Financial Derivatives: Harnessing the Benefits and Containing the Dangers

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Working Paper No. 145

August 1995

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ABSTRACT

Financial derivatives have harmed or destroyed numerous financial firms, nonfinancial firms, and municipalities in 1994 and 1995. This paper discusses the dangers of derivatives and also their benefits. It then considers policies that will maintain the benefits while containing the risks. These include improving the accounting framework used to disclose derivatives transactions, increasing transparency between dealers and end-users, and reducing legal uncertainties between countries. This paper also argues that the government needs to make a concerted effort to acquire more information concerning the dangers that derivatives trading pose to the financial system. If such a study revealed that the systemic risks are too high, then remedial legislation regulating the safety and soundness of nonbank derivatives dealers would be required. Until such a study is conducted, the government should seek to improve the in-house risk management techniques used by major players in the derivatives market.

I. INTRODUCTION

Financial derivatives have harmed or destroyed numerous economic agents during the last year. Gibson Greetings lost $20 million, Proctor & Gamble lost $157 million, Orange County went bankrupt, and Barings Bank lost $1 billion. How should policy makers respond to such devastating losses?

This question has had no shortage of responses. Alan Greenspan, chairman of the Federal Reserve Board, argued that derivatives risks are best regulated by private parties, subject to the discipline of the marketplace. Representative Henry Gonzalez, former chairman of the House Banking Committee, contended that tighter regulation of security firms, insurance companies, and other participants in the derivatives market is necessary. Warren Buffet, chairman of Berkshire Hathaway, said that every CEO should be required in his or her annual report to state that he or she understands every derivative contract that the company has entered into. Charles Bowsher, head of the Government Accounting Office, expressed concern about commercial banks using taxpayer-insured deposits to invest in derivatives for their own accounts.

This paper enters the fray by also recommending policy responses, after first considering the benefits and the dangers of derivatives. The beneficial functions that derivatives perform include hedging market risks, increasing the value of firms, and improving the efficiency of price signals. Their dangers include bankrupting individual firms, threatening the stability of the financial system, and fostering dishonesty in the highly competitive financial services industry. To maintain the benefits

while containing the risks government officials should push for the development of a consistent accounting framework for derivatives transactions, greater transparency between dealers and end-users, and the reduction of legal uncertainties between countries. Whether new legislation regulating the safety and soundness of all OTC derivatives dealers is necessary is a more difficult question. This paper argues that to answer this the government should first obtain more information. It should follow a recommendation by Eugene Rotberg (1995) to place the major players in the derivatives market under oath and determine exactly what risks their trading activities pose to the financial system. This information could be used to determine whether remedial legislation covering nonbank derivatives dealers is necessary and if so what kind of regulation is appropriate. Until such a study is conducted, the government should push the major players in the derivatives markets to improve their own in-house risk management techniques.

The next Section focuses on the benefits of derivatives. Section III considers the dangers that they pose. Section IV recommends policies that preserve the benefits while containing the risks. Section V concludes.

II. THE BENEFICIAL FUNCTIONS OF DERIVATIVES

Derivatives are financial instruments that *derive* their values from underlying assets such as stocks, bonds, or foreign currencies. Examples of derivatives include options, swaps, foreign exchange forwards, and inverse floaters. Table 1 provides

a brief definition of several derivatives.

Derivatives are traded both on organized exchanges and in an over-the-counter (OTC) market. Organized exchanges enforce rules and provide clearinghouse guarantees that ensure that one party is paid off if the counterparty defaults. OTC trading, on the other hand, does not provide guarantees of the financial integrity of each transaction.

Derivatives can perform several useful functions for the economy. These include hedging market risks, increasing the value of firms, improving the efficiency of price signals, and increasing the profitability of the banking system.

The risk that market prices will change before a transaction takes place is pervasive. Farmers might find that the price of wheat has fallen between the time they plant and the time they harvest. Organizers of a tour group to Europe might find that the dollar has depreciated between the time they sell tickets and the time that the tour takes place. Homebuilders might find that mortgage rates have risen between the time they start building and the time they try to sell the houses. Derivative assets allow these economic agents to lock-in fixed prices or rates now, thus providing insurance against adverse movements in asset markets in the future. This frees them to focus on their primary businesses. Given the dizzying volatility in interest rates, exchange rates, and other asset prices in the 1980s and 1990s, the ability to hedge against market risks in this way has become essential to many businesses.

Derivatives also allow the risks from a given cash flow to be unbundled, thereby increasing the value of the underlying asset. For instance, a 30-year bond ordinarily pays the holder a fixed percentage of the principal (a coupon) twice a year and the principal itself after 30 years. However, it can be broken into 60 coupons plus the principle, all of which can be sold separately. This decoupling increases value by permitting individuals who prefer risks of different durations to purchase the risks that they prefer. This is similar to a situation where a family desires chicken legs and breasts and a pet food company desires chicken gizzards and other parts. If each can only purchase the whole chicken, then each will be purchasing some parts that they do not desire. By unbundling the chicken into component parts and selling each component to the customer that desires that part, the value of the chicken is increased.[1] Similarly, by breaking the cash flow from an asset into component parts, the value of the cash flow is increased. When the underlying cash flow is generated by a firm, the use of derivative assets to unbundle risks in this way can increase shareholder value.

The use of derivatives and computer-assisted valuation strategies also aids in the pricing of assets. In a market economy asset prices and interest rates serve as signals that help channel savings to their most profitable uses. An increase in the demand for houses due, for instance, to a change in the age-structure of the population, will increase the mortgage interest rate. This, in turn, will cause more funds to flow into the mortgage market.

However, there is considerable evidence that market prices do not merely reflect such fundamental factors.[2] Computer-assisted strategies allow investors to pinpoint interest rates and asset prices that are inconsistent with fundamentals. By purchasing assets that are underpriced or short-selling assets that are overpriced, these strategies move asset prices towards their fundamental values.

For instance, consider an example discussed by Trent (1994). Because of greater risk, the yield on mortgage-backed securities should pay a premium (historically 1.0%) above the yield on Treasury bonds. This risk premium can be measured using derivatives and computer models. When the yields on mortgage-backeds exceeds the yield on Treasuries by more than this premium, traders using computer-assisted valuation strategies enter the market, purchasing mortgage-backeds and short-selling Treasuries. These actions tend to push the yields back towards their equilibrium values that reflect fundamental factors.

Derivatives can also help increase the profitability of the banking system. Commercial banks have historically made a profit on the spread between the interest they receive from assets such as loans and the interest they pay on liabilities such as deposits. The fact that bank assets were often in fixed rate long term instruments while bank liabilities were in interest rate-sensitive short-term instruments caused bank profits to erode when short-term interest rates rose, as they did in the late seventies and early eighties. The competition from security firms and pension funds

and the tendency for borrowers to interact directly with lenders decreased the spread between loans and deposits and further eroded bank profitability. The difficulty that banks encountered in their traditional lines of business mean that they need new sources of profits. By engaging in derivatives transactions, either as dealers for other end-users or in proprietary trades for their own accounts, banks have the potential to increase profitability.

Derivatives can thus perform many beneficial functions. They are a technological innovation, analogous to electricity or the automobile. They can be used to hedge against changes in market prices, increase the value of firms, improve the efficiency of price signals, and increase the profitability of the banking system. However, just as electricity or automobiles can be dangerous, derivatives when misused can be perilous.

III. THE DANGERS OF DERIVATIVES

The experience of Barings Bank and Proctor & Gamble underscore the dangers of derivatives. Derivative instruments frequently employ complex mathematics and sophisticated computer technology that senior managers are unable to understand. As long as derivatives operations generate profits, managers often adopt strategies of benign neglect towards them. Thus, as Meyer (1995) related, Barings managers sent $550 million to a Singapore exchange when a 27-year old trader requested it. Soon thereafter, this trader's contracts destroyed the bank. Derivatives also permit investors to take on a great deal of risk without putting up much

money. When asset prices are volatile, this ability to leverage can cause traders to lose many times their initial investments. Thus, as Loomis (1995) discussed, Proctor & Gamble used swaps and options to attempt to reduce its borrowing rate from 3.25% to 2.85%. When its option contracts became "in the money," Proctor was locked in to paying an interest rate of 18.9 percent over the next four and a half years.

While these incidents indicate that derivatives are risky, the losses described in these examples primarily affected the stockholders of the company. In a capitalist economy, those purchasing stocks know that they are accepting risk. Since they will be the ones who lose the most if the value of the stock decreases, they have the greatest incentive to monitor the risks (including derivative risks) that the company accepts. Through demands on managers and directors for greater vigilance and better risk management practices, through voting, and through lawsuits, shareholders can help control a firm's exposure to derivatives risk.

A more serious concern for the economy as a whole is the *systemic risk* caused by derivatives trading. The Bank for International Settlements (BIS), quoted in Edwards (1994, 5), defines systemic risk as follows:

> *Systemic Risk*: The risk that a disruption (at a firm, in a market segment, to a settlement system, etc.) causes widespread difficulties at other firms, in other

market segments or in the financial system as a whole.

The BIS also states that a systemic risk can trigger a systemic crisis, in which credit allocation, payments, or the pricing of financial assets is impaired.

Historical examples of systemic crises come from the banking panics that frequently occurred in the U.S. until the 1930s. These panics occurred when large numbers of depositors at several banks suddenly sought to withdraw funds. Many banks had to quickly sell assets. Because markets for these assets were not sufficiently liquid to handle massive selling, assets often sold at deep discounts, forcing some banks into insolvency. These insolvent banks then had difficulty paying counterparties, causing some of them to go into bankruptcy. During these crises, the convertibility of deposits to currency by banks was often suspended.

As discussed by Greenspan (1994), potential channels through which derivatives could pose systemic risks occur if credit exposures are too concentrated among a few dealers, if derivatives markets are illiquid, or if derivatives quickly transmit shocks from one market to another. The danger of credit exposure among dealers occurs because dealers largely trade OTC derivatives with each other, and by avoiding an organized exchange they also forego clearinghouse guarantees that ensure that one party is paid off if the counterparty defaults. By trading so heavily with each other outside of organized exchanges, the probability is increased that

a default by one firm will causes losses and possible defaults by other firms, threatening the stability of the financial system. The danger of illiquid derivatives markets is that hedging strategies could fail if assets held to offset risks can not be sold or can only be sold at deep discounts. This in turn can cause firms to become insolvent and spread losses to counterparties. The danger of closer linkages between markets is that a failure of a major financial firm anywhere in the world could affect and perhaps imperil other firms throughout the world.

The Government Accounting Office (GAO) is especially concerned about the danger of a systemic crisis. The GAO (1994, 7) stated:

> The combination of global involvement, concentration, and linkages means that the sudden failure of any of these large dealers could cause liquidity problems in the markets and could also pose risks to the others, including federally insured banks and the financial system as a whole.

The GAO further warned that these dangers escalate during times of financial stress. While the GAO acknowledged that federal regulators have usually prevented financial stress from producing crises, they noted that it has often been at the expense of taxpayer-financed loans or bailouts.

One source of systemic risk could occur due to the squeeze for profits in the highly competitive financial services industry.

This might induce several firms to take unwise risks. As Gorton and Rosen (1995) have discussed, if several derivatives firms undertake similar positions, then the failure of one firm can trigger the failure of others.

In addition to the systemic risks posed by derivatives there are other dangers. The complexity and opaqueness of some over-the-counter derivatives contracts can facilitate cheating by unscrupulous dealers. Proctor & Gamble, as quoted in Loomis (1995, p. 62) complained that the value of its derivative assets with Bankers Trust was determined by a "secret, proprietary, complex, multivariable pricing model" which it did not have access to. In its dealing with Gibson Greetings, Bankers Trust admits to lying by telling Gibson that it had lost a lot less money than it actually had, causing Gibson to continue to hold its position and lose even more.

Derivative assets also allow managers to short-sell stock in the companies they manage, giving them an incentive to decrease shareholder value. As Norris (1995) reports, a CEO arranged a deal with Lehman Brothers by which he would receive a check for millions of dollars if the price of his company's stock fell and pay a check for millions of dollars if the stock price increased. It is illegal for a corporate insider to directly go short in the corporation's stock. However, through the use of derivatives, an insider can effectively do the same thing. In this case, the worse the company's stock performs, the more the CEO profits.

IV. POLICY RESPONSES TO PRESERVE THE BENEFITS OF DERIVATIVES AND CONTAIN THE RISKS

Certain policy responses are obvious, while others are controversial. Restricting a CEO from selling short stock in the company he or she manages, improving accounting techniques, and removing legal uncertainties between countries are some of the obvious policy responses. Regulating the safety and soundness of all OTC derivatives dealers is a more controversial policy response.

If a CEO uses derivatives to effectively go short in the stock of the company that he or she manages, then the manager's incentive is to decrease shareholder value. Such an arrangement is nonsensical. The laws forbidding corporate insiders from shorting their company's stock should be extended to prohibit insiders from using derivatives to effectively go short.

Adequate disclosure of derivatives transactions in a firm's annual statement is necessary for shareholders to monitor the firm's exposure to derivatives. These shareholders, who own the company, have the greatest incentive to ensure that these risks are not excessive. Unfortunately, the complexity of derivatives transactions makes it hard to agree on one simple, consistent accounting framework for them. Government officials should continue to push the Financial Accounting Standards Board and other interested parties to develop consistent accounting standards for disclosing derivatives risks.

Also, as the Bankers Trust cases with Gibson Greeting Cards

and Proctor & Gamble indicate, transparency between dealers and end-users is important. Dishonest behavior is likely when the value of an end-user's derivative assets is determined by a secret, complex pricing model which only the dealer has access to and when the dealer gains from the end-user's losses. The requirement on Bankers Trust to disclose to customers "every wart, wrinkle, and whisker of their leveraged derivatives contract" (Loomis, 1995, p.60) and to reveal to customers on a daily basis a contract's value would probably be good standards for the industry. Given the enormous competition for limited profits in the financial services industry, the temptation to cheat is inevitable. By eliminating obfuscation wherever possible this temptation is attenuated.

Another policy response that would reduce the systemic risks posed by derivatives would be to remove legal uncertainties between the U.S. and other countries, especially countries with less developed bankruptcy laws. An important uncertainty to be resolved is whether a dealer's credit exposure to a counterparty in another country should be calculated on a net or a gross basis. Exposures between two parties in the U.S. are now calculated on a net basis. To understand why the distinction between net and gross exposure is important consider a situation in which party A in the U.S. has a liability towards party B in another country for $97 million dollars and party B has a corresponding liability towards party A for $100 million. If party B goes bankrupt, A's $100 million will be at jeopardy. But it is possible that the bankruptcy laws in B's country are such that A will still have to pay the $97 million that

it owes B, with the money going to preferred creditors. In this case, A would not only lose the $3 million differential between what it owes B and what it is owed by B but also the $97 million that it owes B. If the laws are such that exposures are calculated on a net basis, then A can subtract B's liability ($100 million) before having to pay B what it owes ($97 million). In this case A would only lose $3 million if B defaults. Thus, if credit exposure is calculated on a net basis, it is less likely that a default by one firm will causes defaults by other firms and in this way threaten the stability of the financial system.

The General Accounting Office (1994) has demanded tighter regulation of all derivatives dealers to reduce the danger of a systemic crisis. They argued that there are significant gaps in derivatives regulation. The derivatives activities of security firms and insurance companies in particular are largely exempt from Federal oversight. The GAO stated that there is an immediate need for Congress to close the gap. It recommended that Congress ensure that these firms set aside sufficient capital to withstand losses due to derivatives trading, that these firms implement effective internal risk management methods, and that they report credit exposures to regulators. The GAO also expressed concern about commercial banks using taxpayer-insured deposits to invest in derivatives for their own accounts.

Greenspan (1994), responding to the GAO report, rejected the need for new regulation. He argued that regulation could create the mistaken expectation that federal regulation will remove the

risk from derivatives activities. He argued that these risks are best regulated by private parties, subject to the discipline of the marketplace. He stated that the voluntary minimum standards for conduct in derivatives businesses being developed by the Securities and Exchange Commission and derivatives dealers should help strengthen the market disciplines already in place. If these were not enough and a derivatives dealer did fail, he claimed that this would not put the Bank Insurance Fund at risk. Bank balance sheets are constantly monitored by Federal regulators to ensure that they do not have too large an exposure to any one derivatives dealer. Greenspan also argued that the risks of banks investing their own funds in derivatives is not greater than the risks associated with other banking activities. Every fixed-rate home mortgage, he stated, has a difficult-to-manage option embedded in it. Thus Greenspan downplayed the need for greater government regulation of the derivatives market.

To choose between the arguments of the GAO and Greenspan there is a need for more facts. How vulnerable are large dealers to common risk factors such as interest rate or exchange rate changes? How have they improved their in-house risk management techniques? How concentrated are their credit exposures to counterparties? Are firms using exchange-traded instruments taking risks that could endanger a clearinghouse? Do CEOs understand the derivatives contracts entered into by the company? Much of the evidence that we have on these and similar questions have been obtained from surveys (e.g., the GAO (1994)). The problem with surveys is that

economic agents do not have an incentive to be entirely forthcoming. A proposal by Eugene Rotberg (1995), former Treasurer at the World Bank, would provide more useful information. He suggested that major players in the derivatives market be questioned under oath in a non-adversarial setting. Lawyers or others skilled at obtaining facts could ask many questions concerning their derivatives operations. These facts could then be provided to economists, regulators, and policy makers, who could use them to more accurately gauge the systemic risks posed by derivatives trading.

While derivatives dealers and others would argue that such an investigation is unnecessary, the complexity of these instruments, their novelty (and consequently our limited experience concerning their systemic effects), and the brutal quickness with which they can destroy firms justifies such a response. In approving medicines for human use, the hypothesis that the drug is dangerous must be rejected at a probability level much lower than the 5 percent level often used in statistical tests. A similar principle should apply to derivatives regulation. Since a strong *prima facia* case has been made by the GAO and others that these instruments pose systemic risks, a thorough study is necessary before complacently accepting the argument that they are innocuous. Such a study is of particular moment at present since, as Allen (1995) reported, derivatives users have shifted into less profitable instruments, increasing the profit squeeze on financial firms. If they respond to this squeeze by greater risk-taking and if several

derivatives firms undertake similar positions, then the decline in profitability in derivatives trading can increase systematic risks. Greenspan may be correct that these and other systemic risks posed by derivatives are minimal. However, it could not hurt to obtain another opinion based on carefully collected facts.

Until such facts are available, all parties agree that in-house risk management is essential to minimizing the systemic risks of derivatives. Senior managers and boards of directors should know and authorize the amount of risk a firm is exposed to through derivatives. They should use computer models to determine how much capital is necessary to shield the firm from possible losses due to derivatives. In conducting such simulations, they should not only perform atheoretical stress testing (e.g., how their portfolio responds to a drop in the exchange rate) but also consider likely macroeconomic scenarios (e.g., how their portfolio responds when the Fed raises interest rates, which would simultaneously depress stock prices and appreciate the dollar). The firm's credit exposure to any limited set of counterparties should also be monitored.

Pressure for such an approach is already developing from several sources. Commercial banks are now required to use computer models to determine the amount of capital to set aside to cushion against derivatives risks.[3] Shareholders, awakened to the dangers of derivatives by the Proctor & Gamble and Barings Bank disasters, are demanding better risk management procedures. The Securities and Exchange Commission has persuaded the six largest securities

firms to voluntarily adopt stronger risk-management techniques. Congress, by using the threat of regulation, could probably induce the other major players in the derivatives market to also adopt better risk management techniques.

The issue of commercial banks using taxpayer-insured deposits to invest in derivatives for their own accounts is thorny. It is true that banks need new sources of profits and that if derivative trading were restricted in the U.S., this business would flow overseas. Further, Greenspan (1994) has also argued that the risks of banks investing their own funds in derivatives is not greater than the risks associated with other banking activities. Still, there is something unseemly about investing taxpayer-insured money in complex derivatives. While instruments such as simple interest rate swaps are unobjectionable, there is a good chance that more complex instruments will be considered gambling and thus ruled illegal by courts in certain jurisdictions (see Mayer, 1995). Most citizens would probably object to using their taxes to guarantee gambling activities, especially following the Savings and Loans crisis that cost taxpayers nearly 300 billion dollars.

Perhaps the best way to stop taxpayer-insured deposits from being channeled into complex derivatives is to make this change part of an overall reform of the financial system. Major changes, such as the extension of interstate banking and the repeal of the Glass-Steagall Act, have either already been enacted or are about to be. A further reform which would prevent taxpayer-insured deposits from being invested in derivatives is the institution of

narrow banking (see Phillips, 1995). Under this proposal, separate monetary service and financial service companies would be created. The monetary service companies would offer demand deposits and invest only in "safe" assets such as short-term Treasury liabilities. The financial service companies would channel savings to riskier investments including derivatives. As Phillips discusses, such a change would make federal deposit insurance redundant. Thus, if this reform were implemented, risky derivatives investments would cease to be protected by the Bank Insurance Fund. If narrow banking were not instituted, then restrictions on channeling taxpayer-insured deposits into complex derivatives should still be instituted as part of an overall reform of the financial system.

V. CONCLUSION

Financial derivatives in 1994 and 1995 have wreaked havoc on financial firms, nonfinancial firms, and municipalities. The devastation has sparked debate on the proper public policy response to derivatives. This paper has made several recommendations designed to preserve the benefits of derivatives while containing their risks. These include restricting the ability of a CEO to use derivatives to short sell his or her company's stock, improving the accounting framework used to disclose derivatives transactions, increasing transparency between dealers and end-users, and reducing legal uncertainties between countries. This paper also argues that more information is needed before it will be clear whether new

legislation recommended by the GAO to regulate the safety and soundness of all OTC derivatives dealers is required. To obtain this information the government should place the major players in the derivatives market under oath and determine the level of systemic risk posed by their derivatives activities. Until such a study has been performed, the government should push dealers and end-users to improve their in-house risk management practices. By threatening legislation if improvements are not made, Congress could probably persuade the major players in the derivatives market to institute such changes.

Financial derivatives represent technological breakthroughs that can be beneficial to the economy. But as previous technological breakthroughs such as airplanes and electricity had dangers, derivatives can also be perilous. Vigilance and common sense on the part of market participants, policy makers, regulators, and citizens are necessary to ensure that derivatives go the way of airplanes and not the way of zeppelins.

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TABLE 1
The Major Types of Derivatives

Derivative	Definition	Example
Forwards and futures	Forwards and futures obligate the holder to buy or sell a specific amount or value of an underlying asset (a stock, bond, currency or stock price index) at a specified price on a specified future date. A future is a standardized contract that trades on an exchange; a forward is a specially designed and negotiated contract.	A U.S. importer promises to buy machinery at a future date for a price quoted in German currency. The importer can use a forward contract - or a future contract, if one is available that meets the company's needs - to fix the dollar cost of converting to German currency at the future date. Thus, the dollar cost of German currency increases between the purchase and delivery dates.
Options	Options contracts grant their purchasers the right, but not the obligation, to buy or sell a specific amount to the underlying asset at a particular price within a specified period.	A mutual fund buys an option on a given amount of Treasury bills. The fund will benefit if the price of the Treasury bills moves in a favorable direction. If the price moves in a n unfavorable direction, the fund will lose the price paid for the option.
Swaps	Swaps are agreements between parties to make specified period. In a simple interest rate swap, one party makes payments based on a fixed interest rate, while the counter party makes payments based on a variable rate. The contractual payments are an abstraction; the interest payments are not actually exchanged.	A bank has a portfolio of loans whose floating rates must be adjusted frequently because they are tied to changes in market interest rates. The bank also has deposits that pay customers at rates that are adjusted infrequently. This bank has interest rate risk, because a decline in interest rates reduces the interest receipts on its loans but not the interest payments the bank must pay depositors. The bank may enter into an interest rate swap with another financial institution to hedge its interest rate risk.

Source: GAO, Financial Derivatives

NOTES

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1. This analogy is due to Edward Kane.

2. While some academics believe that asset prices solely reflect fundamentals, powerful evidence that it does not comes from the 19 October 1987 stock market crash. Stock prices lost 20 percent of their value in one day in the absence of any clear news indicating that fundamentals had changed.

3. Banks also have the option to use the "building block" approach developed by the Basle Committee on Bank Supervision in determining the amount of capital to set aside for derivatives risks. Since this results in considerably more capital being set aside then when banks use their own models, large banks are opting to develop their own models.