FYI: An Update on Emerging Issues in Banking

Derivatives Risk in Commercial Banking

March 26, 2003

Summary

Derivatives activity at commercial banks, as measured by total notional values of over $56 trillion as of December 31, 2002, continues to grow dramatically. Derivatives serve an essential role in the U.S. and world economies but also present certain risks to the deposit insurance funds. This *FYI* explains what these risks are and describes how they are managed within commercial banking.

Derivatives: What They Are and the Role That They Have in the Economy

Derivatives are financial instruments or contracts with values that are linked to, or derived from, the performance of underlying financial instruments, interest rates, currency exchange rates, or indexes. In a simplified sense, a derivative links its holder to the risks and rewards of owning an underlying financial instrument without actually owning the financial instrument.

Derivatives are important to the financial markets and the world economy because they provide a means for companies to separate and trade various kinds of risks. The ability of participants in the financial markets to adjust specific risk exposures enhances the efficiency of capital flows by allowing companies to conduct business activities without amassing certain risks that would otherwise attend that business. For instance, mortgage lenders that are comfortable with the credit risk of mortgage lending may be less comfortable with the amount of exposure to interest rate movements that accompany a large mortgage portfolio. A mortgage company can use derivatives to lessen their exposure to the effect that interest rate movements might have on the value of their business and continue to make mortgage loans. Mortgage borrowers benefit from these arrangements because mortgages are cheaper when lenders have choices about the risks that they retain.

Notional Amounts Measure Derivatives Activity Not Risk

At $56 trillion—a dollar figure that is more than five times GDP—the notional amount of derivatives outstanding can seem daunting. However, the notional amount of a derivative contract is merely the reference point to the underlying instrument. It serves as the basis for calculating cashflows under the contract. For example, a very typical derivative contract would be to pay the 10-year Treasury rate on $1 million in return for a floating rate on the same amount. The notional amount of the contract is $1 million. This amount does not change hands; but for each payment period, the 10-year Treasury rate is multiplied by $1 million to calculate the fixed-rate payment.

While the notional amount is a proxy for the amount of derivatives activity, it does not measure the riskiness of the activity. The notional amount itself is seldom at risk of loss with derivatives. Instead the derivatives investor is at risk of loss from changes in prices of or rates earned on the physical or financial assets that the notional amount represents.

When the derivatives market as a whole is in view, it is important to consider that offsetting positions that add to gross notional amounts do not necessarily add significantly to total market

risk. This concept is illustrated in Transaction Scenario 1.

Transaction Scenario 1:
A derivatives transaction example that illustrates the relationship between notional amounts and potential risk.

An American firm holds $2 million in cash. This company is planning to buy equipment from a German manufacturer six months from today that, given today's exchange rate, is valued at $2 million US Dollars (USD).

Given its plans to purchase this equipment, its cash position in USD actually represents a foreign exchange (FX) exposure to the exchange rate between USD and German marks (DM). The firm calls a derivatives dealer and enters into a FX contract that obligates the firm to sell DM six months from today at today's exchange rate. In so doing, the American firm locks in the USD price of the equipment, thereby hedging its foreign exchange risk. If DM appreciate, the equipment becomes more expensive in terms of USD; but the firm profits in its derivatives contract by roughly the same amount.

After entering the transaction with the American firm, the dealer bank enters into a contract with a hedge fund to sell DM six months from today at today's exchange rate, thereby completely offsetting its exposure to the exchange rate between USD and DM. In actuality, the exchange rates used on both sides of the transaction might be slightly different, allowing the dealer bank to make a spread on the transaction to compensate it for making a market in DM forward agreements.

The hedge fund enters the transaction because its managers believe that DM will weaken against USD in the next six months and the fund is willing to speculate in order to profit from that movement.

In terms of the gross notional amount of derivatives outstanding in the banking system, the transactions in this example contribute $4 million: the sum of both the bank's FX contracts. In terms of market risk, these transactions contribute nothing. There is, however, credit risk associated with the dealer bank's position. While the transaction is open, the exchange rate that the market expects between DM and USD may change. If DM depreciate (a change unfavorable to the American firm's FX derivatives position), then the contract between the dealer and the American firm increases in value to the dealer. This increase in value and potential future increases in value during the contract's life represent credit exposure of the dealer to the American Firm. [1]

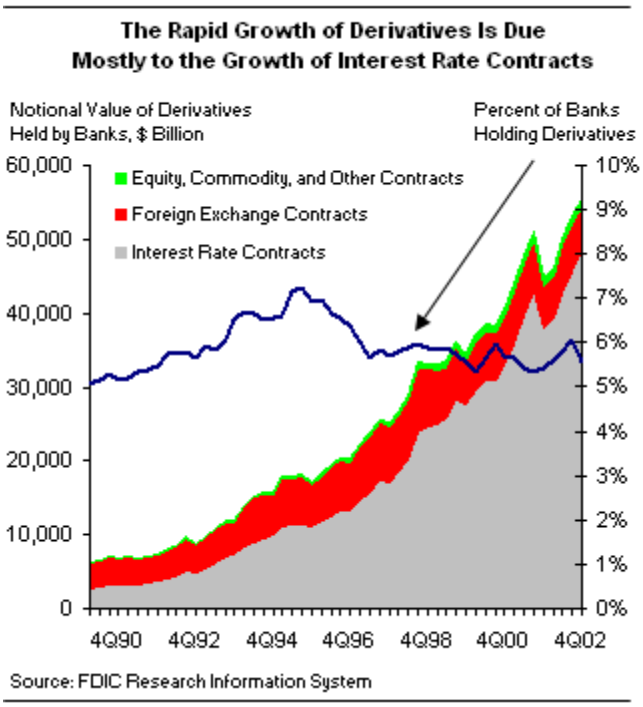
While Derivative Notional Values have Grown, the Number of Banks Involved Has Not

The vast majority of U.S. banks manage their interest rate and other risks within their balance sheets and do not use derivatives. As of December 31, 2002, 439 institutions or 5.6 percent of commercial banks held some amount of derivatives. The percentage of banks holding any derivatives peaked at a little more than 7 percent in the third quarter of 1995.

Chart 1 shows the growth of the notional value of derivatives divided into three broad categories of underlying instruments: interest rate contracts; foreign exchange contracts; and equity, commodity, and other contracts.[2] The extraordinary growth in notional values is due to the growth of interest rate contracts, which, as of December 31, 2002, amounted to a little over 86

percent of the $56 trillion derivatives market.

Chart 1



The Nature of Derivative Activities in Commercial Banking

There are three broad kinds of derivatives activities: hedging, dealing, and speculating. While each of these activities is found to some extent in commercial banking, dealer activities dominate.

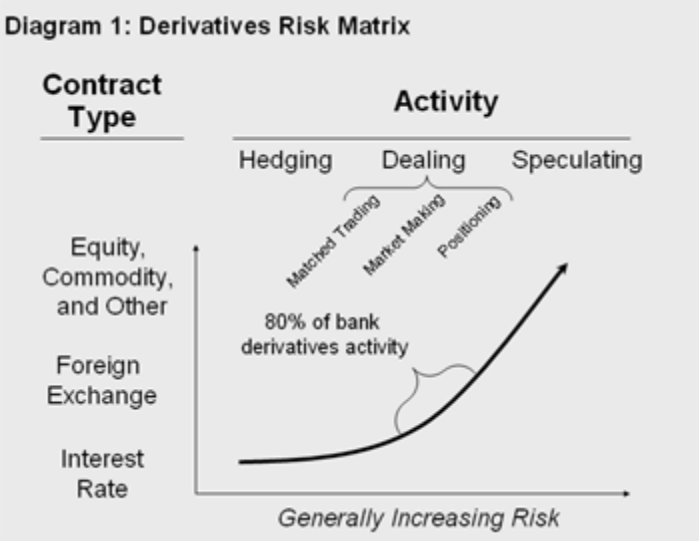
When used for hedging, a derivative position is employed to offset or reduce the risk associated with an existing balance sheet position or future planned transaction. Dealing in derivatives consists of taking an intermediary role and making contracts available for customers to earn fees. Dealers may enter into offsetting positions with other customers or manage derivatives risk in other ways. Speculators enter derivative transactions in order to profit from expectations that are different from the market's expectations about how derivatives prices will move.

Most commercial banks enter derivatives transactions as hedgers or dealers. In terms of notional amounts outstanding, derivatives activity is highly concentrated at dealer banks. In terms of the number of institutions holding any amount of derivatives, most are hedgers using interest rate contracts. The extent of speculation within commercial banking is more difficult to determine because it is not reported as such and speculative-type risks arise from certain dealer activities.

A Risk Ranking of Derivatives Activities

The risk associated with hedging, dealing, or speculating varies substantially. While poorly managed operational risk could lead to losses in any derivatives activity, a generalized rank ordering of derivatives risk can be constructed. Generalizations about the rank ordering of risk are helpful in understanding the nature and source of the risk inherent in the $56 trillion of notionals outstanding. Diagram 1 provides a grid for considering the rank ordering of risk in the

derivatives market.



Transaction Scenario 2: **A derivatives transaction example that illustrates how a derivative's riskiness is related to the volatility of the factors that determine its value and the sensitivity of the derivative to changes in those factors.**

Transaction 1: An Interest Rate Swap
Party A agrees to pay party B a fixed rate of 6 percent and receive from party B the 3-month Treasury rate for a period of 2 years beginning November 15, 2000, on a notional value of $1 million. Party A would enter such a transaction either to profit from a view that rates were going to rise or to hedge a balance sheet position that was subject to erosion in value if rates were to rise, such as holding Treasury bonds. If the short-term rate falls, Party A will lose on its derivatives position. Assuming for simplicity that the 515 basis point decline in 3-month Treasury rates that actually occurred during this contract period was evenly distributed over the two years, Party A would have lost a little more than $57 thousand in the transaction—less than 6 percent of the notional value.

Transaction 2: An Equity Contract
Party A agrees to pay party B a fixed rate of 6 percent and receive from party B the return on the NASDAQ composite for a period of 2 years beginning November 15, 2000, on a notional value of $1 million. Assuming, again for simplicity, that the almost 45 percent decline in the NASDAQ that actually occurred during the contract period was evenly distributed over the two years, Party A would have lost almost $343 thousand in the transaction—more than 34 percent of the notional value.

The relative risk of these two contracts is apparent when one considers the historical changes in 3-month Treasury rates versus the historical changes in NASDAQ returns and the impact that these changes have on the gains and losses associated with the derivatives position. Although short-term rates moved significantly during the past several years, these changes are eclipsed by the changes in NASDAQ return during the past several years.[3]

Contract Type Risk Ranking
Transaction Scenario 2 illustrates why interest rate contracts generally are less risky than other derivative types, such as equity derivatives contracts. Despite the changes in short-term rates

described in the scenario—which were large by historical standards—losses on the interest rate contract are a small percentage of the notional amount. An exposure to the NASDAQ during the same time period resulted in a loss that amounted to a significant percentage of the notional value. Commodity contracts can resemble equity contracts in terms of riskiness.

Although foreign exchange and interest rate contracts enjoy many theoretical similarities, the placement of foreign exchange contracts above interest rate contracts in the risk matrix reflects greater inefficiency in the foreign exchange market and the fact that with foreign exchange forward contracts, although the notional amount is not contractually at risk of loss, it is frequently exchanged. This exchange could increase the operational and credit risk associated with the transaction.

Activities Risk Ranking
The relative riskiness of the major derivatives activities relates to several attributes of each activity. By definition, hedging is a risk mitigating activity. Although it is not without its risks, these risks, which are discussed below, are small relative to the other derivatives activities.

Derivatives dealers are exposed to at least the same risks as hedgers, and they incur additional operational risks as a result of the sheer volume of derivatives activity they undertake. Furthermore, the strategies used by dealers in managing derivatives positions are not of equal risk and some strategies can result in speculative-like risks. Dealer strategies are discussed below.

Pure speculation in derivatives can be extremely risky because derivatives can facilitate magnified risk exposures and high leverage from a capital standpoint. For example, derivatives can be fashioned that allow speculators to be highly exposed to risk with very little capital or cash investment. Due to the leveraged nature of the investment, relatively small unexpected changes in underlying values can compromise a speculator's capital base.

The Extent and Risk of Hedging

The primary risk of hedging lies in the potential for correlations between the derivative value and the hedged item to change from what was observed or assumed when the hedge was constructed.

In terms of the number of institutions holding derivatives, a vast majority of the banks that use derivatives (339 or 77 percent) hold them solely for hedging purposes. However, in terms of dollar volume, these hedging-related holdings amount to less than one half of one percent of total notionals. Most of the derivatives (90 percent) held for hedging purposes are interest rate contracts, indicating that banks are mostly using derivatives to hedge interest rate risk.

Derivatives held for hedging purposes may be somewhat more than indicated by this number. Banks that are motivated to hold derivatives for hedging purposes may use a trading account for accounting reasons. Under Financial Accounting Standard (FAS) 133, the hurdle for using hedge accounting is higher than it was previously. For example, so-called macro hedging does not get hedge accounting treatment under FAS 133.[4] Without hedge accounting, a company's earnings are subject to additional volatility due to the marking of the hedge to market without marking the "hedged" assets or liabilities to market. To avoid this earnings volatility, a company might establish a trading account and hold both the derivative hedge and the hedged balance sheet items in the trading portfolio where both are marked to market and the gains and losses that run through earnings are mostly offsetting.

The risk of hedging lies mostly in how much the value of the derivatives contract varies in

relation to the value of the hedged item. This relationship is referred to as correlation. The least risky hedge exhibits relative price movements between the derivative value and the hedged item that have been consistent over time and that are close to completely opposite, that is, the price movements have tended to offset one another over time.

The risk that hedgers face was exemplified during the market disruption that followed the fall of Long Term Capital Management and Russia's debt default in the last several months of 1998. The spread between mortgage rates and 10-year treasury securities widened unexpectedly during this time. Traditionally, hedgers of certain mortgage-related products rely heavily on the stability of the relationship between these rates.

When this relationship destabilized, hedges performed in ways that were not predicted, and in some cases, would-be hedgers experienced losses on both the derivatives contract and the asset it was intended to hedge.

One measure of the significance of derivative hedging activity for an institution is its effect on the bank's income. Hedging has a significant impact on net operating income at several institutions. As of December 31, 2002, 23 banks that use derivatives to hedge, reported an effect from hedging that amounted to more than 10 percent of net operating income during the fourth quarter of 2002.

The Extent and Risk of Dealing in Derivatives

Nearly 81 percent of the $56 trillion notional value of derivatives represents interest rate contracts at five dealer banks.

The top 5 derivatives dealers hold 93 percent of total notionals.[5] More than 86 percent of these dealers' holdings are interest rate contracts. Therefore, in terms of the derivatives risk matrix, a vast majority of commercial bank derivatives activities is in interest rate contracts at a few dealer banks.

These dealers conduct derivatives activities as part of their total trading operations, which makes analyzing derivatives risk difficult to isolate from total trading risk. Furthermore, if a bank is speculating in derivatives, it occurs within these trading portfolios and is not reported separately.

In customer-related derivatives trading activities, banks engage in some combination of matched trading, market making, and positioning.[6] The relative mix of these three methods, to a large extent, determines not only the magnitude of the market risk of the individual bank's derivatives trading but, because of the derivatives dealers' market dominance, this mix also drives total derivatives market risk in commercial banking. These trading methods are discussed below in order of increasing risk.

Matched Trading
When matched trading, a dealer enters into a trade with a customer and then enters into an equal, offsetting position with another counterparty. A dealer bank that uses matched trading to manage market risk eliminates most of the market risk of its activities. The effectiveness of matched trading in controlling market risk is considerable because its effectiveness does not rely on model accuracy to the extent that other methods of controlling market risk do. Errors in modeling the market values of one side of the transaction are likely to be counterbalanced by offsetting errors on the other side of the transaction. Although market risk may be neutralized in matched trading, the trading bank retains credit risk on both sides of the transaction.

Market Making
Market makers stand ready to enter into certain contract types without regard to whether they

have an offsetting transaction. In accumulating inventory during a given day, intra-day positions develop that result in market risk. Market makers are compensated for market, credit, and liquidity risks through the bid/ask spread, and may experience additional profits or losses from this intra-day positioning. A bank's success in market making depends on the accuracy of its pricing models. Unlike the matched trader, the market maker is likely to be subject to unfavorable movements in their markets that occur during the day. Generally, a market maker will significantly offset these risks at the end of the trading day.

Positioning
Positioning occurs when a trader, perhaps expecting favorable market movements, executes a transaction with a customer without establishing an offsetting position. Other reasons to maintain open positions include the need to maintain an inventory of financial instruments for distribution to customers, the existence of a large position from a customer transaction that takes time to close out, and the need to aggregate a sufficient number of small transactions to be economically efficient to hedge. Unlike the market making strategy, these positions can be carried over for more than a day leaving more time for the markets to move unfavorably. Positioning embodies speculative-like risks that need to be monitored and controlled carefully.

Speculative and Proprietary Trading
Speculative and proprietary trading are distinguished from other trading activities in that they are not initiated to serve customers. A bank engages in speculative trading for the sole purpose of increasing its earnings. A bank may engage in proprietary trading for a number of other reasons.[7] Among these reasons are to increase experience and expertise in the markets, and to diversify risks associated with other trading positions.

Types of Risk at Dealer Banks

Dealer banks face three major risks from derivatives activities. These risks are market risk, credit risk, and operational risk.

Market Risk

The magnitude of derivatives market risk in commercial banking is largely related to the extent to which the major dealers engage in matched trading, market making, or positioning.

At any given time, dealers may be simultaneously engaged more or less in matched trading, market making, or positioning as their business strategies dictate. It is difficult to know the extent to which the activities of each dealer fall within these categories at any point in time. However, the market values of a bank's derivatives portfolios may provide information, albeit imperfect, about the bank's activities. Derivatives contracts may have negative or positive market values. When positively valued, the amount represents the dealer's cost to replace or duplicate the contract. When negatively valued, the amount represents the cost that the dealer would incur to exit the contract. Derivatives portfolios that are equally weighted with negatively valued and positively valued positions would characterize a matched trading strategy. For example, in a matched transaction where the derivative positions are mirror images, at any point in time the sum of the total position should be very close to zero. This is because market moves against one side of the transaction will be favorable to the other side. Extensive positioning would result in larger differences in the positive and negative values of derivatives in a portfolio, and would at least indicate that the bank is managing its market risk using techniques other than matched trading. Extensive use of other techniques requires a high degree of confidence in the reliability of the models that the banks use to manage market risk. In liquid markets, the bank has the benefit of observable trades to benchmark the accuracy of their models. However, when dealers take positions in less liquid contracts, they should be conservative regarding the extent of those

position and the degree of faith they place in the accuracy of their models.

In Table 1, a calculation based on a bank's reported market values of derivatives holdings is used as a proxy to estimate the extent to which the bank is not using matched trading to manage its market risk.[8] Using this proxy technique, in the aggregate, commercial banks have unmatched market values totaling $33 billion. Three of the five dealer banks have unmatched market values that account for over 88 percent of the commercial bank aggregate. While this calculation could reveal apparently open positions, it should be interpreted with care. Banks may have positions in nonderivative assets and liabilities that either exacerbate or mitigate their derivatives positions.

Table 1: Contract Market Values: Positive Values Net of Negative Values by Contract Type

Name	Interest Rate Contracts (Positive-Negative)	Foreign Exchange Contracts (Positive-Negative)	Equity Contracts (Positive-Negative)	Comodity & Other Contracts (Positive-Negative)	Absolute Value of Net Positions	Tier 1 Capital	Absolute Value of Net Position as a Percent of Tier 1 Capital
JPMorgan Chase	12,237,000	(3,746,000)	357,000	1,086,000	17,426,000	31,908,000	55%
Bank of America	3,704,000	(2,034,000)	(330,000)	(1,678,000)	7,746,000	33,420,000	23%
Citibank	5,071,000	124,000	428,000	(2,000)	5,625,000	39,897,000	14%
Bank One NA	703,000	(44,000)	48,000	26,000	821,000	16,888,000	5%
Wachovia Bank NA	(341,000)	(66,000)	225,000	-	632,000	18,594,000	3%

Most of a bank's dealer business may occur in easily managed products, such as plain vanilla interest rate swaps. In fact, most of the $56 trillion in outstanding notional values falls into this category. However, earnings pressure may motivate dealing in riskier products. The high liquidity and common understanding of easily managed products lowers the risk of dealing in them but also limits the potential return. In order to earn a greater margin on transactions, a bank would likely need to take on more complex transactions that are more challenging to manage. A bank that has demonstrated a propensity to take on additional risks under earnings pressure would seem more likely to have engaged significantly in complex derivatives activities that exceed the comfort level of its risk managers. A bank supervisor's familiarity with the risk management culture at a dealer is a key control of risk of this nature.

Credit Risk

While concentrations of credit from derivatives counterparty risk may appear significant, concern is mitigated by the diversity and credit quality of the counterparties and the nature of the transactions.

Dealers that limit market risk by maintaining a reasonably matched derivatives portfolio still

retain significant counterparty credit risk in derivatives transactions. Credit risk in a derivatives transaction has two components: current exposure and potential future exposure. Current exposure is represented by the fair value of a bank's derivatives contracts that have a positive value. The exposure represents the cost of replacing the contract if the current counterparty is unable to perform. Potential future exposure represents an estimate of the replacement cost that a contract could have during its remaining life, which is often difficult to estimate with much reliability. For risk-based capital purposes, potential future exposure is estimated based on several principles. The shorter the time to maturity, the less opportunity a contract will have to fluctuate in value. The greater the price volatility of a contract type, the greater the expectation that its change in value may result in a credit exposure over its life. Although a contract that currently has a negative value poses no current credit exposure, it still carries potential future exposure because market factors may reverse during its life.

Banks are frequently able to net positions that are open to the same counterparty and reduce credit risk exposure. For example, if a bank has two contracts with the same counterparty—one with a negative fair value and one with a positive fair value—a bilateral netting agreement would allow the bank to consider the current exposure to this counterparty as the net fair value of these positions. For the large dealers, netting agreements significantly reduce the credit risk exposure. For example, JPMorgan Chase has derivative contracts with positive fair values totaling over $623 billion. When netting agreements are considered, the total current credit exposure is reduced by more than 86 percent to $87 billion.

Table 2 provides several perspectives on the credit exposure of the top five derivatives dealers. Institutions that do not show significant differences between their current exposures and potential future exposures mostly hold short-dated interest rate contracts.

Table 2: Credit Exposures

Name	Total Derivatives ($ Billion)	Netted Current Exposure as a Percent of Tier 1 Capital	Total Gross Exposure as a Percent of Total Capital	Total Netted Exposure as a Percent of Total Capital	Risk Weighted Exposure as a Percent of Total Capital	Exposure Qualifying for Reduced Risk Weight	Annualized Quarterly Charge-offs as a Percent of Current Exposure
JPMorgan Chase	28,020,366	269.7%	654.5%	427.4%	140.6%	54%	0.00%
Bank of America	12,467,504	81.8%	203.6%	113.9%	42.1%	43%	0.53%
Citibank	8,381,334	97.4%	201.1%	144.9%	52.4%	45%	0.00%
Wachovia	2,041,244	111.7%	102.4%	102.4%	24.6%	62%	0.23%
Bank One	1,090,634	27.2%	45.4%	35.8%	11.5%	59%	0.26%

Concentrations of credit in banking historically have given rise to significant risk. A concentration is a significantly large volume of economically-related financial obligations that an institution has advanced or committed to one person, entity, or affiliated group. In order to identify concentrations that may be of concern, bank supervisors have used certain benchmarks as a starting point. For instance, a concentration of lending to a specific industry like textiles might warrant concern when it exceeds a certain percentage of a bank's Tier 1 capital level. Derivatives concentration risk is similar in concept to an industry concentration in that the counterparties to a dealer have an economic interrelationship through their involvement in a

derivatives market that is dominated by a few dealers.

Even on a netted basis, several dealers have current credit exposures from derivatives that exceed Tier 1 capital. In a stressed market, dealers may suddenly find that seemingly diversified counterparties behave similarly.

Recognizing this possibility, however, several factors mitigate the risk. On average, more than half of the major dealers' credit exposures qualify for reduced risk weighting under risk based capital standards. Most dealer derivative contracts that qualify for reduced risk weighting qualify because the counterparty is another depository institution or the contract is secured. Moreover, internal reports at several dealers indicate that the average derivatives counterparty rating is significantly higher than the average rating of commercial borrowers.

Credit risk is also mitigated if the counterparty is hedging. If the counterparty is hedging with derivatives, its unhedged earnings, and therefore its ability to perform under the contract, are likely to be higher when the derivatives dealer has the highest credit exposure to it. The value of the contract from the dealer's perspective is positively correlated with the hedged aspect of the counterparty's business. For example, a company hedging against rising rates would owe the dealer money when rates are falling. The counterparty's need to hedge against rising rates implies that the company's earnings, apart from the derivatives contract, are improving as rates are falling. This relationship suggests that a higher tolerance for concentrations in counterparty credit risk may be acceptable than what is accepted in other business lines like commercial lending.

Consistent with the preceding considerations, charged off and past due contracts are negligible for derivatives. However, as the Office of the Comptroller of the Currency (OCC) points out in its quarterly bank derivatives report, chargeoffs and past dues do not present a comprehensive credit performance picture. A more complete assessment of the magnitude of troubled derivative exposures would account for restructured derivative contracts, contracts rewritten as loans, and those accounted for on a nonaccrual basis in addition to past due contracts. Call Report instructions, however, currently require banks to report only past due and charged off derivative contracts.

Operational Risk

The largest derivatives losses to date have been because of operational risk.

Most of the significant losses to date from derivatives activities have arisen from operational failures. A review of the largest derivatives losses bears this out. The collapse of Barings Bank in 1995, Daiwa Bank Ltd.'s loss of its charter also in 1995, and more recent troubles at Allfirst Bank in 2002 are just a few examples. In each of these cases, derivatives traders circumvented risk-management controls and the institutions suffered significant, sometimes fatal, losses from derivatives positions.

While much of the risk focus regarding derivatives is rightly placed on less well-understood derivatives, all else being equal, operational risk increases with the volume of transactions. Each derivatives contract must be properly executed and managed throughout the life of the contract. The large and rapidly growing derivatives market presents operational challenges for the few institutions that are largely responsible for this growth. Operational breakdowns at any major dealer could increase its risk profile suddenly and significantly.

Risk Management and Capitalization of Dealers' Derivatives Activities

More than 94 percent of bank derivatives activity takes place in the trading portfolios of

"market risk" banks.

Market Risk
The five major dealer banks set their capital for trading activities using the market risk rule. This rule requires certain institutions to set capital for trading assets using internal value-at-risk (VaR) models. VaR is a method of assessing risk that uses standard statistical techniques. Essentially, VaR is an estimate of a maximum loss that has a low probability of being exceeded over a specified time horizon. For example, a bank might estimate that the daily VaR of its trading portfolio is $35 million at the 99 percent confidence level. This implies that there is one chance in one hundred that, under normal market conditions, a loss greater than $35 million will occur. Typically, VaR models use historical market and pricing information to estimate the maximum loss that a currently-held trading portfolio is expected to incur at a given confidence level.

The VaR models used by the derivatives dealers measure the risk of the entire trading portfolio of which derivatives trading is only a part. To the extent that these banks are managing the risk of their overall trading portfolios well, so they are managing derivatives market risk. The VaR models used by market-risk banks, and the capital levels set for market risk are evaluated and monitored by the bank's primary federal supervisor.

Banks are required to supplement VaR analysis with stress testing. While VaR reflects the risk of loss due to unlikely events in normal markets, stress testing is designed to estimate a bank's exposure to unlikely but plausible events in abnormal markets. Well-defined stress tests that translate into risk limits that are enforced within the bank are essential to managing derivatives risk.

The supervisory emphasis for controlling derivatives risk is in the onsite analysis of a bank's overall risk management. The primary federal supervisors and the FDIC through its dedicated examiner program monitor closely the derivatives activities and risk management systems of the major derivatives dealers.

Credit Risk
With regard to credit risk, banks hold risk-based capital for counterparty credit risk for current and potential future exposure. Legally enforceable bilateral netting agreements are recognized for current exposure and are assumed to persist when setting capital requirements for potential future exposure. Long-dated and volatile contracts require significantly higher capital requirements for potential future exposure.

Operational Risk
Regarding operational risk, implicitly, capital is held for the operational risk of trading activities at "market risk" banks by requiring them to hold a multiple of daily VaR in capital. While this multiple provides a cushion for non-market and non-credit related risks, the requirement bears no empirical relationship to the history of derivatives-related operational losses. Instead, it reflects the current state of operational risk modeling practice, which is nascent. Changes under Basel II should improve the empirical veracity of the operational risk capital requirements.

Derivatives Activities Receive Significant Supervisory Oversight

Supervisory Strategies Regarding Derivatives Activities
The derivatives activities of the major dealer banks receive significant attention through onsite review by the primary supervisors and coordination with the FDIC's dedicated examiner program. Current risk-based examination procedures allow for targeted review of areas such as derivatives risk, which afford supervisors the opportunity to focus specifically, flexibly, and effectively on areas that deserve additional attention. Moreover, oversight and capital requirements for derivatives activities are being carefully considered in the Basel II capital

accord.

Less Well-Understood Derivatives
Despite the careful oversight of derivatives activities at the major dealers, the activities are highly complex as are the models that measure this risk. Errors or omissions in the models of a large derivatives dealers could result in significant mismeasurement of exposure to risk. Moreover, margins are higher in the less commoditized derivatives activities. Managing the risk of more esoteric derivatives, while financially rewarding, is particularly challenging. These derivatives may have risks that are vaguely defined, they may have values that are difficult to validate by risk management personnel, and may lack the volume of data that is necessary to calculate a reliable VaR.[9] An institution's risk management group must be given adequate opportunity to understand and estimate the risks associated with new or illiquid products before a dealer engages significantly in related trading activities.

The Risks of the Concentration of Derivatives Activity
The concentration of derivatives activities in just a few institutions presents risks that are difficult to assess in light of history. The top three derivatives dealers hold 88 percent of total US bank derivatives notionals, 89 percent of derivatives contracts that are not interest rate-related, 88 percent of the apparently unmatched positions, and roughly three quarters of the credit exposure depending on how it is measured. Moreover, these companies hold approximately 30 percent of the global derivatives market in terms of notional values with just a few international institutions filling out most of the remaining market. The consequences of an operational breakdown in one these institutions could result not only in significant losses for that institution but could lead to liquidity stress in the derivatives market.

The fact that a majority of bank derivatives activities are in highly liquid markets promotes a certain level of comfort despite the large volume of these activities. However, an erosion of confidence in one of these dealers triggered by a ratings downgrade or similar event, although it is a remote possibility, could result in a rapid change in its risk profile and cause market disruptions that challenge even the vast liquidity generally in play in these markets.

Triggers exist in some derivatives contracts that require the dealer to maintain a certain credit rating threshold or that may require collateral in certain circumstances. A change in a dealer's status could result in counterparties calling in their contracts and taking their derivatives business elsewhere. Such an event could result in a significant and rapid change in the sensitivities of a derivative dealer's trading portfolio as transactions that were matched previously no longer have an offsetting position in the banks trading account. Such a significant change in the trading book would necessitate a hasty readjustment of positions in order to address the risk of the remaining exposures. If the magnitude of these positions is large enough, the adjustment could result in a liquidity crisis cycle that results in a decline in derivative values as the market reacts to the dealer's attempt to sell in too great a quantity or too quickly for market liquidity to bear.[10] If the dealer is unable to rematch positions before the markets move against its remaining positions, significant losses could result.

Risk also might be transmitted to other institutions through liquidity stress in the markets that disturbs traditional correlations between derivatives and underlying pricing. This effect could cause certain hedging strategies to be less effective than originally estimated. The resulting market dislocation might also make hedging generally more expensive for a time as derivatives holders attempt to replace the contracts that were held previously with the stressed dealer.

Conclusions

- Most significant derivatives losses to date have occurred because of rogue traders or because investment policies were either ignored or not appropriate for the institution

involved.

- Credit exposure from derivatives amounts to a concentration for several dealer banks; but concern is mitigated by the credit quality of the counterparties and the nature of the transactions.

- Significant differences in the positive and negative values of derivatives at a few major dealers suggest that these banks are managing market risk using risk management techniques other than matched trading. Extensive use of other techniques requires a high degree of confidence in the reliability of the banks' models, and these techniques should be approached particularly cautiously in thinly-traded markets.

- Derivative contract types that are well-understood by risk managers do not pose significant risk unless circumstances dictate that a dealer's positions in these contracts change more quickly than market liquidity can bear.

- An erosion of confidence in any one of the major dealers could result in a rapid change in its risk profile and cause market disruptions because of the influence that any major dealer has in the derivatives market.

- Troubles at one major dealer also may transmit to other dealers because of the volume of inter-dealer transactions.

- A dislocated market may make hedging more expensive and less effective for a number of institutions at least temporarily.

- Extensive dealing in less well-understood derivatives should be pursued only when the bank's risk managers develop the ability to reliably quantify the associated risks, even if this requires sacrificing higher potential margins in the interim.

References:

Office of the Comptroller of the Currency. *OCC Bank Derivatives Report Fourth Quarter 2002*. Washington, DC.

Bank for International Settlements. November 8, 2002, *Press Release and Statistics Guide* Version 1.1 September 2002; Derivatives Market.

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[1] The simplified examples in this *FYI* are for illustrative purposes. They ignore certain subtleties that would attend actual transactions.

[2] Credit derivatives, which constitute about 1 percent of the total notional amounts are not specifically addressed in this *FYI*. The risks involved in credit derivatives are dissimilar in many ways from the remainder of the derivatives market, and carry many of the same risks as direct lending with additional operational risk characteristics. Credit derivatives will be explored in a future *FYI*.

[3] Interest rate contracts could be designed that embed as much risk as exposure to the NASDAQ. However, such a contract would be considered highly speculative.

[4] Macro hedging refers to the technique of hedging based on a balance sheet position. For example, the would-be hedger determines that its earnings or equity value are sensitive to rising short-term rates and constructs an appropriate hedge without linking the hedge to a specific asset or liability.

[5] These banks are JPMorgan Chase Bank, Bank of America NA, Citibank NA, Wachovia Bank NA, and Bank One NA.

[6] The discussion of trading activities has been adapted from the FDIC's *Capital Markets Examination Handbook.*

[7] Speculation and proprietary trading differ only in motive and perhaps size of positions.

[8] Open positions are proxied by adding the fair value of derivatives with negative fair values to those with positive fair values for

the derivatives categories (interest rate contracts, foreign exchange contracts, equity contracts, and commodity and other contracts). The absolute value of the position in each category is summed to arrive at a total for each bank.

[9] Falkenstein, Eric. "Value-at-Risk and Derivatives Risk." *Derivatives Quarterly*, Fall 1997. In this article, Falkenstein makes a persuasive argument that while much effort is expended on improving the accuracy of VaR calculations for well-understood derivatives, the more tangible risks relate to instruments that are not yet well understood.

[10] Long-Term Capital Management was involved in a liquidity crisis cycle. Understanding and Monitoring the Liquidity Crisis Cycle; Richard Bookstaber; *Financial Analysts Journal*, Charlottesville; Sep/Oct 2000; Vol. 56, Iss. 5; pg. 17.

ABOUT FYI

FYI is an electronic bulletin summarizing current information about the trends that are driving change in the banking industry, plus links to the wide array of other FDIC publications and data tools.

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Diagram 1
Derivatives Risk Matrix

The diagram is a representation of a graph with a Y and an X axis. On the Y axis are the three major derivatives contracts types with the riskiest type at the top. From top to bottom these are the following: Equity, Commodity, and Other; Foreign Exchange; and Interest Rate Contracts.

Across the top of the diagram on the X axis are the major derivatives activities as follows: Hedging, Dealing, and Speculating. Dealer activities are further broken down into the following: match trading , market making, and positioning (the significance of this breakdown is explained further on in the document). In the center of the diagram is an arrow of increasing upward slope indicating generally increasing risk. The low point of the arrow is at the intersection of interest rate contracts and hedging. The high point of the arrow is at the intersection of equity, commodity, and other contracts and speculating. Slightly less than half way up the arrow is a caption indicating that 80 percent of bank derivatives activity is a mixture of dealer activities in less risky derivative contract types.

Chart 1
The Rapid Growth of Derivatives Is Due Mostly to the Growth of Interest Rate Contracts
(Notional Value of Derivatives Held by Banks, $ Billion)

	Contracts			
Quarter	Interest Rate	Equity, Commodity, and Other	Foreign Exchange	Banks Holding Derivatives
4Q02	48,351	1,009	6,076	5.57%
3Q02	45,695	1,082	6,345	6.06%
2Q02	42,695	1,076	6,313	5.77%
1Q02	39,282	991	5,798	5.61%
4Q01	37,963	950	5,845	5.43%
3Q01	42,880	1,136	6,961	5.35%
2Q01	39,631	1,100	7,131	5.44%
1Q01	35,724	1,096	7,180	5.66%
4Q00	32,966	1,080	6,288	5.69%
3Q00	30,881	1,021	6,471	5.98%
2Q00	30,928	1,018	6,611	5.66%
1Q00	29,699	995	6,406	5.32%
4Q99	27,774	843	5,981	5.58%
3Q99	28,237	807	6,976	5.75%
2Q99	25,734	754	6,803	5.87%
1Q99	25,079	740	7,190	5.85%
4Q98	24,792	684	7,762	5.90%
3Q98	23,847	685	8,763	5.98%
2Q98	20,054	605	8,051	5.88%
1Q98	18,363	528	7,746	5.79%
4Q97	17,087	494	7,746	5.71%
3Q97	17,270	452	7,918	5.83%
2Q97	15,802	413	7,591	5.67%
1Q97	14,562	387	7,387	6.00%
4Q96	13,427	367	6,504	6.38%
3Q96	13,257	351	6,777	6.57%
2Q96	12,517	394	6,685	6.67%
1Q96	11,819	378	6,212	6.96%
4Q95	11,095	378	5,692	6.92%
3Q95	11,330	366	6,546	7.24%
2Q95	11,386	344	6,183	7.14%
1Q95	11,127	349	6,517	6.62%
4Q94	9,925	243	5,605	6.56%
3Q94	9,546	261	5,961	6.53%

2Q94	9,048	236	6,038	6.64%
1Q94	8,329	201	5,387	6.68%
4Q93	7,215	179	4,484	6.51%
3Q93	7,008	190	4,791	6.06%
2Q93	6,316	137	4,496	5.84%
1Q93	5,460	119	4,191	5.92%
4Q92	4,873	102	3,789	5.67%
3Q92	5,051	109	4,555	5.80%
2Q92	4,421	105	3,888	5.75%
1Q92	4,182	109	3,799	5.76%
4Q91	3,837	109	3,394	5.48%
3Q91	3,560	91	3,459	5.38%
2Q91	3,248	86	3,577	5.33%
1Q91	3,301	83	3,683	5.21%
4Q90	3,311	82	3,413	5.18%
3Q90	3,308	79	3,620	5.30%
2Q90	2,963	60	3,491	5.17%
1Q90	2,754	51	3,388	5.07%

Source: FDIC Research Information System