probabilities. So if the deal spread is

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[1] *Please refer to Chapter 17.*

higher than the current par spread, the protection seller makes a payment to the protection buyer.

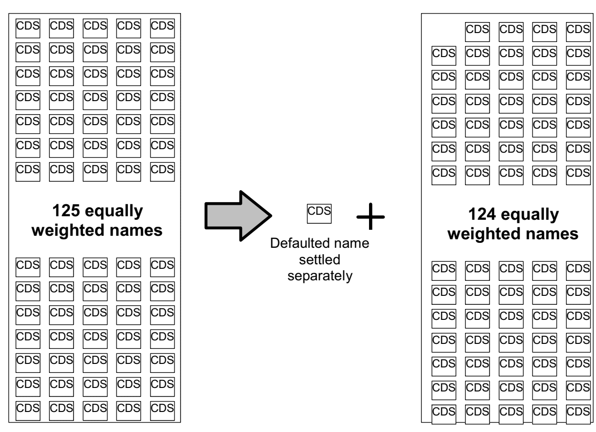
A convenient way to do this conversion is to use the CDSW function on Bloomberg. We simply put in the "Deal Spread" and value the contract using the current par spread. The "Market Value" represents the equivalent upfront payment. In addition to the upfront calculation, we can use this function to calculate mark-to-market, DV01 and cashflows. The DV01 is especially helpful in the delta hedging of portfolio credit exposures using indices.

IMPACT OF DEFAULTS ON INDEX CASHFLOWS

When an underlying single name defaults, it is separated from the index and settled separately. For example, for DJ CDX NA IG index, which has 125 names, if one of the underlying names defaults, the remaining index would have 124 names and the same deal spread. The 1/125th of the notional would be separated and the protection seller would pay par to the protection buyer in exchange for a deliverable obligation.

After a default, the premium payments for the index would be (124/125)*deal spread*original notional, irrespective of which name defaults (this methodology applies to the CDX series and may not hold for previous indices). This is due to having the same deal spread for all underlying names in the index portfolio, as we mentioned earlier. It is important to note that an equal-weighted portfolio of underlying names could now have a different spread, given that each of the underlying names has its own spread level and that, depending on which of the 125 names defaults, the average spread for the remaining 124 names could be different from 124/125 of the original spread.

exhibit 2
Impact of Default on Index



Source: Morgan Stanley

SETTLING CREDIT EVENTS IN THE INDICES – THE ISDA CDS PROTOCOL

Credit events in CDS contracts are generally settled either entirely in cash or entirely physically (with bonds or loans). The standardized index tranches have a hybrid cash/physical settlement mechanism, but both the sheer volume of outstanding CDS contracts on the indices and the demand for index tranches to be fungible after a credit event has created huge demand in the marketplace for a standardized settlement process. Starting in 2005 with the Collins & Aikman default, numerous investors participated in standardized industry-wide settlements.

As of the writing of our second edition of this book, the International Swaps and Derivatives Association (ISDA) has published CDS protocols for five defaulted US companies, with the resulting auctions having been administered by Markit Partners and CreditEx. The protocols are available on the ISDA website, www.isda.org, and details of the auctions are available on www.creditfixings.com. The ISDA CDS protocol specifies which transactions are covered, which typically involves the indices that include the defaulted credit. Such indices are called "covered indices" and the protocol is meant to cover these index transactions, including tranches of these indices. A recent protocol (for Calpine) also included an amendment that applied to index and non-index transactions, which defined the deliverability status of two convertible bonds (one was deemed deliverable, and the other was not). The process determines one recovery rate (arrived at through an industry-wide auction process), which, in turn, is used to cash settle the credit event in all covered index transactions (for adhering parties) and also determine losses (for equity tranches) and subordination levels (for non-equity tranches) for tranches in all covered indices.

exhibit 3 Auctions Administered Under the ISDA Global CDS Protocol

Credit	Bankruptcy Filing Date	CDS Auction Date	No. of Adhering Parties	Final Price
Calpine	12/20/2005	1/17/2006	323	19.125
Delphi	10/10/2005	11/4/2005	577	63.375
Delta	9/15/2005	10/11/2005	71	18.000
Northwest	9/15/2005	10/11/2005	71	28.000
Collins & Aikman (Senior)	5/17/2005	6/14/2005	454	43.625
Collins & Aikman (Sub)	5/17/2005	6/23/2005	NA	6.375

Source: Morgan Stanley

The protocol also includes sample letters for investors and dealers to become adhering parties to the protocol. Adhering parties agree to the terms of the protocol and the auction methodology process, which is described in detail in the document. We provide a summary of this methodology below.

Discussions are circulating in the marketplace today to make a protocol similar to the ones described a standard part of CDX index transactions and perhaps even all corporate credit CDS transactions.

THE ISDA CDS PROTOCOL – AUCTION METHODOLOGY

In an attempt to give readers a general understanding of the auction methodology, we summarize below the auction methodology for Calpine conducted in January 2006, based on information from the www.isda.org website. We encourage readers to visit the website to get current information on this methodology as it is indeed an evolving concept. Readers of this summary should in no way consider this to be a complete or accurate description of either past or future protocols.

- Determine “Inside Market Midpoint”
  - Participating bidders submit to administrators inside markets (bids and offers for $10MM notional) and a market order plus any number of limit orders.
  - Administrator sorts inside market bids and offers to determine midpoint.
  - Administrator creates matched markets by matching highest bid with lowest offer, second highest bid with second lowest offer, etc.
  - Tradeable markets (where bids are lower than offers) will trade at the adjustment price (mid of bid and offer).
  - Non-tradeable markets are sorted by bid-offer spread; the best half is the half with the smallest differences. The mean of the best half inside market bids and offers will be the inside market midpoint.
- First auction
  - Determine the Final Price from the auction by matching market orders with unmatched limit orders (including all inside market bids and offers) according to the following procedure.
  - Market Orders of Participating Bidders must represent (to the best of their knowledge and belief) the aggregate amount of Deliverable Obligations such that Participating Bidders and their relevant affiliates would have to buy or sell in order to obtain a net neutral result with respect to all Covered Index Transactions to be settled pursuant to the Protocol. This applies to orders the Participating Bidder receives from clients who have adhered to the Protocol.
  - Market orders are aggregated and netted to find the Open Interest with the smaller side of the Market Orders matched with the larger side. The netted trades are Market Order Trades.
  - The open interest, if any, is matched to the Limit Orders starting with the lowest offer or highest bid until the open interest is matched, all limit orders are matched or the last limit order that is matched is 15% of par from the Inside Market Midpoint.
  - The Final Price is determined from this process. However, if the last limit order (that is 15% or less of par from the Inside Market Midpoint) is filled, and the sum of market order trades and matched limit order trades is less than 90% of the aggregate of the latter side of Market orders, then a Second Auction will be conducted.

CONCLUSION

With the explosive growth in credit derivatives volumes over the past several years due in part to the success of standardized indices and related products, operational risks have been a growing concern. Numerous 2005 credit events, from Collins & Aikman to Calpine, served as important tests of the system, just as Enron and WorldCom did during a different era. We fully expect further standardization in the market with respect to settling credit events, given the success of recent efforts and the increasing push from market participants to reduce operational risks.

chapter 7 Succeeding in an Activist World – Succession Language

February 10, 2006

Primary Analyst: Sivan Mahadevan
Primary Analyst: Peter Polanskyj
Primary Analyst: Pinar Onur

As the volume of corporate actions rapidly increases, bankers, private equity and hedge funds spend much of their time poring over thick financial statements in search of the optimal debt capital structure for the various entities involved. One large document they are most likely not reading is the *2003 ISDA Credit Derivatives Definitions*. This nearly 100-page tome is what governs most corporate credit CDS transactions today. Successor language has important implications for what obligations are deliverable into CDS following a series of corporate actions. From the perspective of sponsors, this language is arbitrary, but from the perspective of credit markets, it is immensely important as it defines what direction (or directions) CDS can take, which, in many cases, can be quite different from the direction of any given debt obligation.

exhibit 1 Spin-offs and Divestitures – Increasing Volumes

Year Announced	Number of Announced Divestitures	Value of Announced Divestitures Excluding Assumed Liab ($mm)
2000	123	193,127
2001	93	171,917
2002	82	86,919
2003	88	123,295
2004	123	135,558
2005	445	310,565
2006 YTD	40	33,407
Grand Total	**994**	**1,054,788**

Source: Morgan Stanley, Thomson SDC

We provide an interpretation of successor language in the 2003 ISDA definitions and focus on how corporate actions can potentially push CDS in different directions relative to debt obligations. There are a few rules of thumb that we can deduce from the 2003 ISDA definitions; but the devil is in the details, as there are numerous corporate situations where the timing of debt exchanges and the ultimate par value of debt that moves between entities determines successor behavior in CDS. We would also like to quell a common myth. Market participants often say that many events can result in CDS either terminating or being worthless. However, both of these situations are rare, and we offer up some examples.

WHERE DOES CDS GO? RULES OF THUMB

For credit investors, we provide some basic rules of thumb regarding the impact of succession events (or the lack thereof) on CDS contracts, based on the 2003 ISDA definitions.

- When there are corporate successions, CDS contracts follow the debt of a company, rather than equity value, revenues or corporate structure. A corporate succession must result in a "Succession Event," under the 2003 ISDA definitions, for CDS to change, although CDS can be implicitly impacted without such an event.
- The key difference between bonds and CDS in the event of succession is that CDS can be formulaically split, while bonds, by definition, have to go one direction or another (or get taken out).
- Contrary to popular belief, it is rare for CDS to be terminated as a result of corporate succession. The only situation where it can happen is where the party to the corporate action is also the protection seller, in which case a "Termination Event" occurs. Even then, it results in a mark-to-market unwind at the option of the protection buyer.
- A debt exchange that is not in connection with a merger (or other terms of a "Succession Event") will not qualify as a "Succession Event." As such, there could be situations where no obligations are left to be deliverable into the CDS, although debt issued in the future could be.
- One company guaranteeing the debt of another company (say, after buying its stock) does not qualify as a "Succession Event." If the debt is assumed by the parent company and released by the original obligor, then it is a "Succession Event."

DEFINING SUCCESSION

For bond purposes, succession really has more to do with making the credit risk of the instruments of one issuer economically similar to the instruments of another issuer. For CDS contracts, succession is a legal term with a very specific definition (from *2003 ISDA Credit Derivatives Definitions*):

"Succession Event" means an event such as a merger, consolidation, amalgamation, transfer of assets or liabilities, demerger, spin-off or other similar event in which one entity succeeds to the obligations of another entity, whether by operation of law or pursuant to any agreement. Notwithstanding the foregoing, "Succession Event" shall not include an event in which the holders of obligations of the Reference Entity exchange such obligations for the obligations of another entity, unless such exchange occurs in connection with a merger, consolidation, amalgamation, transfer of assets or liabilities, demerger, spin-off or other similar event.

The definition, it would seem, is intended to capture most merger and acquisition activity, but because of the exchange exclusion, the actual timing of events can affect whether they qualify as successor events. For example, does an exchange offer that occurs several weeks or months subsequent to a merger automatically qualify as being "in connection" with the merger? It seems reasonable that interpretations could differ.

THE MATH BEHIND SUCCESSORS AND CDS

Once we have defined whether an event is a successor event, we next need to consider how various instruments react. For cash bonds and loans, generally, the corporation will specify the intention to either buy back debt and have it assumed by the new entity or any other action, which may or may not be subject to approval by bondholders. So the fate of any individual bond is fairly clear.

The world of CDS is not so clear. CDS contracts are generally intended to follow the fate of the debt of a company *in aggregate*, which leads us to the conditions in Exhibit 2 (based on 2003 definitions). CDS contracts can either continue to refer to the original entity, can succeed to a new entity or can be divided into contracts that refer to two or more entities depending on what exactly happens to the total debt of the original reference entity. CDS will move to a sole successor under the following circumstances: When 75% of "Relevant Obligations" move to that successor; when between 25% and 75% move and the original reference entity keeps less than or equal to 25%; or when the original reference entity does not exist and all successors account for less than 25% of relevant obligations (the largest of these will be the sole successor). In this last case, if the original reference entity still exists, then it will be the sole successor. When more than one successor (including the original reference entity) represents greater than 25% and less than 75% of the relevant obligations, they will be equal successors.

Based on 2003 definitions, there is only one way a CDS contract can terminate related to succession events: when the merger is between a reference entity and a CDS counterparty (seller of protection). While we cannot cite a general example of such a situation, it most likely has occurred numerous times historically, for example when credit derivatives dealers (say a large bank) merges with other institutions where CDS activity is common (say a smaller bank). Any investor who bought protection on the smaller bank from the larger bank would have the option to unwind the contract at a mark-to-market.

SPIN OFFS CAN HAVE DIFFERENT RESULTS

With the marked increase in activist investment strategies among levered and private equity investors, we have seen increased activity in divestitures and spin offs (see Exhibit 1). These types of transactions can have different results for CDS investors than typical merger activity.

exhibit 2 CDS Contracts Follow Debt *in Aggregate*

% of Relevant Obligations That Succeed Original Reference Entity	Impact on CDS	Notes
S1 >= 75%	S1 is Sole Successor	
75% > S1 > 25%, REO <= 25%	S1 is Sole Successor	
75%> S1 > 25%, 75% > S2 > 25%, REO <= 25%	S1, S2 Equal Successors	Can apply to 1 or more successors
S1 > 25%, S2 > 25%, REO > 25%	S1, S2, REO Equal Successors	
All Successors <= 25%, REO still exists	REO is the Sole Successor	
All Successors <=25%, REO does not exist	Largest Successor is Sole Successor	Tie breaker is % of all obligations
Seller of Protection “merges” with the reference entity	CDS Terminates with MTM	Merger or other terms of Succession Event

Note: S1 and S2 refer to successors to the reference entity. REO is the original reference entity in the CDS contract.
Source: Morgan Stanley, 2003 ISDA Credit Derivatives Definitions

With all the talk and action breaking up companies like Alltel, Sprint, Tyco, Time Warner, IACI/Interactive and Cendant, the natural question arises about what happens to existing debt, and the direct corollary of that is what happens to CDS contracts. The details are incredibly important in any discussions of how debt and CDS will be treated in spin offs; as such, making broad statements is difficult to do.

To illustrate the point, consider the following: Whether a parent exchanges debt or assumes the debt of a newly acquired subsidiary, and even the timing of those actions, matters in the potential handling of CDS contracts. Even though the economic consequences for bond holders can be virtually equivalent in either case, the fate of CDS users is tied to the details. Another example that is critical in spin offs is the differing treatment of guarantees from parent companies to their subsidiaries and guarantees from subsidiaries to their parent companies. Failure to perform on the former would likely result in a credit event for the parent under CDS contract language 2003 definitions, while failure to perform on the latter would likely not result in a credit event for the subsidiary (it is likely that only downstream guarantees matter; we note that this behavior could be different in Europe).

DETAILS AND MANAGEMENT MOTIVATION MATTER

We can say with near certainty that corporate management teams are less concerned with the consequences of how a deal is executed for CDS users than they are about the strategic, operational and tax consequences of how they execute a restructuring. These exogenous considerations, which drive decision-making at the corporate level, can introduce a fair amount of risk in the execution of derivatives and cash strategies surrounding restructurings.

The key point here is that how a company executes a given transaction can be completely arbitrary from a CDS user's perspective. While the true motivation can be strategic or cost based, the results for default swap users can be big profits or big losses for transactions that are economically equivalent to bondholders, given the nature of the 2003 definitions.

GENERIC CDS VERSUS SPECIFIC BOND PERFORMANCE

One of the places where we see opportunity is in trading bonds whose fate can be reasonably approximated or which are likely to be tendered for in a corporate reorganization against CDS contracts. In any situation in which investors can become comfortable with the treatment of a particular bond issue, there is likely to be opportunity to trade those bonds against CDS contracts that may follow a different path.

This is largely true because a CDS contract behaves similarly to the *aggregate* pool of debt of the corporate issuer involved (subject to the constraints of the successor language), and therefore the pricing on a given CDS contract should mimic the aggregate behavior of the debt. The aggregate behavior of the debt can be meaningfully different than the pricing/return on any particular debt obligation, given covenant provisions and tax and other considerations.

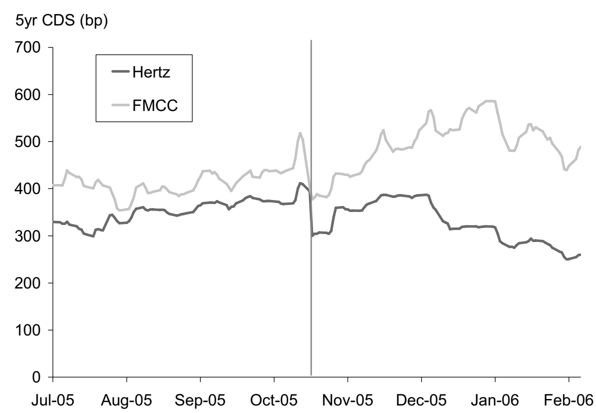
A REAL WORLD EXAMPLE COULD HAVE GONE EITHER WAY: HERTZ

While there are numerous credit situations in the market today that could result in meaningfully different performance for bonds and CDS, we look at a popular recent example. Hertz Corp. was a wholly owned subsidiary of Ford Motor Co., with bonds trading at a slight concession to Ford Co. Hertz was essentially LBO'd via a divestiture of Hertz by Ford to a private group of investors (CCMG). During this process, Ford tendered for outstanding Hertz bonds, although a plan to exchange a portion of the Hertz debt with Ford Motor Credit debt was actually part of the original announcement. Investors who ultimately accepted the tender offer performed similarly to sellers of Hertz protection around the time of the event (October 2005). Sellers of Hertz protection saw the credit rally 135 bp from that date to recent levels.

However, if the exchange had taken place as originally planned, existing CDS could have been split equally between Hertz and Ford Motor Credit. If that had indeed happened, performance would be meaningfully different on the split contract, as the hypothetical Ford Motor Credit portion would have traded off by 95 bp since then, leaving the net return of legacy Hertz CDS at less than one-third of that actually realized.

exhibit 3

Hertz/FMCC CDS Spread History



Source: Morgan Stanley

Section B

Valuation and Investment Frameworks

chapter 8 Valuing Corporate Credit: Quantitative Approaches vs. Fundamental Analysis

October 8, 2002

Primary Analyst: Sivan Mahadevan
Primary Analyst: Young-Sup Lee
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Introduction and Executive Summary

INTRODUCTION

The confluence of several major events in the credit markets has put a new focus on valuing corporate credit. First, the excesses of the 1990s equity bull market have created a harsh market environment, characterized by historically high default rates and investigations into the management and reporting of corporate balance sheets. Second, the rapid development of the credit derivatives market has brought together previously disparate credit markets and created the opportunity to trade credit risk in an isolated form. Third, the market for structured credit products such as CDOs has grown rapidly, with investors in these structures requiring a rigorous understanding of default risk within the context of a portfolio of correlated assets. Finally, speculators have entered the credit markets seeking to identify arbitrage opportunities and implement relative value strategies.

Given this evolution of the credit markets, what methodologies can be used to value corporate credit? There are many potential answers to this question. Quantitative approaches have gained popularity recently, particularly structural models based on equity market inputs. The traditional fundamental approach, used by most credit analysts, requires company and industry knowledge and has been in practice for decades, if not centuries.

In this chapter, we compare fundamental approaches to valuing corporate credit with quantitative approaches, commenting on their relative merits and predictive powers. On the quantitative front, we first review structural models, such as KMV and CreditGrades™, which use information from the equity markets and corporate balance sheets to determine default probabilities or fair market spreads. Second, we describe reduced form models, which use information from the fixed income markets to directly model default probabilities. Third, we review simple statistical techniques such as factor models, which aid in determining relative value. With respect to fundamental approaches, we examine rating agency and credit analyst methodologies in detail.

KEY CONCLUSIONS

We have drawn two sets of conclusions from this research effort. First, we summarize key points, both negative and positive, of various quantitative and fundamental approaches to valuing credit described in this chapter. Second, in deciding which approach should be used, we conclude that the approaches are not mutually exclusive. Both structural models and traditional fundamental analysis require the same set of balance sheet inputs. In determining which approaches are applicable, both investor profile and the situation specific to a given credit should be considered. An investor's choice of a technique can be related to mark-to-market requirements as well as the performance goals (relative to a benchmark versus absolute). With respect to a specific company, we feel it is important to consider three dimensions:

How far is the company from its default barrier? Structural approaches are less useful when companies are very close to the default barrier. In these cases, fundamental issues such as the likelihood of capital structure changes, possible corporate actions and potential changes in the business model are the real drivers of credit valuation. In structural models, the "distance to default" is the difference between a firm's asset value and its liabilities, measured in units of the standard deviation of the asset value. Asset value is inferred from the equity markets.

How levered is the company? The importance of company-specific fundamental analysis increases as leverage levels rise because default is related to the success of the business model. We define leverage levels through metrics like debt-to-EBITDA ratios, which measure a company's ability to service its debt from operations and are often included in a credit analyst's valuation. This is distinct from the notion of distance to default in structural models defined above.

How likely is it that management significantly alters the capital structure of the company? An associated high probability should dominate valuation. Subjective views on the nature and timing of capital structure changes, if available from analysts, are very important in determining valuation. One framework for thinking about this "management option" is to analyze where a company lies along its weighted average cost of capital (WACC) curve. Quantitative approaches can help the credit expert understand the sensitivity of valuation to changes in the capital structure.

QUANTITATIVE APPROACHES: KEY POINTS

- There have been many enhancements to Merton's original structural model, such as KMV and CreditGrades, which have been calibrated to produce realistic default probabilities and spreads. These models incorporate company-specific details and can include credit analyst projections.
- Structural models are based on equity values and volatility. Equity markets are generally more liquid and transparent than corporate bond markets; however, if equity prices become irrationally inflated or deflated, they may be questionable indicators of actual asset values.
- In the structural framework, financial institutions should be modeled with caution, since it can be harder to assess their assets and liabilities.
- Reduced form models are calibrated using fixed income instruments, and do not rely on equity market information. They are well-suited for pricing credit derivatives and credit portfolio products, but do not reveal much new information about the securities used in the calibration.

FUNDAMENTAL APPROACHES: KEY POINTS

- In some cases, there may no substitute for the credit expert who can formulate subjective views on business, financial and strategic risks associated with a company or industry.
- In the fundamental approach, special considerations such as pension liabilities and off-balance-sheet items, which have been a focus in the market recently, can be easily incorporated in an analysis.
- The motivation for changing the capital structure of a company, and the likelihood of such a change occurring, can drive the valuation of corporate credit in a significant manner. Fundamental approaches allow for important subjective views on capital structure changes.
- Fundamental approaches do not directly lead to market prices. Valuations are usually made in a relative value context.

HISTORICAL EXPERIENCE: KEY POINTS

- Based on our simple historical study, KMV Expected Default Frequencies™ (EDF™) were good predictors of default and performed consistently over different categories of risk.
- In a similar study, market-implied default probabilities (i.e., using spread as a predictor) overestimated default in most cases, given risk premiums inherent in market spreads. Furthermore, they were inconsistent predictors of default at different risk levels.
- As a quantifiable measure of the performance of the fundamental approach, changes in free cash flow generation relative to debt were a good predictor of relative spread movements, based on our historical study.
- Over long periods of time for the market at large, actual ratings migration and default behavior have been consistent with ratings expectations from both Moody's and S&P.

Quantitative Approaches to Valuing Corporate Credit

Quantitative approaches for analyzing credit have existed for decades, but have surged in popularity over the last few years. This is due, in large part, to several trends in the credit markets:

- As credit spreads have widened and default rates have increased, investors have looked to increase their arsenal of tools for analyzing corporate bonds. Quantitative models can be used to provide warning signals or to determine whether the spread on a corporate bond adequately compensates the investor for the risk.
- The number of investors interested in credit products has grown worldwide. In part, this can be attributed to declining yields on competing investments and the expansion of the European corporate bond market following the introduction of the euro. Commercially available credit models have been developed to meet the growing investor demand.
- The rapidly expanding credit derivatives market, which includes credit default swaps and collateralized debt obligations, has spurred a new generation of quantitative models. For derivative products, quantitative techniques are critical for valuation and hedging.
- Risk management has become increasingly important for financial institutions. The need to compute "value at risk" and determine appropriate regulatory capital reserves has led to the development of sophisticated quantitative credit models.

In this section, we introduce some popular quantitative techniques for analyzing individual credits. (We discuss quantitative methods for portfolio products later in this publication.) The goal of these methods is to estimate default probabilities or fair market spreads. Although many different quantitative techniques are practiced in the market, we focus on two different approaches for modeling default: structural models and reduced form models. For comparison, we also review a simple factor model of corporate bond spreads.

- Structural models – These models use information from the equity market and corporate balance sheets to model a corporation's assets and liabilities. Default occurs when the value of the corporation's assets falls below its liabilities. Structural models are used to infer default probabilities and fair market spreads. KMV and CreditGrades are two commercial examples of this approach.
- Reduced form models – Unlike structural models, reduced form models rely on information from the fixed income market, such as asset swap spreads or default swap spreads. In these models, default probabilities are modeled directly, similar to the way interest rates are modeled for the purpose of pricing fixed income derivatives. These models are particularly useful for pricing credit derivatives and basket products.
- Factor models – For comparison to default-based models, we briefly present a simple factor model of corporate spreads. It focuses on the *relative* pricing of credit, using linear regression to determine which bonds are rich or cheap. The factors used in the model include credit rating, leverage (total debt/EBITDA), duration and recent equity volatility.

STRUCTURAL MODELS

In the structural approach, we model the assets and liabilities of a corporation, focusing on the economic events that trigger default. Default occurs when the value of the firm's assets falls below its liabilities. The inputs to the model are the firm's liabilities, as projected from its balance sheet, as well as equity value and equity volatility. An option pricing model is used to infer the value and volatility of the firm's assets.

To see why an option pricing model is at the heart of the structural approach, consider a simple firm that has issued a single one-year zero coupon bond with a face value of $100 million. A stylized balance sheet for this firm is shown in Exhibit 1.

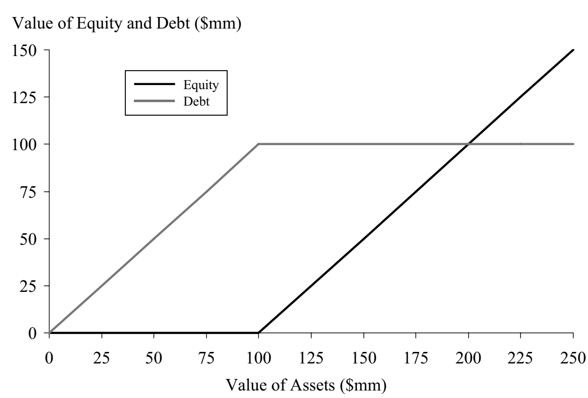
exhibit 1 Stylized Balance Sheet

Assets	**Claims on Assets**
Assets of the firm	**Liabilities (Debt)**
	1 year zero coupon bond with face value of $100 million
	Equity
	Common shares

Source: Morgan Stanley

The key insight comes from examining the values of the equity and debt in one year, when the debt matures. If in one year the value of assets is $140 million, then the $100 million due to bondholders will be paid, leaving the value of equity at $40 million. On the other hand, if in one year the value of assets is $60 million, equity holders can "walk away," turning over the $60 million in assets to the bondholders. Because equity holders have limited liability, the value of equity is $0. The payoff diagram for equity and debt holders in one year as a function of assets is shown in Exhibit 2.

exhibit 2 Value of Equity and Debt in One Year



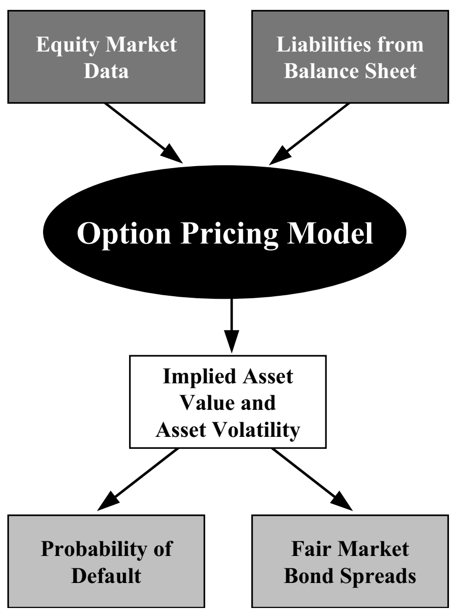
Source: Morgan Stanley

From the “hockey stick” shape of the payoff diagram for equity holders, it is clear that equity can be thought of as a call option on the assets of the firm. In this example, the strike is the face value of the debt, $100 million. Similarly, the zero coupon corporate bond is equivalent to being long a risk-free zero coupon bond and short a put option on the assets of the firm.

With the key insight that equity can be considered a call option on the assets of the firm, the rest of the structural approach falls into place. Exhibit 3 shows the steps involved in implementing a structural model. Equity value and volatility, along with information on the firm’s liabilities, are fed into an option pricing model in order to compute the implied value and volatility of the firm’s assets. Having computed the value and volatility of the firm’s assets, we can determine how close the firm is to default. This “distance to default” can be translated into a probability of default, or it can be used to determine the fair spread on a corporate bond.

exhibit 3

Implementation of a Structural Model



Source: Morgan Stanley

EXAMPLE: MERTON’S ORIGINAL MODEL

To illustrate the calculations behind structural models, we consider the original structural model described by Robert Merton.[1] We revisit our simple firm, which has a single one-year zero coupon bond outstanding with a face value of $100 million. Furthermore, assume that the equity is valued at $30 million and has a volatility of 60%, and that the risk-free interest rate is 4%. These parameters are summarized in Exhibit 4.

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[1] *Robert C. Merton, “On the Pricing of Corporate Debt: The Risk Structure of Interest Rates,” Journal of Finance, Vol. 29, 1974.*

exhibit 4 Parameters for Structural Model Example

Inputs	
Value of Equity	E = $30 million
Volatility of Equity	σ_E = 60%
Face Value of Debt	F = $100 million
Maturity of Debt	T = 1 year
Risk-free Interest Rate	r = 4%
Outputs	
Value of Assets	A = ?
Volatility of Assets	σ_A = ?

Source: Morgan Stanley

Step 1: Computing Asset Value and Volatility

In Merton's original approach, equity is valued as a call option on the firm's assets using the Black-Scholes option pricing formula (N refers to the cumulative normal distribution function):

$$E = AN(d_1) - Fe^{-rT} N(d_2), \text{ where}$$

$$d_1 = \frac{\log(A/F) + (r + \sigma_A^2/2)T}{\sigma_A \sqrt{T}} \text{ and } d_2 = d_1 - \sigma_A \sqrt{T}$$

In the Black-Scholes framework, there is also a relationship between the volatility of equity and the volatility of assets:[2]

$$\sigma_E = \sigma_A N(d_1) \frac{A}{E}$$

The Black-Scholes formula and the relationship between equity volatility and asset volatility provide two equations, which we must solve for the two unknown quantities: the value of assets (A) and the volatility of assets (σA). Solving the equations yields A = $125.9 million and σA = 14.7%.[3]

Step 2a: Computing Fair Market Spreads

Having computed the implied asset value and volatility, we can now determine the implied spread on the zero coupon bond over the risk-free rate. To do this, we note that the value of the debt is equal to the value of the assets minus the value of the equity. That is, the value of the debt equals $125.9 million - $30 million = $95.9 million. Since the face value of the debt is $100 million, we can easily determine that the yield on the zero coupon bond is 4.22%, which corresponds to a spread of 22 bp over the risk-free rate.

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[2] *This equation is derived from Ito's lemma. For details, see Options Futures and Other Derivatives by John C. Hull.*

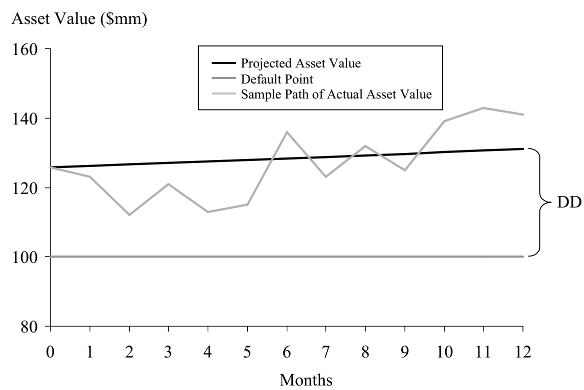
[3] *These two equations can be solved simultaneously in a spreadsheet by an iterative procedure (e.g., Goal Seek or Solver in Excel).*

At this point, it is worth noting that it is difficult to get "reasonable" short-term spreads Merton's original model. In part, the reason for this is that the asset value is assumed to follow a continuous lognormal process, and the probability of being significantly below a static default threshold after only a short amount of time is low. In this example, the spread of 22 bp probably underestimates what would be the observed spread in the market. In practice, adjustments are made to Merton's basic structural model in order to produce more realistic spreads.

Step 2b: Computing Distance to Default and Probability of Default
One popular metric in the structural approach is the "distance to default." Shown graphically in Exhibit 5, the distance to default is the difference between a firm's asset value and its liabilities, measured in units of the standard deviation of the asset value. In short, it is the number of standard deviations that a firm is from default. In the Black-Scholes-Merton framework, the distance to default is equal to *d2*, from above. Using the values of A and σA computed earlier, we calculate the distance to default to be 1.76. In other words, the projected asset value is 1.76 standard deviations above the default threshold.

The distance to default, *d2*, is important because it is used to compute the probability of default. In the Black-Scholes-Merton framework, the risk-neutral probability of default is *N(-d2)*. In our example, the risk-neutral probability of default is *N*(-1.76), which equals 3.1%.

exhibit 5
Distance to Default



Source: Morgan Stanley

Recovery Rates
In Merton's model, recovery rates are determined implicitly. In this example, if the value of assets in one year is $80 million, then the corporation defaults, and bondholders recover $80 million. We can also compute the expected recovery rate (under the risk neutral measure). Conditional on the default of the company, the expected value of assets to be recovered by debtholders is given by *A N(-d1) / N(-d2)*. In this example, expected recovery value is $90.7 million. This is higher than we would likely observe, for the same reason that the model underestimates short-term spreads.

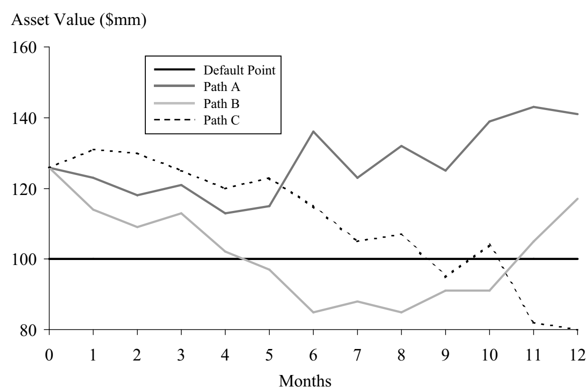
EXTENDING MERTON'S ORIGINAL MODEL

The original Merton model outlined above features a firm with a single zero coupon bond and a single class of equity. Models used in practice will be more elaborate, incorporating short-term and long-term liabilities, convertible debt, preferred equity and common equity. In addition, models used in practice are more sophisticated, in order to produce more realistic spreads, default probabilities and recovery rates. The following list of modeling choices is representative of some of the more popular extensions to Merton's original model:

- The default threshold need not be a constant level. It can be projected to increase or decrease over time.

- Default can occur at maturity, on coupon dates or continuously. Exhibit 6 shows three possible paths for a firm's asset value over the next year. In Merton's original model, where default can only occur at maturity, the firm defaults only in asset value path C, where the recovery rate is 80%. If the default barrier is continuous, the firm defaults in asset value paths B and C, as soon as the asset value hits the default barrier. The recovery rate would be determined separately.

exhibit 6
Sample Asset Value Paths



Source: Morgan Stanley

- The default threshold can have a random component, reflecting imperfect information about current and future liabilities. Indeed, current liabilities may not be observable with sufficient accuracy, for example, because the balance sheet is out of date. Similarly, it is not easy to predict how management will refinance debt or adjust debt levels in the future in response to changing economic conditions.

- Asset value need not follow a lognormal distribution. For example, it can have jumps, reflecting unanticipated surprises that cause asset value to decrease sharply. The option pricing model can be different from the Black-Scholes model, and equity can be modeled as a perpetual option. In addition, asset value and volatility can be inferred from the equity markets in a more robust way, using an iterative procedure that incorporates time series information.

- Firm behavior can be incorporated into a structural model. One example is a "target leverage" model, in which the initial capital structure decision can be altered. The level of debt changes over time in response to changes in the firm's value, so that the Debt/Assets ratio is mean-reverting. In this model, the firm tends to issue more debt as asset values rise.[4]

- In a "strategic debt service" model, there is an additional focus on the incentives that lead to voluntary default and the bargaining game that occurs between debt and equity holders in the event of distress. These models acknowledge the costs associated with financial distress and the possibility of renegotiation before liquidation.[5]

COMMERCIAL IMPLEMENTATIONS OF THE STRUCTURAL APPROACH

Commercial implementations, such as KMV and CreditGrades, have refined the basic Merton model in different ways. Each strives to produce realistic output that can be used by market participants to evaluate potential investments.

KMV has extended the basic structural model according to the Vasicek-Kealhofer (VK) model. The primary goal of the model is to compute real-world probabilities of default, which are referred to as Expected Default Frequencies, or EDFs. The model assumes that the firm's equity is a perpetual option, and default occurs when the default barrier is crossed for the first time. A critical feature of KMV's implementation is the sophisticated mapping between the distance to default and the probability of default (EDF). The mapping is based on an extensive proprietary database of empirical default and bankruptcy evidence. As such, the model produces real-world, not risk-neutral, probabilities.[6]

CreditGrades, a more recent product, is an extension of Merton's model that is primarily focused on computing indicative credit spreads. In the CreditGrades implementation, the default barrier has a random component, which is a significant driver of short-term spreads. Default occurs whenever the default threshold is crossed for the first time. Parameters for the model have been estimated in order to achieve consistency with historical default swap spreads.[7]

ADVANTAGES OF STRUCTURAL MODELS

- Equity markets are generally more liquid and transparent than corporate bond markets, and some argue that they provide more reliable information. Using equity market information allows fixed income instruments to be priced independently, without requiring credit spread information from related fixed income instruments.

- Structural models attempt to explain default from an economic perspective. They are oriented toward the fundamentals of the company, focusing on its balance sheet and asset value.

- Credit analysts' forecasts can be incorporated into the model to enhance the quality of its output. For example, balance sheet projections can be used to create a

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[4] *Collin-Dufresne and Goldstein, "Do Credit Spreads Reflect Stationary Leverage Ratios?" Journal of Finance, Vol. 56, No. 5, 2001.*
[5] *For a simple example, see Fixed Income Markets and Their Derivatives, Second Edition, by Suresh Sundaresan.*
[6] *Modeling Default Risk, KMV LLC, January 2002.*
[7] *CreditGrades Technical Document, RiskMetrics Group, Inc., May 2002.*

more realistic default threshold. The model can also be run under different scenarios for future liabilities.

- Structural models are well-suited for handling different securities of the same issuer, including bonds of various seniorities and convertible bonds.
- A variety of structural models are commercially available. They can be used as a screening tool for large portfolios, especially when credit analyst resources are limited.
- Structural models can be enhanced, for example, to incorporate firm behavior. Examples include target leverage models and strategic debt service models.
- Default correlation can be modeled quite naturally in the structural framework. In a portfolio context, correlation in asset values drives default correlation.

DISADVANTAGES OF STRUCTURAL MODELS

- If equity prices become irrationally inflated, they may be poor indicators of actual asset value. The Internet and telecom bubbles of the past few years are perhaps the most striking examples. Generally, users of structural models must believe that they can reasonably imply asset values from equity market information. This can become a significant issue when current earnings are low or negative and equity valuations are high.
- Bond prices and credit default swap spreads, which arguably contain valuable information about the probability of default, are outputs of the model, not inputs.
- In Merton's structural model, implied credit spreads on short-term debt and very high quality debt are very low when compared to empirical data. Refinements to the model have alleviated this problem, at the expense of simplicity.
- The determination of a unique arbitrage-free option price implicitly assumes that the value of the whole firm is tradable and available as a hedge instrument, which is a questionable assumption. In addition, it may not be clear how to best model a firm's asset value.
- Structural models can be difficult to calibrate. In practice, asset values and volatilities are best calibrated using time series information. Assumptions for equity volatility can have a significant impact on the model.
- Structural models can be complex, depending on the capital structure of the issuer and the level of detail captured by the model. An issuer may have multiple classes of short-term and long-term debt, convertible bonds, preferred shares and common equity.
- It can be difficult to get reliable, current data on a firm's liabilities. Issues regarding transparency and accounting treatment are, of course, not unique to structural models. In addition, once adequate information on the liabilities is obtained, the information must be consolidated to project a default barrier.
- Notwithstanding innovations such as target leverage models and strategic debt service models, it is difficult to model future corporate behavior.

- It can be difficult to model a firm that is close to its default threshold, since firms will often adjust their liabilities as they near default. Firms will vary in terms of their ability to adjust their leverage as they begin to encounter difficulties. (For this reason, KMV reports a maximum EDF of 20%.)
- Financial institutions should be modeled with caution, since it can be harder to assess their assets and liabilities. In addition, since financial institutions are highly regulated, default may not be the point where the value of assets falls below the firm's liabilities.
- Structural models are generally inappropriate for sovereign issuers.

REDUCED FORM MODELS

In the reduced form approach, default is modeled as a surprise event. Rather than modeling the value of a firm's assets, here we directly model the probability of default. This approach is similar to the way interest rates are modeled for the purpose of pricing fixed income derivatives. Unlike the structural models described above, the inputs for reduced form models come from the fixed income markets in the form of default swap spreads or asset swap spreads.

The quantity we are actually modeling in the reduced form approach is called the hazard rate, which we denote by $h(t)$. The hazard rate is a *forward* probability of default, similar to a forward interest rate. The hazard rate has the following interpretation: given that a firm survives until time t, $h(t)\Delta t$ is the probability of default over the next small interval of time Δt.

For example, assume that the hazard rate is constant, with $h = 3\%$. Conditional on a firm surviving until a given date in the future, its probability of default over the subsequent one day (0.0027 years) is approximately $h\Delta t = 3\% * 0.0027 = 0.008\%$.

Letting τ represent the time to default, the hazard rate is defined mathematically as follows:

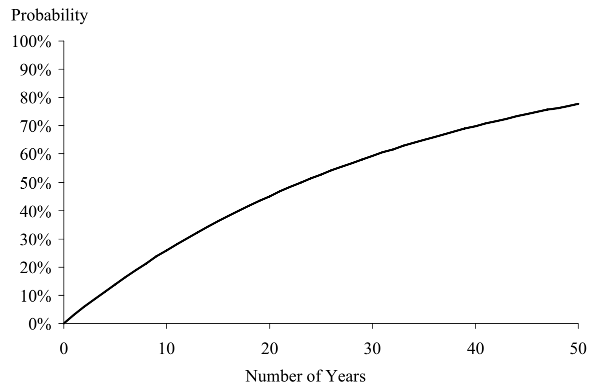
$$h(t) = \frac{\text{Prob}(\tau \le t + \Delta t \mid \tau > t)}{\Delta t}$$

Three features of hazard rates make them particularly useful for modeling default:

- Even though the hazard rate is an instantaneous forward probability of default, it tells us the probability of default over any time horizon.

Example:
Assuming a constant hazard rate, the probability of a bond defaulting in the next t years is $1 - e^{-ht}$. If $h = 3\%$, the probability of the firm defaulting in the next two years is $1 - e^{-0.03(2)} = 5.82\%$. A graph of the cumulative default probability when $h = 3\%$ is shown in Exhibit 7.

exhibit 7
Cumulative Probability of Default – 3% Hazard Rate



Source: Morgan Stanley

- Hazard rates can be inferred from the fixed income markets, in the form of default swap spreads or asset swap spreads.

Example:
Assuming a constant hazard rate, the default swap premium is approximately equal to h * (1 - *Expected Recovery Rate*). If the default swap premium is 180 bp and the expected recovery rate is 40%, we can set h = 1.80% / (1-0.40) = 3%.

- Hazard rates are convenient for running simulations to value derivative and credit portfolio products. In a portfolio context, a simulation would allow for defaults to be correlated.

Example:
Assuming a constant hazard rate, we can simulate the time to default as follows: Repeatedly generate values between 0 and 1 for the uniform random variable U, and use the relation $\tau = -\log(U) / h$ for the time to default. For example, with h = 3%, if in the first path of a simulation U = 0.757, the corresponding time until default is -log(0.757) / 0.03 = 9.28 years.

In the examples above, we have assumed that hazard rates are constant. The real exercise, however, is to *model* the hazard rates. Like interest rates, hazard rates are assumed to have a term structure, and they are assumed to evolve randomly over time. Models for interest rates, such as a lognormal model or the Cox-Ingersoll-Ross model, can be used to model hazard rates. In addition, it is not uncommon for models of hazard rates to incorporate jumps that occur at random times. Hazard rate models are typically calibrated to a term structure of default swap spreads or asset swap spreads.

ADVANTAGES OF REDUCED FORM MODELS

- Reduced form models are calibrated to the fixed income markets in the form of default swap spreads or asset swap spreads. It is natural to expect that bond markets and credit default swap markets contain valuable information regarding the probability of default.

- Reduced form models are extremely tractable, and are well-suited for pricing derivatives and portfolio products. The models are calibrated to correctly price the instruments that a trader will use to hedge.

- In a portfolio context, it is easy to generate correlated hazard rates, which lead to correlated defaults.

- Hazard rates models are closely related to interest rate models, which have been widely researched and implemented.

- Reduced form models can incorporate credit rating migration. However, for pricing purposes, a risk-neutral ratings transition matrix must be generated.

- Reduced form models can be used in the absence of balance sheet information, e.g., for sovereign issuers.

DISADVANTAGES OF REDUCED FORM MODELS

- Reduced form models reveal limited information about the fixed income securities that are used in their calibration.

- Reduced form models can be sensitive to assumptions, such as the volatility of the hazard rate and correlations between hazard rates.

- Even if hazard rates are highly correlated, the occurrences of default may not be highly correlated. For this reason, practitioners pay careful attention to which particular process hazard rates are assumed to follow. Models with jumps have been used to ameliorate this problem.

- Whereas there is a large history on interest rate movements that can be used as a basis for choosing an interest rate model, hazard rates are not directly observable. (Only the events of default are observable.) Thus, it may be difficult to choose between competing hazard rate models.

FACTOR MODELS

For comparison to the default-based pricing models described above, we include a brief discussion of a simple factor model of investment grade corporate spreads.[8] Unlike the structural and reduced form models, the factor model does not attempt to model default in order to gain insight into fair market prices. Rather, it is a simple statistical approach to the *relative* pricing of credit, and is used to determine which bonds are rich or cheap.

This factor model uses linear regression to attribute spreads to various characteristics of the bonds being analyzed. The idea is to quantify the importance of various drivers of corporate bond spreads. The residual from the regression is used to indicate rich and cheap securities. Some potential factors for investment grade credit are shown in Exhibit 8. Later in this publication, in the section on Historical Analysis of Quantitative and Fundamental Approaches, we review the performance of this factor model, along with other quantitative and fundamental approaches.

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[8] *For details, see "A Model of Credit Spreads," Morgan Stanley Fixed Income Research, November 1999.*

exhibit 8 Sample Factor Model Inputs

Factor	Type	Description
Total Debt/EBITDA	Numeric	Measure of leverage
Rating	Numeric	Scaled to a numeric value
Watchlist	{-2,-1,0,1,2}	On watchlist, negative or positive
Duration	Numeric	Modified duration
Stock Returns	Numeric	1 year total return
Stock Volatility	Numeric	Price volatility over last 90 days
Quintile of Debt Outstanding	{1,2,3,4,5}	E.g. top 20% = 5th quintile
10- to 15-Year Maturity	Numeric	Years to maturity >10 but < 15
Gaming	{0,1}	E.g. casinos
Cyclical	{0,1}	E.g. retail, autos
Finance	{0,1}	E.g. banks, finance, brokerage
Technology	{0,1}	E.g. software, hardware
Global	{0,1}	Global bond
AAA/AA	{0,1}	Rated Aaa/AA or Aa/AA or split
Yankee	{0,1}	Yankee bond

Source: Morgan Stanley

Fundamental Approaches to Valuing Corporate Credit

Fundamental approaches for analyzing credit have been practiced for decades, most often by buy- and sell-side credit analysts and rating agency analysts. To give readers a sense of how credit analysts analyze the creditworthiness of companies, we summarize and generalize the credit analyst approach, based on Morgan Stanley experiences. We also describe the process rating agencies go through to arrive at credit ratings (based on their own published research). Our conclusions are as follows:

- In some cases, there may be no substitute for the credit expert who can formulate subjective views on business, financial and strategic risks associated with a company or industry.
- Special considerations such as pension liabilities and off-balance-sheet items, which have been a focus in the market recently, can be easily incorporated by credit analysts.
- The motivation for changing the capital structure of a company, and the likelihood of such a change occurring, can drive the valuation of corporate credit in a significant manner. Credit analysts can have important subjective views on capital structure changes.
- Rating agency approaches focus on determining probability of default and loss severity by evaluating the financial state of a company, with future scenarios weighted in a probabilistic framework. The agencies aim to establish stable credit ratings.
- In general, fundamental approaches do not directly lead to market prices. Valuations are usually made in a relative value context.

Generalizing the Credit Analyst Approach

CREDIT ANALYSIS PRINCIPLES: DISAGGREGATING CREDIT RISK

At the company level, the objective is to use information from the financial statement to assess the firm's capacity and willingness to service a given level of debt. There is specific emphasis on the predictability and variability of corporate cash flows.

Credit risk can be decomposed into a number of constituents, each of which must be considered (see Exhibit 9). Specifically, a basic assessment of credit risk at the company level should involve a consideration of three sorts of risk.

- Business risk: Described as the quality and stability of operations over the business cycle, which implies judgment as to the predictability of corporate cash flows.
- Financial risk: Whether or not current cash flow generation and profitability are sufficient to support debt levels, ratings levels and, therefore, credit quality levels.
- Strategy risk: Considering potential event risk, for example, what's the probability of a change in company strategy by management? What are the probability and credit quality implications of executing a certain acquisition? External risks, such as asbestos- or tobacco-related litigation or the advent of 3G technology, would also be considered here.

exhibit 9
Industrial Credit Research

Source: Morgan Stanley

Clearly, business, financial and strategy risks are not mutually exclusive, but rather interdependent. There is no unique way of weighting or combining these factors. It is at the discretion of the analyst and will vary on a company-to-company basis. The task is to determine what the market thinks about each of these risks, and in what combination. Only then can one make some judgment as to relative richness or cheapness.

CAPITAL STRUCTURE CHANGES AND THE EQUITY OPTION

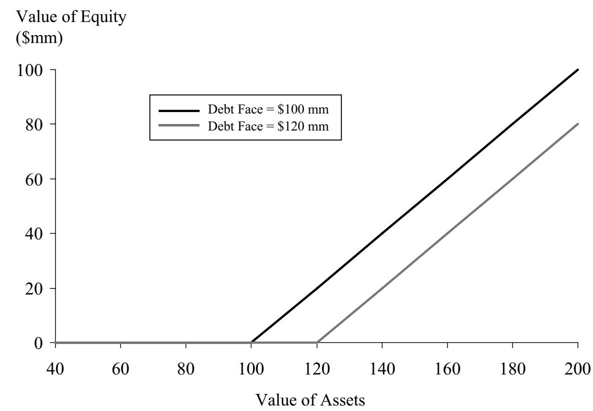
There is one aspect of strategic risk that links together the quantitative structural approach and the fundamental approach. In the Merton framework, the face value of outstanding debt is the strike price of the call option equityholders have on the company's assets. The strike price changes when the capital structure of a company changes, which is very much a part of the strategic risk a credit analyst has to measure.

Consider again our original example of a corporation which has a single zero coupon bond outstanding with a face value of $100 million that will mature in one year. If the total value of the firm's assets is $100 million or less in one year's time, the value of the firm's equity is zero and stockholders simply "walk away," leaving bondholders to recover what value they can from the firm's assets. Now, if the starting position of the corporation were $120 million in debt, as opposed to $100 million, the strike price of the option which bondholders implicitly write to stockholders is raised by $20 million (the increase in the face value of the amount of debt outstanding). Exhibit 10 shows the original and new payoff structures associated with this change in the firm's capital structure.

In the quantitative section, we discussed how extensions to the classic Merton framework address a changing strike price (e.g., modeling the default barrier as a random process). However, analysts can also have a view or assign a probability to the magnitude and timing of a capital structure change. If the magnitude and likelihood of this change is high, then it will dominate any valuation of a credit, whether fundamental or quantitative, so it should be factored in correctly.

exhibit 10

The Value of Equity in One Year



Source: Morgan Stanley

DEVELOPING A FRAMEWORK FOR THINKING ABOUT 'THE MANAGEMENT OPTION'

What motivates a firm's management to exercise this sort of capital structure option? More important from a creditor perspective, can we develop a conceptual framework that gives us some insight as to when a firm's management might be inclined to effect a change in the capital structure? At this point, at the expense of stating the obvious, it is worth highlighting that changes in a firm's capital structure do not always put bondholders at a disadvantage relative to shareholders.

The Weighted Average Cost of Capital

In thinking about the opportunities available to a firm's management, we've found it increasingly useful to think within a weighted average cost of capital (WACC) framework. By way of definition:

$$WACC = Q_d.C_d + Q_e.C_e$$

Q_d and Q_e represent the amount of debt and equity, respectively, as percentage of total enterprise value, and C_d and C_e represent their respective costs. These are in turn defined as:

$$C_d = (r + BS)*(1-\tau)$$

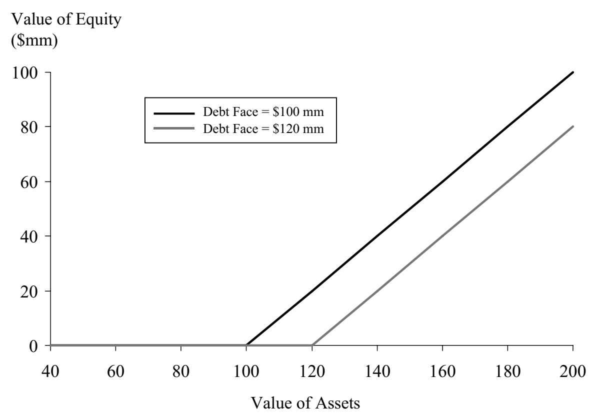
$$C_e = r + (\beta*ERP)$$

Here, r is the risk-free rate (or benchmark government bond yield), BS is the borrowing spread on top of the risk-free rate, τ is the corporate tax rate, β is a measure of the volatility of the company's stock vis-à-vis the broader equity market, and ERP is the market-wide equity risk premium.

Mapping the WACC to credit ratings, one would typically expect to observe the "hockey stick" profile shown in Exhibit 11. Remember, interest is tax deductible and dividends are only distributed after taxes. This is why, as more debt is added to the balance sheet and the firm migrates down the ratings spectrum, we initially observe a negatively-sloped WACC curve. Beyond a certain point, however, the incremental tax benefit associated with adding more debt to the balance sheet is more than offset by a combination of a higher borrowing spread and a rising β. Thus, when we map the WACC to leverage and credit ratings, we observe an eventual shift from a negatively-sloped to a positively-sloped curve.

exhibit 11

A Stylized Version of the Weighted Average Cost of Capital



Source: Morgan Stanley

The WACC is a theoretical concept, but it provides an extremely useful framework for thinking about the circumstances in which management might change the firm's capital structure. A WACC framework helps us put bounds on the risk-reward structure associated with the "management option." Specifically, we believe that it is at the tails of the leverage distribution where the risk-reward mismatch associated with a change in the capital structure is greatest, and therefore the incentive to change the capital structure is arguably the greatest. For example, at the high-end of the ratings spectrum, there is a strong incentive for a company to increase leverage and lower its cost of capital. Similarly, the incentive to pursue a strategy of balance sheet reparation is much stronger at the opposite end of the leverage distribution.

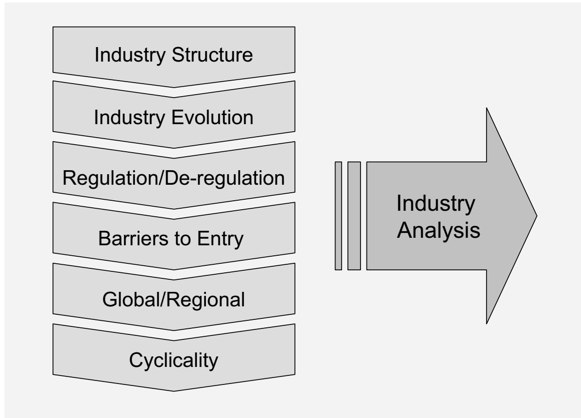
THE OPERATING ENVIRONMENT: INDUSTRY ANALYSIS

Any fundamental assessment of corporate credit risk for a given company must necessarily extend beyond the latest set of financials and consider the 'macro' operating environment including issues related to industry structure and evolution, the regulatory environment and barriers to entry.

To illustrate the questions that one will typically ask, it is important to consider whether, for example, we are dealing with a monopoly or a highly competitive business from an industry structure perspective. Barriers to entry have clear implications for pricing and earnings power. Is the business global or regional? For example, in the case of autos, what is the viability of a regional car maker in a global business?

On the regulatory front, deregulation has been a clear driver of capital structure and credit quality trends in the utility sector. Again, what is important from a credit risk perspective are the ex ante and ex post implications of any regulatory change on pricing power and the ability for a company to generate cash flow and support a given level of debt and credit quality.

exhibit 12
Forces Shaping the Operating Environment



Source: Morgan Stanley

Regarding industry evolution, a classic case in point is the telecommunications business and the advent of 3G technology. As has been the case with deregulation in the utility sector, 3G has been the principal driver of the telecom credit quality rollercoaster of the past two years.

THE OUTPUT FROM CREDIT ANALYSTS: DETERMINING RELATIVE VALUE AND SPREADS

At this point, a natural question to ask is how credit analysts translate their company-specific analyses into a spread? In our experience, we find that credit analysts formulate appropriate valuation levels through a relative value framework based on comparability. Such a framework takes the current market level for spreads as given, and suggests valuations through a peer group of comparable credits. Statements such as "company X should trade 20 bp behind company Y" are common, however subjective they may appear. We explore the importance of ratings versus sectors in determining these peer groups in the next section.

exhibit 13 Single As – Sector Correlation Coefficients Based on Weekly Asset Swap Spread Changes End-1999 to Present

	Banks	Non Bank Fins	Con Disc	Con Staples	Energy	Industrials	Technology	Telecoms	Utilities
Banks	1								
Non Bank Fins	0.55	1							
Con Disc	0.41	0.59	1						
Con Staples	0.23	0.24	0.33	1					
Energy	0.30	0.32	0.33	0.23	1				
Industrials	0.26	0.30	0.44	0.21	0.33	1			
Technology	0.10	0.01	0.11	0.13	0.16	-0.04	1		
Telecoms	0.17	0.11	0.40	0.22	0.12	0.22	0.37	1	
Utilities	0.44	0.45	0.37	0.41	0.31	0.36	0.11	0.31	1

Source: Moody's

exhibit 14 Telecoms – Cross-Credit Correlation Coefficients

	VOD	TELECO	OTE	BRITEL	FRTEL	DT	TIIM	OLIVET	KPN
VOD	1								
TELECO	0.29	1							
OTE	0.21	0.31	1						
BRITEL	0.54	0.04	0.37	1					
FRTEL	0.47	0.13	0.48	0.68	1				
DT	0.41	-0.17	0.39	0.66	0.83	1			
TIIM	0.60	0.39	0.35	0.61	0.60	0.44	1		
OLIVET	0.53	0.49	0.20	0.33	0.25	0.06	0.77	1	
KPN	0.33	0.23	0.39	0.36	0.58	0.39	0.53	0.38	1

Source: Morgan Stanley

COMPARABILITY: SECTORS VS. RATINGS

Given the focus by credit analysts on identifying and utilizing an appropriate peer group for determining spreads, how should such a group of comparable credits be constructed? As an example, in Exhibit 13 we present inter-sector correlation coefficients for single-A rated segments of MSCI's Euro Corporate Credit Index. The average pairwise correlation coefficient of weekly changes in asset swap spreads is 0.28, quite low in our opinion. Similarly, for BBB-rated corporate bonds (not shown), the average pairwise correlation coefficient is 0.24. From this analysis we can conclude that peer groupings based purely on credit ratings may not be appropriate.

What is the degree of correlation within a given sector between different credits with different ratings? We have focused our example on two of the more liquid sectors in the European credit markets, autos and telecommunications. Exhibit 15 presents the results of this exercise for the auto sector. We have selected five credits rated mid-A to mid-BBB with relatively liquid bonds of similar maturities outstanding. The lowest pair-wise correlation in the auto sector, at 0.31 between Ford and Renault, is higher than the average observed for either single As or triple Bs (see Exhibit 15). The average pair-wise correlation for the auto sector is 0.62, which would suggest that sector groupings are more important than ratings groups, at least when considering the auto sector.

The results for the telecom sector are shown in Exhibit 14. Again we have selected a group of credits that cover a reasonable spectrum of European credits. The average pair-wise correlation for the telecom sector is 0.40, which is again higher than that observed between different sectors within a given rating class.

exhibit 15 Autos – Cross-Credit Correlation Coefficients

	GM	DCX	FIAT	RENAUL	F
GM	1				
DCX	0.84	1			
FIAT	0.80	0.67	1		
RENAUL	0.34	0.42	0.50	1	
F	0.82	0.77	0.73	0.31	1

Source: Morgan Stanley

chapter 8

Rating Agency Approaches

No institution wields anywhere near as much influence on how the market perceives the credit quality of an individual borrower as the credit rating agencies. The agencies themselves see their role as being the providers of truly independent credit opinions, and as such, helping to overcome the information asymmetry between borrowers and lenders. With such monumental influence on pricing decisions, rating agencies, unsurprisingly, regularly receive criticism for not achieving all of their aims. Market participants have traditionally criticized the agencies for being too slow to react to new information. Lately the criticism has tended to be that agencies are too quick to change opinions. Nevertheless, given the crucial role the agencies play in the capital markets, it is important to understand the rating process and the factors that influence the agencies' decisions.[9]

REDUCING INFORMATION ASYMMETRY

Corporate borrowers have access to more detailed information on their businesses and credit profiles than do lenders. This is particularly true for capital market lenders. For commercial banks, which work closely with their clients, lending decisions are based on a detailed understanding of the borrowers. The process of lending is characterized by constant monitoring of credit quality and actively using covenants to restrict potentially credit-detrimental activities of borrowers. Ultimately, banks can agree to restructure loans as a final attempt to recover funds before allowing default.

The capital markets, on the other hand, are anonymous to the borrowers in the sense that borrowers will never know nor control who ultimately lent them the money. Precisely because of this distance between borrowers and lenders, bond investors rely on credit analysts to bridge the information asymmetry.

ARRIVING AT A RATING

Credit rating agencies try to assess the probability of default and loss severity. The product of the two yields the expected loss. Based on this, a rating is produced. The rating is expected, over time, to map to a subsequent expected loss, based on historical experience. The process involves three main steps:

- Evaluating the financial status: Observing hard facts associated with the financial state of a particular company.
- Evaluating management: Subjectively evaluating the ability and interest in maintaining a particular credit profile.
- Conducting scenario analysis: Making assumptions about the probability of various scenarios that may impact the future credit profile.

Finally, arriving at a particular rating requires anchoring the two components, default probability and loss severity, to the historical experience. In estimating the default probability, rating agencies target relative risk over time. In estimating loss severity, analysts evaluate security and seniority, as well as sector differences. In addition, recovery rates may differ over time and across jurisdictions.

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[9] *For a more comprehensive survey, see Euro Credit Basis Report: "What's Going on at the Rating Agencies?" Morgan Stanley Fixed Income Research, May 31, 2002.*

CREDITWORTHINESS IS A STABLE CONCEPT

Underlying this process lies a crucial assumption: creditworthiness is a stable concept. Fundamentally, creditworthiness changes only gradually over time or at least is only confirmed over time. In theory, this ought to make multi-notch rating changes unlikely, and the rating agencies therefore use tools such as outlooks and watch lists to flag changes. Even these, however, tend to have a built-in lag. Moody's, for instance, has an 18-month horizon for its outlooks and 90 days for its Watch List, whereas S&P targets 90 days for its CreditWatch listings, with a longer but unspecified time-horizon for Outlooks. This gradual approach gives credit ratings a serially correlated pattern. This is also what creates the impression that ratings activity lags the market so significantly.

HAVE THE AGENCIES CHANGED THEIR APPROACH?

The rating agencies have been criticized for the market-lagging approach and serially correlated ratings pattern. The main criticism is that the approach causes ratings to lag their information content, and therefore lose their value as investor protection. In the case of Enron, for example, senior bonds and loans were already trading below 20 cents to the dollar when the company was downgraded to non-investment grade, which was less than a week before the company filed for Chapter 11 bankruptcy protection.

In response to this criticism, Moody's put its ratings process under review early in 2002. Moody's asked investors whether they wanted ratings decisions to be quicker and more severe. The use of so-called market-based tools for evaluating credit was also suggested. The answer to the consultation was overwhelmingly "no." Investors showed little interest for a quicker ratings process, nor did they show any interest in the use of market-based tools to enhance the process. What there was a need for, according to the published feedback, was transparency.[10]

Standard & Poor's, has not (publicly) put its process up for review, but has increasingly focused on issues that will enhance and complement the information content of the ratings. In particular, S&P has (i) begun surveying its corporate issuers for information on *ratings contingent commitments*, such as ratings triggers; (ii) indicated that it will start rating the transparency, disclosure and corporate governance practices of the companies in the S&P 500; (iii) introduced Core Earnings, a concept reflecting the agency's belief of how fundamental earnings performance *should* be reflected; and (iv) introduced liquidity reports on individual companies.[11]

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[10] *Understanding Moody's Corporate Bond Ratings and Ratings Process, Moody's, May 2002.*
[11] *Enhancing Financial Transparency: The View from Standard & Poor's, S&P, July 2002.*

chapter 8

Historical Analysis of Quantitative and Fundamental Approaches

While we have focused our efforts so far on describing quantitative and fundamental approaches to valuing corporate credit, we have yet to comment on their predictive powers. In this section we compare historical performance studies of our factor model, KMV EDFs, a quantifiable measure of the fundamental approach based on free cash flow changes, and rating agency approaches. Our conclusions are as follows:

- Our simple statistical factor model was a good predictor of *relative* spread movements over short time periods.
- KMV EDFs were good predictors of default and performed consistently over different categories of risk over one-year time horizons.
- Market-implied default probabilities (i.e., using spread as a predictor) overestimated default in most cases, given risk premiums inherent in market spreads. However, they were inconsistent predictors of default at different risk levels over one-year time horizons.
- Changes in free cash flow generation relative to debt (a fundamental measure of credit quality improvement) were a good predictor of *relative* spread movements over one-year time periods.
- Over long periods of time for the market at large, actual ratings migration and default behavior have been consistent with ratings expectations, based on Moody's and S&P data.
- While not always easily observable, market participants should understand the time period for which an indicator is useful. Equity and bond market valuations could be short- or long-term, as can analyst views. We have included our findings in the above points.

While our studies were performed on samples of different sizes based on the availability of reliable data, we believe the data sets are comparable and do not contain any systematic biases.

STATISTICAL FACTOR MODEL HISTORICAL STUDY

We conducted a 16-month historical study (March 2001 through June 2002) of our factor model results (described in the Quantitative Approaches section) to test the predictive power of such a model. The factors used in the model are listed in Exhibit 16.

The study included a universe of 2,000 investment grade corporate bonds. A linear regression was conducted each month where we calculated a residual (i.e., actual spread minus the model's predicted spread) for each bond in the universe. A positive residual value indicates cheapness of the credit, while a negative value suggests richness. Rich-cheap residuals are not statistically significant unless their magnitudes are at least twice the standard error of the regression (standard deviation of all the residuals), which, in our experience, can be over 30 bp in a given month.

exhibit 16 Factors Used in the Model

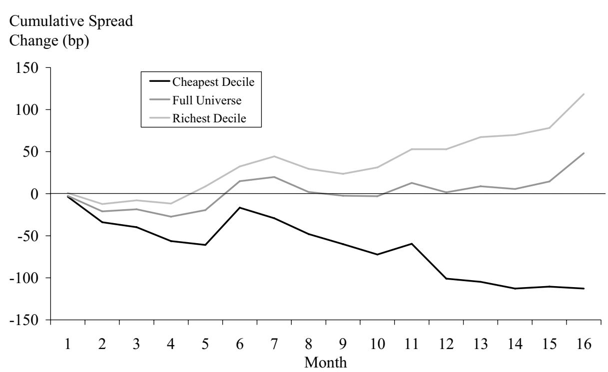
Factor	Type	Description
Total Debt/EBITDA	Numeric	Measure of leverage
Rating	Numeric	Scaled to a numeric value
Watchlist	{-2,-1,0,1,2}	On watchlist, negative or positive
Duration	Numeric	Modified duration
Stock Returns	Numeric	1 year total return
Stock Volatility	Numeric	Price volatility over last 90 days
Quintile of Debt Outstanding	{1,2,3,4,5}	E.g. top 20% = 5th quintile
10- to 15-Year Maturity	Numeric	Years to maturity >10 but < 15
Gaming	{0,1}	E.g. casinos
Cyclical	{0,1}	E.g. retail, autos
Finance	{0,1}	E.g. banks, finance, brokerage
Technology	{0,1}	E.g. software, hardware
Global	{0,1}	Global bond
AAA/AA	{0,1}	Rated Aaa/AA or Aa/AA or split
Yankee	{0,1}	Yankee bond

Source: Morgan Stanley

FACTOR MODEL IS GOOD AT RELATIVE VALUE

The results of our study show that the factor model is quite successful at determining relative value among bonds. The factor model's cheapest decile tightened significantly more than other bonds in nine of 16 months. Similarly, its richest decile significantly widened in nine of the 16 months. In Exhibit 17 we show the cumulative spread changes for richest and cheapest deciles (which are recomputed every month) and for the entire universe. The cheapest decile tightened an average of 160 bp versus the entire universe, while the richest decile widened 70 bp over that same period.

exhibit 17 Factor Model Performance



Source: Morgan Stanley

KMV EDFS ARE NOT AS USEFUL FOR RELATIVE VALUE

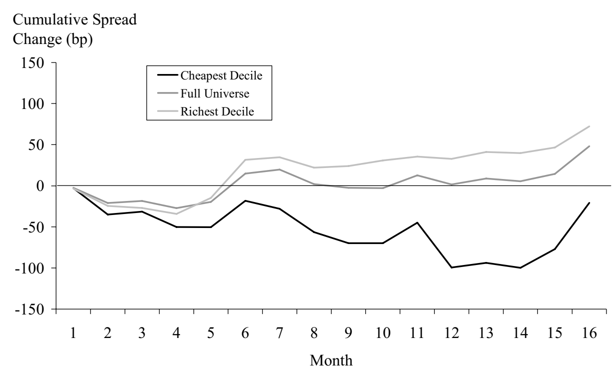
Since many market participants are attempting to use KMV EDF data to predict relative spread changes, we studied how well this worked. It is important to note, however, that KMV is meant to be a predictor of default, not spreads.

In studying how well KMV predicted spread changes, we determined richness and cheapness by comparing KMV EDFs to market-implied probabilities of default. These implied default probabilities are derived from the market spread and an assumed recovery rate.

Similarly to our factor model study, we observed the ensuing month's spread change for the cheapest and richest deciles of this EDF-based relative value measure. The results for the EDF signals, shown in Exhibit 18, are not as compelling as the factor model. In the EDF study, the cheapest bonds rallied by 68 bp, while the richest widened by only 24 bp.

exhibit 18

KMV Spread Model Performance



Source: Morgan Stanley

KMV WORKED WELL AT PREDICTING DEFAULT

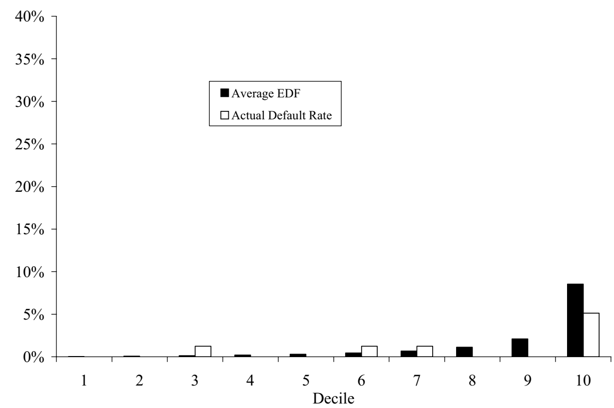
The fact that KMV EDFs are poorer predictors of relative spread movements than our factor model does not surprise us. EDFs are designed to be predictors of default probability, not spread movement. To test this hypothesis, we conducted a default probability study using over 800 investment grade and high yield issuers covered by KMV for the years 2000 and 2001. We ranked all companies by their prior year-end EDFs, divided the universe into deciles based on absolute EDFs, and calculated the average EDF for each decile. If EDFs are a good predictor of the actual probability of default, companies in each decile should default over the next year by roughly that same average EDF. Exhibit 19 shows the results for our study for years 2000 and 2001. Our conclusions are as follows.

- KMV default predictions were within 0% to 3% of actual default experience within each decile.
- During 2001, a more active year for corporate defaults than 2000, KMV default predictions were remarkably close to actual default experience, particularly in the highest deciles (those with the highest default probabilities).

We believe these results are robust, demonstrating that KMV EDFs are good predictors of default, at least over this period. Furthermore, our study did not show that KMV EDFs raised too many false negatives (high EDFs that were disproportionate to default experience), a common market criticism. Default experience was consistent with default probability.

exhibit 19a

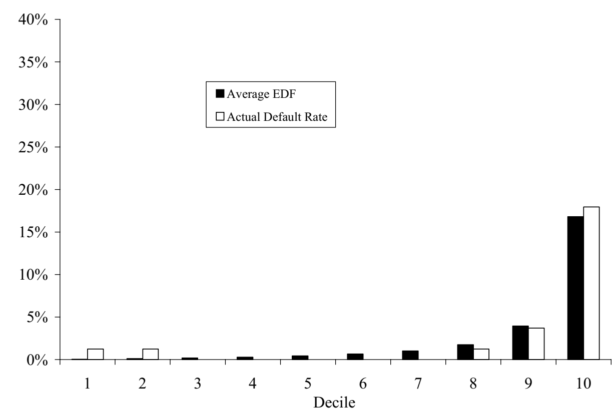
EDF as Predictor of Default Year 2000



Source: Morgan Stanley

exhibit 19b

EDF as Predictor of Default Year 2001



Source: Morgan Stanley

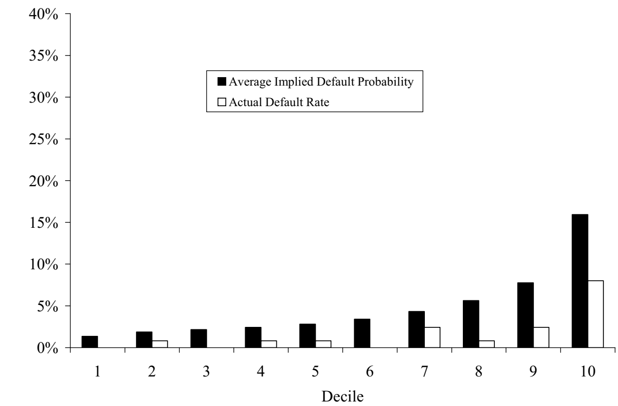
SPREADS WERE LESS RELIABLE PREDICTORS OF DEFAULT

For comparison, we investigated whether the market itself was a good predictor of default. If this were true, then tools such as KMV might not be as useful, since the information would be already priced into the market.

To answer this question, we conducted a study comparing one-year market-implied default rates with actual default experience, where market-implied rates are derived from market spreads and a recovery rate assumption. Our study included over 1,200 issuers over the 2000 and 2001 periods. As in the KMV study, we ranked each year's starting implied default probabilities and divided the population into deciles.

exhibit 20a

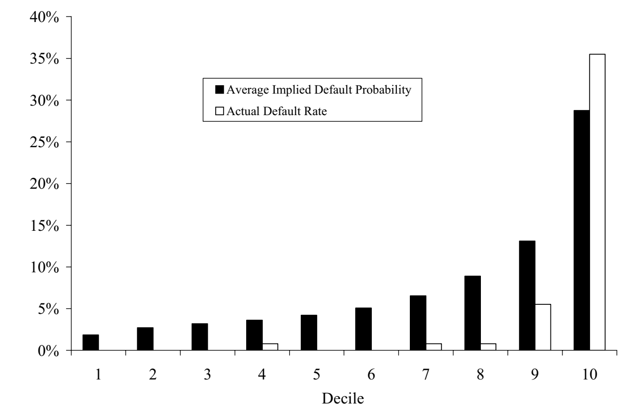
Spread-Implied Default Probability as Predictor of Default Year 2000



Source: Morgan Stanley

exhibit 20b

Spread-Implied Default Probability as Predictor of Default Year 2001



Source: Morgan Stanley

We compared each average to the actual default rate experienced over the following year. Exhibit 20 shows the results of our study. Our conclusions are as follows:

- Market-implied default rates overestimated default for most of the high risk deciles by 5-8% and by 1-3% for the low-risk deciles. The overestimation is understandable, given that the market has priced in an additional risk premium and liquidity premium.

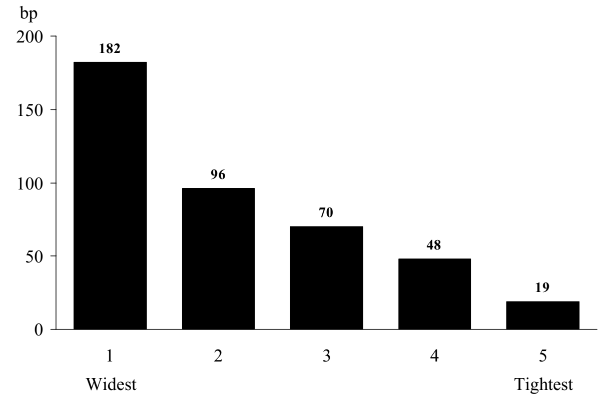
- However, during 2001, market-implied default rates for the highest risk decile actually underestimated default despite the risk premium.

FREE CASH FLOW GOOD AT RELATIVE VALUE

Empirically testing the fundamental approach to credit analysis is not a straightforward task given the subjective nature of the output. Instead, we focus our empirical testing on a simple metric that captures some of what analysts attempt to understand: free cash flow generation.

exhibit 21

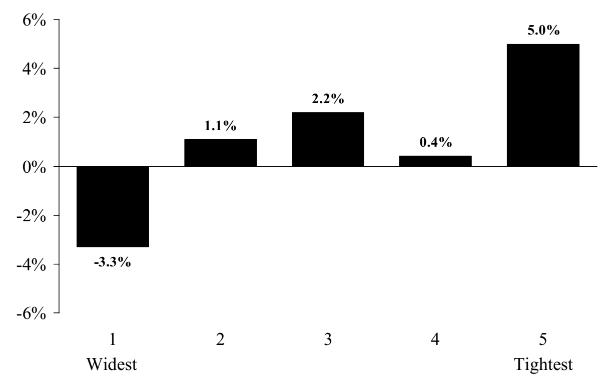
Calendar 2000 Median Spread Performance: Spread Widening versus Treasuries



Source: Morgan Stanley

exhibit 22

Median Free Cash Flow/Debt Changes: 1998 versus 1999



Source: Morgan Stanley

We first tested the hypothesis that free cash flow generation is a good predictor of relative spread in 2001.[12] Results from that study are presented in Exhibits 21 and 22, based on a universe of approximately 200 non-financial US corporate issuers. The study was backward looking in the sense that the universe was sorted into quintiles based on spread performance during calendar year 2000 (see Exhibit 21), and then free cash flow dynamics were observed for these quintiles from 1998 through 1999 (see Exhibit 22). We observed that companies within the poorest performing quintile experienced lower levels of free cash flow generation in 1999 relative to 1998. The best performers through 2000, on the other hand, generated more cash in 1999 relative to 1998.

Exhibit 23 shows median spread performance versus free cash flow trends for the major sectors. Again, prior free cash flow trends are reasonably descriptive of subsequent performance.

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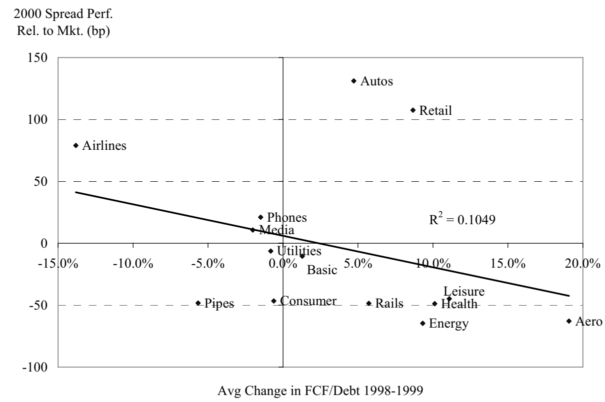
[12] *See "The Bottom Line," Morgan Stanley Fixed Income Research, February 27, 2001.*

exhibit 23

Sector 1998-1999 Free Cash Flow and 2000 Spread Performance

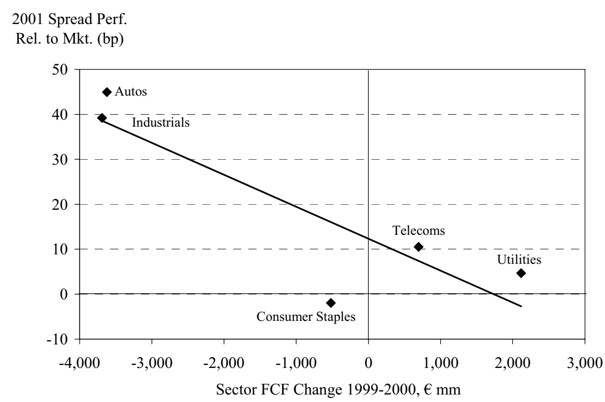


Source: Morgan Stanley

We conducted a similar study for European issuers more recently (spread changes in 2001 based on free cash flow dynamics from 1999 to 2000). In Exhibit 24 we show the free cash flow sector relationships based on a universe of the top 50 non-financial European corporate bond issuers, which account for about 70-80% of all European corporate debt outstanding. Again, we believe that free cash flow generation was a good predictor of spread change.

exhibit 24

Sector 1999-2000 Free Cash Flow Changes versus 2001 Spread Performance



Source: Morgan Stanley

RATINGS ARE CONSISTENT WITH HISTORICAL EXPERIENCE

Ratings agencies have been criticized for being both too slow and too quick in their ratings decisions. The agencies, for their part, consider it their job to produce ratings that, over time, match a default rate (expected loss), which in turn is based on historical experience. Hence, when judging the performance of the agencies, one needs to focus on the historical relationship between ratings and default rates.

Exhibit 26 shows average cumulative default rates by rating using Moody's historical data from 1970-2001. The data show a strong correlation between ratings and default rates. Over a five-year horizon, for instance, the cumulative default rate of Baa-rated companies is almost 14 times that of Aaa-rated companies. Similarly, the cumulative default rate of speculative grade companies is almost 23 times that of investment grade companies.

exhibit 25 S&P Average Cumulative Default Rates (1987-2000)

Outlook	Rating	Year 1 (%)	Year 2 (%)	Year 3 (%)
Stable	AAA	0.00	0.00	0.00
Negative	AAA	0.00	0.00	0.00
Positive	AA	0.00	0.00	0.00
Stable	AA	0.00	0.03	0.07
Negative	AA	0.10	0.22	0.35
Positive	A	0.00	0.00	0.00
Stable	A	0.03	0.05	0.07
Negative	A	0.07	0.21	0.29
Positive	BBB	0.10	0.33	0.33
Stable	BBB	0.15	0.20	0.39
Negative	BBB	0.19	0.52	1.04
Positive	BB	0.12	1.30	2.35
Stable	BB	0.34	1.72	3.59
Negative	BB	2.64	6.86	10.44
Positive	B	2.42	7.55	12.63
Stable	B	2.76	8.45	12.80
Negative	B	9.65	18.05	23.72
Positive	CCC	2.08	2.08	6.25
Stable	CCC	7.84	15.16	20.42
Negative	CCC	29.18	37.95	44.53

Source: S&P

Exhibit 25 illustrates the relationship between ratings outlooks and subsequent defaults. Speculative-grade issuers with negative outlooks are, on average, nearly five times more likely to default than those with positive outlooks. The multiple is highest for the one-year default rate, in which companies with negative outlooks are over nine times more likely to default.

exhibit 26 Moody's Average Cumulative Default Rates by Letter Rating, 1970-2001

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Aaa	-	-	-	0.04	0.14	0.25	0.37	0.49	0.64	0.79	0.96	1.15	1.36	1.48	1.60	1.74	1.88	2.03	2.03	2.03
Aa	0.02	0.04	0.08	0.20	0.31	0.44	0.56	0.69	0.79	0.89	1.01	1.18	1.37	1.64	1.76	1.90	2.13	2.31	2.62	2.87
A	0.02	0.07	0.21	0.35	0.51	0.68	0.87	1.07	1.32	1.57	1.84	2.09	2.38	2.62	2.97	3.35	3.78	4.30	4.88	5.44
Baa	0.15	0.46	0.97	1.44	1.95	2.54	3.16	3.75	4.40	5.09	5.85	6.64	7.42	8.23	9.10	9.94	10.76	11.48	12.05	12.47
Ba	1.27	3.57	6.20	8.83	11.42	13.75	15.63	17.58	19.46	21.27	23.23	25.36	27.38	29.14	30.75	32.62	34.24	35.68	36.88	37.97
B	6.66	13.99	20.51	26.01	31.00	35.15	39.11	42.14	44.80	47.60	49.65	51.23	52.91	54.70	55.95	56.73	57.20	57.20	57.20	57.20
Caa-C	21.99	34.69	44.43	51.85	56.82	62.07	66.61	71.18	74.64	77.31	80.55	80.55	80.55	80.55	80.55	80.55	80.55	80.55	80.55	80.55
Investment Grade	0.06	0.19	0.38	0.65	0.90	1.19	1.50	1.81	2.15	2.15	2.51	2.89	3.30	3.72	4.15	4.60	5.08	5.58	6.55	6.96
Speculative Grade	4.73	9.55	13.88	17.62	20.98	23.84	26.25	28.42	30.40	32.31	34.19	36.05	37.83	39.44	40.84	42.37	43.67	44.78	45.71	46.58
All Corps	1.54	3.08	4.46	5.65	6.67	7.57	8.34	9.04	9.71	10.37	11.03	11.70	12.36	12.98	13.58	14.22	14.84	15.42	15.96	16.43

Source: Moody's

Conclusion

Clearly the topics we have discussed in this chapter are individually worthy of much more in-depth research. Our purpose in juxtaposing them in this chapter is to help investors gain insight into valuing corporate credit and select the most appropriate approach, or combinations of approaches, for a given situation. As we alluded to in our introduction to this chapter, these approaches each have their benefits and drawbacks, and we recommend that investors think about a given company along the three dimensions noted earlier to help decide which approach is best:

- Distance to default
- Leverage, or the ability to service debt from operations
- The management option to change the capital structure

Another issue which can dictate the usefulness of the various approaches is investor profile. In particular, it is important to distinguish those investors who are sensitive to mark-to-market fluctuations from those who are focused on absolute return to maturity. The latter may find the long-term signals provided by credit analysts, rating agencies, and quantitative models to be more important than the near-term risks priced into the market.

Finally, it is important to understand that credit investors, traders, and analysts do not have to select a single approach to value corporate credit as combinations of approaches may prove to be particularly insightful. For example, credit analysts could find structural models very useful in measuring the sensitivity of company valuations to changes in balance sheet items and cash flow projections. Similarly, investors and traders may combine analysts' projections for a company with structural models to understand the potential impact corporate actions could have on valuation. In conclusion, rather than idealistically selecting a single approach, we encourage market participants to understand all approaches and select the best method or combinations of methods for a given investment situation.

chapter 9 Libor Metrics

June 27, 2003

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Anisha Ambardar

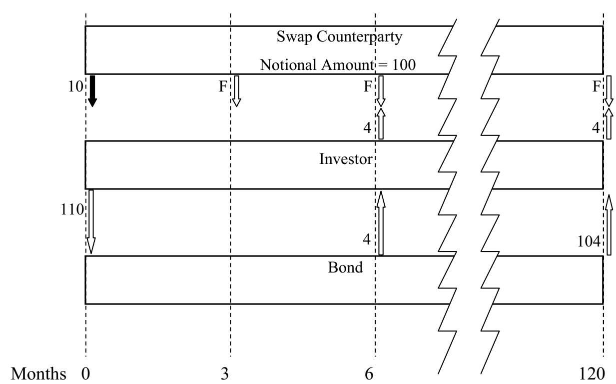
A combination of low spreads, high dollar prices and a steep yield curve has made relative value analyses difficult today, both within the universe of corporate bonds and between bonds and default swaps. Looking at bonds on a Libor basis is supposed to be the common denominator approach, but confusion persists. Using Libor spreads is a bit like the Metric System: everyone agrees that it is better, but it is hard to develop intuition for the measures when the market trades on Treasury spread and dollar price.

We focus on describing the various Libor spread measures in simple terms, recommend using the intuitive Z-Spread approach for relative value purposes (for both cash investors and derivatives users), and show some practical examples to illustrate relative value in an environment where a handful of basis points really matter.

FOUR LIBOR MEASURES

Four Libor spread measures are commonly used by market participants. Par and market value asset swaps are meant to be used by those doing real asset swaps (i.e., converting a fixed rate bond to a floating rate instrument), while interpolated swap curve spreads and Z-Spreads are relative value measures used by those who are focusing on fixed rate assets.

exhibit 1
Par Asset Swap – 8% 10-Year Bond Priced at $110



Note: The floating payment F equals Notional Amount(LIBOR + Spread) / 4.*
Source: Morgan Stanley

ASSET SWAPS

A par asset swap is the most common type of fixed for floating swap used by credit investors. If a bond trades at par, then the swap simply involves an exchange of coupon payments for floating rate Libor plus a fixed spread. When a bond trades at a premium, the swap becomes off-market, and there is typically an upfront payment from the swap counterparty to the investor to make up for the premium (see Exhibit 1).

A market value asset swap is less common and involves converting the fixed-rate bond into a floating rate note with par equal to the original bond's dollar price.

MAKING UP FOR UNACCOUNTED CREDIT RISK

While asset swaps are practical vehicles for converting fixed-rate bonds to floating rate, the "spread" over Libor paid out by the swap counterparty is not necessarily an accurate measure of the credit risk of the bond. This is even truer when there are upfront or residual payments.

In a par asset swap, the present value of all the periodic cash flows is equal to the premium or discount on the bond. This present value is calculated using the Libor term structure, while the premium on the bond is a result of cash flows, which are discounted using a credit-risky rate. As a result, asset swap spreads reflect the shape of the Libor yield curve but fail to fully incorporate the impact of the credit-risky nature of the bond cash flows. This mismatch in discount rates introduces a bias in the asset swap spreads, which is particularly acute for bonds with significant premiums or discounts, as well as bonds with wide credit spreads.

One point we want to make clear is that asset swaps are not incorrectly measuring credit risk. Indeed, the swap itself has no credit exposure (to the bond issuer) because all of the payments on the swap are due whether or not the bond defaults prior to maturity.

GOING BACK TO BASICS

For investors who are simply using Libor measures to make relative value decisions between bonds and/or default swaps, we consider two other measures more relevant. Both measures involve a common and intuitive practice, namely comparing a bond's yield or cash flows to a benchmark. An interpolated swap spread is one measure and is simply the yield to maturity of a bond minus the interpolated yield on the swap curve. This spread is termed I-Spread (or yield-on-yield spread by asset swappers).

I-Spread ignores the shape of both the Libor yield curve and the credit curve, and thus does not reflect any impact for the actual timing of payments. Two bonds with the same maturity and yield but different coupons (and thus different duration) would get the same I-Spread.

The second solution is to take a step back and think about bond basics. What investors require is a method to compare a series of risky cash flows to a risk-free yield curve that is not biased by dollar prices and coupons. An OAS model, using a zero Libor curve can solve this problem. However, OAS models build a tree of paths adding unnecessary complexity to a relatively simple problem.

CONVERGING ON Z-SPREAD

An OAS model with a zero volatility input can reduce the tree to a simple yield curve, which results in an intuitive price/yield type of calculation. Under this method, we calculate a fixed spread over a series of zero-coupon Libor rates that equates the price of the bond with the present value of the cash flows. We call this spread the Z-Spread, which one can think of as zero-volatility Libor OAS. Z-Spread may be easier to explain as an equation than in words. The general price/yield relationship of a credit-risky bond is as follows.

$$P = \sum_{i=1}^{n} \frac{BondPayments}{(1 + Yield_i)^i}$$

We can then decompose the yield into a Libor component and a spread component:

$$Yield_i = ZeroLibor_i + ZSpread$$

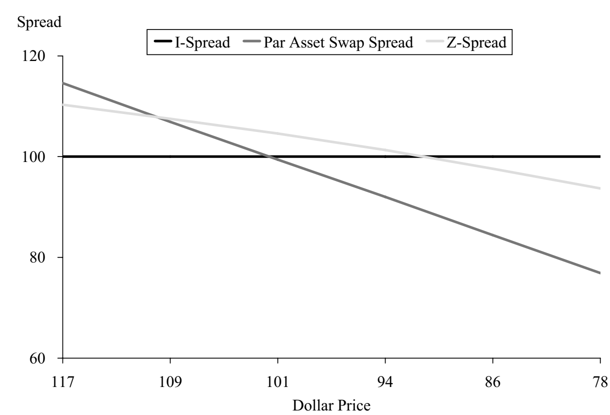
Solving for Z-Spread in the previous equation will give us the desired measure. This method has the advantage of not being biased by premium or discount bonds. It takes the shape of the Libor curve into consideration, but it assumes a fixed spread over all the Libor zero rates. More elaborate models that consider credit spread curves can be used, but they can confuse the issue when an investor's goal is relative value.

MEASURING SENSITIVITY

In Exhibit 2, we use a hypothetical example of a 10-year bond with a fixed yield of 10-year Libor + 100 bp. As we vary the coupon of the bond, we can observe the sensitivity of the Libor measures to changes in the bond's price. The Libor curve does not change in this example, so the I-Spread curve is (by definition) flat. The par asset swap spread curve is steep, implying that it is very sensitive to bond prices, while the Z-Spread is more flat (but not completely flat), demonstrating a more muted sensitivity to price changes.

exhibit 2

Measuring Spread Sensitivity to Price Changes



Source: Morgan Stanley

We highlight three points worth noting. First, at a par price, the asset swap spread and I-Spread are roughly equivalent. Second, the Z-Spread has an intuitive slope; however, it has "shifted" higher because of an upward sloping yield curve. The basis point "shift" increases with Libor curve steepness, absolute credit spread and maturity. Third, in today's high dollar price and steep yield curve environment, the spread measure with the largest "error" is the I-Spread metric.

REAL RELATIVE VALUE

A practical example of a relative value trade where the attractiveness of a transaction depends on the spread metric used comes from a Morgan Stanley Fixed Income Research June 17, 2003, report "Consuming Ideas." The report suggests selling May Department Stores' 2011 issue and swapping into Federated Department Stores' 2011 bonds. As rationale for the trade, the report cites Federated's lower leverage (Debt/LTM EBITDA of 1.8x versus 2.3x for May), as well as the fact that it has paid down debt and generates four times as much cashflow as May. This is a classic "up-in-quality" trade of the type we suggest investors should pursue in an environment of relatively undifferentiated, tight valuations.

exhibit 3 Comparing Valuations in a Trade Idea

		Treasury Spread	Asset Swap Spread	I-Spread	Z-Spread
Buy	FD 6.625 2011	T+80	96	84	93
Sell	MAY 7.45 2011	T+105	118	100	111
Difference		*-25*	*-22*	*-16*	*-18*

Source: Morgan Stanley

The pricing details of the trade are shown in Exhibit 3. The trade is a 25 bp give up on a spread to Treasuries basis, but a less onerous 18 bp give up on a Z-Spread basis (the par asset swap give up is 22 bp). While the numbers may not be that striking on the surface, we believe that, in a world where "nips for blips" is making a comeback in investor psyches, market participants should take note.

CONCLUSION

We recommend using the Z-Spread measure as a relative value tool, given its simplicity, intuitive feel and accuracy. We respect that a flat credit spread curve assumption is a shortcoming, but solving this problem may introduce more complexity than value. Finally, there are approaches to valuing bonds that are built on a risk-neutral framework, where premium bonds would suffer when recovery rate assumptions are fixed. While such an approach may be useful in an absolute return framework (such as in a synthetic CDO), they are less applicable to the day-to-day relative value world that many credit investors live in.

chapter 10 A Tale of Two Credit Markets

August 8, 2003

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Primary Analyst: Peter Polanskyj
Anisha Ambardar

We have an interesting story to tell. It may be not as literary as those of Charles Dickens, but it is certainly relevant to credit investors wondering what happened to corporate credit with all of the swap spread dynamics over the past several trading days. In a nutshell, the gigantic move in interest rates forced mortgage investors to hedge, which blew out swap spreads by 20-30 bp. Initially, corporate credit markets did not react, leaving many "spread over Libor" advocates kind of puzzled. Eventually credit markets moved (and maybe by too much), but the correction was forced by derivatives users, who were able to capitalize on the "dislocation." Spreads over Treasuries are now even wider than they were before the swap spread episode, leaving the ball in the "real money" court.

Market participants learned quite a bit during this process, and we argue that it is important to put this down in writing so that we don't forget (or get caught on the wrong side) the next time it happens.

IT WAS THE WORST OF TIMES

Everyone knows that mortgage-backed securities are prepayment sensitive instruments that are negatively convex and effectively "short" an option that is influenced by the level and volatility of Treasury rates. The historically significant move in Treasury rates over the past three weeks put this phenomenon in the spotlight and forced mortgage investors (and the agencies) to chase the market to readjust duration and battle the negative convexity of their instruments. As a result, swap spreads blew out by 20-30 bp, based purely on flows from these institutions.

IMMEDIATE REACTION: A TIME OF WISDOM OR FOOLISHNESS?

Credit instruments that are "linked" directly to Libor (floating rate paper, ABS and even agencies) became instantly cheaper versus Treasuries as swap spreads blew out, even though perceived "credit" risk in the financial markets did not really change. This cheapness occurred while fixed-rate corporate bonds remained stable on a Treasury spread basis and thus became rich to Libor. Credit default swaps did not move much, driving the basis (CDS minus cash bond Libor spread) significantly wider, into positive territory.

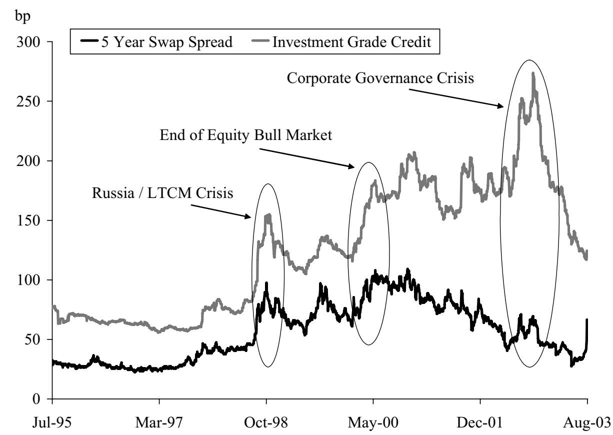
Flows in mortgages and other Libor products have subsequently driven swap spreads back down. This swap spread boomerang suggests that the recent swap spread widening was based on technical factors rather than fundamental changes in perceived risk.

THIS TIME IT WAS DIFFERENT

Turning the clock back, we note that many sharp moves in swap spreads were accompanied by severe moves in corporate credit spreads as well, generally without much of a lead or lag (see Exhibit 1). During those periods, corporate credit risk increased, and arguably the same fear that drove corporate spreads wider influenced swaps spreads as well.

exhibit 1

Strong Links in Times of Crisis



Source: Bloomberg, Salomon Analytics

Yet, the recent market activity is telling us that it was different this time. When swap spreads began moving wider (July 28, 2003), corporate bonds did not react. Effectively, corporates "rallied" versus swaps. If we were in a new swap spread regime, the rational trade would be to sell corporates outright or at least in favor of credit instruments that are "linked" to Libor. The idea behind this trade is that corporates would eventually catch up. "Real money" did not do this trade because, in our view, they did not feel that the swap spread move reflected increased systemic risk. It was hard to let go of those bonds based solely on a technicality, albeit a strong one.

This lack of action by corporate bond investors spurred a lot of discussion. Mortgage, agency and ABS investors wondered why corporates "still trade to Treasuries" while corporate investors wondered why they should care.

ENTER THE CREDIT DERIVATIVES MARKET: THE SPRING OF HOPE

Many credit derivatives users have been positioned in a "negative basis" trade. With bonds trading wider than default swaps, the trade of buying a bond and buying protection was a positive carry trade with offsetting credit risk.[1] While many participated in this trade, only those who put it on with an interest rate swap were able to capitalize on the swap spread move. With the lack of a move in corporate bonds, the basis (CDS minus cash bond Libor spread) widened dramatically and quickly. This move tempted those who put the trades on to take profits, which they did, in size. We feel that much of this flow came from the Street. The mechanics were simple: when swap spreads moved out dramatically, dealers sold bonds, unwound swaps (where they were paying fixed) and sold protection. These unwinds also had the impact of reducing balance sheet, which was generally welcomed by traders' bosses.

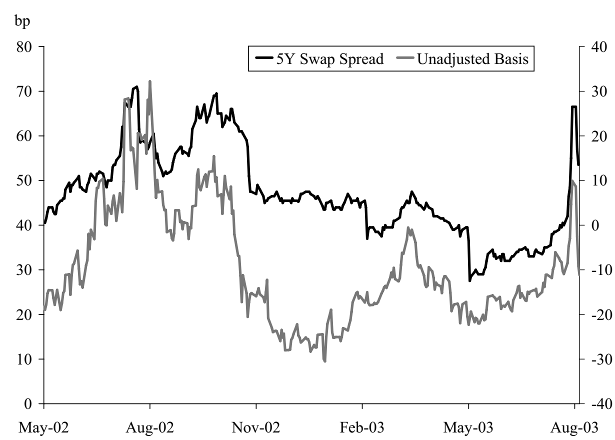
As a result of these flows, defaults swaps were unchanged to somewhat tighter, while bonds widened (versus swaps and Treasuries).

THE BALL IS IN THE "REAL MONEY" COURT

All of this action (or inaction) can easily be explained by the synthetic basis. Our adjusted basis for 88 names in the TRAC-X universe moved from -7 bp two weeks ago to +7 bp last week, back to -7 bp on Wednesday and further down since then (to -10 bp). The unwind of the negative basis trade has effectively pushed the basis back into negative territory as swap spreads rally. What does this mean? Corporate bonds are trading wider today than they did before the swap spread story unfolded. Who is going to step in and bring it back? We are not certain, but we think "real-money" has got to be tempted with current spread and yield levels. If you have been on vacation for the past two weeks, you are coming back to a world where corporate credit is a bit cheaper in cash form, all else being equal. Alternatively, credit derivative users may again position the "negative basis" trade to drive the markets into balance.

exhibit 2

The Basis Move



Source: Morgan Stanley, Bloomberg

[1] *Please refer to Chapter 22.*

LESSONS LEARNED: WE HAVE EVERYTHING BEFORE US

We learned both fundamental and technical lessons from this "event." The technical lesson is for those who want to do basis trades. A critical part of the trade is to use swaps (instead of Treasuries) to hedge the interest rate risk. The basis investor who uses Treasuries to hedge interest rate risk is taking an implicit exposure to swap spreads. Such a basis position would not have benefited from this swap spread move, and, in fact, the subsequent widening of bonds versus Treasuries and tightening of default swaps would have put the trade under water.

The fundamental lesson we learned applies to all credit investors. We argue that the link between corporate credit risk and Libor continues to be strong, and in fact is stronger today as a result of a liquid credit derivatives market. The action of the past few trading days demonstrates this powerfully, in our view. The swap spread move was technical in nature and clearly not about increasing systemic risk. Yet derivatives users were able to force the cash market to "re-couple" with Libor and then de-couple again as swap spreads rallied back. So the lesson for the pure cash investor is that while a swap spread move may not always be an indicator of a change in underlying risk, it can nevertheless impact the corporate bond market, given the linkage created by the credit derivatives market.

chapter 11 Making a Point – Upfront

September 19, 2003

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Anisha Ambardar

A year ago, single-name credit derivatives were in the spotlight, given the high levels of credit volatility, idiosyncratic risk and hedging activity. Market participants focused on flows and liquidity, and, when they could, thought about things like the value of restructuring and expected ISDA definitions. Today, with markets much quieter, we argue for more of a relative value play, and we encourage investors to brush up on the details, as doing so may define fourth quarter and 2004 opportunities.

We have addressed bond versus default swap trading strategies in previous research,[1] but one detail that continues to draw questions is the motivation and mechanics behind credits trading with "points upfront." We focus on this concept in a relative value framework, considering American Airlines unsecured protection the relevant example.

THE MECHANICS OF TRADING UPFRONT

When a credit is distressed, it often trades with points upfront. Dealers quote the CDS with a fixed premium (say 500 bp running) and then adjust for bid-offer and market movements with a points upfront quote. For example, American Airlines (AMR) unsecured protection to September 2013 currently trades at 39/44 points upfront plus 500 bp running (with no restructuring). The buyer of protection will pay 44% of notional upfront, and then pay 500 bp per annum until the protection maturity date, if there is no credit event to terminate the swap. The seller of protection receives 39 points upfront and 500 bp running. Why do credits trade with points upfront, and when does the market decide to change quoting conventions?

exhibit 1 AMR Bonds and Protection – Back of the Envelope Arbitrage Relation

Instrument	Maturity	Price/Points Upfront	Coupon	Principal Payment
Buy Protection	2012	(39)	(5%)	0
Buy AMR 9% 2012	2012	(Implied = 61)*	9%	100
Net Position	*2012*	*(100)*	*4%*	*100*

Note: Arbitrage relationship implies a $61 price for the AMR bond.
Source: Morgan Stanley

[1] *Please refer to Section C.*

MOTIVATION FOR TRADING UPFRONT – ARBITRAGE FORCES

The motivation and details behind a credit trading upfront has everything to do with arbitrage forces. A trader who bids protection on AMR may look for a cash bond to use as a hedge for the protection. The fixed rate bond “plus” the protection results in a default-risk free position; thus, the numbers need to add up, otherwise an arbitrage opportunity arises.

If we consider the AMR 9% of 2012 as a reference bond, the terms of the AMR protection begin to make sense. Given the protection pricing (the points upfront curve is flat from 2008 through 2013), if a trader can purchase the AMR bond for a hypothetical price of $61 (it doesn’t actually trade there– see below), then he or she has built a default-risk free position, more or less (see Exhibit 1). The combined bond and protection position results in an annual coupon stream of 4% (9% minus 5%), which is approximately equal to 10-year Libor. A 10-year credit-risk free instrument with fixed coupons equal to 10-year Libor should have a price near par, which is what the trader has effectively paid ($61 for the bond plus 39 points upfront for the protection).

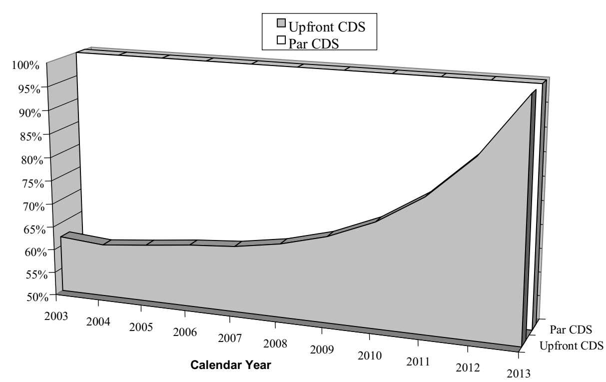
In theory, this market behavior should be true for any credit trading away from par, but in practice, market makers only demand upfront payments when there is a significant deviation, as that is when carry and the timing of cash flows begin to really matter. Clearly, they matter even more if the credit has a high probability of default.

DISCOUNT BONDS AND DEFAULT EXPOSURE

From Exhibit 1 we can see that selling protection with an upfront fee has the same economics as buying a bond at a discount. This risk profile is similar to a par bond with a coupon roughly equal to swaps + 2100 bp. Yet this coupon is not certain and the seller of protection therefore has a different default exposure than the seller who gets paid upfront. The exposure for the par CDS is nominally greater, initially, but it converges with the upfront trade over time (see Exhibit 2). While it is clear that the seller of protection on a par basis is taking more risk, he/she is compensated for that risk by the much higher coupon. To understand the nature of the increased coupon, consider that the PV of 1600 bp (the difference in coupons) is much greater than 39 points (the upfront CDS fee) when discounted at Libor; however, the two are equivalent when discounted at Libor plus 2100 bp.

exhibit 2

Less Near-Term Default Exposure: Upfront vs. Par CDS



Source: Morgan Stanley

AMR – UPFRONT RELATIVE VALUE

Going back to the AMR example, although the “arbitrage free” price of the 9% of 2012 is $61, the bonds actually trade much richer (75½/77½). We attribute this richness to important technicalities, including difficulty shorting the bond and demand from bond investors for the “optionality” associated with American Airlines surviving.

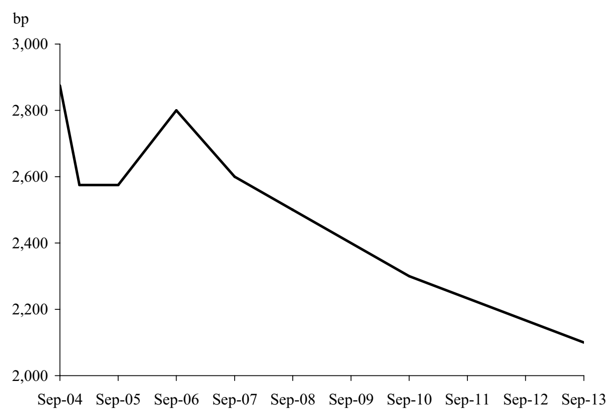
Given this implied richness, are there others ways of betting that AMR survives?

exhibit 3 AMR Protection Curve

Protection Date	Bid/Offer (Points Upfront)	Bp Running	Implied Par Spread (bp, bid side)
9/2004	19/24	500	2,875
1/2005	22/27	500	2,575
9/2005	27/32	500	2,575
9/2006	37/42	500	2,800
9/2007	38/43	500	2,600
9/2008	39/43	500	2,500
9/2010	39/44	500	2,300
9/2013	39/44	500	2,100

Note: Implied spread assumes 40% recovery.
Source: Morgan Stanley

exhibit 4 AMR Protection – Implied Par Spread Curve



Source: Morgan Stanley

The AMR protection curve (Exhibits 3 and 4) is generally inverted (as one would expect for a distressed credit, given equal claim at default). The trough in the curve around the January 2005 date is based on demand to sell protection to this date, which matches the expiration of long-dated equity options (LEAPS). We can take advantage of this technicality to implement a positive view on AMR through forward credit risk. For investors who believe that AMR will survive in the long run if the company survives in the near-term, one can implement this view by buying short-dated protection and either buying a long bond or selling long-dated protection. However, while economically similar in terms of credit risk, the payoffs in these two trades are vastly different (see Exhibit 5).

exhibit 5 AMR Forward Credit Risk Trades

	Price/Points Upfront	Coupon/ Premium	Coupon Period
Trade 1			
Buy 1/2005 Protection	(27)	(500)	
Buy AMR 9% 8/2012	(77.5)	L+923	
Net (Default before 1/05)	(0.27)		
Net (Default after 1/05)	(100.27)		
Net (No Default)		423	Before 1/05
		L+923	After 1/05
Trade 2			
Buy 1/2005 Protection	(27)	(500)	
Sell 9/12 Protection	39	500	
Net (Default before 1/05)	12		
Net (Default after 1/05)	(88)		
Net (No Default)		0	Before 1/05
		500	After 1/05

Note: Implied spread assumes 40% recovery.
Source: Morgan Stanley

The first trade (buy protection, buy bond) is positive carry for the period through January 2005 (+423 bp by our estimates). If default occurs before January 2005, there is also a net loss of at least 0.27 points (a gain of 22.5 on delivery of the bond into the default swap minus 27 points paid upfront minus the value of the carry). If default occurs afterward, the seller must pay par, so the net loss is par plus 4.5 points minus the value of the carry (equals roughly 100.27 assuming 0% recovery through 2/2005).

The second trade (buy short-dated protection, sell long-dated protection) looks much different and is more attractive in a default scenario. The net carry through January 2005 is zero and there is an upfront positive payout of 12 points. If default occurs before January 2005, the swaps offset, and the investor keeps the 12 points plus any interest on that amount. If default occurs after 1/05, the net loss is 88 assuming 0% recovery.

The fact that the payouts of two “similar” AMR strategies are so different is worthy of examination and is driven by technicalities in cash and derivatives markets. We urge investors to keep the magnifying glass handy in this environment, since understanding the details can be rewarding.

chapter 12 Merton vs. the Market

September 26, 2003

Primary Analyst: Sivan Mahadevan
Primary Analyst: Peter Polanskyj
Mohsin Naqvi
Anisha Ambardar

In 2002, market participants focused on avoiding the next credit blowup at any cost, and many used information from the equity markets as early warning signals to hedge out risk. Merton-based models, including Moody's KMV, were in vogue as investors closely examined the results of quantitative models and contemplated their role in fundamental credit analysis.[1]

With spreads where they are today, and volatility dropping like a rock, we hear very little about signals from Merton-type models, although we still believe that investors look at the numbers as part of their routine portfolio analyses. What is Moody's KMV telling us today? Many of our credit analysts feel that the market has run ahead of fundamentals in their respective sectors. Are the models saying the same thing? We take a closer look in this chapter and conclude that for a broad measure of the market, the 2003 move in CDS premiums appears surprisingly consistent with Moody's KMV results. However, there is some interesting dispersion across and within sectors, which we argue is good relative value information.

THE BASIC SIGNALS

A basic familiarity with Merton-like credit models is sufficient to conclude that such predictors of default are going to be much lower today than they were at year-end or a year ago. For a universe of 120 investment grade credit issuers that actively trade in the default swap market (see Exhibit 1), we measure a 9-point drop in implied equity volatility and a 13% rise in stock prices this year. These are the two key drivers of EDF™ measures (assuming no change in corporate fundamentals), so it is no surprise that these default probability measures have fallen over 40 bp for this universe this year, in line with the 74 bp rally in spreads.

exhibit 1 Merton vs. the Market – Surprisingly Consistent

	Current	12/31/2002	9/30/2002	YTD Chg	1 Yr Chg
CDS Premium (bp)	78	152	211	-74	-134
Mkt Imp Def Rate (%)	1.3	2.5	3.2	-1.2	-1.9
Imp Equity Volatility (%)	32.6	41.4	54.9	-8.8	-22.3
Equity Return (%)				13.1	18.7
Moody's KMV EDF (%)	0.41	0.83	0.93	-0.42	-0.52
Mkt Imp Def Rate/EDF	*3.1*	*3.1*	*3.5*	*0.1*	*-0.3*

Note: Universe of 120 equally weighted issuers.
Source: Morgan Stanley, Moody's KMV

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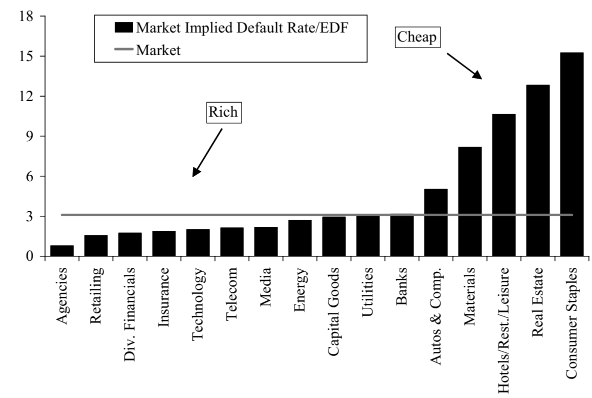
[1] *Please refer to Chapter 8.*

This move in CDS premiums and EDFs is consistent if we consider the ratio of market-implied default rates (Premium/(1-RecoveryRate)) with EDFs. This ratio stands at 3.1 today, the same level it was at year-end, assuming a constant recovery rate across all issuers (it was 3.5 one year ago). While we find it amazing that such a strong move in spreads was "consistent" with the move in EDFs, there is some dispersion around this 3.1 average multiple, which is where the real relative value can be uncovered.

exhibit 2

Sector Dispersion – Market Implied vs. Moody's KMV



Source: Morgan Stanley, Moody's KMV

exhibit 3 Volatility and Equity Returns Drive the Relationships

	Implied Equity Vol (%)	YTD Stock Return (%)	EDF (%)	Mkt Imp Def Rate/EDF
Agencies	31.9	-1.3	0.50	0.8
Autos & Components	47.2	11.8	0.81	5.0
Banks	27.2	18.3	0.19	3.2
Capital Goods	29.6	9.5	0.28	2.9
Consumer Staples	26.7	2.8	0.09	15.3
Div. Financials	32.2	35.7	0.41	1.7
Energy	29.0	6.3	0.29	2.7
Hotels/Rest./Leisure	34.7	35.3	0.29	10.6
Technology	43.3	21.2	1.06	2.0
Insurance	31.7	12.6	0.34	1.9
Materials	34.2	11.0	0.24	8.2
Media	34.0	9.9	0.46	2.2
Real Estate	25.8	19.4	0.06	12.8
Retailing	33.8	42.1	0.37	1.5
Telecom	35.7	-6.0	0.46	2.1
Utilities	25.0	8.1	0.51	3.0
Full Universe	32.6	13.1	0.41	3.1

Source: Morgan Stanley, Moody's KMV

A SIMPLE LOOK AT SECTORS

In Exhibit 3, we show by sector the key drivers of Merton model valuations (equity volatility and stock returns). For sectors that are significantly away from the 3.1

average ratio of market-implied default rates and EDFs, we have highlighted several interesting credits in Exhibit 4. Lower equity volatility and/or higher stock returns will move EDF measures lower (all else being equal). If market-implied default rates (implied from spread) do not move consistently, then credits can appear rich or cheap when comparing the two values.

exhibit 4 Market-Implied and EDFs Disconnection – What's Rich or Cheap?

	Implied Equity Vol (%)	YTD Stock Return (%)	Mkt Imp Def Rate/EDF	Model View
Retail				
Federated Department Stores	32.5	48.4	2.4	Rich
Nordstrom	31.4	34.5	1.4	Rich
May Dept	33.5	7.5	2.7	Rich
Target	34.0	30.4	2.0	Rich
Technology				
Hewlett-Packard	42.7	10.9	0.4	Rich
Dell Computer	29.6	26.9	0.7	Rich
Computer Science	38.0	8.4	0.8	Rich
Motorola	45.9	44.9	1.2	Rich
IBM	26.8	15.4	4.2	Cheap
Applied Materials	48.7	43.3	4.5	Cheap
Arrow Electronics	49.6	45.0	4.2	Cheap
Avnet Inc	51.7	57.2	5.0	Cheap
Telecom				
Citizens Communications	47.1	8.3	1.1	Rich
SBC Communications	28.6	-18.7	1.8	Rich
AT&T Wireless	58.8	48.8	1.8	Rich
Energy				
Transocean	43.2	-14.8	1.1	Rich
Anadarko Petroleum	37.6	-11.6	1.2	Rich
Nabors Industries	35.4	7.2	1.5	Rich
Baker Hughes	33.5	-5.7	1.8	Rich
ConocoPhillips	17.9	14.0	7.8	Cheap
Occidental Petroleum	20.6	23.0	6.9	Cheap
Unocal Corp	23.8	3.0	6.7	Cheap
Autos & Components				
Ford Motor Co	43.3	19.9	11.7	Cheap
General Motors	33.5	10.7	13.3	Cheap
Visteon	81.2	-2.9	2.1	Rich
Delphi	50.0	15.9	2.3	Rich

Source: Morgan Stanley, Moody's KMV

RETAIL IS RICH

Retail issuers, dominated by department stores in our universe, are rich by these measures, with market-implied default rates only 1.5x EDF values today, despite above-average stock returns. The CDS/cash basis for these names is more negative than the market, suggesting that default swaps have run ahead of bonds, further supporting the buying protection argument.

TELECOM AND TECHNOLOGY

Selected technology names look rich by these measures as well, and they are again dominated by low spread names including Hewlett-Packard, Dell Computer, Computer Science and Motorola. IBM and Applied Materials appear more attractive, though, driven by low implied volatility for the former and higher stock returns for the latter, despite their tight CDS premiums. Arrow Electronics and Avnet Inc. appear cheap, as well, driven mainly by spread levels. In telecom, a combination of low stock returns (SBC) and high implied volatility (Citizens and AT&T Wireless) keeps EDF values high, making the credits rich on a model basis.

ENERGY RELATIVE VALUE

The energy sector, which is very tight on an absolute basis in CDS, is modestly rich relative to the market according to the model, but with a lot of dispersion. At the richer end are Transocean, Anadarko Petroleum, Nabors Industries and Baker Hughes (all driven by the lethal combination of low stock returns and high implied volatility). Credits that come up cheap by this metric include ConocoPhillips, Occidental Petroleum and Unocal Corp, with low implied volatility being a key driver.

AUTOS AND CONSUMER STAPLES

Ford and GM both look cheap on this model basis, which we attribute to wide spreads, combined with above-average equity performance for Ford and tame implied volatility for GM. The suppliers (Visteon and Delphi) come up rich, though, as significantly higher levels of implied volatility and stock underperformance drive EDF values higher. Consumer staples credits are surprisingly cheap per the model, but this is driven by incredibly low EDF values, which are in turn driven by a big drop off in implied equity volatility.

WHAT DOES ALL THIS MEAN?

Many would argue that it is not easy to compare valuations from a risk-neutral world (where default risk is derived from spreads) and the Merton (or structural) world. Yet we are doing so anyway because we believe investors need to synch-up the two worlds occasionally, as both approaches are used in the investment process. The Merton methodology is popular in the single-name world, but investors ultimately are motivated by spread, so we think the simple comparisons make for interesting relative value information.

There is an important disconnect between the single-name world and structured credit products (tranches and options), where risk-neutral approaches are employed to evaluate default risk. For the market at large, structured credit investors should be comforted by the consistency in the move in both worlds. However, the relative richness or cheapness of credits when cross comparisons are made should not go unnoticed by structured credit investors when making investment decisions.

chapter 13 The Senior Sub Divide

October 17, 2003

Primary Analyst: Sivan Mahadevan
Primary Analyst: Peter Polanskyj
Anisha Ambardar

Capital structure arbitrage continues to be a popular topic of discussion among credit investors, particularly in the hedge fund world. Many are excited by the opportunities in trading debt versus equity, which we consider to be the core aspect of this emerging art.[1] Yet, probably much simpler, though less talked about, are methodologies and opportunities in the debt capital structure of a company. Senior versus subordinate, secured versus unsecured, and parent company versus subsidiary relationships are tempting trades to put on, but we often wonder what the right levels are.

We do not have all of the answers, but there are simple ways to look at these relationships if we marry some aspects of fundamental credit knowledge with the risk-neutral models of default. We lay out a simple framework and also discuss some existing relationships in the market.

DEBT CAPITAL STRUCTURE ARBITRAGE

There are three simple dimensions in any debt capital structure relationship for the debt classes or issuers.

1. Default likelihood;
2. Recovery assumptions;
3. Spread relationship.

If we assume for a moment that we live in a risk-neutral world where default likelihood is explained completely by spreads, then we can use some basic algebra and simplifying assumptions to establish the relationships between these dimensions.

In many debt capital structure relationships, a default event in one class or issuer implies a default event in the other. In some cases, default swap contract language makes this clear; in other cases it may simply be the view of an investor or analyst.

A BASIC FRAMEWORK

Using the above assumption on default triggering, we can boil down senior and subordinate relationships to spreads and recovery rates, where one is implied from the other. In the risk-neutral world, there is a triangular relationship between default probability, spread and recovery rates.

$$Default\ Probability = \frac{Spread}{(1 - RecovRate)}$$

[1] *Trading Credit Spread vs. Equity Volatility*, Viktor Hjort and Emmanuel Hauptmann, October 17, 2003.

As we described above, if we assume that a credit event in one part of the capital structure triggers a credit event in the other, then we can ignore default probability (since it is the same for both) and focus instead on spread and recovery rate relationships. So, the senior versus subordinate relationship would be as follows:

$$RecovRate_{Sub} = 1 - \frac{Spread_{Sub}}{Spread_{Senior}} * (1 - RecovRate_{Senior})$$

exhibit 1 Implied Recovery Rates – Negative Levels Tell You Somebody's Wrong

	Sub Basis (% of senior spread)						
Senior Recovery	**40%**	**60%**	**80%**	**120%**	**160%**	**240%**	**420%**
20%	-12%	-28%	-44%	-76%	-108%	-172%	-316%
30%	2%	-12%	-26%	-54%	-82%	-138%	-264%
40%	16%	4%	-8%	-32%	-56%	-104%	-212%
50%	30%	20%	10%	-10%	-30%	-70%	-160%
60%	44%	36%	28%	12%	-4%	-36%	-108%
70%	58%	52%	46%	34%	22%	-2%	-56%
80%	72%	68%	64%	56%	48%	32%	-4%

Source: Morgan Stanley

What does this mean practically? In Exhibit 1 we illustrate the implied recovery rate in a hypothetical subordinate instrument, given a recovery assumption for the senior instrument and the spread relationship (in percentage terms) between the two instruments. For credits with a large difference in spread (or basis) between capital structure components and very low recovery rates (given default), the difference in spread levels among different parts of the capital structure have the most dramatic implications. With a floor on actual recovery of zero, implied recoveries less than that indicate relative mispricing in the marketplace between the two parts of the capital structure. In other words, somebody's wrong.

SENIOR VS. SUB – FREDDIE MAC

To illustrate this point, we examine the recent spread relationship in the 5-year CDS market for Freddie Mac senior and subordinate protection (see Exhibit 2).

exhibit 2 Freddie Mac Senior vs. Sub – Market Implies High Senior Recovery

Senior Recovery	Senior Mid	Sub Mid	Implied Sub Recovery
20%	25	50	-60%
30%	25	50	-40%
40%	25	50	-20%
50%	25	50	0%
60%	25	50	20%
70%	25	50	40%
80%	25	50	60%

Source: Morgan Stanley

With a 25 bp difference in spread between the two, the market is telling us that, in the unlikely scenario that a credit event occurs, recovery for the senior debt must be higher than 50% (the first recovery rate where the sub debt has a non-negative recovery rate).

Technical factors clearly affect the market for agency protection and many argue that default is so unlikely that the protection trades like an option on the financial sector of the market. Yet market pricing expresses the view of a large difference in recovery between the two, in the unlikely event of default. For investors with a different view, the absolute low senior spread level and large senior-subordinate basis leads naturally to a trade getting long subordinate credit risk versus senior credit risk. However, we would caution that this spread differential can be very technical and could widen further during times of stress.

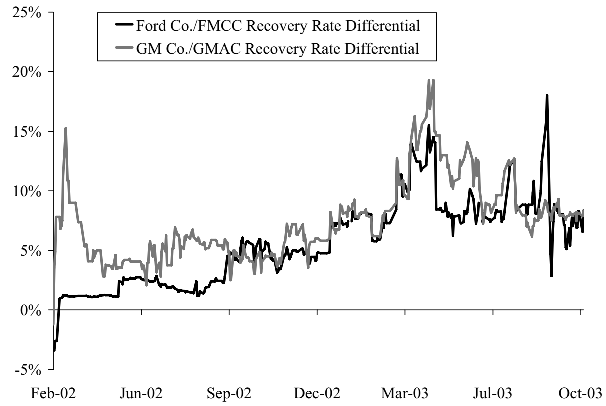
FORD/GM: COMPANY VS. CAPTIVE FINANCE SUBS

Implied recovery rate differentials between parent company and captive financial subs for Ford and GM have moved in a wide range over time (ranging from less than 5% to nearly 20% over the past 18 months; see Exhibit 3). We view this as a good base case, given how much attention market participants give to these spread relationships. There is no general agreement on how recovery would be treated during bankruptcy.

The consolidated claim view would suggest selling Ford or GM company protection versus buying FMCC or GMAC protection. The opposing view would support the reverse trade because that view implies a large recovery difference during bankruptcy, whereas the current market implies less than 10%.

exhibit 3

Ford and GM – Implementing a View on Consolidation During Bankruptcy



Source: Morgan Stanley

SECURED VS. UNSECURED – AMR

Airline investors are certainly accustomed to considering investment opportunities from a recovery rate perspective. We find an interesting opportunity in AMR EETC bonds versus AMR protection when we apply this basic framework. AMR unsecured protection trades at 28/32 points upfront and 500 bp running to a December 2008 expiration (and beyond). The AMR 7.377% of May 2019 EETC is an amortizing security secured by aircraft (it is a B tranche). If we use the framework to compare this protection and bond (priced $69/$73), we find that, assuming 0% recovery for unsecured debt, the implied recovery on the EETC security is approximately 20% to 30%. Doug Runté, our airlines analyst, estimates recovery on this EETC at 70% on a probability-weighted basis.

WHAT ARE WE IGNORING? RISK-NEUTRAL VS. REAL WORLD

Corporate management has the option to change capital structures. Measuring both the likelihood and magnitude of these changes is a critical part of fundamental credit analysis, and a strong view on these changes will drive senior versus subordinate relationships, more so than our simple framework above.

Yet, even when the likelihood of capital structure changes is low, relationships often trade away from the implied levels described above because investors focus on (and are often obsessed by) technical factors. Trading against technical factors can be a painful proposition, but we encourage investors with strong fundamental views on default and recovery treatment to step forward.

chapter 14 Equity Indicators – Is the Tail Wagging the Dog?

February 27, 2004

Primary Analyst: Sivan Mahadevan
Primary Analyst: Peter Polanskyj
Anisha Ambardar

For most of 2003, equity market indicators were largely consistent with credit spread moves, even though their synchronization may not have been perfect. Yet, since the latter part of 2003 and into this year, the so-called Merton-based models have run well ahead of credit spreads (in particular, default swap premiums). However, while equity market indicators may be forecasting less default risk on average, the distribution of this risk is much more disperse when measured by Merton models compared to actual credit spreads. This disagreement argues for careful credit selection and uncovers some interesting relationships, in our view. In particular, many technology and media names come up rich (driven by higher equity volatility), while basic industrials look cheap.

The bigger question, though, is why the two markets diverged in the first place. Corporate bond markets have outperformed default swaps this year, so the equity and credit divergence is less stark if we consider cash instruments instead of default swaps. As such, today's positive basis between cash bonds and default swaps explains at least some of the divergence, and we review the key drivers of this widening basis, as well.

THE EQUITY MARKET INDICATORS

Merton-based models are driven by three main company-specific factors: debt levels and terms, asset value (which is related to equity market capitalization), and equity volatility. For those not familiar, the EDF™ measure from Moody's KMV is an implementation of this model, and represents a company's default probability for a specific term (one year is the most common). If we compare these default probability measures to those implied by market spreads (in a risk-neutral framework), we can get a sense of the relationship of these two approaches. Through the first three quarters of 2003, the rally in the credit markets was largely in sync with changes in EDFs.[1]

[1]*Please refer to Chapter 12 for a detailed study on 120 investment grade credits.*

exhibit 1 The Equity/Credit Divergence

	Current Level	Dec 31, 2003	Sep 30, 2003
S&P 500	1146	1112	996
VIX	14.7	18.3	22.7
TRAC-X NA II (bp)	66	55	73
Inv Grade Corporates – ZSpread (bp)	80	80	97
Moody's KMV EDF (%)	0.16	0.19	0.29
Mkt Implied Def Rate (%)	0.77	0.67	0.88
Mkt Implied Def Rate/EDF	5.4	3.9	3.4

Source: Morgan Stanley, Bloomberg, MSCI, Moody's KMV

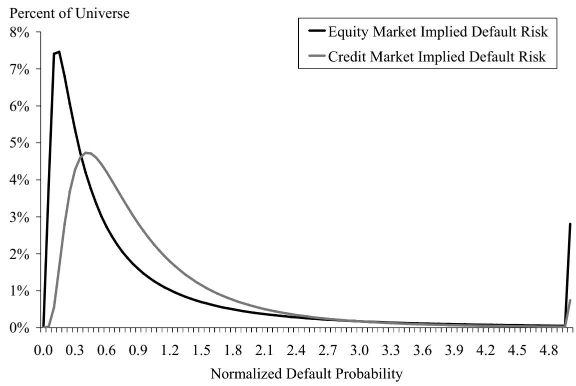
Yet, since the latter part of 2003, the divergence is clear. Default swap premiums are wider (with increased volatility), while equity markets have continued their good performance with falling volatility, on average. The disconnection is evident in our default probability ratio, which we define as the market-implied default rate (derived from spreads) divided by the EDF. The median default probability ratio has risen from about 3.4 to 5.4 since the end of September (for a 160-name universe). If you believe that equity market indicators are a comprehensive measure of default risk, then credit is much cheaper today than it was a few months ago. In fact, it would take an immediate credit rally of 28 bp (with no equity market movement) to reach the September equity-credit relationship level.

RISK DISTRIBUTION – THE TAIL WAGGING THE DOG?

While equity markets may be forecasting less credit risk, on average, than the credit markets, the distribution of this risk is more disperse when measured by the equity market indicators. We argue that this should temper any immediate bullishness. Said another way, the equity markets tell us that credit selection is important, while credit market spreads tell us that credit is more homogeneous. This finding is illustrated in Exhibit 2, where we have plotted the normalized distributions of both equity market indicators and CDS implied default probabilities. The more tempered shape of the CDS distribution is evidence of the relative lack of credit differentiation in our market. We can gain insight by examining both the rich and cheap tails of this distribution.

exhibit 2

Equity Indicators – Less Default Risk, but More Dispersion



Source: Morgan Stanley, Moody's KMV

THE RICH TAIL

In our 160-name universe, the median ratio of market-implied default rates to EDFs is 5.4, but we find 21 credits with a ratio of less than 2.0 (which is still much lower than the September 2003 level, see Exhibit 3). Effectively, these credits are relatively rich when compared to the risk implied by the equity markets, per the Merton approach.

Interestingly, while tight-trading credits would naturally get classified as rich by this approach, only a handful of such names exist in the tail (financials and a few technology companies, like Dell and Hewlett Packard). Many of the rich credits are dominated by high equity volatility (Sun Microsystems, Delphi, Visteon) or low equity returns (Williams Companies, Viacom, Solectron). Also, the media sector is over-represented, which we can attribute to higher equity volatility based on M&A risk. The only strong disagreement with our analyst recommendations is in Delphi, which, again, is driven by both equity volatility and sub-par stock performance.

THE CHEAP TAIL

We identify a cheap tail by selecting those credits with market-implied default to EDF ratios in excess of 11.0 (see Exhibit 4). A strong theme in this list is the basic industrials bias in particular paper companies. Low equity volatility, strong equity performance and debt paydowns are all drivers of the lower EDF values.

Other interesting credits on this list include General Motors (driven both by wide spreads and low equity volatility) and several credits in the consumer staples and energy sectors (despite tight spreads).

WHY THE DIVERGENCE? – THINK ABOUT THE BASIS

While we have provided some relative value food for thought, there is still the bigger question as to why this dislocation occurred in the first place. Our analysis is based on default swap premiums, and the wider basis today partly explains the divergence of equity and credit markets. So why has the basis turned positive? There are four key drivers, in our view.

1. Trading volumes in CDS indices are large and are having an ever-important impact on default swap premiums, but not necessarily the cash markets. Furthermore, CDS indices are increasingly becoming a common tool to reduce credit exposures in "real money" portfolios, particularly in a slow new issue environment.

2. A good portion of the buying of protection in index products has been structured-credit related. This is an interesting twist because in the old days, the CDO bid was always one-way. Today, interest in using correlation products to short credit is significant enough to have an impact on market spreads. Senior tranches, like the much discussed 3-100% trades, have been drivers.

3. The 5s-10s credit curve in default swaps has steepened about 6 bp (to 17 bp mid-market) over the past several weeks, while the cash credit curve (on a Libor basis) has not. With much of the basis activity involving bonds that are longer than five years, the steeper default swap curve forces the basis wider.

4. Finally, swap spread movement, when it is driven by the interest rate and mortgage markets, impacts the basis, largely because fixed-rate corporate bonds do not readjust Libor spreads.[2] As such, the modest recent widening in both five and 10-year swap spreads has been a driver of a widening basis as well.

In a nutshell, the equity and credit divergence is an interesting relationship to test, in our view, and the widening basis between cash and default swaps offers at least a partial technical explanation for the lack of co-movements.

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[2] *Please refer to Chapter 10 for more details.*

exhibit 3 The Rich Tail of Credits, Per Equity Market Indicators

Credit	Industry	Mkt Imp Def Rate/EDF	5 Year CDS (bp)	Implied Equity Vol	Equity Return (Since 9/03)
Delphi Corp	Automobiles and Components	1.8x	100	35.7	11.4%
Visteon Corp	Automobiles and Components	1.8x	203	51.8	53.6%
Goodrich Corp	Capital Goods	1.4x	63	32.4	22.5%
Capital One Financial Corp	Diversified Financials	1.1x	60	36.5	24.1%
Citigroup Inc	Diversified Financials	1.4x	21	19.9	9.5%
JP Morgan Chase & Co	Diversified Financials	1.6x	24	20.6	17.5%
Hewlett-Packard Co	Information Technology	0.7x	24	30.8	17.5%
Sun Microsystems Inc	Information Technology	0.7x	75	56.8	56.2%
Solectron Corp	Information Technology	0.9x	280	69.5	5.1%
Computer Sciences Corp	Information Technology	1.6x	40	30.1	9.1%
Dell Inc	Information Technology	1.7x	16	24.3	-0.4%
MetLife Inc	Insurance	1.9x	25	19.9	24.1%
Viacom Inc	Media	0.2x	47	29.7	1.8%
Interpublic Group of Cos Inc	Media	1.6x	140	35.1	19.7%
Time Warner Inc	Media	1.8x	73	29.5	15.6%
Sears Roebuck and Co	Retailing	0.7x	42	28.5	6.4%
Williams Cos Inc	Telecommunication Services	1.0x	250	49.8	-2.2%
Lucent Technologies Inc	Telecommunication Services	1.6x	340	55.1	91.2%
Centerpoint Energy Inc	Utilities	0.7x	178	37.6	13.4%
Duke Energy Corp	Utilities	1.1x	43	23.8	22.0%
Sempra Energy	Utilities	1.9x	35	22.1	7.9%

Source: Morgan Stanley, Bloomberg, Moody's KMV

exhibit 4 The Cheap Tail of Credits, Per Equity Market Indicators

Credit	Industry	Mkt Imp Def Rate/EDF	5 Year CDS (bp)	Implied Equity Vol	Equity Return (Since 9/03)
General Motors Corp	Automobiles and Components	11.3	177	25.9	17.1%
Northrop Grumman Corp	Capital Goods	11.4	41	18.7	18.3%
Kroger Co	Consumer Staples	11.7	49	28.8	7.1%
Kraft Foods Inc	Consumer Staples	28.3	35	19.2	12.7%
Altria Group Inc	Consumer Staples	37.5	135	22.7	30.2%
General Mills Inc	Consumer Staples	38.3	46	17.1	-2.6%
Ashland Inc	Energy	13.0	70	23.2	44.0%
ConocoPhillips	Energy	16.1	29	18.4	25.8%
Occidental Petroleum Corp	Energy	27.5	33	20.6	25.9%
MGM Mirage	Hotels Restaurants and Leisure	16.7	140	27.4	21.2%
Hilton Hotels Corp	Hotels Restaurants and Leisure	19.7	120	29.5	-1.3%
Starwood Hotels & Resorts Worl	Hotels Restaurants and Leisure	22.2	165	26.6	11.1%
Georgia-Pacific Corp	Materials	11.3	215	33.3	30.0%
Temple-Inland Inc	Materials	13.9	82	23.6	33.1%
Dow Chemical Co/The	Materials	14.3	42	23.5	34.4%
International Paper Co	Materials	16.7	65	21.0	13.8%
Phelps Dodge Corp	Materials	18.3	57	38.1	82.0%
Praxair Inc	Materials	18.3	21	23.1	19.0%
Newmont Mining Corp	Materials	20.0	37	35.7	11.3%
Weyerhaeuser Co	Materials	20.0	65	21.1	11.3%
Bowater Inc	Materials	27.8	255	29.6	7.3%
Boise Cascade Corp	Materials	50.0	200	32.0	20.7%
COX Communications Inc	Media	17.2	67	27.4	3.3%
Simon Property Group Inc	Real Estate	30.0	36	19.5	24.0%
Verizon Communications Inc	Telecommunication Services	13.9	52	24.7	17.2%
FedEx Corp	Transportation	15.0	43	21.9	6.4%
Dominion Resources Inc/VA	Utilities	11.4	49	15.0	1.4%
Kinder Morgan Inc	Utilities	16.7	40	18.9	13.0%

Source: Morgan Stanley, Bloomberg, Moody's KMV

chapter 15 Recalibrating Relative Value

October 15, 2004

Primary Analyst: Sivan Mahadevan
Primary Analyst: Peter Polanskyj
Primary Analyst: Ajit Kumar, CFA
Andrew Sheets

Perhaps we have been too obsessed with this topic recently, but we continue to argue that the technical factors responsible for much tighter spreads over the past two months have had a significant impact on relative value relationships, as well. The basis between corporate bonds and default swaps has collapsed to near zero, if we use straight Libor spread measures, and has turned negative (bonds trade wider) if we take into consideration the steep nature of today's credit curves. We find it equally interesting that, while credit market movements have been synchronized with changes in equity volatility for most of the year, there has been an important disconnection more recently. Moreover, for those who like to look at the world from a Merton perspective, equity-market implied default rates continue to be quite low, and tighter spreads have now forced credit-market implied default rates a bit closer to what the Merton models are saying.

In our experiences, whenever there is a large amount of risk introduced into or removed from financial markets over a short time period, there are usually some reasonable relative value opportunities afterward. The challenge, though, is deciding whether the flows are a one-time or recurring event. As long as investment alternatives to credit (i.e., interest rates and equities) remain uninteresting and new issuance is light, we expect demand for credit (and levered credit) to remain strong, so we would not encourage leaning against the flow in a major way. Yet we cannot discount the amount of long/short money in our markets, and the temptation to short credit at today's levels is a strong one, even if this was a modestly painful experience earlier in the year.

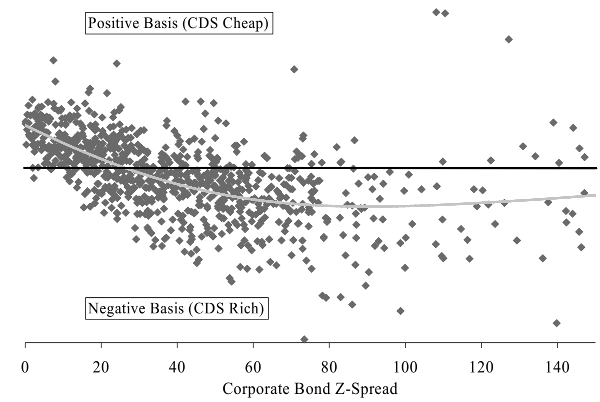
From a relative value perspective, we find some themes in today's markets noteworthy. First, the credit rally has forced even more spread compression in default swap premiums over cash bonds. When comparing default swaps to bonds, the richest part of the derivatives market include the higher-beta investment grade names, which have been commonly thrown into synthetic structures. For those who can trade the basis, or choose between both markets when putting money to work, this recalibration of relative value can be a good source of medium-term performance. Second, as we hinted above, there are some interesting structural changes in debt-equity relationships at very tight spread levels, like today's.

VISUALIZING THE CREDIT RALLY – HIGH BETA GRAB?

The structured credit bid continues to be one of the most popular items for discussion in the credit markets. Many investors have wondered whether there is a certain bias to the bid, as it has been very hard to keep track of all of the flows. We experimented with quite a few ways of measuring the impact, and have determined that a comparison of a fair value basis with corporate bond spreads (see Exhibit 1) best highlights the nature of this flow.

exhibit 1

High Beta Grab in High Grade – Default Swaps Richer to Cash at Higher Spreads



Source: Morgan Stanley

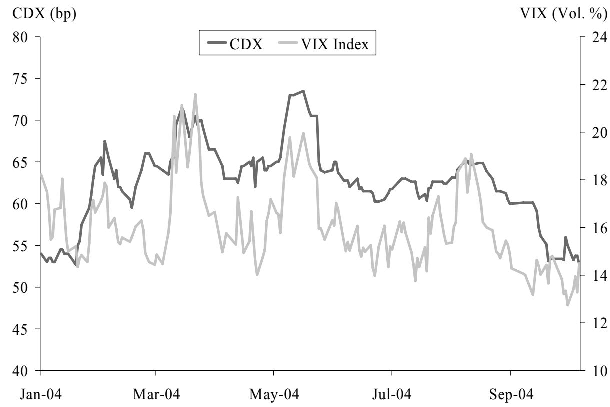
The trend is that the basis for low spread names tends to be positive, meaning default swaps are cheaper than bonds. As we move to higher spread names, the frequency of negative basis credits increases (default swaps are rich to bonds), and after about a spread level of 70 bp, the basis trend stays negative. Clearly there has been a high beta grab, and anecdotally we hear that many recent synthetic structures include a good amount of BB-rated names, as well. In other words, this technical behavior has effectively translated into more of a spread compression in default swaps than in corporate bonds. We recommend that investors use this relative value information as a guide to selecting which market to get long specific single-name risk, rather than putting on basis trades.

EQUITY VERSUS CREDIT MARKETS – VOLATILITY AND SPREADS

Many in the market like to compare implied equity volatility with the level of credit spreads as an uncomplicated relative value indicator. If we focus on relationships this year, we find that rising VIX levels coincided with rising spreads, and vice versa, for the most part (see Exhibit 2). Yet, more recently, the technical rally in the credit markets has resulted in a disconnection in this very traditional relationship, which can be observed fairly easily.

exhibit 2

VIX and CDX Move Together, Most of the Time…



Source: Morgan Stanley

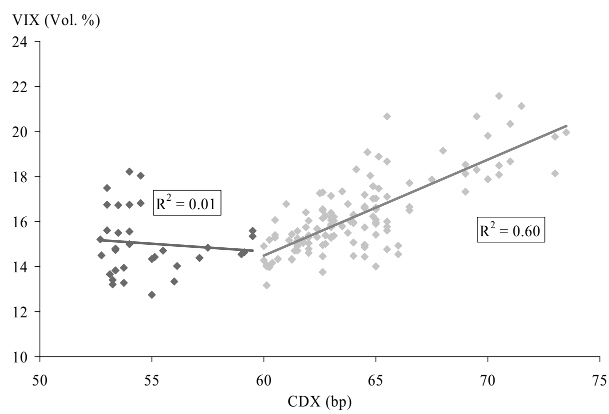
A simple scatter graph shows that for spread levels above 60 bp (on the default swap indices), the relationship between spreads and the VIX is strong (straight-line R-squared of 60%, see Exhibit 3). On the other hand, for spread levels below 60 bp (such as the current environment), the relationship is much weaker (R-squared of only 1%). The technical flow of late has caused an important breakdown between these two very popular market indicators.

EQUITY VERSUS CREDIT – WHAT IS MERTON SAYING?

A more elaborate approach to comparing both equity and credit markets demonstrates a shift in relationships as well.

exhibit 3

… Except When Spreads Are Tight

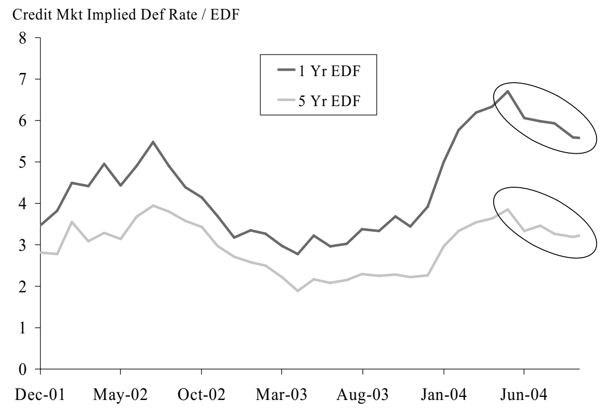


Source: Morgan Stanley

We argued in earlier research this year that while spreads appeared tight optically, equity markets were predicting quite a bit less default risk than credit markets (see Exhibit 4, where we compare the ratio of credit and equity market-implied default risk). After both markets were roughly in synch during the rally of 2003, from a default risk perspective, credit markets got much cheaper relative to Merton models in the first half of this year, as spreads were stable to wider, while the corporate deleveraging theme continued. Yet, since the April peak, the attractiveness of default risk in credit markets (relative to KMV EDFs) has moderated, driven mainly by rallying spreads (EDF levels have been flat in a falling volatility environment). However, it is important to note that on an absolute basis default risk still feels fairly attractively priced by these and more fundamental measures.

exhibit 4

Merton Models – Credit Market Implied Default Risk Falls Relative to KMV EDFs



Source: Morgan Stanley, Moody's KMV

ANYONE DRIVING THE TREND?

While the trend in spreads versus EDF levels is clear, if we take out the outliers, it is even stronger. So who is bucking the trend? Outside of a few financial names, there are a handful of credits where credit-market implied default risk has increased much more than implied by EDF values, including Cox Communications, Limited Brands and Liberty Media. Interestingly, these are names that have the potential to experience shareholder-friendly (and thus credit unfriendly) activity. As such, the implied capital structure change makes Merton model numbers less reliable.

RECALIBRATING RELATIVE VALUE

Tight spread levels resulting from the technical rally have impacted the relative value landscape fairly substantially, in our view. Bonds appear cheaper than default swaps for a good portion of higher-beta investment grade names, and default risk, as implied by credit and equity markets, is reversing trends to some degree. While we continue to believe that approaching credit markets from a fundamental perspective is the right medium-term (and long-term) approach, nearer-term technical aspects are too important to ignore.

chapter 16 Looking Forward to Credit

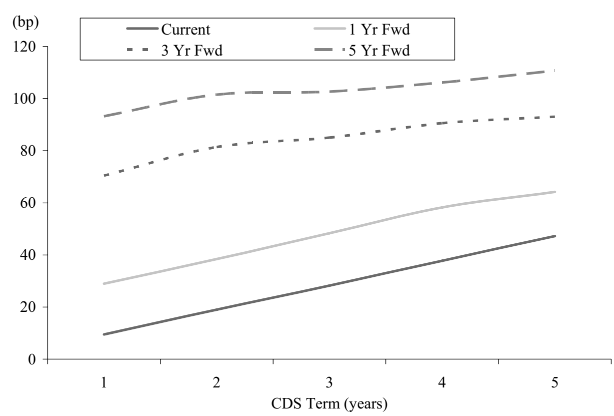
January 14, 2005

Primary Analyst: Sivan Mahadevan
Primary Analyst: Peter Polanskyj
Primary Analyst: Ajit Kumar, CFA

As liquidity along the curves has developed in default swap markets over the past 18 months, curve-based investment strategies have become increasingly popular, and in our own research efforts, we have been quite focused on the opportunity to express curve views. Credit curve shapes were a big theme in 2004, as the general steepness drew the attention of many investors, with positioning for roll-down opportunities being a popular idea. Relationships with the cash corporate bond market strengthened as well, and today we do not see much dispersion in the basis between default swaps and cash across the curve.

Despite increased liquidity and a decent amount of convergence with corporate bonds, default swap curve relationships are by no means mature; in fact, we would argue that the market is still in the infancy stages of thinking about credit term structures. The existence of liquid curves where investors can go long and short to different dates implies that investors can position for "forward" credit risk, a concept that is still relatively nascent.

exhibit 1
IG CDX Spot and Forward Curves



Source: Morgan Stanley

Fortunately, we can borrow quite a bit of math and market experience from the interest rate world in determining forward credit spreads, but there are key differences as well. Most importantly, credit instruments are "risky" assets, and as such, any calculation of implied forward rates must take into consideration the probability of default.

We addressed credit curve ideas as a central theme a total of eight times in our weekly *Credit Derivatives Insights* series over the past 15 months (yes, we were obsessed). However, we feel that it is important to take a few steps back and begin to discuss forward credit risk from an intuitive perspective, which we argue is still a developing concept. Once this is established, we can begin to explore valuation issues, curve shape expectations and better understand instruments that are built upon forwards, including CDS options and constant-maturity credit default swaps (CMCDS), all of which will get more attention as 2005 progresses.

WHAT CAN WE LEARN FROM INTEREST RATES?

In a nutshell, a forward interest rate is simply the break-even rate that makes all investments on the curve equally rewarding. If the forwards are realized, an investor should be indifferent about which point to invest in on the curve. As such, forward curves are important inputs into risk-neutral interest rate derivatives pricing models, which assume, among other things, that there is no relative value among various opportunities, given market pricing. The following equation shows the calculation of one-year implied forward rate starting at the end of year 1, $F_{1\text{-}2}$, given the one-year spot rate S_1 and the two-year spot rate S_2:

$$F_{1\text{-}2}=(1+S_2)^2/(1+S_1) - 1$$

WHAT IS DIFFERENT IN CREDIT? – IMPLIED FORWARD CDS PREMIUMS

On the surface, the same math and relationships used in interest rates should hold for credit, but a key difference is that credit is “risky.” As such, we have to make some adjustments to address the issue that if the reference entity defaults, the protection seller is not entitled to any future premiums and has to pay the difference between par and recovery value. From a set of CDS levels extending up to the end of the intended forward default swap, we can determine the forward spread using the following logic: A long position in a two-year CDS starting now is equivalent to a combination of a long position in a one-year CDS starting now and a long position in a one-year CDS starting one year from now.

The first step toward calculating implied forward rates is to calculate default probabilities for each payment period. To simplify, let us assume that we have two default swap contracts, CDS1 and CDS2, maturing at the end of year 1 and year 2, respectively, with annual spread payments. Now we can determine the implied probability of default at the end of year 1 from CDS1, given a recovery rate. Similarly, given the probability of default in year 1 and CDS2 spread level, we can calculate the probability of default in year 2, given the reference entity does not default in year 1. Thus, we can impute default probabilities for each period from a whole credit curve.[1]

The combination of CDS1 and a forward default swap, which starts at the end of year 1, replicates CDS2. Therefore, by equating the two cashflow streams, we can determine the implied forward default swap level. We show spot and selected forward curves for the CDX index curve in Exhibit 1.

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[1] *Please refer to Chapter 46 for more details.*

chapter 16

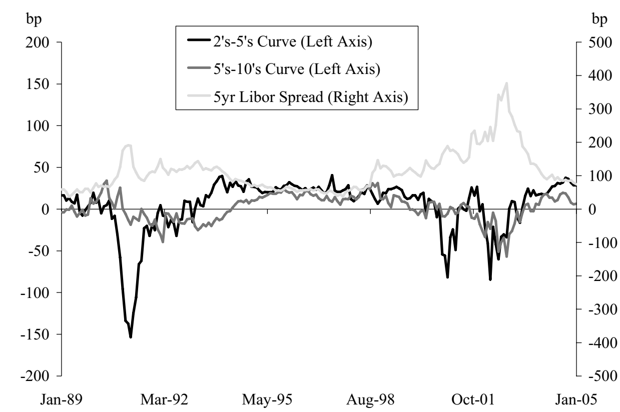
FORWARDS – A DOSE OF REALITY

How realistic are implied forward credit spreads? On a credit-specific basis, almost any curve shape, from very steep to inverted, is justifiable. Distressed credits tend to have inverted curves because of the pari passu claim that bonds of the same seniority (but different terms) have on assets. Market-wide investment grade credit curves (As and BBBs) have indeed been inverted during the worst parts of past credit cycles (1991 and 2002, see Exhibit 2), although the inversion in both periods did not last very long.

Forwards in interest rate markets have tended to overestimate the realized rates (providing evidence of an increasing risk premium for taking longer-duration rate risk). The implied forwards in the credit markets may reflect the expected future spread, as well as the risk premium for taking longer-dated credit risk. Even more so than the interest rate markets, the risk premium associated with taking credit risk with varying maturities can be highly volatile over time and can also vary substantially by credit.

exhibit 2

Flat to Inverted Credit Curves Have Occurred at Much Wider Spreads (BBBs)



Source: Morgan Stanley, The YieldBook

Morgan Stanley

TRADING AGAINST THE CREDIT FORWARDS

While forwards are important inputs into risk-neutral pricing models, forwards rarely get realized, and as such, strategies that lean against the forwards can be interesting ways to implement both credit-specific and macro credit views over time.

Today's steep curves imply relatively flat front-end credit curves 4 to 5 years forward (see Exhibit 1), which, based on historical experience, would suggest a time of substantially increased credit risk. If the forwards are correct from a curve shape perspective, we would argue that spreads ought to be wider than implied by the forwards (based on historical experience, see Exhibit 2). One credit-based argument for this view is that, in investment grade, there tends to be a net negative ratings migration over time, which is an argument against curves staying flat or inverted at relatively tight spread levels.[2]

Furthermore, the linkage between curve shape and absolute spread has intuitive appeal when we consider how investors will perceive credit risk across the term structure. When credit fundamentals are strong and spreads tight (like today), investors will be very comfortable with credit risk in the short end but will charge some incremental premium for longer-dated risk because of a lack of clarity on business conditions or corporate actions in the long term. In times of financial uncertainty and wide spreads, investors will have a lack of clarity over the short term and will charge a large risk premium even for short-dated risk. Longer-dated risk, on the other hand, may be viewed as marginally less risky, as investors view survival in the short term as the key business risk (consider the airlines over the last year).

PUTTING ON THE FLATTENER – AT WHAT COST?

For investors who disagree with the forwards, there are many ways to implement the views, including curve trades and products built upon forwards like options and constant-maturity default swaps. The curve flattening trade is both tempting and rather popular today, and as such, we chose to study three simple flattening trades in the CDX index (sell long-dated protection, buy shorter-dated protection, duration neutral) as ways to position against the forwards. In particular, there are two points worth noting. First, unlike in the interest rate world, a trade that is not notionally neutral has an added risk, namely, the default risk on the incremental difference in notional values. In the case of flatteners, this will imply a positive default P/L. Second, the spread duration of each leg will drift over time, but not uniformly, which will lead to residual spread exposures over time (see Exhibit 3).

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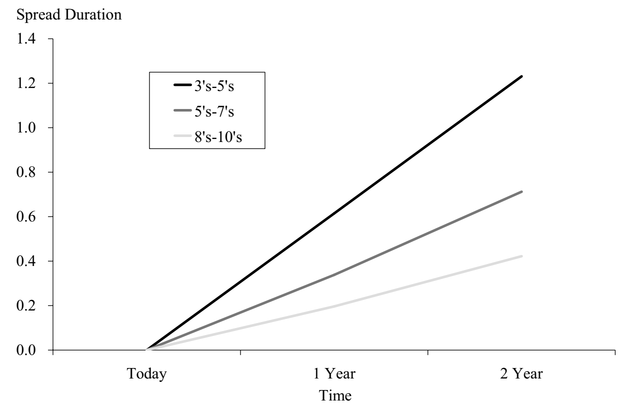
[2] *Please refer to Chapter 33.*

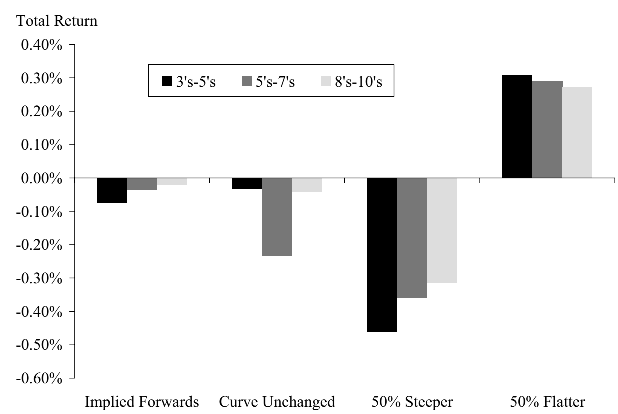
exhibit 3
Duration Drift in Flattening Trades



Source: Morgan Stanley

In Exhibits 3 and 4, we show the duration drift and total returns (across four scenarios) for three flattening trades (each involving two years of curve risk). Because of duration differences, the 3s-5s flattener (sell 5-year protection, buy 3-year protection) has the largest amount of benefit from a jump to default. The cost of this default exposure is the speed with which the spread duration neutral position becomes positive (see Exhibit 3). For this reason, it slightly underperforms the other two trades in the scenario where the forwards are realized (the returns are not zero because we assume credits do not default, but the forwards imply a small probability of default). In the unchanged curve scenario, the 5s-7s flattener (sell 7-year protection, buy 5-year protection) underperforms the others because the 5-year point has almost double the roll-down as the 7-year point in today’s market. The steepening and flattening scenarios (50% beyond the forwards) are mirror images of each other, centered around the slightly negative returns of the first scenario.

exhibit 4
Horizon Returns for Flattening Trades



Source: Morgan Stanley

LOOKING BACK TO MOVE FORWARD

While forward credit spreads are important inputs into risk-neutral derivatives pricing models, we are not supportive of blindly following the forwards. Past market experience as well as ratings migration studies suggest that relatively flat or inverted credit curves are more likely during times of greater credit risk, implying much wider spreads. This in turn argues for flattening strategies where duration is negative or falls off over time through rebalancing. The key point is that we encourage investors to consider the quantitative aspects of forward credit risk within the context of fundamental credit behavior over the credit cycle. Not all scenarios implied by the forwards are equally likely.

chapter 17 Credit Volatility – The Unintended Consequences

April 1, 2005

Primary Analyst: Sivan Mahadevan
Primary Analyst: Peter Polanskyj
Primary Analyst: Ajit Kumar, CFA

Idiosyncratic events in the auto and media sectors, combined with a sharp jump into a new interest rate regime, have introduced a type of negative credit volatility that we have not seen in some time in the investment grade space. The credit-specific issues of a few have been impacting the market at large, and for the first time in a while, we have the opportunity to visualize the pricing impact of convexity in everything from a plain vanilla credit default swap to a first-loss tranche in a synthetic CDO.

When the big moves in spread that some welcome (or fear) actually are experienced, the realities of this convexity actually come to the forefront, however unintended they may be. The liquidity and standardization in today's default swap market means that unwinding off-market swaps with standard par swaps can result in residual default risk, in the form of credit risky residual coupon streams, otherwise known as credit I/Os. This phenomenon can be even more exaggerated in index versus single-name positions, where credit default swaps are 'fixed' at inception at off-market levels, especially for credits that trade far away from index averages. Furthermore, we remind investors that the biggest impacts of sharp single-name moves are in the subordinate tranches of synthetic CDOs, and we explain some of the recent price movements on both an absolute basis and relative to what model deltas would have predicted.

SINGLE-NAME IMPLICATIONS: BUY/SELL VERSUS UNWIND

Convexity is a well understood phenomenon in corporate bonds, both the convexity associated with large changes in interest rates or spreads and the changes in default risk for instruments that trade away from par, given that most bonds have a par claim in default. There is one significant difference between bonds and default swaps when it comes to credit convexity, namely the residual default risk resulting from unwinding positions. When an investor trades in and out of a specific bond, he or she is left with no residual risk, because the specific instrument that was initially bought (or sold) is subsequently sold (or bought). This may seem like an obvious statement, but it is important to understand that with default swaps, trading in and out of risk over time as swaps move 'off-market' can leave residual risks, depending on how the trades are actually performed.

Let's consider the following example (see Exhibit 1), where an investor purchased 5-year protection on Delphi at 187 bp three months ago and then subsequently elected to 'get out of the risk' more recently at 516 bp. If the investor chose to simply sell protection at 516 bp (par swap) to the same date, then he/she would effectively earn the difference of 329 bp per annum (approximately \$131,867 – \$47,789 = \$84,078 quarterly, assuming \$10 million notional) until maturity, assuming both swaps were struck at prevailing market spreads when they traded. Since both contracts are still outstanding, there is still some residual risk to the investor in the event of an unexpected default, as the coupon stream would stop. In fact, if an immediate default occurred, the value of the missed coupon payments would be worth approximately \$1.7 million, or 17% of the initial notional.

exhibit 1 Unwinding Delphi CDS – Two Scenarios

	Original Contract	Off-Market Unwind	Scenario 1: Net Payments from Unwind	Unwind with New Par Swap	Scenario 2: Net Payments from an Offsetting Par Swap
Contract Notional ($)	10,000,000	10,000,000		10,000,000	
Contract Strike (bp)	187	187		516	
Payments ($)					
3/20/2005		1,212,929	1,212,929		
6/20/2005	47,789	47,789	0	131,867	84,078
9/20/2005	47,789	47,789	0	131,867	84,078
...	...	...	...	...	...
12/20/2009	47,269	47,269	0	130,433	83.164
3/20/2010	46,750	46,750	0	129,000	82,250
Residual Jump To Default Exposure ($ Undiscounted)			0		1,668,761

Source: Morgan Stanley

To alleviate this credit I/O risk, the investor can simply ‘unwind’ the default swap with another counterparty, where the contract is struck at the original spread but the present value of the coupon differences would be paid to the investor up front ($1,212,929 in Exhibit 1). This PV payment would take into consideration the probability of default over time (via a credit curve), as well as a recovery assumption (CDSW on Bloomberg can calculate these values). In such an unwind case, the investor no longer has any default exposure since he or she is effectively ‘out of the risk’ entirely (just like selling the bond); however, the risk did not disappear – it was simply transferred to the counterparty who executed the off-market unwind, unless the counterparty had access to an equivalent off-market swap (which is unlikely). While the probability of default captured in spreads is clearly taken into consideration when executing the unwind, the I/O risk is real residual risk and thus must have some amount of risk premium associated with it. This is why unwinds can price differently than new swaps.

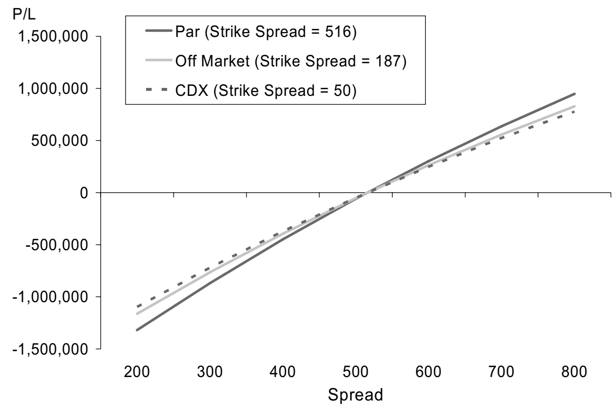
Furthermore, there is a nuance within the popular benchmark Dow Jones CDX indices that can further exacerbate this issue. For simplicity reasons, all single-names in the indices are struck at the same level as the index, which is 50 bp CDX IG 3 index. As such, for anyone implementing index versus single-name strategies, there can be residual jump to default risk in positions hedged with par instruments, particularly for wide-trading names, given the universal 50 bp strike.

DURATION AND CONVEXITY – NOT AN ALIEN CONCEPT

As we saw in Exhibit 1, the differences in off-market spreads versus par spreads comes down to a difference in the timing of cash flows and the resulting impact on risk profile, which can be large when there are large spread moves. In Exhibit 2, we illustrate P/L changes for three swaps on Delphi Corp, using the three scenarios: a par contract struck at the January 2, 2005, level of 187 bp (and 11.9 points upfront), a par contract struck at the March 28, 2005, level of 516 bp and a contract with a running premium of 50 bp (and 17.2 points upfront), which is equivalent to a component contract in the CDX index. The notional amounts and maturity dates are the same for all three scenarios.

exhibit 2

Visualizing Duration and Convexity Differences – Delphi CDS



Source: Morgan Stanley

The variations in performance are attributable to both duration and convexity differences among the contracts (see Exhibit 3). In corporate bond parlance, these contracts would be the equivalent of three bonds with different coupons (and hence different dollar prices), all with the same par amounts, maturing on the same date. Just like these bonds, the contracts have differing spread exposures but they also have different exposure to default risk. The contract with the smallest coupon and, hence, the largest upfront payment has the least exposure to an immediate default event.

For investors actively managing positions in indices and index tranches with new trades in credits with fast moving spreads, the mismatches of cash flows and exposures to default and spread moves can be important drivers of returns.

exhibit 3

Duration and Convexity Differences – Delphi CDS with Varying Strike Spreads

Scenario	Strike Spread	Upfront Payment	Duration (DV01)	Convexity (Par Basis)
New Par Contract	516	0	3.70	27.6
Off Market Contract	187	11.9%	3.24	25.1
CDX Contract	50	17.2%	3.06	24.2

Source: Morgan Stanley

exhibit 4 Tail Wagging the Dog – Index Impact of Autos

	3/1-3/15				3/15-3/29			
Index	**Traded Index Change**	**Underlying Implied Change**	**Auto Impact**	**Non-Auto Impact**	**Traded Index Change**	**Underlying Implied Change**	**Auto Impact**	**Non-Auto Impact**
5Y CDX	0.5	0.7	1.7	(0.9)	6.5	6.5	3.4	3.7
10Y CDX	0.0	0.4	1.8	(1.4)	6.2	7.0	3.0	4.0
5Y HiVol	6.7	7.4	6.9	0.5	18.3	19.9	14.1	5.8
10Y HiVol	6.4	7.8	7.5	0.2	16.5	18.9	12.6	6.3

Source: Morgan Stanley

exhibit 5 Tranche Impacts

Tranches	Actual Price Change 3/1-3/15	Delta Price Change 3/1-3/15	Difference	Actual Price Change 3/1-3/29	Delta Price Change 3/1-3/29	Difference	Total Diff
5Y 0-3%	-0.8%	-0.6%	-0.2%	4.4%	2.7%	1.7%	1.5%
5Y 3-7%	(9.5)	(5.1)	(4.4)	22.5	23.6	(1.1)	(5.6)
5Y 7-10%	(2.3)	(2.0)	(0.3)	5.5	9.1	(3.6)	(3.9)
5Y 10-15%	(2.5)	(0.8)	(1.7)	3.5	3.3	0.2	(1.5)
10Y 0-3%	0.6%	-0.6%	1.2%	0.5%	0.8%	-0.3%	0.9%
10Y 3-7%	(22.5)	(14.9)	(7.6)	21.5	21.3	0.3	(7.4)
10Y 7-10%	(12.3)	(7.4)	(4.8)	12.8	11.3	1.5	(3.3)
10Y 10-15%	(9.0)	(3.9)	(5.1)	8.0	5.3	2.8	(2.3)
5Y 0-3%	-0.8%	-0.6%	-0.2%	4.4%	2.7%	1.7%	1.5%

Source: Morgan Stanley

INDEX IMPLICATIONS – WATCHING THE CARS CRASH

The dynamics in the trading of single name and index products serve as an excellent example of how our markets can become dislocated because of single-name volatility. Exhibit 4 highlights the change in traded index prices during March, as well as the implied index change in the underlying names and an allocation of this change to auto and non-auto related credits. In the first half of the month, the massive moves in auto spreads were offset by tightening among all other credits, while in the second half of the month, the rest of the market followed the autos wider, exacerbating the index widening.

When we compare the traded index moves to the aggregate changes in the single name contracts we find that the index moved less than the underlying names (par swaps). In terms of the auto names' dramatic widening, these differences seem consistent with theory. Exhibit 3 shows us that a par swap will move more for a given move in spreads (because of higher duration and convexity) than an equal notional swap with a lower strike spread. The implication is that a concentrated widening in already wide trading names (like the autos) has less price impact on the CDX indices than for single-name par contracts. Therefore, the traded index spread move should be less than the aggregated moves of single-name par contracts.

TRANCHE IMPACTS – TAIL WAGGING THE DOG?

Finally, we examine how the single-name volatility affected the tranched market versus expectations based on the underlying index moves (Exhibit 5). Because the index changes were driven by large moves in a small number of credits, we should see some deviation in actual versus expected performance derived from index deltas. Given the idiosyncratic nature of the spread widening, the upfront payments on both the 5-and 10 year 0-3% tranches increased by 1.5 and 0.9 points more than the index deltas would suggest for a uniform spread shift. The rest of the tranches all tightened more than our hedge ratios would have predicted. These outsize moves in the different parts of the capital structure reflect the increasingly concentrated risk within the CDX portfolio, which moves risk from the senior and mezzanine tranches into the equity tranche.

The broad-based widening in the second half of the month drove mezzanine and senior tranches generally wider than hedge ratios would indicate, but, in most cases, the tightening bias from the first half of the month dominated. This illustrates the importance of the levered impact of very idiosyncratic events on the most subordinate tranches against the muted impact of the same moves on more senior tranches. These risks are related both to the reshaping of the risk profile (longer tails) and market dislocations relative to the models (i.e., correlation shifts).

chapter 18 Volatility Confuses Credit Spreads

June 3, 2005

Primary Analyst: Sivan Mahadevan
Primary Analyst: Peter Polanskyj
Primary Analyst: Ajit Kumar, CFA

There are many aspects of credit markets that we find confusing today. While it is easy to dismiss market activity as being technical in nature given both dealer and hedge fund activity, such a sentiment is not very helpful for investors attempting to position credit portfolios going forward. When technicals dominate, looking for answers in other markets can sometimes be helpful, but there can be technical issues there as well.

We have been fans of at least garnering indications of default risk and credit valuation from the equity markets through equity volatility, Merton models and the like. While equity volatility and credit spreads have been directionally consistent since volatility itself kicked up nearly 3 months ago, changes in equity volatility (both realized and implied) have been far more muted than changes in credit spreads, in both directions. Using a Merton framework, credit at today's wider spread levels looks the cheapest it has been since we started tracking the relationship in 2001, for both investment grade and high yield issuers. Furthermore, if we simply focus on the equity volatility and credit spread relationship, we can easily observe the differences in magnitude of the shifts, particularly in sectors where credit investors fear capital structure changes.

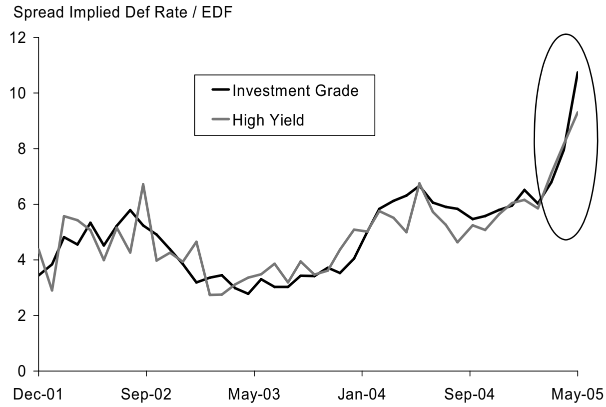
However, we caution that volatility implied from the equity options markets can be misleading in this environment, as technical factors related to structured equity products have been keeping implied volatility low. As such, when we compare implied with historical volatility, we find some interesting differences, particularly in the auto, energy and financial sectors.

MERTON MODELS VS. SPREADS – CREDIT MARKETS IMPLY MUCH MORE DEFAULT RISK

In a Merton context, we have found the relationship of default risk measured by both markets (equity via KMV EDFs and credit via default swap levels) to be an interesting relative value measure. Credit markets will generally imply more default risk because of risk premium in credit spreads, but the ratio of the two has never been higher since we first started tracking it at the end of 2001 (see Exhibit 1 for both investment grade and high yield). Muted shifts in equity volatility (realized instead of implied for KMV EDFs), nearly unchanged stock prices (the S&P 500 is flat since the end of February) and still very healthy corporate leverage levels are the main reasons why EDFs continue to stay low despite wider spreads.

exhibit 1

Credit Markets Imply More Default Risk–Ratio of Spread-Implied Default Rates and EDFs



Source: Morgan Stanley, Moody's KMV

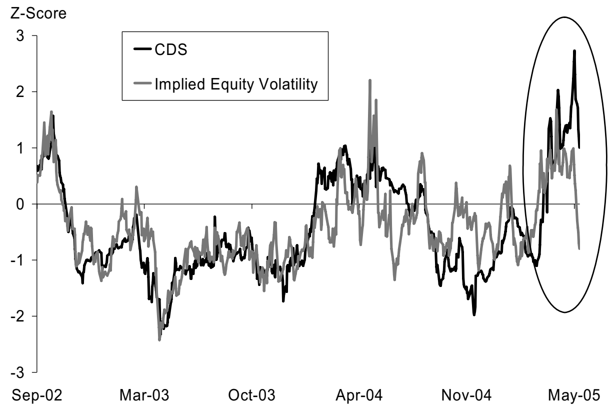
If we dig a little deeper into the analysis, we find that the rise in credit market implied default risk relative to EDFs is actually only partially driven by the wider trading names in the investment grade space. Credits in the 40 to 60 bp zipcode are the biggest drivers of the change, as low leverage levels and low equity volatility have pushed EDFs to near zero levels. Our universe is comprised of 160 investment grade names and another 160 high yield names, although for the latter, the universe was much smaller historically. We compare one-year EDFs with five-year CDS levels, which does have some curve risk in it, but we find that five-year EDFs show similarly-shaped results.

VOLATILITY VS. CREDIT SPREADS – A SIMPLER APPROACH

For those who might be skeptical of complicated credit models like KMV, one can examine equity volatility and credit spread relationships using a much more simple approach. We find that although credit spreads today (CDS levels) are well off their wides from two weeks ago, they have indeed widened more than implied equity volatility has risen, when compared on an apples-to-apples basis (see Exhibit 2). In fact, the magnitude shift in this relationship is the largest it has been since we started tracking it in 2002.

exhibit 2

Spreads Break Away from Equity Volatility



Source: Morgan Stanley

To make comparisons legitimate, we normalize the data by using historical Z-Scores, which is the number of standard deviations away from the mean (we track these values at the credit specific level regularly in our weekly *Credit Derivatives Insights* publication). Our universe includes 185 largely investment grade credits. Note that implied equity volatility is for a 2-month maturity at-the-money put option.

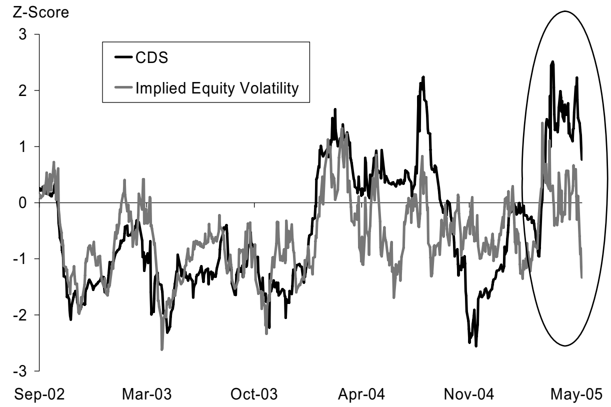
The most notable sector dislocation is in media where potential equity friendly/bond unfriendly capital structure activity has pushed spreads wider while equity volatility has remained largely stable. These results are fairly consistent with the KMV study.

THE STRUCTURED EQUITY BID INFLUENCES VOLATILITY

One important phenomenon in the equity markets that we believe is not well understood by credit market participants is the bid for structured equity products and its impact on option valuations. Similar to the structured credit bid, there is a fair amount of appetite among investors outside of the US for structured equity products that generally involve selling equity options (globally). This flow keeps implied equity volatility levels low, and whenever there is a rise in volatility, dealers are in a position to quickly monetize their residual long volatility positions, keeping volatility moves to the upside muted. So the message here is that blindly looking at measures like the VIX may actually be very misleading for credit investors.

exhibit 3

Notable Sector Dislocation – Media



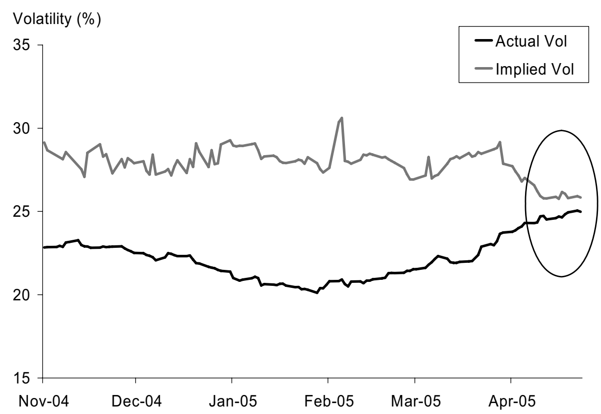
Source: Morgan Stanley

HISTORICAL VOLATILITY MAY BE MORE USEFUL THAN IMPLIED

The structured equity bid may actually be a motivation for credit investors to consider looking at historical equity volatility instead of the more technically influenced implied volatility from the options markets. The Merton approach we use (KMV EDFs) is based on realized volatility, which has generally been lower than volatility implied from options markets.

exhibit 4

Implied vs. Actual Equity Volatility – IG Universe

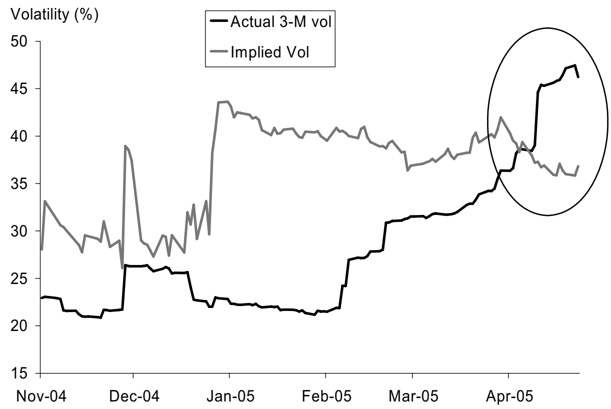


Source: Morgan Stanley

In Exhibit 4, we show the relationship between implied and realized volatility for the same 185-name investment grade universe. While realized volatility has been consistently below the implied volatility, they have converged recently in aggregate. This convergence, however, is driven by a few sectors in which the realized volatility has jumped above that implied by the options markets (see Exhibits 5 and 6 for autos and energy). These are clearly sectors where the structured equity bid may be keeping implied volatility lower than it ought to be.

exhibit 5

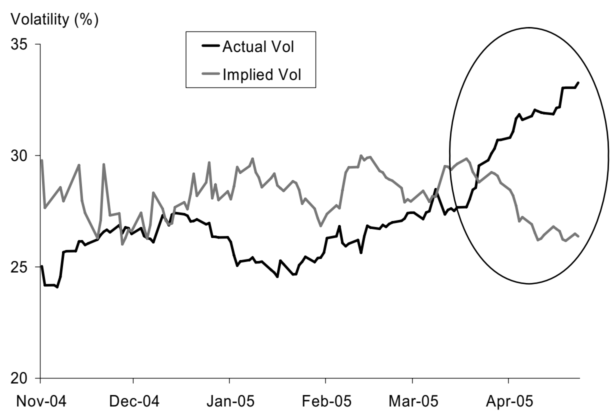
Implied vs. Actual Equity Volatility – Autos



Source: Morgan Stanley

exhibit 6

Implied vs. Actual Equity Volatility – Energy



Source: Morgan Stanley

CONCLUSION

Despite tighter spreads recently, technically-dominated flows and the fear of the unknown have raised risk premiums in credit markets, relative to the default risk implied by equity markets, even in a higher equity volatility environment. Just before the rise in equity volatility in February, we had commented on some of the reasons for dislocation between equity and credit in a then low volatility environment.[1] Some of those themes are even more relevant today, including a higher risk premium that credit investors must charge relative to theoretical numbers derived from equity volatility and a fear among credit investors for credit-unfriendly capital structure changes.

[1]*Please refer to Chapter 52.*

chapter 19 Recovery Lessons

January 27, 2006

Primary Analyst: Sivan Mahadevan
Primary Analyst: Peter Polanskyj
Primary Analyst: Pinar Onur

Two of the most interesting developments last year in the single-name space were the ISDA-coordinated global protocol to settle credit events and the emergence of recovery locks as a means to hedge recovery risk. The two themes, in fact, are quite inter-related, as recovery locks are a play on recovery during the period immediately following bankruptcy filing, which is in many cases determined by the auction process under the global protocol. The market now has experience with global settlements on five bankrupt US companies (see Exhibit 1) and recovery locks were actively traded on two.

exhibit 1 Auctions Administered Under the ISDA Global CDS Protocol

Credit	Auction Date	No. of Adhering Parties	Final Price
Calpine	1/17/2006	323	19.125
Delphi	11/4/2005	577	63.375
Delta	10/11/2005	71	18.000
Northwest	10/11/2005	71	28.000
Collins & Aikman (Senior)	6/14/2005	454	43.625
Collins & Aikman (Sub)	6/23/2005	NA	6.375

Source: Morgan Stanley, creditfixings.com

Since we published our first thoughts on recovery locks a few months ago, we have witnessed a greater than expected acceptance of the instruments among investors, partly as a result of recent credit events.[1] In the month leading up to the bankruptcy filing, unsecured Calpine recovery locks traded very close (17% to 20% range) to Calpine's ultimate recovery in the global settlement (19.125%). Delphi was less stable, with recovery locks at lower levels compared to the recovery value that came out of the auction. The only issue we have seen was inconsistency among dealers with notice of physical settlement (NOPS) language. In a recovery lock, the seller of protection may have an economic incentive to trigger a contract (i.e., when the actual recovery is higher than "locked" in, the recovery lock buyer will want to trigger), so it is important that recovery locks allows for NOPS from either party, in our view.

We remind investors that recovery locks are not instruments for recovery risk management through the whole bankruptcy process, instead they are meant for short-term recovery management (post-bankruptcy until CDS settlement). As such, they are actually good instruments to use in strategies with existing CDS, CDX, or index tranche positions, given the increased fungibility with these instruments. We go through our thoughts on how recovery locks can be incorporated into to the credit portfolio management process in this chapter and see if we can learn anything from the auction process.

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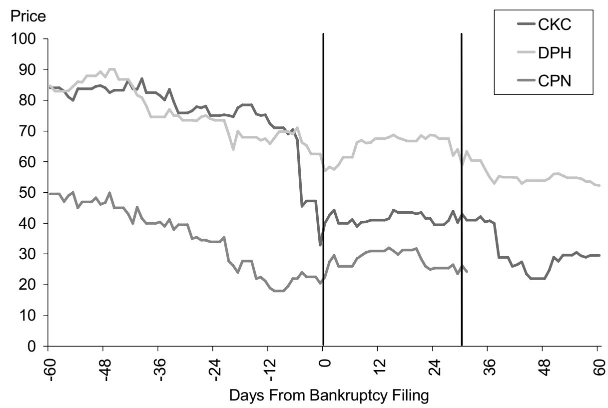
[1]*Please refer to Chapter 4.*

WHAT CAN WE OPINE FROM THE GLOBAL CDS PROTOCOL?

In Exhibit 2 we show the market price of selected deliverable obligations for the CKC, DPH and CPN settlement auctions, focused on the period immediately surrounding the actual credit events. For both Delphi and Calpine, deliverable bonds rallied immediately following the credit events and prices remained generally higher through the auction. For Collins & Aikman, we did not see a similar rally, as pricing remained reasonably flat through the action settlement. But we would argue that the Collins & Aikman default was less well telegraphed given the significant price drop leading into the default.

exhibit 2

Price Shifts – Pre-Bankruptcy to Post-CDS Auction



Source: Morgan Stanley

While the bond price history in Exhibit 2 could indicate the CDS settlement process affected the trading of the underlying obligations, we find that, in these 3 cases at least, the impact was limited to about 10 points on the bonds. We caution that there is only a limited amount of data on this dynamic and therefore we consider any interpretation to be anecdotal. We are also reluctant to predict similar instances universally in the future (see below).

INDICES AND TRUSTING THE SYSTEM

There are at least two reasons why technical factors in credit derivatives markets will influence bond prices surrounding bankruptcies. First, credit events that are in on-the-run or off-the-run indices could behave very differently than those that are not, given both the volume of exposure and the settlement process. Given the amount of trading in the index, there is always the possibility that an imbalance will exist between the cash instruments and CDS contracts. We also point out that without an auction process, CDS contracts could be settled anywhere in the (typically) 30 day windows allowing for the timing of settlement to be distributed over time.

Second, the standardization of the settlement process itself could reduce the demand for bonds required for physical delivery. While market participants may be hesitant to fully trust the auction process and therefore opt to physically settle bonds, in the future it is possible that investors become more comfortable with the auction process and will hence require fewer bonds. This increase in investor confidence would be dependent on the auctions continuing to function well and to arrive at reasonable settlement values. Any breakdown in the system could create significant market technical surrounding future settlements.

Delphi was an important test of the system, given structured credit exposure, and the rise in price ahead of the auction, combined with a fall thereafter shows that there was not enough confidence among market participants in the auction process. While Calpine structured credit exposure was significantly smaller than Delphi (so the comparison is not ideal), the smaller drop-off in price of the CTD post-auction may be the result of more confidence in the process.

One of the secondary effects of the standardized auction is that index and bespoke tranches maybe settled at different times resulting in different recovery values or subordination levels. This issue exists whether or not there is a standard auction for index tranches, and in some sense, the standard auction makes it less of an issue.

INCORPORATING RECOVERY INTO THE MIX

With increased recovery lock activity in the market, adding recovery locks into the mix results in some interesting credit convexity plays, in a market that is indeed very hungry for it.[2] We can think of a handful of applications of recovery locks into the credit portfolio management process, which we detail below. As a quick reminder, a recovery lock is effectively two default swap trades, one with fixed recovery and one with floating. Buying a recovery lock means one is long recovery (i.e., wants recovery to be as high as possible), which is equivalent to selling regular floating protection and buying fixed recovery protection at a premium that equals the floating protection (hence, the quoted fixed recovery is the market implied recovery[3]).

1. **Swapping fixed to floating recovery and vice versa.** Much like combining an interest rate swap with a fixed or floating bond, a recovery lock can be used to "swap" floating recovery protection to fixed or vice versa. Owners of fixed protection (say dealers from fixed recovery CDOs) can swap to floating by selling recovery locks, and then sell floating protection (which is a more liquid trade) to better hedge their risk. Sellers of floating protection can also sell recovery locks to convert protection into fixed there by "locking in" certain recovery.

2. **Outright positions on recovery.** In its simplest form, recovery locks can be used to take a position on recovery without any cash flows until an actual default. This is akin to an "over/under" wager, but where the actual event does not have a 100% chance of occurring. While recovery locks have no cash flows, there can be mark-to-market implications if market-implied recovery rates moves substantially.

3. **Defining senior and sub relationships.** In the simple algebra of senior and sub relationships (i.e., two spreads and two recovery assumptions), the recovery or spread of one entity can be implied by knowing the other three values, but the key assumption is that default events are simultaneous. For example, recovery markets (5 year) in GM and GMAC are 39% and 59% respectively. With GMAC 5 year CDS at 425 bp, GM implied 5 year CDS is only 630 bp, hundreds of basis points

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[2]*Please refer to Chapter 45.*
[3]*Please refer to Chapter 4.*

tighter than where GM actually trades. Effectively, the CDS and recovery markets are telling us that a sale of GMAC is fairly likely.

4. **Manage JTD exposure.** For investors with significant jump-to-default exposure (including structured credit books and bank loan hedging books), recovery locks can be used to reduce the uncertainty in the event of default. In structured credit parlance, this means reducing default P/L numbers to one loss number, instead of a curve of such values based on recovery scenarios. This can greatly simplify correlation and bank loan hedging book risk management.

5. **Partially hedge a stressed position.** If one owns a bond that is stressed or distressed, hedging the position by buying protection can require a large upfront payment, which can be thought of as a straight reduction off the 100% of par payment at default. If default does not happen, the buyer of protection clearly loses the upfront payment and does not benefit from a long spread duration position. Selling a recovery lock would limit losses in the event of default (the recovery swap will generally trade lower than the dollar price of the bond, otherwise default is 100% certain), but no cash flows are required, and the investor still keeps most of the spread duration in case the credit rallies. There are MTM risks on the recovery lock, but this could be less severe than CDS movements.

6. **Debt/equity strategies.** The credit leg of debt/equity strategies generally involves using CDS even though the investor may want the "default option" component of the CDS more than the spread duration component. In fact, the failure of many debt/equity strategies can be blamed on long protection positions in the face of significant credit rallies. A recovery lock can be used instead, where the payout would only be at default and only if one is right about a recovery view. Again, we caution about MTM issues on the recovery lock, but they could be more muted than straight CDS.

7. **Hedging general company risk.** It has become increasingly common for corporations to hedge exposure they have to other companies (through receivables and the like) by using default swaps. Selling a recovery lock could be another way of hedging this risk, the idea being that a lower recovery default would negatively impact any claim by a corporate with receivables exposure, so the recovery lock would help to hedge this risk. The recovery lock (with no cash flows) may be a cheaper hedge to owning protection.

8. **Credit I/O risk from unwinds.** There is a lot of credit I/O risk in the markets given all of the CDS unwind activity.[4] In an unwind where premiums have moved a lot from where trades were put on, investors often ask to unwind earlier positions rather than keeping two legs alive. This eliminates the I/O risk (for the investor) when a credit event occurs. Dealers calculate the unwind value in part by making a recovery assumption, and this recovery assumption can be hedged (to some degree) with a recovery lock.

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[4]*Please refer to Chapter 17.*

chapter 19

CONCLUSION – THE MARKETS FORCE MATURITY

Enough has happened over the past few months for us to state that recovery markets are a bit more mature. We find numerous applications of recovery instruments in the credit portfolio management process, given different duration and default exposure of the instruments relative to plain vanilla CDS. However, we remind investors that market activity in recovery instruments is limited to only a handful of credits, so building out portfolio strategies is difficult.

Section C

Basis Ideas

chapter 20 Getting Long Asymmetry

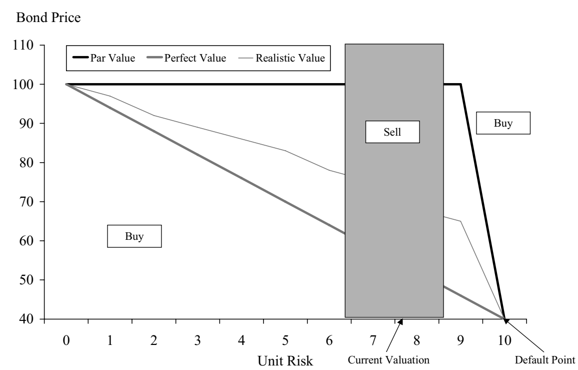
April 14, 2003

Primary Analyst: Sivan Mahadevan
Primary Analyst: Peter Polanskyj

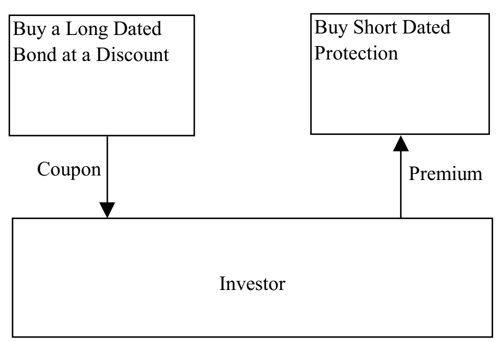
- Investment grade credit can be inherently asymmetric from a performance perspective. The trade package of buying a long-dated bond and buying short-dated protection can implement an asymmetric view on credit.
- We recommend this structure for "stressed" investment grade credits where investors believe that the company is unlikely to succeed in a high funding cost environment. Investors effectively sell the "high spread" outcome while buying the two extreme events: a "normalization" to a tighter spread environment or severe stress up to and including a credit event.

exhibit 1
Getting Long Asymmetry

The Long Asymmetry Trade



The Long Asymmetry Package



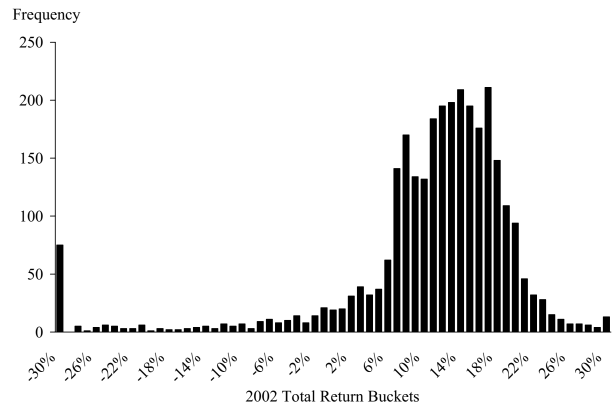
Source: Morgan Stanley

THE ASYMMETRY OF INVESTMENT GRADE CREDIT

This chapter addresses the topic of positioning to take advantage of the inherent asymmetric performance characteristics of investment grade credit, particularly for companies experiencing some amount of "stress." Performance asymmetry in investment grade credit has been a well-discussed theme in the market over the past two years, given the prominent fallen angel and default activity among investment grade names. Simply put, performance asymmetry implies that the downside is greater than the upside, a situation every long-only investment grade credit investor must cope with. In Exhibit 2 we show 2002 returns of the largest 3,000 investment grade corporate bonds, which clearly highlights the "skew" in performance we experienced last year (although many credits experienced very high returns).

exhibit 2

The Performance Skew in Investment Grade Credit (2002)



Source: Morgan Stanley

How can investors deal with performance asymmetry? Clearly being short may help, but on a default-probability-weighted basis for the market at large, being short investment grade credit is a losing battle. Getting short selectively may make more sense, but the cost of being wrong and the negative carry can be painful.

A LONG/SHORT PACKAGE TO IMPLEMENT AN ASYMMETRIC VIEW

A long/short package that can be used to benefit from this asymmetry involves getting exposure to credit on a forward basis, but at the same time getting long the cheapest-to-deliver option in a default swap. Structurally, the trade is already popular in the market place and simply involves buying a long-dated cash bond at a discount to par and buying short-dated protection on the same name. This structure effectively expresses an asymmetry view on the credit through forward credit exposure. The trade may have positive or negative carry, though, depending on the specific situation. Investors can think of this as a long credit straddle position, given the potentially sharp positive pay-off at both extremes.

Consider the payoff diagram in Exhibit 1. If we think of a corporate bond in "par value" terms, then the price of the bond stays constant as risk increases up until the point of default, when the recovery value falls off dramatically. This depicts the "binary" nature of credit events. However, the market price of a corporate bond does not generally follow this price. If market information is perfect, then the price will follow smoothly as risk increases until default is reached. However, in practice, neither payoff diagram is common in the market place, as valuation more likely follows a "realistic" path such as the one shown in the exhibit.

THE WING OUTCOMES RESULT IN GOOD PERFORMANCE

For credits that are moderately stressed, the asymmetry trade becomes very interesting, in our view, particularly if the belief is that the company cannot survive at that funding cost level. Consider the various performance outcomes in Exhibit 3. The extreme cases are easy to follow. If the credit "normalizes," with spreads tightening in strongly, good performance should be realized and attributed to the long spread duration position. Conversely, if the credit defaults, the investor delivers the bond into the default swap contract and receives par, so a positive return is realized if the bond was purchased at a discount (or at a premium when the trade is price-weighted). If there is no change in spreads, then the performance is directly related to the carry.

exhibit 3 Asymmetry Package: Performance Outcomes

Scenario	Asymmetry Package Performance	Attributing the Performance
No change in spreads	Mildly positive or negative, depending on carry	Carry
Spreads rally in parallel or curve flattens	Good	Long spread duration, curve position
Continued stress, spreads wider, or curve steepens	Weak	Long spread duration, curve position
Severe stress	Good	Curve inverts, CTD option
Default	Good	CTD option, deliver discounted cash bond

Source: Morgan Stanley

Other performance outcomes are a bit less clear, but we describe them as follows. If spreads rally in a parallel fashion, the long spread duration will lead to positive performance, as would a bull or bear flattening of the credit curve. If spreads widen or if the curve steepens in a bullish or bearish manner, the opposite performance would be realized, up to a point. If the credit becomes severely stressed, the credit curve would begin to invert (because of the equal claim on assets in the event of default), which would benefit the trade. Note that the position as described has interest rate risk, as well, but this can be offset by asset swapping the long bond position. However, since par payment prior to maturity is possible through the long protection position, a pure asset swap may be over-hedged from an interest rate perspective. The best hedge is one where an investor thinks about the likelihood and timing of a credit event and then "weights" an interest rate hedge appropriately.

MECHANICS OF THE TRADE; PERFORMANCE DETAIL

The mechanics of the trade are important, and in Exhibit 4 we show an example structure. The long bond position is $10 million par for a 25-year bond with an asset swap spread of 450 bp and a resulting price of 76.5. For the long protection position, we show two examples. The first one is "par weighted" with a notional amount equal to the par amount of the long bond position. The second example is "price weighted" with the notional at $7.91 million (based on the full price). The CDS premium is 450 bp, so the "par weighted" position has zero carry, while the price weighted has positive carry. It should be noted that another way to look at carry is purely from cash flows, in which case one would compute the "net coupon" of the position (bond coupon minus CDS premium, adjusted for the interest rate hedge).

exhibit 4 Example Asymmetry Trade Structure

	Value
Long Bond Position	
Par	$10MM
Coupon	6.5%
Maturity	25 Years
Price	76.5
Asset Swap Spread	450 bp
Long Protection Position	
Par Weighted Notional	$10MM
Price Weighted Notional	$7.91MM
Maturity	5 Years
Premium	450 bp
Recovery Rate	40%

Note: Two example notional amounts are shown for the protection position. Price weighted notional is based on the "full price" of the bond, which includes accrued interest.
Source: Morgan Stanley

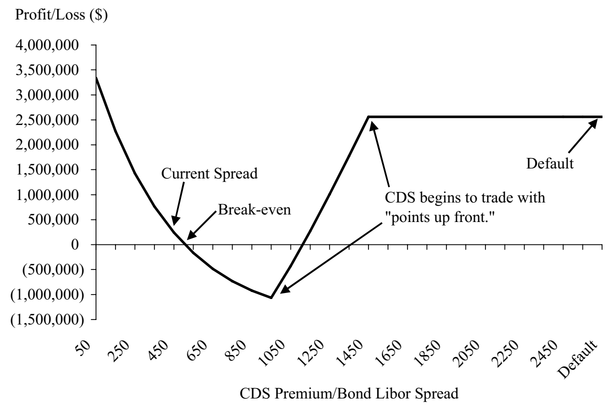
The P/L sensitivity to changes in CDS premium (and bond spread) for the par weighted structure is shown in Exhibit 5. The horizon period for this analysis is one year. We characterize the performance as follows:

- Given that it is a zero carry trade (par for par), the break-even point one-year forward is approximately 550 bp (100 bp of widening), which results from earning net Libor floating rate payments for one year.
- If spreads tighten, P/L is positive.
- If spreads widen from the break-even point, the structure experiences losses up to a point.
- If spreads widen to a point where the CDS begins to trade with "points upfront" (we assume this occurs over the 1,000-1,500 bp premium range), there is a sharp change in the P/L graph. The buyer of protection in such a CDS can unwind and receive the upfront points, which is effectively one step closer to default.

Once this inversion is fully priced in, the P/L remains positive, but flat for further spread widening (up to default), because we assume that the long bond position is the cheapest-to-deliver bond.

exhibit 5

Example Par Weighted Package – P/L Sensitivity (One Year Forward)



Source: Morgan Stanley

The “straddle” nature of this position is clear from the graph in Exhibit 5. Another interesting point is that the five-year break-even point (when the protection expires) is 625 bp (175 bp of widening).

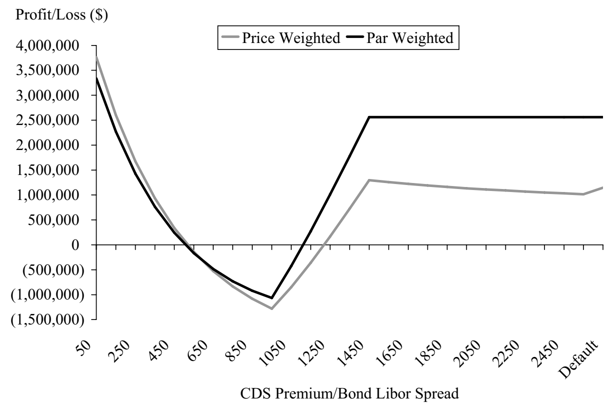
In Exhibit 6, we compare the P/L of the par-weighted package to the price-weighted one. Since the amount of protection purchased is less in the price-weighted package, the pay-off in the severe stress and default scenarios is significantly less. To compensate for this, to some degree, the pay-off, if spreads rally significantly, is higher, but not by an equivalent amount. This higher pay-off results from the more positive carry on the trade. Note that the par-weighted straddle is effectively more convex than the price-weighted straddle in this example. The five-year break-even point for the price-weighted position is 725 bp (275 bp of widening).

REAL WORLD EXAMPLES

As mentioned above, this asymmetric package is best used for “stressed” investment grade credits that are unlikely to succeed in a high funding cost environment for an extended period of time, or have high likelihood of a binary outcome. In Exhibit 7, we show a list of credits that we believe fits this categorization. Ford Motor Co. and Visteon (which is heavily dependent on Ford’s success) are at a crucial point in the success of their business model. Ford does not make money manufacturing cars, but its money making captive finance subsidiary is a critical part of their business model.

exhibit 6

Comparing Par and Price Weighting – P/L Sensitivity (One Year Forward)



Source: Morgan Stanley

Altria (parent company of Philip Morris) is being challenged with a gigantic potential legal liability where a simple binary outcome is likely. Toys "R" Us is an important niche retailer that generates the vast majority of its earnings during the holiday shopping season and therefore has very concentrated risks. CIT Group is a finance company with large near-term refinancing needs. Severe downgrades to this issuer could force it out of business.

exhibit 7

Asymmetry Trade Recommendations

Credit	Rationale
Ford Motor Co.	Success of business model is very dependent on a US economic recovery
Visteon	Heavily dependent on Ford's success
Altria	Potential binary outcome based on legal issues
Toys "R" Us	Heavily dependent on holiday shopping season, loses money outside of this period. Important niche retailer, though.
CIT Group	Large near term refinancing needs combined with a low level of reserves for potential credit losses

Source: Morgan Stanley

As an example of trade structure, the Ford Motor Company's 7.45% of 2031 (a widely held issue) have traded in the 80 dollar price range, while five-year default swaps have traded in 600 bp range recently. If the investor keeps interest rate risk, a par-weighted structure results in positive cash flow approximately equivalent to seven-year Libor. The outcomes could be weighted differently by adjusting the notional amount of the protection (price weighted results in less gain at default but positive cash flow equivalent to 30-year Libor).

chapter 21 Asymmetry Reloaded

May 30, 2003

Primary Analyst: Sivan Mahadevan
Primary Analyst: Peter Polanskyj

THE ASYMMETRY STRUCTURE

In Chapter 20, we described in detail a trade structure for getting long the asymmetric nature of investment grade credit. In particular, trade packages where investors buy long-dated bonds and purchase short-dated protection implement a forward credit view, which we find useful for "stressed" credits. Investors benefit in the cases where the credit rallies or becomes severely distressed and/or eventually experiences a credit event. The package tends to perform poorly if the credit widens out or remains "stressed," where actual performance depends on the carry of the trade. In a nutshell, it is a straddle-like trading structure that benefits when credits move in either direction by significant amounts.

CREDIT-SPECIFIC IDEAS

In this chapter, we provide three specific asymmetry trade ideas. A key part of what we characterize as the "asymmetry" trade is buying the long-dated bond at a discount to par. Assuming the bond is deliverable into the credit default swap contract, the discount to par allows for a capital gain at default (or at some point when the contract begins to trade with points upfront). Yet, with today's low absolute rate environment, the average dollar price of investment grade corporate bonds is north of 112 with only 4% of these bonds having prices below par. Applying the asymmetry trade opportunity in this market environment requires some different weighting schemes, which we outline in our first trade idea, to follow.

exhibit 1 Three Asymmetry Trade Ideas

			Carry (bp)		
Size ($ MM)	**Instrument**	**Price**	**Term Asset Swap**	**Duration Hedge With 10Y Swaps**	**Net Current Yield**
Toys "R" Us					
10.0	TOY 8.75 9/21	106.75	368	572	820
11.4	TOY 5 Yr CDS	–	295	295	295
Net			*26*	*255*	*503*
Unum					
10.0	UNM 7.375 6/32	97.00	284	423	761
10.0	UNM 5 Yr CDS	–	355	355	355
Net			*-66*	*57*	*394*
Ford Motor Co.					
10.0	F 7.45 7/31	93.00	316	477	801
10.0	F 5 Yr CDS	–	415	415	415
Net			*-99*	*31*	*355*

Source: Morgan Stanley

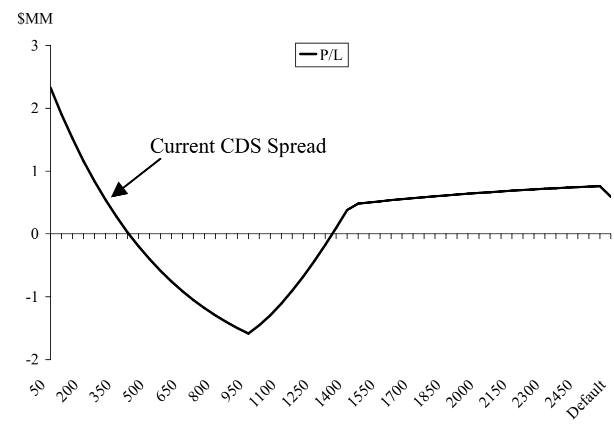
TOYS “R” US

Toys “R” Us is an interesting credit for the application of this trade structure, in our view. The vast majority of toy purchases occur during the year-end shopping season; other, more-diversified retailers are able to reallocate their shelves to meet demand and even use toy products as a loss-leader to bring in more profitable business. Furthermore, Toys “R” Us’ dependence on funding has shifted from the CP market (where the company has been shut out) to longer-term bonds, which has become increasingly expensive. If Toys “R” Us were downgraded to high yield, the company’s ability to access funds would be increasingly impaired. Thus, we feel a situation where Toys “R” Us faces default and/or bankruptcy over the next few years is not to be ignored.

The upside for Toys “R” Us would stem from a corporate action or from the company experiencing a great deal of success in a new business, like Internet-based sales. Brand recognition is certainly in its favor in both cases.

exhibit 2

Toys “R” Us Trade Package – P/L One Year Forward

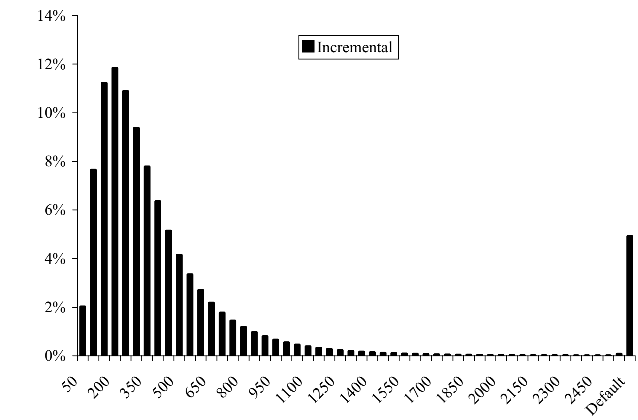


Source: Morgan Stanley

We show a trade package for Toys "R" Us in Exhibit 1 and resulting P/L distribution for changes in credit spreads (one year forward) in Exhibit 2. Our trade structure includes the purchase of a greater notional amount of protection ($11.4 million) than par amount of the long bond ($10.0 million), given that the bond trades at a premium. This results in a gain at default, as shown in Exhibit 2. The carry on the trade is positive; however, it varies with the approach taken. The simplest approach is the "net current yield" measure, which is the difference in periodic coupons between the two positions (adjusted for size). In this scenario, the investor is long the bond with all of the interest rate risk, as well as being long protection. If the investor wishes to hedge interest rate risk, this can be done through an asset swap structure or an alternative interest rate hedge. We show two hedged examples, the first based on an asset swap to maturity of the bond and the second based on a duration-weighted 10 year swap hedge.

exhibit 3

Toys "R" Us – "No Arbitrage" Probability Distribution



Source: Morgan Stanley

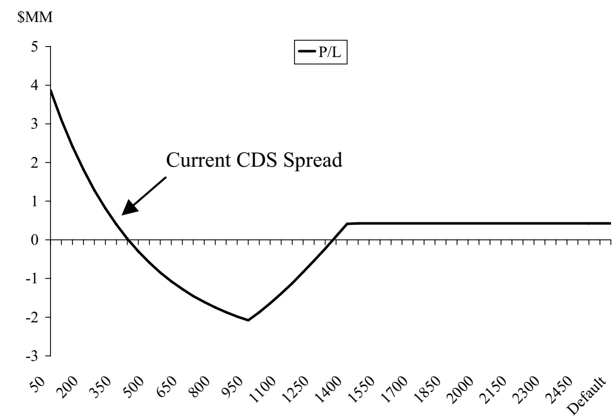
Another interesting output from this trade structure is the implied probability distribution of various spread moves, which we show in Exhibit 3. We calculate these probabilities assuming a log-normal distribution for spreads, deriving a standard deviation for this distribution from the P/L of the trade and assuming a "no arbitrage" framework. This framework implies that the probability-weighted return must equal the risk-free rate (which we assume to be the swap rate matching the term of the bond). From a fundamental perspective, investors can view this as the market-implied probability of the credit moving to different spread levels, including a default scenario. Grouping these outcomes into two categories tells us that there is a 50% probability of Toys "R" Us going to one of the wing scenarios (spread narrowing or severe stress/default) and a 50% chance of the credit staying at current levels or widening out. If an investor's view is that the wing outcomes are more likely, then this trade may be an attractive means to implement those views.

UNUM

Unum is a Baa3/BBB- rated life and health insurer on outlook negative by both agencies. It will become increasingly difficult for Unum to attract new business, and management faces the risk of policyholders canceling existing policies in favor of higher-rated insurers. The upside for Unum lies in corporate actions, where a healthier insurer steps in to acquire businesses.

exhibit 4

Unum Trade Package - P/L One Year Forward



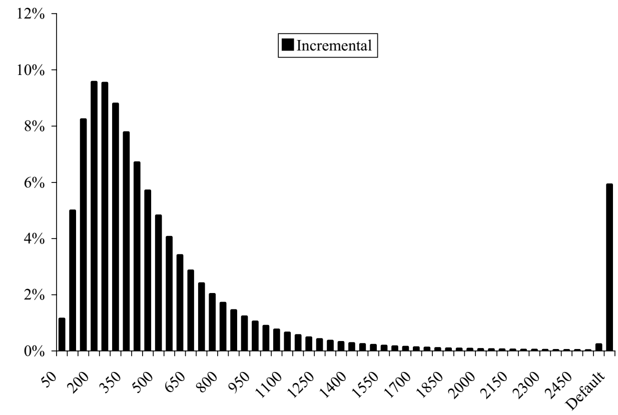
Source: Morgan Stanley

The Unum long bond (see Exhibit 1) trades at a discount, and the result of the asymmetry trade structure is shown in Exhibit 4. The trade has negative carry on an asset-swapped basis (-64 bp) and results in approximately $425,000 of P/L in the default scenario. The arbitrage-free probability distribution is shown in Exhibit 5, which has a classic shape for a company with much near-term uncertainty. The market-implied probability of the wing scenarios is 60% versus 40% for the continued stress scenarios.

chapter 21

exhibit 5

Unum – "No Arbitrage" Probability Distribution



Source: Morgan Stanley

FORD AS A COUNTER-EXAMPLE

Ford has rallied strongly over the past six weeks, with the benchmark Ford Motor Company's 7.45% of 2031 rising by 10 points to a $90 price range, but it remains one of the few real "asymmetry" ideas in the investment grade space with a liquid long bond trading at a discount. Ford does not make money manufacturing cars, but the company's money-making captive finance subsidiary is a critical part of its business model.

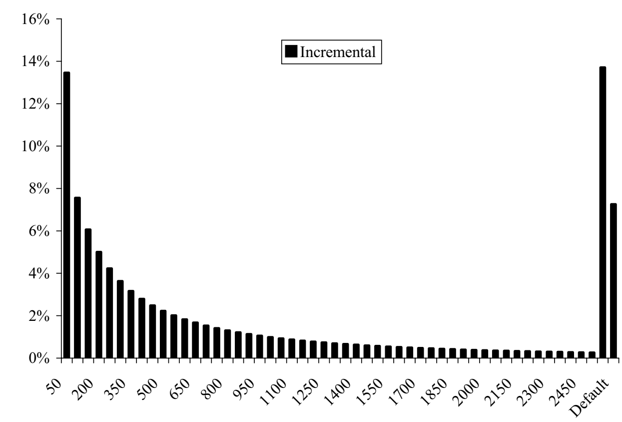
When we measure the attractiveness of the Ford asymmetry trade structure in terms of probability of outcomes, we find the market has priced in a significantly higher likelihood of both severe stress and credit improvement.

The Ford structure's implied probability distribution is shown in Exhibit 6. The distribution has quite a different shape than that of Toys "R" Us or Unum (including a much fatter tail). The implied probabilities are 81% for the wings and 19% for the continued stress scenarios.

This differently shaped distribution implies that Ford's problems may be longer term (i.e., the fatter tail implies more credit uncertainty in the forward credit curve beyond five years than in the current five-year spot curve). At current valuations, the trade structure can only be attractive to investors who have a stronger view (near certainty given the probabilities implied above) on Ford rallying or experiencing distress in the near term.

exhibit 6

Ford – "No Arbitrage" Probability Distribution



Source: Morgan Stanley

chapter 22 Why Is the Basis Negative?

June 6, 2003

Primary Analyst: Sivan Mahadevan
Primary Analyst: Peter Polanskyj
Anisha Ambardar

The basis between derivative and cash instruments, defined as CDS premium minus a bond Libor spread for a given issuer, is certainly one of the most commonly used measures to define the state of the market and make comparisons. The measure is simple in concept, but a "fair" basis is not easy to calculate and not necessarily easy to arbitrage either. With the strong rally in credit markets that started in late 2002, the basis has turned negative as credit default swaps outpaced bonds. We focus this chapter on understanding why the basis is negative, how to fairly value the basis, and recommend some basis trade ideas for investors looking to arbitrage the relationship. Given the strength of the technical support for a negative basis, we do not expect a change in the relationship, at least in the near term, unless credit market sentiment sours dramatically (which we do not expect either).

exhibit 1

TRACERS℠ Raw Basis

Source: Morgan Stanley

WHY IS THE BASIS NEGATIVE?

As shown in Exhibit 1, the aggregate raw basis (of an 88-name subset of the 100-name synthetic TRACERS℠) has been negative this year after being positive for most of the second half of 2002. Most long-term investors in the credit derivatives markets had grown accustomed to the basis being positive, a phenomenon related to a negative tone in the credit markets previously and to flows tilted toward buyers of protection. We attribute today's negative basis to several reasons, all of which we will discuss in more detail below:

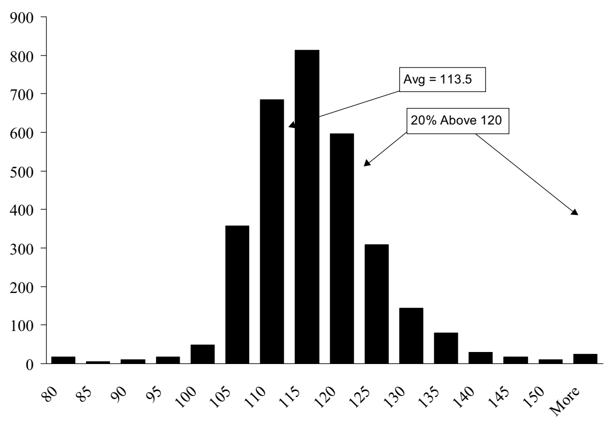
1. Dollar price anxiety among cash investors
2. Transaction costs make arbitrage difficult
3. Steeper cash credit curve
4. High beta nature of CDS relative to cash
5. Diminishing value of modification restructuring
6. Synthetic CDO/single-tranche bid

1. DOLLAR PRICE ANXIETY

Cash credit investors are struggling with accepting higher dollar prices than they have ever seen before. With the average price above $113 and 20% of the market trading above $120, there is resistance to pushing spreads even tighter. Clearly, credit default swap users do not have this concern, although, in a continued tightening spread environment, the natural floor of zero premiums could drive the basis in the other direction (with bonds trading through Libor).

exhibit 2

Dollar Price Anxiety – Distribution of Corporate Prices



Source: Morgan Stanley, Salomon Analytics

2. TRANSACTION COSTS MAKE ARBITRAGE DIFFICULT

Our second technical point supporting a negative basis stems from the notion that it is difficult to arbitrage the negative basis, given transaction costs and the embedded 'basis risk.' Capturing the negative basis (through a long bond/long protection trade) requires enough value to cross the bid-offer and enough carry to make it worthwhile. Simply put, most investors want to take risk and get paid for it, so the near-zero default risk basis trade for a small return does not seem to get enough attention today, given the incredible rally we have witnessed. Perhaps in the low spread environment going forward it may.

The potential embedded forward credit risk in most actionable basis trades is also a barrier for those looking to earn carry for near-zero default risk. The liquid bond in most 'basis trades' is longer than five years, implying forward credit risk, a topic we have discussed in detail in previous research.[1]

3. STEEPER CASH CREDIT CURVE

With most actionable basis trades requiring some amount of curve risk, another reason for the negative basis stems from the reality that cash credit curves are steeper than CDS curves, so even a curve adjustment (as we do in our "adjusted" basis calculation) is not enough to make up for it. We illustrate credit curve steepness for cash markets in Exhibit 3.

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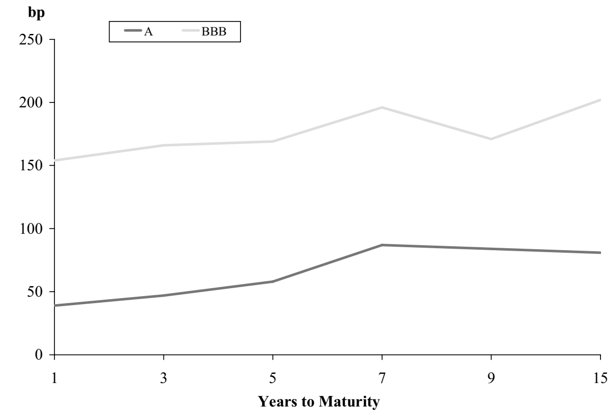
[1] *Please refer to Chapter 20.*

chapter 22

exhibit 3

Dollar Price Anxiety – Distribution of Corporate Prices



Source: Morgan Stanley, Salomon Analytics

4 AND 5. HIGH BETA NATURE OF CDS AND THE DIMINISHING VALUE OF MOD R

Given the strong technical environment we are in, it is not surprising to us that CDS premiums have rallied in more strongly than cash instruments. In previous research, our European credit derivatives strategist, Viktor Hjort, has shown that CDS can be considered a high beta market relative to cash. He has observed higher volatility and a propensity to reinforce trends. Furthermore, there has been much market attention on the value of the cheapest to deliver option and modified restructuring, but in today's tighter spread environment, investors are not demanding much for either.

6. THE SYNTHETIC CDO AND SINGLE TRANCHE BID

Finally, key support for tighter premiums in the CDS market comes from the strong bid we are seeing for structured credit products. We estimate that $12 billion notional of credit risk has moved into 'public' synthetic CDOs issued this year, but the real volume is likely much larger given the emergence of single tranche transactions that are not accounted for in the league tables. There is no real offsetting CDO bid on the cash side, as most of the activity there has been in leveraged loan CLOs. The high dollar price issue makes putting together CBOs difficult.

THE BASIS CALCULATION

The basis we calculate is currently based on an 88-name subset of the 100-name synthetic TRACERS. The 'raw basis' is simply the five-year CDS minus the Libor spread of the bond. We use mid-market levels on both, and the CDS includes modified restructuring as a credit event. The Libor-spread on the bond is a 'Z-spread,' which is equivalent to a Libor OAS calculation run at zero volatility. Investors can think of this as being a static spread over Libor. The Z-spread measure is easily calculated using OAS analytics or the ASW function on Bloomberg. We use a Z-spread rather than a par or market value asset swap spread because it is a more accurate measure of a bond's spread over Libor, given that each cash flow is adjusted based on the dollar price of the bond.

We view this 'raw basis' as being an actionable basis (once bid-offer spreads are taken into consideration) but one that still has some risk in it given mismatches in maturity and premium and discount bond prices. For this reason, we also calculate an 'adjusted basis,' which adjusts for both issues.

THE ADJUSTED BASIS – THEORETICAL VALUE

We adjust the maturity mismatch by simply using an interpolated CDS premium (based on a full CDS curve) to match the maturity of the bond. The adjustment for a premium or discount bond is a bit more complicated. The basic notion is that a par-weighted basis trade results in too little (much) protection for a premium (discount) bond. To compensate for this, we purchase (for a premium bond) or sell (for a discount bond) an additional amount of protection, based on the average forward price of the bond for each year until maturity.

Given positively sloped credit curves and dominance of premium priced bonds, our adjusted basis is less negative than the raw basis (currently the difference is 7 bp).

BASIS TRADE IDEAS

Although we expect the overall basis to remain negative in the near term, there are individual basis trades that appear attractive to us. We recommend these trades for investors looking for positive carry trades but who can tolerate some amount of forward credit risk. We list these ideas in Exhibit 4 based on recent pricing (CDS with modified restructuring to June 20, 2008), but we encourage investors to look for opportunities where they do not have to pay full bid-offer, as this can be an important driver of the relative value and can make the unwind that much easier.

exhibit 4 Basis Trade Ideas

Size ($ MM)	Bond	Z Spread	CDS Prem.	Net Carry	Analyst Recommendation
CIT Group	7.75 4/02/2012	163	110	53	Underweight (V)
Motorola	6.50 3/01/2008	170	140	30	NA
Devon Energy	6.875 9/30/2011	91	60	31	Equal-weight
Anadarko Pet	6.75 5/01/2011	76	38	38	Equal-weight

Source: Morgan Stanley

chapter 23 Trekking the TMT Terrain

December 5, 2003

Primary Analyst: Sivan Mahadevan
Primary Analyst: Peter Polanskyj
Anisha Ambardar

Even in a relatively benign credit risk environment, we argue that investors should avoid being too complacent about the telecom, media and technology sector, as opportunity and relative value certainly exist. We consider two characteristics of this all-important sector critical for investors to understand. First, more so than almost any other investment grade sector, TMT has experienced incredible spread compression this year. Much of the remaining risk differentiation in the names is evident in the shape of credit curves, but cash and default swaps do not necessarily agree. Comparing both on an apples-to-apples basis is important, nevertheless, given the large premium prices on the bonds. We lay out a simple framework to demonstrate some relative value and conclude that, despite high dollar prices, many 10-year cash bonds look attractive to us relative to selling CDS protection.

Second, both our Telecom and Media analysts expect M&A activity to pick up in these sectors in the medium term. While managing single-name risk in this environment can be a guessing game, playing mergers through first-to-default baskets can take some of the uncertainty out by allowing sellers of protection to position for merger activity alone, as we have discussed in previous research. We look at some opportunities going forward.

exhibit 1 “Pure” Credit Curves – Selected TMT 5s-10s Default Swap Levels

	5 Yr (Mid)	**10 Yr (Mid)**	**5s-10s Curve**
Time Warner Inc.	45	58	13
AT&T Corp.	85	106	20
AT&T Wireless Services Inc.	99	111	12
BellSouth Corp.	29	35	6
Sprint Corp.	139	169	31
News America	55	77	22
Dow Jones TRAC-X TMT Basket (25 Names)	**57**	**73**	**16**
Dow Jones TRAC-X II	**54**	**67**	**13**

Source: Morgan Stanley

TMT CREDIT CURVES

For the investment grade market at large, the 5s to 10s default swap curve (at 13 bp for Dow Jones TRAC-X II) seems too flat to us, particularly from a default risk perspective. We have noted in previous research that for a 10-year investment grade position today (given where we are in the economic cycle), default risk is significantly higher in the last five years than in the first five years, which argues for a steeper curve.[1]

Within the TMT space, however, the curve is steeper (TMT TRAC-X 5s versus 10s trades 16 bp apart), and, more importantly, there is a fair amount of curve dispersion among single names. The tightest of the tight trade with fairly flat curves (e.g., BellSouth is only 6 bp steep), but many others trade with much steeper curves (Sprint 5s-10s is 31 bp; see Exhibit 1). We argue that a steeper curve is justified for many TMT credits, given its higher beta nature, but how do we know if these levels are adequate or attractive?

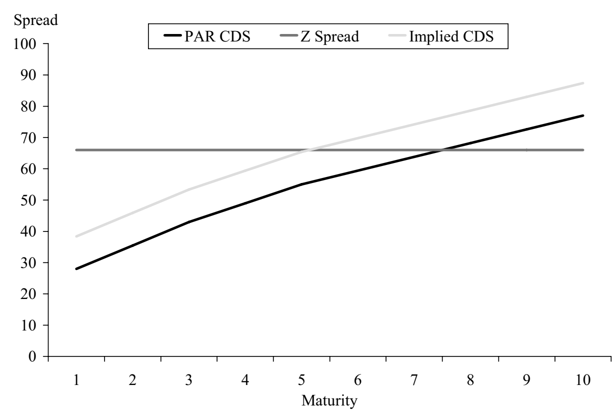
THE CASH CREDIT CURVE LANDSCAPE

The natural curve comparison to make is within the TMT cash market, but Libor spreads and high dollar prices confuse the issue. On a Z-spread basis, cash curves are somewhat steeper, making the case for getting long 10-year risk in cash versus default swaps strong. Yet, we can't forget the most important distinction, namely that the incredible 2003 spread compression trade in TMT translates into much higher than average dollar prices for these longer-dated instruments.

In theory, default risk is higher for a premium instrument (relative to a par instrument) because the incremental exposure over par will have no recovery in default (i.e., claims are based on par). Investors need to be compensated for this phenomenon, which explains the steeper cash curve for many of these issuers. Yet, how can we easily determine whether the compensation is fair?

exhibit 2

News America 10-Yrs Attractive Relative to CDS Curve



Source: Morgan Stanley

AN APPLES-TO-APPLES COMPARISON

Given a cash bond, a (par) default swap curve and a recovery assumption, we can generate an implied (par) default swap curve from the bond price. This implied default swap curve provides a more accurate measure of relative value than Z-Spreads when

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[1] *Please refer to Chapter 33.*

credit curves are steep.[2] This calculation takes into account not only the actual timing of cash flows for the bond but the changing default exposure (caused by any premium or discount accretion over time) and default likelihood (caused by a credit curve that is not flat).

Take News America 10-year bonds, which trade at a $129 price, as an example; they seem rich on a pure Z-Spread basis (trading 11 bp through 10-year default swap levels). Yet, the shape of the curve (22 bp steep) implies that the CDS premium should be wider, or alternatively, that the bond price should be higher, which makes the bonds cheap on this basis (see Exhibits 2 and 3). The implied bond price is about a point higher. The intuition here is that the combination of large, front-loaded cash flows (big coupons) and low discount rates (a steep credit curve) early in the life of the bond makes it more attractive.

10-YEAR BONDS VERSUS DEFAULT SWAPS IN TMT

So are there any opportunities out there? We believe so, and in Exhibit 3, we list some relationships. Like News America, Sprint 10-year bonds appear rich on a Z-Spread basis but are more attractive (by slightly less than one point in price) when taking the shape of the curve into consideration (which is over 30 bp steep between 5s and 10s).

exhibit 3 TMT Relative Value in a Steep Credit Curve, High Dollar Prices Environment

	Time Warner	AT&T Wireless	Sprint	News America
Coupon	6.875	8.125	8.375	9.25
Maturity	05/01/2012	05/01/2012	03/15/2012	02/01/2013
Bond Price	111.56	115.65	114.61	129.07
Z-Spread	63	123	163	66
10-Year CDS Premium	58	111	169	77
Implied Values				
10-Year Par CDS Premium	93	143	179	87
Bond Price	114.44	118.48	115.51	130.13
Bond Relative Value				
Using Z-Spread	Cheap	Cheap	Rich	Rich
Using Implied Values	Cheap	Cheap	Cheap	Cheap

Source: Morgan Stanley

MERGERS AND BASKETS

The other part of the TMT terrain that investors need to get comfortable with in the medium term is a potential increase in merger and acquisition activity, which our credit

[2] *Please refer to Chapter 9.*

analysts expect. In a previous research report, we discussed in detail how the seller of protection in a first-to-default basket is long a merger option if the basket is structured with no replacement language.

The intuition here is that a basket of, say, five credits that experiences a merger between two of the five names becomes a basket of four credits after the merger. Ignoring the impact of potential spread movements for a minute, investors can think of this structural change in the basket as either a “deleveraging” or an increase in correlation (because the correlation of the two merged names goes to 1.0). In either case, this is good for the seller of protection, but he or she is still exposed to the direction of spreads, unless this is delta-hedged.

In the Media sector, there is merger potential and we have designed both “big” and “small” media baskets that support this view (see Exhibit 4). We present a first-to-default basket of wireless operators in Exhibit 4.

exhibit 4 A Table of FTD Baskets

Basket/Name	Spread (Bid/Offer)	Total Spread	Avg Spread	Pct Spread (Bid/Offer)	Correlation (Bid/Offer)
Big Media Basket	403/423	494	99	82%/86%	52%/42%
Time Warner	39				
Comcast	49				
Cox	36				
Disney	33				
Cablevision	335				
Small Media Basket	154/171	213	35	72%/80%	56%/44%
Time Warner	39				
Viacom	23				
News America	58				
Gannett	20				
Belo	47				
Tribune	24				
Wireless Basket	317/339	450	75	70%/75%	55%/47%
AT&T Wireless	84				
Verizon Wireless	28				
Sprint	117				
Cingular	35				
Nextel	160				
Alltel	25				

Source: Morgan Stanley

chapter 24 The High Yield Basis – Calling All Bonds

February 6, 2004

Primary Analyst: Sivan Mahadevan
Primary Analyst: Brian Arsenault
Primary Analyst: Peter Polanskyj
Anisha Ambardar

In the investment grade markets, where default swap usage is commonplace, investors spend quite an amount of energy focusing on the basis between cash and derivatives markets. This basis has been negative for most of the past 15 months, meaning that cash bonds trade wider than CDS, all else being equal. Recent volatility and spread widening has moved the investment grade basis into slightly positive territory. We continue to feel that this basis is driven by technical aspects (such as high dollar-priced bonds and the transaction costs associated with arbitraging the relationship), as well as movements in swap spreads and volatility, which the recent widening has supported.[1]

The high yield basis, on the other hand, is far less trafficked than its investment grade counterpart, and is furthermore affected by different issues, in our view. First, flows in high yield default swaps tend to be dominated by the hedge fund community (convertible arbitrage players in particular), although this landscape could change this year. In investment grade, flows are well split between banks, insurance companies, hedge funds and synthetic structured vehicles. Those hunting for high yield relative value opportunities should keep these distinctions in mind. Second, with the bulk of the high yield cash market consisting of callable bonds, any high yield basis opportunity involving callable bonds is a play on the value of the option, as well. For example, it may be natural for an investor to express a bullish credit view using a given credit's default swap instead of the issuer's callable bonds, if the option itself has value. We describe the high yield basis in more detail focusing on the complications of comparing callable bonds to default swaps. We also highlight some relative value using example issuers.

THE DETAILS – CALCULATING THE HIGH YIELD BASIS

The calculations used in the high yield basis are similar, in spirit, to those used in investment grade. In particular, we calculate both a raw basis (which is simply the five-year CDS premium minus the Z-spread to worst of the bond) and an adjusted basis, which takes into consideration maturity mismatches and adjustments for premium and discount bonds. Our published high yield basis includes 38 issuers. The bonds included for four of these issuers are callable. High yield bonds typically do not trade on an OAS basis.

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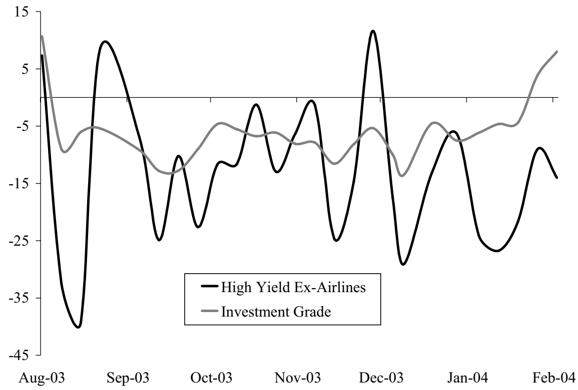
[1] *Please refer to Chapters 10 and 22.*

exhibit 1

A More Volatile Basis – High Yield vs. Investment Grade.



Source: Morgan Stanley

The standard terms under which US high yield credit default swaps trade do not include restructuring as a credit event. This compares to the Mod R contracts we use in computing the investment grade synthetic basis. Finally, the liquidity differences between high yield and investment grade can increase the volatility of our basis estimates (which is illustrated in Exhibit 1).

IT'S NORMAL TO BE CALLABLE

Two-thirds of the high yield index is callable, while, for investment grade, callable issuance is only about 4%. The traditional structure in high yield has been 10nc5, with the issue being callable in year 5 at par + 1/2 the coupon. Over the last few years, there have also been a number of 7nc4 deals. These variable structures translate into differing risk reward profiles, which we feel investors should consider carefully.

The composition of the high yield market has also changed in the recent past. The typical high yield issuer once had 2-3 issues outstanding. With over half the names on our high yield synthetic basis report being fallen angels, we find an increased concentration of credits with a larger number of issues outstanding and extensive credit curves. A well developed credit curve makes synthetic-cash comparison more meaningful, and the increased liquidity in large issues makes taking advantage of these comparisons a more reasonable exercise.

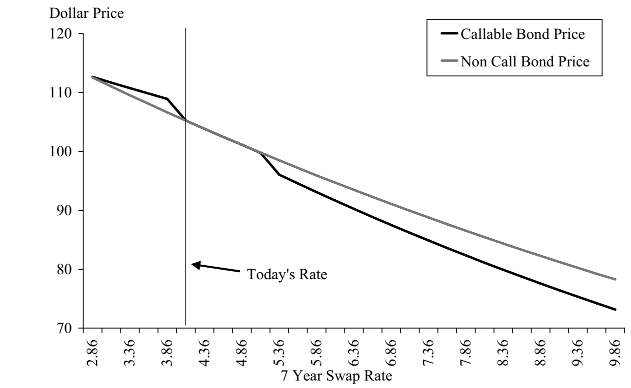
BONDS TRADING TO CALL DATES

With the rally in both rates and spreads, many high yield bonds are priced at significant premiums and, as such, are trading to either the nearest, or some interim, call date. These issues now can have limited upside in the case that rates move lower or spreads move tighter. At the same time, they can have a heightened susceptibility to rising interest rates.

chapter 24

exhibit 2

Xerox Price Sensitivity – Callable Bonds (7.625 of 2013) and a Hypothetical Bullet



Source: Morgan Stanley

The high yield market has traditionally been viewed as having a muted exposure to interest rate moves. That said, we find the current environment of high dollar prices (80% of the market is above par) and low absolute yields one in which interest rate sensitivity may indeed be heightened. The natural interest rate exposure can further be exaggerated by the combination of an upward sloping yield curve and the potential for bonds currently trading to near-dated calls to extend with any widening. Exhibit 2 highlights the price performance of the Xerox 7.625s of 2013 relative to a hypothetical bullet bond maturing on the current worst date for a variety of parallel rate moves. While shifting the rate curve, we assume that the spread to worst for the bond remains fixed at the current level.

BONDS VS. DEFAULT SWAPS – THE IMPACT OF CALL OPTIONS

While credit default swaps (excluding airlines) generally trade inside the comparable cash instruments, and sometimes significantly so, they are not exposed to some of the additional risks that are typical of high yield bonds today. Default swaps do not have direct exposure to interest rates nor are they exposed to the call provisions that may exist in the underlying cash bonds (which can be triggered by either rate or spread moves). Finally, default swaps can be considered par instruments. Cash bonds trading at premium dollar prices can be thought of as having a zero recovery credit exposure in the amount of the premium. Investors need to be compensated for this subtle difference in credit risk.

Bonds trading at yields that make their call options close to at-the-money highlight the importance of the extension risks assumed by buyers of cash instruments. In Exhibit 3, we calculate the CDS equivalent spread for the American Tower 7.25s of 2011 for several possible call dates. The results vary from being close to parity when measured to the 2007 call to 102 bp of positive basis when measured at maturity. For the current worst date in 2009, a long CDS position offers 74 bp of additional yield without exposure to the short call option position or the incremental zero recovery risk caused by the premium price of the bond.

exhibit 3 Scenario Analysis – Callable Bonds Against 5-year CDS

Call Date	Call Price	CDS Equivalent Bond Spread (Ask)	5 year CDS Spread (Bid)	Basis
AMT – 7.25s of 2011				
12/01/07	103.625	328	325	(3)
12/01/08	101.813	273	325	52
12/01/09	100.000	251	325	74
12/01/11	100.000	223	325	102
AV – 11.125s of 2009				
12/01/07	105.563	244	180	(64)
12/01/08	102.781	259	180	(79)
12/01/09	100.000	260	180	(80)
12/01/11	100.000	286	180	(106)

Source: Morgan Stanley

These relationships can be reversed when the basis is sufficiently negative. Callable bonds with very high dollar prices, which would tend to have call options that are deep in the money, require extreme moves in rates or spreads for extension risks to be significant. These are also the bonds that are most susceptible to "dollar price anxiety," which leads to relatively high compensation for the zero recovery risk generated by high coupons.[2] We illustrate this point in Exhibit 3, where we compare the CDS equivalent spread of the Avaya 11.125s of 2009 for several call dates to the 5-year credit default swap spread. We find that the bond offers spreads in excess of 5-year CDS, whether it is assumed to be called on the next call date or outstanding until maturity.

This is a case where the highly negative basis more than compensates for the premium price and optionality inherent in the cash instrument.

PLAY THE BASIS WITH INSIGHT

The basis between high yield cash and derivative instruments is a good source of relative value, but one that can be complicated by differences in flows, liquidity, optionality and associated interest rate risk. We encourage high yield market participants to develop insights into these differences, which can further support a fundamental approach to credit selection and valuation.

[2] *Please refer to Chapters 22 and 23.*

chapter 25 High Yield, Higher Rates, Hello Convexity

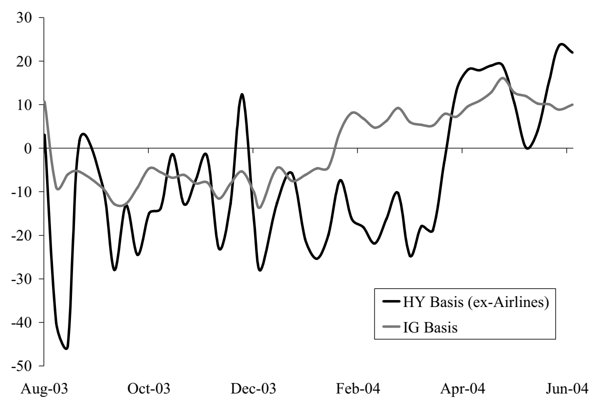
June 18, 2004

Primary Analyst: Sivan Mahadevan
Primary Analyst: Peter Polanskyj
Primary Analyst: Brian Arsenault
Anisha Ambardar
Angira Apte

In investment grade markets, we have discussed in detail the drivers behind the regime shift in the basis (between cash and default swaps), which we argue is related to both interest rate moves and a "cultural" difference in flows. Corporate bond investors, many of whom run portfolios versus credit benchmarks or liabilities, have supported spreads this year, while many in the levered investment community have feared the impact that rising rates may have on credit, and have subsequently lightened up long exposures, established shorts, or left the markets altogether. The result is that default swaps have traded comfortably wider than corporate bonds over the past few months, after having been the other way around for almost 18 months.[1]

exhibit 1

Comparing the Basis – High Yield Catches Up to and Passes Investment Grade.



Source: Morgan Stanley

The high yield basis is a much harder relationship to generalize, but we do find some similar themes playing out in this more levered corner of the credit markets. On the surface, the high yield basis has widened out into positive territory as well, although much more recently than in the investment grade markets (see Exhibit 1). Like investment grade, traditional cash investors are continuing to stay long the market and support spreads, while hedge funds have reduced long credit positions in default swaps. Yet, the rise in interest rates has had a more important impact on high yield. With well over half the market comprised of callable bonds, the high yield index has extended in maturity (to worst) by six months, driven by an average extension of 2.3 years for the more than 250 bonds in the index that actually changed "to-worst" dates over the past two months.

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[1] *Please refer to Chapter 49.*

We believe that high yield callable bond investors have not been adequately compensated for extension risk, as implied by prices on default swaps or bullet bonds.[2] With the rise in rates, we find that, for many callable bonds where implied option prices were small or non-existent, price performance was much worse than for the market at large.

Furthermore, despite a wider basis, we find the current environment in high yield to be attractive for asymmetry (or "convexity") trades, where an investor positions a discount-priced long-dated bond relative to shorter-dated protection to implement a convex pay-off profile for big moves in the credit (in either direction).

HIGH YIELD REACTS TO THE NEW REGIME

The rise in rates and reshaping of the Treasury curve has caused the high yield index to extend in maturity (to-worst date) by six months since the end of March, on average. Yet, since averages are not always the best way to describe the high yield market, the details are important. Out of 1,237 index bonds, 266 (22%) actually extended, meaning that they now trade to a call date that is further out (or to maturity). The average extension among these bonds was 2.3 years, with half of them (11% of the market) extending by more than two years. Who said high yield does not have interest rate risk?

exhibit 2 High Yield Market Reacting to Interest Rate Moves

	High Yield Index			Bonds that Actually Extended		
	Maturity (to Worst)	Duration (to Worst)	Price	Maturity (to Worst)	Duration (to Worst)	Price
2-Month Average Change (Market Weighted)	0.5 yrs	0.0 yrs	-3.6 pts	2.3 yrs	0.9 yrs	-3.8 pts
2-Month Median Change (Not Weighted)	0.0 yrs	-0.2 yrs	-3.1 pts	2.0 yrs	1.0 yrs	-4.0 pts

Source: Morgan Stanley, Salomon Analytics

Spreads to Libor have moved 15 bp tighter since the end of March, but we caution that Z-spread measures should tighten when dollar prices fall, all else being equal. The average price of the index has dropped by 3.6 points over this two-month period. For the bonds that extended, the average price fall was 3.8 points, with half the bonds off by more than 4 points. The 80 bp rise in Treasuries would be worth approximately 3.6 points in price, assuming an index duration of 4.5.

OPTIONS FOR NOTHING, INTEREST RATE RISK FOR FREE

To further highlight the interest rate sensitivity that exists in the high yield market, we focus on the general lack of option premium that callable bond investors are being paid to take on the extension risk. In a previous chapter, we described a methodology for implying the option premium that callable bond investors were being paid, given where bullet securities or default swaps trade.[3] For the callable bonds that we analyzed in detail (see Exhibit 3), many had low or even non-existent implied option premiums, when in fact our methodology implied that they should be several points, based on certain volatility assumptions.

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[2] *Please refer to Chapter 42.*
[3] *Please refer to Chapter 42.*

exhibit 3 Price Performance of Callable Bonds – With Rising Interest Rate

				Price			Z-Spread			CDS / Bullet Z-Spread		
Ticker	Coupon	Maturity	Implied Option Price	March 26	Current	Difference	March 26	Current	Difference	March 26	Current	Difference
WMB	8.625	6/1/2010	3.53	110.250	109.375	(0.875)	356	200	(156)	255*	206*	(49)
AW	7.875	4/15/2013	Less than zero	109.000	103.000	(6.000)	353	251	(102)	290	293	3
NXTL	6.875	10/31/2013	1.53	106.625	98.500	(8.125)	258	188	(70)	175	190	15
DISH	9.125	1/15/2009	5.21	113.375	109.250	(4.125)	212	282	70	180	208	28
LYO	9.5	12/15/2008	Less than zero	99.500	103.500	4.000	574	444	(130)	675	493	(183)
HMT	7.125	11/1/2013	Less than zero	103.500	96.750	(6.750)	293	241	(52)	325	260	(65)
XRX	7.625	6/15/2013	1.20	106.500	99.000	(7.500)	296	264	(32)	255	283	28
EQCHEM	10.625	5/1/2011	2.11	105.500	109.000	3.500	628	403	(225)	556*	353*	(203)
AMT	7.25	12/1/2011	Less than zero	102.000	99.250	(2.750)	365	261	(104)	425	358	(68)
AMKR	7.75	5/15/2013	0.23	101.500	95.000	(6.500)	399	344	(55)	353*	371*	18
DTV	8.375	3/15/2013	8.72	113.125	110.000	(3.120)	296	233	(63)	143	133	(10)

** - Z-spread of bullet security*
Source: Morgan Stanley, Bloomberg

Price performance since then has been very interesting, demonstrating that bonds where option premiums were low or non-existent suffered more pain when interest rates rose. For example, Allied Waste 2013 bonds had a no-option premium based on our March 26 analysis and have dropped 6 points in price since then, extending from a 2008 "to-worst" date to 2011. The Z-spread-to-worst, though, "rallied" 102 bp. Nextel 2013 bonds, where investors were being paid only 1.5 points of option premium based on our analysis, dropped over 8 points in price as rates rose, with the Z-spread-to-worst 70 bp tighter. Host Marriott dropped 6.75 points (with the Z-spread 52 bp tighter) and we argued that implied option prices were also less than zero for this bond in our March 26 report. This rally in Z-spreads relative to CDS spread levels can be explained at least partially by the lower dollar prices of these bonds (and the inherent lack of zero recovery exposure that exists in premium bonds).

For the DirectTV 2013 bonds, our March analysis showed that the implied option price was over 8 points, which we thought was reasonable valuation. These bonds dropped only 3.1 points in price as a result of the interest rate move.

NORTH TO SOUTH SPELLS CONVEXITY TRADES

Basis trades (long bonds, long protection) where bonds are purchased at a discount have convex pay-off profiles because the protection owner can earn the difference between par and the purchase price of the bond at the time of default.[4] If the bond is longer dated than the protection, it also performs well when the credit rallies, which is why market participants have coined the term "convexity trades" for the structure.

Thanks to the interest rate moves, the average price of high yield bonds has now moved to below par for the first time since the fall of 2003, with many names trading well south of par (25% of index bonds are below $95). Such an environment is ripe for "convexity trades" in high yield and we highlight a few opportunities in Exhibit 4. The long position in the 2030 Abitibi bond versus long protection in five-year default swaps is a forward long credit position, but protects the investors from near-term (extreme) stress and would actually profit on default, given that the bond trades at a slight discount.

exhibit 4 Positive Carry, Forward Long Convexity Trades

	Size ($ MM)	Instrument	Dollar Price	Z-Spread/ CDS Spread
Georgia-Pacific Corp	10.00	8.875's of 2031	104.5	277
	10.75	5 Year CDS		180
Net[1]				92
Starwood Hotels & Resorts	10.00	7.75's of 2025	94.0	269
	10.00	5 Year CDS		187
Net[1]				70
Abitibi-Consolidated Inc	10.00	8.85's of 2030	98.0	343
	10.00	5 Year CDS		290
Net[1]				47

[1]*Basis points on dollar price of bond.*
Source: Morgan Stanley

[4]*Please refer to Chapter 20.*

chapter 26 The Airline Triangle

November 7, 2003

Primary Analyst: Sivan Mahadevan
Primary Analyst: Peter Polanskyj
Anisha Ambardar

In the continued hunt for relative value opportunities, bonds versus default swaps are tempting relationships to test, particularly given a developing default swap curve. Simple basis trades are still very popular, but we encourage investors to think about the ultimate motivation for putting these trades on. While the basic maturity-neutral basis trade is positive carry on average, making a living in this space is hard. Higher rates or a significant widening of spreads could produce positive P/L in long bond versus long protection positions, but there are better ways to position for such events. Factors that can make the trade move against basis players include a potential synthetic CDO bid that is stronger than banks' bid for protection, or mortgage-related technical events that move around swap spreads.

Introducing some complexity in the bonds versus default swap space, though, can uncover some interesting relative value, in our view. In the airline sector, we consider the triangular relationship between unsecured protection, unsecured bonds, and secured bonds to be largely uncharted territory. Like the more notorious triangle in the Atlantic Ocean, the reasons behind the relationships are puzzling, leading many investors to just avoid the situation altogether. Yet the relative value is clear.

Using a simple risk-neutral framework, unsecured airline protection curves imply relatively low recoveries for many secured bonds (EETCs and ETCs), when compared to projected recoveries. Moreover, unsecured bonds look rich to the other two parts of the triangle. What's the trade to do? If you are bullish on airlines, some of the secured bonds seem attractive on an absolute basis. If you are bearish, or just less certain in general, buying the same secured bonds versus long protection positions makes for interesting packages.

AIRLINES VS. AIRCRAFT – IMPLYING RECOVERY RATES

Secured versus unsecured relationships in airlines are ripe for relative value analysis because of the nature of recovery rates in this market.[1] There is general agreement that unsecured lenders to airlines will get close to nothing back at default or during bankruptcy. In the simple algebra of risk-neutral math, this removes one important variable, allowing us to imply a recovery rate for secured bonds.

Investors can use such an analysis to get a sense of richness or cheapness of secured bonds relative to a default swap curve. In particular, we suggest an approach involving discounting the bond's cash flows by a default probability factor that is implied not from a single default swap, but rather from the whole curve of protection that trades in the market. Let's focus on some ideas:

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[1]*Please refer to Chapter 13 for our early thoughts.*

SECURED BONDS AND UNSECURED PROTECTION

Doug Runte, our airlines analyst, finds that most unsecured airline debt is rich versus subordinate tranches of EETCs (see "Airline Debt Market Update," November 4, 2003). Using the above risk-neutral framework is a good way to demonstrate this phenomenon quantitatively and to find specific opportunities. Given a set of default probabilities for specific dates (which we derive default swap curves), we compute implied recovery rates for several secured bonds and compare them to Doug's projected valuations (see Exhibit 1). Doug considers these valuations to be conservative estimates in the event of bankruptcy. For EETC subordinate tranches, such projections are somewhat subjective, given that assumptions are made about what the airline may do with the aircraft. Applying other assumptions may imply different strategies or recoveries.

exhibit 1 Implied vs. Projected Recoveries – Long Airline Opportunities

Issuer	Coupon	Maturity	Series/Type	Dollar Price	Implied Recovery	Projected Recovery
AMR	6.817	5/2011	EETC 2001-1 A-Tranche	89	62%	90%
AMR	10.44	3/2007	ETC 1990 Q, R	89	22%	28%
CAL	7.033	6/2011	EETC 2001-1 Class C	86	14%	17%
CAL	8.499	5/2011	EETC 2000-1 Class C-1	88	17%	20%
DAL	10.00	6/2012	ETC 1989-B	87	21%	41%
AMR	9.00	8/2012	Unsecured	84	39%	Near 0%

Source: Morgan Stanley

For example, the AMR 6.817% of 2011 (EETC A-Tranche) has an implied recovery of 62% versus a projected recovery of 90%, making the tranche the most attractive (among the ones listed) based on these valuation metrics. Doug attributes this to too much market focus on the type of aircraft in this transaction versus on the importance of the aircraft within the fleet. By comparison, the AMR unsecured bonds have an implied recovery of 39%, demonstrating the richness of these bonds relative to the other two legs of the triangle. The Delta Airlines 10% of 2012 (an ETC) has a recovery differential of 24% implied versus 41% projected, which is also quite large. Note that for the EETC tranches, the analysis makes the conservative assumption of ignoring the rolling coupon guarantees (typically three payments).

ARE YOU BULLISH TODAY?

For investors who are comfortable getting long airline risk on an absolute basis, these secured airline bonds represent good value, in our view. Although they are the richest part of the triangle purely on a yield basis, they cause the least amount of pain if you are wrong, which is a scenario one cannot afford to ignore in this space. For example, selling unsecured protection outright to 2013 earns 24 points upfront (and 500 bp running), but incurs a loss of 76 points on default, assuming 0% recovery (clearly a trade for the not so faint of heart). A long position in the AMR 6.817 A-tranche, on the other hand, will cost 89 points (earning a 682 bp running), and will *gain* 1 point at default based on a 90% projected recovery, which is far less painful. In a less extreme example, the Delta Airlines 10% of 2012 would cost 87 points (earning 1000 bp running), but would lose 46 points at default (based on a 41% projected recovery).

chapter 26

ARE YOU BEARISH TODAY?

Buying unsecured protection outright has a lot of sticker shock associated with it, even though it is the natural bearish position. Shorting the unsecured bonds is a better way to implement the view, but it is certainly much harder, given the difficulty in borrowing the bonds.

From a total carry perspective, a less expensive way of implementing a bearish view on the airlines is to enter into a secured instrument versus protection package. The net effect of these trades is positive performance at default in exchange for negative carry (see Exhibit 2), albeit this is much more muted (at both ends) than simple long protection positions.

exhibit 2 Are You Bearish? Long Secured Debt/Long Protection Packages

Package	Coupon	Maturity	Price	Carry (bp) over Libor	Proj Recov	Gain on Imm Default	Breakeven Recovery (Prob Wgt)
AMR	6.817	5/2011	89		90		49
CDS	(5.00)	5/2011	31		100		100
Pkg 1	**1.817**		**120**	**(453)**	**190**	**70**	**149**
AMR	10.62	3/2012	87		28		22
CDS	(5.00)	3/2012	32		100		100
Pkg 2	**5.62**		**119**	**(148)**	**128**	**9**	**122**
DAL	10.00	3/2012	87		41		62
CDS	(5.00)	3/2012	25		100		100
Pkg 3	**5.00**		**112**	**(116)**	**141**	**29**	**162**

Source: Morgan Stanley

For example, in package 1, the investor would purchase the AMR 5.817 EETC tranche at $89 and buy protection to the same date paying 31 points upfront. The net price payout is 120 points and the net coupon received would be 1.817%, which translates into a negative carry (assuming funding at Libor) of 453 bp. With the projected recovery on the AMR tranche at 90%, the investor would gain 70 points (190 minus 120) if AMR defaulted immediately. We calculate the breakeven recovery on the tranche over time (which considers the cost of the negative carry and the probability of default) to be 49 points on the tranche, which is still well below our projected number.

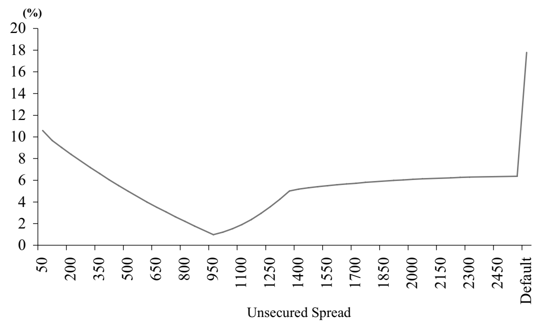
The Delta Airlines package has somewhat of a different payout and makes for an interesting comparison. Here, the secured instrument plus protection costs 112 points, and, given the high coupon, the negative carry is only 116 bp. With a projected recovery of 41%, the gain for an immediate default is 29 points (141 minus 112). However, over time, the trade becomes less favorable, which is attributed to the flatter term structure of protection. The probability-weighted breakeven recovery is 62% on the tranche, well above the 41% projected level. Clearly this package is only attractive if the investor considers default a near-term event.

ARE YOU BEARISH TODAY AND BULLISH TOMORROW?

Finally, in the airline space, we have discussed in the past the rationale for getting long airlines on a forward basis.[2] In their simplest form, forward trades involve selling long-dated protection versus buying short-dated protection. If we consider the same trade using a secured bond instead of long-dated protection, we get very convex payoffs. For example, in Exhibit 3 we show the payoff (in one year) for purchasing AMR 9.87% of 6/2009 (at $77) versus AMR unsecured protection to 12/2006 (25 points upfront plus 500 bp running). Notional weights and maturity dates can be modified to suit specific views.

exhibit 3

Bearish Today, Bullish Tomorrow? Long-Dated Secured Debt vs. Short-Dated Protection



Source: Morgan Stanley

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[2]*Please refer to Chapter 11.*

chapter 27 Oil Reshapes the Airline Triangle

June 4, 2004

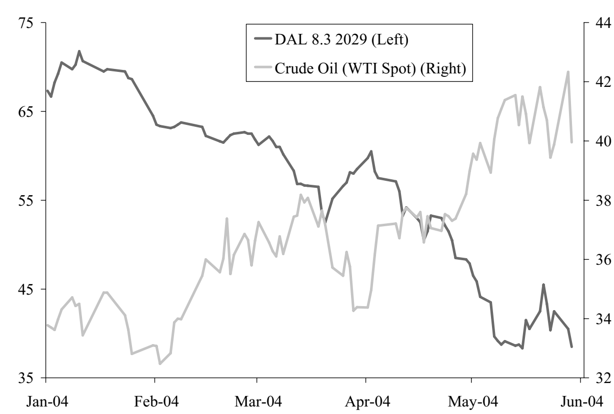
Primary Analyst: Sivan Mahadevan
Primary Analyst: Peter Polanskyj
Anisha Ambardar
Angira Apte

One of the most fascinating cash versus default swap trading strategies exists in the airline space, where we have argued that the triangular relationship between unsecured protection and secured and unsecured debt instruments is an interesting, albeit sometimes treacherous, place to trade. When we last addressed this topic in detail, unsecured bonds seemed rich relative to CDS curves, while selected subordinated secured instruments appeared more attractive when comparing CDS implied recovery rates with projections from our airline team.[1]

Since that time, improving global economies have supported airline travel, boosting demand for aircraft and supporting values for secured debt. Yet, somewhat ironically, rising oil prices, poor oil hedging strategies and a lack of pricing power in the US industry have forced unsecured debt prices much lower (see Doug Runte's report "Fasten Your Seatbelts," May 14, 2004). Furthermore, Delta Airline's problems, which include a negative cashflow operating environment and a large number of retiring pilots (linked to pension incentives in a rising rate environment), are forcing the airline to flirt with bankruptcy. From a technical perspective, flows in Delta dominate liquidity, and the default swap markets have seen numerous new entrants from the equity hedge fund community recently. CDS curves for other airlines have moved wider in sympathy with Delta, although increased oil price is a real issue and is introducing "humps" in the curves, as well.

exhibit 1

Oil Spills into the Delta?



Source: Morgan Stanley

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[1] *Please refer to Chapter 26.*

The correlation breakdown (between secured and unsecured instruments) has interesting implications on the airline triangle. When we employ our implied recovery rate methodology, we find that unsecured bonds appear increasingly rich versus CDS curves, given current curve shapes and absolute moves in CDS premiums. Selected secured tranches seem more attractive, although most currently trade at levels that imply recovery rates above our analysts' estimates.

THE AIRLINE TRIANGLE – THREE SIDES AND THREE THEMES

Three themes seem to dominate day-to-day trading in the airline triangle. First, rising oil prices, coupled with improving economies, have caused an unexpected correlation breakdown between secured and unsecured legs. The scenario of significantly higher operating costs, coupled with stronger demand, was probably not a base case in most investors' minds. Oil is now front-page news, with Middle East tensions and strong consumer demand (not to mention America's love affair with SUVs) having a huge impact. The lack of pricing power in the industry is making the operational aspects of airlines riskier and is helping push unsecured bond prices lower (even away from Delta). For example, AMR Corp. and Northwest Airlines (NWAC) benchmark unsecured bonds are 10-20 points lower today, compared to first quarter 2004 levels. But improving travel, particularly in Europe and Asia, is supporting the EETC market by strengthening values of aircraft collateral. Many A-tranches still trade near par, and prices of select subordinate tranches are unchanged over the past several months.

Second, market activity late last year was dominated by only a handful of participants who could (or were willing) to trade the triangle. Today, there are plenty more players, most importantly in the equity hedge fund community, who are discovering that the term structure of unsecured airline protection offers interesting ways to implement long/short strategies with equity securities and options. Third, flows in Delta dominate liquidity, forcing a bit of a contagion impact on the other airlines, even if not fully justified.

WHAT ARE THE CURVES SAYING?

Unsecured airline term structures (default swaps) have reshaped quite dramatically, given all of these market dynamics. Compared to late last year, equivalent running premiums are 200-300 bp wider, and the riskiest points in the curves have moved closer in, with the "hump" now consistently at a two-year point for AMR Corp. and Northwest Airlines (compared to three- and four-year points seven months ago). We argue that this reshaping is related to near-term operating risks in a higher oil price environment, as well as sympathy related to Delta Airlines.

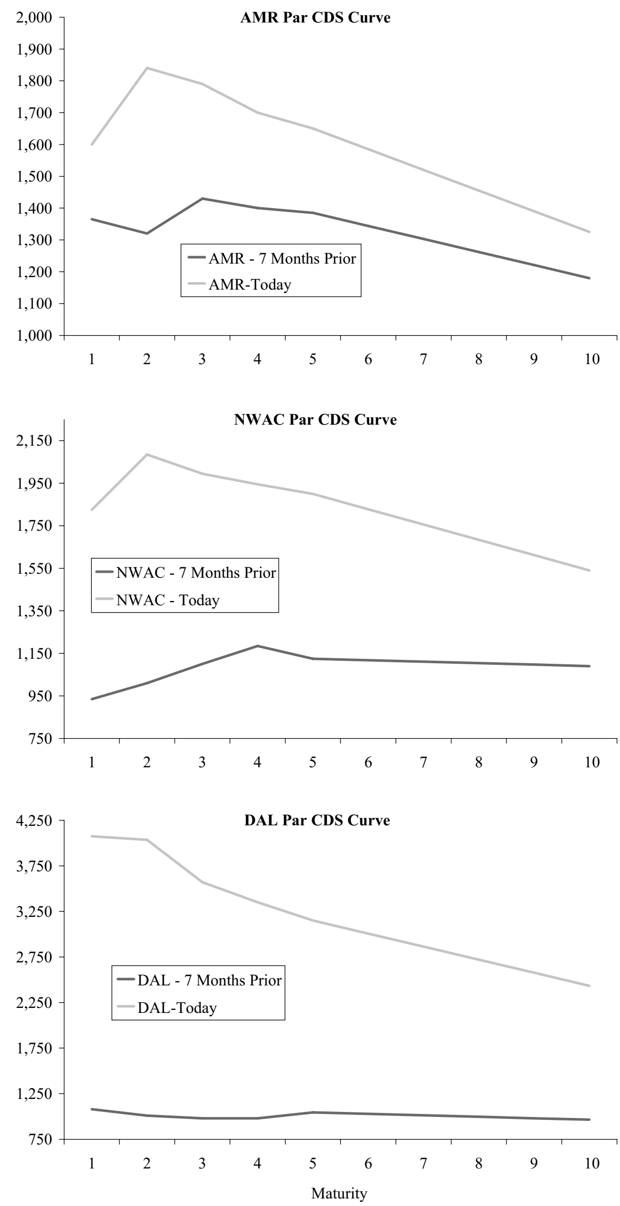
Delta's curve, on the other hand, has moved from a flat curve (with no real humps) to a classic inverted curve for a stressed credit. Based on the current amortization schedule and Doug Runte's estimates of cashflows, Delta will likely have significant cashflow issues within the next 18 months, which helps explain the relative flatness of the curve from one to two years.

THE TRIANGLE – TRADING STRATEGIES

In Chapter 26, we introduced a simple framework for implying recovery rates on secured and unsecured bonds, using default probabilities implied from CDS curves. In a nutshell, we use the full term structure of default swap premiums (and an assumed recovery rate for unsecured debt, which is generally 5%) to generate a strip of default probabilities (over various dates). We then use those default probabilities to imply recovery rates for both secured and unsecured bonds, given their current market prices and expected cash flows. Comparing these implied recovery rates to projected values gives us a sense of relative value. A high implied recovery rate (relative to a projected value) indicates richness; a low implied recovery rate suggests the bond is cheap.

exhibit 2

The Airlines Curves – Trading Wider, with the "Humps" Nearer



Source: Morgan Stanley

As a simple example taken from Exhibit 3, the benchmark AMR 9% of 2012 appeared fairly rich in late 2003 (at $84), with an implied recovery of 39% versus a more realistic recovery in the low-single-digit range. Today, the bonds trade about 5 points lower in dollar price terms; however, they are even richer on a relative basis (62% implied recovery rate), given wider CDS levels (200-300 bp on average) and a reshaped curve. This argues for taking risk in secured paper or unsecured default swaps, rather than in unsecured bonds.

While Delta indeed faces near-term liquidity concerns, we find the location of a spread “hump” for the AMR and NWAC curves to be suspiciously close to the key Delta liquidity point. This leads us to have a preference for going long short-dated risk in AMR and NWAC outright or against the sale of longer-dated instruments.

While subordinated secured paper is cheaper than unsecured bonds today, we find numerous examples of secured instruments appearing rich relative to our analysts’ recovery estimates, using our implied recovery rate methodology.

This is a change from the environment we had late last year, and highlights the lack of downward price action in the secured instruments over this period. We caution that our analysis assumes 100% correlation between the corporate default and default on the equipment trusts. The higher implied recovery could be an indication of the market pricing in a scenario where the equipment trusts continue to perform while a corporate bankruptcy is negotiated.

CONCLUSION

Several months after we published our first thoughts on the airline triangle, we still find the methodology of implying recovery rates on bonds from CDS to be an interesting relative value tool. In particular, since the majority of participants continue to trade one type of instrument instead of the full triangle, technically driven opportunities continue to exist.

exhibit 3 The Airline Triangle – Implying Recovery Rates on Secured and Unsecured Bonds

Ticker	Coupon	Maturity	Class	Dollar Price	Implied Par Spread to Maturity	Implied Recovery	Projected Recovery
DAL	7.111%	2011	Series 2001-1 Class A-2	95.25	NA	90%	100%
DAL	10.125%	2015	ETC 92 B-2	59.00	1,128	51%	30%
DAL	10%	2008	Unsecured	50.00	1,638	42%	5%
DAL	7.9%	2009	Unsecured	46.50	1,268	40%	5%
NWAC	6.841%	2011	Series 2001-1 Class A-2	95.25	NA	88%	100%
NWAC	9.875%	2007	Unsecured	74.00	1,492	32%	5%
NWAC	7.875%	2008	Unsecured	65.00	1,292	40%	5%
NWAC	10%	2009	Unsecured	67.25	1,176	47%	5%
AMR	9%	2012	Unsecured	78.00	619	62%	5%
AMR	6.817%	2011	Series 2001-1 Class A-2	90.00	NA	81%	95%
AMR	10.44%	2007	ETC 1990 Q, R	88.00	1,447	48%	33%

Source: Morgan Stanley

chapter 28 Turning a Triangle into a Square

July 30, 2004

Primary Analyst: Sivan Mahadevan
Primary Analyst: Peter Polanskyj
Anisha Ambardar
Angira Apte

Debt-versus-equity trading opportunities have been an area of market focus for some time now. "Capital structure arbitrage" was a popular "buzz" word at one point, but thankfully the market has gone beyond this nomenclature and focused more specifically on fundamental opportunities. In fact, if we had to characterize the state of debt-versus-equity trading today, we would say that it is indeed very opportunistic. For specific sectors or credits, relationships form because of linked market activity, but for the larger universe of companies, the relationship between the two markets is not necessarily as strong.

We find significant debt-versus-equity focus in the airline space, where investors in the credit and equity markets are eager to determine what investors in the other markets are saying and position ideas accordingly. In previous research, we discussed the rationale for and opportunities to trade what we called the airline triangle (comprised of secured bond, unsecured bond and unsecured default swap legs).[1] The next leg of this trade is with equities, and many equity investors have discovered that default swap curves provide important market-implied probabilities of bankruptcy, which, in turn, can help determine relative value in equity or equity options. Similarly, many in the credit world can express views in the secured or unsecured airline space and hedge risks with equity securities. The triangle may be reshaping into a square.

One of the most difficult aspects of debt-versus-equity trades is determining what the right deltas should be, which is very much related to the current "regime" between the two instruments, and any expected convergence. We do not have any easy answers, nor are there market-standard approaches to solving these problems. A year ago, we used hindsight to calculate "best-fit" deltas, based on historical data, for a large universe of investment grade names (see "Puts vs. Protection – The Delta Divide," July 25, 2003). We found that optimal deltas varied with spread and sector, as one might expect. What we find today is that most real activity in this space is in story credits, or, in the case of airlines, story sectors, so investors need to dig much deeper into company specific matters.

EQUITY AND CREDIT RELATIONSHIPS – GENERALLY SPEAKING

One of the aspects of capital structure arbitrage that many find frustrating is deciding whether there are market triggers to drive convergence. It is interesting to note that in today's credit environment, the basic equity and credit relationships are actually rather weak, at least based on a reasonably broad and liquid segment of the market. In Exhibit 1, we show the average rolling 120-day correlation of credit spreads and equity prices for nearly 100 investment grade issuers. We show these both on an absolute and relative basis, where "relative" means that we subtract broader market movements from company specific spread and equity movements.

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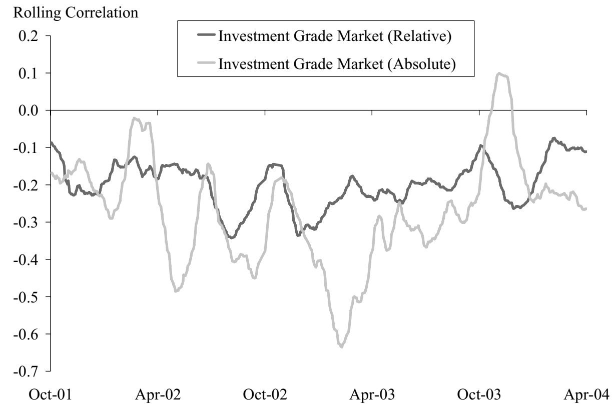
[1] *Please refer to Chapters 26 and 27.*

exhibit 1

Debt vs. Equity Not Necessarily Strongly Linked



Source: Morgan Stanley

Clearly the 2002 time period was one where the relationships between equity and credit were stronger (more negative correlation), but since then, average correlation values have hovered in a tighter range, closer to zero. Currently the relative relationships are actually more stable than the absolute relationships, which we feel is noteworthy. This highlights the dangers that being outright long (or short) credit instruments against equities without hedging market risk has the potential to create unwanted volatility.

However, such market data does not provide a strong argument for capital structure arbitrage opportunities today. Nevertheless, we note two very important caveats. First, as we demonstrated in our aforementioned “Delta Divide” study, the link between equity options and credit spreads is generally stronger for lower-quality credits, by virtue of the more robust theoretical relationship between the two (i.e., both are driven by equity volatility, according to Merton models). Second, capital structure arbitrage is significantly different for story credits, precisely because market activity forces a stronger link, particularly in times of stress.

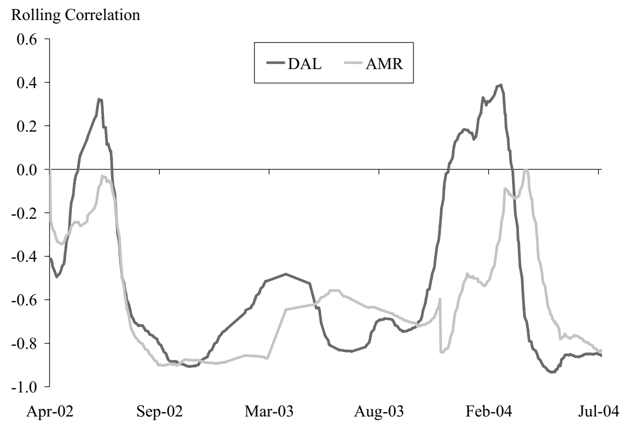
ENTER THE AIRLINES – EQUITY AND CREDIT RELATIONSHIPS GET STRONGER

A very simple historical analysis tells us that, for selected airlines, debt and equity instruments have a stronger link than the larger market, at least since the sector’s regime change after 2001 (see Exhibit 2). Delta (Caa3/CCC+) and AMR (Caa2/B-) unsecured default swap premiums have correlations to their respective equity prices that have been as negative as -0.8 over time including today, which indicates a significantly stronger relationship than within the investment grade market. The correlation analysis is on a market-adjusted basis as well, meaning that we subtract the change in market prices to remove any market bias (which could be either negatively or positively correlated and tends to introduce more volatility).

This “market neutral” approach to comparing debt and equity may be a slightly more complex strategy to implement, but it allows investors to focus on the real relationships between instruments of specific issuers rather than on tectonic shifts in equity and credit market valuation.

exhibit 2

Delta and AMR – Debt and Equity Relationship Much Stronger



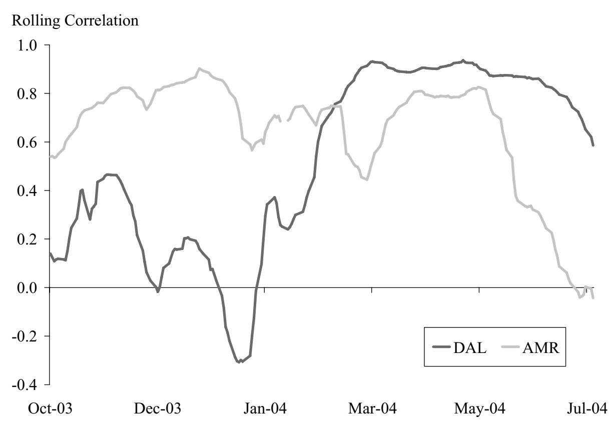
Source: Morgan Stanley

EQUITY OPTIONS ARE EVEN STRONGER

If we consider equity options instead of common stock, the relationships strengthen, with rolling correlation values in the 0.8 to 0.9 range (there is a sign change because we compare put options to default swaps – see Exhibit 3). The equity and debt link today with Delta is very strong, but for AMR (a less stressed credit) it has weakened quite dramatically recently (down to a correlation of zero). We focused on the correlation between default swaps and long-dated out-of-the-money put options to better match the fundamental risks of being long credit. We caution that technical aspects of a given option can cloud the analysis. This analysis was performed on an unadjusted basis, and the results are more consistent through time, as well.

exhibit 3

Delta and AMR – Equity Options Are the Strongest Link



Source: Morgan Stanley

For investors who prefer numbers to pictures, we summarize the strengths of the various relationships above in statistical form (R-squared values) in Exhibit 4. The equity option and credit link has R-squared values at 75% and 84% for AMR and Delta respectively, which is quite strong in general and also in comparison to the credit versus pure equity. The key takeaway is that there are several reasons why equity and credit markets have a much stronger link in airlines than for the broader market.

- The sector is stressed; therefore, default (with very low recovery) is by no means a tail event.
- For credits like Delta, the equity itself resembles an option, given the high default probabilities implied by the credit markets.

Market activity is forcing convergence, as many in the equity and credit communities are using the other market to help devise investment strategies.

exhibit 4 Numbers Instead of Pictures – R-Squared Values Reveal Relative Strength of Equity and Debt Relationships

	Delta	AMR	Southwest
Stock/CDS	70.6%	37.9%	66.0%
Adjusted (stock/CDS)	58.4%	16.8%	30.9%
Option/CDS	84.1%	75.1%	21.7%

Source: Morgan Stanley

Interestingly, the relationship of the options and CDS spreads was weaker for Southwest (Baa1/A) (21% R-squared), which is clearly a credit experiencing much less stress than the others in the airline sector. The lack of a convergence trigger (as above) for higher quality credits again highlights the dangers of blindly implementing debt versus equity strategies.

chapter 29 Stretching the Airline Triangle

March 11, 2005

Primary Analyst: Sivan Mahadevan
Primary Analyst: Peter Polanskyj
Primary Analyst: Ajit Kumar, CFA

From a pure capital structure arbitrage perspective, the airline space continues to be the most interesting sector in the market. US airlines rely heavily on aircraft-secured financing, but an active market for unsecured debt (in cash and derivative forms) exists as well. With the work of our Transportation analyst Doug Runté and his team, we have in the past discussed the triangular relationship between secured bonds, unsecured bonds and default swaps, and how this triangle can be used as a relative value guide.[1] In a nutshell, for a given airline, the triangle is a way of implying recovery values for unsecured and secured bonds, given a full curve of default swap points and assuming a low unsecured recovery value.

The triangle has been stretched a bit of late. Higher oil prices, and the volatility associated with where they might ultimately settle, negatively affect the operational aspects of US airlines in a substantial way, which has a direct impact on unsecured debt prices, not to mention equity. However, the market for aircraft seems to be going in the other direction, with global trends actually stronger. In this current environment, Doug's forecasts for EETC tranche recovery are relatively high for deals that have good aircraft – 100% in many cases – even for subordinated EETC tranches. The net result is that this has important positive relative value ramifications for secured paper, even for those trading near or north of par.

As with many exercises, the devil is in the details, and this is an opportunity where getting one's hands dirty is both necessary and likely worthwhile.

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[1] *Please refer to Chapters 26-28.*

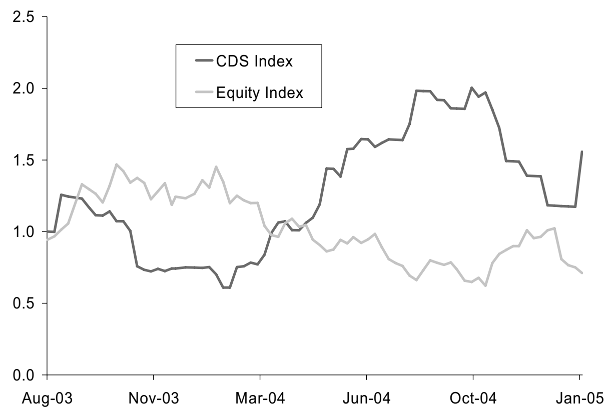
EQUITY AND THE UNSECURED MARKET

The markets for unsecured airline risk and equity have continued to be closely linked, as the fate of both markets is tied to the ability of the US airlines to operate in an increasingly challenging environment. Generally, when we think about the equity and debt of a corporation in a unified framework (i.e., Merton models), we consider equity holders to effectively own a call option on the assets of the corporation and that this call option is far in the money. For stressed US airlines, this call option is actually much closer to being at the money.

Theoretically, this implies a stronger link between debt and equity of airlines than for non-stressed companies, and this has been proven out in recent history. In Exhibit 1, we show the value of two normalized indices we created from the market prices in the 5-year CDS and the equity for three carriers (Delta Airlines, AMR, and Northwest Airlines). The links very clearly show a negative relationship between the two markets.

exhibit 1

Stressed Airlines – Classic Debt/Equity Relationship



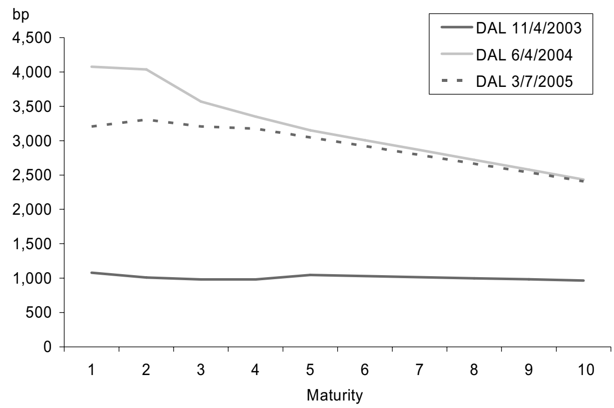
Source: Morgan Stanley

UNSECURED DEFAULT RISK – MORE EVENLY DISTRIBUTED OVER TIME

Within the unsecured default swap space, the curves for the four airlines we focus on (AMR, DAL, NWAC, and CAL) are somewhat flatter today, reflecting the view that operational risk/uncertainty does not seem to change much over time (beyond two to three years; see Exhibit 2). Delta's curve is still inverted though, reflecting the idea that if they make it in the near term, their long-term prospects may be marginally better, but overall spread levels are still very high (2,500 bp and higher). Northwest and AMR actually have the flattest curves, while Continental's curve is also somewhat inverted, at the tightest levels of these four carriers.

exhibit 2a

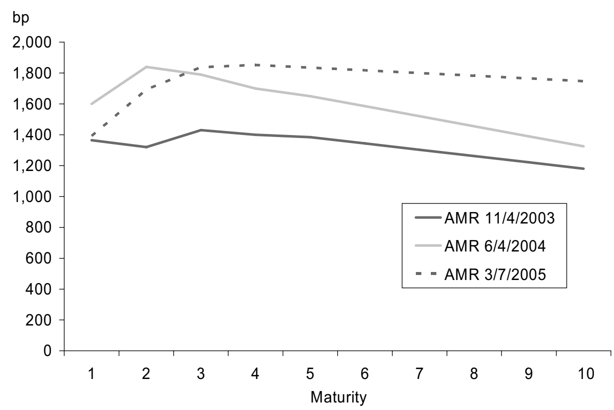
DAL CDS Curve – Still Inverted, but Less So



Source: Morgan Stanley

exhibit 2b

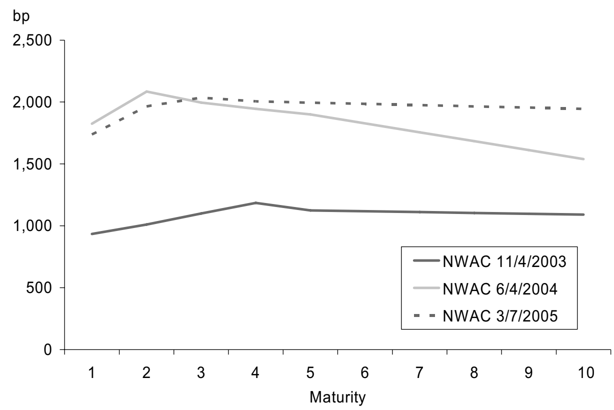
AMR CDS Curve – Less Risky Early, Flat Later



Source: Morgan Stanley

exhibit 2c

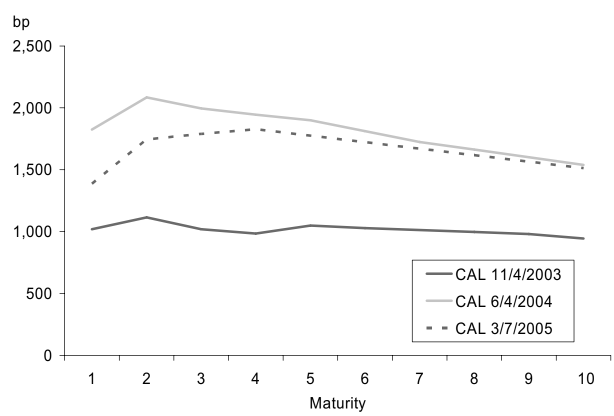
NWAC CDS Curve – Turns Flat



Source: Morgan Stanley

exhibit 2d

CAL CDS Curve – Slightly Inverted in Longer Dates



Source: Morgan Stanley

When we looked at these curves in June of last year, they implied very large differences in default risk through time, with the highest level of risk priced into the front two years of the curve and then falling off fairly quickly.

UNSECURED BONDS – THE NEXT LEG IN THE TRIANGLE

With the unsecured default swap curves from above, we can now apply airline triangle methods to imply recoveries for unsecured bonds, which have a tendency to trade rich to default swaps, given appetite from investors and the difficulty in shorting bonds. The relative richness, though, seems to have fallen a bit since June of last year. In Exhibit 3, we show implied recoveries for one AMR unsecured bond, two Delta, bonds and two Northwest bonds. Assuming that actual recovery on unsecured debt is 5%, the AMR 9% of 2012 appears the richest of these five bonds, with a 42.5% implied recovery (versus implied recoveries of 13% to 21% for the others).

The most notable move (since last year) has been in DAL unsecured paper, which now trades to implied recoveries of 13% to 17% (for the two bonds highlighted).

SECURED PAPER – THE VERTEX OF THE TRIANGLE

The market for aircraft continues to rally from global demand for aircraft. Doug recently pointed to strength both in the ATA bankruptcy proceedings and Geneva Aviation Forum (see "Aircraft Market Update," February 28, 2005). For the numerous EETC tranches that we list in Exhibit 3, Doug estimates 100% recovery based on collateral valuations for many, including (in the case of AMR and Continental) some subtranches. Based on these estimates, EETC paper still seems relatively attractive, when recoveries are implied from the default swap curves, as valuations have only marginally improved in the face of a much stronger aircraft market. Senior tranches continue to trade at implied recoveries of approximately 80-90%, while the healthiest of subtranches have implied recoveries in the 50% to 60% range.

WHAT IS THE SECURED MARKET TELLING US?

Our airline triangle approach uses risk-neutral models to imply the recoveries for secured bonds (note that we ignore the EETC liquidity facilities). As with most credit derivative models, we assume a fixed recovery over time. But the reality is somewhat different, and the volatility of valuations for aircraft since 2001 highlights this risk (which our models do not consider). As such, we would argue that there is a reasonable probability, based on historical movements, that aircraft valuations could fall at some point. EETC tranche investors need to be compensated for aircraft volatility above and beyond other risk premiums in the market for unsecured risk. This volatility is likely higher for subtranches than for senior tranches, and we remind market participants that there can be some "negotiation" risk for subtranche investors relative to senior tranche investors as well.

HOW CAN ONE MEASURE AND CAPTURE RELATIVE VALUE?

In the past, many investors have asked us to take the airline triangle a step forward and determine how one can practically capture relative value, particularly with secured paper. In Exhibit 3 we go through a relatively simple process of calculating how an investor can go long secured paper and then hedge any residual risk, assuming Doug's projected recoveries of the tranches. For example, the first tranche in the analysis (AMR A-1 tranche from series 99-1), trades at a price of 102.50%, leaving the investor with 2.5% of zero-recovery risk in the event of default (assuming 100% recovery based on aircraft). Clearly, any bond that is projected to have 100% recovery and trades wider than LIBOR has positive risk premium, and in this case, even after accounting for the 2.5% of default swap protection, the risk premium (or fully hedged bond spread) amounts to about 130 bp (last column of Exhibit 3). Furthermore, for bonds trading below par but expected to recover 100%, there is over-collateralization that can be monetized (through the sale of default swap protection).

This hedged bond spread varies for different tranches, and is actually quite high for AMR, CAL, and even DAL subtranches (400 to 1,000 bp). Investors can view this metric as the carry for owning the secured paper relative to LIBOR and hedging any residual recovery risk with 5-year CDS.

WHAT ARE THE RISKS?

What are the risks that one needs to be paid for? There are several, including the following:

- Aircraft recovery volatility
- Subtranche negotiation risk with senior tranches
- Unwind cost (bid-offer)
- Interest rate risk in the event of default (i.e., the asset swap would not be clean)
- Residual unsecured airline risk (we have used 5-year CDS as the hedging instrument for the sake of simplicity)

The hedged bond spread provides an indication of how much carry one can capture given today's market prices. Whether or not these levels are attractive depends on how much one needs to be compensated for the risks above.

THE AIRLINE TRIANGLE

We continue to find interesting relative value opportunities in the airline space, particularly when the challenging operational environment for many US airlines is juxtaposed against a more buoyant market for aircraft collateral. Yet, this is by no means an easy trade, as the secured debt side of the triangle requires quite a bit of analysis.

chapter 30 Libor, the Bid and the Basis

February 25, 2005

Primary Analyst: Sivan Mahadevan
Primary Analyst: Peter Polanskyj
Primary Analyst: Ajit Kumar, CFA

While the structured credit bid continues to be the dominant technical theme in the credit markets today, the nature of credit risk that is being put into the structures differs from the core corporate bond market. As such, any measure of the average basis between both markets can be misleading if one expects CDS premiums to be significantly tighter than cash bonds. In fact, the opposite is true for the investment grade market at large, and for the small portion of the high yield market where we can make a fair assessment. The negative basis phenomenon (default swaps trading tighter than bonds) really exists only in the weaker segment of investment grade and stronger segment of high yield markets, which is exactly where the structured credit activity is currently focused.

Yet, the basis shift uncovers a bigger issue. For those who like to use basis measures as a guide to relative value between cash and default swap markets, it is critically important to understand the influence of many factors on valuation. In particular, the structure and curve shape of the cash market, the level and shape of swap spreads, today's absolute spread environment, and the importance of the Treasury benchmark for corporate bonds are key issues. We argue that Libor is becoming a less relevant benchmark for corporates today, particularly in the short end of the curve, where well over 40% of bonds trade near or through the swap rate. Clearly, a flat swap spread curve, which is likely driven more by mortgage convexity hedging fears than by banking system risk today, is a key variable causing the confusion.

THE BID IS NOT UBIQUITOUS

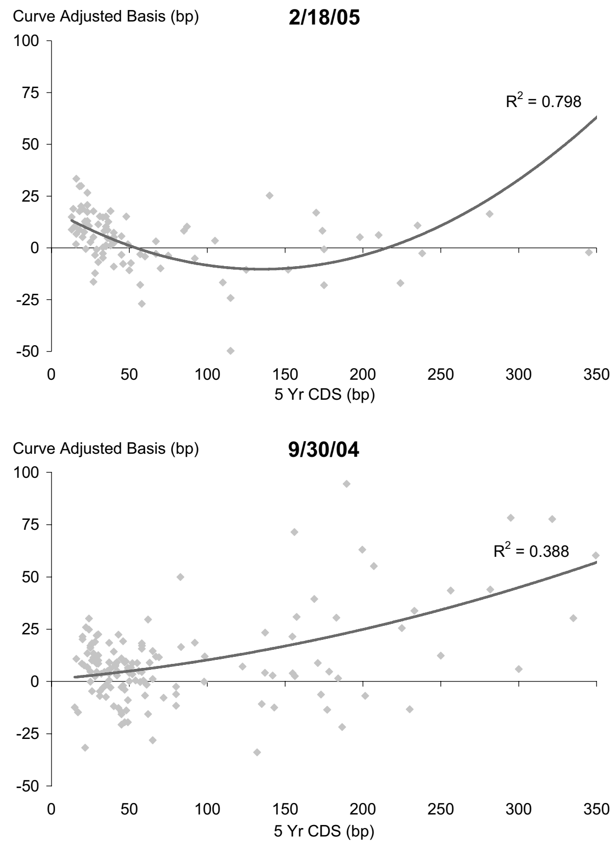
Our first point is that the structured credit activity does not affect the investment grade market uniformly, as general comfort with default risk and a reach for yield has pushed many investors and deal arrangers further down in quality within investment grade and into the higher quality parts of high yield. This is not a new theme, and is something we addressed in detail after the flurry of late summer 2004 activity.[1] Yet, it has become even more acute recently. In Exhibit 1, we compare our curve-adjusted basis (default swaps minus cash bonds) to the level of CDS premium, both today and at the end of the third quarter of 2004. The simple regression lines tell the story, with the negative basis for credits with 5-year CDS premiums between 60 bp and 200 bp matching up well with those credits that go into structures.

[1]*Please refer to Chapter 15.*

Another important disconnect between both markets is the relative performance of corporate bonds and default swaps across the maturity spectrum. Since the end of the third quarter of 2004, 7- to 10-year maturity corporate bonds have rallied over 20 bp (to both Treasuries and Libor), while the rally in default swaps has likely been less than half of that, despite the structured credit bid. The 5-year part of the curve has favored default swaps, though, over this same time period.

exhibit 1

The Basis Is Negative in the Belly of the Market



Source: Morgan Stanley

chapter 30

CORPORATE BONDS AND THE CHANGING RELEVANCE OF LIBOR

Understanding the basis between cash and default swap markets today requires a close inspection of the structure of the corporate bond market. On a market-weighted basis, 21% of corporate bonds today trade 10 bp or tighter to Libor, with 9% actually trading through Libor. With the relatively flat swap spread curve, the numbers are even more extreme if we focus on the front end of the market, where 44% trade below 10 bp to Libor, and 20% are sub-Libor. While one would expect financials to be a big component of these numbers, the distribution across sectors is much more uniform. Only 6% of the 21% for all maturities are made up of US financials, while 16% of the 44% for the front end are financials.

exhibit 2 Large Part of Market Trades Tight to Libor

	Less Than 10 bp Over Libor	Sub Libor
Investment Grade	21%	9%
IG – 1 to 5 Yr Maturities	44%	20%

Source: Morgan Stanley, The Yield Book

The impact of this phenomenon on the basis is quite obvious, as the floor on default swap premiums tends to be about 10 bp for the market's tightest trading names. But the real question revolves around the relevance of Libor.

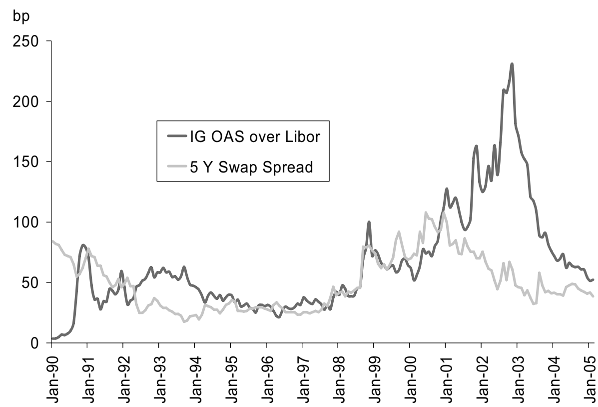
CORPORATE AND SWAP SPREADS – HISTORY LESSON

While it is natural to think that corporate credit spreads and swap spreads should generally move in tandem, disconnects have occurred over time (see Exhibit 3). The most memorable are 1998, when both markets widened dramatically, but corporate credit rallied back quickly despite the remaining systemic fears, and 2001-2002 when the sharp turn in the corporate credit cycle, a much more idiosyncratic corporate event, drove corporate credit spreads massively wider in the face of generally tightening swap spreads.

The incredible compression in spreads from late 2002 through today has coincided with a tightening of swap spreads that began a bit earlier in the 2000-1 period. The tightening of credit spreads is a reflection of the improvements in fundamentals and corporate governance. The swap spread tightening can be thought of as a reflection of the reduction in systemic risk (be it from the cross collateralization of swap contracts or from more comfort with the international banking system) after the turbulence experienced in the late 1990s.

exhibit 3

Corporate Spreads and Swap Spreads – Dislocations in History



Source: Morgan Stanley, The Yield Book

Yet, the swap spread rally ran out of steam some time ago, as fears of mortgage-related convexity hedging likely weigh heavily on the market.

LIBOR OR TREASURIES, WHAT'S THE RIGHT BENCHMARK?

CDS contracts necessarily are exposed to both systemic and idiosyncratic risks given their nature as OTC derivative contracts and credit transfer instruments. Corporate bonds, one could argue, are less exposed to the former because there is less counterparty risk associated with these holdings. At today's spread levels, this difference in risk may be enough to have a meaningful impact on valuation and hence affect pricing comparisons and the basis.

Consider Exhibit 4, where we show the Libor spread of the investment grade index as a percentage of the Treasury spread for the same. Despite what are commonly described as tight spreads, the Libor portion of the credit spread makes up a larger proportion of spread to Treasuries today than during most of the 1990s when spread levels were arguably in the same zip code.

What does this mean for spreads? In the benign credit environment of the mid 1990s, the proportion of the spread associated with idiosyncratic risk continued to drop. If we are in for a similarly benign market environment, this is a bullish indicator for corporate valuations relative to Libor, which could imply that potentially wider swap spreads are not necessarily met with wider corporate spreads. Combining this view with the floor on CDS premiums is an argument for a positive basis as spreads grind tighter.

Additionally, the effect of the large (by historical standards) mortgage market on the volatility of swap spreads cannot be ignored. For those seeking to replicate corporate bonds though CDS and interest rate swaps, the swap spread volatility adds another dimension of risk for which one must be compensated. Some investors learned this lesson well 18 months ago.[2]

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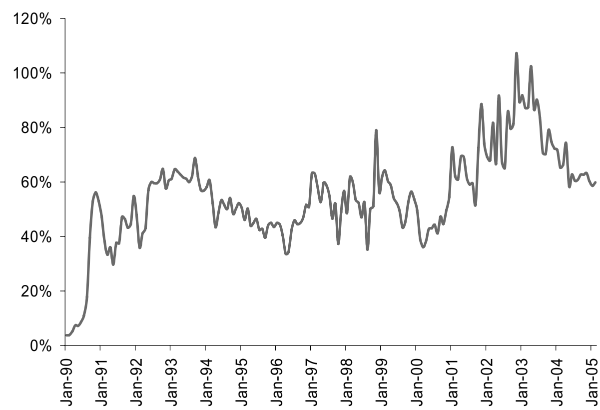
[2]*Please refer to Chapter 10.*

But history need not repeat itself. The last time we were in this type of market environment, not only was there no CDS market but there was also no liquid structured credit market per se. Today, an increasingly efficient structured credit machine seems to step in whenever CDS premiums widen and serves to push the basis down despite the dynamics in cash markets. History provides us with no guidance on which force will dominate in the end, but this week we saw numerous structured credit transactions ramping up, yet a widening basis.

We expect current basis themes to continue in the near term. For the lower-quality areas of the investment grade market, the basis will remain negative based on structured credit activity. For the market at large, swap spreads, however unrelated they may be to corporate credit risk, will likely be the key drivers of basis movements, as the battle between idiosyncratic and system risk continues.

exhibit 4

Corporates – Libor Spread as a % of Treasury Spread



Source: Morgan Stanley

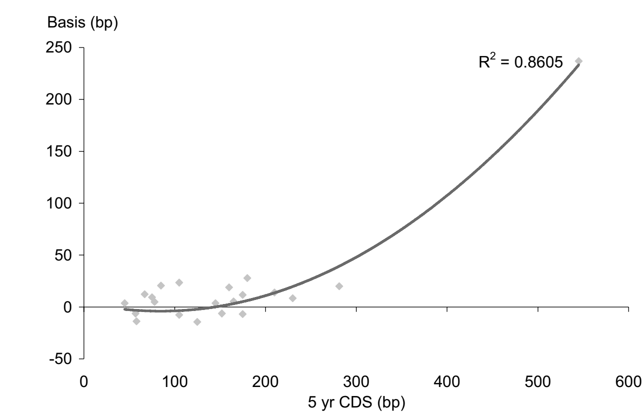
THE HIGH YIELD BASIS – SOME IMPROVEMENTS

As an aside, despite an improving liquidity situation in high yield default swaps, calculating a fair value basis to bonds remains a challenging task for many reasons, including poor curve liquidity and the plethora of callable bonds. The good news is that we have improved our high yield basis monitor, which appears in our weekly *Credit Derivatives Insights* publication, to focus on credits where we have a good indication of valuation across the default swap curve and at the five-year point of the bond market (non-callable). The bad news is that it leaves us with a relatively small universe (25 issuers).

Overall, the trends in the high yield basis remain intact and somewhat more pronounced in the updated universe. The basis remains positive (15 bp, 13 bp curve adjusted), with wider default swaps trading at a larger gap to the corresponding bonds. Difficulties in shorting high yield bonds, combined with a still developing single-name and structured credit market within high yield naturally force this basis to remain positive, especially with wider-trading names (see Exhibit 5). We continue to recommend that investors who have the flexibility of using both high yield bonds and default swaps consider using the positive basis as motivation for establishing long credit positions through default swaps.

exhibit 5

High Yield Basis – Largely Positive



Source: Morgan Stanley

chapter 31 Auto Volatility Turns to Auto Convexity

May 6, 2005

Primary Analyst: Sivan Mahadevan
Primary Analyst: Ajit Kumar, CFA

As we have now addressed several times over the past two months, the storm in the auto sector has introduced the kind of idiosyncratic volatility into the credit markets that we have not seen in over two years. When volatility is high, it uncovers many varieties of "basis" risk in the market, including the I/O risk in unwinding CDS positions after big moves, and the big shifts in P/L that subordinate tranches can experience with subsequent market dispersions[1] (see "Tranches – Navigating the Auto Storm," April 29, 2005). This "basis" risk can be an important driver of performance.

Higher credit volatility generally means that credit convexity becomes more valuable, both for the information that it provides and the performance it can add to portfolios if big moves (in either direction) are actually realized. A convex form of a basis trade is one where investors intentionally mismatch maturities between cash and default swaps both to get long credit risk on a forward basis and to benefit (at distressed levels or default) from being long the cheapest-to-deliver option in CDS contracts.[2]

While many may consider S&P's historic downgrade of both Ford and General Motors to junk status to be an event that actually relieves some of the uncertainty in the market, both auto companies (along with their captive finance units and dependent suppliers) very much face operational challenges going forward. The auto convexity trade, in our view, has some interesting applications in this environment, although the timing of the ultimate moves (in either direction) remains a key risk.

We discuss the auto convexity trade in detail in this chapter, focusing both on the P/L impact and the implied probability of spread movements. We begin with a brief discussion of basis trends for the market, though, which can pose some risks to long bond versus long protection positions if or when credits normalize.

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[1] *Please refer to Chapter 17.*
[2] *Please refer to Chapters 20 and 21 for our initial thoughts on this theme.*

DISSECTING BASIS TRENDS

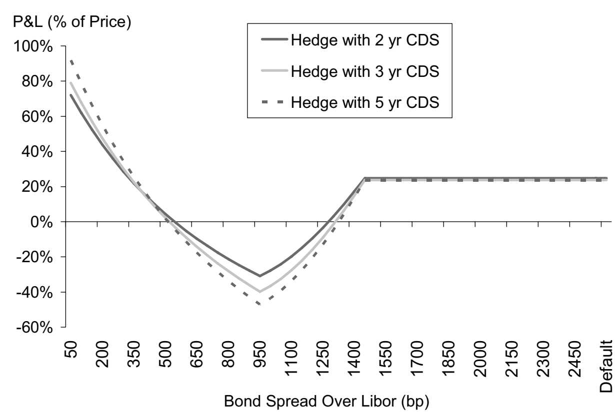
The basis in investment grade credits has moved into comfortably positive territory this year, driven both by credit volatility at the wide end of the market and the impact of relatively wide swap spreads at the tight end of the market.[3] In the early part of 2004, we also saw a positive basis, but less so for credit volatility reasons. The positive basis during much of 2002 was indeed credit volatility induced. Past trends in the basis suggest that when spreads widen, default swaps react quicker than bonds and consequently the basis turns more positive (or less negative). However, when volatility declines the basis can compress again, which is a risk in convexity trades, although in such situations the long duration component of the structure can be beneficial.

THE AUTO CONVEXITY TRADE

The combination of a long-dated bond and short-dated protection creates an interesting pay-off profile for credits in stress, mirroring a straddle on credit spreads. We find these strategies quite applicable to the auto sector in today's environment, although the timing of large moves is still an issue. In Exhibit 1, we show the pay-off diagrams for par-weighted long bond versus long protection positions based on a GMAC 30 year bond and short-dated GMAC protection (2, 3, and 5 years) over a 1 year horizon.

exhibit 1

GMAC Convexity Trade with 30 Year Bonds



Source: Morgan Stanley

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[3] *Please refer to Chapter 30.*

The best P/L profile is if the credit improves (because the trade is long spread duration), or if it deteriorates to a point where protection trades on a points up front basis or actually defaults, in which case the investor can monetize the difference between par and the purchase price of the long bond. However, since the strategy is long credit risk on a forward basis, a continued deterioration of the credit would be the worst P/L profile. Note that the payoff diagrams of the convexity trades shown do have interest rate risk (the fixed rate bonds are not asset swapped), although for credits in stress, we would expect credit issues to dominate price movements more so than interest rate movements. In Exhibit 2, however, we have shown the net carry assuming an asset swap.

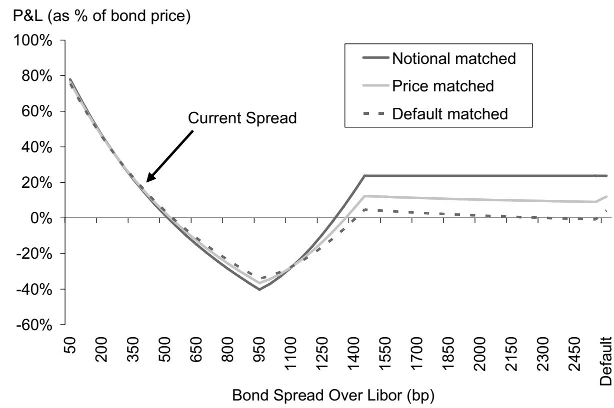
exhibit 2 GMAC Convexity Trades – Weighting Schemes

	Instrument	Size ($MM)	Price ($)	Carry* (bp)	Net Carry ($MM)
Par matched					
Long	GMAC 8 11/01/31	10.0	81.5	392	-0.381
Buy Protection	GMAC CDS 6/20/2008	10.0		700	
Price matched					
Long	GMAC 8 11/01/31	10.0	81.5	392	-0.251
Buy Protection	GMAC CDS 6/20/2008	8.2		700	
Default matched					
Long	GMAC 8 11/01/31	10.0	81.5	392	-0.165
Buy Protection	GMAC CDS 6/20/2008	6.9		700	

**Bond carry assumes an asset swap.*
Source: Morgan Stanley

exhibit 3

GMAC Convexity Trades – Pay-off with Different Weighting Schemes



Source: Morgan Stanley

CHOOSING THE RIGHT HEDGE RATIO

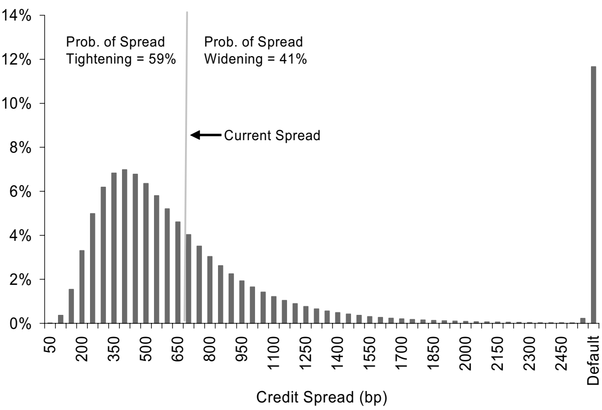
The choice of the hedge ratio between the bond and the CDS can result in materially different pay-offs in case of default. In Exhibits 2 and 3 we have shown three approaches: (1) match the CDS notional to the bond par amount; (2) match the CDS notional to the current bond price; and finally, (3) choose CDS notional such that the loss given default is the same for the bond and the CDS. The third approach results in the smallest CDS notional, and consequently the lowest hedging cost in terms of CDS premiums. Also, since it results in the highest position delta, the upside from improvement in credit quality is slightly higher.

WHAT IS THE AUTO CONVEXITY TRADE TELLING US?

Whether or not one is inclined to position for convexity in the auto sector, there is important information on the probability of spread moves (and default) that we can derive from the auto convexity trade. In Exhibit 4 we show a probability distribution of credit spreads (on 3 year CDS) for GMAC in 1 year, as implied by the auto convexity trade using 30 year bonds described above. We imply these probabilities by assuming that spreads are log-normally distributed with a standard-deviation equal to the P/L of the convexity trade. We assume that the probability-weighted return of trade must equal the risk-free rate on the investment required to put together this package. Based on this framework, GMAC spreads have a 59% chance of actually being tighter, 41% chance of being wider including about 12% probability of default (assuming 40% recovery rate) over a 1 year horizon.

exhibit 4

What Is the GMAC Convexity Trade Telling Us? – "No Arbitrage" Probability Distribution of Spreads



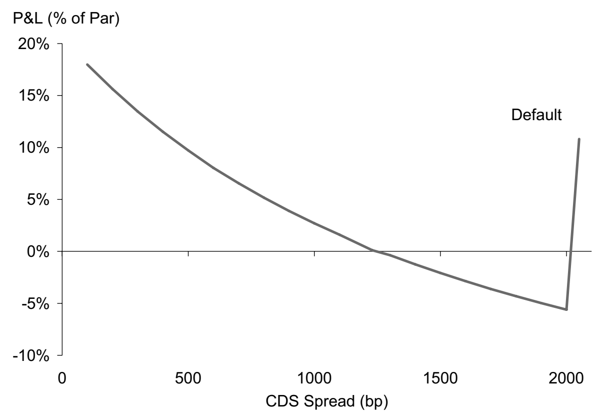
Source: Morgan Stanley

AUTO SUPPLIER CONVEXITY MAY BE MORE INTERESTING

Despite all of the focus on Ford and GM, there are likely greater medium-term operational challenges at Visteon and Delphi and as such, convexity trades in the suppliers may be more justifiable. Delphi's upside is very much tied to GM, but many of its own factors can contribute to the downside. The P/L of the convexity trade, though, in the extreme scenarios is more muted than for GM (see Exhibit 5 for Delphi), with the added twist that purchasing protection with points up front reduces some of the cheapest-to-deliver benefit of delivering a long-bond that trades at a discount. In this example, the Delphi 24 year bond trades at a $71 price while 5 year protection requires 20.5 points in payment up front, leaving only a 8.5 point gain for an immediate default.

exhibit 5

DPH Convexity Trade – A More Muted P/L Profile



Note: Pricing as of 5/5/2005
Source: Morgan Stanley

chapter 32 Playing LBOs with CDS – Details, Details…

October 7, 2005

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Several forces in the market today have been responsible for introducing significant capital structure changes into both investment grade and high yield companies, including a ripe LBO environment and the related existence of cash-rich potential sponsors from the hedge fund and private equity worlds. In many such cases, understanding the potential performance of bonds and default swaps has been at a minimum an insightful exercise in credit fundamentals, but more importantly it highlights the differing "basis" risks that can come to the forefront, particularly when the use of bond and loan covenants (or lack thereof) influences capital structure shifts.

As such, critically important in the process of understanding the credit pricing dynamics during recapitalizations are the details in the indentures of all the bonds involved and the likely financing strategy of an acquirer. Whether bonds would be tendered or remain outstanding is a key driver in their valuations going into recapitalizations, and CDS contracts serve as generic instruments which could continue to be exposed to the credit risk regardless of the fate of the existing company debt.

In this chapter, we go through three real-world examples of bond versus default swap performance during capital structure shifts to illustrate some of the "basis" risks between the instruments, and we provide some covenant background as well.

CDS AS THE LEAST COMMON DENOMINATOR

The key to trading bonds versus CDS contracts in the context of recapitalizations really comes down to the specific covenants in a particular bond issue and how that covenant package affects the risk in that issue as compared to both the other existing bonds in the capital structure and any bonds/loans likely to be issued as part of a new recapitalization plan.

The fact that we must consider newly issued instruments in the context of recapitalizations is a result of the cheapest-to-deliver options associated with CDS contracts. Any existing CDS contracts are generally not retired when old debt is tendered for or is repurchased, therefore they remain outstanding. In recapitalizations, that means they will be anchored, at least in price terms, to the riskiest senior instruments of the entity (assuming the original CDS is a typical senior unsecured contract). This fact is often stated as part of the argument for a positive basis between CDS and bonds of the same maturity, when capital structure changes are a possibility.

TYPICAL BOND COVENANTS

While, anecdotally, we know that most US investment grade transactions have few covenants, we can look to the high yield market to illustrate what covenants can be required by investors. Having a sense for the form of typical covenants can provide some insight as to their potential impact on the performance of the bonds in recapitalizations.

The following is a list of some common covenants included in high yield issues:

Limitation on Restricted Payments: Effectively restricts dividend payments, purchases of equity or subordinated debt of the issuing entity or subsidiaries to some proportion of net income, cashflow or an absolute dollar amount.

Limitation on Incurrence of Indebtedness: Generally limits the ability of the issuer to incur additional indebtedness subject to financial ratios, commonly, the ratio of consolidated cash flow to fixed charges.

Limitation on Asset Sales: Constrains the sale, lease, conveyance or other disposition of assets or equity held in subsidiaries (other than inventory) without offering to repurchase notes.

Payment Restrictions Affecting Subsidiaries: Restricts the ability of the issuer to create an encumbrance or restriction on the ability of subsidiaries to pay dividends to the issuer.

Limitation on Merger, Consolidation, or Sale of Assets: Limits the ability of the entity or subsidiary guarantors to merge under certain circumstances.

Limitation on Affiliate Transactions: Constrains the ability of the issuer to sell, lease, transfer or otherwise dispose of any assets to an affiliate.

Limitation on Liens: Constrains the ability of the issuer to cause any new liens unless all payments due on existing debt are secured on an equal and ratable basis with obligations so secured.

Limitation on Sale/Leaseback Transactions: Restricts the ability of sale/leaseback transactions.

Of these covenants, the limitation on liens has been the most visible recently, given the reliance of LBOs on the leveraged loan market which is generally a secured market. This covenant comes into play in very different ways in our examples below.

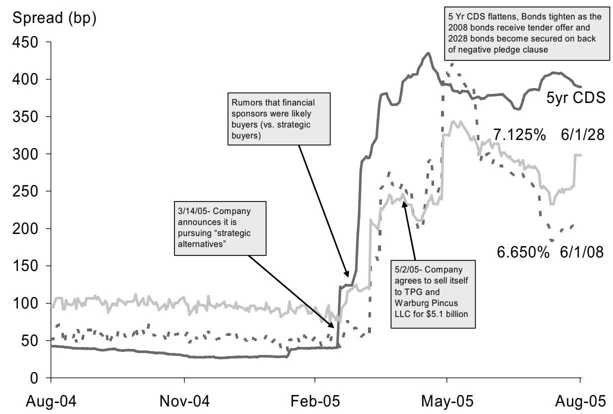
RECAPITALIZATIONS – DEAL DETAILS MATTER

We examine two recent events in the credit markets to show the potential impact of covenants on the relative performance of bonds and CDS during periods of corporate restructuring. These two instances illustrate that the details of any given transaction are critical to assessing relative value, and the market's perception of the risks can also be fluid as the deals develop, allowing for opportunities to position these transactions both before and after the deal announcement.

In the case of Neiman Marcus (which went through an LBO), we find that two issues conspired to drive outperformance of bonds relative to CDS. First, the limited amount of bonds outstanding relative to overall transaction size ($250MM versus $5.1BN enterprise value for the deal) played an important role. Second, the covenants in these bonds related to the limitation of creating new liens on the assets highlighted the "basis" risk. The first issue made it inexpensive for the sponsor to tender for part of the debt (and they tendered for 50%). The second issue forced the sponsor to raise the seniority of remaining bonds to match that of the secured financing done in the leveraged loan market.

exhibit 1

CDS vs. Bonds: Neiman Marcus (NMG) LBO



Source: Morgan Stanley

The new capital structure contains about $2BN of secured bank debt, $125MM of secured bonds (the existing debt), $700MM of new unsecured debt and $500MM of subordinated debt. With existing bonds becoming secured, pricing on both existing and new CDS contracts should follow pricing on the new unsecured senior financing. In fact, CDS pricing went wider than levels on the (soon to be secured or tendered) existing bonds shortly after the deal was announced (see Exhibit 1). While this is the scenario most investors involved in basis trades (long bond/long protection) hope for, we find that exceptions to this dynamic can be common.

DIVESTITURES CAN BE MORE COMPLICATED

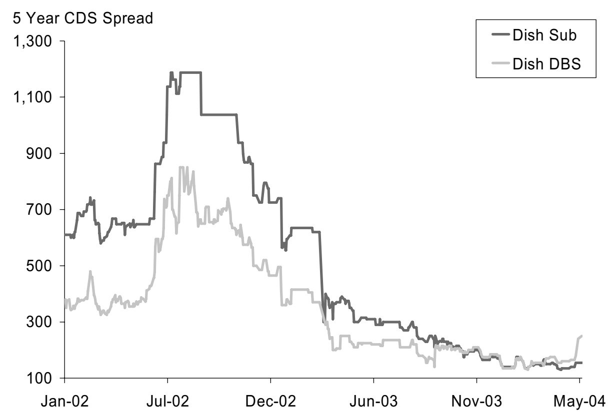
The divestiture of Hertz by Ford to a consortium of investors provides us with a recent counter-example to the Neiman Marcus outcome. The announcement of the deal called for existing debt to either be tendered for or swapped into Ford Motor Credit debt. The question of whether Ford Motor Credit will meet the definition of a successor for the purposes of CDS will depend at least in part on the final amount of debt exchanged. Regardless of that outcome, what remains unclear is where any new debt issued to finance the transaction will reside. The answer to this question has important implications for buyers and sellers of protection in Hertz CDS. The exact nature of this issuing entity and the form of any guarantees between that entity and the issuer of current Hertz debt will define whether any new debt is deliverable into existing Hertz CDS.

If debt issued out of a new entity is not deliverable into existing Hertz CDS contracts once the purchase is consummated, sellers of protection will essentially have a windfall gain (buyers a windfall loss) as these contracts would likely have no deliverable debt. New CDS contracts would have a different reference entity and would likely price differently than contracts referencing the current Hertz entity, which potentially could have no outstanding debt after the deal and may price based on the market view of the probability of issuance out of the old Hertz entity, given the new deal's capital structure.

This scenario would not be a first to impact CDS markets. We point to EchoStar as an earlier example. When convertible bonds issued out of EchoStar Communications, (considered by the market as subordinated debt because it was issued by the holding company) were being purchased back by the issuer and there were rumors of further repurchases at the same part of the capital structure in the market, contracts that were once considered subordinated had the potential to have meaningfully less debt at the Communications level while contracts once considered senior continued to have meaningful amounts of outstanding debt. Eventually, the EchoStar Communications CDS contracts traded flat (and even inverted) to the existing "senior" CDS contracts, with EchoStar DBS as the reference entity, as we illustrate in Exhibit 2.

exhibit 2

Echostar DBS versus Echostar Communications



Source: Morgan Stanley

LESSONS LEARNED – CONSIDER OTHER PERSPECTIVES

We argue that credit investors need to consider the perspectives and motivations of those who are close to any recapitalization process to better understand the potential "basis" risks between bonds (with or without covenants) and default swaps. The cheapest to deliver nature of default swaps (and the potential lack of interest in them by sponsors) has meaningful implications on performance relative to bonds.