

**OVERVIEW OF FINANCIAL DERIVATIVES USED BY FINANCIAL INTERMEDITARIES:  
SOME IMPLICATIONS FOR FINANCING AGRICULTURE**

**Jian Yang and David J. Leatham**

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Department of Agricultural and Consumer Economics  
College of Agricultural, Consumer and Environmental Sciences  
332 Mumford Hall  
Urbana, IL 61801

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# Overview of Financial Derivatives Used by Financial Intermediaries: Some Implications for Financing Agriculture

by  
Jian Yang and David J. Leatham<sup>1</sup>

## Introduction

Financial derivatives<sup>2</sup> are instruments whose value depends, or derives from, one or more underlying financial assets (GAO, 1994). The underlying assets include financial securities, security indexes, reference rates, and some combination of them.

Financial derivative products are normally categorized into four basic types: financial forward, financial futures, financial options, and financial swaps. A financial forward obligates its owner to buy a specified financial asset on a specified future date at the origination of the contract. Financial futures are a special kind of financial forward contract traded on organized exchanges and thus can be defined similarly. A financial option gives its owner the right rather than the obligation to buy or to sell specified financial assets at a predetermined price on (and sometimes before) a stated expiration date. A financial swap is an agreement between counterparties to make periodic payments, based on a specified financial asset, to each other for a specified period. These basic instruments can be combined to create numerous more complex derivatives. Also, financial derivatives exist in two forms: exchange-listed and OTC (over-the-counter). Exchange-listed derivative products are composed of financial futures and options while OTC derivative products include financial swaps and forwards, as well as some financial options.

One of the most important functions of financial derivatives is risk management; it is already widely recognized by most market participants. Recent publicity of losses in derivative transactions casts some doubt on the soundness of using derivatives<sup>3</sup>. However, many have realized that properly managed derivatives are a key to keeping the US financial system competitive, and losses mostly result from speculation and other factors not directly related to derivatives (McGorman, 1995). Better understanding of financial derivatives' uses is necessary and important to keep derivative markets growing and healthy.

This paper provides a review of the use of financial derivatives by several major lenders and extends discussion to financing agriculture, focusing on interest rate

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<sup>1</sup> Jian Yang is a graduate student and David J. Leatham is a professor, Department of Agricultural Economics, Texas A&M University.

<sup>2</sup> "Derivatives" usually refer to derivative contracts, as defined here. However, the term sometimes also covers derivative securities, which are basically composed of two types: hybrid and asset backed. For more details, see Paul Battaglia (1995).

<sup>3</sup> Several most notorious cases are more involved with transactions on derivative securities rather than derivative contracts.

derivatives. First, general benefits of using financial derivatives are presented. Second, individual use of financial derivatives by major lenders is examined in the following order: commercial banks, thrift institutions, and life insurance companies. Third, the risks associated with derivative use are considered briefly. Finally, implications for financing agriculture by using derivatives are discussed in more depth, and concluding remarks are made.

### **Benefits of Using Financial Derivatives**

Sangha (1995) summarized the general benefits of using financial derivatives as follows.

1. A prudent use of financial derivatives can provide a new mechanism to manage or reduce various business risks at low transaction cost.
2. The innovative use of financial derivatives can greatly help end-users cut their financing cost.
3. Financial derivatives can provide more access to financial markets, especially to unfamiliar ones at lower costs. Put another way, they can create more complete markets to investors.
4. Financial derivative instruments play an important role in asset management due to their lower transaction costs relative to the spot market instruments.
5. The users of financial derivatives can expect to be offered opportunities on taking advantage of asymmetries in tax and regulatory requirements across different countries, markets or securities.
6. Financial derivatives can be used to speculate and make profits by assuming certain risks, probably with suitable degree.

Derivatives as a hedging tool in asset/liability management are very attractive, though it has been controversial recently. Asset/liability management is of greatest interest to depository intermediaries, contractual intermediaries, and multinational corporations. Commercial banks and thrift institutions are depository intermediaries because their sources of loanable funds consist of deposits received from businesses, households, and the government. Life insurance companies, the best known contractual intermediaries, enter into contracts with their customers to promote savings and/or financial protection against loss of life. Compared to traditional portfolio adjustment methods, hedging by using financial derivatives has particular strengths, including high speed, lower transaction costs, and no increased credit risk in management of (interest rate) risks (Morris and Merfeld, 1988). We will survey the typical use of financial derivatives by these institutions.

## Use of Financial Derivatives by Commercial Banks

Commercial banks were the earliest and are also the most sophisticated users of financial derivatives. They are not only end-users, but also dealers of derivatives. During the past few years, the use of derivatives in the U.S. banking industry has grown rapidly (Edwards and Eller, 1995). From 1990 to the end of the first quarter of 1995, total assets of those US banks involved in derivatives grew almost 35%, from \$2.3 trillion to \$3.1 trillion. During the same period, the notional amounts of derivative contracts at US banks almost tripled, rising from \$6.8 trillion to almost \$18 trillion.

However, the number of banks involved in derivatives is still relatively small, about 600 as of March 31, 1995. A primary reason for the low participation rate seems to be the large amount of intellectual and reputational capital required to develop and maintain a comprehensive and knowledgeable derivatives trading function (Gunther and Siems, 1995). Typically, only the large institutions can gather the necessary resources to produce extensive derivative trading operations. The available data confirms that the largest banks account for most of the activity: The top fifteen banks hold more than 95 percent of derivative contracts (as measured by notional amounts) of the US banking industry. Many argue that the positive association between bank capital and derivative activities is comforting from a regulatory perspective (Gunther and Siems, 1995).

Gunther and Siems (1995) explored the determining factors motivating banks' derivative usage. Potential effectiveness in hedging risks is claimed to be one of the strongest motivations for using derivatives. Hedging devices vary depending on users' balance sheet structure. Banks offer a wider array of financial services than any other type of financial institutions. The majority of assets are loans (70.4% in 1990). Most short-term loans and term loans have variable rate, but some term loans have a fixed-rate. Long-term security holdings are significant (total proportion of all kinds of security holding is 17.9% in 1990). Interest-bearing deposits, the largest form of liabilities for commercial banks (78.2% in 1990), primarily consists of time and saving deposits. Demand deposits are another important source of liabilities (14.4% in 1990). Traditionally, depository institutions have had longer average maturities on the asset side than on the liability side, and a rise in the interest rate would harm banks (Shaffer, 1991). Today, it is very difficult to specify a maturity structure generally applied to banks since they have diversified assets and liabilities, partly attributable to recent deregulation. Commercial banks still suffer funding gaps, though it may be negative or positive. Banks must manage the interest rate risk arising from the negative or positive gap or duration position in their assets and/or liabilities.

Many commercial banks actively use financial futures to manage their asset and liability price risks. Banks with a portfolio of fixed-rate assets may wish to hedge prices of these assets against a rising interest rate. Equally important, hedging against a rising interest rate by lenders can help lower default risk if increases in market rates are not reflected in the rate paid by the borrower. Two ways available are to fix the cost of financing or to prevent the portfolio from further price erosion (Powers and Castelino,

1991). Since a bank cannot always easily identify the exact source of funds used to finance a portfolio, it often may choose to hedge the asset itself. Consequently, the bank can sell an appropriate amount of underlying interest rate futures (usually long-term). The bank thus effectively unlocks the return on a fixed asset, matching the unlocked cost of liabilities that finance the asset. In another case, when a bank is concerned that liability costs may rise faster than asset returns, it may choose to protect its interest spread. In hedging a bank's interest spread it could be easier to lock in the cost of funding than to hedge particular assets. Short position in Eurodollar and T-bill futures contracts can be used since they more closely coincide with the nature of a bank's liabilities. The increase in cost of loanable funds would be offset by gains in futures contracts.

Some commercial banks may be more concerned about falling rates. Many commercial banks usually make nice profits as rates rise, because the rates of return on many of their assets (prime rate commercial loans) can be adjusted daily but the cost of liabilities does not change until the liability matures. Quite understandably, the rates at which the liabilities roll over often does not fall as fast as the prime rate on a large portion of the bank's assets. To deal with the threat of falling rates, a bank can buy futures contracts, matching the maturity of the existing portfolio of CDs or other variable rate liabilities. Another use of financial futures is in pre-refunding existing assets when rates are expected to fall. Essentially, the bank can purchase futures to lock in the future reinvestment rate. If interest rates move lower between the time the hedge is secured and reinvestment, the hedger's profit in the futures market helps reduce the cost of investments. Rebell and Gordon (1984) detail many more specific considerations of hedging strategies by using financial futures.

Listed interest rate options should be very attractive to banks as a hedging tool because of the contingent nature of many of their assets and liabilities (Ezell 1989). The two basic options are puts and calls. A call option gives the owner the right to buy a particular good at a certain price, with that right lasting until a specified date. A put option gives the owner the right to sell a particular good at a certain price, with that right lasting until a specified date.

The first use of interest rate options in bank asset management involves reducing the risk of a portfolio expansion through the sale of calls or, less frequently, the purchase of puts (against rising rates). For instance, when interest rates payable to depositors increase, the best choice available to banks is to extend out on a positively sloped yield curve (i.e., to invest on longer-term securities and earn a higher positive maturity premium) rather than downgrading the quality of their portfolio (i.e., investing on lower-rated securities typically with higher coupon yield and higher default risk). In that case, the only way available to reduce market risk (i.e., of further rising rates) and not to reduce current yield is to sell the call against position. Interest rate futures are sharply discounted relative to cash instruments in the case of a positively sloped yield curve and thus unacceptable. But the sale of call will bring additional premium income (completely or partially) to offset the depreciation of the portfolio. This proves effective during a

period of time when premium levels are rather high with regard to the volatility actually experienced. In situations where banks only want to run the least possible loss in the hedged asset position, buying put is generally preferable to either selling call or futures. The put hedge can flexibly lock in the floor price of the asset portfolio, and even prevent your portfolio from any direct price erosion at the expense of a premium.

Another good application is the hedging of a prime rate loan. Though banks usually have a large portion of their balance sheets already in a natural hedge (Powers and Castelino, 1991), it still could squeeze bank profits in the short run since earnings on these assets may not be adjusted as quickly as the rising cost of funds. Buying T-bill puts will provide protection against rising rates, and will prove better than other types of hedging methods when the prime rate adjustment in falling rate markets become sticky with regard to the rates on short-term securities. Also note that interest rate swaps generally would be better than interest rate options for hedging maturity mismatch of banks' assets and liabilities if the mismatch can be expected to last for a longer time. However, due to the high transaction cost and lack of liquidity of swaps during fluctuating markets, interest rate option strategies may be preferable if the assets must be hedged quickly or if the assets are expected to be sold after a relatively short holding period.

Interest rate options can also play a unique role in hedging asset risks of a contingent nature. One of the best examples is to hedge loan commitments (Leatham and Baker, 1984). Lenders frequently approve loans, such as mortgages, and allow a period of time for the applicant to accept or reject the loan. In other word, approval of a loan may implicitly be writing and giving to the potential borrower a put option for, say, 30 to 45 days. A lender could purchase a put option to hedge this risk.

The use of interest rate options on the liability side of bank management is for the most part quite similar to the application on the asset side, except they tend to be on the opposite direction and tend to be more oriented toward the short-term securities. Obviously, banks can use interest rate options or futures to hedge floating-rate liabilities and issuance of short-term CDs. In the former case, banks are forced to use the T-bill options or Eurodollar options since there are no listed options on CDs. As in asset hedging, in the situations where the basis (between futures and cash) is expected to move adversely (that is, the basis is strengthening for long hedging and weakening for short hedging), interest rate options hedge may be a good substitute for interest rate futures or cash hedge. Hedging the issuance of longer-term debt by interest rate options can at times be of particular benefit. When rates are generally expected to fall, banks are in a position to purchase calls and extend maturity of their liabilities. The institution can benefit from it whether the expected decline in rates materialize or not. Finally, gap risk, where exposure results from assets repricing before liabilities, can be hedged through the purchase of a call. This will allow greater profitability in the event of sharply rising rates, which may fit the overall risk structure of some banks better than the futures hedge which effectively locks in a rate.

Among OTC derivatives, commercial banks most often use interest rate swaps. Commercial banks enter into interest rate swaps for a variety of purposes. Interest rate swaps can help them reduce funding cost by benefiting from quality spread, which arises due to differences in interest rate spreads between fixed-and floating-rate credit markets. Typically, the quality spread between borrowers with higher credit ratings and smaller borrowers with lower credit ratings in fixed-rate market than the floating-rate market (Sangha, 1995). Whether they are fixed rate or floating rate payers in the swap, both counterparties can share the quality spread differential and have a lower borrowing cost if the market inefficiencies do continue to exist. However, more importantly, commercial banks can utilize interest rate swaps to manage their interest rate risk. Buying or selling swaps can serve to adjust the duration of banks' portfolio to that of their liabilities. Commercial banks can also provide more credit by using interest rate swap, partly because of greater access to some previously unexploited credit sources, and partly because of provision for better service to customers. Many customers prefer to minimize their rate risk by taking fixed-rate loans. But in the past, banks have found it difficult to extend fixed rate loans outright because their fixed rate funding costs have been high, sometimes as high as those faced by some of their customers (Das, 1989). The direct funding sources of lower cost for banks are often from money market. Thus, banks can enter into interest rate swaps agreeing to pay a fixed-rate while receiving a rate based on a floating rate index. Doing so, banks protect them from the later increase in interest rate and make offering of fixed-rate loans feasible: banks pay their debtors the received floating rate (of which a rise is concerned) from swaps and eventually actually pay a fixed-rate and meanwhile expect to receive the other fixed-rate from their loan borrowers. Commercial banks can also provide a floating rate loan, together with a swap, to the borrower. It is creating an equivalent of a fixed-rate loan to the borrower. But, by unbundling the components (the floating rate loan and the swap), banks can price each more efficiently.

It is worthy of noting that the use of financial swaps as an active hedging instrument of asset or liability management requires the capacity to enter into a swap position and subsequently reverse the original transaction. The depth of the relevant markets determines the availability of desired liquidity and the efficiency of financial swaps applied in these cases. However, banks most likely will hedge using an interest rate swap if its gap involves either an intermediate or a long-term planning horizon (Timothy and Kelly, 1995).

### **Use of Financial Derivatives by Thrift Institutions**

Nonbank thrift institutions have a much narrower scope of business and have been highly exposed to interest rate risk. Savings and loans (S&L) are a large percentage of the thrift industry. The S&L's portfolio primarily consists of long-term fixed-rate mortgage funded by short-term liabilities. The correlation coefficient between the S&L industry's ROA and the 10-year Treasury note rate over the 1977-86 period is -0.75 (and it is

statistically significant at the 2 percentage level) (Morris and Merfeld, 1988). The interest rate risk of a typical S&L is heavily dependent on the interest rate risk of its asset portfolio because the market value of liabilities is not very sensitive to changes in interest rates.

Morris and Merfeld (1988) argue that the effect of interest rate movements on the market value of mortgages can be separated into two components: a fixed-income effect and a prepayment effect. The fixed-income effect is the effect of changes in interest rate on the value of a fixed-rate mortgage holding the length of the payment stream—that is prepayments—constants. The fixed-income effect causes the market value of a mortgage to move in the opposite direction of a change in interest rate. The payment effect, an additional effect on mortgage value caused by changes in interest rate change, modifies the fixed-income effect such that mortgages rise in value less than other fixed-income securities when interest rates fall, and mortgages fall in value more than other fixed-income securities when interest rates rise. S&L's lose when interest rates go up and gain when interest rates go down because their costs of funds rise and fall with rate changes but the receipts from fixed-rate mortgage remain constant.

Interest rate swaps may be particularly useful for hedging the interest rate risk of S&L's, in terms of S&L's investment horizons. Swaps essentially allow S&L's to change a variable-rate cost of funds into a fixed-rate cost of funds. To do so, an S&L can enter a swap by becoming the fixed-rate payer and floating-rate receiver. The swap receipts can be used to pay the S&L's variable cost of funds. Thus, interest rate changes would not affect the cost of funds. However, swaps are a good hedge for the fixed-income component of interest rate risk but not for the prepayment component. Thus, swaps are a good hedging instrument for S&L's against small changes in interest rates. But for large changes in interest rates, the prepayment component is large, too. S&L's cannot exclusively rely on swaps to hedge against interest rate risk.

To hedge interest rate risk, S&L's can also use a variety of financial futures trading on different exchanges by taking a short position, selling financial futures. Most hedging by S&L's is done using Treasury bonds or Eurodollar futures. Like interest rate swaps, financial futures are a particularly inexpensive means of hedging. However, since the maturities of financial futures range from three months to two and a half year, swaps are often thought to be better than financial futures for hedging fixed-rate mortgages against variability in interest rates. Short positions in financial futures only provide S&L's with an effective hedge against the fixed-income component of interest rate risk. Still, like swaps, short positions in financial futures cannot hedge accurately against the prepayment risk. Marshall (1990) argued that the more unpredictable the prepayment rate, the greater the advantage of futures hedging over swap hedging.

As an alternative, options can be used effectively to hedge against large interest rate risk and to protect S&L's from prepayment risk. Usually, interest rate options on futures rather than interest rate options on cash instruments are in practice. The latter has a far less liquid market. Mortgage lenders can offset the prepayment effect by buying call



options to protect from falling interest rates; they can offset the prepayment effect by buying put options when interest rate rates rise, particularly above the mortgage coupon rate. In sum, it is possible to construct a mix of options and futures or swaps that practically manage a S&L's interest rate risk.

According to a recent Federal Home Loan Bank Board study, less than 10% of the thrift industry was actively involved in the futures and options at the end of 1986 (Frank, 1988). But the information would be incomplete if we do not allow for the falling interest rates at that time as the most significant deterrent to institutions entering the futures and options markets. Furthermore, the data during 1984-1986 reveals that options tended to be more popular than futures to thrift institutions.

### **Use of Financial Derivatives by Life Insurance Companies**

Life insurers invests the bulk of their funds in long-term securities such as bonds, stocks, and mortgages. But, due to the high predictability of their cash inflows (a major part of which are premiums from policyholders) and outflows, they have less uncertainty in managing their balance sheet than commercial banks and thrifts. Because of legal requirement and tradition, life insurance companies generally pursue income certainty and safety of principal, which have to rely on forecasting interest rate. Life insurers are exposed to interest rate risk particularly rising from their asset management. Thus, employment of financial derivative in their asset management is the focus of life insurers.

Some typical uses of financial futures by life insurers are illustrated by Powers and Castelino (1991). Insurance companies can use the futures market to hedge the depreciation of their assets since they usually hold a huge amount of fixed income securities. They can also use the futures market to increase the liquidity of their portfolio. A unique problem of life insurance companies is that any losses taken by life insurers in their fixed income portfolios must be charged against accumulated surplus and that lowers the amount of insurance a company can write. Financial futures can be used to help solve this problem. When rates begin to increase, a life insurer could sell futures contracts short against its existing portfolio. The decrease in value of existing portfolio can be offset by the gains from futures market when rates are higher. In this type of hedging, it is not necessary to identify futures contracts to be used for each particular cash position. Instead, only categorization of securities into major groups should be conducted.

A closer look at the use of financial derivatives by life insurers in real world is based on a valuable survey conducted in 1987 (Fingleton, 1989).

Table 1: Financial Derivatives in Use by Life Insurers (Percent of the group using the contract)

Derivatives	Larger Firms	Smaller Firms
Financial Futures	80%	25%
Financial Options	60%	12%
Financial Swaps	67%	25%
Financial Forwards (FRAs)	20%	19%

Source: Stephen Figlewski, "How Life Insurers Use Financial Futures and Options," BEST'S Review, March 1989.

Table 2: Most Frequently Used Contract by Life Insurers (Percent of the group using the contract)

Instruments	Larger Firms		Smaller Firms	
	Using Now	Likely In Future	Using Now	Likely In Future
Money market futures (T-Bill, Eurodollar, etc.)	27%	33%	6%	19%
Currency futures	33%	13%	0%	19%
Fixed-income futures (T-bond, T-note, etc.)	80%	13%	31%	44%
Stock index futures	40%	47%	12%	31%
Stock options	27%	27%	19%	19%
Money market options	7%	3%	6%	19%
Fixed-income options	47%	40%	12%	56%
Currency options	13%	27%	0%	19%
Stock index options	13%	53%	6%	44%

Source: Stephen Figlewski, "How Life Insurers Use Financial Futures and Options," BEST'S Review, March 1989.

Tables 1 and 2 show that financial futures are substantially more widely used than options. Financial swaps are also common. This is largely because of the less contingent nature of life insurers' assets and liabilities. The most popular futures contracts are those based on fixed-income instruments and stock indexes, and the most popular options contracts are fixed-income options and stock options. In contrast, life insurers less frequently use money market futures and money market options to hedge short-term interest rate risk since their funding sources are relatively insensitive to the risk.

Many strategies can be employed by life insurers, and the following are some of the most popular. Anticipatory hedging by buying bond futures to lock in a yield in

anticipation of a later purchase of actual bonds is one of the most common hedging strategies of life insurers. Another is immunization, using futures to adjust the duration of a bond portfolio. As a short futures position is added to the bond portfolio, the short position is added with a negative weighting into portfolio duration calculation and thus it can serve to lower the weighted average portfolio duration to the desired number (Leuthold, et al. 1989). To immunize a portfolio, it is necessary to adjust the portfolio so that its duration is equal to the holding period or investment horizon. Short hedging of current security position and hedging commitment period risk are also common. Writing covered calls and buying calls are two most common options strategies for life insurance companies. An option is covered when the writer owns enough of the underlying cash instruments to meet the requirements of the contract if it is exercised. A writer can also be covered by owning another call of the same class that a lower strike price. As a covered call writer, a life insurer is not required to pay any initial margin costs and aim to earn premium at the expense of giving up the right to any increase in the value of the underlying assets beyond the strike price. Buying calls, and buying puts which is another common option strategy for life insurers, help limit the loss of their portfolios and attain great leverage. Also, as we expected, speculation by uncovered long or short position or arbitrage to enhance returns are almost never employed in financial futures or option transactions.

### **The Risks Associated with Derivative Use**

Derivatives can reduce or transfer the risks in underlying cash instruments, but they might also introduce new built-in risks. Opinions differ in whether using derivatives increase more risk to the whole financial system, which is often called system risk. The concern about the system risk is heightened by the global market linkages that have been created by the use of derivatives. Separate studies by the Group of Thirty and the Bank of England suggest that derivative products do not introduce new risks into the financial system (Wood and Shaw, 1994).

However, it is generally agreed upon that there are some new risks associated with derivatives to individual users. The major risks include credit risk, market risk, legal risk and operational risk (GAO, 1994). Credit risk is the exposure to the possibility of financial loss resulting from a counterparty's failure to meet its financial obligations. It usually exists in OTC derivatives. Clearing houses function to eliminate the credit risk for both buyers and sellers in exchanged-run transactions. Market risk is the exposure to the possibility of financial loss resulting from unfavorable movements in interest rate and currency rates as well as equity and commodity prices. Market risk is more involved in speculation than in hedging. Legal risk is the exposure to the possibility of financial loss resulting from an action by a court or by a regulatory or legislative body that invalidates a derivative contract or prior derivative transactions. Legal risk is associated primarily with OTC contracts in the US, particularly with swaps. Operations risk is the exposure to the possibility of financial loss resulting from inadequate systems, management failure, faulty controls, fraud, or human error. Operation risk may compound the effect of other risks.

## **Implications of Financing Agriculture by Using Derivatives**

There are two basic categories of potential users of financial derivatives in agriculture: agricultural production units and financial intermediaries in agriculture. However, only the latter is the focus of this paper.

Financial intermediaries in agriculture refer to commercial banks, Farm Credit System (FCS), life insurance companies, trade credit especially by agribusiness firms, individuals and sellers financing, Farmers Home Administration (FmHA), Commodity Credit Corporation (CCC) and some other governmental lending institution (Barry et al. 1995). For farm real estate loans, normally with the maturity more than 10 years and less than 40 years, FCS (16.1%), commercial banks (14.8%), life insurance companies (6%) are listed as major financing institutions, according to the data in 1995. In the contrast, in 1995, commercial banks (24.8%), individual lenders (10.7%), FCS (8.6%) are the most important sources for intermediate or short-term non-real estate farm debts.

There are various kinds of risks involved with agriculture lenders in the United States. The most significant one, as applied to most financial institutions, is interest rate risk.

Financial deregulation, changing monetary policy, and rapidly fluctuating inflation rates have made market interest rates highly variable. It effects both agricultural borrowers and lenders ( Ladue and Leatham 1984). For the agricultural lenders, most commercial banks and FCS have used floating or variable rates, particularly on longer-term farm loan. Life insurance companies generally have not adopted floating rates. In recent years they typically offer loans with shorter maturities and a provision for interest rate adjustment every 5 years (Barry et al. 1995). The FmHA does not use variable rates. In sum, the major sources of credit to agriculture involve risks associated with floating-rate versus fixed-rate and short-term versus long-term loans.

From the perspectives of agricultural borrowers, they have the same kinds of interest rate risks as lenders but in the reverse directions. Conventional fixed-rate agricultural loans with no prepayment penalties protect agricultural borrowers from upward movements of interest rates and allow them to take advantage of downturns, but things have been changing. During 1980-81, bearing of interest rate risks by agricultural borrowers inflicted losses on their fixed-rate borrowing. Agricultural borrowers can manage these risks by themselves, but may be better off to transfer the risks to agricultural lenders.

Interest rate risk seriously affects the availability of agricultural credit. Based on data on non-real estate agricultural lending by commercial banks in Texas, Betubiza and Leatham (1993) showed that banks have reduced their agricultural loan portfolios in response to increased use of interest sensitive deposits after deregulation since 1980; some banks even stopped making agricultural loans. Quite logically, it can be expected

that the new opportunities for agricultural lenders to manage interest rate risk provided by prudent use of financial derivative may help overturn the unsatisfactory trend.

To manage interest rate risks, large agricultural lenders such as some large commercial banks, life insurance companies, and Farm Credit Banks (FCBs) are the primary users of financial derivatives, particularly interest rate derivatives. Ways of utilizing financial derivatives by these two major agricultural lenders, commercial banks and life insurance companies are discussed as above. However, smaller commercial banks are inactive in participating in the financial derivative markets, and the agricultural banks are mostly smaller banks. Thus, there is much potential left to further finance agriculture by employing derivative instruments.

Now let's turn to specialized farm lending institutions. FCS is the most important among specialized farm lending institutions. In general, FCS is still a modest participant in financial derivative markets (FCA work group report, 1995). Most Farm Credit Banks (FCBs) use only interest rate swaps, which constitute 98 percent of off-balance sheet uses of derivatives. The total outstanding notional amount reached \$13.0 billion as of December 31, 1994, with a credit risk exposure of \$60 million. Swaps are used to lower funding costs or for interest rate management in the FCS. Two typical use of derivatives by FCS are illustrated in greater details (Pederson and Maginnis, 1985). In one example, a St. Paul FCS bank, wanted to shorten the effective maturity of FCS bond portfolio by replacing fixed-rate interest payments with a floating-rate commitment repriced at 6-month intervals. The FCS bank entered a swap and became the floating-rate payer in the swap with the reset based on the Farm Credit bond coupon rate. Later, due to the decline of interest rates and reduced cost of 6-month FCS bonds, the FCS bank received net interest payments in each period and also improved its debt structure. Another study showed that the Treasury bill futures can be used by the Bank for Cooperatives to hedge against unanticipated increase in its 6-months ahead borrowing costs (Severn, 1985).

In sum, using derivatives is beneficial to agriculture because (1) agricultural lenders can lower their funding cost and thus very probably reduce the interest expense of agricultural production units; (2) agricultural lenders can have greater access to more capital market and thus provide more credit sources to agriculture; (3) agricultural lenders can have more flexible ways to manage interest risks and thus provide loans with more favorable terms (such as lower minimum amount of a loan) to serve agricultural production; (4) agricultural lenders can also reduce or transfer the risks inherent in agricultural production in other indirect ways. Agricultural lenders, for example, can act as brokers or counterparties for agribusinesses in OTC derivative transactions, particularly in interest rate swaps (Covey, 1996). In this case, assumption of a counterparty's role is easier than as a broker. Farmers holding fixed-rate or variable rate loans can protect themselves against unfavorable interest rate movements by entering an appropriate OTC interest rate derivative contract.

Finally, there are greater disadvantages of using certain instruments when financial derivatives are applied to finance agriculture. Since agricultural banks with

smaller asset levels are the biggest farm lenders (AIS-60, 1996), the higher cost may often cause financial options unfeasible to agricultural banks and thus to finance agriculture to some extent. Financial options were found to be prohibitively expensive to hedge interest rates (Leatham and Baker ,1988). In contrast, inexpensive means of hedging, like swaps and futures, are more attractive.

In conclusion, proper use of financial derivatives is beneficial to lenders and further to customers they serve. This is extremely important to prevent American agriculture from financial distress which happened before. Some successful strategies in employing financial derivatives by major lenders reported in the paper can help financial intermediaries better utilize the new financial instruments.

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