

JULY/AUGUST 1992

ECONOMIC PERSPECTIVES

A review from the
Federal Reserve Bank
of Chicago

**Ex ante risk and
ex post collapse of
S&Ls in the 1980s**

**Derivative markets
and competitiveness**

FEDERAL RESERVE BANK
OF CHICAGO

Contents

Ex ante risk and ex post collapse of S&Ls in the 1980s 2

**Elijah Brewer III and
Thomas H. Mondschean**

New evidence supports the claim that moral hazard—the incentive for managers and shareholders to take advantage of underpriced deposit insurance by taking additional risks—significantly increased the cost of the S&L bailout.

Derivative markets and competitiveness. 13

Janet A. Napoli

Explosive growth in derivatives trading during the 1980s has resulted in increased competition, decreased transactions costs, and continuing internationalization of financial markets.

ECONOMIC PERSPECTIVES

July/August 1992 Volume XVI, Issue 4

Karl A. Scheld, *Senior Vice President and
Director of Research*

Editorial direction

Carolyn McMullen, *editor*, David R. Allardice, *regional studies*, Herbert Baer, *financial structure and regulation*, Steven Strongin, *monetary policy*, Anne Weaver, *administration*

Production

Nancy Ahlstrom, *typesetting coordinator*, Rita Molloy, Yvonne Peoples, *typesetters*, Kathleen Solotroff, *graphics coordinator*, Roger Thryselius, Thomas O'Connell, Lynn Busby-Ward, John Dixon, *graphics*, Kathryn Moran, *assistant editor*

ECONOMIC PERSPECTIVES is published by the Research Department of the Federal Reserve Bank of Chicago. The views expressed are the authors' and do not necessarily reflect the views of the management of the Federal Reserve Bank.

Single-copy subscriptions are available free of charge. Please send requests for single- and multiple-copy subscriptions, back issues, and address changes to Public Information Center, Federal Reserve Bank of Chicago, P.O. Box 834, Chicago, Illinois 60690-0834, or telephone (312) 322-5111.

Articles may be reprinted provided source is credited and The Public Information Center is provided with a copy of the published material.

ISSN 0164-0682

Ex ante risk and ex post collapse of S&Ls in the 1980s

Elijah Brewer III and
Thomas H. Mondschean



Since 1980, the Federal Savings and Loan Insurance Corporation (FSLIC) and its successor, the Resolution Trust Corporation (RTC), have recognized losses of over \$125 billion. Between 1980 and 1989 the FSLIC spent approximately \$55 billion resolving—that is, liquidating or merging into healthy institutions—546 failed thrift institutions (savings and loan associations and savings banks) with combined total assets of \$192.7 billion. Between August 1989 and February 1992 the RTC resolved another 602 insolvent thrifts with assets of \$186.1 billion.

Observers have attributed the huge cost of the S&L bailout to forbearance and moral hazard [Kane (1989), Barth, Bartholomew and Labich (1989), and Brumbaugh (1988), among others]. Forbearance—the failure to sell or liquidate an economically insolvent institution—has unquestionably played a major role in the S&L debacle. However, the role of moral hazard—the incentive for managers and shareholders to exploit underpriced deposit insurance by taking additional risk—has been harder to pin down. Some observers have argued that the cost of the S&L bailout would have been far lower if managers had not actively sought to increase their risk exposure. They point to the heavy losses that many economically insolvent thrifts experienced on their nontraditional investments. These investments are widely perceived to have been riskier than the residential mortgages in which thrifts traditionally specialized.

Several studies suggest that moral hazard was responsible for a significant portion of the thrift industry's losses during the 1980s [Benston and Koehn (1989), Cole (1990a and 1990b), Kane (1989), and McKenzie, Cole, and Brown (1992)]. However, two important questions relating to the importance of moral hazard remain unanswered. First, did the marketplace view the additional investments as risk increasing at the time they were made? Second, did these investments have a positive impact on the value of the S&Ls' common stock returns? If the answer to either of these questions is "no" then the view that moral hazard played an important role is less plausible.

The purpose of this article is to report on some recent empirical work that attempts to answer these two questions. This research examines the risk premiums on S&Ls' large certificates of deposit (CDs) and returns on and volatility of S&L common stock. These studies report evidence in support of the moral hazard hypothesis. The volatility of S&Ls' stock returns is used to identify those assets which ex post turned out to be risky. The risk premiums on the uninsured CDs issued by S&Ls are employed to demonstrate that, ex ante, the marketplace believed that these investments were causing the institutions' risk to increase. Final-

Elijah Brewer III is a senior economist at the Federal Reserve Bank of Chicago, and Thomas H. Mondschean is a consultant at the Federal Reserve Bank of Chicago and assistant professor of economics at DePaul University. The authors thank Herbert Baer, George Kaufman, Carolyn McMullen, and Larry Mote for helpful comments, and Loretta Ardaugh and George Rodriguez for research assistance.

ly, stock returns are used to demonstrate that the share prices of poorly capitalized S&Ls rose as these S&Ls increased the risk of their asset portfolio. This suggests that shareholders and managers of poorly capitalized institutions were indeed subject to moral hazard.

The article is organized into five sections. The first section examines S&L performance in the early and mid-1980s both to document some of the underlying causes of the S&L crisis and to describe the environment in which S&Ls were operating. The second section explains the economic incentives S&Ls had to increase risk exposure and how this greater risk exposure should be reflected in both the large CD and stock markets. The next sections present evidence concerning the impact of S&L risk taking on CD rates and common stock returns. The final section contains concluding remarks.

Setting the stage for disaster: interest rate and credit risks

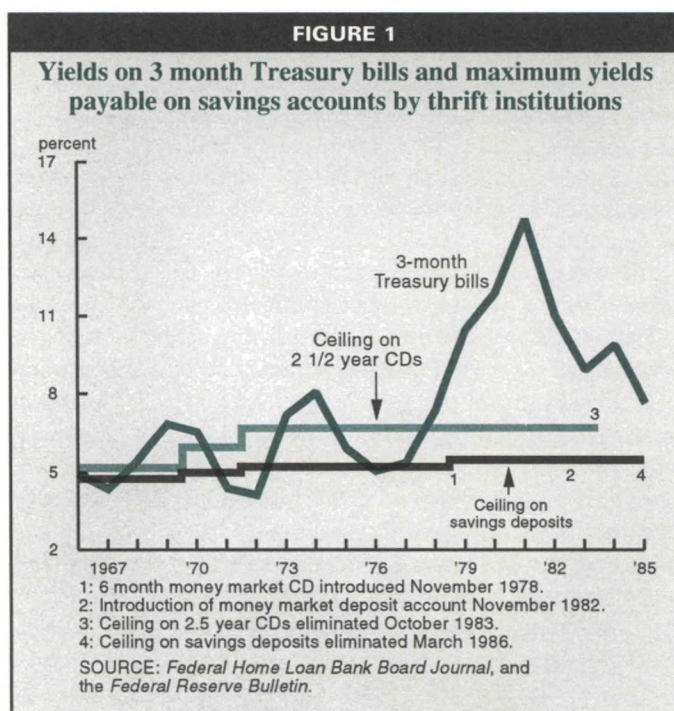
Traditionally, savings and loan associations were consumer-oriented depository institutions which held long term, fixed rate mortgage loans financed largely by short term (and therefore variable rate) liabilities. Regulations established in the 1930s encouraged this specialization and enabled the savings and loan industry to grow rapidly. The qualified thrift lending test offered S&Ls favorable tax treatment in exchange for specializing in residential mortgage lending. S&Ls were encouraged to make long term, fixed rate mortgage loans and to fund them with short term funds that effectively were subject to immediate withdrawals.

Despite the mismatch between the maturities of their assets and liabilities created by these regulations, S&Ls remained profitable until the mid-1960s.¹ The average rate paid on their funds generally remained below the average yield on their longer term assets. S&Ls were able to mismatch asset and liability maturities without seriously affecting profitability because market interest rates remained relatively stable.

In the mid-1960s, however, rising rates of inflation, accompanied by rapidly rising market inter-

est rates, transformed the advantage of a steady stream of interest and principal payments from fixed rate mortgage loans into an overriding disadvantage. Another problem emerged when short term interest rates rose above the Regulation Q type ceiling rate, which, as may be seen from Figure 1, was generally the case during the late 1960s, the 1970s, and 1980s. In those periods when market interest rates rose above the ceiling rate, many depositors withdrew their funds in order to invest them where they could earn higher rates in the money market, resulting in outflows of S&L deposits. A sudden and severe outflow of funds forced S&Ls with insufficient liquid assets to borrow from the Federal Home Loan Bank System and slow down mortgage lending. Once market interest rates fell back below the ceiling rate, funds flowed back into S&Ls and mortgage lending resumed.

Except for a few periods between 1966 and the late 1970s, the average deposit rate paid by S&Ls was less than the average return on their longer term assets. As long as the accounting profits were positive, book value capital did not decline. Book value of capital was also bolstered because assets and liabilities were not written down to reflect the impact of higher interest rates. However, an increase in interest rates lowers the market value of a typical S&L's net worth because the market value of



its long term assets declines more than the market value of its shorter term liabilities. Because S&Ls do not have to recognize these market value losses in their accounting, both regulators and the public may believe that an S&L has more capital than it actually has during periods of high market interest rates.

The effects of interest rate increases on S&L solvency grew progressively worse in the late 1970s. The increase in inflation and the subsequent period of monetary restraint resulted in substantially higher nominal interest rates for a longer period than at any time since the Civil War. As the gap between permissible deposit rates and market rates widened, depositors fled to higher yielding investments, such as Treasury bills and commercial paper. Those with insufficient resources to invest in these financial instruments directly turned to money market mutual funds, which permitted smaller savers to earn higher returns than S&Ls could offer.

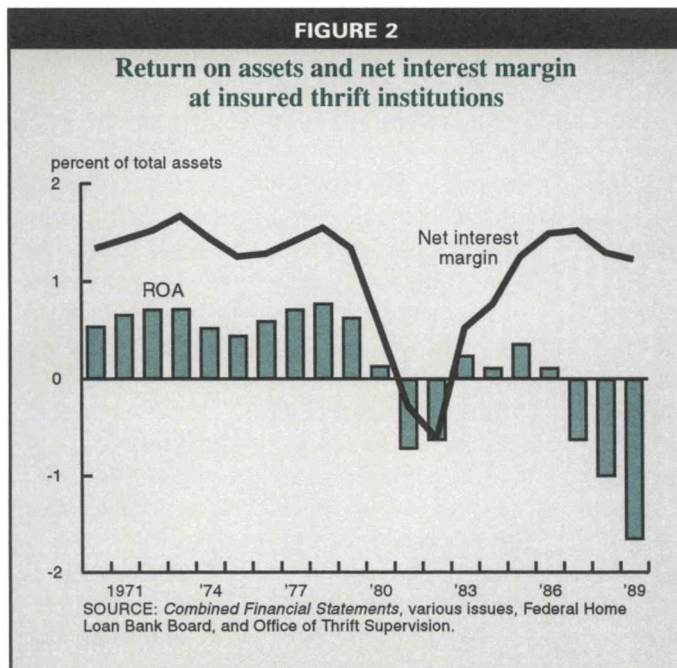
Because the size of deposit outflows was so large, S&Ls were permitted in November 1978 to offer a new type of deposit, a six month money market certificate whose interest rate was tied to the six month Treasury bill rate at the time. As a result, the deposit outflow slowed. However, because over 80 percent of S&L assets were invested in long term, fixed rate mortgage loans made previously at lower interest rates, the interest income on their asset portfolios did not increase as rapidly as their cost of funds, causing S&Ls to suffer large losses. In retrospect, the S&L industry failed to forecast accurately the level of nominal short term interest rates in the late 1970s and early 1980s; consequently, they charged a rate on long term, fixed rate mortgage loans that was too low to cover their future costs of deposits.²

Although much of the S&Ls' exposure to interest rate risk could have been mitigated by permitting them to offer adjustable rate mortgage loans that tied the mortgage interest rate to the cost of funds, few thrifts outside of state chartered S&Ls in California were permitted to issue such mortgage loans prior to 1979. After being prevented from doing so earlier by Congress, the Federal Home Loan Bank Board (FHLBB) authorized adjustable rate mortgage loans for all federally chartered S&Ls in California in January 1979, and it extended these powers nationwide in July of the same year. Besides adjustable rate

mortgage loans, S&Ls can manage interest rate risk by using derivative instruments such as financial futures to hedge or by lengthening the maturity of their deposits. Hedging involves taking a position in the futures market opposite that in the cash market so that, regardless of the movement in interest rates, losses in one market will be offset by gains in the other market. In July 1981, the FHLBB gave S&Ls permission to use financial futures to hedge their interest rate risk exposure. Other interest rate risk hedging instruments, such as swaps and options on financial futures, have become available only in recent years. Thus, the tools S&Ls now have for hedging their interest rate risk exposure became available too late to deal with the interest rate risk problems of the 1970s and early 1980s. Moreover, few S&Ls had the knowledge or experience to effectively use derivative instruments that were available during this period.

Figure 2 illustrates the consequences of S&L interest rate risk exposure. The accounting return on assets (ROA) for the industry was approximately -0.70 percent in 1981 and -0.60 percent in 1982, the first years of negative aggregate returns on assets for the S&L industry since the now defunct FSLIC was established in the early 1930s. Book net worth as measured by generally accepted accounting principles (GAAP) declined by over 37 percent between 1980 and 1982. Moreover, the level of market interest rates was so high in 1981 and 1982 that some 2/3 of all S&Ls were insolvent on a market value basis, since the market value of their longer term assets fell below the value of their liabilities.

In response to the problems that the S&L industry was experiencing, Congress and regulators lowered regulatory capital requirements from 5 percent to 3 percent. They also permitted S&Ls to count as part of capital as defined by regulatory accounting principles (RAP) net worth certificates (paper issued by the FHLBB to increase regulatory, though not economic, net worth), appraised equity capital, and qualifying subordinated debentures, and to defer losses on the sale of assets bearing below market interest rates. All of these items are excluded from net worth calculated using GAAP. Thus, the regulations effectively permitted some GAAP insolvent but RAP solvent S&Ls to remain open.



While RAP clearly represents a softening of GAAP designed to present a more favorable picture of the industry's condition, many critics have argued that what is needed is just the opposite—accounting principles that value industry capital even more conservatively than GAAP. Generally accepted accounting principles allow S&Ls to count as part of capital the amount of goodwill and other intangible assets resulting from mergers. As a result of the supervisory mergers arranged by the Federal Home Loan Bank Board during the early 1980s, over \$20 billion of additional goodwill was put on the books of S&Ls. Supervisory goodwill consists of the amount over market value of capital paid by one S&L to acquire another, troubled, S&L and is not related to a future rise in income, as is regular goodwill. According to Barth (1991), the effect of the supervisory mergers was to increase reported but not economic capital for a long time after the merger.

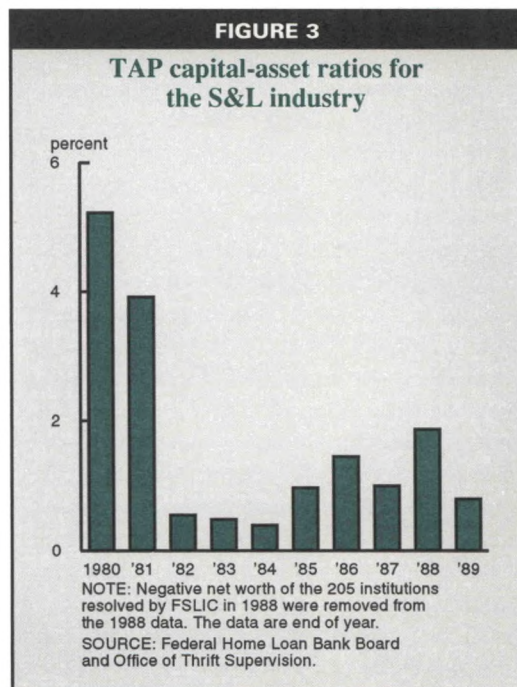
When goodwill and other intangible assets are subtracted from the GAAP measure, the result is net worth computed using tangible accounting principles (TAP). Figure 3 shows book value TAP capital-asset ratios for the S&L industry from 1980 to 1989. At the beginning of the 1980s, the TAP capital-asset ratio for the industry was approximately 5.2 percent. By the end of 1982, the TAP capital ratio had declined to only 0.55 percent and market value

capital was negative due to a rise in interest rates [Kane (1985)]. Between 1982 and 1989, TAP capital increased; however, as indicated in Figure 3, the capital-asset ratio in 1989 was still below 1 percent.

By relaxing solvency rules, Congress and regulators allowed inadequately capitalized S&Ls to remain open to gamble for resurrection. This behavior exacerbated the damage incurred during the high interest rate period. In a recent study, the Congressional Budget Office estimated that the cost of not closing S&Ls in the year when they first became book value insolvent from 1980 through 1990 was over half of the estimated \$127 billion cost (in 1990 dollars) of resolving them

over this period [see CBO (1991)].

In addition to relaxing capital requirements, Congress increased asset powers for S&Ls by permitting them to make mortgage loans backed by commercial real estate as well as other types of nonmortgage loans and to hold junk bonds. Barth, Bartholomew, and Labich (1989) found that nontraditional activities and the capital forbearance policy of the FSLIC



were significantly positively associated with resolution costs. Nevertheless, according to Barth (1991), the delay in reorganizing or closing poorly capitalized institutions was a more important factor affecting the magnitude of S&L losses than was deregulation.

Another factor which affected S&L behavior in the 1980s was access to underpriced deposit insurance. Brickley and James (1986) investigate the effect of underpriced deposit insurance on the common stock returns for financially weak institutions. Using S&L data for the period 1976 through 1983, they found that stock returns for financially weak S&Ls responded to changes in solvency rules as if deposit insurance were a valuable asset. In the next section we describe how underpriced deposit insurance is related to the moral hazard problem.

The theory of moral hazard

Financial theory suggests that changes in asset mix or financial leverage should influence expected returns on equity. Because shareholders hold residual claims on earnings, their interests often diverge from those of creditors. Because their liability is limited to the amount of their investment, shareholders have incentives to invest in risky assets if the increase in the firm's variance of returns from investing in these assets is sufficiently increased. If the investments pay off, shareholders keep all the gains; if losses are incurred, they are shared with creditors. These incentives exist with or without deposit insurance. Without deposit insurance, however, depositors would impose market discipline on the use of their funds either by requiring a higher return on their funds for bearing increased risk or by reducing the availability of funds to perceived riskier institutions. Thus, the willingness of firms to invest in risky assets is held in check by the concern of depositors for the safety of their funds.

In some instances, however, federal deposit insurance creates incentives for excessive risk taking by S&Ls. As with any insurance contract, the insured S&L, having been shielded from some of the consequences of its actions, has an incentive to act in a manner that increases the insurer's exposure to losses. The danger that the insured party may do so is referred to as "moral hazard." Private insurers try to minimize this behavior by charging more to insure

riskier firms and reserving the right to withdraw coverage should firm risk increase after insurance premiums are paid. However, S&L deposit insurance rates have been fixed independently of asset risk, so that riskier S&Ls are more likely to underpay for insurance. This means that deposit insurance becomes a valuable asset for undercapitalized S&Ls. The worth of deposit insurance can be modelled as a put option on the underlying assets of the institution [Merton (1977)]. As for any option, the value of the deposit insurance put option increases with increases in risk assumed through undercapitalization and changes in assets.

Underpriced, fixed rate deposit insurance need not lead managers and shareholders to take excessive risks. If regulators intervene early to limit such behavior, require owners to recapitalize poorly capitalized institutions, or, if preventive measures fail, take steps to resolve institutions through sale or liquidation as soon as they become economically insolvent, the costs of excessive risk taking would either be eliminated or would be borne by the institution's shareholders [Benston and Kaufman (1988)]. Unfortunately for the taxpayer, S&L regulators not only failed to close or recapitalize the large portion of the industry that had become insolvent because of the rise in interest rates during the early 1980s, they actually reduced capital requirements to match the new, lower level of S&Ls' capital. Worse, they frequently permitted insolvent institutions to be managed as if they were going concerns.

In order to test the moral hazard hypothesis, we must determine how various categories of assets are related to S&L risk. An increase in an S&L's risk profile should make the returns on its common stock more volatile, so stock return volatility provides a measure of the riskiness of an S&L's assets. We also need to determine whether the market perceived certain portfolio changes as increasing S&L risk. The impact of changes in risk on the value of deposit insurance and of the institution will not be reflected in accounting data. However, in selecting riskier combinations of mortgage and nonmortgage assets, an S&L may lead the debt and equity markets to revalue the S&L's portfolio. This information will be incorporated into the price of the S&L's shares and debt instruments. According to the moral hazard hypothesis, the value of an undercapitalized S&L and

hence the price of its shares should rise as asset risk increases. Consequently, if market participants perceive that an undercapitalized S&L is increasing risk, they ought to bid up the share price. To determine whether market participants perceived S&Ls to be increasing their risk, we look at the interest rates on uninsured CDs, which should be positively related to risk, and on stock returns, which should increase for undercapitalized S&Ls that increase risk.

The riskiness of S&L investments

In this section, we examine the relationship between two market based measures of risk—the volatility of stock returns and premiums on uninsured CDs—and S&L asset composition. Barth, Bartholomew, and Labich (1989) present evidence indicating that S&L acquisition and development loans (ADLs)—loans to finance the purchase of land and the accomplishment of all improvements required to convert it to developed building lots—were associated with greater losses and resolution costs. Recently, junk bond investments have been associated with some of the largest and most expensive S&L failures. A study by Brewer and Mondschean (1993) found that acquisition and development loans and investments in junk bonds increased S&Ls' risk exposure.

The relationship between an S&L's portfolio composition and the volatility of its stock returns provides a measure of the riskiness of various assets. Using quarterly data on a pooled time series, cross-sectional sample of 75 S&L organizations for the 1987-1989 period, Brewer and Mondschean (1993) regressed the stock return volatility, as measured by the standard deviation of stock returns, on financial leverage and the ratios of several asset categories to market capitalization. Controlling for leverage, we found that ADLs and junk bonds were positively related to stock return volatility while other mortgage assets, nonmortgage loans, and real estate direct investments were negatively related to the volatility measure. These results suggest that ADLs and junk bonds proved to be riskier than other assets available to S&Ls.

We next sought to determine whether uninsured depositors viewed these investments as being risky at the time they were made. To do this we specified a relationship between the interest rate paid on large certificates of deposit (deposits in excess of \$100,000, which are not

insured), the amount of ADLs and junk bonds relative to market capitalization of S&L net worth, and a set of variables designed to proxy for other factors affecting the interest rate on S&L deposits.

We estimated a regression equation using the same 75 S&L organizations for the 1987-1989 period. We found a positive and statistically significant relationship between the proportions of both junk bonds and ADLs held relative to market capitalization and the interest rate paid on large CDs, holding other factors constant. This indicates that depositors demanded higher interest rates to compensate for bearing additional risk. Moreover, the risk premium paid by S&Ls holding junk bonds existed before the decline in junk bond prices in 1989.³ We also found that CD rates were inversely related to an S&L's market capitalization-asset ratio, which is expected because a higher market capitalization-asset ratio represents a larger cushion against unexpected losses. These results are consistent with previous studies that found a risk premium in interest rates paid on large CDs.⁴ Thus, we conclude that institutions with larger shares of ADLs and junk bonds in their portfolios were perceived as more risky by depositors and raised the expected liability to the deposit insurance fund even before the assets went bad.⁵

The potential for shareholders' gains from underpriced federal deposit insurance

The next question is whether the stock market in fact rewarded those institutions that increased their holdings of these risky assets. If we find that they were rewarded for taking additional risk, then we can conclude that shareholders and managers were in fact subject to moral hazard.

The value of shareholders' equity (*MV*) has three components: assets other than the net value of deposit insurance (*A*), explicit liabilities to creditors (*L*), and the option value of the deposit insurance contract (*DI*). That is, the value of shareholders' equity can be written as:

$$(1) \quad MV_{j,t} = A_{j,t} - L_{j,t} + DI_{j,t},$$

where $MV_{j,t}$ is the market value of equity for the j th S&L at the end of period t , $A_{j,t}$ is the value of total assets, $L_{j,t}$ is the value of liabilities, and $DI_{j,t}$ is the value of deposit insurance.⁶ Follow-

ing Merton (1977), the value of the deposit insurance contract, DI can be written as:

$$(2) DI_{j,t} = \delta (A_{j,t} / L_{j,t}, \sigma_A),$$

where $A_{j,t} / L_{j,t}$ is the ratio of total assets to total liabilities and σ_A is the volatility of asset returns. Using a capital asset pricing model derived from the finance literature, Brewer (1992) tested for moral hazard by examining the effect of changes in financial leverage and asset mix on stock returns. The model, discussed in detail in Brewer (1992), can be written as:

$$(3) R_{j,t} = \sum_{k=1}^K \delta_k (\Delta A_{j,t}(k) / MV_{j,t}) + \text{Other Factors} + \epsilon_{j,t},$$

where $R_{j,t}$ is the rate of return on common stock; $\Delta A_{j,t}(k)$ is the change in the holdings of the k th asset during period t of the j th S&L; $MV_{j,t}$ is the market value of capital of the j th S&L at the end of period t ; and the parameter δ_k measures the impact of a change in the holdings of each of the k assets on the value of deposit insurance through the impact on total asset return volatility and therefore on stock returns. The other factors refer to variables such as changes in financial leverage, a stock market return index, and a long term Treasury bond return index; and $\epsilon_{j,t}$ is a stochastic error term.

If deposit insurance is valuable to S&Ls beyond the premium paid and the market recognizes its value and rewards managers and shareholders for taking actions that further increase the value of deposit insurance, then the δ_k for risky assets should be positive. This gives value maximizing S&Ls incentives to shift risk to the deposit insurance fund in an attempt to expropriate wealth.

S&L asset risk exposure can be captured by the following individual asset categories: residential mortgage loans, commercial mortgage loans, acquisition and development loans, other mortgage assets, direct real estate investments, investments in service corporations; nonmortgage loans, and other non-mortgage assets. The δ_k should be larger for more risky assets if the moral hazard hypothesis is correct.

Brewer (1992) developed a procedure for testing the moral hazard hypothesis using Equation (3). First, S&Ls are ranked according to their risk of failure. Risk of failure is measured as the sum of one plus the mean return on common stock divided by the standard deviation of the rate of return on common stock. Intuitively, the risk of failure is an estimate of the number of standard deviations below the mean that the return on common stock would have to fall so as to render equity negative. Negative equity is one common definition of insolvency. High probability of insolvency is reflected in high standard deviation of common stock returns, low mean returns, and low capitalization ratios. The ordered sample is then divided into three groups: high risk, medium risk, and low risk.

Brewer used a sample of 63 S&Ls and S&L holding companies. The high risk category included the first 40 percent of S&Ls in the ordered sample, the medium risk category included the next 20 percent of S&Ls, and the low risk category was comprised of the remaining 40 percent of S&Ls in the ordered sample. Differences in average portfolio holdings of various assets are presented for the high and low risk S&Ls in Table 1. At the end of 1987, low risk S&Ls had on average greater propor-

	High risk	Low risk
Residential mortgage loans	.331 (.169)	.369 (.109)
Mortgage backed securities	.168 (.133)	.166 (.119)
Commercial real estate loans	.130 (.104)	.089 (.069)
Acquisition and development loans	.037 (.052)	.027 (.057)
Direct investments	.010 (.018)	.010 (.020)
Investments in service corporations	.023 (.033)	.017 (.022)
Consumer nonmortgage loans	.036 (.042)	.037 (.037)
Commercial nonmortgage loans	.023 (.036)	.023 (.036)

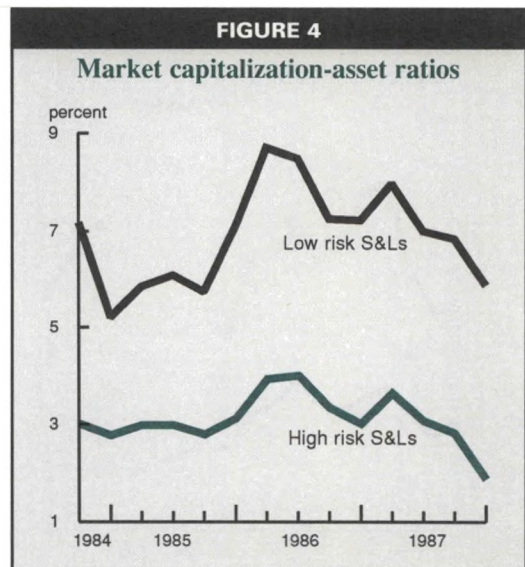
NOTE: Standard deviations are in parentheses below means.

tions of traditional (residential) mortgage loans than high risk S&Ls. High risk S&Ls tended to hold more commercial real estate loans and acquisition and development loans than low risk firms. Nevertheless, high risk S&Ls did not show dramatically different portfolio composition from low risk associations. However, analysis of S&L capital in market capitalization terms, as shown in Figure 4, paints a different picture.

Figure 4 presents the market capitalization-asset ratios for S&Ls classified as having high and low risks of failure in the fourth quarter of 1987. S&Ls which were classified as being high risk in the fourth quarter of 1987 had much lower market capitalization ratios in 1984. The high risk S&Ls in our samples had weaker capital positions even before they undertook nontraditional high risk investments. Because of their low market capitalization-asset ratios, high risk S&Ls would be more likely to benefit from risk increasing strategies and more likely to choose assets that increased risk and shareholder wealth at the expense of the FSLIC. Brewer (1992) found that over the 1981-87 period high risk S&Ls experience one time common stock return increases following a shift from residential mortgage loans to commercial mortgage loans, acquisition and development loans, investments in service corporations, and nonmortgage loans (commercial and consumer loans). In contrast, S&Ls in the low risk category experience no statistically significant association between these asset mix variables and S&L stock returns. The fact that the stock market responded positively to increased risk taking only for the high risk group of S&Ls supports the view that federal deposit insurance combined with inadequate capitalization created a moral hazard problem.

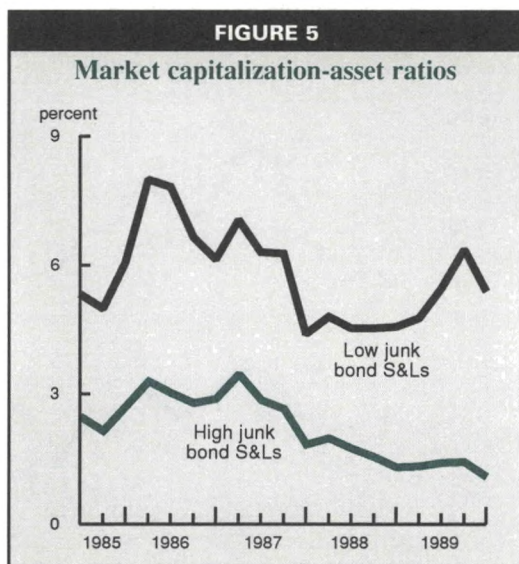
The impact of junk bond investments on S&L stock returns

Another test of the moral hazard hypothesis can be developed by examining the impact of junk bonds on S&L shareholders' equity returns. At the time they were issued it was widely recognized that junk bonds had the risk characteristics of both long term bonds and equity. Brewer and Mondschean (1993) used data on 75 S&L organizations whose stocks were traded on the New York Stock Exchange, American Stock Exchange, or over the counter from 1987 to 1989. S&Ls were classified as



“high” junk bondholders or “low” junk bondholders. To be considered a high junk bondholder, an S&L in the sample must have ranked among the top 50 junk bondholders at the beginning of the sample period. The remaining S&Ls were classified as low junk bondholders. Figure 5 compares the average market capitalization-asset ratios for the 18 S&Ls in the sample classified as high junk bondholders with those for the 57 S&Ls classified as low junk bondholders. The 18 S&Ls in the high junk bond category had much lower capitalization ratios than the low junk bond group.

From the end of 1985 to the end of 1988, total S&L holdings of junk bonds grew from \$5.59 billion to \$14.64 billion, an increase of over 160 percent in three years. After the end of 1988, however, S&Ls began to reduce and/or write down their holdings of junk bonds, so that by the end of 1989 the amount held had declined to \$10.46 billion, at least partly as a result of restrictions imposed by FIRREA. FIRREA, enacted in August 1989, required S&Ls to divest their holdings of junk bonds by July 1, 1994. The regulations implementing the act required S&Ls to record junk bonds at market rather than book value. Throughout the sample period, the top 50 holders had over 95 percent of all S&L junk bond holdings. These investments were large relative to the tangible capital of the S&Ls holding them. For the publicly traded S&Ls that were among the top 50 junk bondholders, the dollar value of junk bonds exceeded their tangible capital.



In order to test the moral hazard hypothesis that the stock market should reward insured institutions with low capital which take additional risk, we divided our sample of 75 S&Ls into two groups using a 3 percent TAP capital-asset ratio as the cutoff point. Using a pooled time series, cross-section from 1987 to 1989, we regressed the quarterly stock return on the quarterly change in financial leverage and changes in the proportion of junk bonds and other assets relative to the market capitalization, controlling for overall stock and junk bond market effects. For more complete information on methodology and data sources, see Brewer and Mondschean (1993).

Our results indicate that, for low capital S&Ls, an increase in junk bonds yielded a one time increase in common stock returns. As expected, increases in junk bonds did not have a statistically significant effect on the common stock returns of high capital S&Ls. This result was consistent with an earlier finding by Brewer (1992). With the exception of real estate direct investments, all of the other asset mix variables have positive coefficients and most have significant impacts on the common stock returns of low capital S&Ls. These results support the notion that the stock returns of S&Ls on the edge of insolvency respond positively to increased risk as implied by the moral hazard hypothesis. They also suggest that access to deposit insurance is not as valuable for better capitalized S&Ls.

Conclusions

The empirical results reported in this paper suggest that there was evidence of moral hazard in the S&L industry in the period preceding the passage of FIRREA. Poorly capitalized S&Ls increased their risk exposure and were rewarded with higher stock returns. Uninsured depositors received higher CD rates from institutions with larger stock return volatility, greater exposure to junk bonds and ADLs, and lower capital-asset ratios. Thus, our work isolated two assets that both raised the value of the deposit insurer's liability and the stock returns of poorly capitalized institutions.

These findings suggest that it was moral hazard and not simply bad luck or delayed closure that led to the S&L crisis and increased its cost. The results also suggest that capital forbearance allowed S&Ls to take on excessive risk in many ways, including the purchase of junk bonds. S&Ls that were classified as high risk in 1987 and S&Ls that purchased large amounts of junk bonds had relatively lower capital-asset ratios. The lack of reserves in the FSLIC fund prevented S&L regulators from closing those institutions commonly known to be beyond hope of recovery. The conclusion is that capital forbearance was a gamble for the FSLIC. The risk inherent in this gamble came from the additional time forbearance gave managers to gamble for resurrection by making large volumes of high risk, potentially high profit loans. If the loans made good, the institutions would have reaped the profits, but if the loans soured and the lender went broke, the federal deposit insurer was liable for the losses, not the institutions' owners.

Underpriced, fixed rate deposit insurance provides an incentive for value maximizing S&Ls to take additional risks, since it induces a positive correlation between stock market returns and changes in holdings of risky assets. The evidence presented in this article suggests that the incentive to take excessive risk is strongest when there is little equity left. Poorly capitalized S&Ls tend to take excessive risks of all types (both in mortgage and nonmortgage investments). Prohibiting S&Ls from holding junk bonds (or other risky assets) will not prevent them from taking more risk because there are many ways for depository institutions to acquire assets which are at least as risky as junk bonds. Legislative action which attacks exces-

sive risk taking by prohibiting institutions from acquiring particular classes of risky assets is attacking the symptoms of the disease instead of its causes and is doomed to fail. If the incentives to increase risk are there, then value maximizing institutions will find a way to circum-

vent regulations and increase risk. The solution is to adopt policies that eliminate incentives for institutions with low capital to increase their risk exposure, as begun in the recently enacted Federal Deposit Insurance Corporation Improvement Act of 1991.

FOOTNOTES

¹A depository institution's sensitivity to interest rate changes can also be calculated using durations of the assets and liabilities rather than their maturities. While maturity takes account only of the date of the last scheduled payment, duration averages the maturity of an instrument's future cash payments, with the present value of the cash payments serving as the weights.

²For a discussion of the importance of interest rate forecasts to S&Ls, see Kaufman (1972).

³In Brewer and Mondschean (1992), we examine the relationship between CD rates and several balance sheet

variables for each quarter from March 1987 to June 1991. We report a positive correlation between junk bond holdings and CD rates for the entire sample period.

⁴See, for example, Baer and Brewer (1986), Hannan and Hanweck (1988), and James (1990).

⁵For a discussion of the impact of ADLs on the risk premiums on insured deposits, see Cook and Spellman (1991).

⁶See Kane (1985).

REFERENCES

Baer, Herbert, and Elijah Brewer III, "Uninsured deposits as a source of market discipline: some new evidence," *Economic Perspectives*, Federal Reserve Bank of Chicago, September/October 1986, pp. 23-31.

Barth, James R., *The Great Savings and Loan Debacle*, Washington, D.C., The AEI Press, 1991.

Barth, James R., Philip F. Bartholomew, and Carol Labich, "Moral hazard and the thrift crisis: an analysis of 1988 resolutions," *Proceedings of a Conference on Bank Structure and Competition*, Federal Reserve Bank of Chicago, 1989.

Barth, James R., and Michael G. Bradley, "Thrift deregulation and federal deposit insurance," *Journal of Financial Services Research* 2, September 1989, pp. 231-259.

Benston, George J. and George G. Kaufman, "Risk and solvency regulation of depository institutions: past policies and current options," *Monograph Series in Finance and Economics*, Salomon Brothers Center for the Study of Financial Institutions, 1988.

Benston, George J. and Michael F. Koehn, "Capital dissipation, deregulation, and the insolvency of thrifts," unpublished paper, Emory University, December 1989.

Brewer, Elijah III, "The impact of the deposit insurance system on S&L shareholders' risk/return trade-offs," *Journal of Financial Services Research*, forthcoming, 1992.

Brewer, Elijah III and Thomas H. Mondschean, "The pricing of large certificates of deposit at savings and loan associations," unpublished paper, Federal Reserve Bank of Chicago, 1992.

_____, "An empirical test of the incentive effects of deposit insurance: the case of junk bonds at savings and loan associations," *Journal of Money, Credit and Banking*, forthcoming, 1993.

Brickley, James A., and Christopher M. James, "Access to deposit insurance, insolvency rules, and the stock returns of financial institutions," *Journal of Financial Economics* 16, July 1986, pp. 345-371.

Brumbaugh, R. Dan, Jr., *Thriffs under siege*, Cambridge, Mass., Ballinger Publishing Co., 1988.

Buser, Stephen A., Andrew H. Chen, and Edward J. Kane, "Federal deposit insurance, regulatory policy and optimal bank capital," *Journal of Finance* 36, March 1981, pp. 51-60.

Cole, Rebel A., "Agency conflicts and thrift resolution costs," Financial industry studies Working Paper No. 3-90, Federal Reserve Bank of Dallas, July 1990a.

_____, "Insolvency versus closure: why the regulatory delay in closing troubled thrifts?" Financial industry studies Working Paper No. 2-90, Federal Reserve Bank of Dallas, July 1990b.

Congressional Budget Office, "The cost of forbearance during the thrift crisis," *CBO Staff Memorandum*, June 1991.

Cook, Douglas O. and Lewis J. Spellman, "Federal financial guarantees and the occasional market pricing of default risk: evidence from insured deposits," *Journal of Banking and Finance* 15, December 1991, pp. 1113-1130.

Hannan, Timothy H., and Gerald A. Hanweck, "Bank insolvency risk and the market for large certificates of deposit," *Journal of Money, Credit, and Banking* 20, May 1988, pp. 203-211.

James, Christopher M., "Heterogeneous creditors and the market value of bank LDC loan portfolios," *Journal of Monetary Economics* 22, June 1990, pp. 325-346.

Kane, Edward J., *The Gathering Crisis in Deposit Insurance*, Cambridge, MA, MIT Press, 1985.

_____, *The S&L Insurance Mess*, Washington, D.C., Urban Institute Press, 1989.

Kaufman, George G., "The thrift institution problem reconsidered," *Journal of Bank Research* 3, Spring 1972, pp. 26-33.

McKenzie, Joseph A., Rebel A. Cole, and Richard A. Brown, "Moral hazard, portfolio allocation, and asset returns for thrift institutions," *Journal of Financial Services Research* 5, April 1992, pp. 315-339.

Merton, Robert C., "Analytical derivation of the cost of deposit insurance and loan guarantees: an application of modern option pricing theory," *Journal of Banking and Finance* 1, June 1977, pp. 3-11.

_____, "On the cost of deposit insurance when there are surveillance costs," *Journal of Business* 51, July 1978, pp. 439-452.

Resolution Trust Corporation, *RTC Review*, Vol. 3, April 1992.

Derivative markets and competitiveness

Janet A. Napoli



“The opening up of new markets, foreign or domestic, and the organizational development...illustrate the same process of industrial muta-

*tion—if I may use that biological term—that incessantly revolutionizes the economic structure **from within**, incessantly destroying the old one, incessantly creating a new one.”*

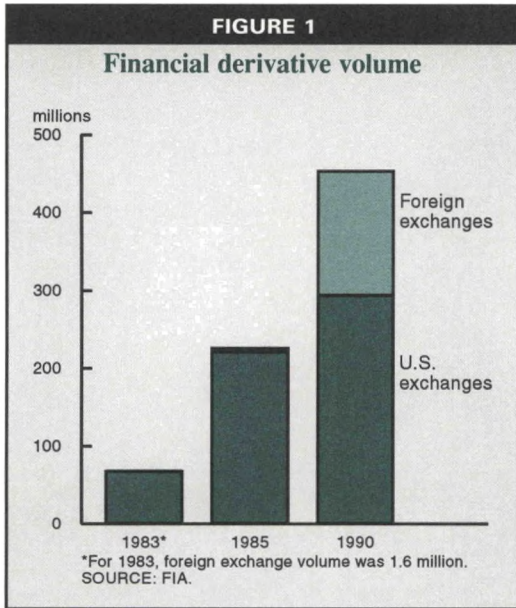
Joseph A. Schumpeter

Derivatives are financial instruments, such as forwards, futures, options, and swaps, which are based upon the future value of a good or instrument. Prior to the 1980s, few futures and options exchanges existed outside the U.S. An unprecedented period of growth occurred during the 1980s as existing derivative exchanges continued to expand and as new derivative exchanges opened throughout Europe and the Pacific Rim. The 1980s growth resulted primarily from the increasing importance of financial derivatives. Figure 1 illustrates the dramatic increases in exchange traded financial derivative volume during the 1980s, with the 1990 volume twice the 1985 volume and almost seven times the 1983 volume. An important factor driving the proliferation of new derivative exchanges and new market participants was financial market deregulation. Derivative exchanges opened in countries where the majority of domestic financial markets had already been deregulated as well as in countries undergoing comprehensive programs of credit, capital, and exchange rate deregulation.

Over-the-counter (OTC) financial derivatives also experienced extraordinary growth during the 1980s. Prior to the 1980s, the primary instruments traded on the largest OTC market, the interbank foreign exchange market, were forward, future and, to a lesser extent, option instruments. The 1980s OTC market growth was based upon innovative financial engineering resulting in a number of new instruments: caps, collars, floors, swaps, and swaptions. In many cases, these derivatives are hybrid instruments, combining a conventional financial instrument, like a bond, with a derivative instrument, like an option. The popularity of the new instruments is attributable to the increasing ability of the OTC markets to customize specific risks, notably foreign exposures. The most actively traded of these new OTC derivatives are currency and interest rate swaps. As shown in Figure 2, the 1990 notional principal of these swaps is more than three times the 1987 notional principal.

This article explores the impact of the 1980s expansion on the derivative markets and its participants. In particular, the discussion focuses upon the growing importance of exchange competition and its impact on transaction costs and liquidity. This increase in competition is driving the continuing internationalization of national financial markets. At the

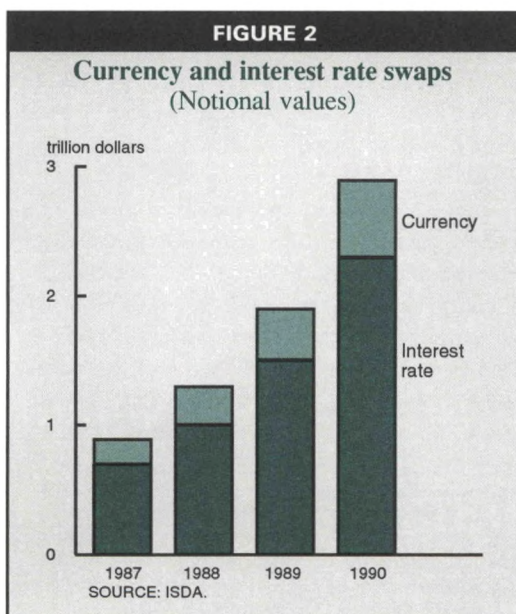
Janet A. Napoli is an associate economist at the Federal Reserve Bank of Chicago. The author is especially grateful to Herbert Baer for his insightful comments. The author would also like to thank John Behof, Hesna Genay, Carolyn McMullen, and James Moser for their comments.



same time, the growth of the exchange and OTC markets is forcing a restructuring of these markets.

Exchange markets and the 1980s expansion

The pervasive deregulation of financial asset markets during the 1980s increased the demand for derivatives based on these assets. The creation of a derivative market largely depends upon features of the underlying asset market. An asset market which is both actively traded and volatile creates investor demand to



trade on information about future prices and reduce the resulting price risk. The economic role of derivative instruments is to provide these price discovery and risk hedging functions [Black (1986) and Moser (1991)]. As highly regulated asset markets were transformed into open market structures, the liquidity, activity, size, and volatility of these markets increased. The new and expanding exchanges during the 1980s addressed the increased demand for price discovery and risk management instruments by introducing derivatives based on these deregulated assets. Today, more than 100 derivative products trade across different countries in comparison to less than 25 in 1983. These previously unavailable products have made the markets for derivatives an important part of the financial infrastructure in these countries.

Exchange traded derivatives based on financial instruments originated in the U.S. during the 1970s.¹ The currency, interest rate, and stock index futures and options introduced by U.S. exchanges were subsequently emulated by international exchanges throughout the 1980s. Whereas today financial derivative exchanges are an international phenomenon spanning 22 countries, only five exchanges—four U.S. and one non-U.S.—traded financial derivatives in 1980 [Miller (1990)]. Today, the Chicago Board of Trade (CBOT) still trades the most active future contract: the U.S. Treasury bond future; while the Chicago Board Options Exchange (CBOE) trades the most active option contract: the S&P 100 index option. The Chicago Mercantile Exchange (CME) trades the third, seventh, and ninth most active futures: the three month Eurodollar, S&P 500 stock index, and German deutschemark futures. The CME is also one of the more internationally oriented exchanges based upon its foreign currency and interest rate product offerings. In 1990, U.S. derivative exchanges accounted for 65 percent of worldwide volume in exchange traded derivatives (see Table 1 for a list of acronyms used in this article).

One of the largest exchange traded derivative markets arose during the 1980s in Japan, where underlying financial market liberalization, primarily interest rate deregulation, continued to progress from the mid-1970s. Interest rates are now market determined for the money markets, the primary medium and long term government bond markets, as well as the sec-

TABLE 1

Exchange acronyms

Acronym	Exchange
AMEX	American Stock Exchange
CBOE	Chicago Board Options Exchange
CBOT	Chicago Board of Trade
CME	Chicago Mercantile Exchange
DTB	Deutsche Terminbörse
LIFFE	London International Financial Future Exchange
MATIF	Marché à Terme International de France
MIDAM	MidAmerica Commodity Exchange
NYSE	New York Stock Exchange
OM	OM Stockholm
OSE	Osaka Stock Exchange
PBOT	Philadelphia Board of Trade
PHLX	Philadelphia Stock Exchange
PSE	Pacific Stock Exchange
SFE	Sydney Futures Exchange
SIMEX	Singapore International Monetary Exchange, Ltd.
SOFE	Swedish Option and Future Exchange
TIFFE	Tokyo International Financial Futures Exchange
TSE	Tokyo Stock Exchange

ondary bond markets. Financial liberalization in Japan has increased securitization as more financial transactions are explicitly priced, with less reliance on indirect or intermediated finance [Cargill and Royama (1992)]. Secondary market equity trading has correspondingly increased, as trading on the Tokyo Stock Exchange (TSE) increased from 100 billion shares traded in 1980 to almost 220 billion shares traded in 1989. As part of the overall financial liberalization in Japan, derivative trading has also progressed incrementally. In 1985, the Ministry of Finance (MOF) permitted Japanese government bond futures to be traded on the TSE. Beginning in 1987, the MOF permitted a group of financial institutions to trade in foreign derivative markets. Following in 1988, the Japanese Securities and Exchange law was amended to permit Japanese stock exchanges to trade derivative products, notably stock index futures. Simultaneously, the Financial Futures Trading law sanctioned financial derivative exchanges, and the Tokyo International Financial Futures Exchange (TIFFE) opened in 1989

[Japan Securities Research Institute (1990)]. As of 1990, Japanese exchanges traded 13 percent of worldwide volume, constituting the largest derivative market in the Pacific Rim and the second largest worldwide. In the same year, the Nikkei 225 stock index futures contract, traded on the Osaka Stock Exchange (OSE), became the most actively traded stock index futures contract.

In addition to Japan, the Pacific Rim has financial derivative exchanges located in Australia, Hong Kong, New Zealand,² the Philippines, and Singapore, with a financial derivative exchange proposed in Malaysia. In 1990, these Pacific Rim exchanges traded 4 percent of worldwide exchange traded volume. The Singapore International Monetary Exchange, Ltd. (SIMEX), the first Asian financial derivative exchange, presently trades only nondomestic financial derivatives. In addition to its international derivative offerings and membership, SIMEX and the CME have effectively offered its members extended trading hours in British pound, German deutschemark, Japanese yen, and three month Eurodollar derivatives since 1984. This is done through a mutual offset system where trading positions established at one exchange can be transferred to or liquidated at the other exchange, providing inter-exchange fungibility for the designated contracts. The remaining exchanges primarily trade domestic financial derivatives.

Numerous financial derivative markets opened in Europe during the 1980s as the European Community (EC) countries modernized financial markets in preparation for Europe 1992. During the 1980s, France was one of the countries which underwent extensive credit, capital, and exchange rate deregulation. The removal of quantitative credit controls and the entry of nonfinancial participants into the money markets created new markets for negotiable rate instruments: commercial paper and certificates of deposit. Capital market reforms were assisted by the Banking Act of 1984 which increased the number of capital market participants by removing the distinction between commercial and investment banking. Throughout the 1980s, exchange rate controls were gradually liberalized [Ducruet and Papadacci (1992)]. The culmination of France's financial industry liberalization and modernization created the demand for financial derivatives, and the

Marché à Terme International de France (MATIF) opened in 1986. As of 1990, MATIF trades the French *notional* bond future, the third largest government bond future worldwide. In contrast to France's financial market deregulation, Germany was motivated to open a derivative exchange by the successful trading of a German government *bund* future on the nearby London International Financial Future Exchange (LIFFE). Amendments to Germany's gambling law in 1989 permitted retail participation in derivative markets, followed by the opening of Germany's first financial derivative exchange, Deutsche Terminbörse (DTB), in 1990.³ In addition to France and Germany, European financial derivative exchanges are presently more or less active in Austria, Belgium, Denmark, Finland, Holland, Ireland, the Netherlands, Spain, Sweden, Switzerland, and the United Kingdom, with financial derivative exchanges proposed in Italy, Luxembourg, and Norway. Similar to France, extensive financial market deregulation programs were implemented during the 1980s in Finland, Ireland, and Sweden. In 1990, European exchanges—excluding LIFFE—traded 10 percent of worldwide exchange traded volume.

LIFFE is the oldest and largest European financial futures exchange. Unlike the majority of European exchanges, LIFFE's derivatives and membership are internationally oriented. LIFFE trades EC, German, Italian, Japanese, Swiss, and U.S. financial derivative products. For each country, LIFFE offers a range of products, notably interest rate derivatives with maturities spanning the yield curve. Additionally, LIFFE trades derivatives based upon the four most actively traded government debt markets: German, Japanese, U.K. and U.S. government bond futures. LIFFE is the third largest volume exchange worldwide, following the U.S. and Japanese markets. In 1990, LIFFE traded 8 percent of worldwide exchange traded volume.

The transaction cost difference

The increasing number and growing size of derivative exchanges has increased exchange competition. Derivative exchanges and their members are increasingly competing with other derivative and cash exchanges through product offerings, trading hours, and notably, competitively priced transaction costs. As similar derivative products continue to be listed and trad-

ed across multiple exchanges, trading will tend to flow to the market offering the lowest transaction costs. The continuing internationalization of markets finds market participants increasingly trading on exchanges across several countries with different cost structures. Assessing execution costs between markets is a complex exercise because transaction costs vary within an individual market across time. A derivative market's transaction costs vary in accordance with the degree of liquidity and price discovery, the size of the trade, the type of market participant, the activity in the underlying financial asset market, and the legal and regulatory framework over a country's financial markets.

Transaction costs for exchange traded derivatives typically include the bid-ask spread (the difference between the bid price and the asked price), commissions, exchange and clearing fees, and margin requirements. Internationally, the trend has been to reduce these costs. Commissions are generally negotiated in most countries' markets according to the market participant and the size of trade, with the exception of the Japanese markets which still adhere to fixed commission rates.⁴ Competitive pressures are reducing negotiated commissions, as shown by a 1991 CBOT survey which reported the majority of CBOT members had reduced average commission rates between 21 percent to 50 percent over the past five years.⁵ During 1991, brokers at MATIF dramatically lowered and, in some instances, temporarily waived commission fees to attract market participants.⁶ Actively traded markets typically have narrow bid-ask spreads, minimizing this trading cost component. New exchanges, such as DTB and MATIF, have asked dealers to minimize the bid-ask cost in order to attract market participants.

To the extent margin requirements force traders to hold assets in proportions that they would not otherwise hold, these requirements impose indirect transaction costs on the trader. The major exchange clearinghouses generally do not require noninterest bearing (that is, cash) margin, except for the Japanese exchange clearinghouses. This increases Japanese trading costs by the amount of foregone interest which could have been earned on investing the noninterest bearing margin in an interest bearing instrument. Other exchanges are actively seek-

ing to reduce the opportunity costs associated with margin requirements. For instance, a CME proposal currently under review by the Commodity Future Trading Commission (CFTC), the U.S. future exchange regulatory agency, could further reduce margin opportunity costs by extending permissible collateral to include stock and mutual fund shares. Exchanges are also seeking to reduce the burden of margin requirements by recognizing offsetting positions traded on the same exchange. This portfolio approach to margin setting leads to reduced margin requirements because margin is calculated on positions which offset and therefore reduce risk [Behof (1989)]. These intra-exchange cross margin programs have been established by the CBOT, CME, LIFFE, MATIF, SIMEX, and Sydney Futures Exchange (SFE) clearinghouses. Cross margin programs have also been established between exchanges, with an inter-exchange program established in 1989 between the CME clearinghouse and the Options Clearing Corporation (OCC), the clearinghouse for five U.S. exchanges which trade options. As a result of this inter-exchange cross margin program, margin requirements have been reduced by 70 percent for some positions. Similarly, the CBOT clearinghouse and OCC established an inter-exchange cross margin program in 1991.⁷

A country's legislative and regulatory rules may impose additional transaction costs. Although the legislative and regulatory playing field is not yet level, many countries are altering or eliminating laws and regulations which increase trading costs. Between 1990 and 1991, Germany, the Netherlands, Sweden, and the U.K. abolished security transfer taxes on their respective asset markets [White, Kupiec, Duffee (1990)]. Along with the elimination of the taxes on the asset markets, Sweden and the U.K. correspondingly eliminated taxes on derivative trades. Presently, derivative taxes are assessed in Finland, France, Hong Kong, and Japan.⁸ Sweden offers an illustration of the impact that transaction taxes can have on an exchange. Sweden doubled its equity transaction tax in 1986, increasing equity trading on Swedish stocks in foreign markets, notably London. In 1989, Sweden extended the tax to futures and options trades, which substantially reduced futures trading on Sweden's OM Stockholm (OM) and closed the Swedish Op-

tion and Future exchange (SOFE).⁹ Although the derivative tax included option trades, the tax on these trades was considerably lower and did not dramatically reduce option trading on OM. The futures tax effectively eliminated futures trading on OM during 1989 and 1990, in comparison to over 300,000 futures contracts traded at OM in 1988, the year prior to the introduction of the derivative tax. With the abolition of the tax on both the underlying asset and derivative markets in 1990, OM's futures volume for 1991 approached 4 million contracts.

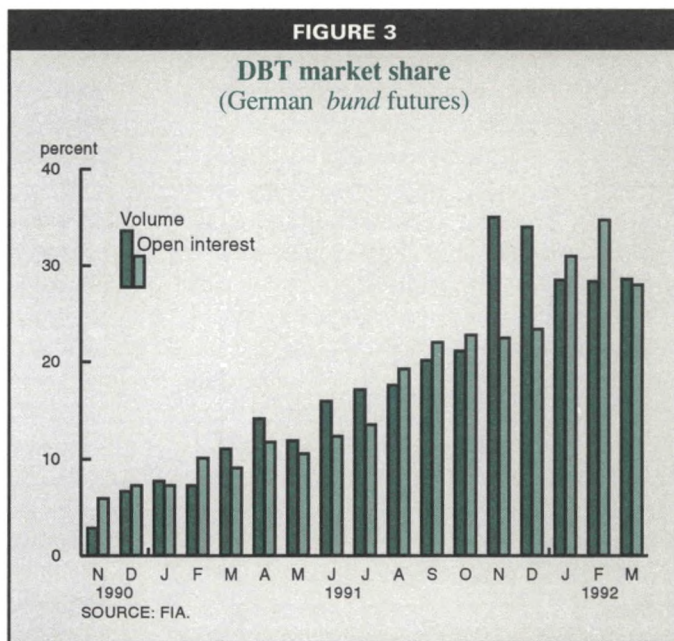
Given the difficulty of making transaction cost generalizations on a "by market" basis, a more feasible comparison can be completed on a "by transaction" basis. A 1991 Salomon Brothers transaction cost study replicated a stock index portfolio transaction specified at a face value of (U.S.) \$50 million in the Japan, U.K., and U.S. markets [Gastineau (1991)]. In the futures markets, total transactions costs were lowest in the U.S., followed by Japan and, finally, the U.K. The noninterest bearing margin requirement of Japanese exchanges and the large bid-ask spread on U.K. exchanges were responsible for the relatively lower transaction costs in the U.S. However, since this study was completed, commission and margin requirement increases have substantially increased the total transaction costs of executing this transaction on the Japanese future markets. In the option markets, total transaction costs were lowest in Japan, followed by the U.S. and the U.K. Cost differences between Japan and the U.S. were slight, with the bid-ask spread marginally higher in the U.S. The study highlighted the fact that of all the U.S. cost estimates, the bid-ask spread on options was the most difficult to estimate because this cost varies widely under different market environments. Once again, the relatively large bid-ask spread increased the total costs of executing the option transaction in the U.K.

Competition for liquidity

A primary characteristic of a successful derivative market is liquidity. Liquid markets are actively traded, with small price changes. Prior to the 1980s expansion, trading in a particular type of future or option contract tended to be concentrated on a single exchange, usually the first exchange to introduce the contract. Being first to create a liquid contract market gave an exchange a competitive advantage which typically eliminated any trading for the same contract

on a competing exchange [Miller (1990)]. With the industry's expansion, exchanges are aggressively competing for existing liquid contract markets. In some instances, newer exchanges are gaining considerable market share, neutralizing this former "first exchange advantage." Decreasing transaction costs assist in increasing market share and, correspondingly, liquidity. In particular, the exchange growth is challenging the internationally oriented exchanges, such as the CBOT, CME, LIFFE, MATIF, and SIMEX, to retain and expand product offerings. During the 1980s, exchanges opened specifically to recapture trading in domestic financial products that was occurring at foreign exchanges. At the same time, many existing exchanges which trade domestic financial derivatives expanded through foreign product introductions. Exchange markets also faced increasing competition from OTC markets for derivative products. For some financial derivatives, exchanges have had greater difficulty in competing with the older, more established OTC markets.

Prior to 1990, German law prohibited the trading of futures. As a result, trading in the German government *bund* future was launched by a nondomestic exchange, LIFFE in 1988. Since November 1990, DTB has pursued German government *bund* future volume traded on LIFFE. DTB's *bund* futures market has consistently grown to account for 34 percent of total volume and 23 percent of total open interest as of December 1991 (see Figure 3).¹⁰ DTB's growing market share is the result of transaction costs reductions to competitively position its contract against LIFFE's contract (see Table 2). Margin requirements were lowered beginning June 1991¹¹ and exchange fees were temporarily suspended beginning August 1991. Dealers are increasing market liquidity by trading at least 20 contracts with a maximum spread of no more than 3 ticks—a tick being the minimum allowable price movement—or 75 deutschemarks.¹²



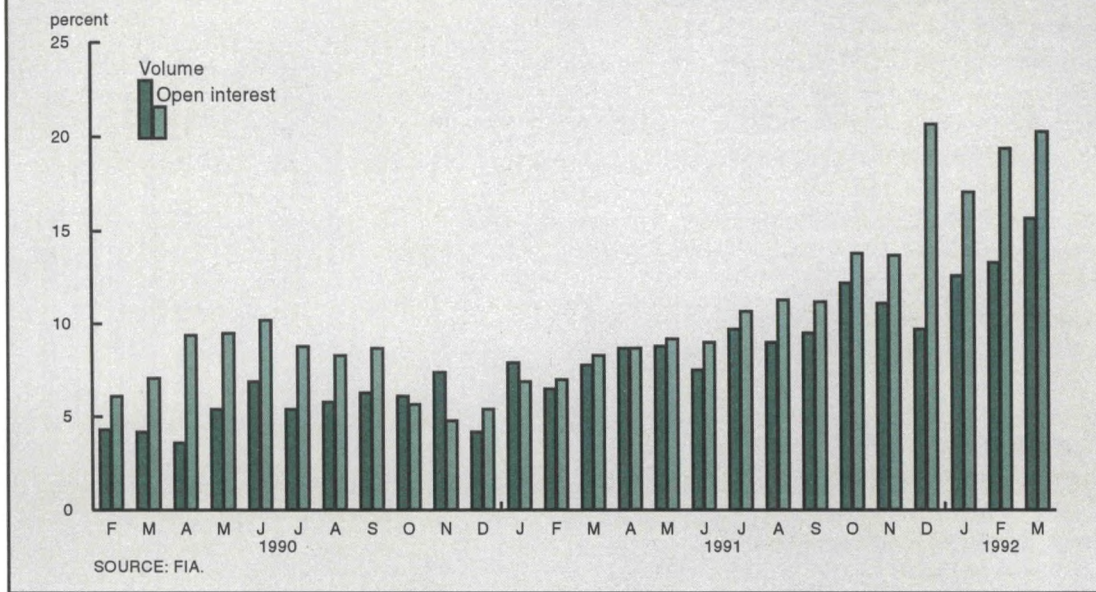
Until recently, TIFFE easily dominated trading of its domestic three month Euroyen future, introduced in June 1989. In October of 1989, SIMEX introduced a comparable future, but volume languished. Until the last half of 1991, TIFFE's market share has been 90 percent of total volume and open interest. Since mid-1991, SIMEX trading gains have gradually increased, exceeding 10 percent of total volume and 20 percent of total open interest by December 1991 (see Figure 4).¹³ Although the competitive impact cannot yet be assessed, TIFFE has responded to SIMEX's increasing market share by extending trading hours to coincide with SIMEX's longer trading hours. However, competition between the two exchanges is not a straightforward transaction cost issue at present. Although SIMEX's transaction costs are lower than TIFFE's, some observers of the Japanese markets believe SIMEX can compete only for a

TABLE 2
German *bund* future transaction costs

	DTB	LIFFE
Commission	Negotiated	Negotiated
Margin	3,000 DM	2,000 DM
B/A spread	50-75 DM (2-3 ticks)	25-50 DM (1-2 ticks)
Exchange fees	None	90 pence

FIGURE 4

SIMEX market share
(Three month Euroyen futures)



subset of the total trading volume. These observers indicate Japanese market participants tend to trade through domestic markets, as shown by TIFFE's market share. SIMEX's competitive transaction costs, however, should continue to challenge TIFFE.

Through a series of competitive contract introductions, MATIF is challenging LIFFE's status as the leading international exchange in Europe. The rivalry started in 1989 when MATIF listed its first nondomestic future, the three month Eurodeutschmark future. LIFFE's contract succeeded, in great part attributable to LIFFE's established international product offerings and membership, but MATIF's failed. However, MATIF followed with the successful introduction in October 1990 of an ECU bond futures contract. By December 1991, MATIF traded 99 percent of total volume and 95 percent of total open interest. Competitive transaction costs and a product revision assisted MATIF's success. Increased competition between brokers substantially reduced commission costs, and similar to DTB, dealers committed to competitive position and bid-ask spreads. MATIF revised its contract to broaden the range of deliverable ECU bonds in comparison with LIFFE's contract, ironically extending delivery to include British ECU bonds.¹⁴ Once again both exchanges went head-to-head in the

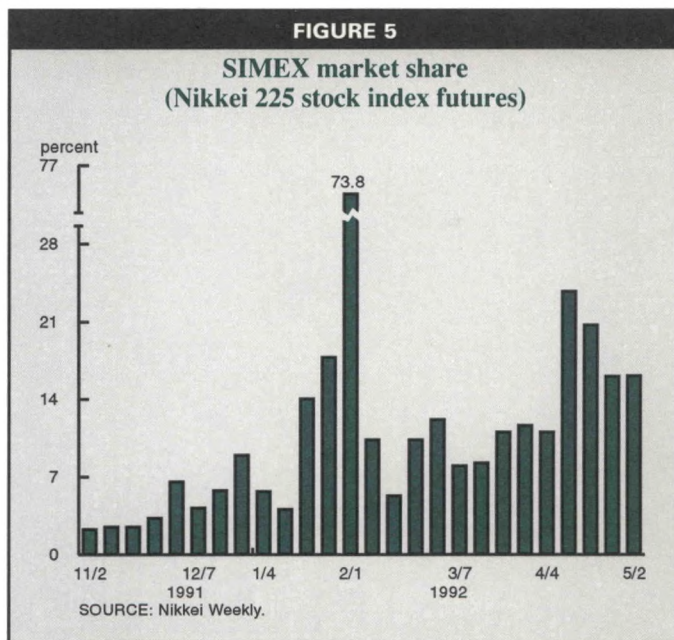
September 1991 launch of Italian bond futures, LIFFE easily dominating trading as London is the largest market for lira denominated debt outside of Italy. However, LIFFE will be challenged by another competing domestic exchange, as Italy is organizing a derivative exchange to trade Italian bond derivatives.¹⁵

Nikkei 225 stock index derivatives are one of a growing number of derivative products that can be exchange traded almost 24 hours through exchange listings on the OSE, SIMEX, CME, and American Stock Exchange (AMEX).¹⁶ Nikkei 225 stock index futures were introduced on SIMEX in 1986; by the OSE in 1988; and by the CME in 1990. The introduction of OSE's contract after SIMEX's contract did not reduce SIMEX's volume. Rather, contract volume at both exchanges increased, however OSE's volume grew faster than SIMEX's. Although the OSE continues to dominate Nikkei 225 stock index future trading, large increases in transaction costs at the OSE have increased SIMEX and CME Nikkei 225 stock index futures trading. Specifically, OSE commissions have doubled, margin requirements have been successively raised from 9 percent of contract value in 1988 to 30 percent in 1992, and trading has been restricted within a narrow range of the previous trading day's closing price, effectively reducing the price

discovery process on the OSE. SIMEX and CME margin requirements are half of the OSE's requirement and, unlike the OSE, do not require noninterest margin collateral [Waltner (1992)]. SIMEX, OSE's regional competitor, has benefitted considerably from OSE's increasing trading costs, increasing market share from only 2 percent of volume in November 1991 to 23 percent in April 1992 (see Figure 5).

Options on the S&P 500 stock index have been traded on nearby rival exchanges (the CME and CBOE) since 1983. The CME option is based on one S&P 500 stock index future contract, also traded at the CME; while the CBOE option is based directly on the S&P 500 stock index.¹⁷ Prior to 1988, the CME option was more actively traded than the CBOE option. As a result of the stock market decline of October 1987, margin requirements on both option contracts were raised, increasing the transaction costs of trading these contracts. CME option trading was more severely impacted than CBOE option trading, possibly due to factors other than the increase in transaction costs. CME option volume declined by 60 percent in 1988, while CBOE option volume declined by only 20 percent. For year-end 1991, the CBOE option traded 57 percent of total option volume. In addition to option competition with the CME, the CBOE now competes with four other U.S. exchanges—AMEX, the New York Stock Exchange (NYSE), the Philadelphia Stock Exchange (PHLX), and the Pacific Stock Exchange (PSE)—for option trading. The Securities and Exchange Commission (SEC), the regulatory body of the five exchanges, terminated option exclusivity in October 1991 to foster competition between the five exchanges.

The 1980s exchange expansion did not include growth of exchange traded currency derivatives. For example, LIFFE delisted all currency derivatives in 1990. The majority of currency derivatives have traded and will continue to trade on OTC interbank foreign exchange markets. The largest of these markets is located in London, with New York, and Tokyo



also major foreign exchange centers. These OTC markets dwarf exchange traded markets because of their large size, product depth, and 24 hour accessibility. The market for yen denominated derivatives illustrates the role of the exchange in this particular product market. Currently, the Japanese yen is the second largest OTC currency traded. Japanese yen derivatives are also exchange traded on the CME, and to a much lesser extent on the MidAmerica Commodity Exchange (MIDAM), Philadelphia Board of Trade (PBOT), PHLX, and SIMEX. Similar to LIFFE, TIFFE no longer trades Japanese yen futures due to Tokyo's active foreign exchange market. The gross daily turnover in 1989 of OTC Japanese yen approximated \$28 billion [Federal Reserve Bank of New York (1989)], seven times the estimated \$4 billion notional principal traded daily on exchanges in 1991.

Exchange versus OTC market structures

The derivative exchange market is a relatively new market organization compared with the OTC market. An exchange market is a highly organized market, specifying rules of trading, contractual terms, market's mode of operation, and conditions of membership. In contrast, an OTC market generally lacks these standardized features [Mulherin, Netter, and Overdahl (1991)]. With growth often a precursor to change, the 1980s expansion foreshadows

a change in the structure of derivative markets. Driving these changes is the increasing sophistication of market participants, as institutional participants trade both exchange and OTC markets. Increasingly, many of the new exchanges do not resemble their predecessors, while certain OTC markets increasingly resemble exchanges. Exchange markets are evolving new trading structures, while OTC markets are incorporating exchange clearinghouse features. This restructuring process tends to be more critical for exchanges, because exchange markets are under regulatory jurisdiction.

Many OTC markets span the New York-London-Tokyo trading day. Likewise, exchange traded derivatives are available for an increasing portion of the 24 hour trading day. However, customers are currently required to shift from exchange to exchange as the day proceeds. The financial derivatives which can be traded currently beyond the normal trading day are: the British pound, German deutschemark, three month Eurodollar, Japanese government bond, Japanese yen, Nikkei 225 stock index, and U.S. Treasury bond futures and options.

Developments since the 1980s point to the increasing acceptance of alternative trading methods which bypass the trading pit. Prior to the 1980s, derivative exchanges traded primarily through the open outcry system, where traders physically convey their bids or offers in the trading pit. The majority of new exchanges which opened in the 1980s instead have selected automated forms of trading, ranging from LIFFE's Automated Pit Trading (APT) open outcry trading system to DTB's trade matching system. LIFFE's APT system supplements the trading pit, extending trading hours as well as supporting markets for low volume derivative products during the LIFFE trading day. Other exchanges with after-hour automated trading also operate in Australia and Japan. In contrast, DTB's trade matching system completely replaces the trading pit. Other fully automated exchanges trading financial derivatives also operate in Austria, Belgium, Denmark, Japan, New Zealand, Spain, Sweden, and Switzerland. With the exception of the Japanese exchanges, these exchange markets are small compared to existing open outcry exchange markets.

Automated trading systems are noticeably absent from U.S. derivative exchanges with the CBOT and CME operating several internation-

ally important open outcry markets. In addition, until recently, the only off-exchange trade permitted by the CFTC was an exchange for physicals (EFP), a trade—primarily after-hour—of an asset for a future based on the asset. CFTC records estimate EFP transactions account for between six and eight percent of currency future volume and between four and six percent of bond future volume.¹⁸ However, the CME's forthcoming Global Automated Transaction System for Futures and Options (GLOBEX) represents the first U.S. automated after-hour trading system. Another automated trading system, the CBOT's Project A, will emulate LIFFE'S APT system for facilitating low volume markets, and additionally will provide access to underlying asset markets.¹⁹ Besides automated trading, the CME's Large Order Execution System (LOX) is the first program which permits large, primarily institutional, S&P 500 future trades of 300 or more to be executed outside the trading pit, known as upstairs trades. LOX trades are similar to the crossing trades already permitted on the U.S. stock exchanges.

As trading of exchange products evolves, the exchange clearinghouse remains the critical mainstay of this market structure. The clearinghouse role as guarantor to member trades mitigates counterparty credit risk, permitting exchange members and their customers to focus on price risk. The exchange clearinghouse has various means to monitor members' risk: customer position limits, large customer reporting systems, member capital-based position limits, and sophisticated risk analysis programs. The exchange clearinghouse also reduces the potential for default of a member through mark to market variation settlement, multilateral netting, additional margin requirements, or position reduction requests. If a member defaults, the clearinghouse has various levels of financial recourse. Since clearinghouse positions are marked to market on a daily basis, and can even be updated within the trading day, financial losses are minimized to, at most, a single trading day's price movement. The first level of financial recourse is the member's margin; following is the member's clearing capital; and finally, losses can be divided pro-rata among other clearinghouse members [Baer and Evanoff (1990) and Rutz (1989)]. The extensive exchange clearinghouse guarantee system is a primary, and critical, difference between

exchange and OTC markets. Although OTC derivative markets are large, these markets are constrained by the lack of mechanisms to control counterparty credit risk.²⁰ If an OTC party defaults, counterparties bear the financial losses of the derivative obligations. Lacking the exchange clearinghouse capitalization, the extent of financial losses borne by OTC counterparties may increase financial system risk [Miller (1990)].

The importance of the clearinghouse's guarantor role lessens when the general level of credit quality of its participants is high and comparable to the clearinghouse, while the clearinghouse is a more attractive counterparty as credit quality deteriorates. During the 1980s, pervasive credit quality deterioration increased counterparty risks in international OTC markets. A large number of financial and nonfinancial firms were downgraded by credit rating agencies. For example, only four private sector banks are rated triple-A worldwide. Motivated by the credit deterioration, OTC market participants are incorporating attributes of the exchange clearinghouse above traditional counterparty selection and monitoring systems. Several OTC participants now require collateral or escrow deposits to be marked to market, similar to the clearinghouse margining system.²¹ A consortium of banks in North America and Europe, respectively, are planning clearinghouses for foreign currency transactions. Both the North American Clearinghouse Organization (NACHO) and the European Clearinghouse Organization (ECHO) would clear and settle OTC interbank foreign exchange trades. An important precedent for NACHO and ECHO is the Government Securities Clearing Corporation (GSCC). Since 1988, the GSCC has cleared and settled U.S. government securities, which trade on OTC markets like the interbank foreign exchange markets [Woldow (1989)]. The GSCC is the counterparty to every trade, providing the guarantor and multilateral netting functions of the exchange clearinghouse. On a very small scale, clearinghouses of derivative exchanges are already clearing and settling OTC derivative trades. The MATIF clearinghouse clears and settles OTC trades on the *notional* bond future.²² Beginning in 1992, the clearinghouse for OM Stockholm and its franchise, OM London, will clear and settle OTC trades on a small number of OTC derivatives.²³ By assuming the counterparty risk, the ex-

change clearinghouse creates fungible exchange traded products.

To the extent OTC markets adopt features of the clearing and settlement systems, such as those employed by exchanges, counterparty credit risk will be more efficiently managed and the safety of the entire financial system will increase [Committee on Interbank Netting Schemes(1990)]. As the OTC market structure increasingly resembles the exchange market structure, regulatory policy will become a central issue. Exchange markets are regulated, while OTC markets are not, although many OTC market participants are regulated. In the U.S., this issue has been raised by the exchanges and is being reviewed by Congress. Currently, the OTC financial swap market, like the OTC forward market, is exempt from the CFTC's regulatory jurisdiction. Forward foreign exchange transactions are exempted under the Commodity Exchange Act (CEA). A 1989 policy statement provided criteria—referred to as the “safe harbor” guidelines—which exempt swap transactions from CFTC regulation [CFTC Policy Statement (1989)]. Several industry analysts argue that the unregulated OTC markets have an unfair competitive advantage compared to the regulated exchange markets [Miller (1990) and Mulherin, Netter, and Overdahl (1991)]. An alternative view would argue that regulated and unregulated markets simply fill different needs. Unlike exchanges, OTC markets facilitate the customization of unique risk management needs and are favored by high credit quality participants who do not require the clearinghouse financial guarantee. Part of the issue is that although the CFTC regulates exchange traded derivatives, there presently is no definition of futurity—what distinguishes a derivative market that is subject to CFTC regulation from a derivative market that is not. Instead, the CFTC has reviewed market issues, like the financial swap market, on a case-by-case basis. The outcome of this issue in the U.S. may serve as a precedent for exchange markets worldwide.

Conclusion

Recent developments indicate that the expansion of the derivative industry will continue. Five countries have opened financial derivative exchanges since 1990 and several other countries are either organizing or proposing financial derivative exchanges. The further application of financial engineering will increase the precision

of managing unique risks, expanding the product offerings of the OTC market. Institutional investor preferences with respect to products, transaction costs, and clearing and settlement features will continue to drive competition and changes in both the exchange and OTC markets. As a result, exchanges are increasing their efforts to lower transaction costs and expand

their array of products. Competition between exchanges operating under different regulatory regimes is driving regulators to reconsider their approach to regulation. Competition from the OTC markets and the blurring of the OTC and exchange market structures will only add to this pressure.

FOOTNOTES

¹In 1972, the CME introduced the first financial derivatives: British pound, Canadian dollar, Dutch guilder, German deutschmark, Japanese yen, Mexican peso, and Swiss franc currency futures.

²The New Zealand Futures and Options Exchange (NZF&OE) has recently been purchased by Australia's Sydney Futures Exchange (SFE).

³Ginger Szala, "Financial walls tumble for German investors," *Futures*, January 1990, pp. 42-44.

⁴"Japan fights big bang," *Futures*, November 1991, pp. 8-9.

⁵Mary Ann Burns, "FCMs today: lean, mean trading machines," *Futures Industry*, September/October 1991, p. 19.

⁶Paul Dickins, "Commissions, commotion, competition trying MATIF," *Futures*, April 1991, p. 48.

⁷"Cross-margining system planned for CBOT trades," *Wall Street Journal*, February 22, 1991.

⁸Thomas R. Donovan, "International taxing matters," *Futures Industry*, May/June 1992, pp. 16-17.

⁹Tony Shale, "Why did SOFE have to die," *Euromoney*, March 1989, pp. 49-52.

¹⁰LIFFE introduced a German *bund* option in April 1989 and DTB in August 1991. As of December 1991, DTB traded 16 percent of total volume and 12 percent of total open interest.

¹¹*DTB Deutsche Terminbourse Press Information*, June 12, 1991.

¹²"Global roundup," *Futures*, September 1991, p. 42; Tony McAuley, "Europe's futures markets hotly pursue U.S. leaders," *Wall Street Journal*, December 27, 1991, p. C1.

¹³SIMEX introduced a three month Euroyen option in June 1990 and TIFFE in July 1991. As of December 1991, TIFFE accounted for 80 percent of total volume and 87 percent of total open interest.

¹⁴"European futures exchanges-street fighters," *The Economist*, December 1, 1990, pp. 96-97.

¹⁵Paul Dickins, "LIFFE, MATIF meet once again in Eurowars sequel," *Futures*, September 1991, p. 40h.

¹⁶AMEX trades Painewebber Nikkei put warrants and Japanese index options, similar to the Nikkei 225 stock index.

¹⁷The CBOE changed the S&P 500 option from an American to a European option beginning in 1986. This contract change also contributed to substantial volume trading of the CBOE option.

¹⁸Keith Schap, "EFPs: Do regulations ruin their utility," *Futures*, November 1991, pp. 14-16.

¹⁹Ginger Szala and Kira McCaffrey, "CBOT has A-plan to automate floor," *Futures*, April 1992, p. 46.

²⁰Kerry Tremble and Arun Sarwal, "Happiness is a full net," *Euromoney*, April 1991, pp. 34-35.

²¹"Seminar: on-exchange versus off-exchange derivatives," Futures Industry Association's Seventh Annual Futures and Option Conference, Chicago, October 1991.

²²"Seminar: transnational transaction issues," Futures Industry Association's Seventh Annual Futures and Option Conference, Chicago, October 1991.

²³*Derivatives Week*, April 13, 1992, p. 13.

REFERENCES

Baer, Herbert L. and Douglas D. Evanoff, "Payment system issues in financial markets that never sleep," Federal Reserve Bank of Chicago, *Economic Perspectives*, November/December 1990, pp. 2-15.

Behof, John P., "Intermarket cross-margining for futures and options," *Issue Summary of the Federal Reserve Bank of Chicago*, May 1989.

Black, Deborah G., "Success and failure of futures contracts: theory and empirical evi-

dence," *Monograph Series in Finance and Economics: Salomon Brothers Center for the Study of Financial Institutions*, 1986, pp. 1-31.

Cargill, Thomas F. and Shoichi Royama, "The evolution of Japanese banking and finance," in George G. Kaufman, ed., *Banking Structures in Major Countries*, 1992, pp. 333-388.

Committee on Interbank Netting Schemes, *Lamfalussy Report*, Bank of International Settlement, Basle, Switzerland, November 1990.

"Commodity futures trading commission: regulation of hybrid instruments; policy statement concerning swap transactions; final rule and notice," *Federal Register*, Volume 54, No. 139, July 21, 1989, pp. 30684-30697.

Ducruzet, L. Beduc F. and P. Papadacci, "The French financial system," in George G. Kaufman, ed., *Banking Structures in Major Countries*, 1992, pp. 245-292.

Euromoney, various issues.

Federal Reserve Bank of New York, "U.S. foreign exchange market survey," April 1989.

Futures, various issues.

Futures Industry, various issues.

Futures Industry Association, *Monthly Volume and Open Interest Reports for Futures and Options*, various issues.

Futures Industry Institute, *Futures and Options Fact Book*, 1992.

Gastineau, Gary L., "A framework for the analysis of portfolio execution costs—stocks versus derivatives," *Portfolio Trading*, Salomon Brothers, October 1991, pp. 1-14.

Japan Securities Research Institute, "Securities futures trading," *Securities Markets In Japan*, 1990, pp. 102-111.

Miller, Merton, "International competitiveness of U.S. futures exchanges," *Journal of Financial Services*, 1990, pp. 129-150.

Moser, James T., "Futures margin and excess volatility," *Chicago Fed Letter*, June 1991.

Mulherin, Harold, Jeffrey M. Netter, and James A. Overdahl, "Prices are property: the organization of exchanges from a transaction cost perspective," Draft, Washington D.C., January 22, 1991, pp. 54-80.

Rutz, Roger D., "Clearance, payment, and settlement systems in the futures, options, and stock markets," Board of Trade Clearing Corporation, February 24, 1989.

The Economist, various issues.

Wall Street Journal, various issues.

Waltner, Nicholas W., "Nikkei 225 futures: Osaka illiquidity and SIMEX boom," *Japanese Equity Research*, Salomon Brothers, Draft, 1992.

White, Pat A., Paul Kupiec, and Gregory Duffee, "A securities transactions tax: beyond the rhetoric, what can we really say?," Finance and Economics Discussion Series, Federal Reserve Board, August 1990, p. 13.

Woldow, Robert, "The Government Securities Clearing Corporation (GSCC)," *Study of International Clearing and Settlement*, Bankers Trust Company, Volume 1, 1989, p. 63.

ECONOMIC PERSPECTIVES

Public Information Center
Federal Reserve Bank of Chicago
P.O. Box 834
Chicago, Illinois 60690-0834

Do Not Forward
Address Correction Requested
Return Postage Guaranteed

BULK RATE
U.S. POSTAGE
PAID
CHICAGO, ILLINOIS
PERMIT NO. 1942

FEDERAL RESERVE BANK
OF CHICAGO