Risk Management by Structured Derivative Product Companies

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The phenomenal growth of the derivatives markets in the last decade and the spate of huge losses there have highlighted the importance of risk management.[1] To respond to customers' concerns about the credit risk of intermediaries in these markets, some U.S. securities firms and non-U.S. banks have created subsidiary derivative product companies (DPCs) that are specially structured to function as intermediaries with triple-A credit ratings. These "structured" DPCs obtain these ratings because of the way in which they manage risk.

The structured DPCs have developed approaches to managing two basic types of risk—market risk and credit risk—in an effort to minimize capital while maintaining triple-A ratings. In particular, the DPCs hedge market risk as fully as they can, typically by means of mirror transactions with their parents. To manage credit risk, DPCs use quantitative models so that they can measure credit exposures precisely and allocate capital to cover just the risks measured in a given day. In addition, the DPCs have a contingency mechanism in place that would limit the risk that would arise should their regular risk management structure break down.

As subsidiaries of securities or banking firms, structured DPCs are organized to secure credit ratings that substantially exceed those of their parents. The nine such DPCs currently operating around the world are rated Aaa by Moody's Investors Service and AAA or AAAt by Standard and Poor's, the highest ratings of these agencies, despite parents with no rating above single-A (Table 1). The first such DPCs were designed to achieve triple-A ratings because it was thought that many customers would insist on dealing only with the most highly rated intermediaries.[2] In 1995, however, four years after they first emerged, the structured DPCs still accounted for a relatively small share of markets in which the major intermediaries generally had substantially lower credit ratings. Are the DPCs getting off to a slow start or are they structurally inhibited from more significant market expansion?

In this article, we explore the DPCs' approaches to risk management and the extent to which these approaches provide competitive advantage. We begin by characterizing the major intermediaries in the derivatives markets and describing how they manage risk. We then discuss the emergence of structured DPCs and their approaches to managing risk, and explain how the approaches minimize the capital required for triple-A ratings. Finally, we discuss the possible reasons why, despite these ratings, DPCs have not succeeded in taking a larger share of the derivatives markets.

In 1995, four years after they first emerged, the structured DPCs still accounted for a relatively small share of markets in which the major intermediaries generally had substantially lower credit ratings.

Table 1
CREDIT RATINGS OF STRUCTURED DPCS AND THEIR PARENTS/SPONSORS

Structured DPC Name	Rating[a] (S&P/ Moody's)	Parent/Sponsor Name	1995 Rating (S&P/ Moody's)
Merrill Lynch Derivative Products (MLDP)	AAA/Aaa	Merrill Lynch	A+/A1
Salomon Swapco	AAAt/Aaa	Salomon Brothers	BBB+/Baa1
Paribas Derives Garantis (PDG)	AAAt/Aaa	Banque Paribas	A/A1
Westpac Derivative Products (WDP)	AAAt/Aaa	Westpac Banking	A+/A1
Morgan Stanley Derivative Products (MSDP)	AAAt/Aaa	Morgan Stanley	A+/A1
Lehman Brothers Financial Products (LBFP)	AAA/Aaa	Lehman Brothers	A/Baa1
Credit Lyonnais Derivatives Program (CLDP)	AAAt/Aaa	Credit Lyonnais	A-/A3
Tokai Derivative Products (TDP)	AAA/Aaa	Tokai Bank	A-/A2
Sumitomo Bank Capital Markets Derivative Products (SBCM DP)	AAA/Aaa	Sumitomo Bank	A+/A1

Sources: Moody's and Standard and Poor's.

[a] The suffix "t" in five of the Standard and Poor's ratings denotes a termination structure and emphasizes that counterparties to a terminating DPC face the risk that their contracts will not run to maturity. Moody's does not distinguish between the two structures.

THE MAJOR INTERMEDIARIES IN THE DERIVATIVES MARKETS

Over the past few years, six U.S. money-center commercial banks and two U.S. securities firms have been the dominant intermediaries in the over-the-counter markets for derivatives, with each having a derivatives book exceeding $1 trillion in notional value at year-end 1994 (Table 2). Together, the six banks accounted for a total of $13 trillion, or about one-third of the global over-the-counter derivatives markets, which total perhaps $40 trillion in notional value.[3] Even the smallest derivatives book held by these banks was sizable, approaching a notional value of $1.3 trillion at the end of 1994.[4] The two securities firms are also major players, having the fifth and seventh largest derivatives books in the markets when ranked with the banks.

CREDIT RATINGS

In a derivatives transaction, the intermediary's credit rating would, in principle, be more critical than the customer's credit rating because a credit-sensitive customer would deal with credit risk not so much by "managing" it as by simply choosing a creditworthy intermediary. When intermediaries manage credit risk, they rely on a large number of counterparties to pool risks so that statistical calculations can

Table 2
DERIVATIVES AND CREDIT RATINGS OF MAJOR U.S. COMMERCIAL BANKS AND SECURITIES FIRMS

Institution	Notional Value (Billions of Dollars)	Rating (S&P/Moody's)
Commercial banks		
Chemical Bank	3,178	A+/Aa3
Citibank	2,665	A+/A1
Morgan Guaranty	2,473	AAA/Aa1
Bankers Trust New York	2,026	A+/A1
BankAmerica	1,401	A/A2
Chase Manhattan Bank	1,306	A/A2
Total	13,049	
Securities firms		
Salomon Brothers	1,509	A-/A3
Merrill Lynch	1,300	A+/A1
Total	2,809	

Source: Annual reports for 1994.

provide reasonable estimates of actual losses. Few customers have the luxury of being able to pool risks; the best they can often do is choose an intermediary. The creditworthiness of that intermediary, in turn, depends on how well it manages risk.

Surprisingly, the banking and the securities firm intermediaries that dominate the derivatives markets do not seem to require triple-A credit ratings. In 1994, only one bank had a triple-A rating from one of the two major rating agencies; the rest, along with the securities firms, were grouped in single-A territory.[5] In fact, a triple-A rating may not be as important to derivatives customers as one might think.

Risk Management by the Major Intermediaries

The major derivatives intermediaries actively manage two basic types of risk: market risk and credit risk.[6] As contracts that derive their values from the market prices of underlying assets, derivatives are volatile instruments that can change in price very rapidly. Market risk is the exposure to changes in derivatives prices, and indeed derivatives tend to be contracts that concentrate such risk. Market risk, in turn, gives rise to credit risk, which is the risk that a counterparty on the losing side of a contract will default on its obligation (Box 1 uses swaps to illustrate market and credit risk).[7] An important distinction between these risks is that market risk can often be hedged, while credit risk cannot so readily be hedged.[8]

In general, derivatives intermediaries manage their risks to strike a balance between risk and return.[9] Their chosen trade-off typically results in some exposure to market risk as well as to credit risk. They routinely try to hedge a large part of their market risk but rarely can they run a perfectly hedged derivatives book in the normal course of business. The major intermediaries have recently developed quantitative models to measure unhedged market risk, summarizing it in a measure called value at risk. Intermediaries mitigate credit risk largely by taking advantage of netting agreements and by holding collateral.[10] Even these efforts, however, still leave intermediaries with a significant amount of credit risk to be measured and controlled.

Market Risk

To measure market risk, the banks with the largest derivatives books have invariably moved from traditional approaches based largely on "risk buckets" to proprietary quantitative models that track not only individual market movements but also comovements among markets. Traditional approaches separated investments by type into various buckets, such as residential mortgages, government securities, and commercial loans, each of which would be assigned a risk weight. By turning to a model-based approach, the banks can now consolidate their exposures into a value-at-risk summary measure, which specifies the potential loss from adverse market movements over a specified time horizon and for a given confidence interval.[11]

The banks' measures of value at risk reveal significant exposures to market risk in the normal course of operations. The precise concept of value at risk used by different banks varies with the chosen confidence interval and the way volatilities and correlations are estimated (Table 3). The confidence intervals range from 95 percent to 99 percent. Because the internal models differ, the value-at-risk numbers are not precisely comparable, even given the same confidence intervals. Nonetheless, the reported numbers show significant market risk exposure, with likely average daily losses of up to $8 million (with a 5.0 percent probability of greater losses) for one bank and daily losses of up to $65 million (with a 2.5 percent probability of greater losses) for another.

In general, derivatives intermediaries manage their risks to strike a balance between risk and return. Their chosen trade-off typically results in some exposure to market risk as well as to credit risk.

Credit Risk

Since credit risk is inherently difficult to hedge, much of the effort to manage it involves measuring it. To measure credit risk, intermediaries estimate both current and potential credit exposures. Current exposures are the market values or replacement costs of contracts with positive market value to the intermediary at the time. These are the contracts for which counterparties would currently have obligations to the intermediary and on which they could default. Credit exposures depend significantly on the extent of netting agreements and the amounts of collateral held. One major intermediary, for example, reported current gross exposures of $26.7 billion at the end of 1994.[12] Netting agreements reduced this exposure to $12.9 billion, and collateral held

BOX 1: THE MARKET RISK AND CREDIT RISK OF SWAPS

Swaps, which are among the most common over-the-counter derivatives contracts, provide a simple illustration of market risk and credit risk. Swaps are contracts that exchange one type of cash flow for another. For example, interest rate swaps exchange flows based on fixed interest rates for flows based on floating interest rates. The typical swap has zero value at origination, but market movements will in short order lead to gains for one of the counterparties and losses for the other. The counterparty with losses will have suffered from market risk, while the one with gains will have benefited. At the same time, however, the one with gains will be exposed to credit risk, the possibility that the other counterparty could default on its obligation. Because market values can change so quickly, this potential credit exposure may be quite large, and quantifying it is important.

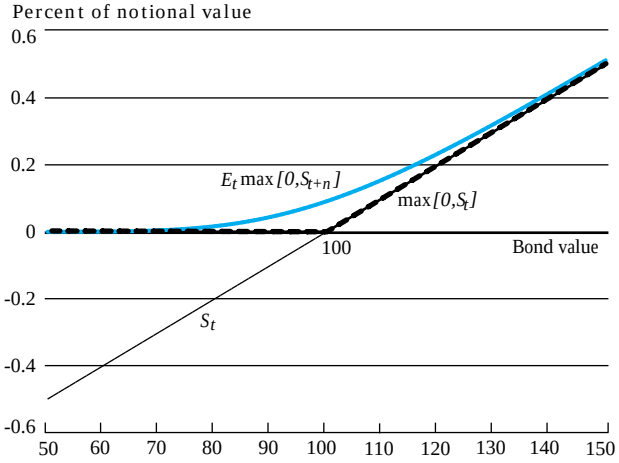
The size of the potential credit exposure of a derivatives contract will depend on the volatility of the underlying asset and on the time horizon being considered. The expected exposure of a swap at time t looking n periods ahead can be denoted by $c_t(n)$ and written as

$$c_t(n) = E_t \max [0, s_{t+n}],$$

where s_{t+n} is the uncertain value of the swap n periods in the future.[1] The value of the swap may turn negative in the future, but for credit exposure we care only about the positive outcomes, that is, about max $[0, s_{t+n}]$.

The chart helps characterize the expected credit exposure for a plain vanilla interest rate swap from the point of view of the fixed-rate receiver. For market valuation purposes, the swap is equivalent to a long position in a fixed-rate bond and a short position in a floating-rate note that is assumed to trade at par at inception and reset dates (Litzenberger 1992). Hence, the swap value s_t is a linear function of the underlying asset, the fixed-rate bond, and is shown as the straight line crossing the horizontal axis at the bond's par value of 100. At initiation, the swap is typically priced to be consistent with the bond starting at its par value, so that $s_t = 0$. As time passes, interest rate movements will change the underlying bond's value, and the current swap exposure will be given by max $[0, st]$, which is shown by the broken line that turns positive for bond values beyond 100. For n periods ahead, the expectation E_t max $[0, s_{t+n}]$ behaves like the value of a call option and is depicted by the curve. The potential exposure is then E_t max $[0, s_{t+n}]$ minus max $[0, s_t]$, a difference that behaves like the time value of swaptions, which are call options on swaps.[2]

Swap Exposures



Source: Authors' calculations.

[1] See Smith, Smithson, and Wilford (1990) and Hull (1993) for related discussions.

[2] Simons (1993), Duffie (1994), and Hendricks (1994) explain how such exposure profiles may be estimated.

Table 3
U.S. COMMERCIAL BANKS' DAILY VALUES AT RISK

Bank	Value-at-Risk Concept	Confidence Interval (Percent)	Average Daily Value at Risk in 1994 (Millions of Dollars)
Chemical Bank	Value at risk	97.5	12
Citibank	Earnings at risk	97.5	65
Morgan Guaranty	Daily earnings at risk	95.0	15
Bankers Trust New York	Daily price volatility	99.0	35
BankAmerica	Earnings at risk	95.0	8
Chase Manhattan Bank	Earnings at risk	97.5	17

Source: Annual reports for 1994.

reduced it further, to $10.9 billion. Such current net exposure represented 0.5 percent of the total notional value of the intermediary's derivatives.

Potential exposures represent the values over time of contracts with possible future positive market values and thus are potentially subject to default. These potential exposures are especially important for derivatives because of the contracts' sensitivity to market movements (Box 2). To measure potential exposures, the major intermediaries often use their quantitative models to take account of market movements over time.[13] By combining current and potential exposures with measures of counterparty creditworthiness, the intermediaries can estimate credit risk.

Clearly, the creditworthiness of an intermediary depends on its risk management, specifically on how much market risk and credit risk it chooses to bear relative to the capital it allocates to absorb these risks. In balancing risk against return, major intermediaries have chosen a certain degree of risk exposure. As a result of such exposure, the assessment by credit rating agencies has typically not led to triple-A ratings.

THE EMERGENCE OF STRUCTURED DPCS

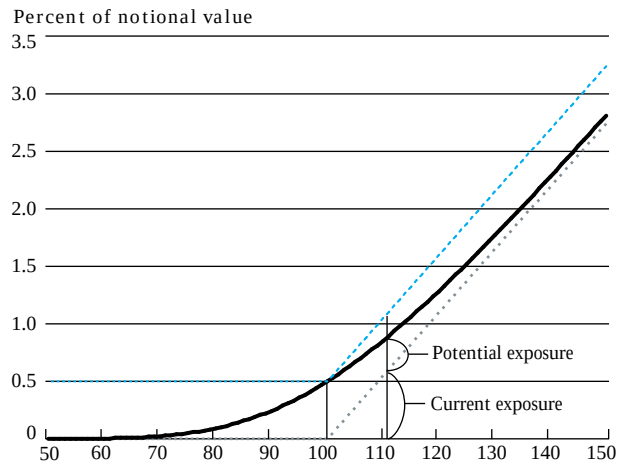
The perceived importance of an intermediary's creditworthiness led to the creation of the first structured DPCs. The bankruptcy in February 1990 of Drexel Burnham Lambert, a securities firm with a sizable derivatives book, made

BOX 2: POTENTIAL CREDIT EXPOSURE FOR AN INTEREST RATE SWAP

The advantage a quantitative model can bring in the case of an interest rate swap with more than a year to maturity is demonstrated in the chart. At origination, the swap would present a current exposure of zero and a potential exposure of 0.5 percent of the notional value, as indicated by the curve. The curve's position is such that for a newly initiated swap the potential exposure would correspond to the existing Basle capital standards for credit risk. The rest of the curve is drawn to represent the way a model would measure exposure.

If interest rates fall, the swap will go into-the-money for the fixed-rate receiver. The chart shows one such point, indicating the amounts of current and potential exposures. The amount of potential exposure at this point will be significantly less than it was when the current exposure was zero or when the swap was at-the-money. In general, potential exposure will decline as the swap moves away from its initial value of zero. By contrast, the traditional buckets approach will set potential exposure at a fixed fraction of notional value, regardless of the swap's current value.

Exposures on a Long-Maturity Interest Rate Swap



Source: Authors' calculations.

many derivatives customers suddenly aware of very real credit risk (Chesler-Marsh 1990).[14] Some observers predicted "credit gridlock," whereby most derivatives customers would refuse to deal with intermediaries other than those with the highest credit ratings (Chew 1994). Merrill Lynch responded to such perceived customer concerns by organizing the first structured DPC in 1991, followed by Salomon in 1993.

The structured DPCs set themselves apart from nonstructured DPCs by using a special operating structure to gain triple-A ratings. By the time Merrill Lynch and Salomon created their subsidiaries, a variety of highly rated, nonstructured DPCs had already been in operation, but they had received their credit ratings by conventional means. For example, the first group of DPCs in Table 4 obtained their credit ratings primarily by virtue of their parents' ratings. The second group of asset-backed DPCs received their triple-A ratings simply by maintaining enough capital to absorb nearly any risk they might take on.

The structured DPCs' unusual approach to risk management drew considerable notice in the derivatives markets and initially led observers to believe that they would take over much of the markets (Chew 1994; Locke 1995). However, such market success has not been evident. The first two structured DPCs, Merrill Lynch Derivative Products (MLDP) and Salomon Swapco, now boast the biggest derivatives books among the structured DPCs. However, they had derivatives books at the end of 1994 with notional values of only $91 billion and $67 billion, respectively, with each book representing less than 7 percent of their parents' derivatives books. To put this in greater perspective, the fifth largest derivatives book among the major bank intermediaries—with a notional value of $1.4 trillion—was at least fourteen times bigger than either MLDP's or Swapco's books. We will attempt to explain why, despite their superior credit ratings, structured DPCs have so far remained relatively small players in the derivatives markets.

Table 4
A VARIETY OF DPCS

Date	Name	DPC Rating[a] (S&P/Moody's)	Parent Rating (S&P/Moody's)
DPCS WITH HIGHLY RATED PARENTS			
5/85	Prudential Global Funding	AA-/	AA-/Aa3
1/87	AIG Financial Products	AAA/Aaa	AAA/Aaa
5/90	Mercadian Capital Mercadian Funding	A+/ NR/NR	A+/A3 NR/NR
7/90	Credit Suisse Financial Products	AAA/Aa2	AAA/Aa2
10/90	General Re Financial Products	AAA/Aaa	AAA/Aaa
12/93	Goldman Sachs Mitsui Marine Derivative Products	AAA/	AAA/Aaa[b]
ASSET-BACKED DPCS			
3/92	Goldman Sachs Financial Products International	AAA/Aaa	A+/A1
7/93	Goldman Sachs Financial Products U.S.	AAA/	A+/A1
STRUCTURED DPCS			
11/91	Merrill Lynch Derivative Products	AAA/Aaa	A+/A1
3/93	Salomon Swapco	AAAt/Aaa	BBB+/Baa1
11/93	Paribas Derives Garantis	AAAt/Aaa	A/A1
11/93	Westpac Derivative Products	AAAt/Aaa	A+/A1
1/94	Morgan Stanley Derivative Products	AAAt/Aaa	A+/A1
1/94	Lehman Brothers Financial Products	AAA/Aaa	A/Baa1
10/94	Credit Lyonnais Derivatives Program	AAAt/Aaa	A-/A3
2/95	Tokai Derivative Products	AAA/Aaa	A-/A2
4/95	Sumitomo Bank Capital Markets Derivative Products	AAA/Aaa	A+/A1

Sources: Moody's and Standard and Poor's.

[a] The suffix "t" in five of the Standard and Poor's ratings denotes a termination structure and emphasizes that counterparties to a terminating DPC face the risk that their contracts will not run to maturity. Moody's does not distinguish between the two structures.

[b] The Moody's Aaa rating applies to Mitsui.

HOW STRUCTURED DPCS MANAGE RISK

The structured DPC approach to risk management can be characterized as an effort to minimize capital subject to the constraint of meeting credit rating agency standards for triple-A ratings. Such an approach has evolved to include the complete hedging of market risk in the normal course of operations, the precise measurement of credit exposures combined with a dynamic allocation of capital, and the creation of an automatic "workout" process to control risk in the event that the regular risk management process begins to fail. Hence, with each type of risk, the DPCs have found ways to reduce the need for capital. Credit rating agencies consider such risk management to be so viable that they assign structured DPCs their highest ratings, even while assigning the parents significantly lower ratings.[15]

Market Risk and Mirror Transactions

A common feature of structured DPCs is the elimination of market risk in the normal course of operations. Such a DPC would typically insulate itself from market risk by engaging in collateralized hedging transactions—known as mirror transactions—with its parent or an affiliated company. The DPC would undertake one such transaction each time it entered into a transaction with a customer. The parent is required to post collateral to cover the net market value of all the mirror transactions, enabling the DPC to avoid any credit risk from its parent.[16] Because the collateral is based on the net exposure to a single counterparty, the amount of collateral required would be much less than if the parent collateralized each transaction with customers.

We illustrate how a mirror transaction works in conjunction with a simple interest rate swap transaction, since the DPCs are primarily vehicles for such transactions (Exhibit 1). In this example, the DPC is the fixed-rate receiver and the customer is the floating-rate receiver. The DPC faces market risk through its exposure to a possible rise in interest rates and a resulting drop in the swap's market value. To hedge against this risk, the DPC simultaneously engages in a mirror transaction with its parent, in which it now becomes the floating-rate receiver and the parent becomes the fixed-rate receiver. In this way, the DPC is insulated from market risk.

The balance sheets of MLDP and Swapco also illustrate the role of mirror transactions (Table 5). The DPCs' main assets are their customer derivative receivables and affiliate derivative receivables, which are respectively the marked-to-market values of the customer transactions and mirror transactions that have positive values. The DPCs' main liabilities are their customer derivative payables and affiliate derivative payables, which are respectively the marked-to-market values of the customer and mirror transactions that have negative values. At the end of 1994, MLDP was "out-of-the-money" (that is, the derivatives had lost value) in its mirror transactions, which are thus reported as affiliate payables of $553 million. In this case, collateral was not required from the parent. MLDP's affiliate payables plus customer payables of $1,320 million exactly match its customer receivables of $1,873 million. In contrast, Swapco was "in-the-money" (the contracts had gained value) in its mirror transactions, which are reported as affiliate receivables of $154 million. In this case, the parent posted collateral amounting to $154 million. The amount of affiliate receivables added to the amount of customer receivables equals the amount of customer payables.

We should note that two of the structured DPCs, Paribas Derives Garantis and the Credit Lyonnais Derivatives Program, do not use mirror transactions because they deal with customers not as derivatives counterparties but as providers of a credit enhancement in the form of a third-party guarantee, with the parent or sponsor still serving as the derivatives intermediary.[17] In this way, the DPCs avoid market risk even as their guarantees expose them to credit risk.

Exhibit 1
Payment Flows for a Structured DPC
A Simple Interest Rate Swap Example

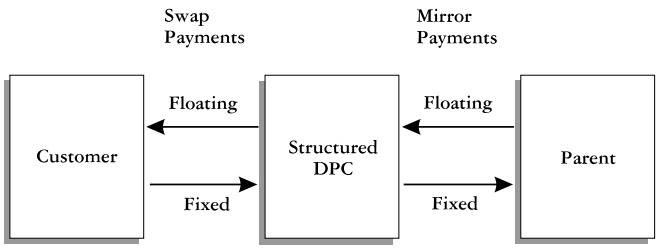


Table 5
Balance Sheets for MLDP and Swapco
Millions of Dollars at December 1994

Balance Sheet	MLDP	Swapco
Total notional book	90,691.0	66,844.0
Assets		
Cash and investments	362.1	432.0
Customer derivative receivables	1,873.3	874.6
Affiliate derivative receivables		154.4
Other assets	15.0	63.4
Total assets	2,250.4	1,524.3
Liabilities		
Customer derivative payables	1,320.3	1,029.0
Affiliate derivative payables	553.0	
Other liabilities	9.0	214.8
Total liabilities	1,882.3	1,243.8
Stockholder's equity	368.1	280.5

Source: Annual reports for 1994.

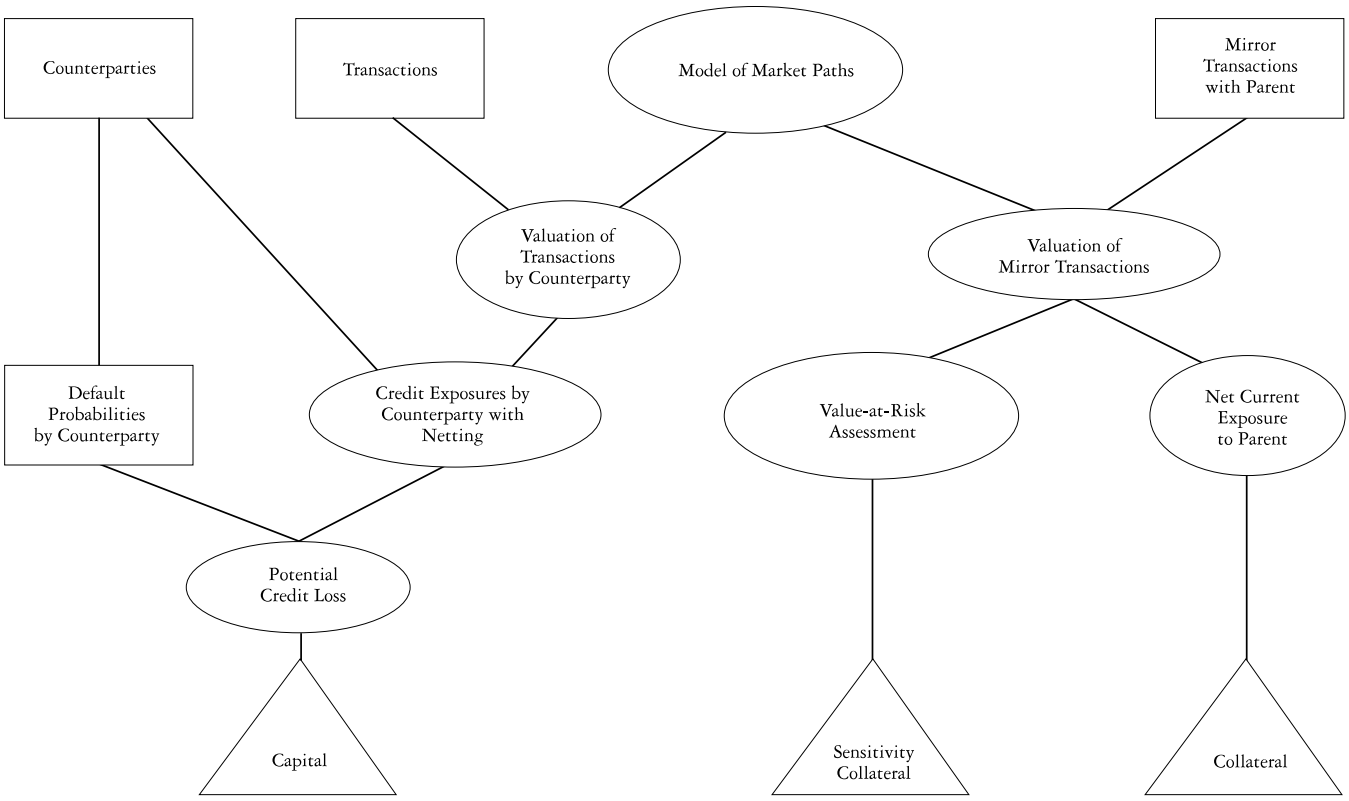
Credit Risk and Capital

With the mirror transactions providing insulation from market risk, structured DPCs are still exposed to the credit risk inherent in their transactions with customers. DPCs earmark capital to manage such credit risk. Again using Exhibit 1 as our example, we see that a decline in interest rates will present the DPC with a gain in the market value of its swap with the customer, but this customer may default on its obligation. The required amount of capital to manage this risk is the amount adequate for the DPC to absorb such a customer default and still meet its obligations to its other customers with a default probability or an expected loss rate consistent with what the rating agencies expect for triple-A borrowers. Since the DPCs rely on their internal models to determine the required capital, additional capital is set aside for model risk, or the risk that the models may not capture credit exposures adequately.[18]

Again, we should note that the two DPCs that rely on a guarantee structure, Paribas Derives Garantis and the Credit Lyonnais Derivatives Program, deal with credit risk in the same way the other structured DPCs do, using internal models to measure potential exposures and maintaining sufficient capital to absorb credit losses consistent with their triple-A ratings. One advantage of the guarantee structure is that insurance coverage for individual customers may be explicitly specified in terms of net exposures, even for jurisdictions where netting agreements would otherwise not be enforceable.

Various portfolio restrictions provide additional protection against credit risk. For example, structured DPCs bar themselves from dealing with counterparties below investment grade and place limits on gross and net exposures to the counterparties with whom they deal. In some cases, the limits may be exceeded if collateral is

Exhibit 2
Use of Model for Credit Risk Management



posted by third parties. The DPCs also deal only in the types of derivatives that do not pose valuation or hedging problems. The capital, collateral, and portfolio restrictions are designed to ensure that the structure remains viable even in the face of unusual strain. MLDP's capital and exposure limits, for example, are designed to allow it to withstand the simultaneous default of seven double-A-rated counterparties.

Using a Model to Measure Credit Risk

Structured DPCs rely on quantitative models that attempt to measure credit risk precisely (Exhibit 2). Such a model would run Monte Carlo simulations, which involve generating a large number of possible future paths for every relevant market variable—mainly interest rates and exchange rates—based on estimated volatilities and correlations among the variables. Using transaction data, the model would evaluate each transaction along each path and thus measure the DPC's exposure to each counterparty.

For mirror transactions, the net current exposure would determine the amount of collateral to be posted by the parent. The net potential exposure would represent a measure of value at risk for an event in which the parent is unable to sustain the mirror transactions, and sensitivity collateral would cover this market risk. For customer transactions, the model would provide potential credit exposure by counterparty, netting the exposures where appropriate. (Box 2 illustrates the advantage of having such a model in the calculation of potential exposures.) The model would then simulate counterparty defaults based on historical probabilities to calculate possible losses to the DPC. The default probabilities are typically assumed to be independent of market movements.[19] The potential credit losses would then set the required amount of capital.

Dynamic Allocation of Capital

The structured DPCs minimize their required capital by allocating an amount that is just enough to cover, with a high degree of confidence, credit risks measured over a short time horizon.[20] The choice of time horizon has resulted in two types of capital rules: a static rule and a dynamic rule. Of the nine structured DPCs in Table 6, MLDP is the only one that operates under the static rule, and is in the process of developing a dynamic model. The static rule imposes a time horizon of one quarter when calculating default probabilities and expected credit losses. Correspondingly, MLDP adjusts its capital requirements quarterly, although it monitors them much more frequently. The eight other DPCs operate under a dynamic capital rule, which shortens the time horizon for calculating default probabilities and expected credit losses to ten trading days. Under this rule, the eight DPCs adjust their capital requirements daily.

STRUCTURAL RISK AND WORKOUT PROCESSES

The various operating components of a structured DPC are so critical to one another that the failure of one component would reexpose the DPC to rising amounts of market risk. The DPC limits its exposure to such risk by triggering a workout process, in which the DPC would effectively self-

Table 6
CAPITAL OF TRIPLE-A DERIVATIVE PRODUCT COMPANIES

Name	Actual Capital	Minimum Required Capital at Inception	Capital Rule
Merrill Lynch Derivative Products	$368 million	$300 million	Static
Salomon Swapco	$285 million	$175 million	Dynamic
Westpac Derivative Products	$200 million	$100 million surety bond + $50 million	Dynamic
Morgan Stanley Derivative Products	$150 million	$150 million	Dynamic
Lehman Brothers Financial Products	$200 million	$150 million	Dynamic
Paribas Derives Garantis	FFr 800 million ($140 mil.)	FFr 800 million	Dynamic
Tokai Derivative Products	£100 million ($160 mil.)	£100 million	Dynamic
Credit Lyonnais Derivatives Program	$200 million surety bond+capital of Credit Lyonnais	$200 million surety bond+capital of Credit Lyonnais	Dynamic
Sumitomo Bank Capital Markets Derivative Products	$300 million	$300 million	Dynamic

Sources: Moody's and Standard and Poor's.

destruct, albeit in an orderly way. The DPC deals with the market risk during the workout process by holding additional collateral from its parent or sponsor. Each of the DPCs has adopted one of two workout structures: a contingent manager (continuation) structure or an early termination structure.

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In the event of a structural failure, DPCs with a contingent manager structure would refrain from taking on new transactions and turn over operations to a predesignated contingent manager. The new manager would service the contracts and manage the risks of the whole derivatives book until the last contract matured. DPCs with an early termination structure would end all contracts within a few weeks, settling each contract for cash on the basis of valuations at mid-market prices.[21] The customers holding out-of-the-money contracts would make the first payments, and the DPC would use the proceeds to pay off the in-the-money contracts. Under either structure, the mirror transactions with the parent would be terminated early and settled for cash, an action that might involve liquidation of collateral. Standard and Poor's attaches the suffix "t" to its ratings of DPCs with the termination structure, while Moody's does not distinguish between workout structures in its ratings.[22]

Choosing the Workout Structure

Customers may have reasons to choose one DPC over another on the basis of workout structure. Structured DPCs let customers know from the outset which workout process will apply. This prespecification of the workout process is an important innovation.

Workouts similar to those specified under the contingent manager and early termination structures have been used before. The main methods by which derivatives were handled in the five largest defaults involving derivatives held by financial institutions are reported in Table 7. In three of the defaults, the derivatives books were transferred to another financial institution in much the same way a DPC would proceed under a contingent manager structure. In two of the defaults, the derivatives were terminated early, just as a DPC would treat its contracts under the termination structure. In no case, however, was the eventual workout process known by the customers at the origination of their contracts.

Customers with rules that bind them to dealing only with triple-A counterparties may prefer the early termination structure. Others, wishing to avoid replicating a

Table 7
DEFAULT EVENTS AND DISPOSITION OF MAJOR DERIVATIVES BOOKS

Defaulting Financial Institution	Event Date	Notional Amount of Derivatives	Number of Counterparties	Main Method of Disposition	Problem Counterparties
Development Finance Corp. of New Zealand	10/89	NZ$4 billion	60	Transfer to Barclays	1
Drexel Burnham Lambert	2/90	US$30 billion	200	Early termination	15
British and Commonwealth	4/90	£2-3 billion	50	Transfer to Barclays	1 or 2
Bank of New England	1/91	US$6.7 billion	387	Transfer to FDIC bridge bank	None
Confederation Life	8/94	C$23 billion	50-100	Early termination	N.A.

Sources: Asquith and Cunningham 1990; *Swaps Monitor*, March 5, 1990.

liquidated contract, may prefer the contingent manager structure. In the case of swaps and forwards, the standard contracts have zero value at inception, so replicating such a contract when it no longer has zero value would involve going to the "off market," where bid-ask spreads are wider. The more active a customer is in the derivatives markets, the more experience it would have with early termination clauses and with the off market; thus, it would be less likely to harbor qualms about an early termination structure.

Trigger Events

Several types of events would trigger a workout under the two different structures (Table 8). Under a contingent manager structure, a parent's failure to post collateral, a serious downgrading of the parent's credit rating on short-term debt, or a default or bankruptcy by the parent would lead to the DPC's self-destruction. Under an early termination structure, a parent's failure to meet capital or collateral obligations, a serious downgrading of the DPC's credit rating, or default or bankruptcy by the parent would result in the DPC's self-destruction. The parent's short-term debt rating tends to be more relevant than its long-term debt rating under the contingent manager structure because liquidity is a more important consideration.

By triggering a workout short of its default, a DPC may avoid problems that arise when out-of-the-money counterparties walk away from intermediaries that had defaulted on other contracts. In at least three cases, major defaulting financial institutions have been beset with problem customers who walked away from out-of-the-money contracts (Table 7). In the most serious case, 15 of Drexel's approximately 200 derivatives counterparties invoked limited two-way payments and refused to honor their out-of-the-money contracts. Appendix I provides a fuller description of problems associated with defaults by intermediaries.

Sensitivity Collateral

The absence of mirror transactions during the workout process would expose DPCs to market risk. To deal with such risk, DPCs hold additional collateral, called sensitivity collateral. The amount of such collateral is derived from a value-at-risk calculation, which depends on the composition of the DPC's derivatives book and the chosen workout structure.

An early termination structure implies a time horizon for market risk of only a few weeks, and exposure to market risk ends with liquidation of the portfolio. A contingent manager structure implies a longer horizon because of the time required for the contingent manager to reconstruct a hedge for the derivatives book in the absence of mirror transactions. Moreover, since the book must be managed until the last contract has expired, even for a book hedged against market risk, out-of-the-money counterparties will still pose a credit risk. Thus, for otherwise equivalent derivatives books, the early termination struc-

Table 8
TRIGGER EVENTS AT DPCS

Type of Structure	Failure of Parent to Meet Capital Obligations	Failure of Parent to Post Required Collateral	Downgrade of Parent (S&P/Moody's)	Downgrade of DPC (S&P/Moody's)	Bankruptcy or Default of Parent or Affiliate	Action by Regulatory Agency
Contingent manager (MLDP, LBFP, TDP, and SBCM DP)		Yes[a]	Below A-2 / P-2[b]		Yes	
Early termination (Swapco, WDP, PDG, MSDP, and CLDP)	Yes[a]	Yes[a]		Below A- / A3[c]	Yes	WDP and PDG

Sources: Moody's and Standard and Poor's.

[a] Swapco, MLDP, and MSDP have a two-day grace period to meet the deficiency.

[b] The trigger for TDP is the downgrade of Tokai Bank below Moody's rating of Baa2.

[c] WDP has three unique provisions: a downgrade of Westpac below BBB/Baa, a sale of WDP that results in a downgrade, or a downgrade of Australia's credit rating below the Standard and Poor's rating of A3.

ture requires less sensitivity collateral than the contingent manager structure does.

Triple-A Ratings and Competitive Advantage

The emergence of structured DPCs in 1991 was viewed as a threat to bank dominance of the over-the-counter derivatives markets, particularly after the recent downgrades of a few banks' credit ratings (Locke 1995).[23] Market observers initially thought that a growing number of derivatives customers would insist on triple-A-rated intermediaries. However, four years after they first emerged, the DPCs had yet to make significant inroads into the derivatives markets, despite their triple-A ratings. The issue examined in this section is whether the DPCs' risk management techniques truly give them a competitive advantage. This advantage would depend on the real importance of a DPC's triple-A rating in the minds of customers and on the amount of capital required to maintain the rating.

The Importance of Triple-A Ratings

Thus far, every structured DPC has been created to obtain a triple-A credit rating. Indeed, the DPCs are set up to cease operations as intermediaries once the rating can no longer be maintained. However, a closer look at the growth of derivatives on the books of the major U.S. intermediaries shows that a triple-A rating contributes to, but is by no means essential for, success in the derivatives business. For instance, if we examine the growth rate of swaps and options at the major intermediaries, we see no clear relationship between high credit ratings and high growth rates in a dealer's derivatives business (Table 9). Between 1991 and 1994, the intermediary with the highest growth rate in swaps was rated only BBB+/Baa3, and the one with the highest growth rate in options only A/A2.

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Regression Analysis

To analyze the effect of credit ratings more systematically, we ran several regressions to control for the initial size of

Table 9
Growth Rate of Swaps and Options at Major Dealers, 1991–94
Percent of Notional Amounts

Dealers	Rating in 1991 (S&P/Moody's)	Swaps Notional Amount Year-End 1990 (Billions of Dollars)	1991-94 Average Growth Rate (Percent)	Options Notional Amount Year-End 1990 (Billions of Dollars)	1991-94 Average Growth Rate (Percent)
Banks					
Morgan Guaranty	AAA/Aa1	260.5	39.1	146.1	41.1
Republic New York Bank	AA/Aa3	16.9	45.9	4.0	87.2
Bankers Trust New York	AA/A1	259.2	20.2	183.4	28.5
Citibank	A+/Baa2	280.1	9.4	220.1	11.9
BankAmerica	A/A2	68.3	14.9	35.7	17.0
Bank of New York	A-/A3	19.6	-13.1	9.1	14.8
Continental Bank[a]	/Baa1	56.9	-3.4	65.2	-5.9
Chase Manhattan Bank	BBB+/Baa3	226.6	9.0	65.8	35.8
Chemical Bank	BBB+/Baa3	224.3	80.0	166.2	25.0
Securities firms					
Salomon Brothers	A+/A2	131.0	38.8	72.0	34.7
Merrill Lynch	A/A2	126.1	55.1	19.4	90.4

Sources: Statements of condition and annual reports.

[a] Continental Bank was taken over by BankAmerica in 1994.

the derivatives books, the yearly growth rates of the overall markets, and whether or not the intermediary is a bank (Appendix II). We used annual growth rates in the notional value of derivatives at each dealer as the dependent variable. Caution should be exercised in interpreting the results because of the small sample size and the rapid growth of the overall derivatives markets during the period. Nonetheless, the regressions failed to show that triple-A ratings carry decisive importance in the derivatives markets. When we assigned numerical values to the ratings (an AAA rating received 9 and a BBB rating 0), the regressions showed that higher ratings do tend to be associated with higher derivatives growth rates. However, when we used dummy variables to find threshold effects in the ratings, the regressions showed that a double-A threshold explained derivatives growth rates better than a triple-A threshold. These results suggest that the expected widespread insistence on triple-A ratings by derivatives customers did not materialize.

Effect of Workout Risk

Even when derivatives customers value an intermediary's triple-A rating, they may not regard a structured DPC's rating as the equal of other triple-A ratings.[24] The DPC's rating may be differently regarded because the workout risk of such a DPC corresponds more closely to the parent's typically single-A rating. The pure risk of default or credit loss allows the credit rating agencies to assign the triple-A ratings. The integrity of the DPC's structure, however, depends on its parent's ability to sustain the mirror transactions and the capital and collateral requirements. Therefore, the risk of losing such parental support corresponds to the parent's rating. This loss of support triggers an automatic workout process that may cause difficulties for the DPC's customers, even in the absence of default or credit loss.

Under a contingent manager structure, the workout process at the very least would cost DPC customers a dealer relationship. The customers would be holding contracts with an intermediary that is no longer rated triple-A and with whom they can no longer engage in new transactions. Under a termination structure, the concerted liquidation of contracts would cause the DPC's customers who still need the derivatives to find ways to replicate terminated contracts and the out-of-the-money customers to make lump-sum cash payments on the spot.[25] Moreover, the workout process would proceed in markets that might still be reeling from the shock that led to the DPC's parent's financial distress or in markets coping with that distress. These market conditions could contribute to problems of liquidity for derivatives, making it difficult for a DPC's contingent manager to rehedge the book or for customers with terminated contracts to replicate their contracts.

Economies of Scope

Rather than focus on triple-A credit ratings, some derivatives customers may instead choose a lower rated bank because of economies of scope between derivatives and other bank products. The major bank intermediaries have affiliated securities firms, called Section 20 subsidiaries, which the Securities and Exchange Commission regulates as broker-dealers. Given the regulatory "firewalls" between banks and their Section 20 affiliates, it is significant that the banks, not the securities affiliates, are uniformly the ones that serve as derivatives intermediaries. The banks' decision to locate the derivatives business in the banking part of the organization is indirect evidence of the importance of economies of scope between derivatives and other bank products.

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In general, these economies of scope may arise from banks' informational advantages. Banks have traditionally specialized in the management of credit risk, and information about such risks can help with managing the

credit risk of derivatives (Edwards and Mishkin 1995). Understanding a customer's credit needs may also help a bank understand the customer's hedging needs, allowing the bank to propose derivatives to help customers hedge the market risk of other bank products. Large banks, for example, dominate the international syndicated loan market, and interest rate and currency swaps may often be useful for hedging syndicated loans.

In principle, the DPCs' risk management techniques may allow them to operate with less capital than non-triple-A intermediaries for similar derivatives transactions. In practice, however, the DPCs seem to operate with considerably more capital than other intermediaries.

The Capital Required for a DPC's Triple-A Rating

The cost of a structured DPC's triple-A rating is represented largely by the amount of capital required to maintain the rating. In competing with non-triple-A intermediaries for customers who do not insist on the higher rating, the DPCs would ordinarily face a cost disadvantage if they simply managed risks the way other intermediaries did.[26] In principle, the DPCs' risk management techniques may allow them to operate with less capital than non-triple-A intermediaries for similar derivatives transactions. In practice, however, the DPCs seem to operate with considerably more capital than other intermediaries.

DPC Capital and Bank Capital

Under current rating agency standards for triple-A ratings, the DPCs' actual capital requirements appear more stringent than those for banks. To meet the minimum requirements for banks under the 1988 Basle Accord, for example, in 1994 MLDP would have needed a minimum of $40 million in tier 1 capital, only about one-ninth the amount of capital it actually had (Table 10). Similarly, Swapco would have needed only one-seventh the amount it actually had.

In comparing DPC capital with bank capital, it should be noted that banks often hold capital well in excess of the Basle Accord's minimum. The well-capitalized double-A banks, for example, hold tier 1 capital amounting to as much as two-and-a-half times the minimum. The single-A banks hold capital amounting to about double the Basle requirement. Nonetheless, such capital still falls short of the capital held by DPCs, especially when measured relative to risk. The banks allocate capital to deal with both market risk and credit risk, while the DPCs allocate capital largely for credit risk because the mirror transactions already take care of market risk.

Capital for a Double-A Rating

If a triple-A rating requires so much capital and the rating is not so critical in the minds of customers, why don't the structured DPCs settle for a double-A rating? We may estimate what the DPC capital requirement would be for a double-A rating by relying on the expected loss approach used by Moody's (Box 3). Our calculations suggest that DPCs pursue triple-A ratings because these do not require much more capital than double-A ratings

Table 10
Implied Capital by Rating and Required Capital
Millions of Dollars

Company Name	Actual Capital	Required BIS Tier 1 Capital	Implied Aa Capital	Implied A Capital
Merrill Lynch Derivative Products	368.1	40.0	317.4	192.3
Salomon Swapco	280.5	39.0	253.7	187.5
Morgan Guaranty	8,265	3,408	8,265	—
Bankers Trust New York	4,372	1,922	4,372	—
Citibank	16,919	8,676	—	16,919
Chase Manhattan Bank	7,759	3,739	—	7,759
Chemical Bank	10,003	4,880	—	10,003

Sources: Annual reports for 1994; FRBNY staff estimates based on Moody's expected loss rates of 0.002 percent, 0.02 percent, 0.04 percent, 0.14 percent, 0.24 percent, for Aaa, Aa1, Aa2, A1, and A2 ratings, respectively. Default rates are 0.7 percent, 0.9 percent, and 2.0 percent for Aaa, Aa, and A ratings, respectively.

(Table 10). For example, MLDP required $368 million for its Aaa rating. Had it settled for an Aa, it would still have needed $317 million, not a huge savings in capital. An A rating would have represented substantially more in savings, but its parent already had that rating. Similarly, Swapco would not have saved very much by settling for an Aa rating. Moreover, for MLDP and Swapco, the fixed costs of setting up the DPC, including the cost of lengthy discussions with the credit rating agencies, should be about the same for double-A and triple-A ratings.

Our analysis suggests that after all the effort to keep required capital to a minimum, the structured DPC approach to risk management still demands so much more capital than is required by non-triple-A intermediaries that the approach is unlikely to lend the DPCs a competitive edge in the derivatives markets as a whole. Moreover, DPCs would apparently not save much capital by simply settling for a lower rating. In attracting customers who must deal with a triple-A intermediary, the DPCs would enjoy a clear advantage, but beyond this niche of customers they would face a significant cost disadvantage.

Conclusion

The first structured DPCs created quite a stir in the derivatives markets in the early 1990s because it was thought that their unique approach to managing risks would allow them to become major intermediaries in the markets. The DPCs' brand of risk management allowed them to gain triple-A credit ratings with as little capital as possible, and market observers believed that increasingly credit-sensitive customers would flock to them. However, the DPCs have so far failed to live up to that promise. Banks without triple-A ratings are still among the dominant market players, and even the DPCs' parents, with at best single-A ratings, engage in considerably more derivatives transactions.

The structured DPCs manage risks in three ways: they hedge market risks as fully as possible by means of mirror transactions with their parents; they manage credit risks—which are inherently difficult to hedge—by using quantitative models to estimate exposures precisely and by allocating capital to just cover the risks as measured daily; and they prepare for the possibility that their structure may someday fail by providing an automatic workout pro-

Box 3: Calculating a DPC's Required Capital

Under the expected loss approach used by Moody's, the expected loss rate is the product qL, where q is the probability of the DPC defaulting and L is the loss rate given the default. The loss rate L is in turn calculated as

$$L = (D - K)/P,$$

where D is the loss from the defaulting receivables that would cause the DPC to default, K the amount of the DPC's capital, and P the amount of customer payables.

To satisfy the threshold for a triple-A rating, the expected loss rate faced by a DPC customer may not exceed 0.002 percent over a ten-year horizon (Gluck and Clarkson 1993). The DPC starts with a trial amount of capital for K and then uses its internal model to calculate the default probability q and the receivable losses D for its derivatives book. If the resulting expected loss exceeds 0.002 percent, the DPC continues to add more capital and to recalculate the expected loss until it reaches 0.002 percent. The resulting amount of capital at the threshold is then the requirement for the triple-A rating.

Knowing the triple-A DPC's expected loss rate, its capital, its default probability, and its potential amount of customer payables, we derive an estimate of D, or the implied loss from defaulting receivables, for the DPC's derivatives book. We then recalculate the required amount of capital for a DPC with the same book but one that would be rated only double-A or single-A by using the corresponding expected loss rates and default probabilities (Fons, Carty, and Kaufman 1994). Strictly speaking, this calculation would be incorrect, because the estimate for D, as well as the loss rate L and default probability q, would depend on the amount of capital. Nonetheless, if we assume that D, L, and q are relatively insensitive to the amount of capital, such a calculation would give us a rough order of magnitude for the capital requirements.

cess designed to limit the ensuing risk.

Considering the strength of their risk management, why haven't structured DPCs taken over a larger share of the derivatives markets? Our analysis suggests two basic reasons. First, credit gridlock did not materialize, and the DPCs' triple-A ratings, in particular, did not become a decisive factor in most customers' choice of intermediaries. In this regard, customers may not have been as comfortable with the DPCs' ratings as with other triple-A ratings because the DPCs are subject to a workout risk corresponding to their parents' typically single-A ratings. Second, despite their efforts to save on capital, under current rating agency standards, the DPCs still faced more demanding capital requirements than those faced by major intermediaries without triple-A ratings. Settling for lower ratings would not have saved the DPCs much capital. The DPCs did not just get off to a slow start; they seem to have been structurally inhibited from taking over a large share of the markets.

Nonetheless, the structured DPCs continue to receive capital support from their parents, and new ones will continue to be formed. In the near future, these DPCs are unlikely to dominate the markets as derivatives intermediaries. Instead, they will serve a market niche consisting of the relatively few, albeit important, customers who insist on triple-A ratings.

Appendix I: Recent Cases of Derivatives Defaults

The recent history of defaults or dispositions of derivatives portfolios points out many of the dangers that can arise when an intermediary defaults. Those dangers include the risk that the defaulting party will not be able to obtain full market value when it transfers its portfolio to an underinformed buyer. In addition, limited two-way payment options give rise to "walk-away" risk because counterparties can attempt to void their obligations to defaulting parties. Finally, some regulators have the authority to "cherry pick" from the portfolio and leave the in-the-money counterparties at the mercy of the bankruptcy courts. However, it appears that the structured DPCs have specific provisions and safeguards designed to mitigate these risks.

The contingent manager provisions of the DPCs would have helped Development Finance Corporation of New Zealand (DFC) and British and Commonwealth transfer their derivatives portfolios more easily. When DFC transferred its contracts to Barclays Bank, it had to make a payment to Barclays based on the mark-to-market value of the portfolio. In the case of British and Commonwealth, local client confidentiality laws prohibited disclosure of the names of its counterparties to potential purchasers of its portfolio.

In each case, the contracts signed by counterparties of Merrill Lynch Derivative Products and Lehman Brothers Financial Products would have specified that the transactions be transferred automatically to a previously agreed-upon contingent manager. Thus, there would be no need for the self-destructing DPC to "settle" the book with the contingent manager. Moreover, the contingent manager would have been familiar with the book and prepared to assume the day-to-day operations of the DPC.

The contingent manager structure also mitigates the risk from limited two-way payments that was experienced by DFC, British and Commonwealth, and Drexel Burnham Lambert. Under limited two-way payments, the nondefaulting counterparty is *not* obligated to make payments to the defaulting counterparty, regardless of the market value of the swap. Assignment to mutually agreed-upon contingent managers would probably prevent such clauses from being exercised.

More important, both terminating and continuation DPCs insist on full two-way payments clauses for the settlement of terminated contracts. This means that regardless of who defaults, the out-of-the-money counterparty must make the payments. The prespecified workout process may also help DPCs avoid walk-away risk by triggering a workout short of default. In addition, the counterparty must agree to settle the contracts based on the mid-market calculations of the DPC, thus eliminating some uncertainty surrounding the valuation of the termination payments.

In the failure of the Bank of New England (BNE), questions arose concerning the role of regulators in the disposal of the bank's derivatives portfolio. Immediately after BNE was declared insolvent, the Federal Deposit Insurance Corporation (FDIC) established a bridge bank to assume BNE's assets and liabilities and continue BNE's operations while a permanent solution was found. The FDIC had the authority, under the Financial Institutions Relief, Recovery, and Reform Act (FIRREA), to transfer to the bridge bank only those contracts with counterparties that were out-of-the money with respect to BNE.

However, the FDIC decided not to follow this course of action because of the existence of limited two-way payments clauses and the possibility of other detrimental actions by counterparties. Since BNE's portfolio was net in-the-money, the decision was made to transfer it to the bridge bank in its entirety. The DPCs are aware of the FIRREA clauses, but they feel confident that the International Swaps and Derivatives Association agreement and the additional protections that they seek from regulated counterparties would be sufficient to protect them from losses.

APPENDIX II: EXPLAINING DERIVATIVES GROWTH FOR MAJOR INTERMEDIARIES

The relative importance of credit ratings can also be shown using regression analyses covering the 1991-94 period. The dependent variable is yearly derivatives growth by institution (DGROW). The independent variables are a credit rating variable (RATING), a dummy for whether an institution was a bank or nonbank dealer (BANK), the size of the book at the beginning of the year (BKSIZE), and a year dummy to control for changing marketwide conditions:

$$DGROW = a + b_1RATING + b_2BANK + b_3BKSIZE + b_4DUM91 + b_5DUM92 + b_6DUM93.$$

We ran several regressions based on different characterizations of the effect of credit ratings. In regression 1, we assumed that credit ratings would have a continuous effect on derivatives growth. Therefore, we defined a credit rating variable, which was assigned a value of 9 for AAA, 8 for AA+, 7 for AA, 6 for AA-, and so on, down to 0 for BBB-. The result shows that the dealer's credit rating was a significant positive factor in determining the growth of its derivatives book.

In regressions 2 to 6, we made the slightly different assumption that credit ratings had a threshold effect (that is, the effect was the same beyond a certain threshold rating). Regression 3, containing a dummy variable for companies rated double-A or higher, explained more of the variation in derivatives growth rates than any of the others. Regression 2 for the triple-A or higher threshold and regression 3 for the double-A or higher threshold yield similar coefficients, but the latter is estimated with a smaller standard error and a higher R-squared.

REGRESSION ANALYSIS OF YEARLY DERIVATIVES GROWTH

Dependent variable: Yearly derivatives growth rates by institution, 1991-94

Independent variables: Credit rating variable, dummy for bank versus nonbank, size of book (lagged), dummy for year

	Regression Number					
Credit Rating Variables	1	2	3	4	5	6
Credit rating[a]	0.441[b] (3.36)	—	—	—	—	—
Dummy for AAA or higher	—	0.221[b] (2.46)	—	—	—	—
Dummy for AA or higher	—	—	0.225[b] (3.46)	—	—	—
Dummy for A+ or higher	—	—	—	0.141[b] (2.26)	—	—
Dummy for A or higher	—	—	—	—	0.103 (1.44)	—
Dummy for A- or higher	—	—	—	—	—	0.105 (1.07)
R^2	0.351	0.293	0.358	0.281	0.241	0.228

Source: Authors' calculations.

[a] We assigned a value of 9 for AAA, 8 for AA+, 7 for AA, 6 for AA-, and so on, down to 0 for BBB-.

[b] Denotes significance at 5 percent level of confidence or higher; R-statistics are in parentheses.

ENDNOTES

1. Remolona (1993) analyzes the economic forces driving the growth of derivatives markets. Figlewski (1994) describes some of the basic strategies that have resulted in losses.

2. Cantor and Packer (1994) provide a thoughtful discussion of the meaning and reliability of such ratings.

3. A survey of dealers conducted by the Bank for International Settlements in April 1995 suggests global markets of $40 trillion in notional value, a much larger estimate than those produced by the regular surveys of the International Swaps and Derivatives Association.

4. However, by merging with Chemical Bank in 1995, Chase Manhattan is now the world's largest derivatives intermediary.

5. In the last few years, only Morgan Guaranty had achieved an Aaa rating from Moody's, but it lost that rating in early 1995.

6. Intermediaries also manage other types of risk, such as legal risk (arising from uncertainty over the enforceability of contracts) and operational risk (arising from the possibility of a breakdown in internal controls or in systems for processing and settling transactions).

7. Credit risk is more of a concern in the over-the-counter markets than in organized derivatives exchanges, such as the Chicago Board of Trade (CBOT) or the London International Financial Futures and Options Exchange (LIFFE). There, the interposition of a clearinghouse as a counterparty and the use of frequent margin payments reduce credit risks drastically (Remolona 1993).

8. The development of the markets in credit derivatives may allow the hedging of some credit risk. Hedging products include credit swaps, credit-linked structured notes, and options on credit spreads, all of which allow investors to isolate and trade the credit risk of their portfolios in much the same way as interest rate and currency derivatives isolate market risk.

9. Santomero (1984), for example, shows how a bank would trade off risk and return in its whole portfolio.

10. There are other ways to mitigate credit risk, but netting and collateral are the most common ones. Netting agreements reduce credit exposures by bilaterally offsetting contracts with positive market values against contracts with negative market values between the intermediary and individual customers. Hendricks (1994) analyzes the effect of netting on credit exposures. The most common form of collateral is the use of interdealer margins in transactions among intermediaries. Chew (1994) and Comptroller of the Currency (1994) provide more general discussions.

11. The confidence interval is an estimate of the probability that losses will *not* exceed the value at risk.

12. Bankers Trust New York Corporation, *1994 Annual Report*, Table 4, p. 28.

13. See, for example, Iben and Ratcliffe (1994).

14. Drexel Burnham Lambert had derivatives amounting to $30 billion in notional value. Under bankruptcy, the contracts were terminated early without any apparent credit losses to counterparties.

15. The discussion in the rest of this section draws from Gluck and Clarkson (1993), Scheyd and Bahar (1994), and Bartmann, Milich, and Volstad (1994).

16. In a recent arrangement, MLDP will serve as the intermediary for swaps with customers of Dai-Ichi Kangyo Bank, but the bank will provide the collateralized mirror transactions.

17. Technically, Credit Lyonnais's ratings are assigned to its derivatives program, which relies on guarantees provided by CLFG Corporation, a special purpose, bankruptcy-remote corporation wholly owned by Financial Security Assurance Holdings, itself a triple-A-rated monoline U.S. insurer. The derivatives program will cover transactions with the New York branch of Credit Lyonnais (the sponsor).

18. The rating agencies rely on external auditors to monitor the DPCs' operations, including the verification of the models' results.

19. Duffie (1994) argues that the assumption of independence is a poor one, particularly in the case of interest rate contracts, because defaults tend to be more common when interest rates decline during a recession.

20. Structured DPCs typically choose a confidence interval of 99 percent, which would cover movements as large as 2.3 standard deviations from the mean and allow only a 1.0 percent probability that actual losses will exceed the threshold estimate.

21. Credit Lyonnais's derivatives program would settle the contracts on the basis of actual quotes from other intermediaries, and customers would have the choice of having their contracts taken over by another intermediary or of settling for cash.

22. Moody's uses an expected loss standard for its credit ratings. Under this standard, it is unnecessary to distinguish between continuation and termination structures.

ENDNOTES (*Continued*)

23. In early 1995, Standard and Poor's lowered its rating of Morgan Guaranty from AAA to AA+ and Bankers Trust from AA- to A+. The rating agency also downgraded the ratings of Credit Suisse, the Swiss Bank Corporation, Banque Indosuez, and the Long-Term Credit Bank of Japan.

24. Just as not all triple-A ratings may be created equal, a bank's credit rating may be "more equal" than others, particularly when such a bank is perceived to be too big to fail. The issue of what a bank's credit rating truly means is beyond the scope of this study.

25. Under the termination structure and depending on the type of customer, a workout may also constitute a tax event because of implied capital gains or losses.

26. This assumes that DPCs and other intermediaries face similar costs of capital.

The authors thank Richard Cantor, Ellen Gaske, Jerry Gluck, Jean Helwege, Darryll Hendricks, John Kambhu, Frank Keane, John Langer, David Laster, James Mahoney, and Tony Rodrigues for helpful discussions.

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* Identify counterparty risk intermediaries including central counterparties (CCPs), derivative product companies (DPCs), special purpose vehicles (SPVs), and monoline insurance companies (monolines) and describe their roles. * Describe the risk management process of a CCP and explain the loss waterfall structure of a CCP. * Compare bilateral and centrally cleared over-the-counter (OTC) derivative markets. * Discuss the impact of central clearing on credit value adjustment (CVA), funding value adjustment (FVA), capital value adjustment (KVA), and margin value adjustment (MVA). Master in Corporate Finance. Credit risk management, modeling loan portdolio loss distribution, a case study. In banking. Masterâ€™s Thesis by the 2.Â Credit models involve estimating default probabilities and term structure of spreads as price of default risk. There are two major approaches in credit risk modelling, structural and intensity based-based models known as reduced-form as well. The former takes default as an endogenous event while the latter models default as an exogenous variable. Primary works on structural models originates from Merton 1976 in line with Black-Scholes options pricing model. In the early 1990s, some U.S. securities firms and foreign banks began creating subsidiary vehicles--known as structured derivative product companies (DPCs)--whose special risk management approaches enabled them to obtain triple-A credit ratings with the least amount of capital. At first, market observers expected credit-sensitive customers to turn increasingly to these DPCs. However, the authors find that structured DPCs--despite their superior ratings--have failed to live up to their initial promise and have yet to gain a competitive edge as intermediaries in the derivatives markets. Suggest