DERIVATIVES: BOON OR BANE? *

Derivatives are financial instruments which derive their value from underlying securities, commodities or indices. They can be used for hedging or speculation and can give rise to credit, legal, fraud and market risk, in the same way as loans. It is not clear that they increase the volatility of financial markets or create systemic instability, as their critics allege.

The volume of derivative instruments traded has grown rapidly since the beginning of the eighties, leading to some concerns about their impact. These concerns include the possibility that investors will be attracted into risky forms of investment, that the volatility of financial markets will increase, that the effectiveness of monetary policy will be reduced and that derivatives trading has a potential to cause bank failures which could undermine the integrity of the global banking system.

This paper describes derivative instruments and their use by corporates, fund managers and individuals to determine whether their advent has increased the risk of financial transactions. The dangers for banks, as providers of derivative products, are also considered.

Derivative Instruments

Derivatives are financial instruments or contracts that derive their value from the value of underlying securities, commodities or indices. For example, futures or options on bills, gold and the share price index depend for their value on, respectively, the price of bills, the gold price and the value of the share price index. In many cases the value of the derivative depends on the price of the underlying product because it can actually be delivered in settlement of the contract. In other cases there is a cash settlement, the magnitude of which depends on the difference between the price at which the derivative was obtained and the price of the underlying product on settlement date. A cash settlement is necessary when the value of the derivative depends on a notional index, such as a share price index, or when the underlying commodity is in short supply so that if a physical settlement is required, it would be possible to "squeeze" the market.

Derivatives fall into two classes – exchange traded or over-the-counter products. Exchange traded derivatives are priced through some form of bidding process on an organised exchange (market). The availability of a market means that holdings of derivatives (called positions) can be adjusted easily. They can also be revalued (marked to market) easily because a market price exists at all times. In order to ensure the liquidity of the market, however, it is necessary to strictly limit the range of contracts available.

Over-the-counter products are contracts between two parties, their prices being determined by negotiation. The terms of these contracts can be tailored to the requirements of the parties. As over-the-counter derivatives are not homogenous, there may not be a liquid market for them or a current market price which can be used to mark positions to market. That this is not always the case is shown by the forward foreign exchange market which is a very liquid market.

Exchange traded and over-the-counter instruments also differ in the credit risk borne by buyers and sellers. Holders of an exchange traded product are exposed to the credit of the exchange's clearing house whereas each party to an over-the-counter contract is exposed to the credit standing of the other.

It is always possible to replicate the cash flows of a derivative by creating a joint position in two other instruments. This process can be represented by the arithmetical statement (see Smith (1993))

$$A = B + C \qquad (1)$$

In this statement the equals sign means that the position in A generates in all circumstances exactly the same cash flows as the combined

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position in B and C. A plus sign indicates that we have a long position and a negative sign indicates a short position.

Equation (1) can be manipulated as if it is a standard arithmetical statement. Thus

$$B = A - C \qquad (2)$$

indicates that the cash flows of B can be replicated by a position combining a long position in A and a short position in C. This kind of manipulation can be used to create synthetic positions, a point illustrated below.

In order to price a derivative, we need to identify the appropriate version of (1) for it. Then the price of A is determined by the total price of the combined position in B and C. If this is not the case, an arbitrage will be possible. For example, assume that the price of A is above the combined price of (B + C). Then a riskless profit can be earned by selling A and using the funds so obtained to buy (B + C).

For derivatives, either B or C will be the underlying product. This means that there is a close relationship between the markets for physical products and the related derivative products. A disturbance in one of these markets must be transmitted to the other because both the derivative and the underlying product must be repriced in line with (1). This relationship also indicates that the prices of derivatives are not determined in a vacuum and they are not the result of random variations on a casino-like market. They depend on the price of an actual product.

A price adjustment can occur smoothly, but it can also be disruptive. The latter is likely to be the case if there are gaps between the markets in terms of trading conventions, speed and cost of transactions, opening hours, etc. This point emphasises the need for consistent regulation of financial markets. If linked markets are subject to different regulatory regimes, it will be easier for disruptions to occur.

Two examples will be sufficient to illustrate the abstract equation (1). First, consider a stock price index futures contract. The version of equation (1) applicable to this case is:

$$\text{Share Price Index Futures} = \text{Spot Share Position} + \text{Loan} \qquad (3)$$

This means that a stock price index futures position is equivalent to a shareholding which is carried to settlement date and funded out of a loan for that period. If, for example, the price of the stock price index contract is above the price at which a future shareholding can be obtained by buying it now and holding it to settlement date, a profitable arbitrage is available. It involves buying and holding shares (funding the holding from a loan) and selling stock price futures. This transaction is a standard arbitrage in the futures market, but in the context of the sharemarket the process is known as *program trading*.

Relationship (3) illustrates how derivatives can be used to create synthetic products. It can be rewritten:

$$\text{Spot Share Position} = \text{Stock Price Futures} - \text{Loan} = \text{Stock Price Futures} + \text{Investment} \qquad (4)$$

This version of the equation shows that a synthetic shareholding can be constructed by combining a long position in stock index futures with an investment. This approach to share investment might be preferable to the alternative of direct share investment in a number of circumstances. Specifically:

- transactions costs will often be lower in the futures market than in the sharemarket;
- the synthetic approach avoids the costs of administering the portfolio, collecting dividends, etc, and
- there is no risk of loss from a company failure.

It is often easier to make offshore share investments via stock index futures (using Equation (4)) than physical shares (see Jorion and Roisenberg (1993)). In this case the fixed interest investment can be in the domestic currency, reducing foreign currency exposure. The futures contracts involve lower transactions costs and less need to collect information. On the other hand, a synthetic share portfolio reflects the average performance of the market. There is no possibility of achieving a superior performance by choosing shares which outperform the market.

Equation (4) also illustrates how a fixed interest portfolio can be converted into a share portfolio when the fund manager believes that such a switch would be advantageous. It can easily be switched back when the fund manager's views change. If this conversion was to be done through the physical market, it would involve the sale of fixed interest securities and the purchase of shares. The switch back would require that the transactions be reversed.

In the case of 90 day bill futures, equation (1) becomes

$$\text{90 Day Bill Futures} = \text{180 Day Bill} - \text{90 Day Bill} \quad (5)$$

in the case of a contract settled in 90 days time. This equation corresponds to buying a 180 day bill and holding it for 90 days in which time it has become a 90 day bill i.e. we get a bill 90 days from now as we would with the futures contract. The bill holding is funded out of a loan for the first 90 days.

Equation (5) can be rewritten:

$$\text{180 Day Bill} = \text{90 Day Bill Futures} + \text{90 Day Bill} \quad (6)$$

That is, a synthetic 180 day bill can be created by combining a 90 day bill futures contract (to be settled in 90 days) with a 90 day bill. This approach will be attractive if the market for 180 day bills is very thin.

Using Derivatives

Derivative products can be used in three ways. They are:

- speculation;
- hedging exposures arising out of the user's normal business activities; and
- investment or borrowing through the creation of synthetic positions.

Speculation with derivatives involves a possibility of large losses. As equations (3) and (5) show, buying a derivative is equivalent to making a leveraged investment. It is well known that such investments can result in a loss which exceeds the initial amount put up. In the case of buying a stock index futures contract, as with any leveraged share investment, a loss will be incurred if the share market falls. In the case of buying a 90 day bill futures contract, as with a leveraged investment in a 180 day bill, a loss will occur if interest rates rise.

There is however, nothing new about this risk. When stock index futures were not available, investors could (and did) construct their own leveraged share investments. Indeed, many investors still prefer the direct way of creating a leveraged share position because it allows them to pick stocks. If anything has changed, it is only in terms of the ease with which derivatives allow a leveraged position to be created, monitored and closed out. This has both advantages and disadvantages. It makes speculation more attractive, but it also makes it safer because it is easier to track and adjust positions.

Derivatives can also be used to hedge exposures to interest rates, commodity prices, exchange rates, share prices, etc. In this way derivatives reduce the risks of doing business rather than increase them. This benefit is sometimes obscured by the reporting of losses on derivative positions as though they represented losses on speculative positions. If they were in fact hedge positions, the reported losses are offset by an equivalent gain on the underlying exposure. Of course, some firms do use derivatives to take speculative positions in an attempt to improve their bottom line. Large losses or, for that matter, large profits from derivatives trading not related to underlying exposures indicate that a company is speculating. This type of behaviour should be of concern to shareholders and creditors of the organisation.

A third use of derivatives, illustrated earlier, is to create synthetic investments or loans. As discussed in the examples, this approach is often attractive because of lower transaction costs, thin physical markets, etc. It can also allow transactors to achieve more favourable returns or costs. In this case, it is possible for the user of derivatives to suffer a loss which is not offset by a gain on some underlying position. However, this loss would also have occurred had the investment been made through the physical market. Derivatives create the possibility of increased losses only if their flexibility induces investors and borrowers to carry out transactions which they would not otherwise have contemplated.

Recent concerns about derivatives have focussed attention on the so-called *hedge funds*. Originally these funds attempted to take advantage of the volatility of share prices without taking a position on the direction of share prices. They would take long positions in some shares and short positions in others. In this sense they were "hedged" although this type of structure involves substantial risk. Many of the funds are now highly speculative and use derivatives to create high risk/high return positions.

There is room in the spectrum of investment opportunities for risky assets which pay a high return. Nevertheless investors must be made aware of the nature of the vehicle in which they are investing and the desirability of investing only a fraction of their wealth in such vehicles. It may be necessary for the authorities to examine the way in which hedge funds are advertised. In particular, the leverage inherent in derivative positions must be recognised.

Risks for Derivatives Providers

Providers of derivatives (typically banks) incur some risks. These risks will be of concern to regulators if they are sufficiently large to endanger the viability of individual banks and, therefore, the stability of the banking system. However, it should be noted at the outset that the risks arising out of derivatives trading are not different in kind from the other risks run by banks e.g. trading in wholesale financial markets or lending. It is the latter activity which has generated the greater part of the losses suffered by banks over the eighties and nineties.

The risks involved in offering derivatives products[1] are:

(a) **Credit risk**. This is the risk that a counterparty will default. It should be noted that the credit exposure arising from most derivatives is not equal to the principal involved. For example, Forward Rate Agreements (FRAs) are over-the-counter instruments for hedging interest rate exposures. An FRA is settled by a net payment from or to the bank providing it to adjust the interest rate paid or received to the value agreed in the contract. The bank stands to lose only the net payment due to it if the customer defaults. It is not exposed to the principal covered by the FRA. In the case of options, it is generally only the holder of an option who has a credit exposure. The writer of an option is not exposed to a default by the counterparty.

Banks manage the credit risk arising from derivatives in the same way as they manage other credit risks. Customers are given credit limits and derivative exposures are counted against these limits. Also, the BIS capital adequacy requirements introduced in 1988 to force banks to hold sufficient capital to cover their credit exposures include exposures arising out of positions in derivatives.

(b) **Documentation and Legal Risk**. Banks face a risk of loss if their documentation for derivative transactions is faulty or if the contracts are not enforceable. Enforcing a contract will be more difficult if the transaction is international. Reserve Bank of Australia (1994) argues that a possible cause of contracts not being enforceable is that the counterparties do not have the legal power to enter into derivative transactions. The major danger lies with bodies working under a statutory restriction to use derivatives only for hedging purposes. Derivatives traders are attempting to minimise these risks by developing standard documentation and by avoiding transactions with customers whose legal status is doubtful.

(c) **Fraud**. Any trading operation is subject to the risk that employees will falsify records in order to divert funds to their own use or to cover up losses. The danger may be greater in the case of derivatives because of their complexity. There have already been a number of

1 See Watsham (1992) and McDougall (1994).

notable example of losses of this type. See the examples given in Derivatives Strategy (1994).

This type of risk can be reduced by installing adequate internal controls and reporting systems. These systems should include checks which make it impossible for traders to misrepresent their transactions or positions. For example, there should be a clear separation between banks' trading and settlement operations. A lack of such separation was one of the causes of the Barings debacle.

(d) **Market Risk**. Banks having a derivatives book are exposed to movements in the market prices of those derivatives. As Banks (1994) points out, market risk will increase with the term of the transaction. In general they try to lay these exposures off so that they are not subject to possible loss from them. For example, a bank selling an FRA to fix a customer's borrowing rate can cover the resulting exposure by:

- selling an offsetting FRA to an investor;
- using the bill futures market or interest rate swaps to take an offsetting position; or
- constructing an offsetting position in the funds market.

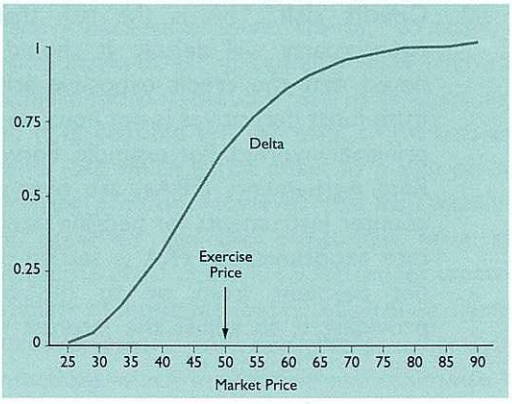
If the bank can offset its derivatives position in this way, it will not be exposed to loss from market movements. Since banks have a prime credit standing in most financial markets, they will be able to lock in a relatively small margin for themselves. However, it is not always possible for a bank to create a position which precisely offsets an exposure. Also, banks frequently take positions in derivatives, as they do in other wholesale financial markets, in order to make a profit. In order to ensure that the risks taken by their traders in this process are not excessive, banks subject them to exposure limits.

The problems of managing derivatives positions are most pronounced in the case of options. Options usually cannot be hedged by selling an offsetting option. Instead the bank must construct a hedge by taking a position in the market for the underlying security. See Silber (1990). Since it is uncertain whether or not an option will be exercised, the value of the hedge position will be only a proportion of the option's face value. The proportion will depend on the probability of the option being exercised and it is equal to the *delta* of the option which is the change in its price caused by a change in the price of the underlying security. This means that changes in the value of a position in the underlying security equal to delta multiplied by the face value of the option position will offset changes in the value of the option position.

The delta of an option can be obtained from the model used to price it. Option pricing models calculate the present value of the expected future cash flows of options by modelling the price movements in the underlying market and identifying the most likely outcomes for the option. The option prices obtained from these models depend on the volatility of the price of the underlying security, the interest rate and the time to expiry.

Unfortunately, the delta of an option changes as the price of the underlying security changes. This behaviour is illustrated by Chart 1 which shows the way in which the delta of a call option changes as the market price changes. A call option gives the holder the right to buy the underlying security at the exercise price. The option has an exercise price of 50, a term of 270 days, the risk-free interest rate is 8% p.a., the standard deviation of price changes is 30% and it is assumed that the underlying security does not produce income. The

Chart 1
Changes in an Option's Delta



delta has been obtained from the Black-Scholes model. Chart 1 shows that as the market price falls below the exercise price, the delta falls, eventually reaching zero. As the market price increases above the exercise price, the delta increases towards unity. At market price of 90, and given the assumed price variability, selling a call option is essentially equivalent to selling the underlying security, i.e. the option is almost certain to be exercised. Thus at this level its price changes by the same amount as the price of the underlying security. The change in the delta of an option as the market price of the underlying security changes is the *gamma* of the option.

This analysis shows that a delta hedge is only valid for small changes in the price of the underlying security. The hedge will therefore need to be rebalanced frequently[2] and profits or losses will be produced by this rebalancing. If the hedge is not rebalanced frequently enough, there will be "slippage", but frequent rebalancing will incur large transactions costs.

A particular problem arises when the price of the underlying security "gaps" i.e. undergoes a sharp finite change. This often happens when a market opens at a price very different from the closing price of the previous trading day as a result of overnight developments. A hedge which is accurate on the previous day could be showing losses after the gapping occurs.

The value of an option declines as it gets closer to its expiry date. This decline in value is measured by the *theta* of the option. The loss of value over time adds to the necessity of rebalancing delta hedges. The option price will also be sensitive to the volatility of the price in the underlying market. This dependence is measured by the option's *kappa* (sometimes called *vega*). Changes in volatility can generate losses or gains on options positions and traders often take positions on future changes in volatility.

The risks involved in managing option positions can be minimised by ensuring that the provider of options has a satisfactory pricing model as part of its system. There is, however, a danger that managers of option books will put too much faith in mathematical pricing models. These models are only as good as the data going into them and their use does not automatically protect banks from losses on their option books.

Possible Problems with Derivatives

(A) Do derivatives increase volatility?

One factor causing concern about the rapid growth in the use of derivatives is the suggestion that it will increase the volatility of financial markets. There are arguments both for and against this proposition.

First, consider the possible sources of increased volatility.

(a) As already noted the adjustments necessary to maintain the equality of the prices of A and (B + C) could be disruptive, particularly if the markets for the securities involved are organised or regulated differently.

(b) The supply of derivatives is effectively unlimited and the face value of derivatives traded can exceed the value of the underlying security available. The flexibility of supply means that prices can be pushed to higher or lower levels than would be possible in a purely physical market. This wider range of prices would represent an increase in long-term volatility.

The arguments suggesting that the expansion in the use of derivatives can reduce volatility are:

(a) It is possible that a derivative market will absorb some of the volatility which will otherwise be concentrated in the market for the underlying security.

(b) As described above, hedging will reduce the losses suffered by transactors. This protection will remove some possible pressures on prices.

(c) Derivatives provide the market with information on the expectations of other market players. The price of the underlying product to be delivered at a future date should be roughly equal to the market's average expectation of the actual price on that date.

2 The Group of Thirty (1993) suggests that adjustment should occur daily.

(d) Derivatives make markets more "complete". For example, an investor who wants to invest in a security can always do so by buying a derivative, even if the physical product is unavailable. The availability of derivatives should therefore reduce short-term price pressures and prevent sharp fluctuations in prices. Also, the existence of derivatives facilitates short selling which can also reduce the pressure on prices.

The 1987 stock market crash has been cited as one example of the way in which the introduction of derivatives has increased the volatility of financial markets. Two processes in derivative markets were supposed to have aggravated the crash – program trading and portfolio insurance.

Program trading is a form of arbitrage which occurs between the futures market and the physical share market when there are differences in the pricing of the two sides of equation (3). The report on the crash of 1987 to the Chicago Mercantile Exchange (the Malkiel, Scholes and Hawke report, reproduced in Miller (1991)) describes this form of arbitrage as "benign". As with all forms of arbitrage it ensures consistency in market pricing, so that prices do not give confused signals, and therefore makes markets more efficient.

Portfolio insurance is a mechanism which allows the managers of share portfolios to put a floor under the value of their holdings. It involves selling shares and investing the funds in fixed interest securities when share prices fall. The reverse transactions are carried out if share prices rise. This process represents a synthetic put option on the share portfolio, but it can be used even when a put option corresponding to the portfolio in question is unavailable.

It has been suggested that portfolio insurance contributed to the crash of 1987 in two ways. First, prior to the crash, rising share prices led to portfolio insurance based purchases, driving prices up even further. Secondly, portfolio insurance accentuated the crash because falling share prices led to additional sales.

It should be noted that these two claims actually describe behaviour which has always occurred in share markets. Investors have always piled into rising markets and sold into falling markets. The Malkiel, Scholes and Hawke report notes that share sales on the New York Stock Exchange arising from portfolio insurance schemes represented only 20-30% of total sales on the day of the crash. The 1987 crash did, however, reveal some shortcomings in portfolio insurance. In particular, it proved impossible to protect the value of share portfolios when share prices gapped. Malkiel, Scholes and Hawke also argue that differences in the institutional arrangements in the share and futures markets increased the confusion in markets at the time of the crash. In a more general analysis, Edwards (1988) concludes that there is no evidence that the introduction of stock index futures increased the volatility of share markets.

(B) Do derivatives create systemic instability?

The fears of systemic instability take a number of forms. First, it is argued that derivatives contribute to the integration of global financial markets so that a disturbance which occurs in a major market is magnified into a global event. In particular, it is feared that a bank failure caused by derivatives trading could have a major impact on the international banking system. Secondly, it has been suggested that the existence of derivatives increases the amplitude of the business cycle. It is argued that derivatives allow businesses to adopt greater leverage and to ignore the constraints of a tight monetary policy so that the ultimate crash is more severe than it would otherwise have been.

The first concern loses some of its force when it is noted that the removal of controls on international capital flows as part of financial deregulation has already created a high degree of integration. In addition, the Group of Thirty (1993) argue that derivatives trading is not concentrated in a few organisations so that a failure of one of these organisations has a major impact on the market or other traders. It also notes that so far it has been possible to transfer the derivatives trading operations of failing financial institutions to other organisations without loss. This concern is also answered by steps to ensure that banks are not endangered by their derivatives operations, a point which will be taken up in the following section.

The second concern seems misplaced. In the eighties borrowers managed to create highly geared positions without the benefit of derivatives and they continue to do so. The problem lies in the area of the factors making debt attractive (such as taxation arrangements and interest rates), not in the means used to achieve a geared position. Also, to the extent that derivatives allow businesses to hedge themselves against loss, they contribute to the stability of the economy.

(C) Do derivatives reduce the effectiveness of monetary policy?

It is argued that derivatives reduce the impact of monetary policy because they allow borrowers to defer the effects of higher interest rates and to continue leveraged activities. This point applies to housing borrowers with fixed rate mortgages as well as businesses using sophisticated interest rate products. It is possible that this effect will affect the lags in the impact of monetary policy, but there is little evidence that it will reduce its impact. Moreover, increases in the forward interest rates available on derivative products could lead to faster reactions to a tightening of monetary policy because market participants receive the appropriate signals at an earlier date.

The Regulatory Reaction

The discussion so far suggests that the major concern of regulators with respect to derivatives should be to ensure that they do not lead to bank failures which have cumulative effects on the international payments system.

As already noted, the BIS capital adequacy controls provide protection against the credit exposure involved in the provision of derivatives. Basle Committee on Banking Supervision (1993) sets out a supplementary framework for controlling market risk in derivatives trading (as well as in other areas). The main elements of this proposal are:

- a third tier of capital consisting largely of subordinated debt will be added to the present two tiers;
- derivatives positions will be allocated to thirteen maturity bands after having been converted into notional security positions;
- the positions in each band will be weighted by a duration factor[4]; and
- the required capital will be related to the sum of these positions.

The suggested control would require banks to hold additional capital against the market risk involved in derivatives operations.

There are some detailed problems with the existing and proposed capital requirements (see Daugaard and Valentine (1994)). Nevertheless, it cannot be denied that the capital accumulated by banks as a result of the imposition of the existing capital adequacy requirements provided a buffer which prevented them from suffering fatal injury from the loan losses of the eighties and nineties. If a bank is going into the provision of derivatives, additional capital will provide some insurance against the risks enumerated above.

This underlying protection is not enough. Bank supervisors must do their best to ensure that large losses do not arise in the first place. An appropriate approach is the one supported by Group of Thirty (1993) and Basle Committee on Banking Supervision (1994) – that regulators should ensure that banks have adequate risk control systems in place to deal with the risks of their derivatives operations. It is worth noting the desirable characteristics of such systems.

First, they should be based on effective systems for identifying exposures and pricing derivatives. This requirement involves effective accounting facilities and settlement procedures as well as indicating the need for adequate supporting software. The need is particularly pressing in the case of options where the calculations are very complex. Supervisors should ensure that the systems adopted have undergone extensive testing in actual market situations.

Secondly, traders must be subject to exposure limits and risks taken up to these limits must have

4 The modified duration of a security is the percentage change in its price which results from a percentage change in the interest rate. The proposal suggests using the duration of a security with an 8% p.a. coupon and assuming an 8% p.a. market yield.

adequate capital backing. It appears that Barings traders were not subject to such limits. Successful implementation of this approach requires that exposures be identified accurately, a condition that will be satisfied if the systems are as described in the previous paragraph.

Thirdly, there must be internal controls to ensure that individual traders cannot misrepresent their positions. This condition requires that the accounting staff of the bank and its auditor share a working knowledge of derivatives.

Fourthly, banks should engage in "stress testing" of their positions, as suggested by Group of Thirty (1993) and supported by the Basle Committee on Banking Supervision (1994). Such testing involves simulating the banks' positions under a "worst case" scenario. The simulation approach is becoming more common because it allows many of the complexities of bank risks to be incorporated. It does not give a simple measure of the risks being run by a bank, but it provides an insight into the whole range of exposures to which it is subject.

Fifthly, a bank should have accurate and timely reporting systems so that senior management and the Board are aware of the risks being run by the bank. The results of "worst case" simulations should be made available to the bank's senior management and Board. The Basle Committee on Banking Supervision (1994) puts considerable weight on the responsibility of the directors of banks in managing the risks of their organisations. This approach would require directors with considerably more knowledge of financial matters than that possessed by most current directors, a point illustrated by the Barings case.

An important conclusion suggested by this discussion is that all the groups involved in derivatives markets require substantial education. Directors and senior management of banks and derivatives users need to be informed on the risks involved and on risk management techniques. Operational staff of both types of organisation must have the necessary technical knowledge. Regulators need to expand their knowledge of risks, control techniques and the available software packages. They also need to deepen their understanding of derivatives markets so that they can maintain stable markets without significantly reducing the benefits conferred by derivatives.

Some additional protection for the stability of the banking industry might be obtained by expanding disclosure requirements to cover derivatives exposures and profits or losses. One way of achieving increased disclosure would be to require banks to mark assets and liabilities to market i.e. to revalue them at market prices. They could also be required to provide information on profits or losses from trading activities. Increased disclosure would subject the banks to a market discipline in that their share prices would be driven down if they were found to be taking risks in the derivatives area.

There are, however, some important limitations on the usefulness of additional disclosure requirements. First, there is a cost involved in obtaining increased information and this cost must be weighted against the advantages obtained.

Secondly, there is no current market value for many of the assets and liabilities held by banks. This is true, for example, of loans and OTC derivative positions. Any attempt to measure the current value of such assets or liabilities would of necessity rely on arbitrary judgements.

Thirdly, there is some evidence that investors already see beyond accounting statements to the true market value of banks (see, for example, Moore (1992)). It might be argued that market perceptions are likely to be less accurate in the case of complex instruments like derivatives, but if this is true, it also raises questions about the market's ability to process the information produced by increased disclosure requirements.

It appears that any increased disclosure requirements should focus on derivatives and trading activities. For this information to be available, the requirement for effective systems, outlined above, must be satisfied.

Conclusion

There are undoubtedly risks for both providers and users of derivatives. Nevertheless, these risks are not different in nature to the risks which existed in the financial system before the emergence of derivatives. For example, investors made leveraged investments before derivatives were

available and it is not clear that their advent has increased the propensity of investors to engage in this type of behaviour.

Nor is it clear that derivatives increase the volatility of financial markets or create a danger of systemic instability. Indeed, they may reduce volatility by providing an additional channel through which pressures can be dissipated. However, disruptions can arise if the markets related by derivative transactions are subject to different regulation or management arrangements. The growth of derivatives has made it necessary that all financial markets should be treated consistently.

Bank supervisors do have a legitimate concern about the risks being run by banks in their derivatives operations. The most useful response to this danger is supervisory activity to ensure that banks are managing their risks sensibly. Supervision should ensure that banks have adequate systems for measuring and controlling exposures, an accurate and timely reporting system and effective internal controls. It should not involve heavy intervention which reduces the usefulness of derivatives in performing their basic function of risk reduction.

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